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The official scientific journal of the International Anesthesia Research Society®, The Society of Cardiovascular Anesthesiologists, the Society for Pediatric Anesthesia, the Society for Ambulatory Anesthesia, the International Society for Anaesthetic Pharmacology, the Society for Technology in Anesthesia, the Anesthesia Patient Safety Foundation, the Society of Critical Care Anesthesiologists, and the Society for Obstetric Anesthesia and Perinatology.

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Abstracts of Posters Presented at the International Anesthesia Research Society IARS 2012 Annual Meeting Boston, Massachusetts May 18-21, 2012

Abstracts (by category):

Authors submitting abstracts have certified that if human research is reported, approval by an institutional human research committee has been obtained, or if animal research is reported, the usual standards and guidelines for animal care have been followed. Material published in this supplement has not undergone review by the Editorial Board of *Anesthesia and Analgesia.* Any of the abstracts in this supplement may have been transmitted by the author to IARS in various forms of electronic medium. IARS has used its best efforts to receive and format electronic submissions for publication in this supplement but has not reviewed each abstract for the purpose of textual error correction and is not liable in any way for any formatting, textual or grammatical error or inaccuracy.

IARS 2012 Annual Meeting
Abstract Presentation Schedule

Ambulatory Anesthesia – 1

S-01	Sabouri, A	Saturday	4:30 PM
S-02	Rasmussen, M	Saturday	4:30 PM
S-03	Rosenberg, N	Saturday	4:30 PM
S-04	Silverberg, M	Saturday	4:30 PM
S-05	Ootaki, C	Saturday	4:30 PM

Ambulatory Anesthesia – 2

S-07	Gombar, S	Friday	10:00 AM
S-08	May, J	Friday	10:00 AM
S-09	Rosero, E	Friday	10:00 AM

Ambulatory Anesthesia – 3

S-10	May, J	Sunday	1:00 PM
S-11	Withdrawn		
S-12	Yoshida, A	Sunday	1:00 PM
S-13	Rosero, E	Sunday	1:00 PM
S-14	Srivastava, S	Sunday	1:00 PM

Bleeding / Blood Product Conservation – 1

S-20	Mudumbai, S	Friday	10:00 AM

Cardiothoracic and Vascular - Basic Science – 1

S-26	Hare, G	Saturday	1:00 PM
S-27	Lotz, C	Saturday	1:00 PM
S-28	Hare, G	Saturday	1:00 PM
S-29	Withdrawn		

Cardiothoracic and Vascular - Basic Science – 2

S-30	Steppan, J	Sunday	8:00 AM
S-31	Woodford, S	Sunday	8:00 AM
S-32	Woodford, S	Sunday	8:00 AM
S-33	Eng, R	Sunday	8:00 AM
S-34	Wang, A	Sunday	8:00 AM
S-35	Tischer-Zeitz, T	Sunday	8:00 AM

Cardiothoracic and Vascular - Basic Science – 3

S-36	Theisen, M	Sunday	10:00 AM
S-37	Theisen, M	Sunday	10:00 AM
S-38	Riess, M	Sunday	10:00 AM
S-39	Abaz, M	Sunday	10:00 AM
S-40	Theilmeier, G	Sunday	10:00 AM
S-41	Larmann, J	Sunday	10:00 AM

Cardiothoracic and Vascular - Clinical – 1

S-47	Assaad, S	Friday	1:00 PM
S-48	Bradford, W	Friday	1:00 PM
S-49	Yoshimura, T	Friday	1:00 PM
S-50	Assaad, S	Friday	1:00 PM
S-51	Komatsu, R	Friday	1:00 PM
S-52	Raphael, J	Friday	1:00 PM

Cardiothoracic and Vascular - Clinical – 2

S-53	Kar, S	Friday	3:00 PM
S-54	Mikami, D	Friday	3:00 PM
S-55	Ringenberg, K	Friday	3:00 PM
S-56	Terao, Y	Friday	3:00 PM
S-57	Huffmyer, J	Friday	3:00 PM

Cardiothoracic and Vascular - Clinical – 3

S-58	Voskanian, S	Sunday	8:00 AM
S-59	Pothula, S	Sunday	8:00 AM
S-60	Woodford, S	Sunday	8:00 AM
S-61	Buehler, J	Sunday	8:00 AM
S-62	Wijeysundera, D	Sunday	8:00 AM
S-63	Fujii, K	Sunday	8:00 AM
S-64	Sharma, A	Sunday	8:00 AM

Cardiothoracic and Vascular - Clinical – 4

S-65	Withdrawn		
S-66	Withdrawn		
S-67	Raphael, J	Sunday	10:00 AM
S-68	Lessa, M. A.	Sunday	10:00 AM
S-69	Lurati Buse, G	Sunday	10:00 AM
S-70	Farar, D	Sunday	10:00 AM

Cardiothoracic and Vascular - Clinical – 5

S-71	Withdrawn		
S-72	Arya, V	Sunday	3:00 PM
S-73	Raghunathan, K	Sunday	3:00 PM
S-74	Yin, J	Sunday	3:00 PM
S-75	Yin, J	Sunday	3:00 PM
S-76	Snyder, M	Sunday	3:00 PM
S-77	Avagliano, E	Sunday	3:00 PM

Critical Care Medicine and Trauma – 1

S-155	Patel, S	Friday	3:00 PM
S-156	Amhaz, H	Friday	3:00 PM
S-157	Attaallah, A	Friday	3:00 PM
S-158	Hatakeyama, N	Friday	3:00 PM
S-159	Kanai, R	Friday	3:00 PM
S-160	Kumar, M	Friday	3:00 PM

Critical Care Medicine and Trauma – 2

S-161	Withdrawn		
S-162	Fuchs, R	Saturday	10:00 AM
S-163	Tokuda, K	Saturday	10:00 AM
S-164	Kida, K	Saturday	10:00 AM

Critical Care Medicine and Trauma – 3

S-165	Kosaka, Y	Sunday	10:00 AM
S-166	Urner, M	Sunday	10:00 AM
S-167	Peña, C	Sunday	10:00 AM
S-168	Withdrawn		
S-169	Herrmann, I	Sunday	10:00 AM

IARS 2012 Annual Meeting
Abstract Presentation Schedule

Critical Care Medicine and Trauma – 4

S-170 ... Mascia, M ... Sunday ... 1:00 PM
S-171 ... Rajaratnam, C ... Sunday ... 1:00 PM
S-172 ... Galiatsou, E ... Sunday ... 1:00 PM
S-173 ... Lehmann, C ... Sunday ... 1:00 PM
S-174 ... Hudcova, J ... Sunday ... 1:00 PM

Economics – 1

S-180 ... Lundberg, J ... Saturday ... 8:00 AM
S-181 ... Targ, A ... Saturday ... 8:00 AM
S-182 ... Targ, A ... Saturday ... 8:00 AM
S-183 ... Quraishi, T ... Saturday ... 8:00 AM
S-184 ... Lurati Buse, G ... Saturday ... 8:00 AM
S-185 ... Agarwal, S ... Saturday ... 8:00 AM
S-186 ... Withdrawn

Education and Patient Safety – 1

S-192 ... Fukushima, Y ... Friday ... 10:00 AM
S-193 ... Fujita, Y ... Friday ... 10:00 AM
S-194 ... Panjwani, A ... Friday ... 10:00 AM
S-195 ... Baker, K ... Friday ... 10:00 AM
S-196 ... Yorozu, T ... Friday ... 10:00 AM
S-197 ... Patel, S ... Friday ... 10:00 AM

Education and Patient Safety –2

S-198 ... Pisklakov, S ... Friday ... 1:00 PM
S-199 ... Ng, V ... Friday ... 1:00 PM
S-200 ... Stol, I ... Friday ... 1:00 PM
S-201 ... Kariya, T ... Friday ... 1:00 PM
S-202 ... Rebello, E ... Friday ... 1:00 PM
S-203 ... Burkle, C ... Friday ... 1:00 PM

Education and Patient Safety – 3

S-204 ... Tsai, M ... Sunday ... 8:00 AM
S-205 ... Mitchell, J ... Sunday ... 8:00 AM
S-206 ... Lin, N ... Sunday ... 8:00 AM
S-207 ... Molloy, B ... Sunday ... 8:00 AM
S-208 ... Epstein, R ... Sunday ... 8:00 AM
S-209 ... Herasevich, V ... Sunday ... 8:00 AM
S-210 ... Morrison, A ... Sunday ... 8:00 AM

Education and Patient Safety – 4

S-211 ... Jameson, L ... Saturday ... 1:00 PM
S-212 ... Kim, C ... Saturday ... 1:00 PM
S-213 ... Jameson, L ... Saturday ... 1:00 PM
S-214 ... Sørensen, M ... Saturday ... 1:00 PM
S-215 ... Navedo, A ... Saturday ... 1:00 PM

Education and Patient Safety – 5

S-216 ... Grande, B ... Saturday ... 8:00 AM
S-217 ... Levine, D ... Saturday ... 8:00 AM
S-218 ... Bernstein, W ... Saturday ... 8:00 AM
S-219 ... Dauber, B ... Saturday ... 8:00 AM
S-220 ... Jafari, A ... Saturday ... 8:00 AM
S-221 ... Saumande, B ... Saturday ... 8:00 AM
S-222 ... May, J ... Saturday ... 8:00 AM

Education and Patient Safety – 6

S-223 ... Anderson, J ... Sunday ... 1:00 PM
S-224 ... Barnet, C ... Sunday ... 1:00 PM
S-225 ... Boone, L ... Sunday ... 1:00 PM
S-226 ... Patel, H ... Sunday ... 1:00 PM
S-227 ... Yin, J ... Sunday ... 1:00 PM
S-228 ... Wagner, R ... Sunday ... 1:00 PM
S-229 ... Matyal, R ... Sunday ... 1:00 PM
S-230 ... Muret-Wagstaff, S ... Sunday ... 1:00 PM

Education and Patient Safety – 7

S-231 ... Lau, J ... Saturday ... 4:30 PM
S-232 ... Wanderer, J ... Saturday ... 4:30 PM
S-233 ... Bause, G ... Saturday ... 4:30 PM
S-234 ... Thackeray, E ... Saturday ... 4:30 PM
S-235 ... Montoya, R ... Saturday ... 4:30 PM
S-236 ... Chau, D ... Saturday ... 4:30 PM

Equipment Monitoring – 1

S-242 ... Ali, M ... Friday ... 10:00 AM
S-243 ... Al Rawahi, K. S. ... Friday ... 10:00 AM
S-244 ... Liaw, C. M. ... Friday ... 10:00 AM
S-246 ... Peterfreund, R ... Friday ... 10:00 AM
S-256 ... Stol, I ... Friday ... 10:00 AM

Equipment Monitoring –2

S-247 ... Targ, A ... Saturday ... 3:00 PM
S-248 ... Kawakami, H ... Saturday ... 3:00 PM
S-249 ... Tampo, A ... Saturday ... 3:00 PM
S-250 ... El-Hadi, S ... Saturday ... 3:00 PM
S-251 ... Withdrawn
S-252 ... Miyake, Y ... Saturday ... 3:00 PM

Equipment Monitoring –3

S-253 ... Kawanishi, S ... Saturday ... 1:00 PM
S-254 ... Rothfield, K ... Saturday ... 1:00 PM
S-255 ... Dimache, F ... Saturday ... 1:00 PM
S-257 ... Riess, M ... Saturday ... 1:00 PM
S-258 ... Yamashita, K ... Saturday ... 1:00 PM

Equipment Monitoring – 4

S-259 ... Dote, K ... Saturday ... 4:30 PM
S-260 ... Saththasivam, P ... Saturday ... 4:30 PM
S-261 ... Li, Z ... Saturday ... 4:30 PM
S-262 ... Yoshida, A ... Saturday ... 4:30 PM
S-263 ... Zheng, X ... Saturday ... 4:30 PM

Equipment Monitoring – 5

S-264 ... Okino, S ... Sunday ... 1:00 PM
S-265 ... Terada, T ... Sunday ... 1:00 PM
S-266 ... Sharpe, M ... Sunday ... 1:00 PM
S-267 ... Yeh, J-R ... Sunday ... 1:00 PM
S-268 ... Saito, J ... Sunday ... 1:00 PM
S-269 ... Emanuel, A ... Sunday ... 1:00 PM

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Abstract Presentation Schedule

Equipment Monitoring –6

S-270 ... Gebre-Amlak, K ..... Sunday ..... 3:00 PM
S-271 ... Marks, R ..... Sunday ..... 3:00 PM
S-272 ... Withdrawn
S-273 ... Targ, A..... Sunday ..... 3:00 PM
S-274 ... Fortier, L. P. ..... Sunday ..... 3:00 PM

Geriatrics – 1

S-280 ... Uchida, M ..... Saturday ..... 3:00 PM
S-281 ... Withdrawn
S-282 ... Withdrawn
S-283 ... Withdrawn
S-284 ... Tse, J. T. C..... Saturday ..... 3:00 PM
S-285 ... Mehta, T ..... Saturday ..... 3:00 PM

Geriatrics – 2

S-286 ... Kendale, S..... Friday..... 1:00 PM
S-287 ... Murdoch, J ..... Friday..... 1:00 PM
S-288 ... Yang, J..... Friday..... 1:00 PM
S-289 ... Shyam, V ..... Friday..... 1:00 PM
S-290 ... Krenk, L ..... Friday..... 1:00 PM
S-291 ... Rowan, C ..... Friday..... 1:00 PM

Liver / Transplantation –1

S-297 ... Ali, M..... Friday..... 3:00 PM
S-298 ... Shah, J..... Friday..... 3:00 PM
S-299 ... Kosaka, J..... Friday..... 3:00 PM
S-300 ... ASHRAFI, B..... Friday..... 3:00 PM
S-302 ... Yang, J..... Friday..... 3:00 PM

Neuroanesthesia – 1

S-308 ... Withdrawn
S-309 ... Withdrawn
S-310 ... Goettel, N..... Saturday ..... 8:00 AM
S-311 ... Cui, D..... Saturday ..... 8:00 AM
S-312 ... Haile, M ..... Saturday ..... 8:00 AM
S-313 ... Cui, D..... Saturday ..... 8:00 AM
S-314 ... Withdrawn

Neuroanesthesia –2

S-315 ... Tiwari, A ..... Sunday ..... 8:00 AM
S-316 ... Monteiro, J ..... Sunday ..... 8:00 AM
S-317 ... Naik, B ..... Sunday ..... 8:00 AM
S-318 ... Withdrawn
S-319 ... Shilo, D ..... Sunday ..... 8:00 AM
S-321 ... Giffard, R. G. ..... Sunday ..... 8:00 AM

Obstetric Anesthesia – 1

S-327 ... Stiles, K..... Friday..... 10:00 AM
S-328 ... Hua, F ..... Friday..... 10:00 AM
S-329 ... Patel, S ..... Friday..... 10:00 AM
S-330 ... Terkawi, A..... Friday..... 10:00 AM
S-331 ... Li, Q..... Friday..... 10:00 AM

Obstetric Anesthesia – 2

S-332 ... Patteson, S..... Saturday ..... 1:00 PM
S-333 ... Collins, B ..... Saturday ..... 1:00 PM
S-334 ... Liu, Y ..... Saturday ..... 1:00 PM
S-335 ... Withdrawn
S-336 ... Withdrawn

Pain - Basic Science – 1

S-342 ... Nishiyama, T..... Sunday ..... 3:00 PM
S-343 ... Kroin, J ..... Sunday ..... 3:00 PM
S-344 ... Kroin, J ..... Sunday ..... 3:00 PM

Pain - Basic Science – 2

S-346 ... Takasusuki, T ..... Saturday ..... 8:00 AM
S-348 ... Du, J ..... Saturday ..... 8:00 AM
S-349 ... Lessa, M. A. ..... Saturday ..... 8:00 AM
S-350 ... Kroin, J ..... Saturday ..... 8:00 AM

Pain - Clinical – Acute – 1

S-356 ... Boscariol, R ..... Friday..... 3:00 PM
S-357 ... Buvanendran, A..... Friday..... 3:00 PM
S-358 ... Doi, K ..... Friday..... 3:00 PM
S-359 ... Buvanendran, A..... Friday..... 3:00 PM
S-360 ... Tomar, G ..... Friday..... 3:00 PM
S-361 ... Sun, Y..... Friday..... 3:00 PM

Pain – Clinical – Acute – 2

S-362 ... Zhao, H ..... Saturday ... 10:00 AM
S-363 ... Candiotti, K..... Saturday ... 10:00 AM
S-364 ... Cierny, G..... Saturday ... 10:00 AM
S-365 ... Sadhasivam, S..... Saturday ... 10:00 AM
S-366 ... Gan, T.J. ..... Saturday ... 10:00 AM

Pain - Clinical – Chronic – 1

S-372 ... Hattori, S..... Sunday ..... 8:00 AM
S-373 ... Mamiya, K ..... Sunday ..... 8:00 AM
S-374 ... Buvanendran, A..... Sunday ..... 8:00 AM
S-375 ... Durkin, B ..... Sunday ..... 8:00 AM
S-376 ... Withdrawn

Pediatric Anesthesia: General Topics – 1

S-382 ... Terkawi, A..... Friday..... 1:00 PM
S-383 ... Fujii, S..... Friday..... 1:00 PM
S-384 ... Fukuhara, A..... Friday..... 1:00 PM
S-385 ... Gombar, S ..... Friday..... 1:00 PM
S-386 ... Maru, A ..... Friday..... 1:00 PM
S-387 ... Ludwig, E ..... Friday..... 1:00 PM

Pediatric Anesthesia: General Topics – 2

S-388 ... Withdrawn
S-389 ... Targ, A..... Saturday ... 10:00 AM
S-390 ... Bjerregaard, J..... Saturday ... 10:00 AM
S-392 ... Chrysostomou, C ..... Saturday ... 10:00 AM
S-393 ... Hammer, G..... Saturday ... 10:00 AM

IARS 2012 Annual Meeting
Abstract Presentation Schedule

Pediatric Anesthesia: Neonatal Safety and Anesthetics – 1

S-399 ... Zhu, R ... Saturday ... 3:00 PM
S-400 ... Diaz, L ... Saturday ... 3:00 PM
S-401 ... Levy, R ... Saturday ... 3:00 PM
S-402 ... Koo, E ... Saturday ... 3:00 PM

Pediatric Anesthesia: Neonatal Safety and Anesthetics – 2

S-403 ... Bong, C ... Sunday ... 3:00 PM
S-404 ... Makaryus, R ... Sunday ... 3:00 PM
S-405 ... Johnson-Akeju, O ... Sunday ... 3:00 PM
S-406 ... Bajic, D ... Sunday ... 3:00 PM

Pharmacology - Basic Science – 1

S-412 ... Perouansky, M ... Saturday ... 8:00 AM
S-413 ... Withdrawn
S-414 ... Withdrawn
S-415 ... Goodchild, C ... Saturday ... 8:00 AM
S-416 ... Ma, H ... Saturday ... 8:00 AM
S-417 ... Piegeler, T ... Saturday ... 8:00 AM

Pharmacology - Basic Science – 2

S-418 ... Forman, S ... Saturday ... 1:00 PM
S-419 ... Withdrawn
S-420 ... Sinner, B ... Saturday ... 1:00 PM
S-421 ... Forman, S ... Saturday ... 1:00 PM
S-422 ... Dershwitz, P ... Saturday ... 1:00 PM

Pharmacology - Basic Science – 3

S-423 ... Withdrawn
S-424 ... Ishizawa, Y ... Sunday ... 8:00 AM
S-425 ... Yuki, K ... Sunday ... 8:00 AM
S-426 ... Lessa, M.A. ... Sunday ... 8:00 AM
S-427 ... Forman, S ... Sunday ... 8:00 AM

Pharmacology - Basic Science – 4

S-429 ... Mishima, Y ... Saturday ... 4:30 PM
S-430 ... LaPierre, C ... Saturday ... 4:30 PM
S-431 ... Lengl, O ... Saturday ... 4:30 PM
S-432 ... Theisen, M ... Saturday ... 4:30 PM
S-433 ... Lin, J ... Saturday ... 4:30 PM

Pharmacology - Basic Science – 5

S-434 ... Yamaguchi, K ... Sunday ... 10:00 AM
S-435 ... Theisen, M ... Sunday ... 10:00 AM
S-436 ... Orser, B ... Sunday ... 10:00 AM
S-437 ... Murphy, K ... Sunday ... 10:00 AM
S-438 ... Zhang, X ... Sunday ... 10:00 AM
S-439 ... Wu, J ... Sunday ... 10:00 AM

Pharmacology - Clinical – 1

S-445 ... Terasako, K ... Saturday ... 3:00 PM
S-446 ... Withdrawn
S-447 ... Van Haelst, I.M.M. ... Saturday ... 3:00 PM
S-448 ... Tanno, M ... Saturday ... 3:00 PM
S-449 ... Mirzakhani, H ... Saturday ... 3:00 PM

Pharmacology - Clinical – 2

S-450 ... Withdrawn
S-451 ... Amornyotin, S ... Saturday ... 10:00 AM
S-452 ... Iwasaki, H ... Saturday ... 10:00 AM
S-453 ... Jeleazcov, C ... Saturday ... 10:00 AM
S-455 ... Desjardins St-Jean, O ... Saturday ... 10:00 AM

Pharmacology - Clinical – 3

S-456 ... Zheng, X ... Sunday ... 10:00 AM
S-457 ... Asimolowo, O ... Sunday ... 10:00 AM
S-458 ... Takahoko, K ... Sunday ... 10:00 AM
S-459 ... Kurosaki, H ... Sunday ... 10:00 AM
S-460 ... Lurati Buse, G ... Sunday ... 10:00 AM

Pharmacology - Clinical – 4

S-461 ... Lurati Buse, G ... Sunday ... 3:00 PM
S-462 ... LaPierre, C ... Sunday ... 3:00 PM
S-463 ... Lurati Buse, G ... Sunday ... 3:00 PM
S-464 ... Morioka, N ... Sunday ... 3:00 PM
S-465 ... Meissner, K ... Sunday ... 3:00 PM
S-466 ... Soon Im, K ... Sunday ... 3:00 PM

Regional Anesthesia – 1

S-472 ... Alrayashi, W ... Friday ... 3:00 PM
S-473 ... Withdrawn
S-474 ... Kolodzie, K ... Friday ... 3:00 PM
S-475 ... Samhan, Y ... Friday ... 3:00 PM
S-476 ... Al Mahrami, M ... Friday ... 3:00 PM
S-477 ... Ogura, A ... Friday ... 3:00 PM

Regional Anesthesia – 2

S-478 ... Traiyawong, R ... Saturday ... 10:00 AM
S-479 ... Withdrawn
S-480 ... Withdrawn
S-481 ... De Oliveira, G ... Saturday ... 10:00 AM

Regional Anesthesia – 3

S-482 ... Liu, J ... Saturday ... 3:00 PM
S-483 ... Manis, E ... Saturday ... 3:00 PM
S-484 ... Li, Z ... Saturday ... 3:00 PM
S-485 ... Bae, J ... Saturday ... 3:00 PM
S-486 ... Withdrawn

Regional Anesthesia – 4

S-487 ... McClain, R ... Sunday ... 1:00 PM
S-488 ... Kaur, B ... Sunday ... 1:00 PM
S-489 ... Kaur, B ... Sunday ... 1:00 PM
S-490 ... Ma, H ... Sunday ... 1:00 PM
S-491 ... Withdrawn
S-492 ... Hsu, Y ... Sunday ... 1:00 PM
S-493 ... Wallace, A ... Sunday ... 1:00 PM

Ambulatory Anesthesia

S-01.

IS THE BIS INDEX A RELIABLE AND ACCURATE PREDICTOR OF AIRWAY OBSTRUCTION AND SEDATION QUALITY IN OUTPATIENT SEDATION IN DENTAL CLINIC?

AUTHORS: A. S. Sabouri[1,2], C. Heard1, P. R. Creighton[1], A. N. Shepherd[1]

AFFILIATION: [1]Anesthesiology, SUNY at Buffalo, Buffalo, MA; [2]Anesthesiology, Critical Care and Pain Medicine, MGH, Boston, MA

INTRODUCTION: During procedures performed under deep sedation, periods of apnea, airway obstruction and hypoxia can occur. 1 In this study we evaluated the efficacy of using the BIS monitor to determine the depth of sedation associated with airway obstruction also to test the efficacy of the BIS in predicting the patient movement as reflected by the surgeon's assessment.

METHODS: After IRB review and approval, 47 patients scheduled for elective 3rd molar teeth extraction in the dental clinic were recruited for this study. Written, informed consent/assent was obtained from each patient. After establishing IV access, a BIS monitor strip was placed. A standardized sedation regimen, including a total of 4 mg midazolam, 100 mcg fentany[1] followed by propofol titrated in 10 mg increments to effect was used. The appropriateness/quality of the level of sedation was evaluated by the surgeon and the occurrence of any airway complications was assessed by the sedation provider. All staff were blinded to the BIS index values.

RESULTS: Most patients were ASA class 1 or 2 (97.5%). Average age was 17.3 (SD=1.4), BMI of 26.8 (SD= 6.5).Airway obstruction occurred in 26 cases (65%) with desaturation in further 8 cases (20%). During airway obstruction episodes, the mean BIS index (In one minute period) was 64 (±10.2), which was significantly lower than the BIS during non obstructed sedation (77 ±11.6). (P<0.001).By using ROC analysis, almost all airway complications (sensitivity: 99%) occurred at a BIS level of less than 81. A BIS of < 52 was associated with an airway complication in 98% of the cases (specificity). A BIS of > 81 appears to be safe with respect to airway complications. A BIS of < 52 can be considered a very high risk for airway complication (Table).Those patients who by surgical assessment were considered to have significant movement had a mean BIS (±SD) of 74.1 (±7.9). The mean BIS score in movers and non-movers cases were significantly higher (P< 0.01) then obstructed cases (Figure).

DISCUSSION: The BIS can be used to aid in sedation titration during dental procedures. Patients with a BIS index > 80 were moderately sedated, during which airway patency was preserved. Airway obstruction and over-sedation is a very common complication during office deep sedation with propofol titration regimen. Titrating the sedation to a BIS of about 65 may reduce the incidence of airway problems and as such may increase safety of office sedation by non- anesthesia practitioners. The quality of block and complexity of cases are the confounding factors that limited usage of BIS monitor in this regard.

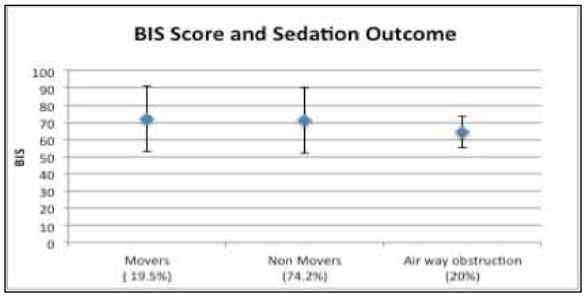
REFERENCES:

1. Hybarger S E, Sloan T B, SNAP Index with Light Anesthesia and MAC during Surgery. Anesthesiology 2003; 99: A330

Table. Sensitivity and Specificity of The BIS Index in Order to Detect The Airway Complication by Using ROC Analysis

BIS	SENSITIVITY (%)	SPECIFICITY(%)
81	99	37
75	80	57
67	62	80
60	33	90
52	10	98

Area Under The Curve 0.75



S-02.

EVALUATION OF DEXMEDETOMIDINE/PROFOFOL (D/P) COMBINATION ANESTHESIA FOR PATIENTS WITH OBSTRUCTIVE SLEEP APNEA (OSA) CHARACTERISTICS DURING UPPER GASTROINTESTINAL (GI) ENDOSCOPY

AUTHORS: M. S. Hannallah[1], M. Rasmussen[1], J. Carroll[2], A. Charabaty[2], C. Palese[2], N. Haddad[2]

AFFILIATION: [1]Department of Anesthesia, Georgetown University Hospital, Washington, DC; [2]Department of Gastroenterology, Georgetown University Hospital, Washington, DC

INTRODUCTION: Patients with OSA are at increased risk of anesthesia-related morbidity and mortality.1 That risk may justify endotracheal (ET) intubation during anesthesia for upper GI endoscopy in OSA patients. Dexmedetomidine provides sedation with minimal respiratory depression.2 This observational study prospectively evaluated the efficacy and safety of D/P anesthesia for patients with OSA characteristics without ET intubation during upper GI endoscopy.

METHODS: With IRB approval 20 consented patients undergoing upper GI endoscopy alone or with ultrasound examination, Barrx procedure, or colonoscopy were enrolled in the study. All patients were considered high probability of having OSA based on an adjusted neck circumference greater than 48 cm.3 (Table 1) Dexmedetomidine 1 mcg/kg (maximum 100 mcg) was given over 10 min followed by propofol boluses until adequate depth of anesthesia was achieved. Propofol infusion was used to maintain anesthesia. BP, HR, and O2 saturation were recorded before, during, and after the procedure. The endoscopists evaluated the anesthesia conditions on a 10 points numerical scale (10 = perfect). PACU phase 1 time was recorded. The following day, patients were questioned about complications and were asked to evaluate their overall anesthesia experience on a 10 points numerical scale (10 = perfect). Propofol induction dose and phase 1 time were compared to data we acquired from a different but comparable IRB approved study using only propofol for anesthesia in patients without OSA.

RESULTS: 15 males and 5 females aged 51±8 years were enrolled. Their BMI was 34.7±8.4, and their modified neck circumference was 53.4±3.4 cm. 7 had positive OSA diagnoses. Propofol induction dose was 0.8±0.4 mg/kg; and phase 1 time was 67.5±26.7 min. (In the propofol only study we used for comparison, the induction dose was 2.0±0.5 mg/kg and phase 1 time was 33.4±5.9 min). Two patients developed transient hypoxemic episodes during the procedure that were easily corrected with airway maneuvers. Transient hypotension requiring vasopressor support was experienced by 3 patients during the procedure and 3 patients in PACU. The evaluation score was 9±1.7 by the endoscopists, and 8±2.3 by the patients. Post-discharge, drowsiness was common, 2 patients reported dysphoric symptoms, and one patient complained of dry mouth.

DISCUSSION: P/D can provide satisfactory anesthesia for upper GI endoscopy in OSA patients. The technique provides an alternative to ET intubation in these high risk patients. The prolonged induction and recovery times, however, may limit its routine use.

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1. Anesth Analg 2008;107(5):1543-63.

2. Anesth Analg 2010;110(1):47-56.

3. N Engl J Med 2002;347(7):498-504.

Table 1: OSA Risk / Modified Neck Circumference.

1) Neck circumference in cm.
2) H/O snoring: add 3 points.
3) Hypertension: add 4 points.
4) Nighttime choking: add 3 points.
Total items 1-4. A score >48 indicates high probability of OSA.
Patient Satisfication

S-03.

THE EFFECTS OF A CUSTOMIZABLE, OFFICE-BASED SURGICAL SAFETY CHECKLIST ON THE RATES OF KEY PATIENT SAFETY INDICATORS

AUTHORS: N. Rosenberg[1], S. Gallagher[2], J. Stenglein[3], R. Urman[3], P. Hess[3], F. E. Shapiro[3]

AFFILIATION: [1]University of Massachusetts Medical School, Worcester, MA; [2]Tufts University School of Medicine, Boston, MA; [3]Harvard Medical School, Boston, MA

INTRODUCTION: Recent hospital-based studies found that a comprehensive checklist used in an interdisciplinary, team-based setting resulted in a reduction in surgical complications as well as cost savings [1,2]. We developed a safety checklist template for use in the office surgery setting to determine the feasibility of its implementation and its effect on key patient safety indicators.

METHODS: Based on the W.H.O checklist, we developed a 28-element, perioperative checklist template for use in the office-based surgical setting (Figure 1). With focus-group input from office personnel, including surgeons, anesthesiologists, and nurses, the checklist was customized to an office-based plastic surgery practice and IRB approval obtained. We recorded baseline, pre-checklist rates for each checklist item as well as post-op adverse outcomes via a retrospective chart review of 219 cases. After an education program and 30-day run-in period, a prospective, post-checklist implementation chart review was initiated and is ongoing.

RESULTS: At baseline, 90% of charts were missing documentation of three or more checklist elements. 15% of cases had adverse events, of which pain (3.7%) and bleeding/bruising (3.2%) were most common. Preliminary analysis shows that documentation of several key safety indicators and practices increased to 90-100% (Figure 2).

DISCUSSION: We have demonstrated the feasibility of implementing a locally customized safety checklist in an office-based surgery setting, and that there is a measurable rate of adverse events that suggest potential for improvement. Use of the checklist was associated with increases in the rates of a number of important safety indicators and recommended practices. Improvement in practices such as site/side marking and the increase in discussion of patient preparation and critical events demonstrate an important change in the operating room environment because improved communication and teamwork are critical to any patient safety endeavor. The 90-100% increases in availability of case-specific equipment, confirmation of EMS policy, and availability of local anesthetic toxicity precautions demonstrate recognition by practitioners that effective rescue is impossible without access to the necessary materials and systems. Further work will define the impact of the checklist on adverse outcomes and its applicability to a range of different types of office settings.

REFERENCES:

1. de Vries EN et al. N Engl J Med. 2010;363(20):1928-37.

2. Semel ME et al. Health Aff (Millwood). 2010;29(9):1593-9.

Figure 2. Percentage of Positive Responses
Pre- and Post-Checklist Implementation

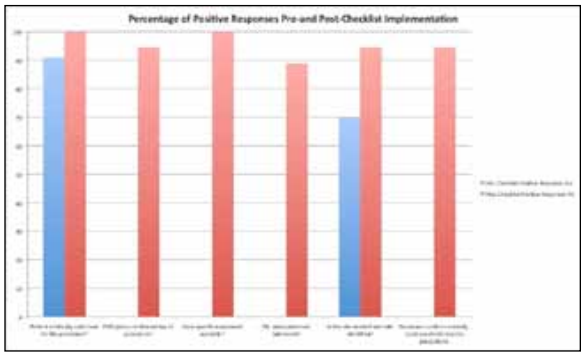
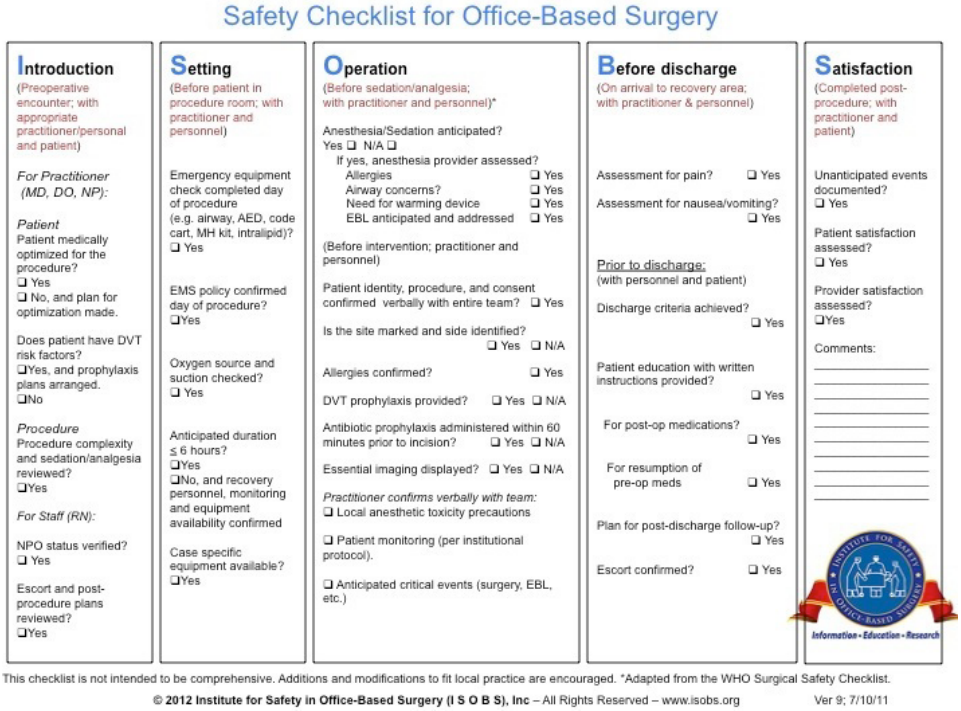


Figure 1. ISOBS Safety Checklist



S-04.

APREPITANT FOR THE PREVENTION OF POSTOPERATIVE NAUSEA AND VOMITING: A PROSPECTIVE, RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED STUDY IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

AUTHORS: M. B. Silverberg[1,2], V. R. Pothula[2], A. Schiavone[2], P. Muddasani[2], A. Madupu[2], S. Allanku[2]

AFFILIATION: [1]Anesthesiology, Toms River Surgery Center, Toms River, NJ; [2]Anesthesiology, Staten Island University Hospital, Staten Island, NY

INTRODUCTION: Neurokinin 1 receptor antagonists like aprepitant (AP) are anti-emetic. PONV occurs even among patients who receive standard antiemetic prophylaxis. We studied whether AP adds to the effects of dexamethasone (DX) and ondansetron (ON) in preventing PONV.

METHODS: One AP 40 mg or placebo tablet was randomly given to each study patient 30 minutes prior to surgery. All patients received a standardized anesthetic including propofol, fentanyl, rocuronium,isoflurane, nitrous oxide, neostigmine, and glycopyrrolate. All patients received DX 8 mg IV with induction, and ON 4 mg IV 20 minutes prior to emergence. No other antiemetics were used. All peri-op nausea or vomiting episodes were recorded. Using an 11-point verbal rating score, patients rated their nausea at pre op, PACU admission, and at 2, 24, 48 hrs, and 2 weeks after surgery, as well as just before receiving any rescue ON for nausea.

RESULTS: A total of 171 patients,mean age 48.4,were enrolled. 88 patients received AP; 83 received placebo. The fraction of patients with post-operative vomiting in the placebo group was significantly larger (13/83) than in the AP group (0/88)($P < 0.0001$). The verbal rating scores for nausea were slightly higher in the placebo group, but the results did not achieve significance. The two groups were similar demographically. No adverse event attributable to AP was observed. All 13 patients in the placebo group who vomited received rescue ON in the PACU. No patients who received AP vomited, so none received rescue medication.

DISCUSSION: Habib[2] compared AP/DX with ON/DX and found less post-operative vomiting with AP, but no difference in post-operative nausea. Gan[1] compared rolapitant with ON or placebo and found rolapitant to be superior to placebo at preventing PONV. Neither of these recent studies, however, addressed whether an NK-1 inhibitor would add to the anti-emetic efficacy of the current standard DX/ON regimen.

This study shows that AP is superior to placebo when added to DX/ON in preventing PONV. We deliberately enrolled only patients undergoing a known emetogenic operation (laparoscopic cholecystectomy),and we deliberately used a standardized, "real-world" anesthetic technique, rather than a specifically nausea-preventing technique.

REFERENCES:

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2. Habib, A.S. A comparison of aprepitant and dexamethasone versus the combination of ondansetron and dexamethasone for the prevention of post-operative nausea and vomiting in patients undergoing craniotomy. Anesthesia and Analgesia 2011: 112:813-818 esthesiology 2003; 99: A330

S-05.

DOES GENERAL ANESTHESIA INCREASE THE DIAGNOSTIC YIELD OF EUS-GUIDED FINE NEEDLE ASPIRATION OF PANCREATIC MASSES?

AUTHORS: C. Ootaki[1], T. Stevens[2], J. Vargo[2], Y. Jing[3], A. Shiba[3], W. G. Maurer[4]

AFFILIATION: [1]Anesthesiology, Wake Forest University, Winston-Salem, NC; [2]Digestive Disease Institute, Wake Forest University, Cleveland, OH; [3]Outcomes Research, Cleveland Clinic, Cleveland, OH; [4]Anesthesiology, Cleveland Clinic, Cleveland, OH

INTRODUCTION: Early diagnosis may improve the outcome and survival in patients with pancreatic cancer. Endoscopic Ultrasound-Guided Fine-Needle Aspiration(EUS-FNA) has emerged as a preferred method, combining attributes of safety, minimal invasiveness, and good yield. Diagnostic yield for EUS-FNA is affected by several factors, including endoscopist experience, type of needle, and use of an in-room cytopathologist. We are unaware of any data comparing the impact of sedation technique on the diagnostic yield of EUS-FNA in the diagnosis of solid pancreatic mass. Our objective was to determine the association between the sedation method employed and the diagnostic yield of EUS-FNA.

METHODS: This study was approved by the Institutional Review Board. A retrospective cohort study was conducted involving consecutive patients who received EUS-FNA for diagnosis of a solid pancreatic mass at our institution's gastrointestinal endoscopy units from 2007 to 2009. We compared the diagnostic yield of EUS-FNA between patients receiving general anesthesia (GA group) and conscious sedation with the combination of a benzodiazepine and opioid provided by a qualified registered nurse (CS group). In the GA group, a propofol (1 mg/kg) and alfentanil (5.0 μg/kg) loading was administered followed by a 100 - 50 μg/kg/min propofol infusion mixed with alfentanil 0.5 - 0.25 μg/kg/min, and a MacSafe® nasal cannula was used to administer oxygen and monitor end-tidal carbon dioxide. The EUS-FNA was defined as "successful" if it was completed, a specimen was obtained, and if a cytological diagnosis was obtained for the case. Secondary outcome included the rate of complications during or after the EUS-FNA procedure.

RESULTS: Of 371 patients, a cytological diagnosis was obtained in 73/88 patients (83%) in the GA group and 206/283 patients (73%) in the CS group. GA was associated with an increased odds of having a successful diagnosis as compared to CS (adjusted odds ratio, 95% CI: 2.04, 1.06-3.9, P = 0.03). There was no difference between the groups in rate of complications during or after the procedure (P = 0.99).

DISCUSSION: GA was associated with a significantly higher diagnostic yield of EUS-FNA. It is well known the EUS-FNA yield is in part controlled by the environment. However this is the first study that demonstrated that the sedation technique affected the diagnostic yield of EUS-FNA in the diagnosis of solid pancreatic lesions. Among the 77 patients who had a failed initial EUS-FNA diagnosis under CS, twenty one patients needed surgical laparotomy and thirty nine patients could not obtain histological diagnosis. GA should be considered a preferred sedation method for EUS-FNA of a solid pancreatic mass.

REFERENCES: N/A

Demographics and tumor characteristics

Variables	GA group (N = 88)	CS group (N =283)	P value *	Standardized Difference †
Age - yr	63 ± 14 a	66 ± 12	0.045 c	- 0.24 ‡
Gender, Female - %	50	47	0.62 d	0.06
Body mass index - kg/m2	27 [23, 29] a	26 [22, 30] b	0.62	0.06
Tumor location - %			0.04 d	0.45 ‡
Head of pancreas	70 a	59 a		
Neck of pancreas	3	2		
Body of pancreas	10	26		
Tail of pancreas	13	7		
Uncinate of pancreas	3	6		
Tumor type, Malignant (vs. Benign) - %	72	78	0.24 d	0.14 ‡
Size of tumor - cm2	12 [5, 28] a	12 [5, 28] b	0.74	0.04
Reason for biopsy, Image (vs. not) - %	80	88 a	0.05 d	0.26 ‡
Biopsy conducted by a fellow, Yes - %	28	12	< 0.001 d	0.41 ‡
Number of needles passed	3 [2, 3] a	3 [2, 4] b	0.67	0.06

Statistics were presented as mean ± SD, median [Q1, Q3], or %, as appropriate. a 1-6 patients and b 32-48 patients had a missing value * Wilcoxon rank-sum test, unless specified; c student's t test; and d Pearson's chi-squared test. † Standardized differences (GA-CS) in means or proportions divided by the pooled standard deviation; ‡ > 0.1 in absolute value suggests imbalance.

S-07.

PULMONARY MECHANICS DURING LAPAROSCOPIC CHOLECYSTECTOMY: A COMPARISON BETWEEN CUFFED ENDOTRACHEAL TUBE AND PROSEAL LMA

AUTHORS: S. Gombar[1], N. Bajaj[1], U. Dalal[2]

AFFILIATION: [1]Anaesthesia & Intensive Care, Government Medical College & Hospital, Sector 32, Chandigarh, India; [2]Surgery, Government Medical College & Hospital, Sector 32, Chandigarh, India

INTRODUCTION: Proseal LMA (PLMA) has been used for airway maintenance during laparoscopic cholecystectomy[1] however there is limited data regarding the effects of pneumoperitoneum on pulmonary mechanics with PLMA.[2] Objective of present study was to evaluate and compare the use of PLMA with a cuffed endotracheal tube (ETT) with regard to changes in pulmonary function in patients undergoing laparoscopic cholecystectomy.

METHODS: After written informed consent and institutional ethics committee approval, we studied one hundred patients (ASA physical status1/2), 18-60 years of age who were scheduled to undergo laparoscopic cholecystectomy under GA. Patients were randomly allocated to one of the two groups of 50 each. Group I: cuffed endotracheal tube and Group II ProSeal LMA. Patients as well as the surgeons were unaware of the airway device used. Insertion parameters, hemodynamic & ventilatory parameters (compliance,resistance and peak/plateau airway pressure) were measured at different time intervals before, during and after peumoperitoneum. The statistical analysis was carried out using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 15.0 for Windows).

RESULTS: Statistically significant ($p < 0.05$) but clinically insignificant difference was found in time taken for device insertion in the two groups (21.8 ± 5.9 s group I & 25.4 ± 5.7 s group II). Insertion of orogastric tube was easier and less number of attempts were required with PLMA. Hemodynamic parameters like heart rate, systolic, diastolic and mean blood pressures all increased after the ETT insertion while there was a decrease/no change after PLMA insertion. There was a significant decline in the pulmonary compliance in group II which was more pronounced after pneumoperitoneum. During pneumoperitoneum, higher peak and plateau airway pressures were noted in PLMA group than in ETT group.(TableI) After desufflation these parameters returned to near preinsufflation levels.There was no episode of arterial desaturation in either group.

DISCUSSION: Our results indicate that in the PLMA group, the degree of changes in pulmonary mechanics caused by the pneumoperitoneum were significant however there was no incidence of arterial desaturation, or gastric regurgitation. It may even be better than the ETT in hypertensive/cardiac patients due to better hemodynamic stability. Hence PLMA is a satisfactory airway device for laparoscopic cholecystectomy under GA, but further studies are required reagarding its safety in patients with decreased pulmonary compliance like morbid obesity or COPD.

REFERENCES:

1. Can J Anaesth 2002; 49:857-62
2. Anesth Analg 2000; 90: S1-523

Pulmonary Parameters

Parameters	Before Insufflation	Before Insufflation	During eumoperitoneum	During pneumoperitoneum	After desufflation	After desufflation
	Group I (ETT)	Group II (PLMA)	Group I (ETT)	Group II (PLMA)	Group I (ETT)	Group II (PLMA)
Compliance(ml/cmH_2O)	48.68±12.40	39.54±8.68	28.36±7.66	25.78±5.94	40.68±9.32	35.20±5.15
Resistance (cmH_2O/L/sec)	9.14±1.51	9.7±2.18	11.68±1.59	11.9±2.29	9.02±1.23	9.22±1.83
Peak Pressure (cm H_2O)	15.5±2.95	17.36±2.5	21.42±3.32	23.1±2.95	17.12±2.76	18.62±2.20
Plateau Pressure (cm H_2O)	13.42±2.87	15.6±2.57	18.84±3.12	21.14±2.63	14.72±2.43	16.82±2.30

$p<0.05$ when compared with the pre-pneumoperitoneal values, Figures are Mean±S.D.

S-08.

USING A STANDARDIZED AIRWAY AND ANESTHETIC TECHNIQUE IN MORBIDLY OBESE PATIENTS UNDERGOING BARIATRIC SURGERY: FACILITATING INTUBATION, AVOIDING MASK VENTILATION AND DECREASING DESATURATION

AUTHORS: Y. Bryan[1], T. Taylor[1], J. May[1], L. Hoke[1], M. Laxton[1], A. Fernandez[2]

AFFILIATION: [1]Anesthesiology, Wake Forest School of Medicine, Winston Salem, NC; [2]General Surgery, Wake Forest School of Medicine, Winston-Salem, NC

INTRODUCTION: Various airway/anesthetic techniques have been safely used in morbidly obese (MO) patients[1]; however, studies have focused on a single aspect of airway management, e.g., intubation[2]. A high incidence of airway-related problems has been found when measuring patient-centered (PC) outcomes of intubation, ventilation, and oxygenation (IVO)[3]. Differences exist regarding positioning, induction agents/doses, difficulty of bag mask ventilation (BMV), and choices of intubating devices. We measured the airway outcomes of IVO in MO patients undergoing bariatric surgery using a standardized airway and anesthetic technique.

METHODS: After IRB approval and informed consent, 116 patients were recruited. After premedication with midazolam 1-2 mg, patients were placed in reverse Trendelenburg and preoxygenated for 4 min. IV induction was performed with propofol, succinylcholine, and fentanyl using total body weight. Patients were intubated with the Storz® DCI video laryngoscope (VL) with maintenance 1-2% isoflurane, O2/air 1 L/min each, and a dexmedetomidine infusion (0.4 mcg/kg/hr). Prior to extubation, a lidocaine-coated 36-F nasopharyngeal airway was placed for administration of CPAP after extubation and during transport to PACU. Data collected included demographics, airway exam, any problems with IVO throughout any phase of anesthetic care, and different times during the intubation (Table 2).

RESULTS: A total of 115 patients were analyzed (Table 1 - Demographics). One patient was excluded due to a protocol deviation at induction. All patients were intubated using the VL; however, intubation was > 2 min in 7/115 (6.1%) of patients (Table 2). Two of the 115 (1.7%) patients required BMV. Forty-five (39.1%) experienced 66 episodes of desaturation (Tables 3 & 4). Nineteen (16.5%) patients experienced multiple desaturations throughout the different phases of airway management. Five (4.3%) patients experienced major desaturation (SpO2 < 85%).

DISCUSSION: The majority of oxygenation problems was minor and occurred more frequently during extubation than intubation. The incidence of major desaturations was low—in contrast to the findings of other studies[4]. BMV was required in a few patients with prolonged intubation (necessitating a change in stylet for placement of the endotracheal tube) and due to desaturation. Variability in intubation time may be related to the experience level of the laryngoscopist. Further studies are required regarding patient positioning and airway/anesthetic techniques to optimize PC airway outcomes of IVO.

REFERENCES:

1. Anesth Analg 2011;113:4-6.
2. Anesth Analg 2002;94:732-6.
3. Anesthesiology 2011; A548.
4. BJA 2011;106:617-31.

Table 1: Demographics

	n	%
Female	92	80.0
Male	23	20.0
		Mean±SD (Range)
Age		45.2±9.1 (23-65)
Weight		131.8±28.4 (89.8-244.9)
BMI		46.7±7.8 (31.8-77.3)
	n	**%**
Mallampati Class		
I/II	106	92.2
III/IV	9	7.8
Thyromental Distance		
<3 FB	26	22.6
≥3 FB	89	77.4
Neck Range of Motion		
Limited	24	20.9
All	91	79.1

Table 2: Times for intubation

Time (seconds)	Mean±SD (Range)
Visualization of vocal cords	16.5 ± 12.8 (2-93)
Placement of ETT	23.3 ± 21.0 (5-131)
Verification of $ETCO_2$	28.8 ± 9.1 (14-57)
Total time	**67.5 ± 29.0 (27-185)**

Table 3: Phases of problems with oxygenation

Phase of Desaturation	n*	%
One Phase	**26**	**57.8%**
Intubation	5	11.1%
Maintenance	3	6.7%
Extubation	18	40.0%
Two Phases	**16**	**35.6%**
Intubation & Maintenance	2	4.4%
Intubation & Extubation	11	24.4%
Maintenance & Extubation	3	6.7%
Three Phases	**3**	**6.7%**
Intubation, Maintenance, & Extubation	3	6.7%

*n=45 patients with an oxygenation problem

Table 4: Frequency and magnitude of oxygen desaturations

	Intubation		Maintenance		Extubation		Total	
Lowest SpO_2	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
90-95%	9	13.6%	8	12.1%	24	36.4%	41	62.1%
80-89%	9	13.6%	3	4.5%	7	10.6%	19	28.8%
70-79%	2	3.0%	0	0.0%	2	3.0%	4	6.1%
≤ 69%	1	1.5%	0	0.0%	1	1.5%	2	3.0%

*Out of 115 patients, 45 patients experienced a total of 66 episodes of oxygen desaturation.

S-09.

EFFECTS OF PREINDUCTION FENTANYL ON DESFLURANE ANESTHESIA VIA A LARYNGEAL MASK AIRWAY

AUTHORS: A. Kamali, J. Meng, I. Gasanova, E. Rosero, G. P. Joshi

AFFILIATION: Anesthesiology and Pain Management, University of Texas Southwestern Medical Center, Dallas, TX

INTRODUCTION: Desflurane is sometimes avoided with the use of laryngeal mask airway (LMA) due to concerns of airway irritability. Opioids may reduce the airway responses to desflurane; however, this has not been assessed in a double blind, randomized manner. Therefore, we evaluated the effects of fentanyl pretreatment on respiratory events in patients receiving desflurane via the LMA.

METHODS: Outpatients randomly received either fentanyl 1 μg/kg (n=51) or saline (n=49) 3-5 min prior to induction with propofol 2-2.5 mg/kg and lidocaine 20-30 mg, IV, followed by LMA placement. Anesthesia was maintained with desflurane titrated to BIS 50-60, and nitrous oxide in oxygen. Fentanyl 25-50 μg was administered as needed to achieve a respiratory rate of 10-15/ min. In addition to occurrence of apnea and duration of manual ventilation, incidence and severity of movement, apnea, coughing, breath holding, and laryngospasm were recorded from the start of induction until removal of the LMA.

RESULTS: Two patients in each group were excluded from analysis. There were no differences between the groups with respect to baseline demographics and clinical characteristics as well as intraoperative anesthetic and analgesic characteristics except higher total opioid use in the fentanyl group. The fentanyl pretreatment group had higher incidence of apnea (94% vs. 64%) and longer duration of manual ventilation (3 [1.5-5] min vs. 1 [0-1.5] min) at induction. In contrast, the fentanyl pretreatment group had lower incidence of movements (16% vs. 51%), albeit mild. There was no difference between the fentanyl pretreatment and placebo groups with respect to the rates of intraoperative coughing (2.1% vs. 12.8%), breath holding (6.1% vs. 8.5%), and laryngospasm (2% vs. 4.3%). One patient in the placebo group had severe coughing requiring propofol administration and one patient in the fentanyl group had laryngospasm requiring succinylcholine 20 mg. Adjusting for smoking status did not affect the differences in apnea, need for manual ventilation, and movement between groups; however, occurrence of coughing statistically was higher in the placebo group (11.8% vs 0%, respectively).

DISCUSSION: The incidence and severity of respiratory events with the use of desflurane via the LMA were low and similar to previous reports[1,2]. Fentanyl pretreatment reduced movements at induction of anesthesia but increased the incidence of apnea and need for manual ventilation as well as reduced the incidence of coughing in smokers. The remaining perioperative course was similar.

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2. Anesth Analg 2006;103:1147-54.

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S-10.

AIRWAY AND ANESTHETIC MANAGEMENT IN PATIENTS UNDERGOING THYROID SURGERY

AUTHORS: S. Davis, A. Campos, N. Bhatti, J. May, L. Hoke, Y. Bryan

AFFILIATION: Anesthesiology, Wake Forest School of Medicine, Winston-Salem, NC

INTRODUCTION: Airway management in patients undergoing thyroid and/or parathyroid surgery may be challenging. Certain features make airways difficult to manage, e.g., small mouth opening, Mallampati class III or IV, decreased thyromental distance, and/or neck range of motion[1]. Additionally, the size of the thyroid mass, the type of malignancy, and/or evidence of tracheal deviation makes laryngoscopy and intubation difficult[2]. For intubation, specialized airway devices (SADs) such as video laryngoscopes or flexible fiberoptic bronchoscopes (FFBs) are used[3]. We present our preliminary data comparing the effectiveness of different airway devices and anesthetic techniques in patients undergoing thyroid/parathyroid surgery by measuring the combined airway outcomes of oxygenation, ventilation, and intubation (OVI).

METHODS: As part of an IRB-approved, observational difficult airway (DA) study, patients scheduled for thyroidectomy and parathyroidectomy were enrolled between March 2010 and August 2011. DA was defined as above. Demographic data collected included age, weight, height, BMI, ASA status, gender, and diagnosis. Anesthetic technique, maneuvers used for bag mask ventilation, device used for intubation, laryngoscopy attempts, and problems with oxygenation and ventilation data were collected.

RESULTS: A total of 26 patients were enrolled. Basic demographic data are provided in Table 1. Seven of the 26 (27%) patients had Mallampati class III-IV. Four of 26 (15%) patients and 1/26 (4%) patient had <3 FB for mouth opening and TMD, respectively. Ten of the 26 (38%) patients had limited neck range of motion. Table 2 details the frequency of various intubating devices used and anesthetic technique (awake /sedation vs. general). Direct laryngoscopy (DL) was used in 4/26 (15%) patients while SADs were used in 22/26 (85%) patients (Table 2). Table 3 provides data regarding problems with oxygenation and ventilation. Table 4 contains detailed intubation data.

DISCUSSION: A variety of airway devices and techniques were safely used to intubate patients undergoing thyroidectomies. A high incidence of desaturation occurred during airway management related to certain patient factors. However, choice of airway device was also dependent upon the relationship between airway exam and extent of thyroid mass/tumor[4]. In addition to airway exam, the size and location of thyroid mass/tumor was a critical factor in choosing airway management technique.

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2. Can J Anaesth 2003;50:81-5
3. Anaesthesia 2007;62:214-9
4. Laryngoscope 2009;119:S242

ACKNOWLEDGMENT: This study was supported by funding from Baxter Healthcare corporation.

Table 1. Demographics

AGE (yr) Mean±SD (Range)	58.9±13.5 (37-86)
WEIGHT (kg) Mean±SD (Range)	91.2±24.3 (51.7-167.4)
BMI (kg/m^2)	45.15±8.04
ASA	
1	1 (3.8%)
2	7 (27%)
3	1 (3.8%)
4	17 (65.4%)
GENDER	
MALE	8 (69%)
FEMALE	18 (31%)

Table 2. Device and Technique

INTUBATION DEVICE	**FREQUENCY (n)**	**%**
Conventional laryngoscope	4	15.4
Flexible fiberoptic bronchoscope	11	42.3
Glidescope®	4	15.4
Storz® video laryngoscope	7	26.9
TECHNIQUE		
Awake	10	38.5
Asleep	16	61.5

Table 3. Problems with Oxygenation and Ventilation

OXYGENATION		
Phases	**Frequency of desaturation**	
Preparation	4	
Intubation	7	
Maintenance	1	
Extubation	4	
*12 patients with 16 episodes of oxygen desaturation		
VENTILATION		
Bag Mask Ventilation	**Frequency (n)**	**%**
0-2 Maneuvers	5	19.2
3-5 Maneuvers	5	19.2
RSI (No BMV)	16	61.5

Table 4. Intubation

VISUALIZATION OF VOCAL CORDS		
Conventional	**Frequency (n)**	**%**
1-2 Attempts	4	13.8
≥3 Attempts	1	3.4
Specialized airway device		
1-2 Attempts	18	62.1
≥3 Attempts	6	20.7
*3 patients required conventional and SAD		
PLACEMENT OF ETT		
Conventional		
1-2 Attempts	5	17.2
≥3 Attempts	0	0.0
Specialized airway device		
1-2 Attempts	22	75.9
≥3 Attempts	2	6.9
*3 patients required conventional and SAD		

S-11.

WITHDRAWN.

S-12.

GOOD DREAMS DURING GENERAL ANESTHESIA ARE ASSOCIATED WITH THE INCIDENCE OF PONV

AUTHORS: A. Yoshida, K. Fujii, K. Nishikawa

AFFILIATION: Anesthesiology, Wakayama Medical University, Wakayama, Japan

INTRODUCTION: In terms of the relationship between dreams and awareness during general anesthesia, there have been many studies evaluating the factors which influence the incidence of dreams during general anesthesia. However, the association of dreams during general anesthesia with postoperative complications has not been clarified. This study was aimed to examine whether dreams during general anesthesia are related to postoperative pain, postoperative nausea and vomiting (PONV), or patient satisfaction.

METHODS: Patients scheduled for elective surgery under general anesthesia during 3 months in our hospital were included in this study. Preoperative mental status was assessed by the Hospital Anxiety and Depression Scale (HADS). Postoperative interview was conducted repeatedly on leaving the operation theater and on the next day of operation. Dreams and awareness during general anesthesia were detected with the modified Brice interview including the question of quality of dreams categorized as good, indifferent, or bad. The incidence of postoperative pain and PONV were also recorded. Data were analyzed using Mann-Whitney U test and chi-square test. P value < 0.05 was considered significant. All values are expressed as median [interquartile ranges] or numbers [%].

RESULTS: Six hundred and fifty-six patients were included in this study and 171 [26.1%] patients reported having a dream. Younger age (59 [40-70] vs. 63 [48-73]; P=0.002) and propofol maintenance (101 [33.6%] vs. 70 [19.7%]; P<0.001) were associated with dreams. Although having a dream could not affect the incidence of postoperative complications, good dreams (92 [53.8%]) were related to lower incidence of PONV (3 [3.5%] vs. 60 [11.4%]; P=0.025). Depressive patients were inclined to have bad dreams (5 [2.9%], P=0.008).

DISCUSSION: The quality of dreams during general anesthesia may associate with postoperative complication.

References: N/A

S-13.

EFFICIENCY OF FREE-STANDING AMBULATORY SURGERY CENTERS AND HOSPITAL-BASED AMBULATORY SURGERY DEPARTMENTS IN THE USA: A PROPENSITY ANALYSIS

AUTHORS: E. B. Rosero, G. P. Joshi

AFFILIATION: Anesthesiology & Pain Management, UT Southwestern Medical Center, Dallas, TX

INTRODUCTION: Use of time is frequently employed as a measure of efficiency in surgical facilities[1,2]. It is not clear, however, whether free-standing ambulatory surgery centers (ASCs) are as efficient as hospital-based ambulatory surgery departments (HOPDs). The purpose of the study was to compare nationwide efficiency of ASCs and HOPDs in terms of operating room (OR) times, surgery time, postoperative time, and total time in facility for commonly performed surgical procedures.

METHODS: Discharges with the top-ten ambulatory surgery procedures performed in the United States in ASCs and HOPDs were identified from the 2006 National Survey of Ambulatory Surgery. Propensity scores (PS) derived from a logistic regression model were used to assemble a 1:1 matched cohort of patients undergoing the procedures in ASCs and HOPDs. Covariates in the model for PS included type of surgical procedure, age, sex, comorbidities, type of anesthesia, metropolitan status of facility, and type of insurance. Differences in total OR time, surgical time, non-surgical OR time, and time in recovery room as well as total facility time were assessed between the matched groups.

RESULTS: The discharges with the top-ten procedures represented 55.1% of all the ambulatory surgical procedures performed in 2006 in the United States. The PS algorithm produced a matched cohort of 3,741 surgical visits performed in ASCs and 3,741 visits performed in HOPDs, balanced on baseline characteristics (Table). The OR times were significantly shorter in ASCs than in HOPDs (median [interquartile range, IQR] = 31 [21-45] vs. 39 [27-58] min, respectively; P<0.0001). The operative times were also significantly shorter in ASCs than in HOPDs (15 [10-25] vs. 20 [12-31] min, respectively; P<0.0001). Similarly, times in recovery area and total times in facility were shorter in ASCs than in HOPDs (41 [28-65] vs. 55 [35-83] and 76 [55-115] vs. 100 [71-145] min, respectively; P<0.0001 for both).

DISCUSSION: In this propensity-matched national sample, our study reveals that for the top-ten ambulatory surgery procedures performed in the United States, ASCs are more efficient than HOPDs in terms of use of operative and non-operative times. Factors associated with differences in use of time between the two type of facilities deserve further study.

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S-14.

THE MINIMUM EFFECTIVE DOSE OF DEXAMETHASONE IN COMBINATION WITH MIDAZOLAM IN PATIENTS UNDERGOING LAPROSCOPIC CHOLECYSTECTOMY FOR PREVENTION OF POST OPERATIVE NAUSEA AND VOMITING

AUTHORS: S. Srivastava, S. Dhiraaj, R. Gupta

AFFILIATION: Anesthesiology, SGPGIMS, Lucknow, India

INTRODUCTION: Postoperative nausea and vomiting (PONV), defined as nausea and/or vomiting occurring within 24 hours after surgery, affects between 20% and 30% of patients.[1] As many as 70% to 80% of patients at high risk may be affected.[2] The aim of the present study is to determine the minimal dose of dexamethasone (D) that combined with midazolam (M) would provide effective prophylaxis of PONV after laparoscopic cholecystectomy in patients at high risk for PONV.

METHODS: A randomized, placebo-controlled, double blind study of 155 females 18 to 60 years old, ASA class I and II, nonsmokers, underwent general anesthesia for elective laparoscopic cholecystectomy of more than one hour duration along with the use of systemic opioids was conducted after institute ethical approval. The study groups were divided in five groups, C (placebo-2 ml of normal saline) ,MD1(M 0.04 mg/kg + D 1 mg), MD2(M 0.04 mg/kg + D 2 mg), MD4 (M 0.04 mg/kg + D 4 mg) and MD8 (M 0.04 mg/kg + D 8mg), drugs were given at induction of anesthesia. All episodes of nausea and vomiting while in the hospital, during the 0 to 6 hr, 6 to 12-hr and 12 to 24 hr intervals after surgery were recorded and the severity of nausea and pain was recorded using the VAS scale and data were compared in the five groups.

RESULTS: At 0-24 hrs, There was significant difference in severity of nausea when group C was compared with MD4 and MD8 while no difference was found with groups MD1 and MD2 .On intergroup comparison when MD4 group was compared with MD8 then again significant difference was found (p = 0.01). Significant difference in incidence of vomiting when group C was compared with either group MD2, MD4 and MD8. On intergroup comparison no significant difference was found between MD2 & MD4 group (p=0.44). However comparisons between MD2 & MD8; and MD4 & MD8 were significant statistically (p=0.00 in both).

DISCUSSION: According to our study,the minimum effective dose for prevention of post operative nausea and vomiting in high risk patients undergoing laproscopic cholecystectomy is 4 mg of dexamethasone in combination with midazolam. There is no difference in the severity of postoperative pain. Further reduction in incidence and severity of PONV can be achieved with a dose of 8 mg. Use of recue antiemetic and analgesics is even reduced considerably with this dose.

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Groups (n=31)	Post Operative Nausea Severity (assessed by VAS of 0-10)	
	0-24 hrs	
	Mean ±SD	'p'
C	4.04±4.8	
MD1	2.97±4.27	0.11
MD2	2.75±4.08	0.05
MD4	1.29±3.37	0.00*
MD8	0.29±1.62	0.00*

*Signifies P≤0.05

Bleeding / Blood Product Conservation

S-20.

EPIDEMIOLOGY AND RISKS OF TRANSFUSION AMONG DIFFERENT AGE STRATA IN ICU PATIENTS

AUTHORS: S. Mudumbai[1,2], R. Cronkite[3], E. Bertaccini[1,2], B. Cason[4,5], E. Mariano[1,2], T. Wagner[3]

AFFILIATION: [1]Anesthesia Service, VA Palo Alto, Palo Alto, CA; [2]Anesthesiology, Stanford University, Palo Alto, CA; [3]Center for Health Care Excellence, VA Palo Alto, Palo Alto, CA; [4]Anesthesia Service, VA San Francisco, San Francsico, CA; [5]Anesthesiology, University of California-San Francisco, San Francsico, CA

INTRODUCTION: While advanced age is associated with increased mortality in intensive care unit (ICU) patients[1], all elderly ICU patients may not have a poor prognosis. Because ICUs continue to exhibit intense utilization of packed red blood cell (PRBC) transfusions among the elderly[2], this project characterizes for different age strata of ICU patients a) rates of transfusion and volumes of transfusion and b) the differential risk for transfusion at various levels of hematocrit.

METHODS: We retrospectively examined data on 2,393 ICU patients from year 2003-2009. After stratifying age, measured in years, into intervals starting with 21 <= Age <= 50, 51 <= Age <= 60, 61 <= Age <= 70, 71 <= Age <= 80 and Age > 80,we examined whether transfusion rates differed by age group using a multivariate logistic regression predicting receipt of transfusion, including the age strata as our main predictor variable with hematocrit strata, type of admission, and Charlson co-morbidity indices as control variables. We then calculated a series of full Cox proportional hazard regression models to determine the adjusted hazard ratio for 1-year mortality associated with a receipt of a transfusion for each age strata.All reported p-values are two-sided and a p-value less than .05 is considered to be statistically significant. SAS software, version 9.2 (SAS Institute Inc, Cary, NC) was used for the statistical analyses.

RESULTS: Table 1 provides a description of patient treatment characteristics. The reference group, age>80, was transfused at higher levels even after controlling for hematocrit levels across almost all other age strata.The age>80 group was transfused at about twice the rate of the 3 lowest age groups(21-50, 51-60, and 61-70). The crude survival rates for each age group showed an increased mortality associated with transfusions (Table 2). After adjustment, transfusions were associated with increased mortality for all age groups except age 21-50. However, our Cox regression interaction model indicated that transfusions were not more or less strongly associated with 1 year mortality for the age>80 group versus any other age group.

DISCUSSION: In this single-institution retrospective study,we found that even though receiving a transfusion may confer no greater risk on an individual basis for patients age >80, the fact that transfusions do confer a mortality risk and that patients age>80 are transfused in greater numbers means that this population of older patients may still be at greater risk.

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Table 1: Patient and treatment characteristics and odds ratios from multivariate logistic regression predicting receipt of transfusion

	Number receiving transfusion	1-year Mortality	Odds Ratio for receipt of transfusion	95% CI	P-value
Overall sample (n = 2393)	707 (29.5%)	501 (20.9%)			
Patient Characteristics					
21<=Age<=50 (n = 143, 6.0%)	35 (24.5%)*	12 (8.4%)*	0.49	0.29-0.82	0.006
51<=Age<=60 (n = 628, 26.2%)	159 (25.3%)*	107 (17.0%)*	0.51	0.37-0.70	<0.001
61<=Age<=70 (n = 742, 31.0%)	204 (27.5%)*	129 (17.4%)*	0.61	0.45-0.83	0.001
71<=Age<=80 (n = 540, 22.6%)	173 (32.0%)*	114 (21.1%)*	0.76	0.56-1.04	0.091
Age>80 (n = 340, 14.2%)	136 (40.0%)	139 (40.9%)	Ref.	Ref.	

*Differs from Age Group 5 (Age > 80) at the p <0.05 level.

Cardiothoracic & Vascular Basic Science

S-26.

HEMOGLOBIN THRESHOLDS FOR TISSUE HYPOXIA IN ANEMIC MICE

AUTHORS: G. Hare[1], K. Lee[1], A. K. Tsui[1], D. Mazer[1], M. Henkelman[3], P. A. Marsden[2]

AFFILIATION: [1]Anesthesia, University of Toronto, Toronto, ON, Canada; [2]Medicine, University of Toronto, Toronto, ON, Canada; [3]Medical Biophysics, University of Toronto, Toronto, ON, Canada

INTRODUCTION: Despite the common prevalence of anemia (~40-50% of acute care patients), treatment of anemia does not necessarily improve survival. Therefore, a clear understanding of the cellular and molecular response to anemia is required. Severe anemia affects tissue hypoxia (PO2) and hypoxia inducible factor-α (HIF-α) signaling[1]. The current study is directed at understanding how mild or moderate anemia affects hypoxia signaling in specific tissues within a whole animal model. We hypothesize that tissue hypoxia occurs at different Hb thresholds throughout the body.

METHODS: After obtaining institutional Animal Care Committee approval, spontaneously breathing anesthetized HIF (ODD)-luciferase mice (21% Oxygen, 2% isoflurane), were made anemic to different Hb thresholds (90,70, 50 g/L) by stepwise hemodilution and fluid resuscitation (pentastarch) via the tail vein and artery. Arterial blood gases (ABG) and Hb levels (co-oximetry, Radiometer) were measured. Realtime bioluminescent imaging was performed, in vivo, in anesthetized mice at baseline and at 6hrs following hemodilution. Organ specific tissue luciferase activities were measured in vitro, at 6 hrs, relative to total protein levels in extracted tissues (brain, liver, kidney). Plasma erythropoietin levels were measured by ELISA. Data are presented as (mean ± SD).

RESULTS: Target Hb thresholds near of 90 ± 2, 71 ±1 and 52 ± 1 were reached. Real-time whole body luciferase increased in a stepwise manner to a maximum level at a Hb concentration near 50g/L in vivo ($p<0.05$). At the end of 6hrs, organs were extracted for assessment of luciferase activity in vitro. The Hb threshold for increased HIF-luciferase activity was initially reduced by ~50% at Hb 90g/L ($p<0.05$), returned to baseline at Hb 70g/L and increased by ~ 50% at Hb 50g/L ($p<0.05$). By contrast, kidney and liver HIF luciferase levels remained stable until increasing at Hb thresholds below values of 70 and 90 g/L, respectively (p,0.05 for both). The Hb threshold for increased systemic erythropoietin (EPO) levels was near 100 g/L.

DISCUSSION: HIF-α stabilization occurs at a higher Hb threshold in the liver, and kidney relative to the brain, suggesting that hierarchical preservation of tissue oxygen delivery during anemia. Increased systemic EPO levels may remain a sensitive and clinically applicable measure of anemia-induced tissue hypoxia. This knowledge may help define the mechanism of anemia induced organ injury and help to develop novel treatment strategies to reduce morbidity and mortality in anemic patients. (IARS-SCA, CIHR, HSF support)

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S-27.

ISOFLURANE PROTECTS THE MURINE HEART AGAINST ISCHEMIC INJURY VIA THE PRESERVATION OF MITOCHONDRIAL RESPIRATION AND ITS SUPRAMOLECULAR ORGANIZATION

AUTHORS: C. Lotz[1,2], J. Zhang[2], C. Fang[2], P. Ping[2], T. Smul[1]

AFFILIATION: [1]Anesthesiology, University of Wuerzburg, Wuerzburg, Germany; [2]Physiology, University of California at Los Angeles, Los Angeles, CA

INTRODUCTION: The administration of isoflurane has been demonstrated to elicit a protective cardiac phenotype, effectively limiting ischemic injury[1]. Isoflurane is hypothesized to act on major signaling pathways and recent evidence suggests its protective effects are mainly executed at the level of the mitochondrion[2]. We investigated the hypothesis that isoflurane mediates a cardioprotective phenotype by preserving the in-vivo functionality of the mitochondrial respiratory chain.

METHODS: The current study was approved by the respective IRB for animal research. Mice (9-12 wks of age, n=6 in all groups) received isoflurane (1.0 MAC for 30 min) 36 h prior to a 30 min coronary artery occlusion followed by 24 h of reperfusion. TTC-staining was used to determine the myocardial infarct size. Cardiac mitochondria were isolated after the sole administration of isoflurane with or without 4 hrs of reperfusion or at the corresponding time-points, respectively. Mitochondrial Ca2+-induced swelling, mitochondrial lipid peroxidation, as well as mitochondrial respiratory chain complex activities (I-V) were investigated. In addition, Blue Native-PAGE electrophoresis followed by in-gel activity measurements was used to monitor mitochondrial supercomplex functionality. LC-MS/MS was utilized for protein identification purposes.

RESULTS: Our data showed that isoflurane elicited a protective cardiac phenotype after 36h, evidenced by a reduced myocardial infarct size ($p<0.05$). The protective effects of the volatile anesthetic simultaneously preserved respiratory complex III ($p<0.05$) activity, as well as amended the activity of supramolecular complex assemblies constituted by complex I-III-IV ($p<0.05$). The functional benefits further were accompanied by a diminished mitochondrial lipid peroxidation pinpointing towards reduced oxidative stress. A decreased mitochondrial susceptibility to Ca2+-induced swelling ($p<0.05$) in the isoflurane treated groups indicated circumvention of mitochondrial permeability transition (mPT) .

DISCUSSION: Taken together, our findings support the concept that isoflurane protects the heart against ischemic injury in-vivo by maintaining mitochondrial respiratory complex and supercomplex functionality, preventing the development of an increased oxidative stress burden and subsequent mPT.

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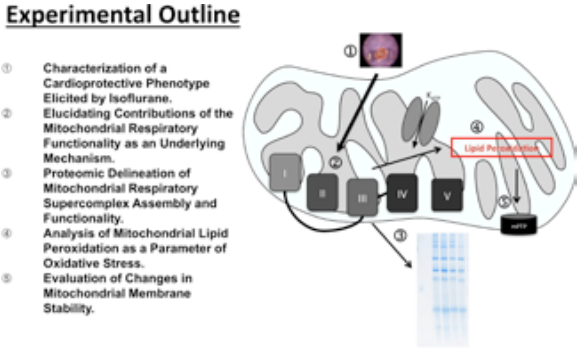
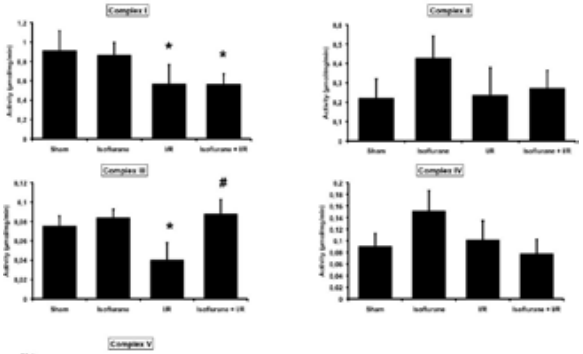
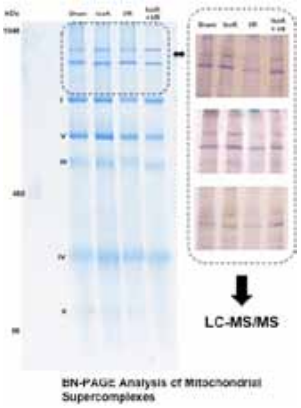
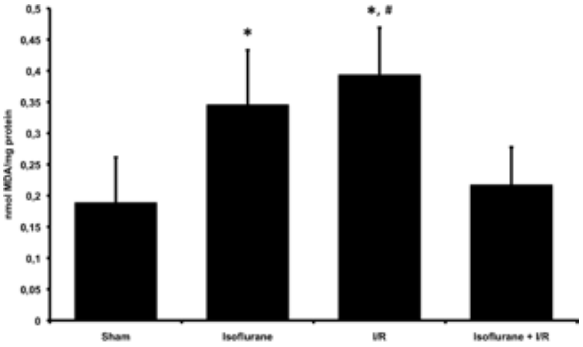




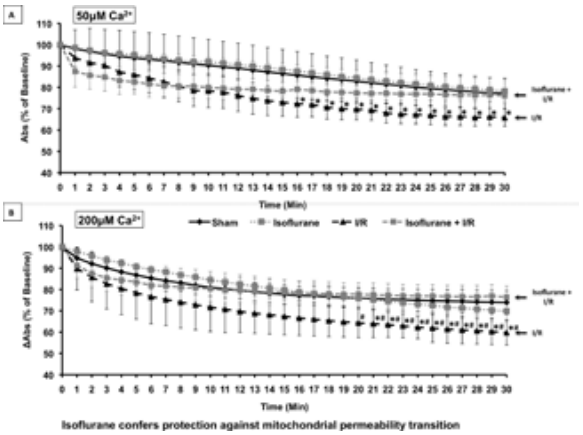
Isoflurane preserves the mitochondrial respiratory complex functionality during ischemic injury and protection.



BN-PAGE Analysis of Mitochondrial Supercomplexes



Isoflurane circumvents mitochondrial lipid peroxidation after ischemic injury.



Isoflurane confers protection against mitochondrial permeability transition

S-28.

HIGH DOSE BETA-BLOCKADE ACCENTUATED CEREBRAL HYPOXIA IN ANEMIC RATS

AUTHORS: G. Hare[1], T. Hu[1], S. Beattie[1], H. Leong_Poi[2], D. F. Wilson[3], D. Mazer[1]

AFFILIATION: [1]Anesthesia, University of Toronto, Toronto, ON, Canada; [2]Medicine, University of Toronto, Toronto, ON, Canada; [3]Biochemistry and Biophysics, University of Pennsylvania, Philadelphia, PA

INTRODUCTION: β-blockade reduces the incidence of perioperative myocardial infarction at the expense of impaired brain perfusion. Anemia may accentuate cerebral hypoxia and brain injury in beta blocked patients. Metoprolol impairs cerebral perfusion during anemia by limiting the cardiac output (β1-effect) and impairing β2 mediated vasodilation in isolated resistance arteries[1,2]. We hypothesized that treatment with a highly β1-selective antagonist (nebivolol) will impair cerebral perfusion during hemodilution in a dose dependent manner.

METHODS: After obtaining institutional Animal Care Committee approval, anesthetised rats were randomized to receive vehicle (control) or nebivolol (1.25 or 2.5 mg/kg intravenously). Heart rate (HR), cardiac output (CO, echocardiography), normalized cerebral blood flow (nCBF, laser Doppler), and brain microvascular PO2 (G2 oxyphor) were measured before and after hemodilution to a target hemoglobin concentration of 60 g/L. Brain hypoxia inducible factor-α (HIF-α) levels were determined by Western blot. CO, and cerebral PO2 data were collected in a blinded fashion. Data (mean ± SD) are assessed by two-way ANOVA.

RESULTS: A comparable hemoglobin nadir was achieved in all groups (~60 g/L). HR decreased comparably from baseline (~300) to ~250 bpm in both treated groups ($p<0.05$ for both). The CO increased from control values (122 ± 9.5 mL) after hemodilution (205 ± 41 mL/min, n=5, $p<0.05$). This effect was attenuated by both nebivolol doses (161 ± 24 and 151 ± 13 mL/min, n=5, $p<0.05$). The increase in nCBF observed after hemodilution was similar in control and low dose nebivolol groups (90 ± 49 and 80 ± 53%, $p<0.05$ for both), but attenuated in the high dose group (9 ± 12 %, $p<0.05$ vs. low dose nebivolol). Similarly, brain microvascular PO2 values were decreased to a greater degree after hemodilution with high dose nebivolol (28.4 ± 9.6 mmHg, n=11, $p<0.05$), relative to both control and low dose nebivolol groups (45.8 ± 18.7, n=5 and 36.0 ± 4.9, n=10). Increased cerebral cortical HIF-1α levels were seen in hemodiluted rats treated with 2.5 mg/kg of nebivolol compared to control and low dose nebivolol groups.

DISCUSSION: Both nebivolol doses impaired the cardiac output response to hemodilution (β1-effect). However, only the higher dose of nebivolol attenuated cerebral perfusion and accentuated cerebral tissue hypoxia during acute anemia. We conclude that lower dose treatment with a highly selective β1-antagonist may provide cardiac protection with reduced risk of cerebral ischemia (Forest Research Laboratories, IMS and IARS-SCA support).

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S-29.

WITHDRAWN.

S-30.

EXERCISE AND A BREAKER OF ADVANCED GLYCATION END PRODUCTS ATTENUATE AGE RELATED VASCULAR STIFFNESS AND DECREASE TISSUE TRANSGLUTAMINASE ACTIVITY AND CROSSLINKING

AUTHORS: J. Steppan[1], G. Sikka1, L. Santhanam[1], D. Nyhan[1], D. E. Berkowitz[1,2]

AFFILIATION: [1]Anesthesiology & Critical Care Medicine, Johns Hopkins University, Baltimore, MD; [2]Biomedical Engineering, Johns Hopkins University, Baltimore, MD

INTRODUCTION: Cardiovascular disease is the leading cause of morbidity and mortality at an advanced age. Pathologically, aging is associated with increased vascular stiffness, which can by measured by pulse wave velocity (PWV) - an important an index of vascular aging. Although both dynamic, and structural changes have been described in aging, the underlying molecular mechanisms remain poorly understood. Tissue transglutaminase (TG2), which forms crosslinks between extracellular matrix proteins, may contribute to this pathobiology. Another mechanism is the formation of advanced glycation end product (AGE) resulting in irreversible non-enzymatic glycosylation of proteins. We hypothesized that aging associated changes in vascular stiffness as measured by PWV can be attenuated by exercise and breakdown of AGE.

METHODS: We determined age-dependent changes in vascular stiffness in male Fisher rats by measuring PWV using a dual blood pressure catheter in vivo over a wide range of blood pressures (BPs). The animals were stratified into three groups: young, middle aged, old. We determined the changes in vascular stiffness following either exercise alone (4 weeks) or exercise plus ALT injection (AGE breaker) in old animals. Furthermore we measured TG2 activity and crosslinking.

RESULTS: Aging lead to an incremental increase in PWV that is more pronounced at higher BPs. According to PWV animals were categorized into three groups: young (3-4 month), middle aged (5-9 month) and old (above 9 month of age). Baseline BPs were identical, but PWV was significantly different at baseline and at higher BPs. Exercise alone failed to attenuate the increased PWV in old animals, but significantly decreased TG2 activity and crosslinking. The combination of an AGE-breaker and exercise significantly reduced PWV and vascular stiffness.

DISCUSSION: We demonstrate that PWV is lowest in young animals and then gradually increases as the vasculature stiffens. Interestingly, PWV in the different age groups converges at lower BPs suggesting that at lower pressure passive properties are less important. At higher BPs, the curves diverge suggesting that, collagen becomes the major passive contributor, leading to stiffer vessels. A short period of exercise at an advanced age fails to attenuate vascular stiffness, despite decreased TG2 activity and increased TG2 crosslinking, suggesting that once vascular remodeling has occurred exercise alone is insufficient to reverse this process. The additional treatment with an AGE-breaker, however, reduces vascular stiffness even in old animals. This novel finding has potential therapeutic implications for the aging population and further studies extending these results seem to be warranted.

S-31.

SYSTEMIC PERFUSION PRESSURE AND THE CLOSING PRESSURE OF THE MICROCIRCULATION: THE IMPORTANCE OF 30MM HG

AUTHOR: S. F. Woodford[1,2]

AFFILIATION: [1]Anesthesia, Brisbane Waters Private Hospital, Woy Woy, NSW, Australia; [2]Australian School of Advanced Medicine, Macquarie University, Sydney, NSW, Australia

INTRODUCTION: Perfusion of the microcirculation requires a minimum pressure of 30 mm Hg, the so called 'closing pressure'. The critical closing pressure has been understood primarily in relation to dermal capillary patency, but examination of hemodynamic data suggests that a systemic pressure gradient (MAP-CVP) of 30 mm. Hg is a universal value below which all flow ceases in the human adult circulation.

METHODS: Continuous hemodynamic monitoring using Flotrac in association with arterial and central venous lines was routinely implemented over 36 months in patients presenting for elective and urgent major surgery, and in the ICU. Hemodynamic data was recorded at intervals between 30 minutes and 12 seconds. Graphical analysis of hemodynamic data was performed on 419 patients over 36 months, and the clinical state of the patient was correlated with hemodynamic variables. Hemodynamic data was analysed in the context of proven diagnosis and clinical setting, and included patients with anaphylaxis/cardiac arrest, life-threatening hemorrhage, overwhelming sepsis, cardiac tamponade, cardiopulmonary bypass,syncope and drug reactions.

RESULTS: Ohm's Law of the circulation (MAP-CVP=CO*SVR) relates 3 variables, of which 2 can be measured and the third calculated. Graphically, the relationship can be plotted in 3 configurations. If a stream of data is continuously plotted, the patterns of response to any insult or intervention can be analysed. Ohm's Law can be simplified to the equation MAP-CVP=SV*SE, where SE(systemic elastance) = MAP-CVP/SV . The systemic perfusion pressure is the product of SV(ml/beat) and systemic elastance (mm Hg/L). The systemic perfusion pressure never fell below a gradient of 30 mm Hg., but a fall in systemic perfusion pressure to 30 mm Hg was common during bypass, exsanguinating hemorrhage preceding cardiac arrest, anaphylaxis accompanied by cardiac arrest, fatal sepsis,syncope and induction of anesthesia. Prior to circulatory arrest, the systemic perfusion pressure reached a minimum at or near 30 mm Hg in every case.

DISCUSSION: The closing pressure of the microcirculation corresponds clinically to a systemic perfusion gradient of 30 mm Hg. If the pressure gradient across the systemic microcirculation falls below the capillary closing pressure, all systemic flow ceases.

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S-32.

GUYTON AND THE SYSTEMIC VASCULAR RESISTANCE: THE PROBLEM OF APPLYING DC CONCEPTS TO A PULSATILE SYSTEM

AUTHOR: S. F. Woodford[1,2]

AFFILIATION: [1]Anesthesia, Brisbane Waters Private Hospital, Woy Woy, NSW, Australia; [2]Australian School of Advanced Medicine, Macquarie University, Sydney, NSW, Australia

INTRODUCTION: It has long been recognised that Ohms Law describes a DC circuit, but the human circulation is pulsatile, and continuous flow is only approximated in cardiopulmonary bypass and with the artificial heart. Despite the conceptual problem surrounding Ohm's Law (MAP-CVP = CO*SVR) it remains the basis of our understanding of afterload and the treatment of heart failure. Deconstructing the basis for variation in cardiac output suggests that Ohm's Law contains a systematic error.

METHODS: Over 36 months, the regulation of pressure and flow (CO) in the adult systemic circulation were analysed using data derived from Flotrac (Edwards Lifesciences) in 370 subjects at intervals varying from 12 seconds to 1 hour. Because the equations for flow (CO=SV*HR) and pressure (P=CO*SVR) relate three variables, it is possible to plot flow and pressure in a X-Y plot, and solve for the 3rd variable (the 'Z' variable) in the graph. There are thus 3 possible ways of representing the three variables describing flow and pressure. Data was graphed and time dependent changes were correlated with fluid and drug administration, arrhythmias, haemorrhage, anaphylaxis, syncope and sepsis.

RESULTS: A change in cardiac output may reflect a change in SV at constant HR, a change in HR at constant SV, or changes in both; the systemic perfusion pressure will remain constant if SV remains unchanged at a varying heart rate, or if heart rate remains constant and SV changes with a reciprocal change in vascular resistance. But if SV remains constant and heart rate increases, CO will rise and SVR decrease. Graphically, it is clear that SVR may change with heart rate alone, without any change in SV, so the hydraulic relationship implied in the equation is in error. This is corrected by simplifying Ohm's Law to the relationship MAP-CVP = SV x Elastance, where Elastance = MAP-CVP/SV, and therefore SVR = E/HR. Using dynes sec/cm5, this yields the relationship SVR = E (80/HR). When HR is 160, the SVR and SVR range is halved, and at HR 40, the SVR and SVR range are doubled.

DISCUSSION: Ohms Law (P=CO*SVR) has led to a preoccupation with cardiac output, but unless cardiac output is constantly corrected for HR variation, the relationship between cardiac performance and the vasculature is in error. The relationship described by Ohms Law is only applicable when flow is constant (bypass, artificial heart). Failure to apply a heart rate correction implies that much hemodynamic literature contains a systematic error. The correct equation is MAP-CVP = SV*Elastance where Elastance = MAP-CVP/SV.

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S-33.

SPINAL ANESTHESIA AND CENTRAL HEMODYNAMICS: RE-ANALYSIS OF PILOT STUDY DATA

AUTHOR: R. Eng[1], G. Dobson[1,2]

AFFILIATION: [1]Anesthesia, University of Calgary, Calgary, AB, Canada; [2]Surgery, University of Calgary, Calgary, AB, Canada

INTRODUCTION: The role of central hemodynamics on cardiovascular outcomes is becoming increasingly apparent and has resulted in the development of new approaches to pressure waveform analysis. These approaches were applied to data acquired from a pilot study of patients undergoing spinal anesthesia for transurethral prostate resection.

METHODS: The study was approved by the Conjoint Health Research Ethics Board of our University and all subjects provided informed consent. Six men with no history of cardiopulmonary disease, and not consuming any medications, were enrolled. All subjects were monitored with continuous electrocardiogram and an intermittent non-invasive blood pressure device. Carotid and femoral blood pressure waveforms were recorded simultaneously using arterial tonometers. The patients were sedated using standardized doses of intravenous fentanyl and midazolam. Following a fluid bolus of 15 mL/kg of normal saline, a standardized spinal anesthestic (isobaric Bupivacaine 15 mg) was given. Twenty minutes later, the height of the block was determined using an icepack, and the tonometric measurements were repeated.

RESULTS: Mean age of subjects was 63+5 years. Baseline mean blood pressure was unchanged between control and post-spinal measurements (98+20mmHg vs. 96.5+13mmHg, p=0.7). The reflection coefficient (Γ) of the lower extremities decreased (0.55+0.17 to 0.22+0.07, p=0.006), whereas none of the time domain indices of the carotid pressure wave reflection changed significantly. The effective site of reflection (ESR) changed from 44+8 cm to 36+9 cm, but this did not reach statistical significance (p=0.11). Using changes to Γ (ΔΓ) and ESR (ΔESR) as the independent variables, changes to augmentation index (ΔAIx) were modelled using multilinear regression (figure 1), $\Delta AIx = 23+63.4 * \Delta\Gamma + 0.96* \Delta ESR$, $R2=0.87$, $p<0.05$.

DISCUSSION: This pilot study demonstrates that spinal anesthesia results in a decrease in the Γ from the lower extremities without the expected reduction in carotid artery AI. Statistical modelling suggests that there are two opposing factors in play, with vasodilation of lower extremities being offset with more central vasoconstriction.

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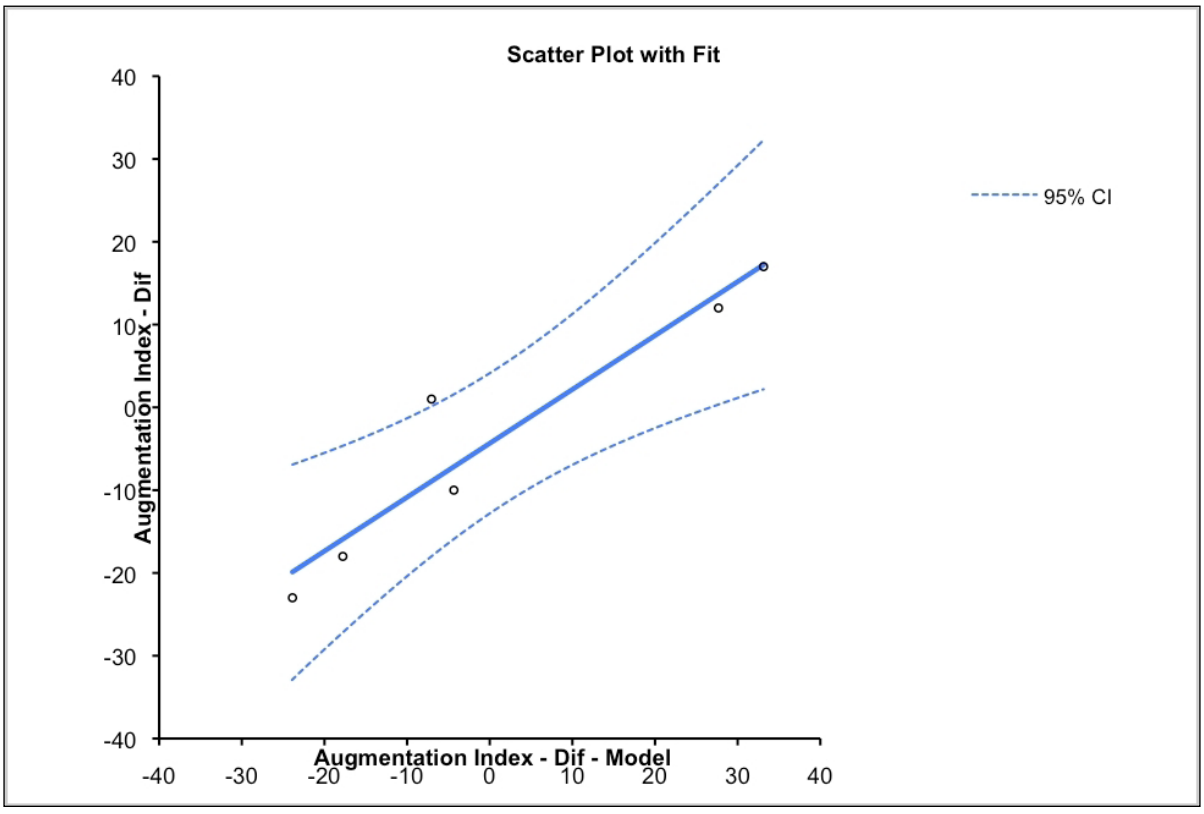

Figure 1

S-34.

NEUROTRANSMITTER NPY3-36 CAN INDUCE ANGIOGENESIS IN A HIGH CHOLESTEROL PIG MODEL OF CHRONIC MYOCARDIAL ISCHEMIA

AUTHORS: A. Wang[1], F. Mahmood[1,2], K. Khabbaz[1,2], P. Hess[1,2], F. W. Sellke[1,2], R. Matyal[1,2]

AFFILIATION: [1]Anesthesia, Beth Israel Deaconess Medical Center, Boston, MA; [2]Harvard Medical School, Boston, MA

INTRODUCTION: Neuropeptide Y (NPY3-36) has potential to cause angiogenesis. The purpose of the study is to evaluate effects of NPY on myocardial angiogenesis in a high cholesterol swine model with chronic myocardial ischemia.

METHODS: After Institutional Review Board approval, male Yorkshire pigs were divided into three groups (n=6 in each group). The first group was fed a normal diet, the other two groups were fed with high cholesterol diet, one with placebo infiltration and the other with neurotransmitter infiltration. After 6 weeks, the animals were anesthetized and underwent a mini-thoracotomy and an ameroid constrictor was placed around the proximal left circumflex artery to cause chronic ischemia. Three weeks after ameroid placement, an angiography was preformed and microspheres were injected into the left atrium to determine myocardial perfusion. An osmotic pump with NPY3-36/placebo was placed for delivery at a constant rate in the ischemic area. Five weeks after the pump placement, final surgery was performed with coronary angiography, microspheres injection and myocardial function assessment. Tissue was harvested for bench analysis.

RESULTS: Comparisons between the groups was done using two tailed t-test and with Newman-Keuls Multiple Comparison post-hoc test. Probability values less than 0.05 were considered significant. There was significant upregulation of flow in the ischemic territory in pigs treated with NPY at rest and at paced rhythm as compared to high cholesterol placebo group (p=<0.001 at rest and 0.03 at paced rhythm). There was significant increase in blood vessels in the ischemic area treated with NPY as compared to placebo group (p=0.05). Immunoblotting showed a significant downregulation of two angiogenesis inhibitors angiostatin (p = 0.05) and endostatin (p = 0.004) in the NPY3-36 treated pigs.

DISCUSSION: We have demonstrated that NPY3-36 can cause increase in blood flow, through increased vessels formation and inhibition of anti-angiogenic factors in the ischemic myocardium. This is advantageous because there are 37% of patients cannot receive any intervention because of the diffuse or severe nature of the cardiovascular disease. This is especially significant in patients with diabetes mellitus and hypercholesterolemia, where the process of angiogenesis is impaired.

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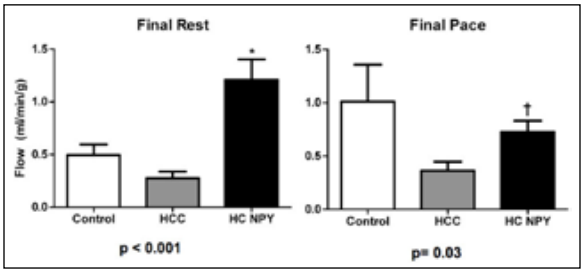
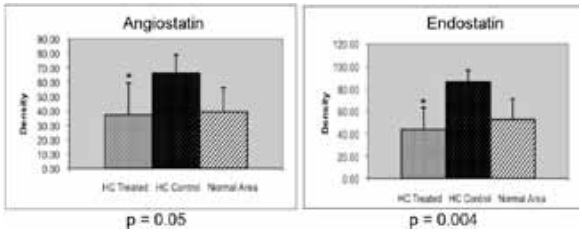
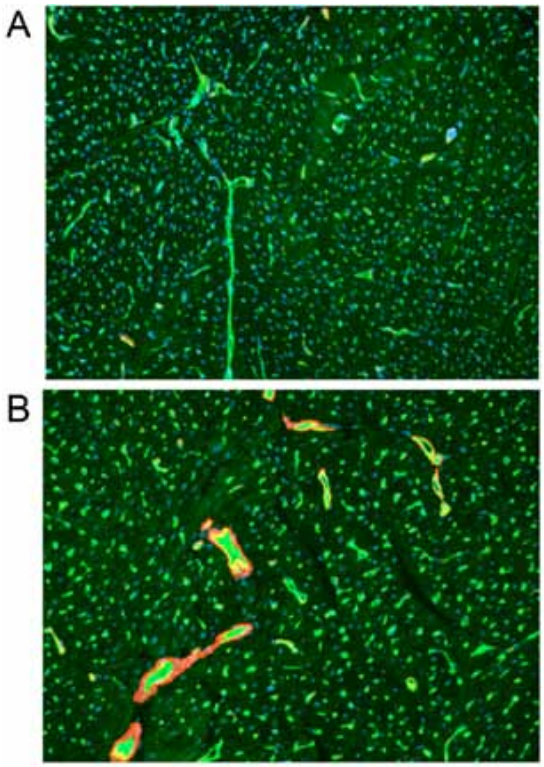


Blood flow in pigs with normal diet (control) compared to those with a high cholesterol diet and placebo infiltration (HCC), and those with a high cholesterol diet and neurotransmitter infiltration (HC NPY)



Immunoblot data showing the expression of angiostatin and endostatin



Immunohistochemistry images of the ischemic area of the pigs fed with a high cholesterol diet. A: Exposed to placebo B: Treated with NPY3-36

S-35.

INHIBITION OF DESFLURANE-INDUCED POSTCONDITIONING IN A MURINE MODEL OF LONG TERM BETA-ADRENERGIC RECEPTOR BLOCKADE

AUTHORS: T. Tischer-Zeitz[1], J. Stumpner[1], C. Lotz[1], M. Lange[1,2], N. Roewer[1], T. Smul[1]

AFFILIATION: [1]Department of Anaesthesia and Critical Care, University of Würzburg, Würzburg, Germany; [2]Department of Anaesthesia and Critical Care, Mathias-Spital, Rheine, Germany

INTRODUCTION: Beta blockers are an important element of the therapy of patients at increased cardiovascular risk[1]. However, beta-1 adrenergic receptor (ADRB1) activation represents a pivotal signalling event of anesthetic-induced postconditioning (APOST)[2]. The influence of long term blockade of the ADBR1 (LTBB) on APOST is yet unknown. We tested the hypothesis that LTBB induces distinct changes within the receptor signalling profile and thus inhibits APOST.

METHODS: After institutional approval by the local IRB, the ADRB1 antagonist metoprolol (Meto, 10mg/kg/d) or 0.9% NaCl were subcutaneously administered in male BL6 mice via osmotic pumps for a minimum of 21 days. Blood pressure and heart rate (HR) were noninvasively monitored. Sufficient ADRB1 blockade was defined as a continuous HR reduction of 9% or more compared to basic value. Subsequently all animals were subjected to a 45 min coronary artery occlusion (CAO) followed by 3 h of reperfusion. In the respective group 1.0 MAC desflurane (Des) was administered starting 3 min prior to the end of CAO. Myocardial infarct size (IS) was determined by gravitoplanimetry and expressed as a percentage of the area at risk (AAR). Changes in the expression of ADRB1, arrestin beta 1 (Arrb1) and the alpha subunit of the Gs protein (Gnas) were determined by RT-PCR and western immunoblotting. Data are mean±SEM.

RESULTS: Meto (n=30) significantly reduced the HR compared to NaCl (n=21, *p<0.05) and pre-implantation measurements (#p<0.0056) (Fig. 1, Day 0 = Day of implantation). LTBB concomitantly elicited an increase of ADRB1 mRNA (*p<0.05) whereas ADRB1 protein concentration didn't alter (Fig. 2). Des-induced postconditioning caused a significant reduction of IS (32±2%, n=7; *p<0.05) compared to control group (CON, 48±2, n=8). Long term application of Meto did not affect IS (41±3%, n=6) but inhibited cardioprotection by Des-induced postconditioning (43±3%, n=6) (Fig. 3). Meto caused an increase of ADRB1, Arrb1 and Gnas mRNA after ischemia/reperfusion that was abolished by Des.

DISCUSSION: In the introduced murine model of controlled LTBB Meto as well as its combination with APOST altered ADRB1 dependent signal transduction. In this clinically relevant constellation cardioprotection by Des-induced postconditioning was abolished by LTBB.

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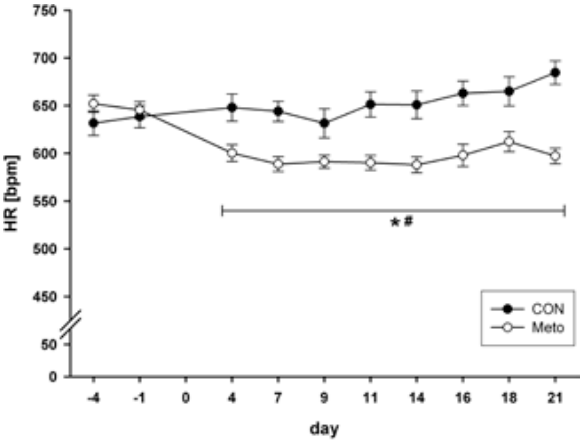

Fig. 1: Long term application of Meto induced a permanent HR reduction.

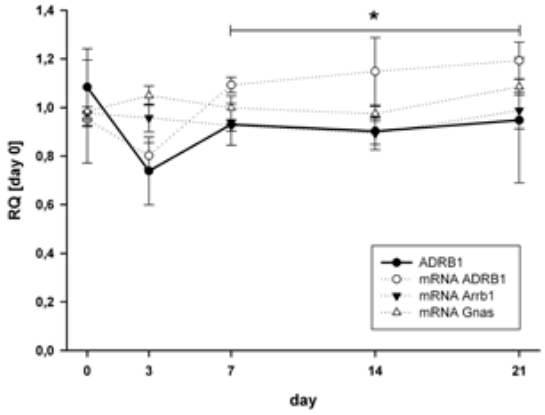

Fig. 2: Long term application of Meto induced an increase of ADRB1 mRNA level.

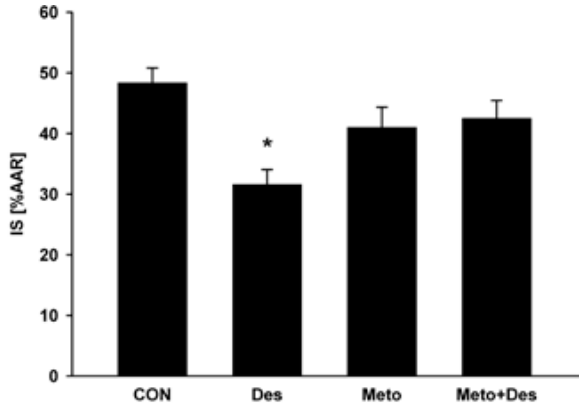

Fig. 3: Long term application of Meto inhibited Des-induced IS reduction.

S-36.

THE KAPPA OPIOID RECEPTOR ANTAGONIST NOR-BINALTHORPHIMINE IMPROVES MYOCARDIAL PERFUSION IN PIGS UNDERGOING CARDIOPULMONARY BYPASS

AUTHORS: M. M. Theisen[1,2], J. Blumenstiel[1], T. P. Weber[6], H. Nagase[4], J. Stypmann[5], F. Ploner[3]

AFFILIATION: [1]Department of Anesthesiology and Intensive Care, Münster University Hospital, Muenster, Germany; [2]Department of Anaesthesia and Intensive Care, Raphaelsklinik Münster, Muenster, Germany; [3]Department of Anesthesiology and Critical Care Medicine, Vipiteno Hospital, Vipiteno, Italy; [4]Laboratory of Medical Chemistry, School of Pharmacy, Kitasato University, Tokyo, Japan; [5]Department of Cardiology and Angiology, Münster University Hospital, Münster, Germany; [6]Department of Anesthesia and Intensive Care, St. Joseph Hospital Ruhr University Bochum, Bochum, Germany

INTRODUCTION: Previous studies have demonstrated a significant reduction in myocardial stunning and improved splanchnic perfusion with the use of κ-opioid receptor antagonists (κ-ORA)[1,2]. This study aims to further elucidate the effect of the κ-ORA nor-BNI on myocardial perfusion both during and post cardiopulmonary bypass (CPB) in pigs.

METHODS: In this study 21 pigs (mean weight 35 kg) were randomized and 24 hours prior to surgery received either nor-BNI (3,7mg/kg) or Placebo (Plc) according to the previously established methods used by[3]. The anaesthetized and intubated animals were hemodynamically monitored using established invasive techniques. Regional myocardial perfusion (MP) was determined using fluorescent microspheres (FMS) infused via a fluid filled catheter, placed in the left atrial appendage. Following induction of CPB and baseline measurements (compound) the pigs were exposed to electrically induced VF and cardioplegia as well as hypothermia (28°C for 90 min, ischemia). Following re-establishment of normal body temperature the animals were re-perfused for 30 minutes. Time points used to measure MP post application of FMS were compound, ischemia and experimental end. Mean arterial pressure (MAP), central venous pressure and cardiac output (CO) were maintained constant according to the established algorithms using fluid resuscitation, norepinephrine (NE) and dobutamine (DBx). Post mortem myocardial tissue samples were obtained from the LAD, RCX and RCA and analyzed for retained FMS content.

RESULTS: There was no significant difference in CO between the two groups. The MAP was comparable in both groups during ischemia measurement and as expected was increased at baseline and the experimental end, although the required amount of NE remained less compared to placebo[4]. Detailed data is shown in the table.

DISCUSSION: This study demonstrates that nor-BNI significantly improves MP in pigs undergoing CPB. We propose that nor-BNI could potentially be therapeutically beneficial in patients that are difficult to wean off CPB. Furthermore, the incidence of cardiogenic shock and late onset ischemic complications following cardiothoracic surgery involving CPB may be significantly reduced.

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	Placebo			nor-BNI		
	Compound	*Ischemia*	*End*	*Compound*	*Ischemia*	*End*
MAP [mm Hg]	70 (64; 80)	68 (65; 88)	64 (55; 74)	98 (88; 116)#	65 (59; 69)	76 (71; 86) #
CO [ml/min]	2311 (2093; 2704)	33 (15; 99)	2662 (2093; 2948)	1792 (1560; 2861)	121 (23; 221)	2308 (1686; 2430)
LAD [mol/g/min]	0,261 (0,206; 0,375)	0,014 (0,008; 0,036)	0,620 (0,366; 0,803)	0,544 (0,434; 0,950) #	0,014 (0,010; 0,023)	0,863 (0,683; 1,148) #
RCX [ml/g/min]	0,230 (0,173; 0,358)	0,015 (0,009; 0,046)	0,539 (0,377; 0,725)	0,533 (0,407; 0,986) #	0,035 (0,024; 0,054) #	0,818 (0,691; 1,024) #
RCA [ml/g/min	0,252 (0,196; 0,310)	0,018 (0,011; 0,031)	0,584 (0,480; 0,833)	0,380 (0,279; 0,716) #	0,042 (0,025; 0,062) #	0,703 (0,462; 1,051)

S-37.

OPIOID RECEPTOR ANTAGONISTS AFFECT THE SUCCESS OF DEFIBRILLATION OF VENTRICULAR FIBRILLATION (VF) IN PIGS UNDERGOING CARDIOPULMONARY BYPASS (CPB)

AUTHORS: M. M. Theisen[1,2], J. Stypmann[3], H. Nagase[4], T. P. Weber[5,1], T. Iden[6], K. Kaerlein[1]

AFFILIATION: [1]Department of Anesthesiology and Intensive Care, Münster University Hospital, Münster, Germany; [2]Department of Anaesthesia and Intensive Care, Raphaelsklinik Münster, Münster, Germany; [3]Department of Cardiology and Angiology, Münster University Hospital Münster, Muenster, Germany; [4]Laboratory of Medical Chemistry, School of Pharmacy, Kitasato University, Tokyo, Tokyo, Japan; [5]Department of Anesthesia and Intensive Care, St. Joseph Hospital Ruhr University Bochum, Bochum, Germany; [6]Department of Anesthesiology and Intensive Care, Schleswig-Holstein University Hospital, Campus Kiel, Kiel, Germany

INTRODUCTION: Previous studies demonstrated that κ-opioid receptor agonists show cardioprotective and anti-arrhythmic effects[1,2]. Therefore we investigated the effect of four different opioid receptor antagonists (ORA), the κ-ORA nor-binaltorphimine (nor-BNI), the δ-ORA nantrindole (NTI), the μ/κ/δ-ORA naltrexone (NTX, acting both peripheral and central) and the solely peripheral acting μ/κ/δ-ORA naltrexone methiodide (NTX-M, not able to cross the blood-brain barrier) on the success of defibrillation of VF in pigs which had been exposed to CPB.

METHODS: Ethics approval was obtained from the Bezirksregierung Muenster. 51 pigs (mean weight 35 kg) were randomized and anaesthetised. Animals were monitored using established invasive techniques and were infused with either NTX (2,0mg/kg), NTX-M (2,56mg/kg), NTI (4,0mg/kg) or Placebo. Nor-BNI was infused at a rate of 3,7mg/kg, 24h prior to begin of experiments as established by[3]. Following induction of CPB pigs were exposed to VF, cardioplegia, cross-clamp of the aortic root as well as hypothermia (28°C, 90min). After normal body temperature was obtained cross-clamping was opened and pigs were re-perfused for 30min. Consecutive VF was defibrillated according to a standardized protocol derived from ERC Guidelines. We measured the cumulative amount of energy required (measured in joules) to achieve a return of spontaneous circulation (ROSC).

RESULTS: Pigs treated with NTX-M required significantly more energy to achieve a ROSC (See table).

DISCUSSION: There was no difference in the energy required from placebo in the group of animals treated with NTX. Hence, blockade of peripheral opiate receptors (OR) appears to have a negative effect on the success of defibrillation. This effect can be reversed when the centrally acting OR are blocked. The effect caused by peripheral action is most likely mediated by δ-OR, as animals treated with central and peripherally acting NTI required substantially more energy to achieve a ROSC. While pigs treated with nor-BNI required less energy to achieve a ROSC (p=0.052), this result seems to indicate strongly that a centrally mediated κ-OR effect exists and results in a decrease in defibrillation success, which in turn can be antagonized by the centrally acting κ-ORA nor-BNI. Furthermore, these results indicate that μ-OR mediated effects exist and may enhance defibrillation success, and in turn can be blocked by the "general" peripheral acting ORA NTX-M. How this relates to the postulated cardioprotective and anti-arrhythmic properties needs to be further investigated.

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	NTX	NTX-M	NTI	nor-BNI	Placebo
cumulative amount of energy [J]	125 (12,5; 212,5)	362,6 (112,5; 737,5)	87,5 (62,5; 212,5)	25 (12,5; 62,5)	62,5 (43,8; 150,0)
	p = 0,777	p < 0,05	p = 0,62	p = 0,052	

p compound vs placebo

S-38.

DIFFERENTIAL CARDIOPROTECTION BY CHROMOSOMAL SUBSTITUTION IN A CONSOMIC RAT MODEL: ROLE OF NITRIC OXIDE IN ANESTHETIC PRECONDITIONING

AUTHORS: D. Nabor[1], Q. Cheng[1], J. R. Kersten[1,3], D. F. Stowe[1,2], J. Lazar[4], M. L. Riess[1,5]

AFFILIATION: [1]Anesthesiology, Medical College of Wisconsin, Milwaukee, WI; [2]Physiology, Medical College of Wisconsin, Milwaukee, WI; [3]Pharmacology & Toxicology, Medical College of Wisconsin, Milwaukee, WI; [4]Dermatology, Medical College of Wisconsin, Milwaukee, WI; [5]Anesthesiology, VA Medical Center, Milwaukee, WI

INTRODUCTION: Dahl Salt Sensitive (SS) rat hearts are more susceptible to ischemia/reperfusion (IR) injury than Brown Norway (BN) or consomic SS^{6BN} hearts.[1] Moreover, IR injury can be attenuated by anesthetic (APC) and ischemic preconditioning (IPC) in BN, but not in SS hearts.[2,3] We hypothesized that cardioprotection is similar between APC and IPC[4] and due to genetic information on BN chromosome 6 that mediates nitric oxide (NO) generation.

METHODS: Isolated hearts from BN, SS and SS^{6BN} rats were preconditioned with two 5-min exposures to 2 MAC sevoflurane before 30 min global ischemia and 2 h reperfusion; controls (Con) were not preconditioned. In some hearts, NO synthase (NOS) was inhibited during APC by L-NAME. We monitored LV pressure and its derivatives before, during and after ischemia and measured infarct size (IS).

RESULTS: Functional return on reperfusion was lower, and IS larger in SS than in BN or SS^{6BN} Con hearts. APC additionally improved LV function and reduced IS in BN, but not in SS or and SS^{6BN} hearts. L-NAME abolished both the APC-mediated protection in BN and the endogenous protection in BN and SS^{6BN} hearts.

DISCUSSION: Endogenous cardioprotection in BN and SS^{6BN} vs SS rats depends on NO availability as does APC-mediated protection in BN vs SS rats. In contrast to IPC, however, APC did not protect consomic SS^{6BN} hearts. These novel findings suggest that NO availability is necessary, but not always sufficient, for APC to protect cardiac function against IR injury. In addition to NOS, possible candidate genes for the observed genome-dependent differences in APC-mediated cardioprotection include upstream regulators of NOS. Supported by the Society of Cardiovascular Anesthesiologists and the Department of Veterans Affairs.

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S-39.

ENDOGENOUS OPIOIDS IN WOUND-SITE NEUTROPHILS OF STERNOTOMY PATIENTS

AUTHORS: DH. Elsayed-Awad[1], M. Abaz[1], T. Theofilos[1], R. S. Tripathi[1], C. B. Sai-Sudhakar[2], S. Roy[2]

AFFILIATION: [1]Anesthesiology, The Ohio State University Medical Center, Columbus, OH; [2]Surgery, The Ohio State University Medical Center, Columbus, OH

INTRODUCTION: Postoperative pain management is especially challenging in cardiac surgery due to the nature and extent of the procedure. The inflammatory state of the post-sternotomy surgical wound sensitizes nerve endings, causing the transmission of pain signals with improperly managed pain having detrimental effects on wound healing. Animal and human models support the involvement of peripheral opioid receptors in analgesia, particularly under inflammatory conditions where both opioid receptor expression and efficacy are increased. Opioid peptides expressed in leukocytes include β-endorphin (END), met-enkephalin (ENK), and dynorphin-A (DYN), with END being predominant.

METHODS: In this work, we examined the micro-environment of sternotomy wounds of patients undergoing coronary artery bypass grafting (CABG) to study the role of inflammatory cells in the production of opioid peptides. Eight patients 21-80 years of age and equally distributed between genders participated in this study. Protocols were approved by the Institutional Review Board. Declaration of Helsinki protocols was followed and patients gave their written, informed consent. Wound fluid and cells were collected from sternal wounds using a Jackson-Pratt Blake drain at 24, 48, and 72 hours post sternum closure. Venous blood was also collected at the same time-points as well as 0 hour (pre-operative). Wound fluid and peripheral blood samples were transported on ice for immediate laboratory analysis after collection.

RESULTS: Using anti-CD15 staining and flow cytometry, we show that polymorphonuclear neutrophils (PMN) are the predominant cells in fluid collected from sternotomy wound sites 24-72h post-surgery ($n=8$, $p<0.05$). Compared to pre-operative peripheral blood derived PMN, significant increases in CD177+/CD66b+ PMN were observed suggesting activation of PMN present at the wound site ($n=8$, $p<0.05$). Increased activation state of PMN was associated with higher levels of pro-inflammatory cytokines IL-1β, TNFα and IL-6 in the wound fluid compared to corresponding plasma samples ($n=4$, $P<0.05$). Strikingly higher (>500-fold) levels of IL-1β were noted. Sternal wound fluid contained high levels of opioid peptides END and ENK 24-72h post-surgery ($n=4$, $P<0.05$). Wound-site PMN showed significantly high levels of the mRNA of the precursors of END and ENK suggesting that increased levels of these peptides in the wound fluid may be in part contributed by wound-site activated PMN ($n=4$, $P<0.05$).

DISCUSSION: This constitutes first evidence from a patient-based study elucidating the role of inflammatory cells in generation of opioid peptides in the sternotomy wound environment.

REFERENCES: N/A

S-40.

STATINS AND IL-6-INHIBITION PREVENT ATHEROSCLEROTIC LESION GROWTH AND DESTABILIZATION IN A MODEL OF PERIOPERATIVE STRESS IN ATHEROSCLEROSIS-PRONE MICE

AUTHORS: G. Theilmeier[1], H. Janssen[1], C. Wagner[1], P. Demmer[1], U. Tietge , J. Larmann[1]

AFFILIATION: [1]Anesthesiology, MHH, Hannover, Germany; [2]Pediatrics, University Hospital Groningen, Groningen, Netherlands

INTRODUCTION: Prevention of peri-operative myocardial infarction can be achieved using statins. Statins are known to reduce inflammation of the plaque, plaque load and rupture of unstable atherosclerotic lesions.[1] Models for testing strategies to prevent plaque growth and destabilization during the perioperative period are lacking.[2] We have therefore devised a model for perioperative stress using the atherosclerosis-prone mouse apoE-/--strain subjected to a double hit model of laparotomy and blood loss. We tested statins and Il-6-blocking to prevent perioperative stress induced (POS) plaque growth and destabilization.

METHODS: With approval of the IRB 45 ApoE-/- mice were fed a Western diet for 7 weeks and then subjected to a combination of laparotomy (30' before closure) and 20% blood loss (400 µl). Animals were treated PO for 72 hours pre- and 72h postoperatively with 80 mg/kg bw atorvastatin or postoperatively SC with an Il-6-blocking antibody (200µg MP5-20S3). 72h post-POS animals were sacrificed and plaque volume in the inomminate artery was assessed on cryosections stained with H&E. Macrophage and VSMC content were assessed by immunohistochemistry. Lipoprotein profiles (baseline and 72h) as well as plasma Il-6 and TNFα (at baseline, 4h, 6h, 12h and 24h) were assessed. Data are presented as median (25%/75% CI) and tested by Kruskal-Wallis and Dunn's test.

RESULTS: Diet-induced hypercholesterolemia (total and VLDL cholesterol, but not HDL and TG) was reduced by POS. Plaque volume increased by POS (2.5x107 (1.0x107; 5.5x107) vs 0.17x107(0.0x107;0.99x107) µm3; n=10; $p<0.01$). Relative macrophage and VSMC content of the plaque remained unchanged. POS significantly increased plasma levels of IL-6 with a peak at 6h (758±85 ng/mL, $p<0.01$, n=6) but not TNFα. Statins reduced plaque volume to 20%, Il-6-inhibition to 30% of POS with no change in composition. To assess plaque vulnerability plaque rupture, intraplaque hemorrhage and necrosis were scored and revealed a significant destabilization of plaques by POS and a significant reduction of vulnerability by statin or Il-6 inhibition.

DISCUSSION: We have developed a clinically relevant model of plaque growth and destabilization by POS. We have further demonstrated that brief courses of high-dose statin, a known strategy to reduce plaque vulnerability, or inhibition of Il-6, as one cytokine endighted to cause plaque destabilization, can prevent plaque growth and destabilization fostered by POS. Our model will allow to screen novel and known strategies for prevention of complication of atherosclerosis for their usefulness during the perioperative phase.

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S-41.

IN VIVO FLUORESCENCE-MEDIATED TOMOGRAPHY IMAGING DEMONSTRATES ATORVASTATIN MEDIATED REDUCTION OF LESION MACROPHAGES IN APOE-DEFICIENT MICE

AUTHORS: J. Larmann[1], T. Frenzel[2,3], P. Demmer[1], U. J. Tietge[4], C. Bremer[5], G. Theilmeier[1]

AFFILIATION: [1]Department of Anesthesiology and Intensive Care Medicine, Hannover Medical School, Hannover, Germany; [2]Department of Anesthesiology and Intensive Care Medicine, University Hospital Muenster, Muenster, Germany; [3]Institute for Anatomy, University of Muenster, Muenster, Germany; [4]Department of Pediatrics, Center for Liver, Digestive, and Metabolic Diseases, University Medical Center Groningen, Groningen, Netherlands; [5]Department of Clinical Radiology, University Hospital Muenster, Muenster, Germany

INTRODUCTION: Perioperative statins protect patients at cardio-vascular risk from adverse events and mortality. The underlying mechanisms are unknown. Atherosclerotic lesion progression, destabilization and rupture are driven by macrophages (MØ).[1] We used non-invasive fluorescence-mediated tomography (FMT) to image MØ homing to vulnerable plaques in vivo. We assessed whether short-term high-dose atorvastatin has plaque-stabilizing effects in a mouse model for advanced atherosclerotic lesions.

METHODS: After IRB approval 14 ApoE-/--mice were fed a high-cholesterol diet to establish complex atherosclerotic plaques. After 16 wks on diet mice received 40mg/kg BW atorvastatin or vehicle twice daily for 4 days. Thioglycollate elicited peritoneal MØ from eGFP-mice were labeled with near-infrared fluorescent dye DiR. 107 eGFP/DiR indicator MØ were injected IV 2 days prior to treatment. FMT-scans were performed on day 0, 2 and 4 to quantify MØ infiltration into aortic and brachiocephalic artery plaques. eGFP/DiR-MØ that infiltrated plaques were counted on frozen-sections of brachiocephalic arteries by fluorescence microscopy. Lesion size was measured on H&E stainings. Immunohistochemistry for CD68 was utilized to assess overall MØ content. Plasma was collected on day 4 for lipoprotein analysis. Data were tested for Gaussian distribution and evaluated for significant differences ($p<0.05$) by Students t-test. Results are displayed as mean or mean % of baseline ±SEM.

RESULTS: Longitudinal FMT scans detected an increase of DiR-signal derived from indicator MØ recruited into aortic and brachiocephalic artery plaques. After 4 days of high-dose statin the signal was lower than in untreated controls (75±7 vs. 175±35, % of baseline, $p<0.05$). The reduction of recruited eGFP/DiR-MØ in the statin group was confirmed by fluorescent microscopy (50±13 vs. 125±23, eGFP/DiR pos. cells/lesion, $p<0.02$). Plaque size was not affected ($p=0.67$). However, statin treatment reduced the plaque area that stained positive for CD68 by 35% ($p<0.05$). Total cholesterol was moderately reduced in statin animals (351±21 vs. 504±58, mg/dl, $p<0.01$). Triglycerides, phospholipids, HDL, LDL and VLDL did not differ (p=ns).

DISCUSSION: In vivo FMT optical imaging proved its high potential for clinical applicability to track infiltration of DiR-labeled MØ into vulnerable atherosclerotic plaques. FMT-based quantification of MØ recruitment demonstrated a stabilization of atherosclerotic lesions in ApoE-/--mice by 4-day atorvastatin treatment. This rapid and likely lipoprotein-independent effect could explain the reduction in cardio-vascular events in patients on perioperative statin therapy.

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Cardiothoracic & Vascular Clinical

S-47.

LIBERALIZED FLUID PROTOCOL AND TISSUE PERFUSION BIOMARKERS IN LUNG RESECTION SURGERY

AUTHORS: S. Assaad[1,2], M. Perkal[1,3], T. Kyriakides[1], G. Tellides[1,3], M. Ditillo[1,3], A. Perrino[1,2]

AFFILIATION: [1]Anestehsiology and Surgery, VA Connecticut Healthcare Systems, West Haven, CT; [2]Anesthesiology, Yale University, School of Medicine, New Haven, CT; [3]Surgery, Yale University, School of Medicine, New Haven, CT

INTRODUCTION: Perioperative fluid management for lung resection surgery is a challenging task. Excess fluid balance has been associated with postoperative pulmonary edema and hence restrictive fluid management has been advised[1]. Concerns with restrictive fluids include impaired tissue perfusion and acute kidney injury (AKI) with an incidence ~25%[2]. Recently, protective lung ventilation has been found to decrease the incidence of pulmonary edema post lung resection surgery[3]. We hypothesize that by employing a protective lung ventilation anesthetic, the use of a liberalized fluid protocol targeting normovolemia would avoid tissue hypoperfusion and AKI.

METHODS: After IRB approval, pts scheduled for lung resection surgery excluding those for planned pneumonectomy, ejection fraction < 40% or serum creatinine > 2 mg/dl, were asked to enroll in this prospective observational trial. Biochemical markers of tissue perfusion (serum creatinine, BNP, lactic acid, central venous oxygen saturation) were measured through POD 3. Protective lung ventilation protocol was implemented. Intraoperative fluids consisted of crystalloid solution for maintenance (1.5 ml/kg/hr), deficit replacement and replacement of the insensible loss (1 ml/kg/hr). Blood loss was repleted 1:1 with colloid solution or PRBCs. The protocol was continued postoperatively until oral intake. AKIN criteria defined AKI. Data is presented as a mean ± SD with non-parametric analysis to compare variables.

RESULTS: 14 pts consented and 3 surgeries were cancelled. The 11 remaining pts were males (65 ± 6.0 yrs). 8 had lobectomy, 2 wedge resection and 1 unplanned pneumonectomy. One-lung ventilation time was 233 ± 110 min. Tidal volume was 4.5 ml/kg ± 0.2, with peak pressure of 19.9 ± 4.5 cmH2O. Intraoperative fluids were crystalloid 2200 ± 593 ml and colloid 472 ± 403 ml. POD1-3 pts received 1260 ± 796 ml/day of crystalloids in addition to oral intake. Central venous oxygen saturation and lactic acid were within normal range postoperatively. Serum creatinine ($p<0.05$) and BNP decreased compared to baseline and no pts met AKIN criteria (Table 1, Figure 1).

DISCUSSION: These preliminary data did not detect AKI or tissue hypoperfusion post lung resection surgery in patients administered a liberalized fluid protocol in conjunction with protective lung ventilation anesthetic. These findings suggest future randomized controlled trials assessing liberal versus restrictive fluid management's impact on tissue perfusion in lung resection surgery.

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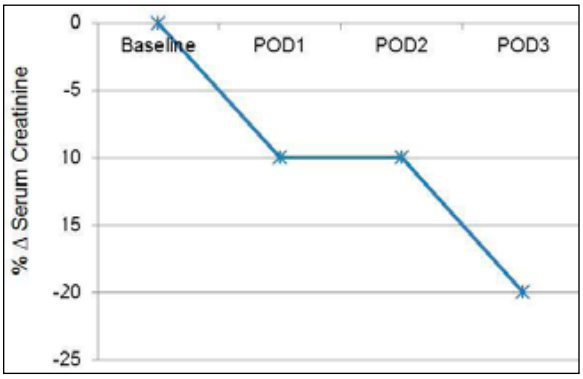

Table 1: Perioperative Biochemical Marker Profile

	Preoperative	Day of Surgery	POD 1	POD 2	POD 3	p-value
Serum creatinine (mg/dl)	1.0 ± 0.2 (0.7-1.6)	0.9 ± 0.2 (0.7-1.3)	0.9 ± 0.4 (0.6-1.8)	0.9 ± 0.3 (0.6-1.5)	0.8 ± 0.2 (0.6-1.2)	0.004*
Lactic acid (mg/dl)		1.2 ± 0.6 (0.6-2.6)	1.3 ± 0.5 (0.7-2.1)	1.1 ± 0.5 (0.-2.1)	0.6 ± 0.2 (0.3-1.0)	
Central venous saturation (%)		71 ± 12 (51-89)	71 ± 9.8 (52-86)	71 ± 8.6 (58-82)	69 ± (50-87)	
BNP (pg/ml)	207 ± 305 (19-933)				155 ± 70 (43-223	NS

*Comparison between mean (DOS + POD 1-3) to baseline serum creatinine

S-48.

SURVEY OF US ACADEMIC INSTITUTIONS REGARDING THE PRACTICE OF LUMBAR CEREBROSPINAL FLUID DRAINS FOR AORTIC ANEURYSM REPAIRS

AUTHORS: W. Bradford, H. Arora, P. Kumar

AFFILIATION: Anesthesiology, UNC Hospitals, Chapel Hill, NC

INTRODUCTION: Lumbar (cerebrospinal fluid, CSF) drains are commonly placed for spinal cord protection during thoracoabdominal aneurysm repairs. The practice of placing the drains and their management could vary widely from institution to institution. We surveyed all academic institutions in the United States to get an understanding of these practice patterns.

METHODS: A web-based questionnaire was sent to all US academic Chairs. The survey comprised of questions related to placement, timing, monitoring and follow up of lumbar drains. The chairs were contacted through mass email via the Society of Academic Anesthesiologists Association as well as by postal mailings. All chairs were requested to forward the questionnaire to their vascular section chief so as to only have one response per institution.

RESULTS: The overall response rate was 34% (45/132). The survey demonstrated wide variation in the average number of lumbar drains performed as well as their management and follow up. Drains were placed by anesthesiologists (84.4%), neurosurgery (13.3%) or vascular surgery (2.2%). At institutions where neurosurgery primarily placed lumbar drains, a majority (63.6%) were placed after induction of anesthesia. Institutions where lumbar drains were placed by anesthesiologists, a majority were done awake, (71.7%) with only 29.3% being done after induction of anesthesia. Roughly half of the respondents acknowledged placement of lumbar drains for aortic surgery involving full cardiopulmonary bypass and high dose heparinization, where a majority were done the day of surgery (83.9%) as opposed to a day prior (16.1%). Over half of the respondents affirmed that they would proceed with the scheduled surgery even after a traumatic (bloody) placement. Post-operatively, most drains were managed by vascular surgery (48.9%) and the remaining by anesthesiology (33.3%), pain service (4.4%), or by neurosurgery (13.3%). A majority of lumbar drains were pulled by anesthesiology (66.7%) and the remaining by pain service (6.7%), vascular surgery (13.3%), or by neurosurgery (13.3%).

DISCUSSION: In the United States, perioperative management of lumbar drains for aortic aneurysm repair varies widely among academic institutions.

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S-49.

THE EFFICACY OF NITROUS OXIDE ON FACILITATING LUNG COLLAPSE AT THE INITIATION OF ONE-LUNG VENTILATION WITH BRONCHIAL BLOCKER

AUTHORS: T. Yoshimura[1,2], K. Ueda[2], J. Sawai[1], Y. Nakata[3,1]

AFFILIATION: [1]Anesthesia, Teikyo University Hospital, Tokyo, Japan; [2]Anesthesia, University of Iowa Hospitals and Clinics, Iowa City, IA; [3]Graduate School of Public Health, Teikyo University, Tokyo, Japan

INTRODUCTION: Prompt collapse of the non-ventilated lung can facilitate thoracic surgery. However, it could be challenging due to a small suction channel with use of bronchial blocker. We hypothesized that the use of nitrous oxide (N2O) in the inspired gas mixture during two-lung ventilation (TLV) leads to clinically relevant improvement of the lung collapse during subsequent one-lung ventilation (OLV) with a bronchial blocker.

METHODS: After approval by the hospital's Research Ethics Board, written informed consent was obtained from patients undergoing elective thoracotomy or thoracoscopic surgery. Forty patients were randomized into two groups: N2O (n = 22) or O2 (n = 18). The N2O group received a gas mixture of oxygen and N2O (FiO2 = 0.50) and the O2 group received 100% oxygen until the start of OLV. Anesthesia was induced with propofol (1-2 mg/kg) and 1 mg/kg of rocuronium and was maintained with propofol infusion (100-150 mcg/kg/min), remifentanil (0.15-0.25 mcg/kg/min) and intermittent boluses of rocuronium. The patients' trachea was intubated with an 8.0-mm internal diameter endotracheal tube. Lung isolation was achieved with an Arndt® wire-guided bronchial blocker (Cook® Critical Care, Bloomington, IN). All bronchial blockers were placed via the endotracheal tube using a pediatric fiberoptic bronchoscope. After turning the patients to the lateral position, the cuff of the bronchial blocker was inflated with fiberoptic surveillance and patients' lungs in both groups were then ventilated with 100% oxygen during OLV. The surgeons, who were blinded to the randomization, evaluated the lung deflation using a verbal rating scale (lung collapse scale, 0= no collapse, to 10 = complete collapse) at 1 min after opening the pleura for assessment of initial phase of lung collapse, and also 5min and 10min for assessment of second phase of lung collapse. Data analysis of lung collapse scales between groups was done with Mann- Whitney tests. Statistical significance was defined as $p < 0.05$.

RESULTS: There were no significant differences in demographics between both groups. The results of lung collapse scales were shown in the Table. Lung collapse scales in the N2O group were significantly improved compared with the O2 group at 5 min after opening the pleura. However, their differences were insignificant at 1 min and 10 min.

DISCUSSION: Animal studies have demonstrated that two phases are primarily involved in the determination of rate of collapse of the non-ventilated lung[1,2]. Our findings support that the use of N2O clinically improves the second phase of lung collapse compared with 100% oxygen during OLV with bronchial blockers.

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Lung collapse scale	N2O (n=22)	O2 (n=18)	P-value
1 min	2 (1-6)	2 (1-4)	0.7988
5 min	8 (6-10)	6 (3-7)	0.0003
10 min	10 (7-10)	9.5 (5-10)	0.1531

Data are expressed as median (range). A p-value < 0.05 is considered statistically significant.

S-50.

DOES LIBERALIZED FLUID PROTOCOL INCREASE LUNG WATER POST LUNG RESECTION SURGERY?

AUTHORS: S. Assaad[1,2], M. Perkal[1,3], T. Kyriakides[1], G. Tellides[1,3], A. W. Kim[1,3], A. Perrino[1,2]

AFFILIATION: [1]Anesthesiology and Surgery, VA Connecticut Healthcare Systems, West Haven, CT; [2]Anesthesiology, Yale University, School of Medicine, New Haven, CT; [3]Surgery, Yale University, School of Medicine, New Haven, CT

INTRODUCTION: Acute lung injury following lung resection surgery is a rare but serious complication[1,2]. Although the pathogenesis is unclear, an increase in pulmonary capillary hydrostatic pressure has been suggested. This has led to the practice of restrictive fluid therapy[3]. We hypothesized that with an anesthetic technique employing protective lung ventilation, fluid therapy directed at normovolemia will not result in an increase in the extravascular lung water in the perioperative period.

METHODS: After IRB approval, all patients scheduled for lung resection surgery were asked to enroll in a prospective, observational trial. Exclusion criteria included planned pneumonectomy, ejection fraction < 40% or serum creatinine > 2 mg/dl. Extravascular lung water index (EVLWI), global end diastolic index (GEDI) and cardiac index (CI) were measured using the PiCCO monitor (Pulsion Medical Systems, Germany). Baseline measurements were obtained pre-incision. Following one-lung ventilation, patients were pressure control ventilated with 100% O2 for tidal volume (Vt) of 4-6 ml/kg, peak airway pressure (Paw)< 30 cmH2O, PEEP 5 cmH_2O and recruitment maneuver. Intraoperative fluids consisted of crystalloid solution maintenance at 1.5 ml/kg/hr, deficit volume replacement, and replacement of the insensible loss at 1 ml/kg/hr for open surgeries. Blood loss was repleted 1:1 with colloid solution. The protocol was continued postoperatively until oral intake. Diuretics were not used routinely. PiCCO measurements were obtained for 3 days postoperatively. Data is presented as a mean ± SD. Non-parametric analysis used to compare variables.

RESULTS: 14 patients consented to participate. Three patients' surgeries were cancelled. The 11 remaining patients were males age 65 ± 6.0 yrs. 8 patients had lobectomy, 2 wedge resection and 1 an unplanned pneumonectomy. Open thoracotomy was used in 8 patients and a video assisted approach in 3 patients. One-lung ventilation time was 233 ± 110 min. Vt was 4.5 ml/kg ± 0.2, with Paw of 19.9 ± 4.5 cmH2O. Intraoperative crystalloid fluids intake was 2200 ± 593 ml and Hextend 472 ± 403 ml. On POD 1-3 patients received 1260 + 796 ml/day of crystalloids in addition to oral intake. Compared to baseline, GEDI was maintained and CI significantly increased on POD 1-3. EVLW showed no change. (Table1).

DISCUSSION: These preliminary results suggest that adoption of a liberalized perioperative fluid protocol achieves normovolemia as shown by GEDI, increased CI, without an increase in lung water.

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Table 1: Values of EVLWI, GEDI and CI on POD 1-3 compared to baseline value.

	Baseline	POD 1		POD 2		POD 3	
		Value	p-value	Value	p-value	Value	p-value
EVLWI (ml/kg)	11.2	10.5	NS	11.5	NS	12.2	NS
GEDI (ml/ m2)	815	856	NS	787	NS	831	NS
CI (l/min/m2)	2.6	3.95	0.002	3.8	0.001	3.7	0.003

S-51.

ANESTHETIC INDUCTION WITH ETOMIDATE, RATHER THAN PROPOFOL, IS ASSOCIATED WITH INCREASED CARDIOVASCULR MORBIDITY AFTER NON-CARDIAC SURGERY

AUTHORS: R. Komatsu[1], J. You[2], E. J. Mascha[2], D. I. Sessler[3], A. Turan[3]

AFFILIATION: [1]Anesthesiology Institute, Cleveland Clinic, Cleveland, OH; [2]Departments of Quantitative Health Sciences and Outcomes Research, Cleveland Clinic, Cleveland, OH; [3]Department of Outcomes Research, Cleveland Clinic, Cleveland, OH

INTRODUCTION: Etomidate is used to induce anesthesia in critically ill patients because of its favorable hemodynamic profile. However, the drug causes adrenal impairment which blunts release of cortisol that accompanies surgical tissue injury[1]. Cortisol augments vascular effects of endogenous epinephrine and norepinephrine, thus maintaining blood pressure[2] and etomidate may consequently provoke postoperative hemodynamic instability. We tested the hypothesis that etomidate is associated with post-operative cardiovascular morbidity.

METHODS: We evaluated the electronic records of 31,148 ASA physical status 3-4 patients who had non-cardiac surgery at our institution. Among these, anesthesia was induced with etomidate in 2,616 patients whereas 28,532 were given propofol. Two thousand one hundred forty-five patients given etomidate were propensity-score matched with 5,211 patients given propofol. The groups were compared on post-operative cardiovascular morbidity (Table 2) and intraoperative vasopressor requirement using logistic regression; the significance criterion was 0.025 (Bonferroni correction). Finally, we summarized the differences in intraoperative hemodynamics between the etomidate and propofol patients using the standardized difference.

RESULTS: Patients given etomidate had significantly greater odds of having cardiovascular morbidity (odds ratio [OR], 1.54; 97.5% CI, 1.22-1.94; $P < 0.001$). However, intraoperative vasopressor requirement (OR, 0.98; 97.5% CI, 0.86-1.12; $P = 0.72$) did not differ between the agents. The etomidate and propofol groups were descriptively similar on systolic blood pressure during closing to end of the case, and on diastolic blood pressure during induction to intubation (Table 3, absolute standardized difference (STD) <0.10; Figure). The propofol patients were more likely to have a lower systolic blood pressure during induction to intubation and during intubation to incision than the etomidate patients. Although slight differences in blood pressure between etomidate and propofol patients during other intraoperative periods were observed (Table 3, absolute STD> 0.10; Figure), none of the differences were clinically important.

DISCUSSION: Etomidate was associated with increased risk for cardiovascular morbidity. Clinicians should use etomidate judiciously, considering improved hemodynamic stability at induction may be accompanied by substantially worse longer-term outcomes.

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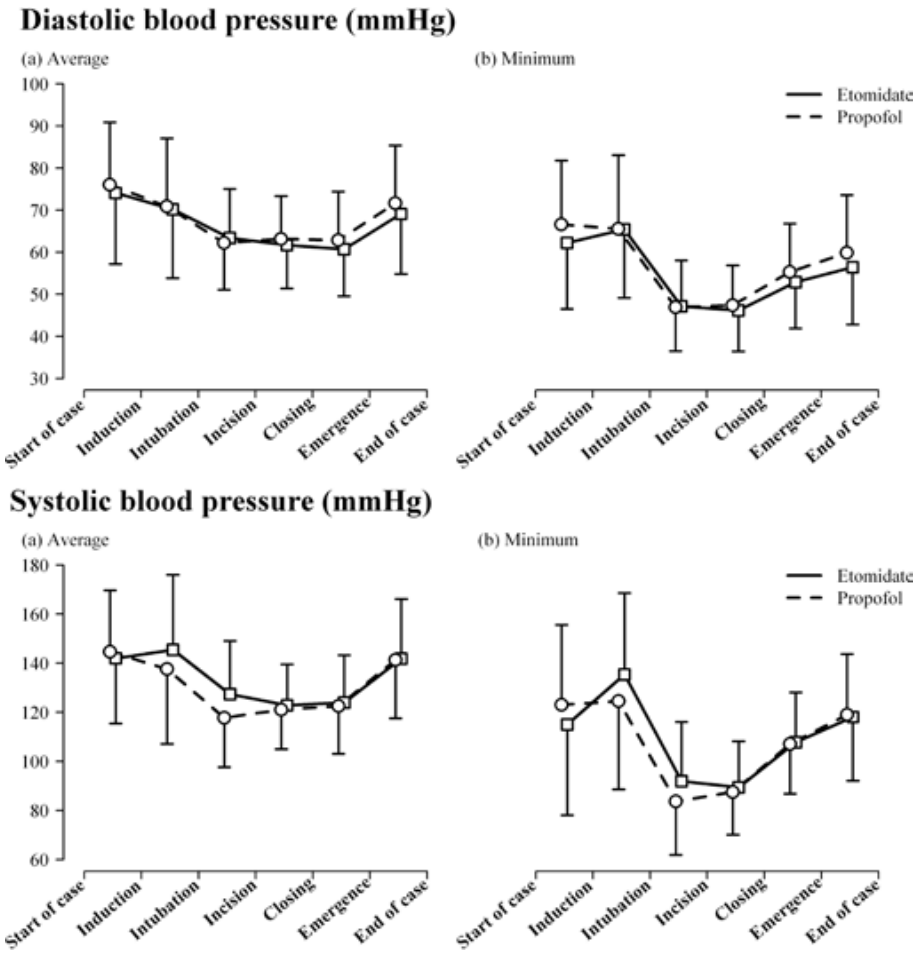

S-52.

HAPTOGLOBIN POLYMORPHISM AND NEW ONSET ATRIAL FIBRILLATION FOLLOWING CORONARY ARTERY BYPASS SURGERY

AUTHORS: J. Raphael[1], A. Fox[3], C. D. Collard[2], S. Shernan[3], J. D. Muehlschlegel[3], S. Body[3]

AFFILIATION: [1]Anesthesiology, University of Virginia, Charlottesville, VA; [2]Anesthesiology, Texas Heart Institute, Houston, TX; [3]Anesthesiology, Perioperative and Pain Medicine, Brigham and Women's Hospital, Boston, MA

INTRODUCTION: Atrial fibrillation (AF) is the most common complication after cardiac surgery (up to 40% incidence), and is associated with increased risk of neurological, renal and infectious complications, as well as postoperative hospital stay. Numerous epidemiological studies have documented an association between hemoglobin-binding protein haptoglobin (Hp) polymorphisms (specifically the Hp 2-2 phenotype) and cardiovascular morbidity in non-surgical patients. We sought to determine whether the Hp-2-2 phenotype is independently associated with new onset AF after coronary artery bypass graft (CABG) surgery with cardiopulmonary bypass (CPB).

METHODS: Retrospective analysis of prospectively collected data of 775 patients undergoing primary CABG surgery with CPB at two institutions (CABG Genomics Project; http://clinicaltrials.gov/show/NCT00281164). Haptoglobin phenotypes were determined by gel electrophoresis[1]. AF was defined as the occurrence of new onset AF during the postoperative period of the primary hospitalization. Univariable analysis was performed to evaluate the association between Hp phenotypes and postoperative AF. Multivariable adjustments were made for patient demographics and perioperative risk factors.

RESULTS: 267 patients (34.4%) had the Hp 2-2 phenotype, while 508 patients were either Hp 1-1 (15%) or 2-1 (50.6%). 209 patients (27%) developed new onset AF after surgery. Within the Hp-2-2 group, 84 patients developed AF (31.5%), vs. 125 patients (24.6%) with the non-2-2 phenotype. On univariable analysis, the Hp 2-2 phenotype was associated with increased risk of postoperative AF ($p<0.05$). Other independent risk factors were patient age ($p<0.01$), prior history of AF ($p<0.01$), and CPB time ($p<0.05$). After multivariable adjustments, only age ($p<0.01$; OR-5.32, 95% CI-2.32-6.03) and prior history of AF ($p<0.01$; OR-2.63, 95%CI-1.47-5.72) were associated with postoperative AF.

DISCUSSION: Although patients with the Hp-2-2 phenotype had an absolute 6.9% higher risk to develop postoperative AF, this Hp phenotype was not independently associated with postoperative AF after CABG surgery.

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S-53.

EFFECT OF INDIAN CLASSICAL MUSIC (RAGA THERAPY) ON FENTANYL , PROPOFOL , VECURONIUM REQUIREMENTS AND CORTISOL LEVELS IN CARDIOPULMONARY BYPASS

AUTHORS: S. K. Kar, C. S. Sen

AFFILIATION: Cardiac Anesthesia, Ipgmer, Kolkata, India

INTRODUCTION: Cardiopulmonary bypass is associated with immense stress response and high levels of intraoperative cortisol levels which is detrimental to the patient and involves large doses of Fentanyl, propofol and vecuronium requirement to maintain hemodynamic stability intraoperatively

METHODS: After obtaining clearance from Institutional Ethical Committee and written informed consent from patients, 34 patients were assigned to either Group I Music group (n= 17) and Blank CD Group II (n= 17). The patients awareness .level and depth of anesthesia was monitored by BIS (Bispectral index) , Fentanyl and propofol infusion titrated to a BIS score of 50 and neuromuscular monitoring was done by Post tetanic count (PTC) in the Aductor Pollicis muscle .Vecuronium was repeated whenever a PTC count of 7 was achieved, in both the groups. Music therapy or blank CD was played by earphone, in the patient's ear in both the groups, from 30 mins before induction to till the patient was shifted to the ICU.

RESULTS: We found significant decrease in the cortisol levels both after Sternotomy and after aortic crosscalmp release. In the Music group (Group I) which was 30 % less than the Blank CD group (Group II). Fentanyl, propofol and vecuronium requirement in the Music group were reduced by 30 % and 25 %and 25 % respectively, which were statistically significant ($P< 0.05$)

DISCUSSION: By unknown mechanism s Indian classical music therapy reduced the intraoperative stress and analgesic requirement.

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S-54.

HIGH PRE-OPERATIVE BRAIN NATRIURETIC PEPTIDE LEVELS PREDICT POST-OPERATIVE PROLONGED ICU STAY AND HIGHER MORTALITY IN PATIENTS UNDERGOING NON-EMERGENT CARDIAC SURGERY

AUTHORS: D. Mikami, H. Nakazawa, K. Moriyama, T. Yorozu

AFFILIATION: Tokyo, Japan

INTRODUCTION: Recent evidences suggest that pre-operative brain natriuretic peptide (BNP) levels have a high negative predictive value of post-operative complications after cardiac and non-cardiac surgery[1]. We invstigated whether pre-operative BNP levels predict post-operative morbidity and mortality in patients undergoing non-emergent cardiac surgery.

METHODS: We retrospectively evaluated records of patients who underwent non-emergent cardiac surgery at our institution since April 2009 to March 2010. Patients with pre-operative renal dysfunction (serum creatinine >1.2mg/dL), respiratory failure (P/F ratio<300 and/or SpO2□95% (room air), hemodynamic instability (any vasopressor use), and patients undergoing vascular surgery were excluded from the study. Major morbidity was defined as one of the following: prolonged ventilation >48 hours, prolonged ICU stay >7 days, all-cause mortality within 30 days. Estimations of the risks were performed using logistic regression and quoted as odds ratio (OR). Preoperative BNP value were entered into logistic regression models along with the following parameters; physiological findings of echocardiography, ASA physical status, fluid administration, blood loss, transfusion required, urine output during surgery, duration of anesthesia, and types of surgical procedures. The cutoff value of BNP for prolonged ventilation was defined by a receiver operating characteristic curve (ROC).Using this cutoff value of BNP, the data were reanalyzed by entering parameters of post-operative cardiac function, vasopressor use and blood gas analysis.

RESULTS: A total of 62 patients with a mean age of 68.7±12.4 were included in this study. 42 patients underwent isolated coronary artery bypass graft (including 23 off-pump surgery), 16 underwent valve procedure alone, and 4 underwent combined procedures. Mean pre-operative BNP value was 391±324 pg/mL. Risk factors for prolonged ventilation were preoperative BNP, and combined procedures. The risk factor for prolonged ICU stay was preoperative BNP alone. All-cause mortality within 30 days were associated with preoperative BNP and intraoperative urine output. A ROC analysis demonstrated that a preoperative BNP>259pg/mL (sensitivity:72%, specificity 57%) provided the optimal BNP cutoff point. In the higher BNP group (>259pg/mL), postoperative CVP and vasopressor use were significantly higher, and P/F ratio was significantly lower ($p<0.05$).

DISCUSSION: BNP is predictable of prolonged ventilation, prolonged ICU stay and all-cause mortality within 30 days. The cutoff value of BNP (>259pg/mL) is also predictable of post-operative hemodynamic instability .

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S-55.

POST-OPERATIVE SUPPLEMENTAL OXYGEN THERAPY ASSOCIATED WITH INCREASED RISK FOR POST-OPERATIVE MYOCARDIAL INFARCTION IN NON-CARDIAC SURGICAL PATIENTS

AUTHORS: K. J. Ringenberg, S. Shillcutt

AFFILIATION: Anesthesiology, University of Nebraska Medical Center, Omaha, NE

INTRODUCTION: Approximately 500,000-900,000 (0.5-0.9%) patients experience peri-operative cardiac events annually following non-cardiac surgery. Patients who suffer post-operative MI are known to have an increase in morbidity and mortality.[1]

METHODS: A retrospective evaluation was conducted of 107 medical records of patients between ages 21-93 who had elevated serum troponin-I (>0.4 ng/mL) on post operative days zero to five, and documentation of myocardial ischemia or MI following non-cardiac surgery at a single academic medical center during 2004 and 2005. Seventy categorical variables were evaluated for an association with post-operative MI. Two control patients who did not suffer peri-operative MI were identified and appropriately matched for each study patient.

RESULTS: Univariate analysis of all categorical variables revealed findings largely consistent with previously published data from large, well designed studies.[1] Multiple logistic regression revealed other factors that correlated to peri-operative MI (Table 1). Supplemental O_2 therapy after PACU discharge had the strongest correlation to MI.

DISCUSSION: Routine use of supplemental oxygen in certain patient groups has been questioned.[2,3] High flow O_2 administration may decrease cardiac output, cardiac perfusion and coronary O_2 delivery in patients with and without coronary artery disease.[2,3] Cabello et al examined the efficacy of O_2 therapy in the setting of acute MI, and concluded there is little evidence of benefit in non-hypoxic patients.[3] In patients who have sustained a stress response associated with surgery, it is feasible that delivery of supplemental O_2 to non-hypoxic post-operative patients may have similar effects, such as altered hemodynamics and myocardial perfusion, particularly in the coronary microcirculation.

Our study did not establish that patients who received supplemental O_2 were hypoxic. However, only 16 of the 72 patients who received O_2 after PACU discharge and developed a MI were hypoxic in the PACU suggesting a significant number of normoxic patients received supplemental O_2.

Additional research is needed to evaluate the association between the delivery of supplemental O2 to post-operative patients and MI.

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Table 1

VARIABLE	Odds Ratio	95% Wald Confidence Limits	p-value of fixed effect
HTN (intra-operative SBP>160 or DBP>110)	2.221	(1.086, 4.543)	0.0289
Poor Exercise tolerance (pre-operative)	3.203	(1.25, 8.205)	0.0153
ICU stay (post-op)	4.348	(2.142, 8.826)	<.0001
Elevated Serum Creatinine Post-operatively (male >1.5, female >1.3)	6.711	(3.310, 13.608)	<.0001
Supplemental O2via nasal cannula or face mask after discharge from PACU	7.033	(3.581, 13.811)	<.0001

S-56.

THE INTERRACTION OF LOW-DOSE DROPERIDOL WITH PROPOFOL ON QTC INTERVAL DURING ANESTHETIC INDUCTION

AUTHORS: Y. Terao[1], T. Toyoda[1,2], M. Oji[1,2], U. Higashijima[1,2], M. Fukusaki[1], K. Sumikawa[2]

AFFILIATION: [1]Anesthesia, Nagasaki Rosai Hospital, Sasebo, Japan; [2]Anesthesiology, Nagasaki University School of Medicine, Nagasaki, Japan

INTRODUCTION: Although droperidol is an excellent antiemetics, the use is limited to specific indication because of FDA warning of the risk of critical arrhythmias due to the effect of QT prolongation[1]. Our previous study showed that propofol shortened QTc interval during anesthetic induction[2]. In this study, we investigated the effect of low-dose droperidol and the interaction with propofol on heart rate corrected QT (QTc) interval in surgical patients.

METHODS: Seventy-two patients undergoing upper limb surgery were included in this study. Patients were randomly allocated to one of 3 groups to receive 1 mL of saline (group A; n = 24), 1.25 mg of droperidol (group B; n = 24) or 2.5 mg of droperidol (group C, n = 24) droperidol. The patients breathed 100% oxygen via a facemask for 1 min, and received a bolus injection of saline or droperidol. One min later, fentanyl, 3 μg/kg, was given and anesthesia was induced using propofol, 1.5mg/kg, 2 min after fentanyl administration. Immediately after loss of consciousness, a bolus of vecuronium ,0.15 mg/kg, was administered to facilitate tracheal intubation. Tracheal intubation was performed 3 min after vecronium administration. If bispectral index (BIS) was above 50, an additional boluse of propofol, 0.5 mg/kg, was administered. Heart rate (HR), mean arterial pressure (MAP), BIS, and 12-lead ECG were recorded at the following time points: just before droperidol injection (baseline); 3 min after saline or droperidol injection (droperidol); 3 min after propofol injection (propofol); 2 min after tracheal intubation (intubation). The QTc interval was calculated using Fridericia formula. A factorial ANOVA with repeated measures and post hoc comparison, Bonferrori/Dunn procedure, were performed. A p value < 0.05 was considered statistically significant.

RESULTS: BIS and MAP declined after anesthetic induction in all groups. HR declined after anesthetic induction and recovered after tracheal intubation in all groups. As shown in table 1, QTc interval was significantly shortened after propofol injection, compared with baseline in group A and B, but recovered after tracheal intubation. In group C, the QTc interval significantly prolonged after droperidol injection, but recovered after propofol injection, and prolonged after tracheal intubation.

DISCUSSION: The results show that 1.25 mg of droperidol does not prolong QTc interval, while 2.5 mg of droperidol prolongs QTc interval significantly, and that QTc interval prolongation caused by 2.5 mg of droperidol is counteracted by propofol. When droperidol is used alone in high-risk patients, the low dose of 1.25 mg would be advisable.

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Time course of QTc interval (msec)

Droperidol (mg)	Baseline	Droperidol	Propofol	Intubation
0mg	422 (413, 434)	424 (415, 432)	417 (408, 426) *	423 (408, 433)
1.25mg	429 (415, 448)	425 (414, 445)	418 (405, 445) *	421 (409, 454)
2.5mg	431 (419, 442)	436 (424, 446) * #	432 (422, 442)#	442 (428, 451) *#

S-57.

PERIOPERATIVE USE OF THE GLUCOMMANDER® FOR GLUCOSE CONTROL IN PATIENTS UNDERGOING CARDIAC SURGERY

AUTHORS: J. L. Huffmyer, F. E. Blum, D. S. Groves, E. C. Nemergut

AFFILIATION: Anesthesiology, University of Virginia, Charlottesville, VA

INTRODUCTION: Hyperglycemia is a common perioperative problem in diabetic and non-diabetic patients undergoing cardiac surgery.[1] Perioperative hyperglycemia as well as hypoglycemia has been associated with increased morbidity and mortality.[2,3] The Glucommander® (Glytec Systems, Greenville, SC) is a computerized algorithm designed to direct the administration of intravenous insulin by continuous infusion and has been used to control postoperative hyperglycemia in hospitalized patients. This study evaluated use of the Glucommander® versus acute care insulin protocol during the perioperative period in cardiac surgical patients.

METHODS: After IRB approval and written informed consent, 65 patients (diabetic and non-diabetic) having cardiac surgery were prospectively randomized to the Glucommander® (30 patients) or to the standard of care group with acute care insulin protocol (35 patients). For both groups arterial blood glucose measurements were analyzed every 30 minutes in the operating room and in the intensive care unit for 24 hours postoperatively. The Glucommander® and acute care protocols were started once the blood glucose reached 120 mg/dl and continued 24 hours postoperatively. The goal range for glucose was 120-150 mg/dl. Data were analyzed using mixed effect modeling.

RESULTS: Arterial blood glucose values were significantly different between the groups such that the Glucommander® patients had an average mean glucose 129 ± 12.4 mg/dl versus the standard care patients with average mean glucose 145 ± 15.8 mg/dl ($p < 0.001$). The Glucommander® patients also spent more time in the goal glucose range of 120-150 mg/dl as compared to the standard of care patients.

DISCUSSION: The Glucommander® yielded lower overall average mean glucose levels with more time spent in the target range as compared to patients treated with a standard acute care insulin protocol for glucose control. The Glucommander® was feasible for use in both the operating room as well as the intensive care unit. Further studies should be conducted to determine the ideal glucose target range for patients undergoing cardiac surgery in order to maximize benefit and minimize hypoglycemic risk.

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S-58.

INTRAVASCULAR EXPANSION WITH NITROGYCERIN ENHANCES TISSUE OXYGENATION

AUTHORS: S. J. Voskanian, A. Yen, N. Samimi, M. Mogos, P. Roffey, D. Thangathurai

AFFILIATION: Anesthesiology, USC Keck School of Medicine, Los Angeles, CA

INTRODUCTION: Optimal tissue perfusion is key in preserving organ function during high-risk surgery. We hypothesize that perioperative intravascular volume expansion with vasodilators increases tissue perfusion via enhancement of the microcirculation. We used central venous oxygen (ScVO2) values as surrogate measure of the balance between total body oxygen and consumption.

METHODS: Data was prospectively collected on twelve patients undergoing laparoscopic partial nephrectomy. Patients with vital organ dysfunction or anemia were excluded. Anesthesia was induced with propofol and muscle relaxant and maintained with inhalational agents supplemented by narcotics. Arterial and central venous lines were placed and two liters intravenous fluids were given while a low-dose (average 33mcg/min) NTG infusion was titrated to maintain mean pressures within 10% of baseline.Central venous samples were taken before and 30 minutes after the NTG infusion and volume expansion.

RESULTS: There was a statistically significant change in central venous oxygen tension following intervention."Pre-test" mean central venous PO2 was 48.78mmHg, "post-test" was 55.14mmHg.

DISCUSSION: After initiation of NTG, ScVO2 increased, suggesting improved tissue oxygenation, likely due to improved microcirculation. Abnormalities in microvascular function occur during sepsis and various other inflammatory states. We hypothesize that surgery, with its concomitant inflammatory response, is associated with a similar disruption in the microcirculation and can be counteracted with careful vasodilation using NTG. NTG may reverse sympathetic tissue vasoconstriction, promote capillary recruitment, and correct maldistributed microcirculatory blood flow. Maintenance of tissue perfusion and oxygenation in high-risk surgical patients may decrease the incidence of ARDS. Whether NTG with volume loading improves global tissue oxygenation by increasing microcirculatory flow, and whether this leads to a reduction in morbidity and mortality in certain high-risk patients needs further investigation.

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S-59.

CORRELATION OF EARLY HEMODYNAMIC MEASURES IN CARDIAC SURGERY TO POSTOPERATIVE OXYGEN UTILIZATION CAPACITY

AUTHORS: R. J. LaFaro[1], S. Pothula[1], D. Maerz[1], L. Montes[1], S. Oleszkiewicz[1], A. Yusupov[2], M. A. Inchiosa[1]

AFFILIATION: [1]New York Medical College, Valhalla, NY; [2]New York College of Osteopathic Medicine, Old Westbury, NY

INTRODUCTION: There has been extensive study in the attempt to identify factors that predict the quality of postoperative outcome. We have focused in this preliminary analysis on the relationship of some of the earliest hemodynamic measures taken in the pre-incision period to the oxygen consumption index (ml/min/m2) (VO2 index) upon arrival in the ICU.

METHODS: Institutional IRB approval and patient consent were obtained to allow sampling for blood gas measurements at intervals that were not necessarily routine, and for the confidential use of the entire patient record. Consents were obtained from a total of 55 patients that were scheduled for CABG or valve surgeries, or a combination of both. All surgeries were performed in conjunction with cardiopulmonary bypass. Complete data necessary for calculation of VO2 index in the immediate postoperative period in the ICU was available from 48 patients. Although we report here on pre-incision measures that may have predictive value for certain outcome measures, a full record of demographic characteristics, anthropomorphic measurements, medical and surgical histories, extracorporeal circulation and surgical times, and hemodynamic measurements in all perioperative phases were preserved for future analysis of possible predictive value in relation to outcome measures.

RESULTS: Among the measures collected, four pre-incision values, cardiac index (CI), central venous pressure (CVP), systemic vascular resistance (SVR) and oxygen delivery index (DO2 index) were found to have statistically significant correlations with the ICU VO2 index (Table 1).

Table 1: Correlations with ICU VO_2 index.

Variable	Correlation coefficient	p value
DO_2 index	0.4939	0.001
CI	0.4001	0.012
SVR	-0.3938	0.013
CVP	-0.3598	0.013

Multiple linear regression analysis for the combined influence of these four variables on ICU VO2 index yielded a correlation coefficient of 0.548 ($p < 0.001$). Preliminary results from a neural network analysis of the data, which evaluates interactions among the 4 hemodynamic variables, yielded a model for correlation with ICU VO2 index of $r = 0.885$ ($p < 0.001$). The true value of this model can only be evaluated by its application to future patient data.

DISCUSSION: These preliminary findings suggest that it may be possible to utilize pre-incision hemodynamic measures to identify patients who may pose an increased surgical or postoperative risk.

REFERENCES: None

S-60.

PRESSURE AND FLOW REGULATION IN THE AGING HUMAN CIRCULATION: FUNCTIONAL ANALYSIS OF 370 ADULT PATIENTS PRESENTING FOR ELECTIVE MAJOR SURGERY

AUTHOR: S. F. Woodford[1,2]

AFFILIATION: [1]Anesthesia, Brisbane Waters Private Hospital, Woy Woy, NSW, Australia; [2]Australian School of Advanced Medicine, Macquarie University, Sydney, NSW, Australia

INTRODUCTION: From 1945 to 1999, at least 24 studies examined the effect of age on SV and CO, using a range of methodologies, in patients of both genders, aged 16-89 years. The effect of gender on cardiovascular performance in the aging human remains unexamined, and recommended normal values for the human circulation do not reflect even the effect of aging. The emergence of new measurement technologies provides anesthetists with the opportunity to re-examine long standing recommendations.

METHODS: 370 adult patients presenting for elective major surgery over a 36 month period were monitored using arterial and central lines and Flotrac transducers(Edwards Lifesciences). Lines were inserted prior to induction, and baseline values recorded. Values were recorded over 3 to 10 minutes and averaged, and the resultant data analysed graphically. The type of surgery included joint arthroplasty (210 subjects- 122F,88M), coronary artery and/or valve replacement surgery(102 subjects- 26F,76M), esophagectomy and abdominal surgery (47 subjects-19F,28M) and 11 endovascular procedures. There were 169 female subjects and 201 male subjects in the cohort studied. The age range was 35-93 yrs(females) and 30-91yrs (males).

RESULTS: At any age, there is a gender dependent difference in resting hemodynamic parameters. At an age consistent with female menopause, there is an overt change in the adult female circulation, characterised by a progressive fall in SV and SV range, and a rise in vascular resistance, independent of BSA. A similar change appears to develop in the adult male circulation commencing a decade later. At any age, the male circulation is characterised by a high SV and low resistance, and the female circulation by a low SV and high resistance. The progressive fall in SV and SV range beyond the 6th decade in both genders raises the possibility of an endocrine/ menopausal effect on the regulation of pressure and flow in the adult circulation. The gender specific difference in the premenopausal adult circulation is consistent with higher work capacity and superior athletic performance in male compared with female subjects.

DISCUSSION: the male circulation at any age differs from the female circulation. A consistent and predictable change occurs around the female menopause, and a decade later in males, suggestive of an endocrine influence on blood pressure, and arguing for a male menopause. The greater work capacity of the male circulation prior to menopause has implications for athletic performance and combat roles.

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S-61.

THE EFFECT OF PREOPERATIVE ANTIHYPERTENSIVE THERAPY ON INTRAOPERATIVE SYSTOLIC BLOOD PRESSURE VARIABILITY

AUTHORS: R. M. Craft, J. Buehler, R. C. Carroll, C. G. Snider, Z. Dickson

AFFILIATION: Anesthesiology, University of Tennessee Medical Center, Knoxville, TN

INTRODUCTION: Although perioperative blood pressure control is often recommended, there is little data connecting these efforts with improved outcomes. Recently, intraoperative blood pressure variability has been shown to predict postoperative morbidity and mortality in cardiac bypass surgery[1]. Risk factors for increased variability have not been identified, but data suggests that intraoperative instability may be the result of preoperative antihypertensive treatment[2]. In this study, we have looked at the effect of preoperative antihypertensive regimens upon intraoperative blood pressure variability.

METHODS: After IRB approval, a retrospective EMR database search was performed. Selection criteria included hypertensive patients on single drug therapy preoperatively who had non-emergent surgery with an arterial line. 131 patients were identified and divided into cohorts based on preoperative antihypertensive medication. Operative records were analyzed for the percent of total case time that systolic blood pressure was above 135mmHg and/or below 90mmHg. This range was derived from previously established systolic pressure ranges that were associated with poor outcomes in previous trials1. This data underwent statistical analysis to compare the effect of preoperative antihypertensive medication with intraoperative variability using $\chi 2$ and Fisher's Exact Test, as appropriate. Comparison of demographics, co morbidities, and intraoperative vasopressor requirement was also completed.

RESULTS: Refer to Figure 1 and Tables 1-4.

DISCUSSION: Patients on beta-blockers preoperatively demonstrated significantly less high-end and overall variability compared to patients treated with ACE-Inhibitors/ARBs or diuretics. They also had less high-end variability compared with diet controlled patients with a trend towards less overall variability. The beta-blocker cohort required less vasopressor support intraoperatively. An increase in SBP variability with ACE-inhibitors/ARBs was not demonstrated.

In conclusion, antihypertensive patients treated with beta-blockers preoperatively had less intraoperative systolic blood pressure variability. This effect could be explained by a preponderance of younger males in the beta blocker group. Further studies are indicated to study the effect of gender and age upon intraoperative hemodynamic variability

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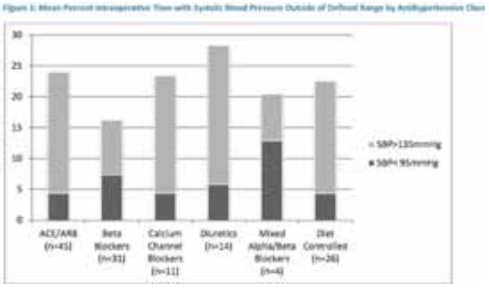


Table 1: Difference Between Mean Percent Intraoperative Time with Systolic Blood Pressure Outside of Defined Range by Antihypertensive Classes (= Statistically Significant)*

Comparison	>135mmHg (p-value)	<90mmHg (p-value)	135mmHg>SBP>90mmHg (p-value)
ACE/ARB vs. Beta Blocker	10.186 (0.0039)*	-3.012 (0.0945)	7.803 (0.0315)*
ACE/ARB vs. Ca Channel Blocker	0.635 (0.9049)	-0.034 (0.9895)	0.601 (0.9076)
ACE/ARB vs. Diuretics	-2.817 (0.5604)	-1.487 (0.5270)	-4.304 (0.3619)
ACE/ARB vs. Mixed Alpha-Beta Blocker	12.099 (0.1439)	-8.555 (0.0342)*	3.545 (0.6592)
ACE/ARB vs. Diet Controlled	1.478 (0.7042)	-0.003 (0.9987)	1.475 (0.6975)
Beta Blocker vs. Ca Channel Blocker	-10.181 (0.0682)	2.978 (0.2699)	-7.202 (0.1842)
Beta Blocker vs. Diuretics	-13.632 (0.0082)*	1.525 (0.5373)	-12.107 (0.0158)*
Beta Blocker vs. Mixed Alpha-Beta Blocker	1.284 (0.8785)	-5.542 (0.1756)	-4.259 (0.06029)
Beta Blocker vs. Diet Controlled	-9.338 (0.0277)*	3.009 (0.1421)	-6.329 (0.1240)
Ca Channel Blocker vs. Diuretics	-3.452 (0.5879)	-1.453 (0.6386)	-4.905 (0.4298)
Ca Channel Blocker vs. Mixed Alpha-Beta Blocker	11.464 (0.2154)	-8.521 (0.0590)	2.944 (0.7434)
Ca Channel Blocker vs. Diet Controlled	0.843 (0.8821)	0.031 (0.9911)	0.874 (0.8747)
Diuretics vs. Mixed Alpha-Beta Blocker	14.916 (0.0977)	-7.068 (0.1061)	7.848 (0.3695)
Diuretics vs. Diet Controlled	4.295 (0.4128)	1.484 (0.56)	5.778 (0.2589)
Mixed Alpha-Beta Blocker vs. Diet Controlled	-10.621 (0.2121)	8.551 (0.0397)*	-2.07 (0.8024)

Table 2: Comparison of Variables between Beta Blocker Cohort and ACE/ARB Cohort

Demographics	Beta Blocker Cohort	ACE/ARB Cohort
Age	57.161	62.6
Sex (Male: Female)*p=0.0018	23:8	17:28
Type of Surgery		
Vascular	5	10
Neurosurgery	12	19
Cardiothoracic	9	10
General	3	3
Preoperative Comorbidities		
CHF	1	2
CAD *p=0.017	15	10
Renal Disease	3	1
Diabetes Mellitus	6	15
Vascular Disease	7	10
Dysrhythmia	4	3
Cardiac Valvular Disease	1	3
Vasopressor Requirements		
Average Amount of Ephedrine Bolus (mg)	11.447	23.676
Average Amount of Phenylephrine Bolus (mcg)	188.235	248.077
Required Phenylephrine Infusion	26	34

Table 3: Comparison of Variables between Beta Blocker Cohort and Diuretic Cohort

Demographics	Beta Blocker Cohort	Diuretic Cohort
Age* p=0.0319	57.161	65.571
Sex (Male: Female)	23:8	7:7
Type of Surgery		
Vascular	5	2
Neurosurgery	12	5
Cardiothoracic	9	3
General	3	2
Preoperative Comorbidities		
CHF	1	2
CAD	15	4
Renal Disease	3	1
Diabetes Mellitus	6	3
Vascular Disease	7	5
Dysrhythmia	4	2
Cardiac Valvular Disease	1	0
Vasopressor Requirements		
Total Amount of Ephedrine Bolus (mg)*p=0.003	11.447	24
Total Amount of Phenylephrine Bolus (mcg)	188.235	290
Required Phenylephrine Infusion	26	9

Table 4: Comparison of Variables between Beta Blocker Cohort and Diet Controlled Cohort

Demographics	Beta Blocker Cohort	Diet Controlled Cohort
Age	57.161	58.308
Sex (Male: Female)*p=0.0303	23:8	12:14
Type of Surgery		
Vascular	5	4
Neurosurgery	12	13
Cardiothoracic	9	4
General	3	3
Preoperative Comorbidities		
CHF	1	2
CAD	15	7
Renal Disease	3	1
Diabetes Mellitus	6	1
Vascular Disease	7	7
Dysrhythmia	4	0
Cardiac Valvular Disease	1	2
Vasopressor Requirements		
Total Amount of Ephedrine Bolus (mg)*p=0.0207	11.447	18.846
Total Amount of Phenylephrine Bolus (mcg)	188.235	185.714
Required Phenylephrine Infusion	26	18

S-62.

RISK OF ELECTIVE MAJOR NON-CARDIAC SURGERY AFTER CORONARY STENT INSERTION

AUTHORS: D. N. Wijeysundera[1,2], H. C. Wijeysundera[3], M. Wasowicz[2], S. Beattie[2], J. Velianou[4], D. Ko[3,5]

AFFILIATION: [1]Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, ON, Canada; [2]Anesthesia and Pain Management, Toronto General Hospital, Toronto, ON, Canada; [3]Cardiology, Sunnybrook Health Sciences Centre, Toronto, ON, Canada; [4]Cardiology, McMaster University, Hamilton, ON, Canada; [5]Institute for Clinical Evaluative Sciences, Toronto, ON, Canada

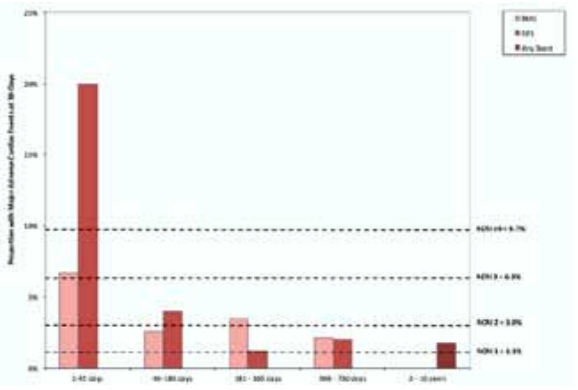
INTRODUCTION: For patients who require non-cardiac surgery following coronary stent insertion, current practice guidelines recommend that surgery be delayed until 30 to 45 days after bare-metal stent insertion and one-year after drug-eluting stent insertion. However, these recommendations are largely based on single-center studies and expert opinion. We therefore conducted a population-based study to evaluate the outcomes of elective intermediate-to-high risk non-cardiac surgery following stent insertion.

METHODS: Following research ethics board approval, we used linked registry data and population-based administrative databases to conduct a cohort study of 8116 patients, aged 40 years or older, who underwent major elective non-cardiac surgery between 2003 and 2009, and received coronary stents within 10 years before their non-cardiac surgery. Approximately 34% (n=2725) underwent stent insertion within two years before surgery, of whom 905 (33%) received drug-eluting stents. For comparison, we assembled a separate cohort of 341,350 individuals, aged 40 years or older, who underwent major elective surgery during the time period and had not undergone coronary revascularization. The primary outcome was postoperative 30-day major adverse cardiac events (mortality, hospital readmission for acute coronary syndrome or repeat coronary revascularization).

RESULTS: The overall rate of 30-day events in patients with coronary stents was 2.1% (n=170). As shown in the Figure, when the interval between stent insertion and surgery was less than 30-days, event rates were high for bare-metal (6.7%) and drug-eluting (20.0%) stents. When the interval was 45 to 180 days, the event rate for bare-metal stents was 2.6%, approaching that of intermediate-risk non-revascularized individuals. Adjusted analyses suggested that event rates were increased if this interval exceeded 180 days (adjusted OR 1.89; 95% CI 1.08 to 3.32). For drug-eluting stents, the event rate was 1.2% once the interval exceeded 180 days, approaching that of intermediate-risk non-revascularized individuals.

DISCUSSION: The earliest optimal time for elective surgery is 46 to 180 days after bare-metal stent insertion or more than 180 days after drug-eluting stent insertion. In addition to suggesting that practice guidelines be re-evaluated, these findings will help inform clinical decision-making when weighing the risks of operative versus non-operative therapy in patients being considered for major elective non-cardiac surgery following recent coronary stent insertion.

REFERENCES: N/A



Proportion of patients with 30-day major adverse cardiac events, based on the interval between the most recent coronary stent insertion and subsequent non-cardiac surgery. The red columns represent proportions for individuals who received bare metal stents (BMS), drug eluting stents (DES), or either type of stent (for stent insertions two to 10 years before non-cardiac surgery). For comparison, the horizontal dashed lines represent event rates for individuals who did not undergo coronary revascularization within 10 years before non-cardiac surgery, and had been stratified by their Revised Cardiac Risk Index scores.

S-63.

PERIOPERATIVE REMIFENTANIL ADMINISTRATION INHIBITS ARRHYTHMIA ATTACK INDUCED BY NON-REENTRY MECHANISMS IN PEDIATRIC PATIENTS UNDERGOING RADIOFREQUENCY CATHETER ABLATION

AUTHORS: K. Fujii[1,2], H. Iranami[2], K. Nishikawa[1]

AFFILIATION: [1]Anesthesiology, Wakayama Medical University, Wakayama, Japan; [2]Anesthesiology, Japanese Red Cross Society Wakayama Medical Center, Wakayama, Japan

INTRODUCTION: Remifentanil has been known to affect the autonomic nervous system. Although there have been many reports indicating the relationship between the autonomic nervous system balance and arrhythmia, the effect of remifentanil on arrhythmia induction has not been clarified. The aim of this prospective observational study was to determine whether remifentanil administration during general anesthesia can affect the arrhythmia induction in pediatric patients undergoing radiofrequency catheter ablation (RFCA).

METHODS: After obtaining informed consent, 205 patients undergoing elective RFCA during 22 months in our hospital were included in this study. The anesthesia maintenance was accomplished with propofol 6-10 mg/kg/h and remifentanil 0.05 μg/kg/min. If programmed cardiac stimulation, isoproterenol infusion, or their combination were not effective in arrhythmia induction, remifentanil administration was discontinued. Patients whose arrhythmia could not be induced even after remifentanil discontinuation were defined as induction-impossible cases. Arrhythmia was classified according to their mechanisms, Reentry or non-Reentry. The mechanisms of Non-Reentry arrhythmia include automaticity and triggered activity. Statistical analysis was performed using logistic regression analysis and data were presented as number (%) or Odds ratio (OR) [95% confidence interval (CI)].

RESULTS: Sixty-nine patients (33.7%) were diagnosed as Non-Reentry arrhythmia. Remifentanil was discontinued in 6 (4.4%) and 46 (66.7%) patients in Reentry and non-Reentry groups, respectively (OR 43.3 [95%CI 16.6-113], P<0.001). The incidence of induction-impossible cases in non-Reentry group was higher than in Reentry group (13 (18.8%) vs. 4 (2.9%), OR 7.7 [95%CI 2.4-24.5], P=0.001).

DISCUSSION: Remifentanil during general anesthesia was often discontinued in patients with non-Reentry arrhythmia. We have to pay attention to remifentanil administration during RFCA because of its inhibitory effect on arrhythmia attack induced by non-Reentry mechanisms.

REFERENCES: N/A

S-64.

INVESTIGATION OF INCIDENCE, FACTORS AND OUTCOME MEASURES ASSOCIATED WITH INCREASED WEIGHT GAIN FOLLOWING ADULT CARDIAC SURGERY

AUTHORS: A. D. Sharma[1], A. Al-Achi[2], H. Trettin[1], J. Seccombe[1]

AFFILIATION: [1]Cardiac Anesthesia/Surgery, St Vincent's Hospital, Green Bay, WI; [2]Department of Pharmaceutical Sciences, Campbell University, Buies Creek, NC

INTRODUCTION: Peri-operative weight gain, a marker of fluid storage, is strongly related to patient morbidity and mortality[1]. We investigated the incidence, factors, and outcome measures associated with weight gain following cardiac surgery that have not been extensively studied before.

METHODS: Retrospectively, 375 records were studied (Figure1). Admission day (AD), post-op day (POD) 1,2,3, and discharge day (DD) weights in kilograms (kg) were recorded. Maximum percentage patient weight gain or loss at POD1,2,3 and DD was calculated [with respect to AD weight]. Patient's were divided in to two groups: High Weight Gain [HWG] group (P75 or higher) and Lower Weight Gain [LWG] group (P25 or lower). Outcome measures recorded were tracheal extubation time, day 4 creatinine, total hospital LOS (length of stay), and post-surgery 30-day alive.

RESULTS: Maximum percentage weight gain occurred at POD 2 (35.0%). Highest Weight Gain (%) [Mean± S.D. (n)]=6.567% ± 4.304%(375). HWG group (n=85), 75th percentile was 8.37% and for the LWG group (n=84), 25th percentile was 4.0% (Figure2&3 and Table1). A) No difference between groups with regards to, I) pre-operative hemoglobin, creatinine, Prothrombin time (PT), International Normalized Ratio (INR), Partial Thromboplastin time (PTT), Platelet counts, and II) pre-operative use of Asprin, ACE inhibitors, Beta blockers, Amiodarone, and incidence of diabetes. B) HWG group, older (69.84±12.41vs63.55±13.05yrs(p=0.001), longer bypass times (137.05±57.95vs117.15±45.37 min(p=0.02), higher blood loss post-op (24hrs) (1014.70±630.65vs842.13±451 .56cc(p=0.02), higher total perioperative PRBC (2.66±2.66vs0.73 8±1.45U(p<0.0001), platelet (0.81±1.2vs0.16±0.57 U(p<0.0001), FFP (1.53±2.31vs0.33±1.1U(p<0.0001), Cryoprecipitate (0.46±0.91vs0.13±0.46U(p=0.008) transfusions, and 5%Albumin use (1882.35±1062.47vs1461.31±891.30cc(p=002). C) HWG group with longer tracheal extubation times(18.92± 34.86vs10.31±21.41 hrs(p=0.02). No difference in Day-4 creatinine, LOS, and 30-day alive(p>0.05). D) Multivariate analysis, HWG group: No effect of age, bypass time, gender, blood loss post-op (24 hrs), total PRBC, platelet, FFP, cryoprecipitate use, day 4 creatinine, and tracheal extubation times(p>0.05). G) HWG positively associated with total 5% albumin used(p=0.002), hospital LOS(p=0.004), and negatively associated with BSA(p=0.02). [Based on Wilcoxon/Kruskal-Wallis Test (Rank Sums), p<0.03, considered significant].

DISCUSSION: Weight gain following adult cardiac surgery is common, one-third of patient's gaining 7.5% or more, and is directly related to amount of peri-operative colloid administered (5% Albumin), and increased hospital length of stay.

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Table 1: Maximum Patient Weight Gain POD Occurrence

POD1	n=93/25%
POD2	n=131/35%
POD3	n=124/33%
DD	n=27/7%
Total	375

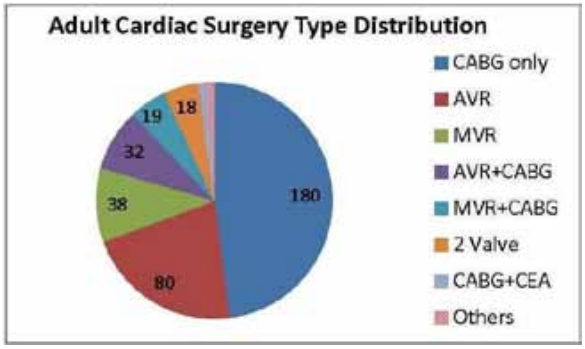

Figure 1: Patient Distribution Based On Type Of Procedure.

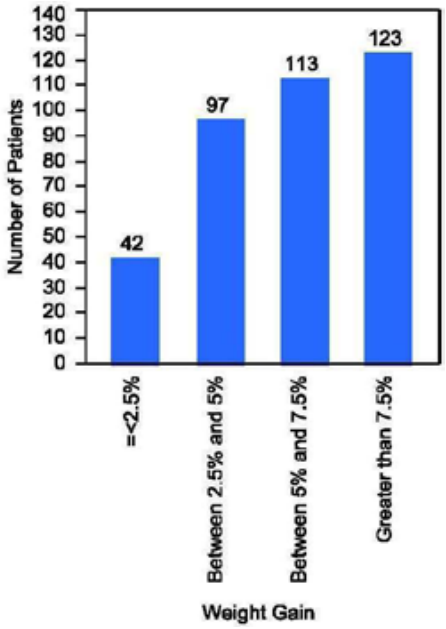

Figure 2: Post-op Weight Gain Distribution(Patient Numbers/%Weight Gain)

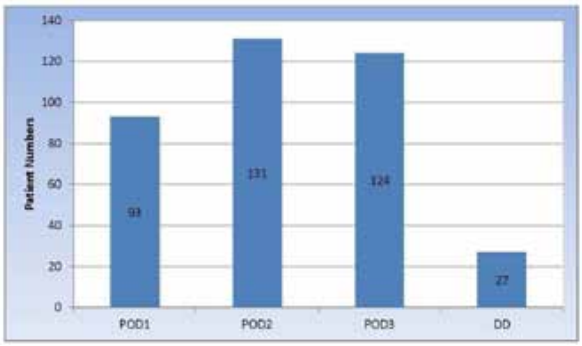

Figure 3: Highest Weight Gain Occurrence (POD1/2/3/DD)

S-65.

WITHDRAWN.

S-66.

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S-67.

HAPTOGLOBIN POLYMORPHISM AND PERIOPERATIVE MYOCARDIAL INJURY FOLLOWING CORONARY ARTERY BYPASS SURGERY

AUTHORS: J. Raphael[1], A. Fox[2], C. D. Collard[3], S. Shernan[2], J. D. Muehlschlegel[2], S. Body[2]

AFFILIATION: [1]Anesthesiology, University of Virginia, Charlottesville, VA; [2]Anesthesiology, Perioperative and Pain Medicine, Brigham and Women's Hospital, Boston, MA; [3]Anesthesiology, Texas Heart Institute, Houston, TX

INTRODUCTION: Perioperative myocardial injury (PMI) occurs in 10-15% of patients after cardiac surgery and is associated with increased short and long-term mortality, as well as, increased utilization of healthcare resources[1]. Numerous epidemiological studies have documented an association between hemoglobin-binding protein haptoglobin (Hp) polymorphisms (specifically the Hp 2-2 phenotype) and coronary artery disease in non-surgical patients. We sought to determine whether the Hp-2-2 phenotype is independently associated with myocardial injury after coronary artery bypass graft (CABG) surgery with cardiopulmonary bypass (CPB).

METHODS: Retrospective analysis of prospectively collected data of 707 patients undergoing primary CABG surgery with CPB at two institutions (CABG Genomics Project; http://clinicaltrials.gov/show/NCT00281164). Haptoglobin phenotypes were determined as previously described using gel electrophoresis . PMI was defined as postoperative day 1 (POD-1) cardiac troponin I (cTnI) serum level in the top 10th percentile (>10.1 µg/L). Continuous and categorical variables were compared between groups using student t and chi aquare tests respectively. A multivariable logistic model was used to derive perioperative and demographic variables associated with PMI.

RESULTS: 248 patients (35.1%) had the Hp 2-2 phenotype, while 459 patients were either Hp 1-1 (15.3%) or 2-1 (49.6%). POD-1 cTnI levels were higher in patients with the Hp 2-2 phenotype compared to patients with the non-2-2 phenotype (4.4 µg/L vs. 3.6 µg/L, $p<0.05$). Within the patients in the top 10th percentile for cTnI, 32 (45.7%) had the Hp 2-2 phenotype, while 38 were either Hp 1-1(20%) or Hp 2-1 (34.3%). Other risk factors associated with PMI were myocardial infarction within 14 days prior to surgery ($p<0.01$) and CPB time ($p<0.05$). After multivariable adjustments, only CPB time ($p<0.05$; OR-1.76, 95% CI-1.18-3.45) and myocardial infarction within 14 days prior to surgery ($p<0.01$; OR-2.83, 95%CI-1.85-4.32) were associated with PMI

DISCUSSION: Although patients with the Hp-2-2 phenotype had higher levels of cTnI on POD-1, this Hp phenotype was not independently associated with perioperative myocardial injury after CABG surgery.

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S-68.

OXYHEMODYNAMIC EFFECTS OF NORMAL VERSUS HIGH ARTERIAL BLOOD FLOW DURING CARDIOPULMONARY BYPASS CORONARY ARTERY BYPASS GRAFTING SURGERY

AUTHORS: M. A. Salgado[1], A. Siciliano[1], M. Lessa[2]

AFFILIATION: [1]Surgical Division, National Institute of Cardiology, Rio De Janeiro, Brazil; [2]Laboratory of Cardiovascular Investigation, Oswaldo Cruz Foundation, Rio De Janeiro, Brazil

INTRODUCTION: Optimal blood flow to cardiopulmonary bypass (CPB) is a controversial matter, and so far there is no consensus about the oxyhemodynamic variables that could reflect the adequacy of blood flow during CPB[1]. Although the use of body surface to calculate the blood flow is largely advocated, there are no standard definitions of ideal flow to be used during CPB. The present study investigates the changes in oxyhemodynamic variables induced by normal versus high arterial blood flow during CPB in patients that underwent coronary artery bypass graft surgery.

METHODS: Prospective, randomized, double blind study. Sixty six adult patients scheduled for coronary artery bypass grafting using normothermic CBP were divided into two different group according to blood flow parameters: Control group (2.4 ± 2 L/min/m2) and High-flow group (3.2 ± 2 L/min/m2). Variables analyzed were lactate, oxygen delivery, oxygen consumption, venous oxygen saturation and venous-arterial carbon dioxide gradient, measured at 10, 20, 40 and 60 minutes.

RESULTS: The High-flow group showed a significant improvement of the oxygen delivery, oxygen consumption, venous oxygen saturation, and venous-arterial carbon dioxide gradient when compared to control group. The differences in oxyhemodynamic variables were more significant after 40 and 60 minutes of CPB. The systemic lactate concentration was not significantly different when comparing High-flow group with the Control group.

DISCUSSION: We concluded that blood flow from 3.2 ± 2 L/min/m2 better preserves oxyhemodynamic parameters during normothermic cardiopulmonary bypass in patients undergoing coronary artery bypass grafting when compared to flow of 2.4 ± 2 L/min/m2. We also concluded high-flow in CPB does not change lactate concentration, suggesting similarity in tissue perfusion in both perfusion techniques.

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S-69.

VALUE OF COMBINED PRE- AND POSTOPERATIVE NT-PROBNP MEASUREMENT TO PREDICT DEATH AND MAJOR CARDIOVASCULAR EVENTS AT 1 YEAR AFTER NONCARDIAC SURGERY

AUTHORS: G. A. Lurati Buse[1], E. Seeberger[1], C. Werner[1], M. Filipovic[2,1], D. Bolliger[1], M. Seeberger[1]

AFFILIATION: [1]Anesthesiology, University Hospital Basel, Basel, Switzerland; [2]Anesthesiology, Kantonsspital St. Gallen, St.Gallen, Switzerland

INTRODUCTION: Several studies addressed the prognostic value of perioperative natriuretic peptides' measurement[1,2]. It is not established if combined pre- and postoperative measurements add to the prognostic accuracy. Our objective was to evaluate the incremental prognostic value of combined pre- and postoperative NT-proBNP measurement in patients undergoing noncardiac surgery.

METHODS: This is a predefined cohort analysis nested in a randomized controlled trial. The prespecified endpoint was a composite of all-cause mortality, acute coronary syndrome, coronary revascularisation, and congestive heart failure requiring hospitalization within 1 year after surgery. We measured NT-proBNP prior to induction, on postoperative day 1 and 2. Patients and outcome adjudicators were blinded. We calculated the area under the receiver operating characteristics curve (AUC) for NT-proBNP at each timepoint. We conducted a multivariate logistic regression with the composite endpoint as dependent and NT-proBNP(preoperative and day 2), postoperative troponin T elevation and treatment allocation as independent variables.

RESULTS: We assessed 380 patients. Information on major adverse cardiac event at 1 year was missing in 2 (0.5%) patients; survival data were complete. Seventy (18.4%) patients suffered an event at 1 year. The AUC of NT-proBNP for 1-year outcome was 0.666 (95%confidence interval 0.59-0.84), 0.659 (0.59-0.73) and 0.656 (0.58-0.73) prior to induction, on day 1, and day 2, respectively. After multivariate adjustment, preoperative NT-proBNP was no longer significantly associated with 1-year outcome, whereas the association for NT-proBNP on day 2 persisted (OR 1.012 per 100 pg/mL increase, 95%CI 1.001-1.023).

DISCUSSION: After multivariate adjustment, including by postoperative NT-proBNP, preoperative NT-proBNP waqs no longer associated with 1-year all-cause mortality and major cardiovascular events after major noncardiac surgery. In contrast, the predictive value of postoperative NT-proBNP concentrations persisted after adjustment by the preoperative values. This findings need confirmation in a larger cohort.

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S-70.

CARDIAC EVALUATION AND OUTCOMES IN PANCREAS TRANSPLANTATION

AUTHORS: D. Farar[2], R. Mangus[1], S. Kinsella[2], C. Creal[1], J. A. Fridell[1]

AFFILIATION: [1]Surgery, Indiana University School of Medicine, Indianapolis, IN; [2]Anesthesia, Indiana University School of Medicine, Indianapolis, IN

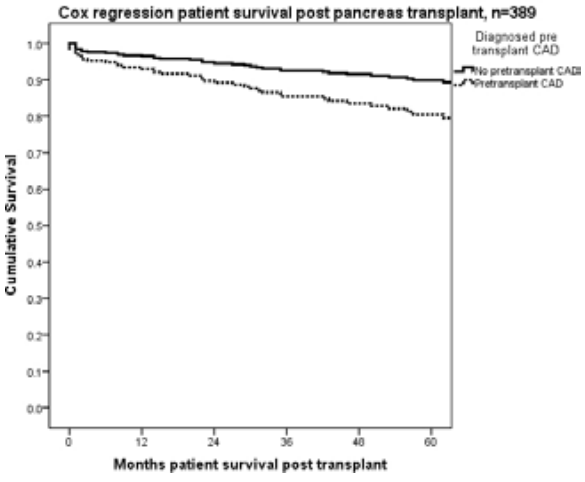
INTRODUCTION: Pancreas transplantation is an effective therapy for the treatment of diabetes. Patients with diabetes are at high risk of developing coronary artery disease (CAD). A thorough cardiac evaluation is required prior to pancreas transplantation. This study reviews a large number of pancreas transplant patients to assess the prevalence of CAD and cardiac interventions and to determine the impact of cardiac history on post-transplant outcomes.

METHODS: The records of all pancreas transplant patients from 2003 to 2010 at a single high volume center were reviewed. CAD was assessed from a review of all available pretransplant records for each patient. Cardiac interventions included coronary artery bypass, stent placement or angioplasty. Post-transplant outcomes of myocardial infarction and stroke required confirmatory testing. Survival was assessed using Cox regression survival analysis.

RESULTS: There were 405 transplants in 389 patients during the study period. There were 63 patients with diagnosed CAD (16%), 19 patients with prior MI (5%), and 47 patients with previous coronary artery intervention (12%). Median follow up was 46 months. Posttransplant, there were 11 patients who suffered MI (3%) and 13 who suffered stroke (3%). Survival at 5-years for patients with and without a pretransplant history of CAD was 80% and 90%, p=0.04.

DISCUSSION: Pancreas transplant patients overall have a low post-transplant risk of MI and stroke. Survival at 5-years post-transplant differs significantly based upon previous history of coronary artery disease. Pancreas transplant patients should undergo thorough pretransplant cardiac risk stratification because of their underlying risk of CAD and their lower survival posttransplant.

REFERENCES: None



S-71.

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S-72.

HIGH SPINAL ANESTHESIA IN SEVERE MITRAL STENOSIS: COMPARISON OF HEMODYNAMICS WITH HIGH DOSE OPIOID ANESTHESIA

AUTHORS: V. K. Arya[1], L. Yaddanapuri[1], P. Madhusudan[1], S. K. Thingnam[2], A. Bahl[3]

AFFILIATION: [1]Cardiac Anaesthesia Unit, Department of Anaesthesia & Intensive Care, Postgraduate Institute of Medical Education And Research, Chandigarh, India; [2]Department of Cardiothoracic and vascular surgery, Postgraduate Institute of Medical Education And Research, Chandigarh, India; [3]Department of Cardiology, Postgraduate Institute of Medical Education And Research, Chandigarh, India

INTRODUCTION: Severe mitral stenosis (MS) has been considered a contraindication to spinal anesthesia for fear of unstable hemodynamics[1]. This prospective randomized trial examined the effect of high spinal in combination with general anesthesia on hemodynamics and postoperative outcome during mitral valve replacement (MVR) surgery in patients with severe MS and atrial fibrillation.

METHODS: Fifty patients were randomized to opioid group O (n=25) or spinal group S (n=25). Patients in group S received spinal hyperbaric bupivacaine 40mg+1mg morphine while in group O intravenous morphine 0.5mg/kg+4µg/kg fentanyl was given before induction of general anesthesia. Phenylepherine infusion was used to maintain mean BP > 65 mmHg in both groups. Comparisons were made between groups for hemodynamic parameters derived by echocardiography and pulmonary artery catheter and postoperative profile of the patients.

RESULTS: High spinal resulted in significant reduction of heart rate (HR) and systemic vascular resistance index as compared to opioids (64.6±8.5 vs. 94.7±18.2 beats/min and 3068.7±726.7 vs. 3964.5±763.6 dynes.s.cm-5.m-2 respectively, p<0.05). The mitral diastolic velocity time integral (MVVTI) and stroke volume index across aortic valve increased significantly after spinal as compared to opioid (89.8±17.7 cm/s vs 58.0±23.3 cm/s and 39.2±18.4 ml/m2 vs 18.5±12.6 ml/m2 respectively, p<0.05). Total phenylephrine dose used, cardiac index (CI) and other hemodynamic parameters remained comparable between the two groups. Postoperatively, incentive spirometry volume at first hour postextubation was significantly higher in group S than group O (320±103.2 vs. 212±67.5 ml/s; p< 0.05). Total morphine requirement in 24 hrs was significantly less in spinal group. However, mean duration of mechanical ventilation and ICU stay were comparable.

DISCUSSION: Significant fall in HR after high spinal in this study was similar to the earlier study in coronary artery bypass graft patients by Kowalewsky et al[2]. Mean MVVTI increased as a result of reduction in HR. This increased left ventricle filling and resulted in maintained CI in spinal group. The lower incentive spirometry volumes in group O may be due to effect of morphine that might have prevented maximal patient effort. Comparable extubation times in both groups were due to their dependence on various factors other than early awakening of the patients. In conclusion, high spinal anaesthesia can safely be given to patients with severe MS undergoing MVR. It reduces the opioid consumption and provides stable hemodynamic profile comparable to opioid anesthesia.

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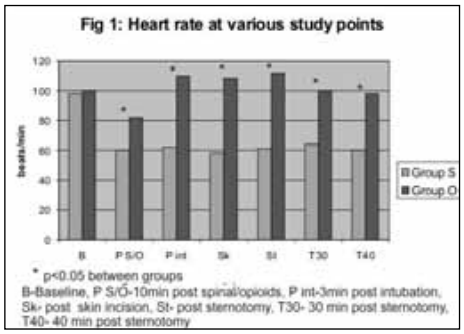

Figure 1: Heart rate at various study points

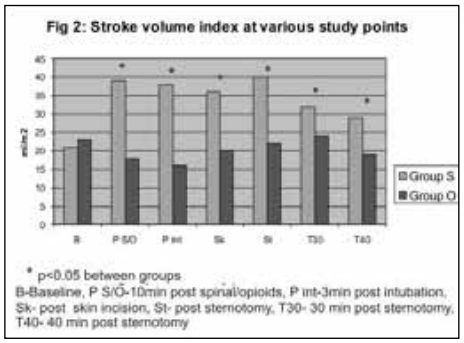

Figure 2: Stroke volume index at various study points

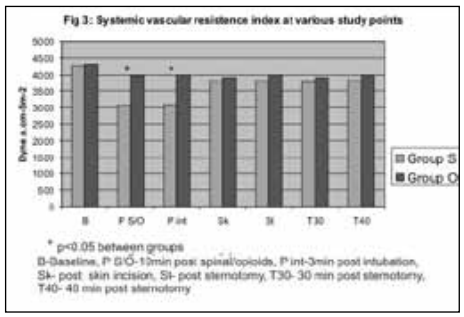

Figure 3: Systemic vascular resistance index at various study points

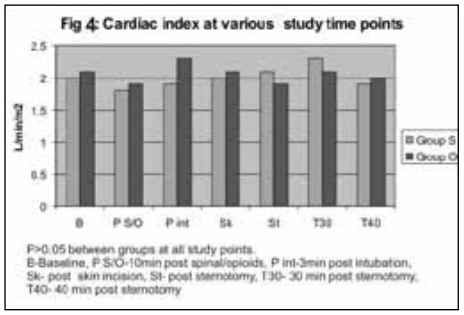

Figure 4: Cardiac index at various study points

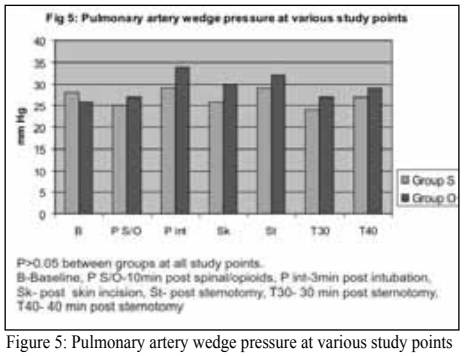

Figure 5: Pulmonary artery wedge pressure at various study points

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OBSERVATIONAL STUDY OF FUNCTIONAL HEMODYNAMICS DURING ONE LUNG VENTILATION

AUTHORS: K. Raghunathan[1], W. T. McGee[2], R. Thanawala[3], C. Gibson[1], G. Hochheiser[3], R. Ganim[3]

AFFILIATION: [1]Anesthesiology, Baystate Medical Center, Springfield, MA; [2]Division of Critical Care, Baystate Medical Center, Springfield, MA; [3]Division of Thoracic Surgery, Baystate Medical Center, Springfield, MA

INTRODUCTION: Intraoperative hemodynamic monitoring with an intra-arterial catheter is common 1 during Video-Assisted Thoracoscopic Surgeries (VATS) and Thoracotomies. The Vigileo-Flotrac device (Edwards LifeSciences, Irvine, CA) uses Arterial Pulse contour based analytic methods to report Cardiac Output (CO), Stroke Volume (SV) and Stroke Volume Variation (SVV). Dynamic functional hemodyanmic parameters such as the SVV have been widely studied[2] and values to volume responders identified[3]. Cardio-respiratory interactions during procedures requiring one lung ventilation (OLV) remain under-studied[4]. Our goal is to evaluate the SVV:SV relationship during OLV.

METHODS: After local IRB approval, patients scheduled to undergo elective thoracic surgical procedures requiring OLV and intra-arterial catheters (based on the clinical judgement of the attending anesthesiologist) were made eligible for inclusion. After informed consent, the Vigileo device with the Flo-Trac sensor (software version 3.02) was attached to the intra-arterial catheter and data (recalculated by auto-calibration every 20 seconds) continuously displayed and captured using a computer data logger through: transition from two lung to one lung ventilation, supine to lateral positioning, surgical resection of lung tissue, and transition from mechanical to spontaneous ventilation. In addition the Passive Leg Raise (PLR) maneuver was performed in the OR.

RESULTS: CO, SV, and SVV were tracked during routine VATS or open thoracic surgery for our first 10 patients included in the study. Based on all 242 paired observations collected to-date, SVV and SV showed an inverse relationship ($p<0.001$). The standardized correlation co-efficient was -0.370. Based on data from our first 8 patients, the PLR maneuver produced a predictable effect. Compared to the baseline state, passive leg raising produced an increase in both the CO (by 0.63 l/minute) and SV (by 9.5 cc/beat), $p<0.05$. The change in CO was largely explained by the change in SV rather than an increase in the heart rate.

DISCUSSION: The preliminary findings in this report on functional hemodynamics during one lung ventilation (n=10 patients, 242 paired data points) confirms that the expected inverse relationship between SVV and SV persists during OLV despite lower tidal volumes.

In addition, we confirmed that the positive effects of PLR on CO are reproducible under anesthesia.

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S-74.

INCIDENCE OF ASYMPTOMATIC DVTS FOUND IMMEDIATELY PRIOR TO ELECTIVE SURGERY

AUTHORS: J. Yin[2], K. Clinite[1], M. Ngozi[2], P. O'Connor[1], M. F. O'Connor[1], D. Glick[1]

AFFILIATION: [1]Anesthesia and Critical Care, University of Chicago, Chicago, IL; [2]University of Illinois at Chicago, Chicago, IL

INTRODUCTION: Deep venous thrombosis (DVT) is a common surgical complication with potentially serious consequences including pulmonary embolism. The development of postoperative DVTs is a great concern both clinically and administratively, and their prevention is one of the quality standards by which hospitals are ranked. Much of the existing literature on DVT incidences have been on postoperative and population-based data, with a focus on high risk groups or specific surgeries. For moderate to high risk surgical patients, the incidence of developing DVTs postoperatively has varied (2-20% in the thigh and 10-80% in the calf veins)[1]. Meanwhile, the incidence of DVTs in the general population is reported to be between 0.35 and 1.8 per 1,000 people per year[2,3]. This study looks to determine if stress and other perioperative considerations increase the incidence of asymptomatic DVTs in the lower extremities immediately prior to elective surgery.

METHODS: After IRB approval and informed consent 200 adult patients scheduled for elective surgery between April and August of 2011 were enrolled in this study. Bilateral color Doppler ultrasound examinations of the patients' proximal and distal lower extremities were conducted in the preoperative holding area with a portable sonographic unit (SonoSite Micromaxx) by trained examiners. Patients with a history of DVT within 6 months were excluded from the study. Patient risk factors, anticoagulant medication, and ASA classification were collected and analyzed.

RESULTS: No DVT was found in the preoperative examinations of the 200 patients enrolled. The mean age of the patients scanned was 58.1 years (±14.5). Mean BMI was 28.7 (±6.6), with 29% of patients obese. 38.5% of the patients were taking daily aspirin or coumadin up to one week prior to surgery. 4.5% had a history of DVT more than 6 months prior to the study. Among other risk factors, 37% of patients had a malignancy, 43% had hypertension, and 12% had diabetes. 9% were taking oral contraceptives or hormone replacement at the time of surgery. No patient was pregnant. 95% of the patients enrolled had an ASA status of II or III.

DISCUSSION: The incidence of asymptomatic DVTs in this preoperative cohort was not higher than the rate of the general population. As a result, it is unlikely that a significant proportion of the DVTs seen after surgery are the result of previously unrecognized clots present prior to surgery. Thus, continued efforts to limit the risk of perioperative DVTs must concentrate on the mechanisms and risk factors for clot formation during and after surgery.

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S-75.

INCIDENCE OF POSTOPERATIVE DVTS SHORTLY AFTER ELECTIVE SURGERY

AUTHORS: J. Yin[2], K. Clinite[1], P. Vishwanath[1], M. Ngozi[2], M. F. O'Connor[1], D. Glick[1]

AFFILIATION: [1]Anesthesia and Critical Care, University of Chicago, Chicago, IL; [2]University of Illinois at Chicago, Chicago, IL

INTRODUCTION: The risk of developing a deep venous thrombosis for some surgeries is highest two to five days after surgery, with a second peak occurring around 10 days after surgery[1]. For moderate to high risk surgical patients, the incidence of developing DVTs postoperatively has varied (2-20% in the thigh and 10-80% in the calf veins)[2]. This study looks to determine the incidence of postoperative DVTs in the lower extremities following elective surgery and to identify some of the perioperative risk factors.

METHODS: After IRB approval and informed consent 200 adult patients scheduled for elective surgery between April and August of 2011 were enrolled in this study. Following their surgery, bilateral color Doppler ultrasound examinations of the patient's proximal and distal lower extremities were conducted in the PACU for same-day discharge patients and within 7 days for admitted patients using a portable sonographic unit (SonoSite Micromaxx) by trained examiners. Only the contralateral leg was scanned for patients with casts following hip or knee surgery. Type of surgery and anesthesia, duration under anesthesia, intraoperative DVT prophylaxis, operative positioning, and the time interval between surgery and post-operative scan were collected and analyzed. Patient charts were followed for 90 days after surgery to identify the development of postoperative DVT or PE or other complications.

RESULTS: No DVT was found in the 166 postoperative scans conducted an average 1.4 days following surgery. 83% of the patients had general anesthesia for their surgery and 11% received spinal anesthesia. The types of operations enrolled are described in Figure 1. DVT prophylaxis was given to 50% of the patients. The mean operative time was 173.8 minutes (±109.0). Chart follow-up identified the development of acute DVTs 3 and 18 days after surgery in 2 orthopedic patients on the ipsilateral side of surgery, for a rate of 5.5% among orthopedic patients examined in this study and an overall rate of 1.0% among all patients enrolled. Both patients received DVT prophylaxis and were given spinal anesthesia during surgery.

DISCUSSION: The risk of developing postoperative DVTs is low shortly after elective surgery, but this may potentially underestimate the actual incidence of postoperative DVTs. Risk factors that increase the incidence of postoperative DVTs may involve longer hospital stays or periods of immobility following surgery and orthopedic procedures. The overall low incidence of postoperative DVTs found may also suggest that preventative measures made perioperatively to reduce the development of DVTs are working effectively.

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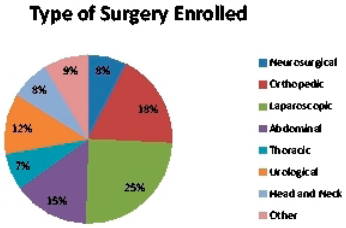
Figure 1. The share of operations enrolled for the study.



S-76.

PAIN MANAGEMENT FOLLOWING ROBOTIC CORONARY ARTERY BYPASS GRAFTING

AUTHORS: M. Snyder[1], G. Leyvi[1], M. Cecchini[1], L. Boone[1], S. Nair[1], J. DeRose[2]

AFFILIATION: [1]Anesthesiology, Albert Einstein College of Medicine & Montefiore Medical Center, Bronx, NY; [2]Cardiothoracic and Vascular Surgery, Albert Einstein College of Medicine & Montefiore Medical Center, Bronx, NY

INTRODUCTION: Robotic coronary artery bypass grafting (CABG) avoids sternotomy and cardiopulmonary bypass, but may lead to greater postoperative pain due to the need for lateral thoracic incisions. Both continuous delivery of anesthetic through a subpleural catheter (e.g. OnQ® [I-Flow Corporation, Lake Forest, CA]) and intraoperative intercostal nerve blocks effectively control robotic CABG patients' pain. This study seeks to determine if either OnQ or intercostal nerve block offers an advantage in treating postoperative pain.

METHODS: A cardiothoracic surgical database was searched for patients who received robotic CABG performed by a single surgeon between 2007-2011. Analgesic method (OnQ or intercostal nerve block -both using 0.25% bupivacaine) was chosen by the surgeon. Postoperative pain was assessed using a Visual Analog Scale. Average pain scores for the 1st - and 2nd -24 hour intervals were compared between groups. Total amount of intraoperative and postoperative opioids (in morphine equivalents) administered were each compared. The Mann-Whitney test was used for data analysis.

RESULTS: Of the 110 patients enrolled, 54 received OnQ, 54 received intercostal nerve blocks and 2 were excluded. There was no difference between groups in the amount of intraoperative fentanyl received (median=1250 mcg; 25th-75th percentile=825-1712 OnQ vs. 1000 mcg; 750-1500 intercostal; p=0.33). Average pain scores for the first 24 hour interval were significantly lower in the OnQ group (0.68; 0.29-1.34 On-Q vs. 1.21; 0.53-1.74 intercostal, p=0.04). However, for the second 24 hour interval the average pain scores were not statistically different (0.56; 0.00-1.28 OnQ vs. 0.96; 0.20-1.91 intercostal, p=0.08). OnQ patients required less postoperative IV fentanyl (100.00 mcg; 50-150 OnQ vs. 150.00 mcg; 50-250 intercostal; p=0.01) and postoperative IV opioids (10 mg; 5-15 OnQ vs. 17.5 mg; 10-30 intercostal, p=0.01). There was no difference between the groups in the amount of postoperative PO opioids received (15 mg; 5-25 OnQ vs. 20 mg; 5-35 intercostal, p=0.30).

DISCUSSION: Both pain control methods achieved satisfactory results. Patients who received OnQ had lower pain scores during the first 24 hours and required less postoperative IV opioids than patients in the intercostal group despite no difference in the amount of intraoperative fentanyl received. Although OnQ is significantly more expensive than intercostal nerve block, it may result in more patient satisfaction and less postoperative opioid use. However, in an environment where reduction in health care spending is becoming increasingly important, the benefits of using OnQ must be weighed against its increased cost.

REFERENCES: none

S-77.

KIDNEY INJURY AFTER PERCUTANEOUS AND SURGICAL AORTIC VALVE REPLACEMENT

AUTHORS: F. Guarracino, R. Baldassarri, L. Lombardi, E. Avagliano

AFFILIATION: Cardiothoracic, University Hospital of Pisa, Pisa, Italy

INTRODUCTION: Standard AVR (SAVR) is the first option treatment for patients (pts) with severe aortic stenosis. Transcatheter aortic valve implantation (TAVI) offers the possibility of valve implantation in high risk pts, thus reducing complications[1].

Renal failure is a frequent and severe complication of cardiac surgery, and it is traditionally diagnosed by serum creatinine. A novel biomarker, the neutrophil gelatinase-associated lipocalin (NGAL), can be measured after cardiac surgery, as it has shown to be an excellent early predictor for acute kidney injury (AKI)[2].

In the hypothesis that the avoidance of cardiopulmonary bypass and cardioplegic arrest could prevent renal damage, we compared the postoperative plasmatic NGAL between patients undergoing TAVI and those undergoing SAVR.

METHODS: We collected data from 20 pts undergoing TAVI who were case-matched with 20 control pts undergoing SAVR.

NGAL plasma test was performed at baseline and 4 hours after cardiopulmonary bypass initiation and balloon valvuloplasty respectively in patients undergoing surgical and percutaneous procedure. Baseline, 4 hours and postoperative peak creatinine were recorded. Dichotomous data were compared by using $\chi 2$ test with Yate's correction or Fisher's exact test when appropriate. Continuous measures were compared by analysis of variance (ANOVA) or the Mann-Whitney U test when appropriate.

RESULTS: Baseline NGAL level was similar in the two groups, whereas postoperative NGAL was significantly different in the two groups (133±76 in group TAVI vs 256±23 in group SAVR on arrival in ICU, $p < 0.05$).

Five pts in the SAVR group and two pts in the TAVI group doubled serum creatinine levels when compared to baseline: NGAL plasma concentration raised significantly only in these patients of the SAVR group ($p<0.05$) when compared to baseline. On arrival in ICU NGAL (p 0.015) was an independent predictor of AKI whereas serum creatinine and serum urea were not independent predictors of AKI.

DISCUSSION: We suggest that cardiopulmonary bypass alone, as required for SAVR, can lead to an increase in plasma NGAL. In our study NGAL, compared to serum creatinine and glomerular filtration, allowed an earlier detection of AKI thus providing the possibility to treat kidney injury at an early stage and to prevent its extension.

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Critical Care Medicine & Trauma

S-155.

ABDOMINAL ETIOLOGY FOR MIMICKED ST SEGMENT ELEVATED MYOCARDIAL INFARCTION ON THE ELECTROCARDIOGRAPH

AUTHOR: S. Patel

AFFILIATION: Anesthesia, The Pennine Acute NHS Trust, Rochdale, United Kingdom

INTRODUCTION: Introduction: ST segment elevation on the electrocardiograph (ECG) may occur in the absence of coronary artery disease.

METHODS: Medline database and Google scholar were searched for primary non-cardiac causes of ST segment elevation on the ECG. Search was done for 'mimicked myocardial infarction (MI)', 'simulating MI', 'pseudo MI' for the period 2002-2011. The reports of abdominal causes for ST segment elevation were retrieved. Initial diagnosis and leads affected were noted. Cardiac investigations and interventions done were noted. Proposed mechanisms and timing of resolution of ST segment elevation were summarized.

RESULTS: Various abdominal conditions (table) caused ST segment elevation. Acute MI was wrongly diagnosed. Drastic investigations and management such as coronary angiography (CA) and thrombolytic therapy were carried out in some cases(table). CA was performed and reported normal in 10 (out of 16) cases of pseudo MI (table). Correct diagnosis of primary condition was by made after investigations such as radiological (Ultrasound and CT scan of abdomen) and biochemical in cases of acute pancreatitis, cholecystitis, appendicitis and pheochromocytoma. Changes reverted with correction and management of primary abdominal condition.

Abdominal conditions causing pseudo STEMI

Clinical Condition	Year	Site of Pseudo STEMI	Cardiac Interventions and Investigations Done
Acute pancreatitis	2008	Inf	Aspirin, clopidogrel, Heparin infusion. CA
	2008	Inf	CA
	2009	Inf	Thrombolytic therapy given. CA.Cardiac enzymes and perfusion scans normal
	2009	AL	NTG infusion. CA. Normal CK-MB and reversible changes on ECHO
Acute cholecystitis	2006	AS	Aspirin, NTG, thrombolytic therapy. ECHO normal. CA
	2011	IL	Aspirin, Low molecular weight heparin, Clopidogrel, Echocardiograpghy and troponin level normal
Acute appendictis	2002	AS	Thrombolytic therapy, cardiac enzymes normal
	2009	Inf	Cardiac enzymes and echocardiography normal
Pheochromocytoma	2004	Ant	CA. Reversible changes on ECHO
	2007	Ant	Aspirin, carvedilol, perindopril given. CA. Normal ECHO.
Cancer -collecting duct of kidney	2006	Inf and AL	Cardiac enzymes normal, ECHO showed mass lesion in LV
Cancer - Urinary bladder	2011	AS	CA. Mass lesion in LV on ECHO and MRI
Distended gastric conduit	2006	Inf	CA, Normal troponin T and LV function on ECHO
Ruptured gastric volvulus	2009	IL	CA, normal ventricular function on ECHO
Intestinal obstruction	2003	Ant	urgent cardiology consultation, normal cardiac enzymes and normal ventricular function
Rectus sheath haematoma	2006	Inf	Troponin I normal

Inf=inferior; Ant=anterior; AS=anteroseptal; AL=anterolateral; CA=coronary angiography

DISCUSSION: It is estimated that 500,000 STEMI events occur every year in the US[1]. Confirmed STEMI requires initiation of time bound protocol management. However, pseudo changes should be considered in initial differential diagnosis (DD) of STEMI on ECG. ECG changes simulating STEMI has also been reported with intracranial haemorrhage, pneumothorax, pulmonary embolism, pericarditis, myocarditis and hyperkalemia[2]. Clinical history and examination, atypical course of ST elevation and unusual changes in other ECG leads may help in DD. Further non-cardiac investigations could prevent invasive cardiac procedures and management.

Mechanisms for pseudo ST segment elevation depend on primary abdominal etiology. Acute pancreatitis related changes may occur due to associated sepsis, cardiac effects of proteolytic enzymes or calcium disturbances. Acute cholecystitis can cause reflex (afferent via vagal and efferent α receptor mediated) decrease in coronary blood flow. Myocardial stunning due to coronary artery spasm or neurogenic mechanism was reported as a cause in case of pheochromocytoma. Myocardial metastasis causing local inflammation and mass effect mimicked STEMI which was persistent.

In conclusion, incorrect diagnosis of STEMI may lead to serious consequences including delay in true diagnosis of acute abdominal pathology. Physicians should be aware of rare causes of ST segment elevation on the ECG.

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S-156.

SODIUM BICARBONATE INFUSION IN THE CARDIAC SURGERY PATIENT: A RETROSPECTIVE STUDY

AUTHORS: H. H. Amhaz, D. Gupta, D. Apostolou, Y. Al-Baghdadi, L. Safadi, M. Orlewicz

AFFILIATION: Anesthesiology, Wayne State University / Detroit Medical Center, Detroit, MI

INTRODUCTION: There are multiple factors that contribute to acute renal dysfunction in patients undergoing cardiac surgery. Although some studies have shown the use of sodium bicarbonate to be renal protective in these patients, much controversy remains.

METHODS: A retrospective analysis of patients who underwent cardiac bypass or valvular surgery over a three year period (2007-20010) was performed to compare biochemical and clinical parameters in the patients who either received or did not receive POSBI at our institution. Two groups were analyzed; 1) African-American (AA) patients (n = 89 POSBI; n = 97 no treatment) and 2) Non African-American (NAA) patients (n= 17 POSBI; n = 26 no treatment). Serum creatinine and incidence of acute renal dysfuntion as per the Acute Kidney Injury Network (AKIN) criteria were measured within the first five post-operative days. Secondary outcomes including ventilator time, intensive care unit length of stay, post-operative stay and three month mortality were measured.

RESULTS: Peri-operative sodium bicarbonate infusion (POSBI) showed no difference between AA patients in regards to renal dysfunction [AKIN Stage 1: 31% vs 30% (p=0.87); AKIN Stage 2: 4% vs 2% (p=0.43); or AKIN Stage 3: 9% vs 10% (p=0.81)]. Peri-operative sodium bicarbonate infusion (POSBI) also showed no difference between NAA patients in regards to renal dysfunction [AKIN Stage 1: 18% vs 35% (P=0.3); AKIN Stage 2: 6% vs 4% (p=0.99); and AKIN Stage 3: 0% vs 0% (p=0.99)]. No difference was observed in the maximal change in the serum creatinine in the first five post-operative days following POSBI within AA patients (p=0.91) or NAA patients (p=0.56). For other post-operative clinical outcomes measured, the only statistically significant finding was a decreased ventilator time in the AA patients who received POSBI [2.0 days vs 4.8 days (p=0.0025)].

DISCUSSION: POSBI did not result in measurable increases of renal protection in post-cardiac surgery patients. A reduction in ventilator time was seen in AA patients receiving POSBI.

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S-157.

GOAL-DIRECTED THERAPY AFTER CORONARY ARTERY BYPASS GRAFTING IMPROVES OUTCOME IN PATIENTS WITH SEVERE LEFT VENTRICULAR DYSFUNCTION

AUTHORS: A. F. Attaallah[1,2], H. H. Abdelwahab[2]

AFFILIATION: [1]Department of Anesthesiology, West Virginia University, Morgantown, WV; [2]Department of Anesthesia and Critical Care, Cairo University, Cairo, Egypt

INTRODUCTION: Despite the poor prognosis of advanced ischemic cardiomyopathy, Coronary Artery Bypass Grafting (CABG) remains an option for a selected subsets of patients. These patients with severe left ventricular dysfunction carry a high mortality rate (10% to 37%) and a very delicate Intesive Care Unit (ICU) course in the early postoperative period.

We evaluated our experience with the use of a postoperative goal-directed hemodynamic management protocol, in order to identify it's clinical benefit on the outcome measures, for CABG patients with severe left ventricular dysfunction.

METHODS: This is a retrospective review in which we analzyed our database of 138 consecutive patients with severe left ventricular dysfunction (Ejection Fraction < or = 35%) who underwent isolated coronary artery bypass grafting with cardiopulmonary bypass during a 4-year period (2001-2005). Patients were divided into two groups, Group A (n=74 - before 2003) where the normal routine postoperative ICU protocol was used based on vital signs, and Group B (n=64 - after 2003) when we started a tighter and more invasive ICU protcol. This approach implied the insertion of a Pulmonary Artery Catheter (PAC) and frequent echocardiography studies (on admision and every 6 hours for the first 24 hours) to guide inotropic support needs and fluid management therapy.

RESULTS: The patients in both groups had similar preoperative characteristics, were operated by the same surgical teams, and had no significant operative differences. By using PAC measurements and echocardiographic studies to guide inotropic support and volume needs, a marked reduction in cardiac morbidity and mortality and a shorter ICU stay ware observed. Third degree heart block, cardiac related mortality, and mean ICU stay were higher in group A (5 vs 1 patients P = 0.044, 8 vs 2 patients P = 0.006, and 7.19 vs 4.98 days P = 0.023 respectively).

DISCUSSION: The value of PAC use, in comparison to conventional routine ICU management, generated much controversy. Also, the exact contribution of echocardiography in the hemodynamic management remains undefined and the optimal exam frequency is still debated.

Our analysis showed that PAC and echocardiographic guided therapy following coronary artery bypass grafting in patients with severe left ventricular dysfunction appear to be superior to routine care. Further prospective studies are needed to draw firm conclusions.

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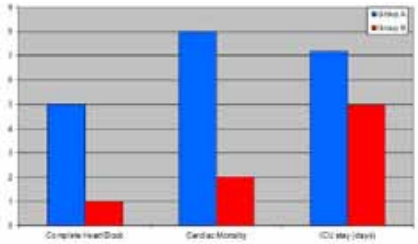

S-158.

MECHANISM OF TACHYARRHYTHMIA IN SEPTIC MODEL OF GUINEA PIG

AUTHORS: N. Hatakeyama[1,2], Y. Aoki[2], Y. Yasuda[1], Y. Fujiwara[1]

AFFILIATION: [1]Anesthesiology, Aichi Medical University, Nagakute, Japan; [2]Anesthesiology, Toyama University Hospital, Toyama, Japan

INTRODUCTION: In systemic inflammatory response syndrome (SIRS) including sepsis[1], tachyarrhythmia, such as atrial fibrillation, is sometimes difficult to cure. Septic modulation of cardiac ion channel function and expression may play a role in the formation of tachyarrhythmia.

METHODS: Septic model animal was made by intraperitoneal lipopolysaccharide (LPS, 300 μg/kg) in guinea pigs. Whole cell patch clamp was used to monitor membrane potentials and ionic currents in atrial myocytes isolated from guinea pigs 10 h after LPS injection. Western blot, RT-PCR, and immunohistochemical staining were also examined.

RESULTS: In electrophysiological monitoring, action potential duration was significantly shortened. This was associated with the reduction of L-type Ca^{2+}, current and an increase of delayed rectifier K+, current. We also observed reduced expression of Ca^{2+}, channel subunits and increase of K+ channel subunits. Furthermore, iNOS synthase in atrial tissues was up regulated, and atrial nitric oxide production evidently increased in immunohistochemical staining.

DISCUSSION: In atrial myocytes from septic model of guinea pig, action potential was significantly shortened. This may be the result of the nitration of the ion channels that would alter channel functions rather than the changes in atrial expression of the channels. The reduction of action potential could play a role for the occurrence of atrial tachyarrhythmia in SIRS and sepsis.

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S-159.

RELIABILITY OF OXYGEN SATURATION BY PULSE OXIMETER TO DETECT HYPOXEMIA OF PATIENTS IN THE INTENSIVE CARE UNIT

AUTHORS: R. Kanai[1,2], K. Moriyama[1], T. Kohyama[2,1], T. Yorozu[1]

AFFILIATION: [1]Anesthesiology, Kyorin University School of Medicine, Tokyo, Japan; [2]Intensive Care Medicine, Saiseikai Yokohamashi Tobu Hospital, Yokohama, Japan

INTRODUCTION: Pulse oximeter is generally used as a non-invasive monitor to alert respiratory dysfunction in the intensive care unit (ICU). SpO_2 (oxygen saturation by pulse oximeter / percutaneous oxygen saturation) are expected to be an indirect estimation of arterial oxygen saturation (SaO_2). However, there often are gaps between SpO_2 and SaO_2. In this study, we investigated the dissociation between SpO_2 and SaO_2 value of patients in the ICU, and examined whether SpO_2 can detect hypoxemia of patients in the ICU.

Methods: We retrospectively evaluated 20717 arterial blood gas samples from 3120 patients who stayed in our ICU since January 2008 to December 2010. Data were excluded when SaO_2 were less than 85% or PaO_2 were higher than 100mmHg. We also excluded data from patients under 20 years of age. First, SpO_2 and SaO_2 values were compared by paired t-test. Second, we calculated the gaps between SaO_2 and SpO_2. SaO_2 was analyzed by ABL 800 FLEX analyzer (Radiometer), and SpO_2 was sampled by Masimo SET LONPTM sensors. SpO_2 value was calculated as an average value of SpO_2 0, 1 ,2 and 3 minutes before blood sampling. The gaps between SpO_2 and SaO_2 were calculated as SpO_2 minus SaO_2[SpO_2-SaO_2]. Third, we investigated serum lactic acid level measured simultaneously with SaO_2 level as a marker of hypoxia. Data are expressed as means ± SD.

RESULTS: A total of 8219 arterial blood gas samples from 1834 patients (1108 male and 726 female) were analyzed. SpO_2 was significantly higher than SaO_2 (97.4±2.4% v.s. 96.2±2.4% , $p<0.05$). The overall gaps between SpO_2- SaO_2 [SpO_2- SaO_2] were 1.2±1.9. In the range of 85□SaO_2<90%, 90□SaO_2<92%, and 92□SaO_2<95%, [SpO_2-SaO_2] were 3.5±4.2%, 2.7±3.1% and 2.1±2.1% (mean ± SD), respectively. 31% of patients with 90□SpO_2<92% had hypoxemia (SaO_2<90%), and 5.6% of patients with 92□SpO_2<95% had hypoxemia. Serum lactic acid levels measured simultaneously at 85□SaO_2<90%, 90□SaO_2<92%, and 92□SaO_2<95% were 2.5±3.4, 2.2±3.3 and 1.9±2.6 mmol/L, respectively.

DISCUSSION: SpO_2 tended to show higher value than SaO_2. This tendency was more apparent as SaO_2 decreased. These results suggest that keeping SpO_2 above 90% is not enough to avoid hypoxemia. As SpO_2<90% were associated with increased morbidity and mortality among outpatients with pneumonia compared with SpO_2<92%1), we suggest to keep SpO_2 above 92% to avoid hypoxemia in the ICU.

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Clin Infect Dis. 2011;52(3):325-31.

S-160.

RAPID INDUCTION OF THERAPEUTIC HYPOTHERMIA THROUGH AUGMENTED HEAT LOSS FROM THE LUNGS: A FEASIBILITY STUDY IN SWINE

AUTHORS: M. M. Kumar[1], B. Afessa[1], J. L. Atkinson[1], L. Johnson[1], V. Nayagam[2]

AFFILIATION:[1]Mayo Clinic, Rochester, MN; [2]National Center for Space Exploration Research, NASA Glenn Research Center, Cleveland, OH

INTRODUCTION: Hypothermia is gaining acceptance as an adjunct therapeutic option in the management of traumatic brain injury, strokes and cardiac arrest.[1] Yet, the current methods to induce hypothermia are slow, inefficient and cumbersome.[2] The authors report a novel technique of rapidly inducing hypothermia through augmented heat extraction from the lungs using perfluorocarbon (PFC) mist and cooled heliox ventilation.

METHODS: Six female domestic cross-bred pigs (34-35 kg) were used in this IACUC-approved study. Following induction of anesthesia, a Camino® 4-Fr fiber-optic pressure transducer tipped catheter with thermistor was inserted 1.0 cm into the brain parenchyma through a right frontal bur hole. The core temperatures were monitored in the pulmonary artery, lower esophagus, bladder, rectum, nasopharynx and tympanum. After stabilizing the baseline respiratory parameters with room air ventilation for several minutes, ventilation was switched to cooled heliox (0±2°C, He 70%:O2 30%) and 0.14% (v/v) PFC mist. Heliox-PFC ventilation was continued for 90 minutes or until the target temperature of 32°C was reached. All temperatures, intracranial pressure, and cerebral perfusion pressure were recorded as a function of time using a data acquisition system (~0.017 Hz or faster).

RESULTS: Core temperatures declined rapidly in all animals following the initiation of heliox-PFC mist ventilation. The brain temperatures lagged 5-7 minutes before starting to decline. The esophageal temperature (mean ±SD) reached target in 40±6.8 minutes. The brain temperature declined to target in 65±10.4 minutes (Figure 1). Cardiopulmonary functions and intracranial (5-20 torr) and cerebral perfusion (50-70 torr) pressures remained stable.

DISCUSSION: A novel, minimally-invasive and effective technique to rapidly induce hypothermia is described. The combined influence of the thermal conductivity of helium and the vaporization of PFC produce rapid cooling of the alveolar gases. The thin alveolar membrane and the large surface area of contact between the inspired gases and the pulmonary capillary blood results in a high rate of heat transfer which rapidly cools the pulmonary blood. The subsequent flow of the cooled arterial blood to the brain reduces the brain temperature. The time lag between the core and the brain temperatures depends on the blood perfusion rate to the brain (convective flow velocity and volume). Due to the thermal mass of the blood, the brain continues to cool for several minutes after the cessation of heliox-PFC ventilation.

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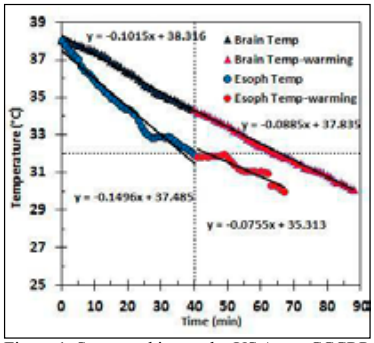

Figure 1. Supported in part by US Army CCCRP W81XWH

S-161.

WITHDRAWN.

S-162.

THE ROLE OF NRF2 IN INNATE IMMUNE RESPONSE AND SURVIVAL DURING SEPTIC SHOCK IN CRITICALLY ILL ADULTS

AUTHORS: R. Fuchs[1], S. Noel[2], L. Zheng[2], R. Thimmulappa[2], A. Navas-Acien[2], S. Biswal[2]

AFFILIATION: [1]Anesthesiology and Critical Care Medicine, Johns Hopkins University, Baltimore, MD; [2]Environmental Health Science, Johns Hopkins School of Public Health, Baltimore, MD

INTRODUCTION: Sepsis is characterized by an inappropriate host immune-inflammatory response and sustained oxidative damage. Nrf2, a bZIP oxidant-responsive transcription factor, regulates a battery of cytoprotective genes. Murine model studies have demonstrated a critical role of Nrf2 in improving survival during sepsis[1]. Hypothesis: We hypothesize that increased gene expression of Nrf2 is protective and could be correlated with an improved survival outcome.

METHODS: Design: Prospective cohort study. Setting: Patients with septic shock in the medical and surgical ICU. Sample: Adults greater than 18 years of age were screened into study within 24 h of diagnosis. 118 patients with septic shock were enrolled between January 2008 and March 2010. Exposure Measure: Nrf2 gene expression level.Outcome Measures: The primary outcome measure for the cohort design is 60 day mortality. Nrf2 was measured in PBMC by RT-PCR. Statistics: To assess the prospective association of Nrf2 gene expression with mortality, we used Cox proportional hazard models. With 60-day mortality as the outcome and hospital days as the time metric, crude models for the outcome and log2 transformed Nrf2 gene expressions were run. Models were then adjusted for age, gender, race, BMI and apache 2 score. Hazard ratios are presented.

RESULTS: At 60 days 67/118 (56.8%) patients were alive and 51/118 (43.2%) patients were dead. The hazard ratio for doubling the Nrf2 gene expression was significant in the crude model (HR = 1.26; C.I. 1.09, 1.47): for each doubling in Nrf2 gene expression there is a 26% increased instant threat of dying; adjusted for age, gender, race, and body mass index (BMI): HR = 1.25; C.I. 1.06, 1.48). Once adjusted for severity of illness (Apache 2 score) the effect was not statistically significant anymore: HR = 1.17; C.I. 0.98, 1.41. Ventilator days and days of vasopressor support were not statistically different between the Nrf2 mRNA levels.

DISCUSSION: Preliminary findings suggest that higher Nrf2 mRNA expression at enrollment is associated with higher 60 day mortality based on the crude hazard ratio for Nrf2 gene expression level and adjusted for age, gender, race, and BMI. Since this effect is not present once adjusted for severity of illness, we postulate that Nrf2 gene expression level is a mediator in the pathophysiologic cascade that leads to severity of illness in septic shock. The data do not support the hypothesis that higher Nrf2 gene expression levels are associated with a reduction of mortality risk. Therefore, we have to reject our hypothesis.

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S-163.

INHALED HYDROGEN SULFIDE PREVENTS ENDOTOXIN-INDUCED SYSTEMIC INFLAMMATION AND IMPROVES SURVIVAL BY ALTERING SULFIDE METABOLISM IN MICE

AUTHORS: K. Tokuda, E. Marutani, K. Kida, F. Ichinose

AFFILIATION: Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Charlestown, MA

INTRODUCTION: Hydrogen sulfide (H2S) is a colorless gas with a characteristic rotten-egg odor found in various natural and industrial sources. In mammalian tissues, H2S is also produced endogenously, acting as a gaseous-signaling molecule. Although it has become increasingly clear that H2S can exert a host of biological effects on various targets, the role of H2S in inflammation remains controversial. We examined impact of H2S-breathing on lipopolysaccharide[LPS]-induced changes in sulfide metabolism, systemic inflammation, and survival in mice.

METHODS: After obtaining IRB approval, all animal experiments were performed. Mice were administered with LPS (10 mg/kg) or saline intraperitoneally (IP) followed by breathing air or H2S (80 ppm) mixed in air for 6h. Tissue and blood were harvested at 6h or 24h after LPS challenge. To examine the effects of thiosulfate, a major metabolite of H2S, sodium thiosulfate (STS, 1 or 2 g/kg) was administered IP immediately after LPS challenge in separate groups of mice. Data were analyzed by one-way ANOVA. Kaplan-Meier survival analysis was performed using Log-rank test.

RESULTS: Mice that breathed air alone exhibited poor survival rate and decreased plasma sulfide levels after LPS challenge. Endotoxemia markedly increased alanine aminotransferase (ALT) and nitrite/nitrate (NOx) levels in plasma and lung myeloperoxidase (MPO) activity in mice that breathed air. In contrast, breathing air supplemented with 80ppm of H2S for 6h after LPS challenge markedly improved survival rate (Fig. 1) and attenuated LPS-induced increase of plasma ALT and NOx levels and lung MPO activity. Inhaled H2S suppressed LPS-induced upregulation of inflammatory cytokines in the liver and the lung. Beneficial effects of H2S inhalation after LPS challenge were associated with restored sulfide levels and remarkably increased thiosulfate levels in plasma (Fig. 2). Increased thiosulfate levels in mice that breathed H2S after LPS challenge were associated with upregulation of rhodanese, an enzyme responsible for H2S metabolism, but not cystathionine γ-lyase, a H2S-producing enzyme, in the liver. Administration of STS dose-dependently improved survival after LPS challenge in mice (Fig. 3).

DISCUSSION: Our results revealed that plasma sulfide levels were decreased by LPS challenge whereas H2S breathing after LPS challenge restored sulfide levels and remarkably increased thiosulfate concentrations. We further demonstrated that administration of thiosulfate per se markedly improved survival after LPS challenge. These observations suggest that H2S breathing attenuates inflammation and improves survival after LPS challenge in part by altering sulfide metabolism in mice.

References: N/A

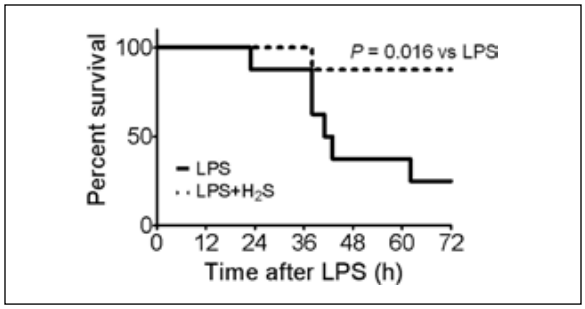

Figure 1. Survival rates after LPS challenge followed by 6h inhalation of air with or without H2S (80ppm).

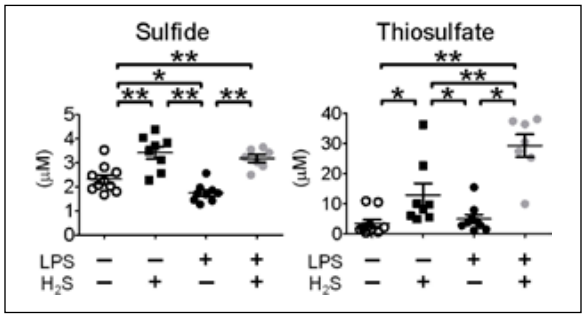

Figure 2. Plasma sulfide and thiosulfate levels at 6h after challenge with saline or LPS without or with H2S breathing. *P < 0.05. **P < 0.01.

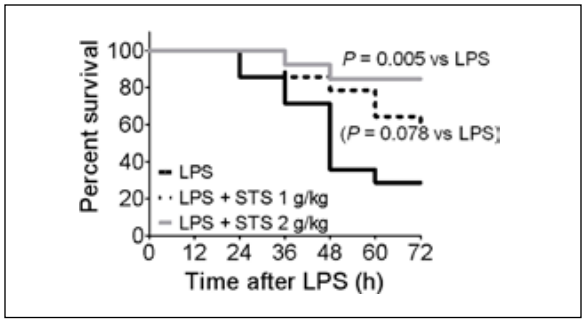

Figure 3. Survival rates after LPS challenge with or without administration of respective dose of sodium thiosulfate (STS).

S-164.

SODIUM SULFIDE PREVENTS WATER DIFFUSION ABNORMALITY IN THE BRAIN AND IMPROVES LONG TERM OUTCOME AFTER CARDIAC ARREST IN MICE

AUTHORS: K. Kida, S. Minamishima, F. Ichinose

AFFILIATION: Department of Anaesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital and Harvard Medical School, Boston, MA

INTRODUCTION: Sudden cardiac arrest (CA) is one of the leading causes of death worldwide. Despite advances in cardio-pulmonary resuscitation (CPR) methods, including the introduction of the automatic electrical defibrillator (AED) and therapeutic hypothermia (TH), fewer than 8% of adult out-of-hospital CA victims survive to hospital discharge.[1] Previously we demonstrated that administration of sodium sulfide, a hydrogen sulfide donor, markedly improved the neurological outcome and survival rate at 24 hours after CA and CPR in mice.[2] In this study, we sought to elucidate the mechanism responsible for the neuroprotective effects of sodium sulfide and its impact on the long-term survival after CA/CPR in mice.

METHODS: Adult male mice were subjected to potassium-induced CA for 7.5 minutes at 37°C whereupon CPR was performed with chest compression and mechanical ventilation. Mice received sodium sulfide (0.55 mg/kg i.v.) or vehicle 1 minute before CPR. We assessed abnormality in water diffusion in the brain caused by blood brain barrier (BBB) leakage by diffusion-weighted imaging (DWI) in live mice. Activity of matrix metalloproteinase 9 (MMP-9) which disrupts the BBB was assessed with gelatin zymography.

Results: Cardiac arrest and CPR induced abnormal water diffusion in the vulnerable regions of the brain after resuscitation, as demonstrated by hyperintense diffusion-weighted imaging (DWI) in the brain 24 hours after CA/CPR. Extent of hyperintense DWI was associated with MMP-9 activation, worse neurological outcomes, and poor survival rate at 10 days after CA/CPR. Administration of sodium sulfide prevented the development of abnormal water diffusion (Fig.1) and MMP-9 activation (Fig.2) and markedly improved neurological function (Fig.3) and long-term survival after CA/CPR (Fig.4).

DISCUSSION: These results suggest that administration of sodium sulfide 1 minute before CPR improves neurological function and survival rate at 10 days after CA/CPR by preventing water diffusion abnormality in the brain potentially via inhibiting MMP-9 activation early after resuscitation.

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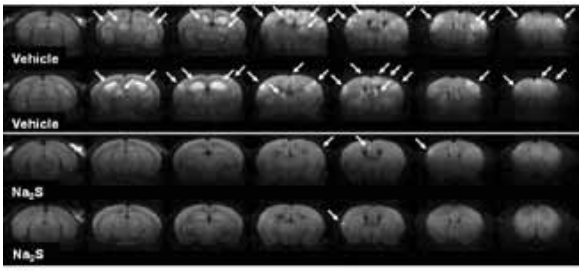

Fig. 1. Representative diffusion-weighted image (DWI) of mice 24 hours after CA and CPR. White arrows indicate the areas of hyperintense DWI

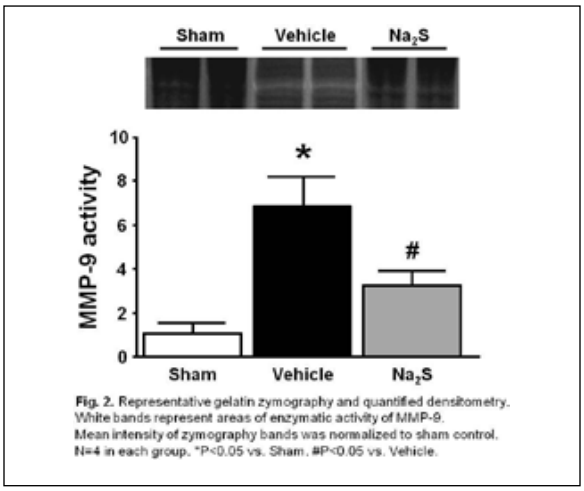

Fig. 2. Representative gelatin zymography and quantified densitometry. White bands represent areas of enzymatic activity of MMP-9. Mean intensity of zymography bands was normalized to sham control. N=4 in each group. *P<0.05 vs. Sham, #P<0.05 vs. Vehicle.

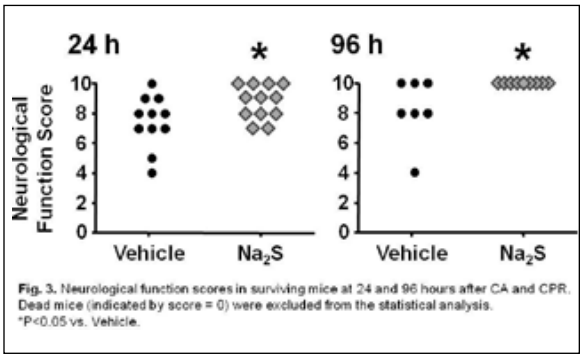

Fig. 3. Neurological function scores in surviving mice at 24 and 96 hours after CA and CPR. Dead mice (indicated by score = 0) were excluded from the statistical analysis. *P<0.05 vs. Vehicle.

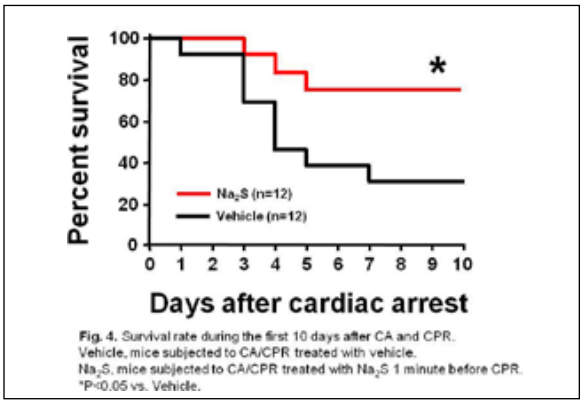

Fig. 4. Survival rate during the first 10 days after CA and CPR. Vehicle, mice subjected to CA/CPR treated with vehicle. Na_2S, mice subjected to CA/CPR treated with Na_2S 1 minute before CPR. *P<0.05 vs. Vehicle.

S-165.

ROLES OF BLT1 SIGNALING IN ENHANCEMENT OF RENOPROTECTIVE AFTER CARDIAC ARREST

AUTHORS: Y. Kosaka[1,2], M. Majima[2], Y. Nara[1], M. Toda[1], T. Yokomizo[3], H. Okamoto[1]

AFFILIATION: [1]Anesthesiology, Kitasato University of Medicine, Sagamihara, Japan; [2]Pharmacology, Kitasato University of Medicine, Sagamihara, Japan; [3]Medical Biochemistry, Graduate School of Medical Sciences, Kyusyu University, Fukuoka, Japan

INTRODUCTION: Leukotriene B4 (LTB4), a 5-lipoxygenase (5-LOX) metabolite of arachidonic acid has been well-documented to be a potent chemotactic factor for granulocytes. LTB4 exerts its biological activities through two distinct LTB receptors: BLT1 and BLT2. We have demonstrated that LTB4/BLT1 signaling enhanced hepatic microcirculatory dysfunction during endotoxemia. The glomerular endothelium forms an important part of the filtration barrier in the kidney, and is damaged by ischemia-reperfusion. Thus, we hypothesized cardiac arrest damages the glomerular barrier through the LTB4/BLT1 signaling.

METHODS: All animal experiment procedures were performed in accordance with the guidelines for animal experimentation of Kitasato University School of Medicine. We made 2 groups, wild type male mice (WT, n=14), BLT1 knockout mice (BLT1-/-, n=12). The mice were subjected to Cardiac arrest (CA) induced by intravenous (IV) KCL. After 8 min of CA, we reopened their ventilation with 100% oxygen, and the chest compressions were started at a rate of 300bpm. Moreover, the resuscitation was initiated with IV epinephrine (8-16μg in 0.5-1.0ml 0.9% saline). During surgery, the rectal temperature was maintained at 37.0±0.5°C. At the 24 hours after CA, we measured their Blood Urea Nitrogen (BUN) and serum creatinine (Cr). Statistical analysis was performed by using one-way Mann-Whitney U-test, and statistical significance was set at $p < 0.05$.

RESULTS: There were no significant differences in time to resuscitate, rectal temperature, and epinephrine dose between WT and BLT1-/-. BUN was significantly higher in WT compared with BLT1-/- (180.6±11.2 versus 104.6±11.0). Further, there was significant difference between WT and BLT-/- (1.62±0.17 versus 0.69±0.17) in the creatinine.

DISCUSSION: Present study showed the blockade of LTB4/BLT1 pathway prevented the ischemia-reperfusion injury in the kidney. The results suggested that LTB4/BLT1 signaling is an attractive therapeutic target with available specific agonists.

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S-166.

EFFECTS OF HEXAFLUORO-2-PROPANOL ON INFLAMMATORY AND HEMODYNAMIC RESPONSES IN A RAT MODEL OF ENDOTOXIC SHOCK

AUTHORS: M. Urner, I. K. Herrmann, M. Hasler, C. Booy, B. Roth-Z'Graggen, B. Beck-Schimmer

AFFILIATION: Anesthesiology, University Hospital Zurich, Zurich, Switzerland

INTRODUCTION: Sepsis with multiple organ failure remains a leading cause of hospital morbidity and mortality on intensive care units imparting tremendous financial costs. Recently, the primary metabolite of sevoflurane, hexafluoro-2-propanol (HFIP), has been found to exert immunomodulatory properties attenuating inflammatory response to lipopolysaccharides (LPS) in vitro[1]. We investigated whether HFIP attenuates plasma and tissue inflammatory mediator expression in a rat model of endotoxic shock.

METHODS: Thirty-two male wistar rats were anesthetized, tracheotomized, and mechanically ventilated. The animals were randomly assigned to one of the following groups: I) LPS group (n=8), which received intravenous Escherichia coli endotoxin (1mg/kg); II) LPS/HFIP group (n=8), which was treated identically to the LPS group with the additional administration of HFIP (67mcg/kg over 30min) after LPS injection. Control groups received ringer's lactate instead of LPS. General anesthesia was maintained with propofol. All animals received additional 30ml/kg of ringer's lactate after injection of LPS over a time period of 1 hour. Arterial blood gases were measured every hour. Animals were euthanized 6 hours after endotoxin injection. The concentrations of monocyte chemoattractant protein-1, key player in the recruitment of monocytes during endotoxemia, was analyzed in bronchoalveolar lavage fluid and in plasma. Linear regression was used to evaluate influence of HFIP on inflammatory mediator expression.

RESULTS: Plasma MCP-1 protein levels assessed 6 hours after LPS injection were increased by +5192ng/ml compared to baseline ($R2=0.661$, $p<0.001$). This increase in MCP-1 protein was attenuated by -48% in the LPS/HFIP group (+2706ng/ml to baseline, R2: 0.661; $p=0.004$). Similar results were found in BALF, in which HFIP decreased the LPS-induced raise in MCP-1 protein concentration by -62% (difference of 54ng/ml, $p=0.034$). LPS-stimulated animals had a +12% higher mean arterial blood pressure after 6 hours when treated with HFIP (78mmHg versus 67mmHg, $R2=0.684$, $p=0.035$). No significant differences in lactate levels were observed. HFIP attenuated base deficit in LPS-stimulated animals by 1mmol/L ($R2=0.522$, $p=0.034$).

DISCUSSION: Hexafluoro-2-propanol attenuated LPS-induced inflammatory mediator secretion, the decrease in mean arterial blood pressure, and base deficit. These results suggest that hexafluoro-2-propanol may partly inhibit inflammatory response, hypotension and the development of metabolic acidosis during endotoxic shock.

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S-167.

RETROSPECTIVE ANALYSIS OF CRICOTHYROTOMIES PERFORMED IN A LEVEL 1 TRAUMA CENTER OVER A TEN YEAR PERIOD

AUTHORS: Christiane Vogt-Harenkamp[1], H. Wang[1], Antonio Gonzales[1], Cecilia Peña[1]

AFFILIATION: Anesthesiology, Texas Tech University Health Sciences Center, Lubbock, TX

INTRODUCTION: In retrospective analyses the incidence of cricothyrotomies (CTT) varies from 1.1[1] to 14.9%[2] among emergency airway procedures. Mortality related to CTTs ranges from 40-85% and is higher in cardiac arrest[3] and outside-the-hospital scenarios. Data is inconclusive as to whether this high mortality is due to the severity of the underlying condition or to complications from CTT. The goal of this study was to identify main factors determining outcome in these scenarios.

METHODS: In compliance with our institutional IRB we evaluated 1423 de-identified medical and autopsy records with a CPT code for invasive airway management in regard to CTTs performed in the University Medical Center Hospital, Level 1 Trauma Center, Lubbock, Texas between 1999 and 2010. Collected data included patient demographics, clinical setting, CTT method, types of providers, numbers and types of complications and patient outcome. Descriptive statistics were used calculating means and standard deviations for continuous variables and counts and proportions for categorical variables. Statistical comparisons between survivors and non-survisors were done using Student's t-test for continuous variables and Fisher's exact test for categorical variables.

RESULTS: CTTs were done in 44 (3.1%) out of 1423 patients. Fourteen patients died during or after the procedure (31.8%). No death was reported as being due to a failed procedure. Fourteen (70%) of 20 CTTs (45.4%) performed in a trauma setting were survived. All 4 (9%) coding patients deceased. EMS personnel and trauma physicians performed the majority of CTTs, 31 (70.4%) at a survival rate of 24 (77.4%) vs. anesthesiologists and ER physicians with 5 CTTs each and 40% surviving. Surgical CTT (28 (63.3%) and wire guided CTT (16, 36.4%) had similar survival rates: 18 (64.3%) versus 12 (75%). Five complications occurred (11.3%), three (60%) related to bleeding. One of these patients died. Age, gender or BMI were not found to influence outcome.

DISCUSSION: Incidence, mortality and rate of complications after CTTs in our study were similar to numbers reported in the literature. Mortality seemed poorly related to complications. The underlying cause and the provider's experience seem to be of more impact on outcome. The main shortcoming of our and any retrospective study of cricothyrotomies is their small number throughout a wide variety of high acuity scenarios and often insufficient documentation thus limiting the value of statistical comparisons.

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S-168.

WITHDRAWN.

S-169.

CF3-MEDIATED PROTECTION - SEVOFLURANE AND ITS PRIMARY METABOLITE IMPROVE SURVIVAL IN MURINE SEPTIC PERITONITIS

AUTHORS: I. K. Herrmann[1], M. Castellon[2], D. E. Schwartz[2], G. Hu[2], R. D. Minshall[2], B. Beck-Schimmer[1]

AFFILIATION: [1]Anesthesiology, University and University Hospital Zurich, Zurich, Switzerland; [2]Anesthesiology and Pharmacology, University of Illinois at Chicago, Chicago, IL

INTRODUCTION: Sepsis remains a leading cause of death in intensive care units worldwide. There is growing evidence that volatile anesthetics have beneficial immunomodulatory effects in complex inflammatory conditions[1-4]. In this presentation, we discuss how volatile anesthetics and their primary metabolites affect overall survival of mice suffering from sepsis with intra-abdominal focus in a murine cecal ligation and puncture (CLP) model.

METHODS: The study protocol was approved by the Animal Care and Use Committee. Mice were exposed to sevoflurane (and isoflurane) either during sepsis-induction (conditioning) or when the mice showed pronounced symptoms of inflammation (post-conditioning), and compared to the CLP group regarding outcome. In an additional treatment group, the primary sevoflurane metabolite, hexafluoroisopropanol, was administered intravenously.

RESULTS: With sevoflurane conditioning (1.2 MAC for 2 hours), overall survival was increased to 86% compared to 17% in the CLP group ($p < 0.001$, N=12). Equi-anesthetic isoflurane concentrations did not significantly improve outcome (overall survival 44%, $p = 0.12$, N=10). Application of sevoflurane 24 hours post sepsis induction improved overall survival to 66% ($p = 0.045$, N=12). Interestingly, the intravenously administered primary metabolite of sevoflurane (hexafluoroisopropanol) was also highly effective in improving the overall survival in CLP mice (77%, $p = 0.037$, N=12).

DISCUSSION: Both sevoflurane and intravenous administration of the primary sevoflurane CF3-metabolite reduced CLP-induced mortality in a murine model of septic peritonitis.

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S-170.

ASSESSMENT OF PERIOPERATIVE RISK: IMPACT OF CO-MORBIDITIES & TIMING OF TREATMENT ON PERIOPERATIVE MORBIDITY AND MORTALITY

AUTHORS: M. F. Mascia, R. Neusch, S. Stamper

AFFILIATION: Anesthesiology, West Virginia University School of Medicine, Morgantown, WV

INTRODUCTION: The purpose of this sudy is to examine the relationship between comorbidities and early treatment on perioperative outcome of critically ill and injured patients.

METHODS: we examined clinical indicators likely to predict increased risk of adverse outcomes in critically ill patients before and after surgical interventions. By reviewing completed records (emrs) for all patients admitted to our intensive care units we created a database including those who had at least one operating room encounter, and at least one night in the intensive care unit (icu) prior to October 2011. Data including demographics, morbidity, mortality, 17 co-morbidities, use of shock drugs was statistically analyzed to determine relationships between co-morbidities, treatment timing, morbidity and mortality.

RESULTS: We found that patients who spent the first night after admission in any intensive care unit (ICU) had a better chance of survival than those who spent their first night in non-ICU beds.

In addition, strong correlations were found between some comorbidities and adverse outcomes. The comorbidities that showed the highest associated mortality rates were malnutrition, cancer, shock, sepsis, dialysis, chf, pulmonary heart disease, other heart disease, stroke and peripheral vascular disease. Adverse outcomes were not associated with morbid obesity (bmi > 35), diabetes, hypothermia, ischemic heart disease, copd and allied conditions, brain injury and spinal cord injury.

DISCUSSION: We hypothesized that, despite comorbidities, early definitive treatment is most likely to result in the best outcome for critically ill and injured patients, and that time and response to definitive therapy is a measurable and significant determinant of outcome. We found that early ICU care resulted in better survival rates as compared to early care in stepdown and floor beds. Most co-morbidities increased chances of death, but some, surprisingly, had no significant adverse impact.

Most of our preliminary findings are expected, but definitive facts are lacking for most disease states and there are no definitive outcome prediction tools that incorporate time to treatment, or response to definitive therapy. It is important to quantify expected outcome to avoid arbitrary, or untimely decisions regarding end of life care, and to enable proper allocation of limited healthcare resources. In other words, intuition is not good enough when lives are on the line.

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S-171.

THE EFFICACY OF LOW DOSE KETAMINE, FENTANYL, AND MIDAZOLAM INFUSION FOR PREOPERATIVE SEDATION, AND POSTOPERATIVE ANALGESIA IN THE ICU

AUTHORS: C. R. Rajaratnam, P. Roffey, M. Mogos, D. Thangathurai

AFFILIATION: Anesthesiology, USC Keck Medical Center, Los Angeles, CA

INTRODUCTION: Fears of an unknown environment coupled with extreme anxiety and anticipation /stress are a concern for patients undergoing a major surgical operation. These fears often lead to undesireable physiological and psychological lability. Standard modes of sedation which include benzodiazepines may not be effective. Low dose ketamine with midazolam and fentanyl may work to eliminate this sequelae associated with surgery.

METHODS: Our patients were age 45-82, M=F, ASA II-IV, undergoing urologic surgery. The patients were allocated into two groups. The control group received standard premedication of midazolam only. The second group received premedication which included midazolam, fentanyl, and low dose ketamine. Following administration of the premedication, patients were constantly observed for changes in mood, sedation, and hemodynamic variability in response to arrival in the OR suite. The patients were also observed and interviewed postoperatively for evidence of recall, or discomfort.

RESULTS: Problems associated with preoperative sympathetic stimulation secondary to anxiety and fear were avoided in the patient group who received combination ketamine, fentanyl, and midazolam. 7/10 patients in this group demonstrated a tranquil demeanor upon entry into the OR manifested by stability in their immediate pre-induction vital signs. This group of people described no recall to any events that occurred after administration of the medications. When compared to the group of patients who received only midazolam as a preoperative sedative, 8/10 of these patients showed no change in demeanor or level of anxiety upon entry into the OR. These patients demonstrated sympathetic stimulation evidenced by tachycardia and hypertension that had previously not been present in the early preoperative period. Similarly, this group of patients also were able to recall events leading up to the immediate preinduction period.

DISCUSSION: For the last 25 years at our institution, low dose ketamine in combination with opioids and benzodiazepines has been used as an infusion to provide excellent preoperative sedation and postoperative analgesia when compared with the use of each drug individually.

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S-172.

INTRA-ABDOMINAL PRESSURE IN ARDS: THE EFFECT OF PRONE POSITIONING

AUTHORS: E. Galiatsou, A. Moraiti, E. Kostanti, A. Papathanasiou, G. Nakos

AFFILIATION: Intensive Care Unit, University Hospital of Ioannina, Ioannina, Greece

INTRODUCTION: Prone positioning improves oxygenation in ARDS and may be an effective means of recruiting nonaerated alveolar units and minimizing lung overinflation[1]. In ARDS patients lying supine, loss of aeration predominates in the caudal and dependent lung regions because of alveolar flooding and compression exerted by the heart and the abdomen. Intra-abdominal hypertension (IAH) is common in critically ill patients[2]. The effect of proning on the intra-abdominal pressure (IAP) is not clear. Previous studies have shown that IAP may remain unchanged in the prone position and that proning improves gas exchange to a greater degree in the presence of IAH. The purpose of this study was to look at the effects of proning on IAP, lung mechanics and distribution of ventilation in patients with acute respiratory failure.

METHODS: The study protocoll was approved by the hospital's Ethics Comittee and an informed consent was taken from patients' next of kin. All patients were sedated, paralyzed and mechanically ventilated with a 6ml/kg tidal volume and optimum PEEP. Patients were turned prone with the abdomen suspended by placing pillows under the chest and the pelvis. Plateau pressure, auto-PEEP and respiratory system compliance (CRS) were measured. Urinary bladder pressure was used as a surrogate for IAP. A lung ultrasound scan (LUS) was performed to assess distribution of lung aeration. Four LUS patterns were defined and each one of the 12 lung regions scanned was accordingly scored: normal aeration 0, interstitial pattern 1, alveolar pattern 2, consolidation 3. All measurements were taken in the supine position and after 60 min in the prone position.

RESULTS: Six patients (4 male/2 female, age 57.7±17.0) entered the study. Oxygenation significantly improved with proning (pO2/fiO2 supine 112±45.1 vs 178.2±68.9 prone), while CRS tended to increase (supine 32.5±16.8 vs 41.8±20.3 prone). The LUS score tended to improve with proning (21.5±9.1 supine vs 15.2±11.4 prone). IAP in the supine position was more than 7mmHg in 4 of the patients and tended to decrease in the prone position (11.6±6.2 supine vs 7.6±4.3). This was more prominent in those with a higher IAP while supine.

DISCUSSION: IAP may remain stable or decrease in the prone position and this is possibly associated with improvement in lung mechanics and distribution of aeration. Patients with IAH may benefit more from proning.

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S-173.

INHIBITION OF THE CIAP2 PATHWAY REDUCES LEUKOCYTE RECRUITMENT IN THE INTESTINAL MICROCIRCULATION IN MURINE EXPERIMENTAL SEPSIS

AUTHORS: C. Lehmann[1,2], L. Schuster[4,1], F. Götz[4,1], F. Ashour[3], D. Pavlovic[4], G. Robertson[2]

AFFILIATION: [1]Anesthesia, Dalhousie University, Halifax, NS, Canada; [2]Pharmacology, Dalhousie University, Halifax, NS, Canada; [3]Microbiology and Immunology, Dalhousie University, Halifax, NS, Canada; [4]Anesthesiology and Intensive Care Medicine, Ernst Moritz Arndt University, Greifswald, Germany

INTRODUCTION: Inhibition of the cellular Inhibitor of Apoptosis Protein 2 (cIAP2) is able to render LPS-activated macrophages highly susceptible to apoptotic triggers, thereby quickly eliminating the resident macrophage population soon after the initiation of a systemic inflammatory response[1]. Aim of our study was to evaluate whether cIAP2 inhibition is able to reduce leukocyte recruitment within the intestinal microcirculation, which is crucial in the pathogenesis of septic multiple organ failure.

METHODS: The study was approved by Institutional Animal Care and Use Committee. We studied five groups of animals: wildtype control mice, cIAP2 knockout mice, endotoxemic wildtype mice (5 mg/kg LPS), and endotoxemic cIAP2 knockouts (5 or 50 mg/kg LPS, respectively). Intravital microscopy of the intestinal microcirculation was performed following 2 hours of observation in all animals. Intestinal microvascular blood flow (IMBF) was measured using laser Doppler flowmetry.

RESULTS: Following two hours of endotoxemia (5 mg/kg LPS) we observed a significant increase of leukocyte adhesion in intestinal submucosal venules of wildtype mice in comparison to control animals ($p<.01$). cIAP2 knockout mice did not show an increased leukocyte recruitment within the intestinal submucosal microvasculature following 5 or 50 mg/kg LPS challenge, respectively. IMBF was not affected by cIAP2 inhibition.

DISCUSSION: Inhibition of the cIAP2 pathway reduced leukocyte recruitment in the intestinal microcirculation in experimental sepsis. Pharmacological ablation of cIAP2 will potentially limit the severity of inflammatory diseases by transiently abolishing activated immune cells.

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S-174.

ROLE OF SURVEILLANCE CULTURES IN IDENTIFYING THE PATHOGENS RESPONSIBLE FOR VENTILATOR-ASSOCIATED PNEUMONIA (VAP): ANALYSIS OF COLONIZATION CURVES

AUTHORS: J. Hudcova[1], Y. Lei[2,3], A. Sarwar[2], D. E. Craven[3]

AFFILIATION: [1]Department of Surgical Critical Care, Lahey Clinic, Burlington, MA; [2]Department of Pulmonary Medicine, Lahey Clinic, Burlington, MA; [3]Center for Infectious Diseases & Prevention, Lahey Clinic, Burlington, MA

INTRODUCTION: Leakage of bacteria laden subglottic secretions around the endotracheal tube cuff with subsequent colonization of trachea plays an important role in the pathogenesis of VAP. This natural history study evaluated intubated patients for a VAP development on a daily basis. Colonization curves of those who developed VAP were reviewed in order to determine whether surveillance cultures are useful in identifying responsible pathogen(s).

METHODS: After IRB approval, we collected daily endotracheal aspirate (EA) cultures and clinical data on 188 medical and surgical patients who were intubated and ventilated >48h. Patients were followed until extubated, had tracheostomy, died, or were comfort measures only. Results of quantitative study surveillance cultures (Q-EA) were not reported to treating clinicians. Growth with Q-EA $\geq$ 105 cfu/ml was considered significant for heavy colonization. Infection was suspected if two of three clinical criteria (CC): (temperature >38°C, leukocytosis >12,000/mm3, purulent sputum) were present. Presence of heavy colonization and CC established diagnosis of ventilator-associated tracheobronchitis (VAT). VAP required criteria for VAT plus a new or increasing infiltrate on the chest radiograph. Colonization curves of patients with VAP were constructed and analyzed. Appropriateness of antibiotic treatment was assessed.

CHALLENGING CASE REPORT: N/A

RESULTS: Out of 188 study patients, 23% (n=44) patients developed at least one episode of VAT; VAP was diagnosed in 7% (n=13) patients. Ten patients with VAP had one pathogen identified and 3 patients had two different pathogens. All patients except one with VAP were on antibiotics at time of study enrollment.

Pathogens identified were S. aureus x 4, and Gram-negative rods (GNR) in 9 patients: Pseudomonas aeruginosa, Acinetobacter spp, H. influenzae, Klebsiella pneumoniae, Enterobacter spp, Escherichia coli and Stenotrophomonas maltophilia.

Five cases of VAP occurred on day 2 and were not evaluated as no Q-EA was obtained. Q-EA identified pathogens in 62% (8/13) of patients prior to VAP: in 4 cases by 1 day, in 3 cases by 2 days, in one case by 4 days, and in one case by 5 days. VAT preceded VAP in 63% (5/8) patients 1 - 6 days earlier. Out of 8 patients with colonization curves, appropriate antibiotic coverage at time of VAP diagnosis was present in three patients only.

DISCUSSION: Our study surveillance cultures identified responsible pathogen(s) for VAP ~ 2 days prior to diagnosis. VAT preceded VAP in 63% of cases. Only three patients were treated with appropriate antibiotics at time of VAP diagnosis. We believe that surveillance cultures may assist in guidance of antibiotic therapy and in identification of MDR pathogens.

REFERENCES: N/A

Economics

S-180.

COST-EFFECTIVENESS ANALYSIS OF ROCURONIUM AND SUGAMMADEX VERSUS SUCCINYLCHOLINE FOR RAPID SEQUENCE INDUCTION

AUTHORS: R. P. Insinga[1], J. Lundberg[2]

AFFILIATION: [1]Department of Health Economic Statistics, Merck & Co., Inc., Whitehouse Station, NJ; [2]Outcomes Research, MSD, Sollentuna, Sweden

INTRODUCTION: Sugammadex is approved by the European Medicines Agency for reversal of neuromuscular blockade induced by rocuronium or vecuronium. Rapid sequence induction (RSI) is used to expedite endotracheal intubation for patients at increased risk of getting stomach contents into the lungs and in emergency settings. In the event of a cannot intubate cannot ventilate (CICV) situation following anesthetic induction, neuromuscular blockade must be reversed quickly, as patients otherwise face a high risk of morbidity and mortality. Traditionally, a short-acting agent, succinylcholine, has been used for RSI, which can cause hyperkalemic cardiac arrest (HCA). This analysis investigates the cost-effectiveness of using rocuronium and sugammadex vs. succinylcholine for RSI in the Swedish setting.

METHODS: A model of costs and clinical outcomes was developed. Clinical outcomes of RSI were assumed similar across strategies, except for the risk of fatal HCA. Costs were only estimated for pharmaceuticals, as other costs would not contribute appreciably within the model. Expected loss in quality adjusted life years (QALYs) due to fatal HCA was calculated using Swedish life tables and population-based utility scores. To estimate excess risk of HCA with succinylcholine, a literature review was conducted. QALYs were discounted at 3% annually. As the risk of a CICV event may differ by setting, results are presented for various CICV risks.

RESULTS: Based on data pooled from 17 published studies, the excess risk of fatal HCA with succinylcholine was estimated to range between 0.03-0.13%. Costs per QALY ranged between 2,524-236,062 SEK/QALY (378-35,392 USD/QALY)* when CICV risks were varied from 1-100%, assuming the upper bound succinylcholine risk of fatal HCA (0.13%). Costs per QALY ranged between 12,620-1,180,308 SEK/QALY (1892-176,958 USD/QALY)* when CICV risks were varied from 1-100%, assuming the lower bound fatal HCA risk (0.03%). The figure shows the CICV and fatal HCA risks for which cost/QALY thresholds of 100,000, 300,000 and 500,000 SEK/QALY are reached (constrained by the lower/upper bounds for fatal HCA risk).

DISCUSSION: As the risk of a CICV event using RSI is a few percent or less in most settings, this analysis has demonstrated that rocuronium and sugammadex can provide a cost-effective alternative to succinylcholine for RSI in Sweden.

REFERENCES:

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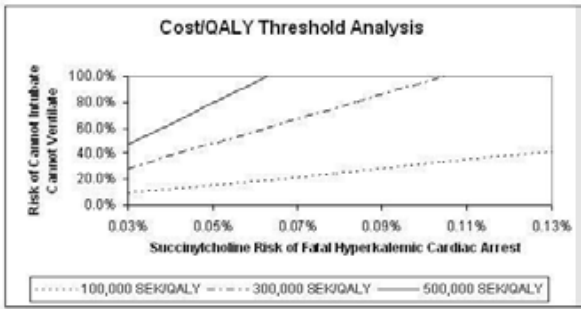
Statistics Sweden (life tables)

Rapport 2002:1 Folkhälsovetenskapligt Centrum

www.apoteket.se (drug prices)

*USD/SEK=6.67, 11/9/11, www.ft.com



S-181.

PEDIATRIC SEDATION OUTSIDE THE OPERATING ROOM WITH A PARAMEDIC

AUTHORS: A. Targ, A. Rogers

AFFILIATION: Targ Mobile Anesthesia, Palo Alto, CA

INTRODUCTION: Hiring an Emergency Medical Technician can be a valuable but often overlooked option for finding an assistant with a skill-set uniquely matched to the needs of a mobile pediatric dental sedation practice. The EMT scope of practice varies by state and training level, with the continuum ranging from EMT-B (Basic) to EMT-P (Paramedic), all of whom practice completely independent, unsupervised airway management, including endotracheal intubation (depending upon local laws). In addition to assisting with medical procedures, this individual can be trained to bill insurance, settle payments, handle scheduling and correspondence, and transport and set up equipment.

There are over 200,000 EMTs in the United States who are trained specifically to stabilize patients and transport them to a hospital[1]. An EMT can assist with pediatric sedation outside the operating room with hourly wages as low as $8/hour and replace more expensive Anesthesia Assistants (AAs) and RNs (Figure 1) without compromising quality of care.

METHODS: N/A

RESULTS: An EMT hired to assist the anesthesiologist performed the following responsibilities: equipment set up, greeting patients, verifying NPO and medical history, assisting with sevoflurane inhalation induction, GlideScope nasal intubation, and recovery, disinfecting and packaging instruments for the autoclave, and equipment troubleshooting.

The maximum full-time salary equivalent for an AA is $131,563 compared with the maximum of $52,686 for an EMT (Figure 1). When the salaries of an RN, AA, CRNA, and EMT are compared, the EMT is the most cost effective solution. Most states do not even recognize the AA as a legal certificate whereas the EMT continuum is legally recognized in every state[3] (Figure 2).

DISCUSSION: An EMT anesthesia assistant benefits both the medical practice and patients. An economical assistant lowers the cost of health care and increases affordability. Although an EMT cannot completely replace a CRNA or an AA, an EMT can provide support to the physician in routine sedation and may have the most experience of any available assistant when it comes to independent decision making and properly executing cardiopulmonary resuscitation procedures.

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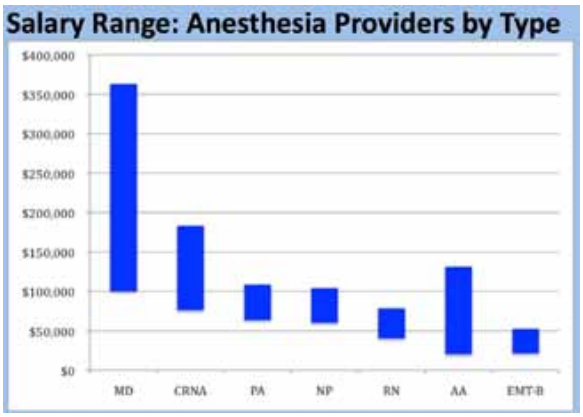

Figure 1: Full time equivalent salary range by healthcare provider (2).

33 states prohibit AA practice by statute. Only seventeen states (shown in blue) recognize the Anesthesia Assistant (AA) as a valid certification: AL, CO, FL, GA, KY, MI, MO, NC, NH, NM, OH, OK, SC, TX, VT, WI, and WV.

S-182.

30 OUT OF 50 STATES NOW MANDATE PRIVATE MEDICAL INSURERS MUST PAY CHARGES FOR PEDIATRIC DENTAL SEDATION

AUTHOR: A. Targ

AFFILIATION: Targ Mobile Anesthesia, Palo Alto, CA

INTRODUCTION: Introduction: Historically, private medical insurers in the United States have refused to cover sedation and facility charges for dental procedures by insisting that they should be covered by dental insurance. At the same time, the private dental insurers have been refusing to cover the sedation and facility charges on the basis that they are for the practice of medicine and thus not a dental benefit. To resolve the situation where a patient has both medical and dental insurance and still has no coverage, many states starting in the late 1990's passed legislation requiring medical insurers to cover sedation and facility charges for dental procedures for children under 5 to 8 years of age and for other people with disabilities that make them require sedation for procedures which normally would not require sedation. Each state has its own description of the sedation locations covered, ranging from a "dental office" to "surgery center setting" to "hospital." The purpose of this study was to identify which states currently have passed such mandates.

METHODS: A search of the internet and public health organizations and state legislature archives therein was the source of all data.

RESULTS: The 34 states listed in the category of "Mandates" in the table are those for which a mandate could be found. There are 16 states in the "No Mandates" category. Classification in the "No Mandates" category does not mean that evidence was found that there is no mandate. It means simply that no evidence of a mandate could be located.

DISCUSSION: Knowledge of the details of a practitioner's particular state statutes may be helpful when submitting a claim to the patient's insurer since the insurer, particularly if it is based out of state, may need to be educated about the laws governing coverage for the sedation. In addition, the preponderance of states with statutes may have caused national insurers for the sake of simplicity to write guidelines applied nationally which provide a form of the mandated benefits to insureds in states that have not in fact passed laws mandating the benefits.

REFERENCES: N/A

State Laws (nationwide)

Mandates	No Mandates
AK	AL
AR	AZ
CA	DE
CO	HI
CT	MA
FL	MI
GA	NV
IA	NM
ID	OR
IL	PA
IN	RI
KS	SC
KY	UT
LA	VT
MD	WV
ME	WY
MN	
MO	
MS	
MT	
NC	
ND	
NE	
NH	
NJ	
NY	
OH	
OK	
SD	
TN	
TX	
VA	
WA	
WI	

Sample Mandate - California
CALIFORNIA CODES HEALTH AND SAFETY CODE - SECTION 1367-1374.16

1367.71. (a) Every health care service plan contract, other than a specialized health care service plan contract, that is issued, amended, renewed, or delivered on or after January 1, 2000, shall be deemed to cover general anesthesia and associated facility charges for dental procedures rendered in a hospital or surgery center setting, when the clinical status or underlying medical condition of the patient requires dental procedures that ordinarily would not require general anesthesia to be rendered in a hospital or surgery center setting. The health care service plan may require prior authorization of general anesthesia and associated charges required for dental care procedures in the same manner that prior authorization is required for other covered diseases or conditions. (b) This section shall apply only to general anesthesia and associated facility charges for only the following enrollees, and only if the enrollees meet the criteria in subdivision (a): (1) Enrollees who are under seven years of age. (2) Enrollees who are developmentally disabled, regardless of age. (3) Enrollees whose health is compromised and for whom general anesthesia is medically necessary, regardless of age. (c) Nothing in this section shall require the health care service plan to cover any charges for the dental **procedure** itself, including, but not limited to, the professional fee of the dentist. Coverage for anesthesia and associated facility charges pursuant to this section shall be subject to all other terms and conditions of the plan that apply generally to other benefits. (d) Nothing in this section shall be construed to allow a health care service plan to deny coverage for basic health care services, as defined in Section 1345. (e) A health care service plan may include coverage specified in subdivision (a) at any time prior to January 1, 2000.

S-183.

ECONOMIC IMPACT OF MULTI-DISCIPLINARY PATHWAY FOR URO-ONCOLOGY SURGICAL SERVICES IN A TERTIARY TEACHING HOSPITAL IN THE UNITED KINGDOM

AUTHORS: T. Quraishi, U. Panchagnula, S. Bansal

AFFILIATION: Department of Anaesthesia, Central Manchester University Hospitals, Manchester, United Kingdom

INTRODUCTION: We evaluated the impact of multi-disciplinary perioperative pathway on patient outcomes undergoing uro-oncological surgical procedures at Central Manchester University Hospitals (CMFT) in United Kingdom; namely perioperative length of stay (LOS).

Following reconfiguration of cancer services in Northwest England, recommendations from National Institute for Clinical Excellence and Health (NICE)1 and National Cancer Standards in England for Urological Cancer, CMFT is recognised as high volume and high risk tertiary centre for uro-oncological procedures ie radical cystectomy (RC) and radical prostatectomy (RP).

Multi-disciplinary pathway was developed in 2009 to streamline services and improve patient outcomes.

METHODS: Outcome measures (Pre and Post pathway): LOS, perioperative morbidity/mortality and re-admissions within 30 days postoperatively were reviewed systematically by a researcher independent from patient care. Risk assessment scores included ASA, Lee's cardiac index and Clavien-Dindo2. All RC patients underwent cardiopulmonary exercise testing.

RESULTS: 104 patients were included in the study over 18 months. We evaluated 38 patients (10 RC and 28 RP) prior to pathway and 76 patients (24 RC and 52 RP) after implementation. Postoperative LOS was calculated from the date of surgery to patients' discharge to regular residence. A 35.6% decrease in median postoperative LOS for RC following implementation was noted. Within 30 days postoperatively, none of the RC or RP patients were readmitted or died. Increased use of oesophageal Doppler for goal directed therapy and a decrease in central venous catheter use in RP patients was noted. Increased use of rectal sheath and TAP blocks was observed as part of multi-modal analgesia. Decreased use of epidural was observed. Prior to the pathway, all RP were admitted 1 day prior and admitted postoperatively to critical care; following pathway all RP patients are admitted on the day of surgery and discharged to the ward postoperatively.

DISCUSSION: The results demonstrate that multi-disciplinary pathway can improve patient outcomes resulting in economic benefit to the hospital, primarily by reducing LOS. From average bed costs, results can be translated to a saving of $48,000 for 30 RC & $96,000 from critical care LOS for 80 RP per annum at CMFT. RC and RP referral rates have increased at CMFT as a result of efficient throughput. This pathway has been integrated into enhanced recovery (ERAS) programmes and has also been adapted for gynae-oncology procedures at CMFT.

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1. Improving Outcomes in Urological Cancers. NICE,2002.
2. Short- and long-term complications of open radical prostatectomy according to the Clavien classification system,103;336;2009.

S-184.

COST-CONSEQUENCE ANALYSIS OF CLONIDINE FOR THE PREVENTION OF PERIOPERATIVE CARDIOVASCULAR EVENTS IN NONCARDIAC SURGERY PATIENTS

AUTHORS: G. A. Lurati Buse[1,2], R. Goeree[3]

AFFILIATION: [1]Anesthesiology, University Hospital, Basel, Switzerland; [2]Population Health Research Institute, McMaster University, Hamilton, ON, Canada; [3]Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, ON, Canada

INTRODUCTION: Introduction: Cardiovascular events after noncardiac surgery represent a major population health problem. Alpha-2 agonists appear to prevent those events[1]. Our objective was to compare costs and consequences of prophylactic clonidine to prevent cardiovascular events in patients undergoing noncardiac surgery.

METHODS: We conducted a model-based cost-consequences analysis at a program implementation level from a public payer perspective in Canada. Primary outcomes were myocardial infarction, stroke, and death. We set the time horizon of 30 days and 1-year given the heterogeneous long-term prognosis of noncardiac surgery patients. We tested model assumptions by one-way sensitivity analyses.

RESULTS: Clonidine administration to prevent cardiovascular complications after noncardiac surgery dominated standard care, i.e. it saved costs and prevented adverse events. Of the 1,000 simulations, 88.3% lay in the dominant quadrant for perioperative myocardial infarction, 68.2% for stroke, 89.1% for perioperative death, and 92.1% for 1-year death. The impact of the program (means over 1,000 simulations) per 100,000 patients undergoing noncardiac surgery was 15.04 million $CAD saved and 2,397 averted perioperative myocardial infarctions, 82 averted strokes and 851 averted death at 30 day after surgery. At 1 year, the clonidine program implementation saved 30.74 million $CAD and averted 1,134 deaths. The results were insensitive to model assumptions with the exception of a moderate effect scenario.

DISCUSSION: Based on current evidence, perioperative clonidine administration to prevent cardiovascular events dominated standard care. There are, however, methodological concerns about the current evidence because it was generated in a limited number of patients and because its immoderate effect size. Effectiveness data in a large sample are required to achieve a definitive statement of the budget impact of a program of perioperative clonidine administration.

REFERENCES:

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S-185.

CONTEMPORARY ANALYSIS OF THE INCIDENCE AND ECONOMIC IMPACT OF POSTOPERATIVE PNEUMONIA

AUTHORS: S. D. Kelley[1,2], S. J. Agarwal[1], M. G. Erslon[1], S. T. Bent[3]

AFFILIATION: [1]Covidien, Mansfield, MA; [2]Brigham and Women's Hospital, Boston, MA; [3]Tulane University Department of Anesthesiology, New Orleans, LA

INTRODUCTION: Pneumonia is a serious complication after surgery. Postoperative pneumonia (POP) is the second most common hospital-acquired infection in the US and leads to mortality, increased hospital length of stay (LOS) and cost(1). We utilized a large administrative database to report the incidence, clinical and economic outcomes of POP not present on admission (POA) to describe the burden of POP.

METHODS: We studied a population of inpatient surgical adults using the Premier Perspective™ Database (PPD) 2010. PPD is the largest hospital resource utilization and economic database in the US. Pneumonia was identified using ICD-9 codes 481, 482, 485 and 486. Cases with pneumonia POA and pneumonia as admitting or primary diagnoses were excluded from the study. A 1:1 match was performed between those with POP (cases) and those without (controls) based on propensity scores. Patient demographics, provider characteristics, diseases of Charlson comorbidity index, admission status and major diagnostic categories were used to calculate propensity scores. We used the post-matching cohort to describe outcomes of mortality, discharge disposition, length of stay (LOS) and hospital costs. We assessed the US-wide burden of POP using Premier-provided projection weights.

RESULTS: Of the 1,139,792 discharges that met the inclusion criteria 17,177 (1.5%) developed POP. 11.8% of those with POP died in hospital compared to 3.96% in the control group ($p<0.0001$). About half the POP cases (49.34%) were discharged to a facility other than home compared to 31.99% in the control group ($p<0.0001$). Post-matching POP cases had mean total hospitalization cost of $62,773 and LOS of 20.8 days compared to total cost of $28,886 and 9.2 days LOS for cases without POP, respectively. POP cases had longer postoperative stay, longer ICU stay, and higher pharmacy, imaging and respiratory therapy costs compared to the control group. Outcome measures post-matching are shown in Table 1. Nationally there were about 143,000 cases of POP accounting for $8.98 billion in hospital costs and 2.98 million days of hospital stay.

Table 1: Post-matching outcomes of patients with and without postoperative pneumonia (POP)*

Variable	No POP		POP	
	N	Mean	N	Mean
Total cost	17177	$28,886	17177	$62,773
LOS (days)	17177	9.2	17177	20.8
ICU time (days)	6678	6.7	12075	12.9
ICU cost	6678	$11,178	12075	$22,327
Antibiotic cost	15096	$469	16918	$1,549
Pharmacy cost	17165	$3,373	17177	$8,435
Imaging cost	15302	$1,008	17165	$1,983
Respiratory therapy cost	12173	$1,297	16290	$3,878

*$p<0.0001$ for all comparisons

DISCUSSION: POP is associated with increased mortality and patient discharge to facilities other than home and high economic burden for the hospital. Better strategies for the prevention and management of POP may lead to greatly improved patient outcomes and substantial hospital savings.

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S-186.

WITHDRAWN.

Education & Patient Safety

S-192.

REAL AMOUNT OF DRINKING INVESTIGATION WITH THE PREOPERATION ORAL REHYDRATION THERAPY

AUTHOR: Y. Fukushima[1], S. Tani[1], T. Tateda[2]

AFFILIATION: [1]Anesthesiology, Tama South Regional Hospital, Tama, Japan; [2]Anesthesiology, St. Marianna University School of Medicine, Kawasaki, Japan

INTRODUCTION: There are guidelines on preoperative oral rehydration therapy in Europe and America. However, guidelines are not yet established in Japan. We introduced preoperative oral rehydration therapy at our hospital, but unevenness was seen in the real amount of drinking by a patient individual.

We examined an investigation into real amount of drinking and future measures this time.

METHODS: We did 257 cases with water to drink possibility to up to 500 ml until two hours before operating room admission from 0:00 on the operation day at the anesthesia department management operation appointed hour of the adult in our institution and investigated amount of drinking.

RESULTS: The overall amount of drinking mean is 321 ml.

The average younger than 70 years is 303 ml. The average 70 years or older is 336 ml.

The average of the case of the morning is 321 ml. The average of the case of the afternoon is 333 ml.

These results did not have significant difference.

The average of the man is 340 ml. The average of the woman accepted significant difference at 383 ml.

DISCUSSION: There are the present conditions that are not still carried out in an institution of approximately 60% in this country after guidelines on ASA announcement. It is pointed out that the oral rehydration therapy reduces the stress of a patient and the healthcare worker in preoperation. However, a difference is seen in amount of drinking by a patient. It was shown in old women in this investigation that there was much amount of drinking.

We introduce commercial oral supplementary water liquid to prevent unevenness of the amount of drinking or set the minimum amount of drinking, and it is thought that it is necessary to examine quantity and a kind of the water to drink which is not inferior to an infusion therapy in future.

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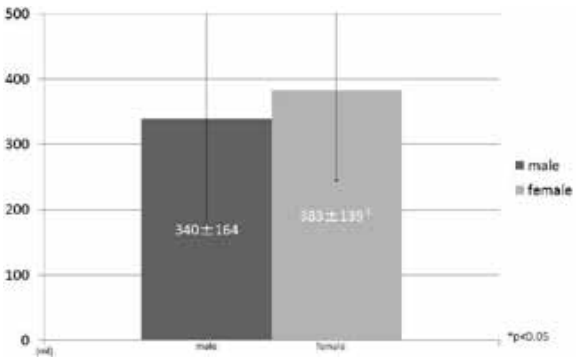

S-193.

COMPARISON OF THE REAL-TIME ULTRASOUND-GUIDED CATHETERIZATION AND THE TRAADITIONAL PALPITATION TECHNIQUE FOR RADIAL ARTERY CATHETERIZATION

AUTHOR: Y. Fujita, J. Nakata, M. Nakajima, I. Sano, Y. Teramoto

AFFILIATION: Toyohashi-city, Japan

INTRODUCTION: Radial artery catheterization is a procedure by palpation in the operating room has been made on a daily basis. Some patients in shock or obesity patient hardly touch the pulse, so far, the palpation technique may take some time to catheterization. There are reports that the initial success rate could be increased by using the real-time ultrasound guidance for a radial artery catheterization. (Chest.2011;139:524-529)

METHODS: Thirty-eight patients requiring invasive blood pressure who underwent surgery randomly divided into two groups; the traditional palpation techniques of radial artery catheterization (group P) and ultrasound guidance (group U). We measured time from the start disinfection to catheterization and number of punctures.

RESULTS: Group P was significantly shorter the time to catheterization than group U. [median seconds 84.5 vs.188.5, $P<0.05$]. Group P was significantly less than the number of punctures than group U [median number 1.0 vs.1.5, $P<0.05$]. Group P was significantly higher initial success rate than group U. [mean 88.3 vs. 44.4 %, $P<0.05$]. Compared with the ultrasound, the palpitation method was associated with an 87.5% improvement in the likelihood of initial success rate [relative risk, 1.875; 95% CI, 1.075-3.270]. Because Initial success rate was so high in the palpation method in our facility, we couldn't improve initial success rate by the ultrasound guidance. Although the palpation technique was impossible, even there were 2 cases ultrasound guidance has been possible. The one case was in a dialysis patient with arteriosclerosis. The other case was in a patient with a history of ischemic heart disease

DISCUSSION: Generally the traditional palpation techniques of radial artery catheterization might be more certainty and more rapid than the ultrasound guidance. If we use ultrasound guidance after several times of punctures by the palpitation technique, the total number of punctures may potentially reduce. We may puncture so many times for patients with atherosclerosis and pulse less. Ultrasound guidance is possible to catheterization even if they can't touch pulse. Therefore the ultrasound guidance is useful for patients in shock and obese patients. We can observe the lumen vessel of radial artery by ultrasound. We can insert catheters to narrow lumen due to atherosclerosis with ultrasound guidance. Patients in shock, obese patients, and patients with atherosclerosis may be better under the ultrasound guidance from the first catheterization.

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Ultrasound-Guided Catheterization of the Radial Artery

A Systematic Review and Meta-analysis of Randomized Controlled Trials Ariel L. Shiloh, CHEST March 2011 vol. 139 no. 3 524-529

S-194.

THE LEVEL OF NOISE IN THE OPERATING ROOM AT CRITICAL TIMES

AUTHORS: S. H. Ginsberg, A. S. Panjwani, A. R. Solina, W. Grubb, J. Kraidin

AFFILIATION: Anesthesiology, UMDNJ-RWJ, New Brunswick, NJ

INTRODUCTION: The level of noise in the operating room is of importance to the anesthesiologist as it directly impacts the ability to maintain concentration levels. Noise in the operating room has many sources and examples include: preparation for surgery, moving equipment, conversations among staff, telephones and pagers, alarms and monitors. Previous studies have identified staff related activities to be the main contributor of noise.[1,2]

METHODS: The study was approved by the IRB. The noise level was monitored in the operating room for 50 patients undergoing surgery with general anesthesia (23 of which were for cardiac surgery) during the following times: room set up, induction, skin incision, 60 minutes into the case, drapes down and at transport. The noise level measured during room set up was during the anesthesia set up of the room, prior to the patient arrival.

A "Thomas scientific" sound level meter which had the ability to record between 35- 130 decibels was used.

Noise levels were analyzed under an analysis of variance model with random intercepts for patients. Holm's method (Holm, 1979) was used to adjust for multiple comparisons among the contrasts.

RESULTS: This study consistently demonstrated that it is louder in the operating room during the critical anesthesia components of the case such as induction and emergence when compared to surgical times such as skin incision or during the actual surgical procedure.

The difference in noise levels was not significant for emergence/ drapes down versus just off bypass. All other differences were highly significant.

DISCUSSION: The level of noise in the operating room is important to anesthesiologists and other healthcare providers in order to maintain concentration. However, the significance of this increases during the more critical stages for anesthesia, such as induction and emergence. The aim of this study was to compare the level of noise in the operating room at times determined critical for anesthesiologists compared with other surgical periods. This study consistently demonstrated that it is louder in the operating room during the critical anesthesia components of the case such as induction and emergence than at skin incision or during the actual surgical procedure.

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S-195.

SUMMER ANESTHESIOLOGY EXTERNSHIP:DEMONSTRATING THE ABILITY OF EARLY CLINICAL INVOLVEMENT TO RECRUIT AND EDUCATE MEDICAL STUDENTS

AUTHORS: K. S. Baker, C. Daniel, P. Glass, P. A. Seidman

AFFILIATION: Stony Brook University Hospital, Stony Brook, NY

INTRODUCTION: Typical medical school curriculum organization leaves students with little elective time until late in the third year, or early in the fourth year. This causes some Anesthesiology residency applicants to have little time to develop their interest in the field, and some to discover their potential career too late entirely. Realizing this,the authors describe a "Summer Anesthesiology Externship" at their institution aimed at acquiring and developing early medical student interest in Anesthesiology by running a 6-week program which provides procedural, informational, and simulation education for two medical students annually during the summer after their first year.

METHODS: The organization, timeline, and goals of the program are outlined for review and possible implementation/adaptation from other institutions/departments. To analyze the utility of various aspects of the educational experience, questionnaires were sent to externs after completion.

RESULTS: Students unanimously (14 of 14) agreed that the program introduced them to the true breadth of the field, and that their practiced clinical/procedural skills improved their confidence when performing the procedures later in medical school. Interestingly, most (9 of 14) students applied for the externship with some working idea of specialty choice, although the majority (10 of 14) were not explicitly interested in Anesthesiology. However, at the end of the externship, nearly all (12 of 14) students were strongly considering the field as a career choice.

Various aspects and importances of simulational training were evaluated. The student simulations were shown to be adaptable to the learning of junior level students (mean agreement rating 9.21), and effective in developing clinical knowledge and interpersonal skills (mean agreement ratings of 9.43 and 8.14, respectively).

DISCUSSION: Our results show that early clinical "hands-on" learning experience has the capacity to recruit and educate students earlier in the medical school continuum. This has potential to inspire more students to participate in field research, politics, conferences, and education at a more junior level.

Numerous areas of program utility are demonstrated, including the ability of students to identify certain niches of Anesthesia for which they would feel most comfortable in the long-term. Importance of simulation is shown, as above. The importance of clinical and procedural skills learned is shown by data confirmation that the skills are often used later in medical school, and that repeated performance in clinical and simulational work boosted confidence when performing these procedures.

REFERENCES: NA

S-196.

USEFULNESS OF ULTRASOUND GUIDED CENTRAL VENOUS INSERTION IS DEPENDENT ON THE DIFFERENT CLINICAL EXPERIENCES

AUTHORS: T. Yorozu[1], Y. Shiokawa[2], K. Moriyama[1], Y. Ohashi[2]

AFFILIATION: [1]Anesthesiology, Kyorin University School of Medicine, Mitaka, Tokyo, Japan; [2]Neurosurgery, Kyorin University School of Medicine, Mitaka, Tokyo, Japan

INTRODUCTION: Recently many reports showed that ultrasound guided central venous catheter (CVC) insertion reduced mechanical complications[1,2]. However the benefit of ultrasound devices (US) was not shown without an adequate training of this technique[2,3]. The purpose of this study is to evaluate the usefulness in reduction of mechanical complications using US, relating to the clinical experiences of our doctors.

METHODS: Since 2008, Certifications for CVC insertions has been given to the doctors in our hospital after they took the educational course of CVC insertion including basic technique using US. We divided the doctors in three groups according to the years of their clinical experiences; group 1: junior residents less than 2 year experiences, group 2: doctors whose clinical experiences are between 2 to 5 years, group 3: doctors whose clinical experiences more than 5 years. The observation sheets of CVC insertion were collected. We compared the reduction of mechanical complications using US among the groups over 3 years (2008-2010). The data were analyzed with Chi square tests. Research Ethics Committee of our university approved this study.

RESULTS: A total of 4637 observation sheets were collected. US were used in 32.4% of all cases. Overall mechanical complication rate was 3.5%. Reduction of the mechanical complications when the doctors in group 2 used US was seen (Table). On the other hand, the mechanical complications tended to increase when the doctors in group 3 used US. Mechanical complications in group 1 varied among years.

DISCUSSION: The reduction of mechanical complications using US was seen only in the insertions by the doctors of the clinical experience between 2 and 5 years. These doctors have acquainted this fairy new technique as well as the conventional land mark technique in their early years of clinical experiences. They seem to have acquired the technique successfully to reduce mechanical complications using US after their troublesome resident years. On the other hand most of senior doctors have already spent many years using only land mark technique for CVC insertions. It may seem to be difficult for them to realize that US guided CVC insertion would not be easily successful unless they understand the differences of these two techniques. In order to facilitate safety management of ultrasound guided CVC insertion, enlightenment of accurate standard technique of US guided CVC insertion for even senior doctors is important and urgent.

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The rates of mechanical complications of each group over three years

	2008	2009	2010	Total
Group 1 (junior residents)	13.3%*	4.2%	2 . 4 %	4.3% 3.2%
US used US not used	3.3%	6.5%	1.2%	
Group 2 (clinical experience	3.4%	2.3%	1 . 1 %	2.0%* 4.2%
2 to 5 y) US used US not used	6.0%	4.1%	1.4%	
Group 3 (clinical experience	5.1%	7.0%*	2 . 7 %	4.4% 3.2%
>5 y) US used US not used	4.2%	3.4%	2.3%	

US: ultrasound devices, y: years * $p<0.05$

S-197.

DRUG ADMINISTRATION ERRORS DURING EPIDURAL OR SPINAL ANESTHESIA OR ANALGESIA

AUTHOR: S. Patel

AFFILIATION: Anesthesia, The Pennine Acute NHS Trust, Rochdale, United Kingdom

INTRODUCTION: Accidental wrong drug administration via epidural (ED) or intrathecal (IT) route is a serious human error and can lead to serious complications.

METHODS: For the period between 2002-2011, I searched medline database and google scholar using terms ‘epidural drug error’, ‘accidental epidural drug injection’, ‘inadvertent epidural drug injection’. Search was also done using intrathecal word in place of epidural. Cases reported in non-english literature and non-anaesthetic practice/procedures were excluded. Drugs administered, route and clinical circumstances were noted. Immediate (< 1hr), short term (< 1 day) and long term (> 1 day) consequences were summarized. Cause of error and likely prevention strategy was noted.

RESULTS: Mishaps took place at various stages of clinical care including postoperative period in case of ED errors. Of 34 cases (table 1) reported, all 9 errors of muscle relaxants were during non-obstetric practice. In contrast, magnesium sulphate (2 cases) and ephedrine (2 cases) errors occurred in obstetric practice (total 10 out of 34). IT errors occurred in 10 cases. ED rocuronium, suxamethonium and remifentanyl administration required emergency airway management and tracheal intubation. ED glutraldehyde and IT aminophylline caused paraplegia.The later patient died 2 years later. ED potassium chloride (KCL) resulted in reversible cardiomyopathy post caesarean section. All 3 cases of IT Tranexamic acid resulted in convulsions, refractory ventricular fibrillation and death within few hours. Ampoule error was the cause in all 4 fatal cases . In few cases systemic or ED steroids or ED saline were administered to limit spinal cord damage.

DISCUSSION: Common ED/IT drug administration errors differ in obstetric and other anesthetic practice. Hew et al[1] reviewed 37 cases of epidural drug administration errors covering a period of more than 3 decades. In their report potassium chloride was the most common drug involved followed by IV induction agents and antibiotics. In contrast, in this study muscle relaxants followed by MgSo4, paracetamol and tranexamic acid were frequently reported. However, the common causes of error remain same - ampoule errors (size, shape, label), syringe swap (size, unlabelled, wrong labelled) and epidural/spinal catheter-IV line mixup/confusion. Preventing ED/IT unintended drug administration should focus on multiple strategies including high vigilance by staff involved. Use of touch sense (by specific size, shape and surface design) to identify local anesthetic ampoules, syringe or infusion bag might be beneficial. Non-Luer safety connector system for neuraxial procedures has also been recommended.

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1. Anaesth Intensive Care. 2003;31:44-9

Wrong drugs given via epidural (ED) or intrathecal (IT) route

Group	Drug given (number of reports)
Muscle relaxants	Atracrium (2 -IT, 1-ED), Rocuronium (2), Cisatracrium, Vecuronium, Pancuronium, Suxamethonium
Electrolyte based solutions	Magnesium sulphate (2), Potassium chloride (2)
Analgesics	Paracetamol (3), Remifantanyl, Tramadol - (IT), Morphine - (IT large dose)
Vasopressor/antihypertensive	Ephedrine (2), Metaraminol, Labetalol
Anticoagulants	Trenexamic acid - (3 - IT), Heparin
Antiemetics	Metochlopramide (IT), Ondansetron
Miscellaneous	Neostigmine (IT), Insulin, Gularaldehyde, Tazobactum, Aminophylline (IT)

Where not indicated drug was given via ED route. Number indicates number of cases reported.

S-198.

A PILOT STUDY: TO DEVELOP A TOOL TO MEASURE THE CLIMATE OF BULLYING AMONG ANESTHESIA CARE PROVIDERS

AUTHORS: S. V. Pisklakov, M. Davidson, C. Schoenberg, D. Munoz
AFFILIATION: Anesthesiology, UMDNJ-NJMS, Newark, NJ

INTRODUCTION: The primary aim of this study is to develop a survey to aid in determining the incidence and consequences of bullying among anesthesia providers. This will assist in ascertaining the causes of the problem and aid in developing preventive measures leading to a comprehensive policy to deal with bullying.

METHODS: Our department has three levels of anesthesia providers: faculty, residents and CRNAs. The view point of all three levels was considered to assess how bullying is perceived. Our protocol included four phases. Phase I consisted of a focus group of three volunteers from each of the three anesthesia care provider categories. Their input provided a definition for bullying. The focus group was conducted using the four question sequence:

1. Main question was open ended and geared to start a discussion about a subject.
2. Follow up questions providing details.
3. Probing questions.
4. Prompt questions

Phase II consisted of the development of the survey. Phase III consisted of validation by seven individuals who were asked to assess the survey for clarity and relevance. In Phase IV we will pilot this anonymous paper and pencil survey amongst our staff.

RESULTS: The input from the Phase I focus group provided a definition for bullying. Phase II resulted in the developed survey. Phase III resulted in survey validation.

DISCUSSION: Bullying is an aggressive behavior intended to cause distress and involves an imbalance of power between the aggressor and the victim. Bullying causes high turnover and thwarts productivity.[2,3] The Joint Commission (TJC) requires hospitals to create policies for dealing with this aggressive behavior.[4] To mitigate risk departments must establish comprehensive anti-bullying policy and provide education[5]. One study reports that 37% of doctors in training have been bullied[1]. Departments and personnel need to develop a higher level of awareness. A mechanism for victims to come forward should be established.[6] Preventive methods might include providing anti-bullying education and communication skill training as a part of the curricula[7].

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S-199.

THE USE OF AIRTRAQ IN AN ALTERNATE TEACHING APPROACH TO LEARNING DIRECT LARYNGOSCOPY

AUTHORS: V. Ng, T. Straker
AFFILIATION: Montefiore Medical Center, Bronx, NY

INTRODUCTION: Endotracheal intubation is a fundamental psychomotor skill essential to the field of anesthesiology. Mastering this skill is one of the goals of all anesthesiology residencies. Teaching intubation usually involves a laryngoscope, blades, endotracheal tubes, and verbal instruction from a teacher. Many factors contribute to proficiency in laryngoscopy - various teaching styles, restricted visualization, patient anatomy, and individualized learning curves. With these limitations we hypothesize that the initial exposure to endotracheal intubation with the Airtraq, a rigid optical device adapted to a camera system, may improve the technique and speed with which direct laryngoscopy skills may be acquired.

METHODS: For the first three weeks of a month long mentoring program, the new CA-1 resident was taught to intubate using only the Airtraq. During the first week, the Airtraq was adapted to a wireless camera system allowing for visualization by both the resident and the attending. Learning airway anatomy and terminology of various structures was stressed more than the actual intubation itself. In the second week, the Airtraq was used without the camera system. The focus was on intubation technique utilizing the Airtraq. The third week, the CA-1 was allowed to intubate with the Airtraq but without instruction from the attending. During the final week of mentorship, the CA-1 was given a laryngoscope with a MAC 3 blade and taught the technique for direct laryngoscopy. The transition from Airtraq to direct laryngoscopy was seamless. The resident and the attending were able to communicate in medical language regarding the anatomy of the airway. If the resident was experiencing difficulty, communicating and troubleshooting the problem was accurate as the resident knew the anatomy. Motor skills needed for the technical aspect of laryngsocopy were not hindered by initially teaching with the Airtraq. The resident demonstrated knowledge of the airway anatomy and was able to utilize the anatomy to intubate correctly.

RESULTS: N/A

DISCUSSION: Anesthesiology requires extensive knowledge of multiple types of equipment, pharmacology, pharmacokinetics, and an advanced technical skill set. This skill set involves psychomotor learning, a process applying cognitive function and physical movement. Focus on visualization and learning anatomy may be a suitable model for teaching laryngoscopy. In addition, communication using appropriate medical terminology may enhance the trust and relieve the anxiety between student and teacher. This pilot study fulfilled the hypothesis of this investigation. This project will be expanded to include the CA-1 class of 2012.

References: N/A

S-200.

ANESTHESIA INFORMATION MANAGEMENT SYSTEMS (AIMS) MEDIATE IMPROVED SCIP COMPLIANCE COMPARED TO HOSPITALS WITHOUT AN AIMS

AUTHORS: I. S. Stol, W. S. Sandberg, J. M. Ehrenfeld

AFFILIATION: Vanderbilt University, Nashville, TN

INTRODUCTION: The Surgical Care Improvement Program (SCIP) is a national attempt to improve care of the patient undergoing anesthesia and surgery by putting specific measures in place to reduce surgical complications. Hospitals now publicly report SCIP compliance scores to CMS in various categories based on process measures which map to surgical outcomes. Recent studies utilizing the Nationwide Inpatient Sample have demonstrated that SCIP1 compliance (giving prophylactic antibiotics within 1 hour of skin incision) has been improving over the last five years ranging from 74.8% in 2005 to 88.9% in 2007,[1] However, in the informatics literature, hospitals using an AIMS have reported significantly higher compliance rates approaching 100%[2,3]. This study is aimed to assess the association between SCIP1 compliance and AIMS usage in U.S. hospitals.

METHODS: We validated and then distributed a survey to 200 U.S. hospitals to evaluate the association between AIMS use and SCIP1 compliance. We chose a representative sample of U.S. hospitals based on the following: Size, Geography, Urban/Rural, and Teaching/Non-Teaching. We mailed the surveys to the Department of Anesthesiology Chair at each hospital, followed up with an online survey, phone calls, and ultimately, a second mailing to those hospitals who did not return a survey. Using the Medicare Hospital Compare database, we collected the 2005-2010 SCIP1 compliance scores from all surveyed hospitals.

RESULTS: 106 surveys were returned. 33% of the hospitals reported using an AIMS, and 67% did not use an AIMS. Of those hospitals who reported using an AIMS, 67% reported installing AIMS in the operating room within the past 5 years. Our preliminary analysis of the 2010 data shows that the mean compliance in hospitals without an AIMS is 94.55% and for those hospitals with an AIMS is 95.05% (p=0.2769).

DISCUSSION: Based on past studies such as the one done by O'Reilly in 2006, who showed that AIMS mediated reminders improve performance on specific elements of the SCIP measure, one might expect hospitals with AIMS to out perform those without. Based on our preliminary analysis, we observed a trend towards higher compliance in the AIMS group, but the difference does not reach statistical significance. One might conclude that either AIMS contribute little to managing execution on SCIP measures, or that AIMS users are not taking full advantage of the decision support potential such systems bring. A complete analysis of the entire 2005-2010 data set will be performed.

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S-201.

A SIMULATION STUDY OF UNINTENTIONAL CATECHOLAMINE FLUSH DUE TO INAPPROPRIATE RELEASE OF AN INTRAVENOUS LINE OCCLUSION USING SYRINGE PUMP IN INTENSIVE CARE UNIT

AUTHORS: T. Kariya1, T. Miyashita1, H. Sato1, H. Kawakami1, K. Nakamura2, T. Goto1

AFFILIATION: 1Anesthesiology, Yokohama City University Hospital, Yokahama, Japan; 2Emergency Medicine, Yokohama City University Hospital, Yokohama, Japan

INTRODUCTION: Unintentional catecholamine flush due to inappropriate release of an intravenous line occlusion using syringe pump in intensive care unit (ICU) is dangerous for patients who need critical care. We investigated how anesthesiology residents handled this situation in simulated ICU setting.

METHODS: Preparation and primary situation

We set up a mannequin (SimMan®, Laerdal, Norway) that was virtually simulated as a sedated patient under mechanical ventilation after cardiac surgery with epinephrine and dopamine being infused via central venous catheter by syringe pumps (Terufusion®, Terumo, Japan) to maintain the blood pressure 100/50 mmHg in simulated ICU. An operator operated the vital signs by remote control.

Scenario: A facilitator explained the primary situation to each participant before the scenario started. Prior to a participant came into the simulated ICU, one of the stopcocks for the catecholamine was occluded, and the blood pressure of the mannequin dropped to 60/30 mmHg. A few minutes after a participant came in, the occlusion alarm of the syringe pump went off. The behavior of the participant was observed, and if the participant inappropriately released the occlusion and flushed catecholamine, the operator immediately rose the blood pressure to 200/100 mmHg.

Evaluation: In the debriefing session, the facilitator evaluated whether the participant could diagnose the intravenous line occlusion that caused hypotension in this scenario. The participant was asked whether he/she understood why hypertension occurred after releasing occlusion inappropriately, and how they should have handled.

RESULTS: Sixteen anesthesiology residents of our hospital consented to participate in this study. Three of them understood the occlusion was the cause of hypotension and handled the occlusion appropriately. Two didn't recognize the cause of hypotension. Eleven residents released the occlusion without relieving pressure. One of them didn't recognize that the cause of hypotension was catecholamine flush.

DISCUSSION: Anesthesiology residents might have handled the situation of intravenous line occlusion in their clinical practice without understanding the problem. To avoid the incident, they may need some lessons about the intravenous line occlusion and the properties of syringe pumps. In addition, it may be necessary for the manufactures to improve syringe pumps, too.

REFERENCES: N/A

S-202.

REDUCING ERRORS IN PATIENT ELECTRONIC MEDICAL RECORDS IN THE PERIOPERATIVE ENVIRONMENT

AUTHORS: E. Rebello[1], S. Kee[1], J. Berger[1], A. Kowalski[1], N. Harun[2], F. Goravanchi[1]

AFFILIATION: [1]Anesthesiology and Perioperative Medicine, MD Anderson Cancer Center, Houston, TX; [2]Biostatistics, MD Anderson Cancer Center, Houston, TX

INTRODUCTION: With the advent of anesthesia information management systems (AIMS) in the operating room, opening and charting in the wrong patient record presents a documentable patient safety issue. Almost half of the 140 US academic anesthesia departments and at least fifty percent of anesthesiologists in non-academic settings surveyed have already implemented, are planning to acquire, or are currently searching for an AIMS1-2. The purpose of this study was to examine the incidence of errors in opening the wrong patient record in the perioperative environment by location in our practice, and to determine whether efforts to reduce such errors have decreased the incidence over time.

METHODS: We retrospectively analyzed data for all surgeries and procedures requiring anesthesia from our Automated Anesthesia Information System (AAIS database). Out of 73,077 total cases, there were 45 documented errors from January 2009 - June 2011. The anesthesia time-out was implemented in Quarter 5 (Jan 2010) and barcoding utilizing the patient id bracelet has been ongoing. Descriptive statistics were used in data analysis.

Results: Among the 45 errors, 9 were recorded in the operating room, 33 were at off-site locations, and 3 did not have a case type or location. Table 1 summarizes the case type, rate, and location of the reported errors. There was no trend observed for all sites combined (p value = 0.2456), or the operating room (p value = 0.4693); however, there was evidence of a significant exponentially decreasing percent of errors observed at the off-site (Figure 1) location (p value 0.0078).

DISCUSSION: The off-site location was the only site that demonstrated a statistically significant decreasing pattern over time. Interestingly, this area had the largest number of wrong records opened. Thus, interventions such as the anesthesia time-out and utilizing barcodes may play an important role in decreasing errors in wrong patient record opening in the perioperative environment.

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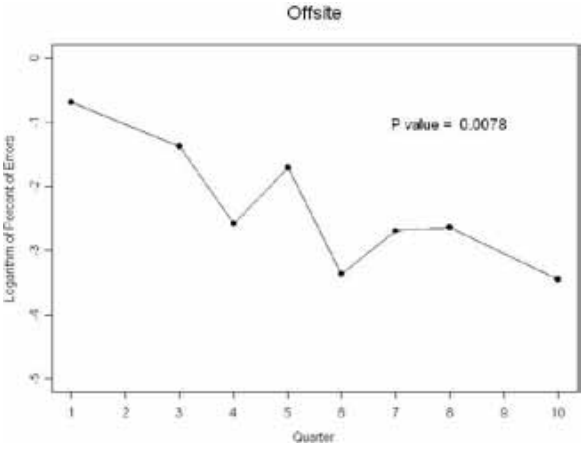

Figure 1: Logarithm of percent errors in the Offsite location as a function of time. The p-value corresponds to a test for a decreasing trend in the log of percent errors.

Variable	Category	N (%)
Case Type		3 (6.67)
	Add-On	4 (8.89)
	Scheduled	38 (84.44)
Location		3 (6.67)
	MAIN OR	9 (20.00)
	OFFSITE MRI	1 (2.22)
	OFFSITE-BONE MARROW	7 (15.56)
	OFFSITE-GI	17 (37.78)
	OFFSITE-MRI	2 (4.44)
	OFFSITE-PEDI	2 (4.44)
	OFFSITE-PULM LAB	4 (8.89)

S-203.

PHYSICIAN ATTITUDES AND BELIEFS SURROUNDING PERIOPERATIVE DO NOT RESUSCITATE ORDERS: ANESTHESIOLOGISTS' GROWING COMPLIANCE WITH PATIENT AUTONOMY AND SELF DETERMINATION GUIDELINES

AUTHORS: C. Burkle, M. Keegan, K. H. Berge, K. M. Swetz

AFFILIATION: Rochester, MN

INTRODUCTION: Patients with "do not resuscitate" (DNR) orders presenting for surgical procedures may pose ethical and practical challenges. ASA guidelines condemn the automatic perioperative suspension of DNR orders as a practice in conflict with patient autonomy and self determination.[1,2] We sought to ascertain physician beliefs regarding DNR status and resuscitative efforts (REs) during the perioperative period.

METHODS: Following IRB approval, 1726 internists (IM), surgeons (S) and anesthesiologists (A) at our tertiary referral institution were surveyed using a web based tool. Respondents were asked to rate their agreement with a series of statements concerning ethical, philosophical and practical aspects of perioperative resuscitation on a 5 point scale - (strongly) agree, (strongly) disagree, neither agree nor disagree. Descriptive statistics, chi-square, and the Cochrane Armitage trend test were used to analyze data.

RESULTS: Of 388 surveys returned, 26%, 28% and 40%, were from A, S, and IM physicians, respectively of whom 38% were physicians in training. Overall, 30% of respondents would automatically suspend DNR orders prior to surgery (18% of A, 38% of S, 34% of IM, $p<0.01$). Fifty five percent agreed/strongly agreed that perioperative DNR requests were "illogical", with 71% of surgeons expressing such an opinion ($p< 0.01$). Surgeons were also more likely to agree/strongly agree that anesthesiologists should be permitted to use all resuscitative skills independent of a patient's DNR status (A 64%, IM 68%, S 84%, $p < 0.01$). Despite these opinions, independent of specialty, three quarters of respondents disagreed/strongly disagreed with a statement that perioperative DNR decisions should be made solely by physicians and 77% believed that patients capable of consenting to surgery could separately determine their desire for perioperative resuscitation.

DISCUSSION: Our institution requires physician-patient discussion of DNR orders prior to surgery. One possible outcome includes continuation of DNR status. Yet, 30% of respondents would automatically suspend a patient's DNR order, possibly resulting in conflict with patient self determination. Unlike earlier studies, A were less likely than S or IM to assume suspension, suggesting increased awareness of published guidelines.[2,3] The majority of respondents, however, believed patients can appreciate the idiosyncrasies involved with OR care and make decisions regarding REs. Our data highlight the importance of discussions to educate patients about the spectrum and outcome of intraoperative REs and to ensure patient autonomy.

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2. ASA DNR Guidelines at asahq.org
3. Anesth Analg 78:651, 1994

S-204.

A FOUR WEEK OR MANAGEMENT ROTATION UTILIZING A CRNA-BASED EVALUTION TOOL

AUTHORS: M. Tsai[1,2], Y. Patel[1], C. Yen[1], J. Kelbert[2], J. Easdowne[3], A. Macario[4]

AFFILIATION: [1]Anesthesiology, University of Vermont College of Medicine, Burlington, VT; [2]Anesthesiology, Fletcher Allen Health Care, Burlington, VT; [3]Anesthesiology, Vanderbilt University, Nashville, TN; [4]Anesthsiology, Stanford University, Stanford, CA

INTRODUCTION: The traditional training model for anesthesiology residents has been a one-on-one mentorship with an attending physician with little opportunity for the residents to supervise and learn to manage a team unit. However, Busso et al have demonstrated that OR proficiency (e.g. anesthesia ready, anesthesia prep and turnover times) and OR management skills improved for the residents who have completed a clinical transition to practice program[1]. We created a similar rotation with a focus on concepts in leadership and management and where the actual team members (e.g. CRNAs, AAs) of the anesthesia care team directly evaluated the performance of the anesthesiology resident.

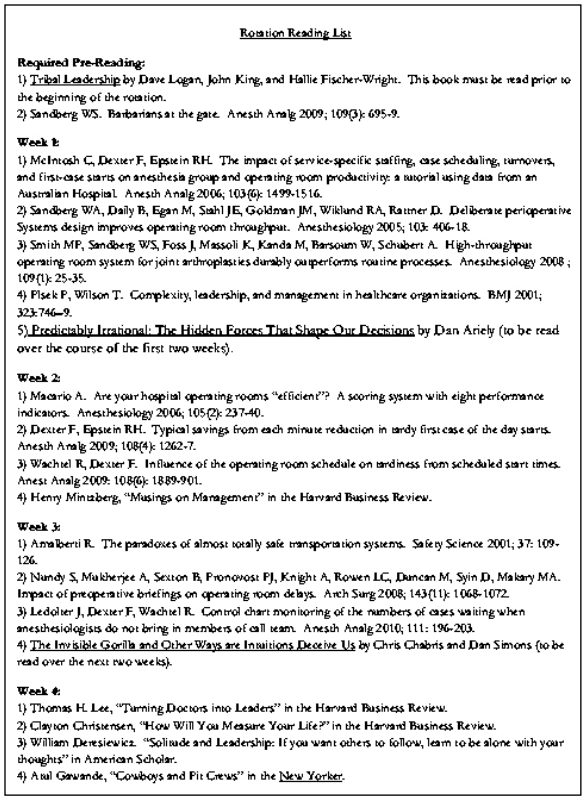
Methods: Prior to the OR Management Rotation commencing, the foundation was set with various reading material including articles on topics such as leadership skills, OR productivity and OR throughput. The rotation progressed with increasing supervisory duties: Week 1 involved managing two ORs staffed by CRNAs, Week 2 increased to managing up to 3 ORs, and in Weeks 3 and 4, the resident assumed role of Charge Attending who is responsible for operational decisions, serves as a liaison among the surgical and nursing services, and oversees the telephone-based preoperative assessment center. We modified a 360-degree evaluation tool from Vanderbilt University to fit the competencies and learning goals for our rotation.

RESULTS: One resident has completed the rotation and 5/5's ("consistently" on a 5-point Likert scale) at the beginning and end of the rotation. Therefore, the CRNAs and AAs felt that the residents "consistently" performed his supervisory duties. Of note, the resident commented that the rotation provided a venue for administrative and management responsibilities that were not available during residency.

DISCUSSION: With the increasing depth and breadth of clinical anesthesia and the large number of ACGME required rotations and case numbers, most anesthesiologists interested in leadership and management skills gain them with on the job training at their first job, while others attend a business school or pursue further training with a postgraduate fellowship. We believe that an OR management elective coupled with a formal evaluation tool presents an opportunity for anesthesiology residents to practice and acquire real-world non-clinical, administrative skills.

REFERENCES:

1. Busso VO et al. Implementation of a novel CA3 assistant coordinator rotation that embraces ACGME core competencies with focus on practice-based learning & improvement and systems-based practice. Presented at the 2011 Annual Meeting of the International Anesthesia Research Society. Vancouver, British Columbia, Canada.



Rotation Reading List

Required Pre-Reading:

1) Tribal Leadership by Dave Logan, John King, and Hallie Fischer-Wright. This book must be read prior to the beginning of the rotation.
2) Sandberg WS. Barbarians at the gate. Anesth Analg 2009; 109(3): 695-9.

Week 1:

1) McIntosh C, Dexter F, Epstein RH. The impact of service-specific staffing, case scheduling, turnovers, and first-case starts on anesthesia group and operating room productivity: a tutorial using data from an Australian Hospital. Anesth Analg 2006; 103(6): 1499-1516.
2) Sandberg WA, Daily B, Egan M, Stahl JE, Goldman JM, Wiklund RA, Rattner D. Deliberate perioperative Systems design improves operating room throughput. Anesthesiology 2005; 103: 406-18.
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4) Plsek P, Wilson T. Complexity, leadership, and management in healthcare organizations. BMJ 2001; 323:746–9.
5) Predictably Irrational: The Hidden Forces That Shape Our Decisions by Dan Ariely (to be read over the course of the first two weeks).

Week 2:

1) Macario A. Are your hospital operating rooms "efficient"? A scoring system with eight performance indicators. Anesthesiology 2006; 105(2): 237-40.
2) Dexter F, Epstein RH. Typical savings from each minute reduction in tardy first case of the day starts. Anesth Analg 2009; 108(4): 1262-7.
3) Wachtel R, Dexter F. Influence of the operating room schedule on tardiness from scheduled start times. Anest Analg 2009: 108(6): 1889-901.
4) Henry Mintzberg, "Musings on Management" in the Harvard Business Review.

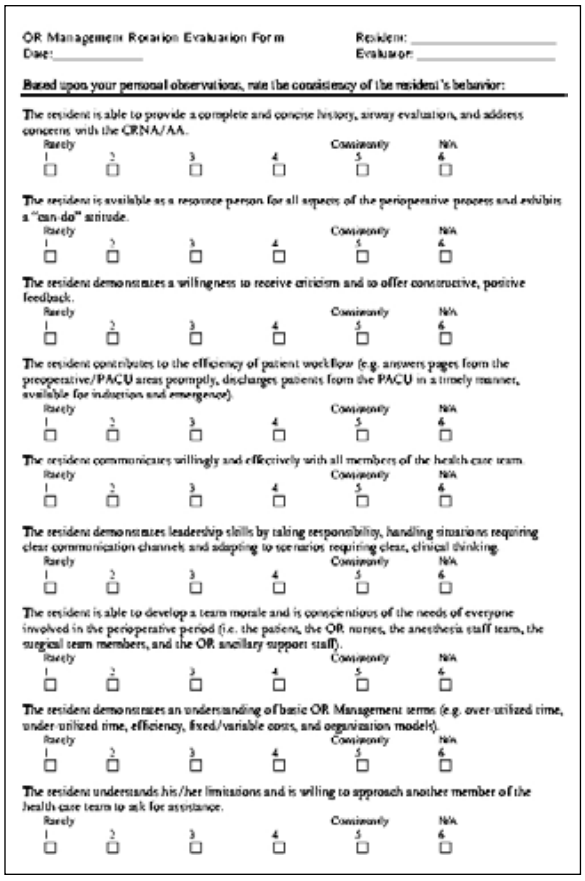
Week 3:

1) Amalberti R. The paradoxes of almost totally safe transportation systems. Safety Science 2001; 37: 109-126.
2) Nundy S, Mukherjee A, Sexton B, Pronovost PJ, Knight A, Rowen LC, Duncan M, Syin D, Makary MA. Impact of preoperative briefings on operating room delays. Arch Surg 2008; 143(11): 1068-1072.
3) Ledolter J, Dexter F, Wachtel R. Control chart monitoring of the numbers of cases waiting when anesthesiologists do not bring in members of call team. Anesth Analg 2010; 111: 196-203.
4) The Invisible Gorilla and Other Ways are Intuitions Deceive Us by Chris Chabris and Dan Simons (to be read over the next two weeks).

Week 4:

1) Thomas H. Lee, "Turning Doctors into Leaders" in the Harvard Business Review.
2) Clayton Christensen, "How Will You Measure Your Life?" in the Harvard Business Review.
3) William Deresiewicz. "Solitude and Leadership: If you want others to follow, learn to be alone with your thoughts" in American Scholar.
4) Atul Gawande, "Cowboys and Pit Crews" in the New Yorker.

Figure 2. Reading Materials



OR Management Rotation Evaluation Form
Resident: _____
Date: _____
Evaluator: _____

Based upon your personal observations, rate the consistency of the resident's behavior:

The resident is able to provide a complete and concise history, airway evaluation, and address concerns with the CRNA/AA.
Rarely 1 2 3 4 5 6 Consistently N/A

The resident is available as a resource person for all aspects of the perioperative process and exhibits a "can-do" attitude.
Rarely 1 2 3 4 5 6 Consistently N/A

The resident demonstrates a willingness to receive criticism and to offer constructive, positive feedback.
Rarely 1 2 3 4 5 6 Consistently N/A

The resident contributes to the efficiency of patient workflow (e.g. answers pages from the preoperative/PACU areas promptly, discharges patients from the PACU in a timely manner, available for inductions and emergence).
Rarely 1 2 3 4 5 6 Consistently N/A

The resident communicates willingly and effectively with all members of the health care team.
Rarely 1 2 3 4 5 6 Consistently N/A

The resident demonstrates leadership skills by taking responsibility, handling situations requiring clear communication channels and adapting to scenarios requiring clear, clinical thinking.
Rarely 1 2 3 4 5 6 Consistently N/A

The resident is able to develop a team morale and is conscientious of the needs of everyone involved in the perioperative period (i.e. the patient, the OR nurses, the anesthesia staff team, the surgical team members, and the OR ancillary support staff).
Rarely 1 2 3 4 5 6 Consistently N/A

The resident demonstrates an understanding of basic OR Management terms (e.g. over-utilized time, under-utilized time, efficiency, fixed/variable costs, and organization models).
Rarely 1 2 3 4 5 6 Consistently N/A

The resident understands his/her limitations and is willing to approach another member of the health care team to ask for assistance.
Rarely 1 2 3 4 5 6 Consistently N/A

FIgure 3. Evaluation Tool

S-205.

TEACHING FACULTY TO PROVIDE DIFFICULT FEEDBACK— A FEASABILITY STUDY

AUTHORS: J. D. Mitchell[1], M. Brzezinski[2], E. J. Holak[3], L. J. Fisher[1], Q. Cui[1], S. B. Jones[1]

AFFILIATION: [1]Anesthesia, Critical Care, and Pain Medicine, Beth Israel Deaconess Medical Center, Boston, MA; [2]Anesthesia and Perioperative Care, University of California San Francisco, San Francisco, CA; [3]Anesthesiology, Medical College of Wisconsin, Wisconsin, WI

INTRODUCTION: Trainee competence is undermined if gaps exist in interpersonal and communication skills and professionalism. Trainees with uncorrected deficits in professionalism are more likely to have performance issues and face disciplinary action during their careers.[1,2] Existing teaching tools are limited and not adapted to the unique needs of anesthesia faculty and training programs.

METHODS: Three videotaped resident-faculty scenarios were created to address issues in providing difficult feedback to residents. These scenarios were incorporated into a four-part video tool focusing on basic elements of feedback, interpersonal communication, professionalism, and advanced feedback and debriefing techniques. The videos were the centerpiece of a live course for faculty (average N = 22) featuring four interactive discussion sessions. Questions on knowledge and perceived utility of the tools and format were asked of attendees during and at the end of each session using an audience response system (Turning Point Technologies). All faculty participated in a basic feedback workshop 6 months prior to this pilot intervention study.

RESULTS: During each of the four sessions, an average of 15 faculty members participated in answering the questions. Learners rated the course highly for quality and utility (Figure 1). Ratings of video quality and utility averaged between 3 (good) and 4 (very good) on a 5-point scale for each session. Quality and utility of the small group discussion format similarly averaged between good and very good. While changes in scores for the knowledge questions were not statistically significant in this small pilot sample, faculty reported that this course provided additional information and techniques to help them improve their skills and comfort in providing feedback (Figure 2).

DISCUSSION: This technique proved feasible and was rated favorably by faculty for teaching a complex set of skills. The small-group format allowed for discussion and further modeling of the skill sets. The audience response system enabled data collection, immediate feedback, and group engagement. The course required 3 hours of staff time, which is shorter than comparable courses. Plans involve testing at other centers and as part of web-based tools.

REFERENCES:

1. Rhoton MF. Professionalism and clinical excellence among anesthesiology residents. Acad Med. Apr 1994;69(4):313-315.
2. Papadakis MA, Teherani A, Banach MA, et al. Disciplinary action by medical boards and prior behavior in medical school. N Engl J Med. Dec 22 2005;353(25):2673-2682.

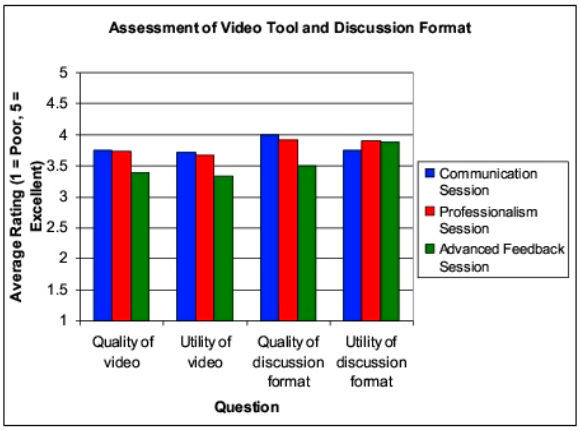


Figure 1: Assessment of Video Tool and Discussion Format

Figure 2: Perceived Changes in Knowledge, Comfort, and Success

S-206.

EVALUATION OF UPPER AIRWAY COLLAPSIBILITY IN PATIENTS WITH OSAHS

AUTHORS: N. Lin[1], Y. Li[2], T. Li[1], J. Ye[2], B. Zhang[1]

AFFILIATION: [1]Anesthesiology, Beijing Tongren Hospital, Capital Medical University, Beijing, China; [2]Key Laboratory of Otolaryngology Head and Neck Surgery, Beijing Tongren Hospital, Capital Medical University, Beijing, China

INTRODUCTION: OSAHS is a serious respiratory sleep disorders. The upper airway of those patients is prone to collapse during sleep. Serious complications, such as airway obstruction, ventilation failure or even death, might occurr during the induction and recovery period of anesthesia with the action of sedative and analgesic drugs. We try to explore the characteristics of upper airway collapse in OSAHS in order to provide the basis for airway management during the perioperative period.

METHODS: 30 cases of patients with OSAHS, ASA 2 or 3 and aged 20 to 59 years, were performed Uvulopalatopharyngoplasty procedure under general anesthesia. With complete muscle relaxation, the observation on the upper airway was conducted. At atmospheric pressure, the collapse in the plane of palate, uvula and the base of tongue was observed and the airway area was record respectively. Positive airway pressure, 3 to 20 cmH_2O, was given. Each time the pressure was increased by 1 cmH_2O, the changes of the area and diameters in retropalatal airway were recorded. The opening pressure (Popen) and the compliance of pharyngeal wall were measured. Awaking pharyngeal diameters, area and Müller's respiratory collapse degree were compared with those in passive condition. The correlations of the data between the two conditions were analyzed.

RESULTS: With full muscle relaxation, the plane of hard palate full collapse in 1 case (3.3%). The uvula plane of all patients (100%) completely collapses. The Popen ranged from 3 to 19 cmH2O. The correlation of Popen with AHI ($r = 0.377$, $P = 0.044$) was statistically significant, especially with supine AHI ($r = 0.495$, $P = 0.006$). With the block length increasing, the Popen increased significantly. The airway obstructive length, cross-sectional area and diameter were positive correlated with BMI. Multiple regression analysis showed that 85.2% Popen variations can be predicted based on the thickness of lateral pharyngeal pharynx, the length of airway obstruction and compliance of pharynx anterior and posterior wall in palate. The process of pharyngeal opening is different in patients with different structural loads.

DISCUSSION: One or more plane of the pharyngeal cavity completely collapsed in patients with OSAHS under general anesthesia. The main parts were the soft palate and pharynx, tongue. The cross-sectional area and anteroposterior diameter in hard palate plane were significantly decreased. The Popen in 90% Patients with OSAHS were not more than 15cmH_2O. Popen and AHI, especially with supine AHI, had a good correlation. In different structural load group, the process of pharyngeal opening was different.

REFERENCES: N/A

S-207.

PREVENTIVE INTERVENTIONS FOR RISING INTRAOCULAR PRESSURE: DEVELOPMENT OF AN OBSERVATION SCALE

AUTHORS: B. L. Molloy, C. B. Watson

AFFILIATION: Fairfield, CT

INTRODUCTION: Following a case of postoperative visual loss (POVL) in the steep trendelenburg (ST) position, IOP measurements were taken during laparoscopic surgery. IOP was observed to rise over time with increases (4 times baseline). We observed eyelid edema, corneal edema, ecchymosis and hypothesized that findings were correlated to rising IOP. We trialed supine intervention significantly impacting increase in IOP and potentially preventing future (POVL) events since literature cites retinal cell ganglion dysfunction following brief acute increases in IOP. Additionally, increased venous congestion secondary to trabecular meshwork dysregulated pressure dependent outflow may produce a low perfusion state in the eye. Cosopt eye drops were trialed since dual role as carbonic anhydrase inhibitor and beta adrenergic blocker is noted. Prevention of IOP rising above 40 mmHg was the goal since this was determined to be a critical threshold in POVL incidents. The aim is to provide an observation scale enabling the anesthesia caregiver to gage timing of intervention so as to prevent increases in IOP.

METHODS: The study is an instrumentation development design comparing the Molloy/BAA observation scale with the gold standard of IOP measurement, tonometry. An anesthesia team was credentialed in use of a validated instrument -Reichert Tonopenxl tonometer. Following informed consent patients undergoing ST position procedures were enrolled. IOP was measured at start, 30 minute intervals and end of surgery. Observations were noted at each time frame. Via multiple regression analysis a correlation of observations were analyzed and assessed to be significantly predictive of rising IOP levels.

RESULTS: Analysis showed statistically significant decrease in mean IOP of supine intervention group in comparison to ST group with $P<.001$. Cosopt trial analysis showed statistical significance in comparison to ST group. Findings of eyelid edema correlated to a 2.5 times increase in baseline IOP. Findings of corneal edema (chemosis) correlated to a 3.4 times increase.

DISCUSSION: A supine intervention as well as Cosopt eye drops can minimize the impact of lengthy ST positioning on increasing IOP. Observed findings of eyelid edema and chemosis have significantly correlated to increasing IOP levels. Anesthesia caregivers can assess need for timing of interventions when observing facial changes in lieu of performing intraocular tonometry.

REFERENCES:

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Rhee DJ, Alvarado JA, Calkins DJ, Gupta N. The Brain the Drain. Eye Net 2011; Nov/Dec:36- 41.

S-208.

EVALUATION OF A TEXT PAGING DEVICE FOR USE IN A CRITICAL MESSAGING ENVIRONMENT

AUTHORS: R. H. Epstein[1], F. Dexter[2]

AFFILIATION: [1]Anesthesiology, Jefferson Medical College, Philadelphia, PA; [2]Anesthesia, University of Iowa, Iowa City, IA

INTRODUCTION: Introduction: An increasing number of anesthesia groups are implementing decision support systems (DSSs) that periodically query hospital databases and send real-time text messages to mobile devices regarding clinical recommendations, quality of care, and billing compliance. Typically, these devices are also used for ad hoc urgent messages to medically directing anesthesiologists.

Highly reliable, rapid message delivery is required. Cell phone texting is not ideal for such use due to poor coverage in some hospital locations, heterogeneity among mobile phone carriers in message and phone reliability, battery issues, and occasional prolonged latency due to high network traffic (e.g., disasters, severe weather). We evaluated an alphanumeric pager for use in a critical messaging environment. We subsequently implemented the tested pager in our DSS using a web form on our anesthesia workstations (Fig 1).

METHODS: Our hospital maintains a local short-range radio paging system covering all hospital locations for phone-based ad hoc numeric paging and operator-initiated text paging for codes. A dedicated interface (Zetron) was installed, allowing pages from SQL Server (Microsoft) to Advisor II pagers (Motorola). Group paging was configured by special codes, allowing a single page to be transmitted to all group members (e.g., "Attendings", "All Staff").

Latencies of manual numeric messages were determined using a stopwatch (phone "Send" button to pager beep). Latencies of automated SQL pages (sent approximately every 2 min over a two-month period) were determined from timestamps in the message files. Computers were synchronized to network time. Percentiles were calculated using Cleveland's method. Confidence limits (CL) were calculated using the method of batch means. As a control comparison, the mean latency for phone initiated numeric pages was 7.1 ± 0.9 sec (N=100, range 5.0 to 9.0 sec).

RESULTS: We analyzed 38,885 automated SQL pages, binned by week. All but one page was sent within 30 sec of creation by SQL (Fig 2). During the first two weeks, the 99.9th percentile was 24.6 sec. Following a transmitter upgrade, the 99.9th percentile was 16.1 sec (95% CL < 16.8 sec, N=6 weeks). Mean latency was 8.6 sec (95% CL <9.3 sec). When 100 messages were sent simultaneously, each took 1.9 ± 1.0 sec to clear the queue (i.e., total time for the 100th page was 3.3 min).

DISCUSSION: Message delivery via the Advisor II pager was sufficiently rapid and reliable for use in a critical messaging environment. Determination of message latency is necessary for devices being considered for use in an anesthesia DSS. Delivery of multiple simultaneous pages should be avoided to mitigate queuing delays.

REFERENCES: N/A

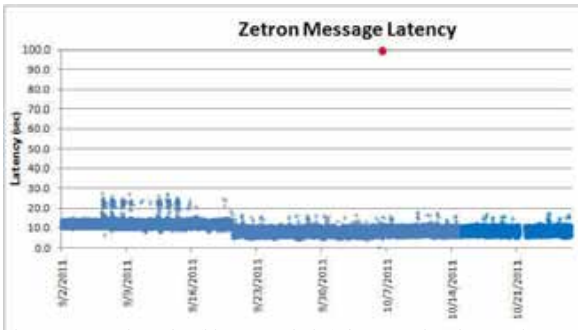

Figure 1. Pager latencies (blue open circles) from creation time on the SQL server to successful transmission. The one outlier page is noted in red.

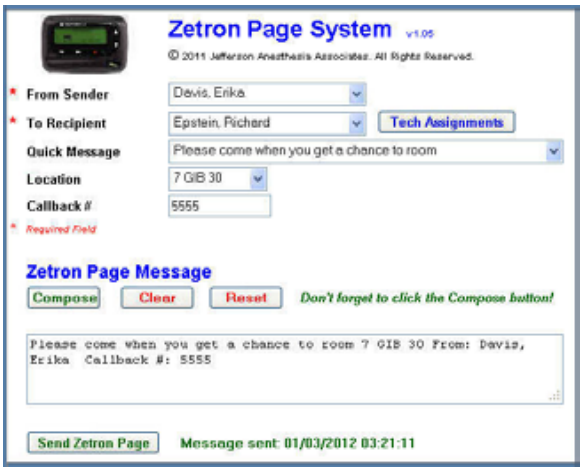

Figure 2. Web paging form (aspx.net) for transmission of text messages from the anesthesia information management system (AIMS) workstations to the paging devices. Pager numbers for valid senders and recipients are stored in the AIMS, along with common messages, selectable from the droplists. The composed message can be manually edited, as needed. The anesthesia tech assignments button indicates whom to page for supplies and technical assistance.

S-209.

INFORMATION SEARCH PATTERNS AMONG PRACTICING ANESTHESIOLOGISTS: SURVEY RESULTS

AUTHORS: V. Herasevich, T. Weingarten, T. Long, B. Pickering

AFFILIATION: Department of Anesthesiology, Mayo Clinic, Rochester, MN

INTRODUCTION: The tremendous growth in electronic information presents busy clinicians with the challenge of remaining well informed while avoiding pitfalls of information overload. Increased availability of mobile devices is changing how, where and when information is retrieved and used. However, the access to information source systems is often suboptimal. One strategy is to provide clinicians with tools that optimize internet and literature searches. To better understand how practicing anesthesiologists access internet based information we performed a brief survey during an anesthesiology weekly grand rounds presentation on search strategies for research and clinical practice.

METHODS: A grand rounds presentation on "Finding the evidence. Search skills toolkit." was made for the department of Anesthesiology at tertiary academic medical center. Prior to the didactic portion of the presentation, several questions were asked of the audience using for answers recording an audience response system - i.e. Turning Point© (Turning Technology, inc. Youngstown, OH) Responses to these questions are presented as a percentage of respondents.

RESULTS: Forty two grand rounds participants answered questions. Most respondents were practicing anesthesiologists (66%) and anesthesia residents. The answers were distributed as following:

1. What general search engine do you usually use first? Google - 95%
2. Do you use Scopus on a regular basis? Yes - 5%; I don't know what it is - 83%
3. Do you perform searches from a mobile device? Yes - 80% (10% of audience do not own smart phone and 75% own iPhone, 10% Android and 5% Blackberry)
4. Do you use RSS for tracking literature updates? Yes - 7%; I don't know what it is - 56%
5. If you have both versions of article/document: do you prefer read from paper or monitor screen? Prefer paper - 78%
6. Do you wish to improve search skills? 100% Yes

DISCUSSION: The results from this survey indicate a demand for educational activities that equip clinicians with the skills to better utilize internet search tools for professional literature searches and tracking. Even with increasing accessibility to mobile devices (i.e smart phones) among practicing anesthesiologists, the majority preferred to read printed rather than electronic versions of documents. Additional educational endeavors aimed at informing users regarding the various internet searching and tracking utilities may result in increased utilization of these resources.

REFERENCES: N/A

S-210.

AUDIT INTO EARLY POSTOPERATIVE RENAL FUNCTION FOLLOWING HIP OR KNEE ARTHROPLASTY WITH TWO ANTIBIOTIC REGIMES

AUTHORS: A. Morrison, T. Tarr

AFFILIATION: Anaesthesia, Wirral University Teaching Hospitals, Liverpool, United Kingdom

INTRODUCTION: Surgical antibiotic prophylaxis with cephalosporins is associated with an increase in hospital acquired infections, leading to increased morbidity and mortality1. This Trust, adjusted prophylaxis for arthroplasty to teicoplanin and gentamicin. As both drugs are associated with renal impairment in repeated doses, this study assessed the effect of a single dose on postoperative renal function.

METHODS: This retrospective study reviewed serum urea and creatinine of patients undergoing elective primary hip or knee arthroplasty. The 2008 group received perioperative cefuroxime 1.5g at 0, 8 and 16hrs, the 2010 group one dose of teicoplanin 400mg and gentamicin 3.5mg/kg ideal body weight at induction. The first 150 patients in either group were identified from the Trust's Theatre Register. Inclusion criteria were a preoperative serum urea and creatinine with a subsequent measurement 18-36 hours postoperatively.

A within-subject highly significant change in serum creatinine was defined as a 30% increase from preoperative value and above normal limits, in accordance with the guidelines from the Ontario Society for Clinical Chemists[2]. Categorical data was analysed using Fisher's exact test, continuous data utilised a paired t-test.

RESULTS: There were no significant differences with respect to age, sex, ASA, type of operation, or mean preoperative urea concentrations (Table 1). Mean preoperative creatinine was lower in the 2010 group (p=0.0001). Postoperative mean urea fell significantly in both groups. Pre- and postoperative mean creatinine levels were similar in 2008, but 2010 postoperative creatinine levels significantly rose. 6.4% of 2008 patients had a creatinine rise compared to 10.4% in 2010, including 15.2% of all knee patients. 5.6% of 2010 patients had a 50% rise which was significantly higher than 2008 (0.7%).

DISCUSSION: Teicoplanin and gentamicin prophylaxis may be associated with acute kidney injury in those receiving elective arthroplasty, particularly knee surgery. A prospective study enrolling more patients, which monitors creatinine clearance is warranted to validate the potential adverse effects of these antibiotics.

REFERENCES:

1. J Hosp Infect. 40. 1-15. 1998.
2. http://www.clinicalchemistry.on.ca/Documents/eGFR%20CLP%20Feb%202006.pdf (this is an invalid URL)

S-211.

GOAL DIRECTED USER TRAINING IMPROVES EFFICIENCY OVER CENTRICITY ANESTHESIA DURING TO EPIC ANESTHESIA AS A COMPONENT OF A SYSTEM WIDE EMR

AUTHORS: L. C. Jameson, J. Negin, K. Bullard

AFFILIATION: Department of Anesthesiology, University of Colorado, Aurora, CO

INTRODUCTION: Medical Centers and anesthesia departments expect a decrement in efficiency when the hospital converts from paper or standalone electronic anesthesia record (aEMR) to an hospital wide EMR (oEMR). This is ascribed to the complexity of change and decreased user proficiency where proficiency is believed dependent on user training and experience. Goal directed training was developed by the E anesthesia MDs to assure user proficiency and during the conversion from Centricity (C) (GE Medical IT), an aEMR, to EPIC (E) (Epic Corp), an oEMR. The training effectiveness was measured by comparing delay of case start time (DOC) in C and E. DOC is the hospital metric to define efficiency.

METHODS: An locally developed E training consisted of 1) interactive web activity covering all anesthesia charting and orders functions for aEMR and oEMR 2) half day interactive classroom activity with an E trainer 3) completion of ≥3 mock pre, intra and post anesthesia records 4) classroom competency certification. Competency required efficient and accurate charting of a complex perioperative record that included all patient care skills. Super-users conducted the classroom activities, evaluated the all charting products and tutored as required. Some users repeated the competency test; passing was mandatory to work after E go-live. SQL query measured DOC, time between cases that was in excess of turn over time goal, between for Sept 3 through Nov 30 2010, C, and 2011, E. The dates were chosen by the "go-live" of E and a comparable period for C. All care areas were queried: OpTime scheduled-Inpatient (AIP), Outpatient (AOP) ORs and Cadence scheduled--interventional procedures (CVC), GI endoscopy (GI). The E and C chart functions were the same in all areas.

RESULTS: DOC in the OpTime scheduled areas (AOP/AIP) was consistent in both E and C (Figure 1, 2). E DOC was consistently less than C for the study period (Table). GI cases done using C were efficient. Use of Cadence caused GI DOC to increase from 10 min (C) to >30min over 3 months. CVC was inefficient and unpredictable in both E and C.

DISCUSSION: The training program was effective in preparing anesthesia care team members with the skills to efficiently provide all aspects of anesthesia care. DOC decreased with E. DOC was stable with C and E in AOP, AIP, and CVC. DOC in GI increased >3X. The only difference was Cadence scheduling. Hospital and E IT were not prepared for managing anesthesia services using Cadence. External IT decision and planning can have a major negative impact on productivity that is independent of anesthesia performance.

REFERENCES: N/A

Average excess turnover time (min)

Location	Centricity	Epic
	Average ± SD	Average ± SD
CVC	43.7±6.4	33.4±17.8
GI	10.0±0.3	31.2±9.2*
AIP	17.1±0.5	10.4±0.8
AOP	5.2±0.6	5.1±0.6

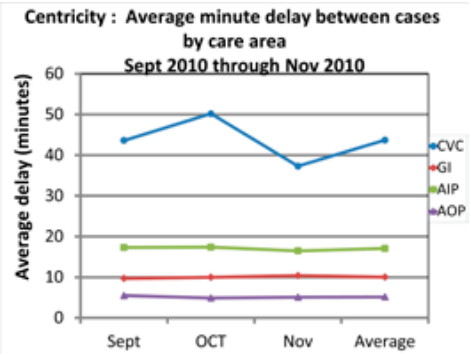

Figure 1

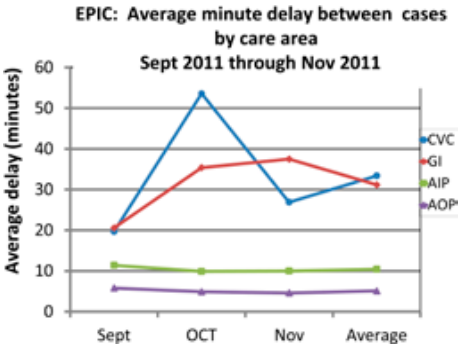

Figure 2

S-212.

MULTIMEDIA APP FOR ANESTHESIOLOGY: INTERACTIVE LEARNING AND SELF ASSESSMENT

AUTHORS: C. M. Kim, N. Tahir, P. Sekhar, R. Azocar

AFFILIATION: Boston, MA

INTRODUCTION: Introduction: The implications of the geriatric population on the practice of anesthesiology are complex and constantly evolving. Our University's School of Medicine, Department of Anesthesiology obtained the American Geriatrics Society's Geriatrics Education for Specialty Residents (GSR) in 2008. We continue to facilitate the acquisition of the most up to date geriatrics knowledge with development of multimedia learning modules in our educational curriculum. Advances in technology have allowed for innovative development and distribution of educational materials. The concepts of self-education and self-assessment are gaining a wide popularity in medical education. Our interactive, multimedia learning app in geriatric anesthesia will allow students to have remote access to educational materials that not only provide pertinent information, but also offer audio explanation of digital graphs and texts followed by immediate evaluation of their knowledge with oral board styled self-assessment.

METHODS: Our user-friendly audio and video app allow remote learning in an interactive manner, similar to attending a lecture. We attempted to maximize the multimedia experience by employing audio, video, and text to convey the key concepts that are crucial for understanding geriatric anesthesiology. Additionally, we have included clinical case scenarios with oral board styled questions, combined with a video and audio commenting capabilities. Thus, allowing the educators as well as students to watch and learn from each other.

RESULTS: Under attending and faculty supervision, teams of senior residents and medical students work together to develop modules for their assigned topic in geriatric anesthesiology. Each team completed a thorough literature review and summarized their findings. Moreover, applicable clinical scenarios were created to test learner's knowledge with detailed explanations.

DISCUSSION: By completing a literature review and synthesizing learning modules together, each team members became experts in their topics and in turn, were able to teach each other. Furthermore, during the process of creating their own multimedia modules, each member acquired essential skills in digital media production. We predict continued advancement in multimedia and interactive learning technology in all aspects of medical education and strive to serve as an example of multifaceted medical curriculum in the future.

REFERENCES: none

Figure 1: Interactive tablet for presentations

Figure 2: Seven different multimedia modules focusing on geriatric anesthesiology are being developed.

Figure 3: Students can log in remotely through their digital tablets and access each module. Each module will include an audio/visual presentation paired with several clinical questions and scenarios.

Figure 4: Clinical questions and scenarios are presented and students' audio/video answers can be recorded via webcam. The recorded answers can be viewed and critiqued by other users.

S-213.

CHARTING OF ESSENTIAL ANESTHESIA ELEMENTS IS LESS RELIABLE IN EPIC THAN IN CENTRICITY

AUTHORS: L. C. Jameson, J. Vasquez, K. Bullard

AFFILIATION: Department of Anesthesiology, University of Colorado, Aurora, CO

INTRODUCTION: Centers for Medicare and Medicaid (CMS), Institutes of Medicine and The Joint Commission have embraced the Electronic Medical Record (EMR) as a solution for clear, concise, consistent and auditable medical records. World Health Organization and CMS believe best care begins with checklists, protocols and error checking imbedded and systematically documented in the medical record. Yet EMR functionality and user interface requirements remain largely unregulated. The hospital converted its anesthesia EMR (aEMR) from Centricity (C) (GE Medical IT), a check list, protocol organized product, to Epic (E) (Epic Corp), an activity organized product. This study compares the impact the change from C to E had on charting compliance for 3 standard items that are required in electronic or paper anesthesia records.

METHODS: A SQL query was performed on the E and C patient database from 9/1/11 to 11/30/11 and 9/1/10 to 11/30/10 respectively for charting events in the outpatient (OUTpt) and inpatient (INpt) ORs. The dates were chosen by the "go-live" of E and a comparable period for C. The audited items were: I/O note, vital signs in the PACU transfer note (PACU VS) and extubation note (EXTUB). Each item required different user interaction: 1) C automatically totaled I/O while E required user charting 2) PACU VS identical to C process 3) EXTUB required new process in E. I/O and PACU VS were expected in all charts. Expectation of EXTUB required OR intubation. Patients with an ICU transfer or tracheal tube in PACU nurse chart were removed. PACU VS process was changed for E in Sept. Data was collected for Oct-Nov. Data is presented as % total. Chi Square statistic was used for significance ($p \geq 0.05$).

RESULTS: Comparable volume of cases was performed in INpt and OUTpt ORs during both study periods. Charting compliance was significantly less ($p \geq 0.05$) in E for all items in all months in both areas (Tables). There was no improvement charting during the study period except in OUTpt EXTUB, difference Sept to Nov. The same staff provided care in all locations.

DISCUSSION: Training was not a factor in charting compliance since there was no improvement over time in E. Compliance was high in C suggesting recognition of these items as important. PACU VS with the same charting process had a lower compliance. This suggests that the change from a check list, protocol organized aEMR (C) to an activity organized word oriented (E) aEMR had a significant persistent negative impact on basic charting compliance.

REFERENCES: N/A

	I/O		PACU Vital Signs		Extubation	
	Centricity (N)	Epic (N)	Centricity (N)	Epic (N)	Centricity (N)	Epic (N)
Sept	100 (678)	78* (667)	XX	XX	93 (497)	73* (563)
Oct	100 (779)	78* (764)	98 (779)	87* (764)	91 (550)	73* (643)
Nov	100 (811)	79* (778)	98 (811)	90* (778)	93 (581)	76* (649)

Significant p>0.05 : *between E and C

Table 1: INpatient Charting Compliance (%)

	I/O		PACU Vital Signs		Extubation	
	Centricity (N)	EPIC (N)	Centricity (N)	EPIC (N)	Centricity (N)	EPIC (N)
Sept	100 (626)	86* (468)			98 (308)	69* (289)
Oct	100 (678)	89* (524)	100 (678)	88* (524)	100 (342)	71* (350)
Nov	100 (654)	84* (555)	100 (654)	85* (555)	99 (350)	75* (346)

Significant p>0.05 : *between E and C; ^ Sept to Nov E EXTUB

Table 2: OUTpatient Charting Compliance (%)

S-214.

LARYNGEAL MORBIDITY AFTER INTUBATION WITH ENDOFLEX® TUBE VERSUS A CONVENTIONAL ENDOTRACHEALTUBE WITH STYLET - A RANDOMIZED TRIAL

AUTHORS: M. K. Sørensen[1], N. Rasmussen[2], M. S. Kristensen[1], L. S. Rasmussen[1]

AFFILIATION: [1]Department of Anaesthesia, Centre of Head and Orthopaedics, Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark; [2]Department of Otorhinolaryngology, Centre of Head and Orthopaedics, Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark

INTRODUCTION: Airway injury may occur in connection with airway management, especially tracheal intubation. This trial was designed to assess laryngeal morbidity evaluated as hoarseness, vocal fold injury, and abnormal voice analysis variables in a comparison of the Endoflex® tube with a conventional endotracheal tube with stylet. Our hypothesis was that use of the Endoflex® tube would result in a lower incidence of hoarseness at 24 hours after extubation.

METHODS: This prospective and patient and observer-blinded randomized trial was approved by the regional ethics committee and registered at ClinicalTrials.gov (ID: NCT00953433). The study included 130 elective surgical patients scheduled for general anesthesia with endotracheal intubation. Preoperative assessment of hoarseness, vocal fold pathology with a flexible videolaryngoscope, and voice analysis variables with Multi Dimensional Voice Program (MDVP) was performed. Induction of anesthesia was done using propofol, remifentanil and a non-depolarizing neuromuscular blocking agent. After complete neuromuscular paralysis intubation was performed with either an Endoflex® tube or a conventional endotracheal tube with stylet by one of four consultants skilled in airway management. Hoarseness was assessed at 24 hours after extubation. A postoperative evaluation of vocal fold injury and of voice analysis variables was performed 12-24 hours after extubation.

RESULTS: Postoperative hoarseness was found in 47% after intubation with the Endoflex® tube and in 57% after intubation with a conventional tube with stylet (P=0.24). After exclusion of patients who also had preoperative hoarseness, postoperative hoarseness was found in 40% in the Endoflex® tube-group and 54% in the conventional endotracheal tube with stylet group (P=0.14). Abnormal voice analysis variables were present postoperatively in 38% in the Endoflex® tube group and in 39% in the group allocated to endotracheal tube with stylet (P=0.96). Postoperative vocal fold injury was present in 23% in the Endoflex® tube group and in 36% in the endotracheal tube with stylet group (P=0.13). Intubation conditions were not significantly different.

DISCUSSION: In conclusion, no significant differences in the frequency of hoarseness or other endpoints of laryngeal morbidity were found after tracheal intubation using either an Endoflex® tube or a conventional endotracheal tube with stylet.

REFERENCES: None

New videolaryngoscopic identified vocal fold injuries and abnormal voice variables measured with Multi Dimensional Voice Program in the total population. Patients with both preoperative and postoperative pathology have been excluded.

	Endoflex® tube (n=59)	**Coventional endotracheal tube with stylet (n=61)**
Unilateralt	4	7
Bilateralt	1	2
Thickening of the vocal folds	0	2
Edema	2	6
Erythema	2	1
Hematoma	1	0
Abnormal voice variables	8	4

S-215.

GO WITH THE FLOW: A TWO-WEEK LOW FLOW AND CLOSED CIRCUIT ANESTHESIA ELECTIVE FOR PEDIATRIC ANESTHESIA CLINICAL FELLOWS: EXPERIENCE OF THE FIRST TWO YEARS

AUTHORS: A. Navedo[1,2], C. D. McClain[1,2], C. Sullivan[1], R. S. Holzman[1,2]

AFFILIATION: [1]Department of Anesthesiology, Perioperative and Pain Medicine, Children's Hospital Boston, Boston, MA; [2] Harvard Medical School, Boston, MA

INTRODUCTION: The techniques of low flow and closed circuit anesthesia (LF/CC) provide patients with the amounts of oxygen and anesthetic gases that match the patient's metabolic and clinical needs. Using LF/CC, the anesthesiologist can measure and follow the patient's oxygen consumption and cardiac index without the need for sophisticated or invasive techniques. Furthermore, heat loss is minimized as is loss of airway humidification. In addition, LF/CC allows the clinician to avoid the waste of resources, minimizing environmental contamination by halogenated anesthetics and greenhouse gases such as nitrous oxide.

The authors developed this 10-day course that introduces participants to the foundational science and clinical practice of LF/CC anesthesia. In addition, the last two days serve to focus on the participants' instruction of LF/CC concepts to junior trainees while receiving focused mentoring on teaching skills.

The purpose of this poster is to illustrate the scope of this course.

METHODS: A formal program evaluation was initiated including a review of the two-year experience of program activities. This involved a chart review that resulted in a description of program activities to date. An anonymous record audit will examine the prevalence of LF/CC technique implementation by participants subsequent to their rotation and patient outcomes with regard to perioperative hypothermia. Finally, the cost and environmental impact of practicing LF/CC techniques will be examined.

CHALLENGING CASE REPORT: N/A

RESULTS: Twenty-five pediatric anesthesiology clinical fellows have participated in this elective over two years and have administered 376 anesthetics. One case had missing data and two cases were cancelled, leaving 373 for analysis. Both vaporizer and liquid injection techniques were utilized; injection was used in 34 cases (9.1%) by 13/25 fellows (52%). For 14/25 fellows (56%) a teaching experience was provided.

DISCUSSION: This elective has become the most popular for pediatric anesthesia fellows. Feedback has been enthusiastic for being able to estimate CO2 production, soda lime consumption, cost, free water requirements, and a hands-on way to study Severinghaus square root of time model and the basics of allometric scaling.

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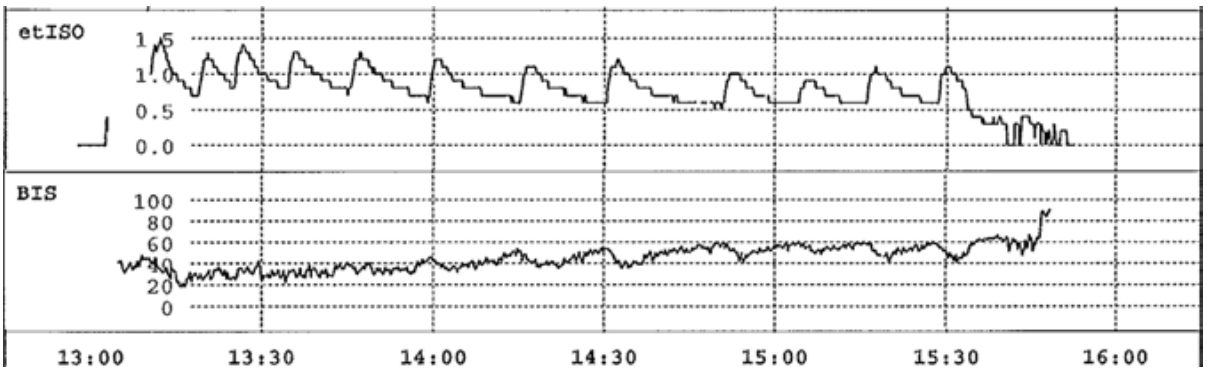
Fellow's Experience

Used LF/CC	25/25 (100%)
Teaching Experience	14/25 (56%)
Injection Technique	13/25 (52%)

Increased oxygen consumption detected upon establishing closed circuit.



Injection technique with isoflurane: BIS correlation.

S-216.

COMBINED TRAINING OF TECHNICAL AND NONTECHNICAL SKILLS FOR AIRWAY MANAGEMENT IN THE ICU

AUTHORS: B. Grande[1], M. Kolbe[2], M. Weiss[2], G. Grote[2], D. R. Spahn[1,3], P. Steiger[3]

AFFILIATION: [1]Institute of Anesthesiology, University Hospital Zurich, Zurich, Switzerland; [2]Management, Technology, and Economics, ETH Zurich, Zurich, Switzerland; [3]Surgical Intensive Care, University Hospital Zurich, Zurich, Switzerland

INTRODUCTION: Airway management is a rare but high-risk task in Intensive Care Units. As intensive care specialists only rarely encounter airway emergencies, acquisition and maintenance of the respective task- and teamwork skills on the job is difficult. Therefore, we suggest that technical as well as nontechnical aspects (i.e., teamwork) should be integrated in simulation-based technical mannequin training in airway management.[1] This will allow for learning, practicing, and reflecting on concrete behaviors based on models for good taskwork and teamwork. In particular, we propose that more emphasis should be laid on interactions between intensive care specialists.[2] As during stressful events teamwork is likely to break down, we suggest that during airway management training, coordination within the team should be addressed in detail.[3] In doing so, airway management is likely to be more efficient, miscommunication may be avoided and iatrogenic harm can be prevented.

METHODS: Inspired by the institutional 'Difficult Intubation Drill', the continuous technical airway management training of the Department of Anesthesia of the University Hospital Zurich (USZ), Switzerland, we designed a modular airway management course for the surgical intensive care unit (CIM). The CIM at the USZ consists of three intensive care units with a total of 28 breathing spaces. 37 medical staff members are trained to manage difficult airways. This training consists of three steps: (1) technical training of airway management on a phantom head, (2) technical training of the difficult airway using high-fidelity simulation environment with additional introduction of nontechnical skills (SimMan, Laerdal), and (3) combined technical and nontechnical training of airway management during critical situations again using high-fidelity simulation.

RESULTS: We will present the evaluation results of how each step has led to improved technical as well as nontechnical airway management results.

DISCUSSION: Conclusions are presented referring to how the combined training of technical and nontechnical skills has enhanced learning of how various technical and nontechnical actions depend on and influence each other.

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S-217.

COMPARISON OF RESPONSES AT EMERGENCE TO RESPONSES IN THE PACU IN PATIENTS WHO SPEAK ENGLISH AS A SECOND LANGUAGE

AUTHORS: D. Levine, R. Bhansali, B. Dauber, T. Tarsha, D. Glick

AFFILIATION: Anesthesia and Critical Care, University of Chicago, Chicago, IL

INTRODUCTION: Responsiveness is often used to determine whether a patient is ready for extubation following a general anesthetic, but little is known about the difference in English comprehension of non-native English-speakers between conscious states and semi-conscious states (as seen at emergence). The purpose of this study is to determine if there is a difference in the ability to follow commands in English in these two states.

METHODS: After obtaining IRB approval and informed consent 55 adult non-native English-speaking patients and their families were enrolled in the study. Prior to surgery, each patient was questioned about his/her language development and proficiency in English vs. their native language using an ascending scale from 1 to 10. A family member recorded three commands in both languages using a laptop computer: "open your eyes," "squeeze my fingers," and "wiggle your toes." These were then played back in timed intervals through wireless headphones upon emergence from general anesthesia. Data were recorded for which language a patient responded to first in the operating room as well as their response frequencies. The commands also were played back to the patients in the PACU to compare conscious vs. semi-conscious understanding of the commands.

RESULTS: Patients' response patterns to verbal commands in the operating room and the recovery room are summarized in Table 1. Strikingly, 37/55 (68%) of the patients responded better to their native language in the OR. In contrast, only 8/55 (16%) showed a native advantage in the PACU. Further, twenty-eight (51%) of the 55 participants responded better to native language commands at emergence, but equally well to both languages in the PACU. Eight patients (15%) responded better to the native language in the OR and in the PACU. Seventeen (31%) of the patients responded equally well to English and the native language in both the OR and the PACU.

DISCUSSION: These results suggest that the majority of patients for whom English is not the first language may respond to English commands normally when they are fully conscious, but may not respond as readily to English commands as to commands in their native language when they are emerging from general anesthesia. Further work is necessary to determine which characteristics define the patients that will benefit from language-based modifications at emergence and which patients do not require special arrangements at emergence.

REFERENCES: N/A

S-218.

AN ANESTHESIA CRITERION-REFERENCED ASSESSMENT TOOL STRATIFYING LEARNERS BY SKILL LEVEL

AUTHORS: W. K. Bernstein[1], D. Schreibman[1], Y. Zhu[3], S. Carter Chase[2], I. M. George[2,3]

AFFILIATION: [1]Anesthesiology, University of Maryland, Baltimore, MD; [2]MASTRI Center, University of Maryland, Baltimore, MD; [3]Surgery, University of Maryland, Baltimore, MD

INTRODUCTION: Anesthesiology residency is impacted by duty hour restrictions. We have been engaged in development and deployment of multidisciplinary simulated learning experiences involving various learners. The decision to use ultrarealistic events have led to insights regarding team function, coordination, communication gaps and clinical aptitude (in a high stress, low stakes environment). Further, recorded metrics suggest these events can be refined and used in the training of other healthcare providers, and the evaluation of individual or team performance. These simulated clinical learning exercises have generated numerous performance metrics and expert observer data. Preliminary review suggests a relationship between performance and skill level or year of training.

METHODS:

1. Review data from past simulation events- documented expert observer notes, feedback, and captured media. (IRB compliant manner)
2. Apply statistical analysis
3. Refine instruments used for acquiring metrics
4. Develop and submit IRB protocol for prospective longitudinal study of Anesthesiology resident performance
5. Deploy instrument

RESULTS: Preliminary data appeared to NOT show correlation between simulation performance and relative skill level. CA-3 showed highest performance rating, with CA-1s next. Further investigation and comparison of aggregate class performance vs aggregate class in-training exams showed average board scores as 26.3 for CA-1, 23.6 for CA-2, and 28.8 for CA-3, which strongly correlated with our findings.

DISCUSSION: Anesthesia residents need to master clinical knowledge and technical skills in a limited amount of time. Use of an advanced Simulation Center (MASTRI) comprised of reworked former ORs, High fidelity manikins and debriefing methods creates a realistic and believable environment, instilling similar thought processes and emotions that residents encounter in a true operative setting. In our scenarios, residents have the ability to interact with the simulated patient and environment much as they would in the real world. Further investigation is planned with psychometric analysis to improve team dynamics and decision-making processes. We propose to next study if the validated tool can show or predict transfer of skills to the live OR.

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S-219.

THE IMPACT OF SELF-ASSESSED LANGUAGE SKILLS AS A PREDICTOR OF LANGUAGE PREFERENCE UPON EMERGENCE

AUTHORS: B. Dauber, J. Yin, D. Glick

AFFILIATION: Anesthesia and Critical Care, University of Chicago, Chicago, IL

INTRODUCTION: When emerging from anesthesia, one must be able to judge a patient's level of awareness by responses to verbal commands in order to determine the timing of extubation. However, when a patient and anesthesiologist do not speak the same language, it may be impossible for the patient to respond to verbal commands. In addition, many English-proficient patients learn English as a second language and may respond more quickly to their native language. This may be because second languages are stored in external memory systems and pharmacologic alterations of consciousness (i.e., anesthetics) cause a loss of the ability to use these specialized, external memory systems [1, 2]. The goal of this study was to determine which patients would benefit the most from a computer assisted language intervention upon emergence.

METHODS: After obtaining IRB approval and informed consent, 96 adult patients who spoke English as a second language were enrolled. With a laptop computer, three commands were recorded in English and in the native language from a family member of each patient: "open your eyes", "squeeze my fingers", and "wiggle your toes". Additionally, each patient was asked to assess their English and foreign language understanding skills on an ascending scale of 1-10. During emergence from general anesthesia, the English and foreign language commands were played in alternation, pausing to allow for a response. Statistical analysis was performed using a multinomial logit (MNL) model using STATA 11 SE.

RESULTS: There were a total of 239 responses given for the three commands. 61.1% of the responses came only to the foreign language, 32.6% of the responses came to both English and the foreign language at the same time, and 6% of the responses came to English only. The mean self-assessed English understanding skills were rated at 7.0 (±3.0). The mean foreign language understanding skills were rated at 9.7 (±0.9). We defined the "fluency gap index" as the difference between self-assessed foreign language skills and self-assessed English skills, and it showed significant predictive value for whether the patient responded to the foreign language only or to both the foreign language and English upon emergence (Table 1).

DISCUSSION: We found a statistically significant relationship between self-assessed language ability and patient responses to commands upon emergence. These results emphasize the importance of considering the special needs of those who speak English as a second language as they emerge from anesthesia, especially when the "fluency gap index" is large.

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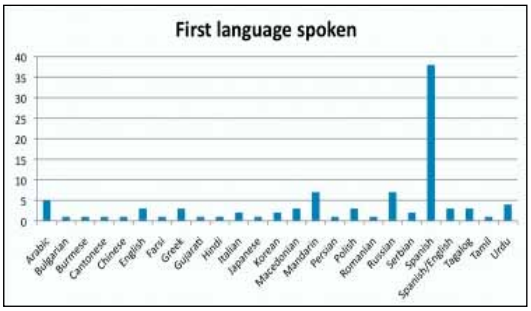

S-220.

COMPARING OF ACROMIOAXILLOSUPRASTERNAL NOTCH INDEX(A NEW TEST)WITH MODIFIED MALLAMPATI TEST IN PREDICTING DIFFICULT LARYNGOSCOPIC VIEW

AUTHORS: A. R. Jafari, M. R. Kamranmanesh, H. Aghamohammadi, B. Gharaei, M. Poorzamani, A. H. Kashi

AFFILIATION: Tehran, Islamic Republic of Iran

INTRODUCTION: We aimed to compare the efficacy of a new bedside screening test named Acromio Axillo Suprasternal notch index (AASI) with modified Mallampati (MMP) for predicting difficult laryngoscopic view.

METHODS: Three hundred adult patients, who were candidates for tracheal intubation under elective surgery, were enrolled in this prospective double blinded study. Preoperative airway assessments were carried out with AASI and MMP. The new AASI test is calculated as following measurement: 1) Using a ruler a line is drawn vertically from the top of the acromion process to the superior border of the axilla at the pectoralis major muscle, line A; 2) A second line is drawn perpendicular to line A from the suprasternal notch (line B); and 3) That portion of line A that lies above where line B bisects line A is line C. AASI is calculated from the length of line C divided by line A(AASI= C/A) After induction of anaesthesia, laryngeal view according to the Cormack- Lehane grading system was recorded. Receiver operating characteristic (ROC) curve analysis was employed to compare AASI with MMP.

RESULTS: Difficult visualization of larynx (DVL, Cormack-Lehane III & IV) was observed in 19 (6.3%)of patients. The best cut off point for DVL was defined at AASI≤0.49 cm. AASI had a lower false negative and higher predictive values(sensitivity, positive predictive value and accuracy had significant and specificity and negative predictive value had insignificant difference) compare with MMP

DISCUSSION: AASI was associated with higher predictive values than MMP and could be a useful bedside test for estimation of DVL

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S-221.

CROSS-CONTAMINATION OF REUSABLE ANESTHESIA EQUIPMENT IN THE OPERATING ROOM

AUTHORS: B. Samyn, B. Saumande, B. Lebas, V. Garcia, L. Belotti, P. Diemunsch

AFFILIATION: Strasbourg, France

INTRODUCTION: In the operating room (OR), one of the common sources of cross-contamination between patients and caregivers is reusable equipment such as electrocardiogram (ECG) cables and pulse oxymeter. The aim of this observational trial was to evaluate the microbiological contamination of ECG cables and pulse oxymeters used in the ORs of a university hospital. Also, this study attempted to verify the efficacy of our institutional decontamination protocol.

METHODS: A trained practitioner randomly took 96 sets of swab samples from ECG cables, and 46 from pulse oxymeters in 15 ORs after the decontamination was performed but just before their use for the next patient. Each set consisted of 2 swabs one for bacteriological and one other for mycological examination. The OR staff were not aware of the study so as not to interfere with the routine decontamination protocol used in the OR.

RESULTS: Table shows the results of the 142 sets of samples, with the identified pathogenic germs. No resistant pathogen was identified.

DISCUSSION: The results of this study suggest that the risks of cross-transmission of pathogens through reusable equipment are significant. We observed microorganisms, including MSSA, Enterococcus faecalis and Corynebacterium in 52% of the devices examined. This suggests a need for improved decontamination protocol particularly regular audit of the process. In addition, it may be appropriate to use single-use equipment particularly in contagious patients as well as in immunocompromised patients.

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	Pulse oxymeter	ECG cables
Number of swabs performed, n	46	96
Negative swabs culture, n [%]	15 [33]	46 [48]
Positive swabs culture, n [%]	31 [67]	50 [52]
Positive swabs finfing at least 1 non pathogenic microorganism, witout potentially pathogenic microorganism; n [%]	27 [58]	45 [47]
Positive swabs finding at least 1 pathogenic microorganism, with or without non pathogenic microorganism ; n [%]	4 [9]	5 [5]
Staphylococcus aureus, n	2	1
Enterococcus faecalis, n	1	_
Aspergillus fumigatus, n	_	1
Staphylococcus aureus + Enterococcus faecalis, n	1	1
Corynebacterium, n	_	2

S-222.

KIDNEY INJURY AFTER PERCUTANEOUS AND SURGICAL AORTIC VALVE REPLACEMENT

AUTHORS: E. Crawford, L. Hoke, J. May, A. Blevins, R. Calicott, Y. F. Bryan

AFFILIATION: Anesthesiology, Wake Forest School of Medicine, Winston-Salem, NC

INTRODUCTION: Evaluation of new airway devices for airway management is essential to study the effectiveness of new products and for comparison to existing devices. The FDA's Center for Devices and Radiological Health is responsible for the approval and safety of medical devices[1]. Upon airway device approval, manufacturer recommendations regarding device use may be uncertain[2]. After extensive testing in manikins, results may be different than in patients[3]. New devices must be evaluated for nuances, design flaws, and any unknown hidden dangers[4] . We present an alternative process in the evaluation of new airway devices prior to use in patients.

METHODS: Upon the decision to evaluate a specific airway device, the manufacturer or distributor was contacted. Brochures, peer-reviewed publications, and airway device samples were requested. Permission to evaluate airway devices in patients was sought from the Surgical Services Product Evaluation Committee (SSPEC) ensuring that devices were FDA-approved. Prior to committee approval, airway device evaluation began under the directive of an anesthesiologist using manikins in the Center for Applied Learning. The device representative inserviced anesthesia technicians and clinicians regarding sterile processing, handling and proper use and function. After device approval by the SSPEC, anesthesiologists evaluated the specific devices and determined patient selection (fig 1).

RESULTS: The airway device evaluation process described was used to evaluate video laryngoscopes (Truview Evo©), fiberoptic bronchoscopes (Olympus© Airway Mobilscope), and intubating airways (Berman©, VBM©, Williams©). All of these devices were deemed suitable for evaluation in patients after SSPEC approval in summer 2011. Devices not approved for use by the SSPEC or deemed not evaluable by the anesthesiologists were not used in patients.

DISCUSSION: This alternative process of evaluating new airway devices was effective. Manikins have been used to supplement device evaluation "on the bench" prior to pilot studies and randomized controlled trials (4,5). A streamlined device evaluation process assists health care providers in deciding which products to purchase, reject, or study further. More importantly, an unbiased evaluation of airway devices is critical to discern which patient subpopulations benefit most from the proliferation of airway devices currently on the market. Further research is required regarding the development of impartial airway device evaluation processes.

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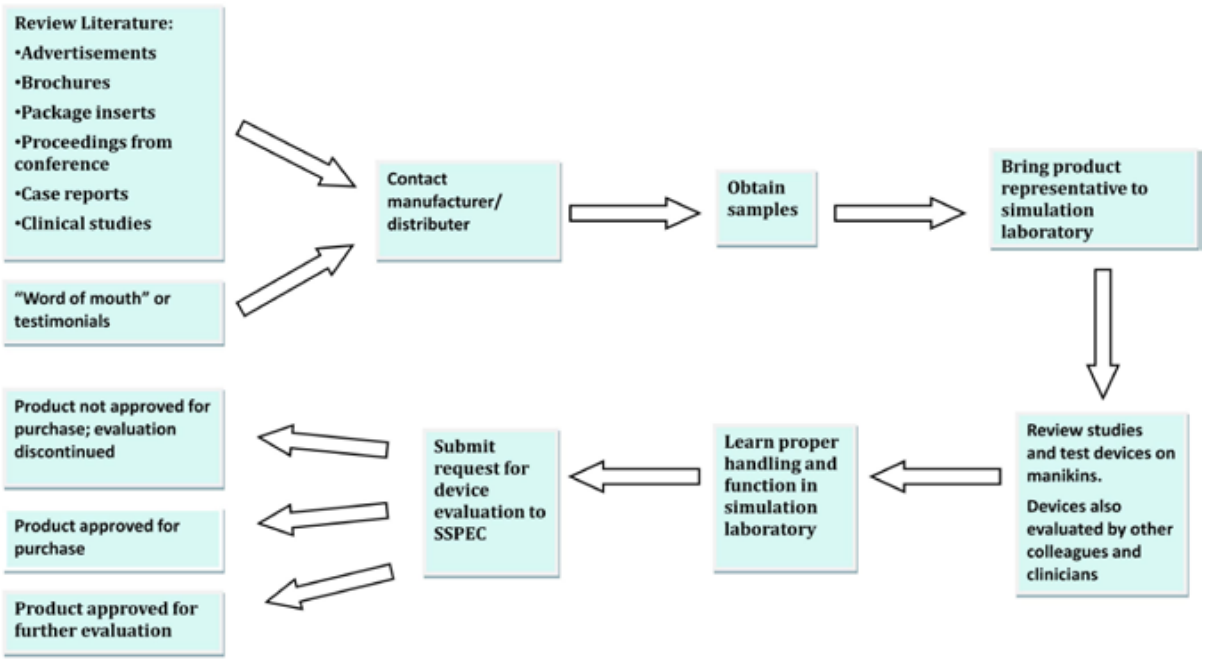
Figure 1. Airway device evaluation process



S-223.

VARIOUS OPERATING ROOM DEVICES PRODUCE EXCESSIVE NOISE THAT MAY INCREASE STAFF STRESS AND IMPAIR EFFECTIVE COMMUNICATION

AUTHORS: J. P. Anderson, M. J. Sharpe, S. McNulty

AFFILIATION: Philadelphia, PA

INTRODUCTION: Noise results in stress response by the hypothalamic-pituitary adrenal axis which contributes to sleep deprivation, provider fatigue and impairs effective communication. The physiological stress response is sensitive to noise levels as low as 65 dB(A). The Environmental Protection Agency has recommended noise not exceed 45 dB(A) in hospitals. Noise in the intensive care, operating room and emergency department settings has been established to be above this desired level. This study seeks to quantify the noise levels produced by devices commonly used by anesthesia personnel in the operating room.

METHODS: A Extech Digital Datalogging Model HD600 sound meter was placed 10 cm from noise producing equipment that was encountered in use in different operating rooms. Noise producing equipment evaluated was classified as either suction equipment, patient monitoring equipment, or music radio. Acoustic data were acquired once per second for one minute and stored in an MS-Excel spreadsheet. Average noise level, as well minimum, maximum, and 95% confidence levels were calculated for each type of device.

RESULTS: 72 total noise measurements were taken in 25 different operating rooms. The average noise level for all measurements was 73.07 dB(A) (95%CI: 72.40-73.73 dB(A), average maximum: 77.83 dB(A)). 48 different suction device measurements were obtained and the average noise produced by these devices was 71.53 dB(A) (95%CI: 71.26-71.79 dB(A), average maximum: 74.42 dB(A)). 23 different patient monitoring device alarm measurements were obtained and the average noise produced by these devices was 76.01 dB(A) (95%CI: 74.52-77.50 dB(A), average maximum: 84.61 dB(A)). One music radio was measured and its associated noise was 79.22 dB(A) (95%CI: 78.62-79.82 dB(A), average maximum: 85.8 dB(A)).

DISCUSSION: Common devices used by anesthesia personnel in operating rooms create noise that is above standard accepted levels and may be contributing to increased patient and healthcare provider stress and medical errors. Increased staff awareness and sensitivity regarding the leading causes of noise in the operating room may allow for reduced levels of noise pollution

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S-224.

SURGERY AT THE END OF LIFE: A PRE-PROCEDURE PERSPECTIVE

AUTHORS: C. S. Barnet[1], A. F. Arriaga[2,3], D. L. Hepner[1], D. J. Correll[1], A. A. Gawande[3,4], A. M. Bader[1,3]

AFFILIATION: [1]Anesthesiology, Perioperative, and Pain Medicine, Brigham and Women's Hospital, Boston, MA; [2]Center for Surgery and Public Health, Brigham and Women's Hospital, Boston, MA; [3]Health Policy and Management, Harvard School of Public Health, Boston, MA; 4Surgery, Brigham and Women's Hospital, Boston, MA

INTRODUCTION: Over one quarter of medical costs for Medicare beneficiaries are incurred during the last year of life[1]. Surgical intensity during this time is also significant. The rate of surgical intervention has been shown to vary with patient age and geographical region[2]. Existing studies fail to fully characterize the types of procedures patients undergo in the last year of life and we know of no study that includes patients from non-Medicare payers. This study was undertaken to better understand the types of patients evaluated in the preoperative clinic who died within 1 year of their procedure.

METHODS: We studied 747 consecutive patients seen at the preoperative assessment center of a tertiary care hospital during a one month time period. All patients were scheduled for outpatient or same day admission surgery, interventional or diagnostic procedures. Demographic data were obtained from our patient tracking system and the hospital's longitudinal medical record (LMR). Surgical indication (palliative, curative, diagnostic, elective) was assessed based on the procedure performed and underlying diagnosis (see Figure). Patients were assessed as alive or dead using the LMR with confirmation via the social security national death master file. Descriptive statistics were performed to compare the characteristics of those that died (within one year of their procedure) to the rest of the patient sample.

RESULTS: Of 747 consecutive patients, there were 37 patients confirmed dead within 365 days of surgery (5%). Average time to death was 200+/-108 days. Twenty seven percent of these patients had undergone palliative procedures, 30% diagnostic, 38% curative, and 5% elective procedures (see Table). Thirty percent had undergone low risk, 65% intermediate risk, and 5% high risk surgical interventions. Only 54% of those who died had advanced directives on the date of operation. When comparing decedents to survivors, those who died within a year of surgery were older (mean age 68.4 years vs. 59.2 years, p=0.0002) and were more likely to have undergone a palliative (27% vs. 3%) or diagnostic (30% vs. 14%) procedure (p<0.0001).

DISCUSSION: Nearly 1 in 20 patients seen in this tertiary care preoperative assessment center died within one year of the date of their procedure. Over 70% underwent non-palliative procedures. Of those patients who died, nearly half did not have a health care proxy or living will by the date of surgical intervention. These data underscore the importance of pre-operative planning and preparedness, including adequate discussions of procedure risks and benefits at the time of surgical decision making.

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Figure: Definitions of Surgical Indications with Examples

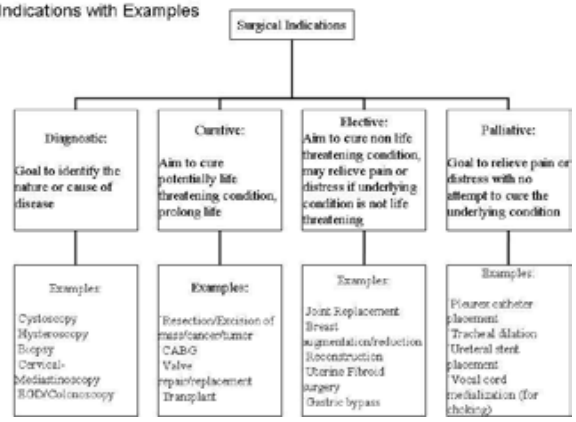

Table: Patient Characteristics by Vital Status

	Survivors	Decedents	P*
N	701 (95%)	37 (5%)	
Age (mean +/- SD)	59.2 +/- 14.5	68.4 +/- 11.7	0.0002
Sex [N(%)] Male Female	219 (31.2%) 482 (68.7%)	19 (51.4%) 18 (48.7%)	0.018
Surgical Risk [N(%)] Low Intermediate High	190 (27.1%) 468 (66.8%) 43 (6.1%)	11 (29.7%) 24 (64.9%) 2 (5.4%)	0.918
Surgical Procedure Type (top 5 procedure types, by percentage, are shown)	Gynecologic 18% General 15.8% Orthopedic 14.1% Thoracic 9.1% Urologic 9%	Thoracic 48.7% Urologic 13.5% Oncologic 10.8% Otolaryngologic 10.8% Neurosurgical 5.4% General 5.4%	<0.0001
Indication [N(%)] Diagnostic Curative Elective Palliative	99 (14.1%) 281 (40.1%) 297 (42.4%) 24 (3.4%)	11 (29.7%) 14 (37.8%) 2 (5.4%) 10 (27%)	<0.0001

* p-values comparing decedents to survivors. All p-values are 2-sided. T-tests were used to compare means, and Fisher's exact tests were used to compare the binary and categorical data

S-225.

OBESITY'S EFFECT ON JOINT REPLACEMENT: A RETROSPECTIVE REVIEW OF EARLY POST-OPERATIVE COMPLICATIONS

AUTHORS: W. Lee, L. Boone, J. Widyn, S. Nair, E. Delphin

AFFILIATION: Anesthesiology, Albert Einstein College of Medicine & Montefiore Medical Center, Bronx, NY

INTRODUCTION: While obesity has been linked to diabetes, hypertension, dyslipidemia, and longer hospital stays, its impact on adverse outcomes after total hip replacement has been debated[1,2]. A retrospective, single-center study was conducted to evaluate this relationship.

METHODS: Clinical Looking Glass (CLG), a hospital-based database was queried for patients with an adverse event within 30 days after total hip replacement. A chart review of identified patients was conducted. Exclusion criteria were patients with major or bilateral joint replacement or revision surgery, or history of hypercoagulability. Univariate analyses were conducted for comparison of baseline characteristics. Odds ratios were calculated for each stratified BMI group and also calculated as obese versus non-obese. Subsequent to data collection, patients were stratified by BMI. Adverse events were defined as deep vein thrombosis, pulmonary embolism, joint or surgical site infection, joint dislocation, fracture, or death.

RESULTS: Initial evaluation identified 308 patients, Four were excluded for incomplete records, One for past medical history. Twelve of the remaining 303 patients had a complication of interest without prior history. After stratification by BMI, prevalence of adverse outcomes was reviewed, see Table. When grouped as non-obese versus obese, there was a non-significant increase in the risk an adverse event for a non-obese patient (OR 3.15, CI 0.99-10.10).

DISCUSSION: From our data we observe that obesity confers no effect on 30-day complication rates. While there are multiple studies that link obesity to long-term complication rates, a direct relationship between short-term and perioperative adverse outcomes and obesity is not apparent.[3] The limitations of this study may include selection bias; subjects were identified indirectly, via ICD-9 codes using CLG software. Additionally, adverse events could have been under reported. And finally, there is a potential for intervention bias: obese patients may have received special care. Despite these limitations this study is highlights the need for a larger, nationwide cohort study to further elucidate the relationship between obesity and joint replacement surgeries.

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Characteristics	NON-Obese BMI			Obese BMI			Total
	< 18.5	18.5-25	25-30	30-35	35-40	< 40	
Adverse Events	1	5	2	2	2	0	12
Patients	11	65	83	94	33	17	303
Adverse Event Rate Per 100 Patients	9.1	7.7	2.4	2.1	6.1	0	4

S-226.

HANDWASHING COMPLIANCE MAY BE LOWER THAN PREVIOUSLY REPORTED: A VIDEO OBSERVATION STUDY

AUTHORS: J. P. Rowlands, R. W. Loftus, H. M. Patel

AFFILIATION: Department of Anesthesiology, Dartmouth-Hitchcock Medical Center, Lebanon, NH

INTRODUCTION: Health care acquired infections (HCAIs) affect 10% of hospitalized patients.[1] The incidence of HCAIs is partially explained by suboptimal hand hygiene compliance. Novel hand hygiene systems have been shown to reduce 30-day postoperative infections.[2,3] A limitation of this prior work is reliance on hourly hand hygiene decontamination events (HDEs) as a marker for hand hygiene compliance as opposed to opportunity-based hand hygiene compliance as recommended by the World Health Organization (WHO) guidelines. The primary aim of the current study was to ascertain intraoperative, opportunity based hand hygiene compliance.

METHODS: Video observation was utilized to evaluate opportunity based hand hygiene compliance in five randomly selected operating rooms at a large, academic medical center. Surgical cases were videotaped using a small video camera mounted inconspicuously on the wall behind the anesthesia work area. The videotapes were reviewed and coded for overall hourly hand washing compliance based on WHO criteria including before patient contact, before an aseptic task, after body fluid exposure risk (and glove removal), after patient contact, and after contact with the immediate patient surroundings. In addition, hand hygiene compliance was measured throughout 20 minute time periods in order to assess the evolution of compliance throughout phases of the administration of general anesthesia according to usual practice.

RESULTS: There were 323 (± SD 45.3) opportunities for hand hygiene per hour of anesthesia time. Most opportunities occurred at case start or after contact with the immediate patient surroundings. Overall hand hygiene compliance was 2.9% (± SD 2.7%), ranging from 1.8% during the first 20 minutes of the case to 5% during the subsequent 20 minutes (Table 1.) Anesthesia providers were most likely to follow WHO guidelines pertaining to hand decontamination following a potential body fluid exposure and least likely to follow recommendations pertaining to hand decontamination prior to patient contact (Table 2.)

DISCUSSION: These findings suggest that intraoperative hand hygiene compliance of anesthesia providers as measured by WHO guidelines is suboptimal. These results are consistent with prior assessments of hand hygiene compliance based on HDEs. Novel hand hygiene systems designed to facilitate intraoperative hand hygiene compliance are indicated in order to address the exceedingly high number of hourly hand hygiene opportunities that occur during the complex practice of general anesthesia.

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S-227.

FOR NON-ENGLISH SPEAKING PATIENTS IMPROVED COMMUNICATION LEADS TO GREATER SATISFACTION

AUTHORS: J. Yin[2], B. Dauber[1], D. Glick[1]

AFFILIATION: [1]Anesthesia and Critical Care, University of Chicago, Chicago, IL; [2]University of Illinois, Chicago, Chicago, IL

INTRODUCTION: As patients awaken from general anesthetics, they may experience periods of confusion and disorientation. This disorientation may be particularly difficult for patients who do not speak English or for whom English is a second language. In general, health care organizations that provide more personal care have been associated with higher levels of patient satisfaction[1]. This study assesses the impact that the use of translated commands has on patient satisfaction.

METHODS: Patients for whom English is not their first language were identified and enrolled for this IRB approved study after obtaining informed consent. Each patient was asked to assess their English and foreign language ability on an ascending scale of 1 to 10. Commands in English and in the native language were recorded from a family member for each patient and played during emergence from general anesthesia. After fully regaining consciousness, patient and family satisfaction data on an ascending scale of 1 to 10 were collected in the recovery room. Patients with a previous general anesthesia experience were asked whether their current experience was improved, stayed the same or was worse relative to their previous experience. The difference in self-assessed ratings of foreign language and English speaking ability was calculated to create a "fluency gap index." A logit model with fluency gap as a predictor was run on Stata 11 SE to determine the odds ratio of an improved anesthesia experience with the translated commands.

RESULTS: A total of 96 patients were enrolled, of which 76 patients provided a response for patient satisfaction and 68 of the patients' families provided a response for the family satisfaction survey. The mean patient satisfaction score was 9.3 (range 5-10) and the mean family satisfaction score was 9.9 (range 8-10). Of the 53 patients who compared their anesthesia experience with their prior ones, 23 (43.4%) found it to be an improvement, while 28 (53.8%) found no change, and 2 (3.8%) said the new experience was worse. The logit odds ratio for the fluency gap predictor variable was found to be 1.20 ($p=0.03$) for an improved experience versus a same/worse experience.

DISCUSSION: Patients and their family members reported very high levels of satisfaction. Each unit difference in the self-assessed fluency gap implies a 1.20 increase in odds that a patient for whom English is not the first language would find their anesthesia experience with the translated recordings an improvement over their previous non-translated experience. Thus, the poorer a patient's relative English language skills the greater the benefit of the recorded commands on patient satisfaction.

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S-228.

ASSESSING THE IMPACT OF A STRUCTURED AIRWAY SKILLS ROTATION: FROM RESIDENT CLINICAL EXPERIENCE TO FACULTY OPINION

AUTHORS: R. G. Wagner, W. A. Weigel

AFFILIATION: Anesthesiology, Virginia Mason Medical Center, Seattle, WA

INTRODUCTION: In 2007, an Airway Skills Rotation (AWR) was started at our residency program. The purpose of the AWR is to improve residents' airway skills, with a minimum number of airway techniques (AWTs) required during CA1 year (Table 1). All residents must perform the required AWTs, pass AWT OSCEs, and pass a written exam focused on airway management. We propose that the AWR improves residents' skills with advanced AWTs.

METHODS: Case log data was obtained and analyzed (2007-present) for Fastrachs (FT), fiberoptic (FOB) and video laryngoscopy (VL). To further evaluate the perceived efficacy of the AWR, we surveyed the first two classes to complete the AWR (2010-11). The survey was designed to obtain objective data and opinions regarding the structure of the AWR. Additionally, we surveyed faculty members about their perception of the AWR.

RESULTS: Prior to the AWR, only FOBs were logged by residents. Figure 1 shows the average number of FOBs performed by residents between 2007-11. Classes of 2010 and 2011 were required to perform FTs, yet there was no significant change in the average number of FOBs between classes. To assess trends of AWTs performed, case log data for the class of 2011 were analyzed (Figure 2). For this class, 15 FTs and 20 FOBs were required as a CA1. The average number of FOBs during CA1, CA2, and CA3 years was 24, 14, and 17, respectively. The average number of FTs during CA1, CA2, and CA3 years was 17, 2, and 1, respectively. The average number of VLs during CA2 and CA3 years were 6 and 8, respectively (VL was unavailable prior to CA2 year). Faculty were surveyed regarding their comfort level while supervising AWTs. For faculty who had been at our institution before 2007, our goal was to assess changes in comfort level since that time (Figure 3). The majority of faculty reported an increased comfort level. The Class of 2011 was also surveyed about comfort levels with AWTs and whether they felt the minimum requirements were sufficient to gain proficiency. Overall, residents felt comfortable performing FOB, VL, and FT intubations (Figure 4). One notable finding is that most residents believed they would have benefited from more FT experience, especially during CA2 and CA3 years.

DISCUSSION: Our findings suggest that residents are capable of learning multiple AWTs simultaneously, and will seek out techniques they find effective (exemplified by use of VL). FT use decreases significantly after the AWR, which supports that most residents will not independently seek training for more complicated AWTs. The positive feedback from faculty and residents regarding the AWR supports that it raises comfort levels and improves skills with advanced AWTs.

REFERENCES: None

Table 1: Airway Rotation Requirements

Class	Residents in Class	Year as CA1	Fiberoptics	Fastrachs	Video Laryngoscopes
2010 Class	8	2007	15	5	Not Available
2011 Class	8	2008	20	15	Not Available
2012 Class	7	2009	15	20	No Requirement
2013 Class	8	2010	15	20	5
2014 Class	9	2011	15	20	5

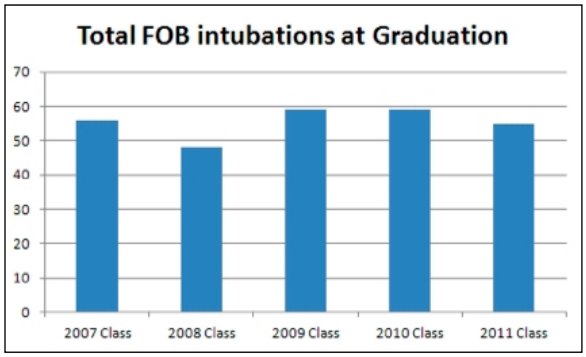

Figure 1: Average number of Fiberoptic Intubations (FOBs) performed by residents from graduating classes of 2007-2011.

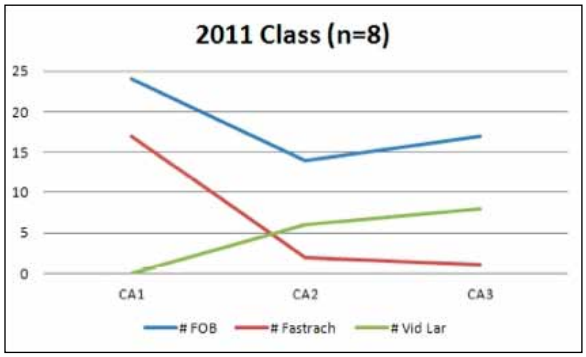

Figure 2: Average number of advanced airway procedures performed by residents of graduating class of 2011.

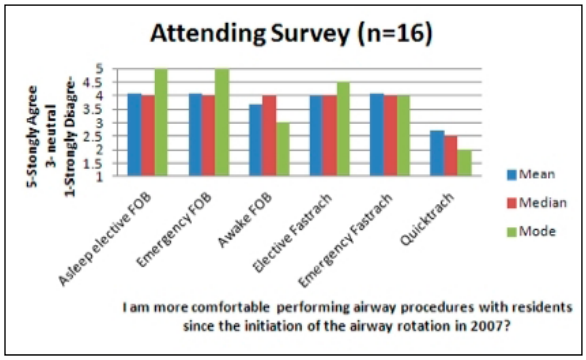

Figure 3: Faculty members' survey responses regarding changes in comfort level while performing advanced airway procedures with residents since implementation of airway rotation in 2007.

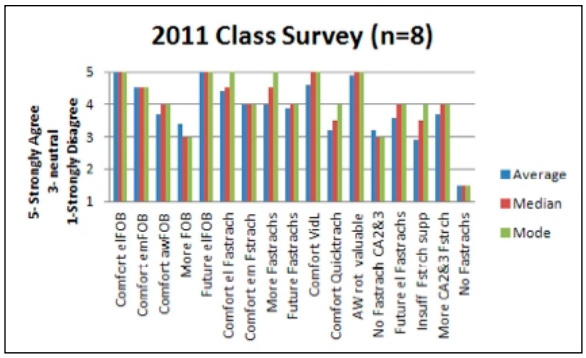

Figure 4: Class of 2011 resident survey responses regarding comfort level with specific airway techniques and adequacy of number of required procedures for each advanced airway skill.

S-229.

UTILITY OF SIMULATOR BASED TRANSESOPHAGEAL ECHOCARDIOGRAPHY TRAINING FOR RESIDENTS

AUTHORS: R. Matyal, J. D. Mitchell, R. Bose, P. Hess, D. Nicolai, F. Mahmood

AFFILIATION: Anesthesia, Critical Care, and Pain Medicine, Beth Israel Deaconess Medical Center, Boston, MA

INTRODUCTION: Performing an intraoperative TEE exam requires cognitive and manual dexterity in the operator. Simulation technology has been employed to reduce the initial learning curve in procedures requiring fine motor skills and eye-hand coordination.[1] Training facilitation could possibly be achieved for TEE training utilizing a simulator. The recent development and availability of TEE simulators provides the opportunity to test this hypothesis.[2] This method of training has the potential to improve anesthesia resident education and training.

METHODS: A one-month course for anesthesia residents (n = 12) was developed with both simulator and web-based components. The objective was to improve cognitive understanding and image acquisition skills. The cognitive component was achieved with didactic lectures and web-based exercises. Pre- and post-course exam scores were used to track cognitive improvement. Image acquisition skills were facilitated with a hands-on simulator-based TEE education model. A metrics software capable of recording the simulator TEE probe manipulations made by the operator was used to quantify image acquisition skills. The metrics compared between residents and experts included initial assessment plateau, variability of the probe movement, time to achieve the final image, distance, and accuracy.

RESULTS: Exam scores increased significantly after the training ($p = 0.023$, Figure 1). Manual skill performance improved after the training (Figure 2). Specifically, the initial assessment plateau and the time required to settle on a final image was reduced (Table 1).

DISCUSSION: Both cognitive understanding and image acquisition skills improved after the intervention. These results suggest that a structured course utilizing a simulator accompanied by didactic lectures and web-based exercises can be an effective training program for residents. Data collected from this study might detail how novice learners develop skills and how an individual performs compared to their peers. A training program similar to the one in this study may improve both cognitive and manual performance of novice trainees.

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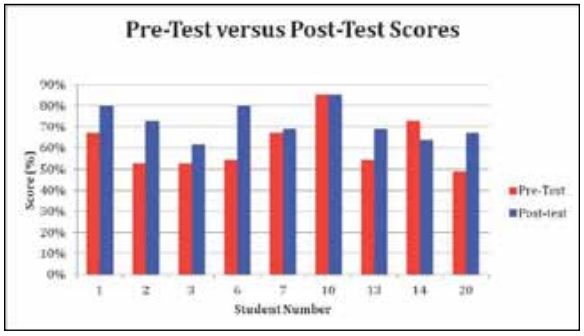

Figure 1.Comparison of exam scores pre- and post-training ($p = 0.023$).

Table 1. Quantitative comparison of first and final session performance in acquiring the Trans-Gastric short axis view. Comparison was performed using Mann-Whitney test between the first and final sessions. Data are presented as median (25% - 75% Inter-Quartile Range). The expert performance is included for information. *significant difference first to final.

Measure	First Session	Final Session	P-Value	Expert Comparison
Plateau	16 (10 – 23)	6 (3 – 9)	<0.001*	3 (3 – 10)
Variability	0.07 (0.05 – 0.11)	0.10 (0.07 – 0.12)	0.28	0.15 (0.10 – 0.15)
Time	259 (174 – 380)	180 (118 – 231)	0.02*	145 (86 – 151)
Distance	19.1 (14.6 – 29.0)	18.5 (12.1 – 23.1)	0.51	17.9 (10.9 – 21.8)
Accuracy	4.32 (1.0 – 6.66)	3.95 (1.39 – 5.62)	0.42	2.44 (1.21 – 5.33)

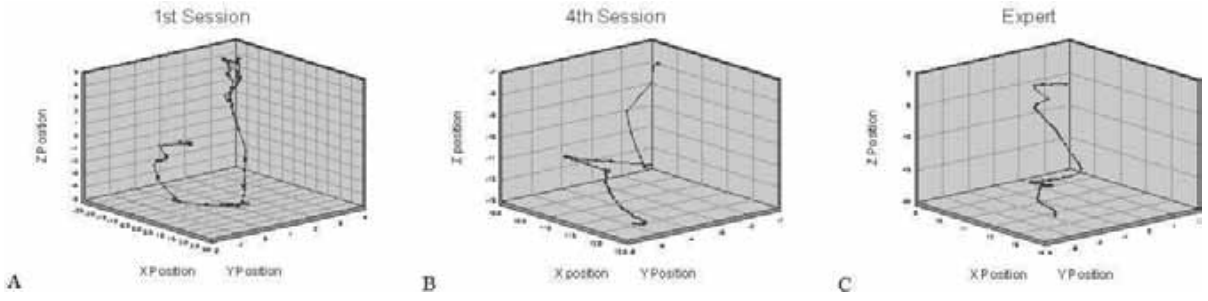

Figure 2. A: Probe manipulation in 3D space by the trainee after the first training session. B: Probe manipulation by the trainee after the fourth training session. In B there is more contained probe motion that is more comparable to probe motion by an expert (C)

S-230.

IMPACT ON DEPARTMENTAL PERFORMANCE OF AN ANESTHESIA-LED MODEL FOR INTERDISCIPLINARY LEARNING, INNOVATION, AND IMPROVEMENT

AUTHORS: S. Muret-Wagstaff, B. A. Simon

AFFILIATION: Anesthesia, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Center/Harvard Medical School, Boston, MA

INTRODUCTION: Healthcare reform and advances in improvement science create new opportunities for anesthesia departments to lead perioperative efforts to learn, innovate, and improve outcomes. However, clinical demands and production pressure limit opportunities for caregivers from the intensive OR environment to interact in collaborative learning and improvement efforts. Our aim was to deploy and determine the departmental impact of a weekly anesthesia-led, interdisciplinary learning platform providing protected time, infrastructure, and resources for improvement in the OR environment.

METHODS: We launched Faculty Hour in 2010, uniting Anesthesia, Surgery, Nursing and others in improvement and professional development efforts at a large teaching hospital. OR start time is moved 30 min. later each Tuesday to provide protected time; a Steering Committee and Dept. Advisory Council guide efforts. Staff participate voluntarily at 6:45 am in 90-day chartered teams, combined anesthesia and surgery division meetings, and peer-led faculty development sessions. We surveyed faculty anonymously using an 11-item modification of a Baldrige assessment tool (2009) before and one year after launch to determine progress in organizational performance as a department in leading this effort. Chi square test was used for analyses. IRB exempted the study.

RESULTS: 44 of 69 faculty (63%) responded to the survey before and after starting the intervention. Marked improvement in organizational performance was noted overall ($p<.0001$) as well as gains in each individual item ranging from 9 to 38 percentage points. For example, faculty perceptions changed favorably in items regarding leadership, measurement, flexibility, and innovation. In the first 18 months, 114 anesthesiologists, surgeons, and nurses served on 12 chartered teams; 11 cross-disciplinary divisions met quarterly; and all anesthesia faculty participated in clinical innovation workshops and leadership, scholarship, and education development series. Teams achieved diverse aims such as improved patient flow, new patient-centered trauma care pathways, and monthly simulation-based, interdisciplinary OR team training. Counter-intuitively, on-time OR start rates are better on Tuesdays than any other day.

DISCUSSION: We have deployed a replicable model for interdisciplinary learning, innovation, and improvement in the OR environment. Faculty Hour engages anesthesiologists, surgeons, nurses, and others in robust collaborative efforts, with high participation rates, striking evidence of change in organizational performance, and better care, learning, and efficiency.

REFERENCES: Baldrige Performance Excellence Program (2009). www.nist.gov/baldrige/publications/progess.cfm (this link is invalid. suggest using http://www.nist.gov/baldrige/)

S-231.

USING HIGH-FIDELITY SIMULATION AND SKILLS TRAINING IN-SITU TO PREPARE ANESTHESIOLOGY RESIDENTS FOR A PEDIATRIC ANESTHESIA ROTATION

AUTHORS: J. Lau, R. Minehart, A. Derevianko, C. Mai

AFFILIATION: Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA

INTRODUCTION: Studies have shown that simulation-based training is superior to traditional teaching methods in health care training[1,2]. At our institution, lecture-based curriculum is the primary mode of orienting anesthesiology residents to specialty-specific rotations. We describe implementation of an immersive simulation-based two-hour orientation incorporating procedural skills practice (via task trainers) and high-fidelity mannequin simulation to teach initial treatment of common intraoperative events.

METHODS: Anesthesiology residents participate in a recurring monthly orientation curriculum utilizing simulation on the first day of their pediatric anesthesia rotation at our institution, in lieu of the standard didactic lecture orientation. These sessions are taught in-situ in the operating rooms (OR) by pediatric anesthesia faculty. Residents are divided into two groups, and each group participates in one hour of high-fidelity simulation and one hour of skills training, both followed by feedback/debriefing sessions. The cases include: 1) a parent interview for anesthesia consent and a parent-present standard induction with a small child, and 2) a pediatric airway emergency in the form of laryngospasm during routine surgery, both followed by a focused debriefing. The skills training involves intubating pediatric patients (Laerdal Sim NewB), peripheral IV placement (NITA Newborn Modal #800 Infant Access Simulator, VATA), and caudal anesthesia techniques (M43C Pediatric LP Simulator, Kyoto Kagaku). Anonymous surveys were given to residents to evaluate the orientation.

RESULTS: The pilot orientation was initiated September 1, 2011, with 2 to 4 residents participating each month. Seven residents have completed the orientation to date and have all rated the course to be very positive and helpful on anonymous surveys.

DISCUSSION: Orientation is critical in new subspecialty rotations, with unique and potentially challenging situations to novice learners. Our group created a multi-modal curriculum to help familiarize and prepare residents for challenges, without the production-pressure of the OR or risking patient care. This model may be a useful approach to teaching skills and how to handle emergencies within the context of a subspecialty rotation.

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S-232.

PLATFORM FOR OPERATING ROOM TEACHING AND LEARNING (PORTAL): DEVELOPMENT OF A NEW EDUCATIONAL PARADIGM

AUTHORS: J. P. Wanderer, K. H. Baker, S. A. Forman

AFFILIATION: Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA

INTRODUCTION: Standard AVR (SAVR) is the first option treatment for patients (pts) with severe aortic stenosis. Transcatheter aortic valve implantation (TAVI) offers the possibility of valve implantation in high risk pts, thus reducing complications[1].

Renal failure is a frequent and severe complication of cardiac surgery, and it is traditionally diagnosed by serum creatinine. A novel biomarker, the neutrophil gelatinase-associated lipocalin (NGAL), can be measured after cardiac surgery, as it has shown to be an excellent early predictor for acute kidney injury (AKI)[2].

In the hypothesis that the avoidance of cardiopulmonary bypass and cardioplegic arrest could prevent renal damage, we compared the postoperative plasmatic NGAL between patients undergoing TAVI and those undergoing SAVR.

METHODS: We collected data from 20 pts undergoing TAVI who were case-matched with 20 control pts undergoing SAVR.

NGAL plasma test was performed at baseline and 4 hours after cardiopulmonary bypass initiation and balloon valvuloplasty respectively in patients undergoing surgical and percutaneous procedure. Baseline, 4 hours and postoperative peak creatinine were recorded. Dichotomous data were compared by using $\chi 2$ test with Yate's correction or Fisher's exact test when appropriate. Continuous measures were compared by analysis of variance (ANOVA) or the Mann-Whitney U test when appropriate.

RESULTS: Baseline NGAL level was similar in the two groups, whereas postoperative NGAL was significantly different in the two groups (133±76 in group TAVI vs 256±23 in group SAVR on arrival in ICU, $p < 0.05$).

Five pts in the SAVR group and two pts in the TAVI group doubled serum creatinine levels when compared to baseline: NGAL plasma concentration raised significantly only in these patients of the SAVR group ($p<0.05$) when compared to baseline. On arrival in ICU NGAL (p 0.015) was an independent predictor of AKI whereas serum creatinine and serum urea were not independent predictors of AKI.

DISCUSSION: We suggest that cardiopulmonary bypass alone, as required for SAVR, can lead to an increase in plasma NGAL. In our study NGAL, compared to serum creatinine and glomerular filtration, allowed an earlier detection of AKI thus providing the possibility to treat kidney injury at an early stage and to prevent its extension.

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S-233.

RECOVERING THE LONG-LOST 1937 TROPHY AWARDED TO THE FOUNDERS MCMECHAN BY THE INTERNATIONAL ANESTHESIA RESEARCH SOCIETY

AUTHOR: G. S. Bause

AFFILIATION: [1]Anesthesiology & Perioperative Medicine, Case Western Reserve University, Cleveland, OH; [2]Wood Library-Museum of Anesthesiology, Park Ridge, IL

INTRODUCTION: In presenting this paper, the author's purpose is to illustrate techniques useful in recovering long-lost anesthesia antiques. At the 16th Congress of Anesthetists Meeting held in Chicago in 1937, the IARS awarded a trophy to Dr. Francis and Mrs. Laurette McMechan.[1] Sadly, Dr. McMechan was so ill at the time that the "Founders McMechan" were honored in absentia. Widowed by 1939, Mrs. Laurette McMechan resisted subsequent efforts to merge the Cleveland-based International Anesthesia Research Society with the New York-based American Society of Anesthetists or to merge their journals. She died in California in 1970, and the trophy disappeared.[2]

METHODS: The author used three sets of techniques in pursuing, validating, and recovering this trophy:

1. consulting contacts in the medical antiques world;
2. researching the trophy's identifying characteristics, including the inscription recorded by Omar Ranney(1); and
3. acquiring the trophy using previously successful techniques.

RESULTS:

1. Networking Results: An overseas authority's email alerted the author of the trophy's availability.
2. Results on Identifying Characteristics: From New Mexico, the author recovered a large "loving cup" trophy. It bore the inscription: "To F. Hoeffer McMechan, M.A., M.D., F.I.C.A., Editor, Secretary-General and Laurette Van Varseveld McMechan, Associate Editor, Secretary and Hostess. In Loving Appreciation of Devoted Services and Splendid Achievements for the Organization, Economics, Research, Practice, Teaching, Journalism and Fellowship of the Specialty of Anesthesia for the World Conquest of Human Pain. In Behalf of Suffering Humanity, Presented by the International Anesthesia Research Society and International College of Anesthetists, Sixteenth Annual Congress of Anesthetists, 1937."
3. Acquisition Technique Results: The trophy was secured for the IARS Archives by blending techniques from the worlds of auctions and poker.

DISCUSSION: In the mid-1990s, a furnishings vendor from southern California spotted the McMechans' trophy at a swap meet. Identifying personally with the late Dr. McMechan, that terminally ill collector kept the trophy on his mantel at home. After he died, the trophy passed in 1996 to his brother, who, five years later, began seeking a "more proper" owner for the "loving cup."

This paper illustrates how a variety of acquisition techniques were blended successfully to recover a priceless IARS treasure for a place of honor in the Society's archives. This 1937 "Loving Cup" trophy was the highest award that a grateful IARS could bestow on its Founders, Dr. Francis McMechan and Mrs. Laurette McMechan.

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S-234.

TEACHING INTRAVENOUS CATHETER PLACEMENT TO MEDICAL STUDENTS

AUTHORS: E. Thackeray, Z. Stehlikova

AFFILIATION: Anesthesiology, University of Utah, Salt Lake City, UT

INTRODUCTION: Intravenous (IV) catheter placement is a key element of regional and general anesthesia, resuscitations, and routine patient care. Medical students frequently have little or no training in IV catheter placement prior to an anesthesiology rotation. Production pressure in a busy academic center may preclude adequate IV catheter teaching for medical students. We developed a one hour class and implemented an IV practice day during the two week anesthesiology elective to improve medical student skills in IV catheter placement.

METHODS: On the first day of the anesthesiology elective, medical students are taught anatomy, theory, universal precautions, and techniques of IV catheter placement. The one hour class includes a video on IV cannulation produced by the New England Journal of Medicine, discussion with a faculty anesthesiologist, demonstration and practice on a simulated arm, and supervised IV cannulation of participants.

Students are scheduled for one day of IV practice skills during the first week of the two week elective. Students are assigned to an ambulatory surgery center to place IVs under the supervision of the preoperative nurses.

Students self-report IV attempts (total attempted, number successful, number unsuccessful). Procedure logs are required to be completed but do not affect the student's grade.

RESULTS: Students report a greater number of successful IV cannulations after the course. In the five months prior to implementation of the IV course, students reported an average of 6.07 successful IV placements (SD 5.0). In the first six months after implementation of the IV course, students report an average of 14.93 successful IV placements (SD 7.88). This represents a significant improvement in successful IV placements($p < 0.001$), and an increase in the success rate from 61% to 75%.

DISCUSSION: We present an effective method for teaching IV cannulation to medical students during an anesthesiology elective. The success rate of IV cannulation increased from 61% to 75%, a rate comparable with that of registered nurses in practice.

IV cannulation is a relatively simple skill, but of great importance in effectively performing general or regional anesthesia, resuscitation, or routine clinical care. Students with strong IV skills may be more fully incorporated into the anesthesia team and may be offered more clinical opportunities than students without strong IV skills.

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S-235.

DEVELOPING PUBLICATIONS FOR THE MOBILE PHYSICIAN WITH EPUB AND ADOBE INDESIGN©

AUTHORS: R. Montoya, G. Sheplock

AFFILIATION: Department of Anesthesia, Indiana University School of Medicine, Indianapolis, IN

INTRODUCTION: Distribution of academic literature has been dominated by Adobe's PDF format in recent years. However with the popularity of eReaders such as Apple's iPhone, iPad and Amazon's Kindle, small and varied screen sizes call attention to the format's rigid structure of content display. This limitation is solved using the ePUB format allowing creation of content that can be distributed as a single file but optimized not only for the specific device but also for the specific reader.

METHODS: Adobe InDesign© was utilized to adapt an existing article for distribution using the ePUB format. First, the article was replicated in InDesign© using the traditional format (1 and 2 column format with multiple images). Then, the article was modified and exported using the ePUB format. Finally the re-formatted article was loaded onto various platforms for viewing.

RESULTS: With some effort, the article was successfully ported to multiple devices using the flexible ePUB format. This allowed for adjustable font styles and sizes, resizable static and dynamic media, as well as capabilities such as bookmarks, highlighting and note taking. Limitations include single column restrictions, inability to accommodate precise layouts, and a high learning curve to efficiently work within Adobe InDesign©.

DISCUSSION: Despite a few limitations, creation and distribution of content utilizing InDesign© and the ePUB format is a viable way to create and distribute educational materials for easy viewing on the variety of mobile devices. These technologies serve to empower researchers by allowing them to be their own publisher. They also benefit physicians by giving them access to the most up to date information in a flexible and portable format.

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S-236.

IMPLEMENTATION OF A COMPREHENSIVE BUT SIMPLE METHOD TO MANAGE AND TRACK RESIDENT KNOWLEDGE AND SKILL ACQUISITION DURING PEDIATRIC ANESTHESIA TRAINING: IMPACT ON ITS FIRST GRADUATING CLASS

AUTHORS: D. Chau, E. Bowe, R. Brown, A. DiLorenzo

AFFILIATION: Anesthesiology, University of Kentucky, Lexington, KY

INTRODUCTION: Pediatric anesthesiology knowledge and skills is imparted in different ways during residency training. Ideally, resident learners will take the initiative in determining, directing and evaluating their learning process. Documentation of acquisition and tracking of such knowledge has been difficult. Defining the extent that the information is presented to each individual resident is a complex issue and requires substantial data gathering. As a solution we have created a program that allows a program director to determine: 1. Whether all aspects of a curriculum are covered within the training program, 2. The extent to which residents access the presented information, 3. Individual learning styles and 4. Objective and subjective progress. This comprehensive management method was implemented 2 years ago. The first group of residents to begin this curriculum has now graduated. The results are presented.

METHODS: A master program tracks all pediatric knowledge and skills as required by the ABA/SPA and all current methods that such knowledge is imparted. This well-defined knowledge base is split into 3 rotations with unique pre/post rotation self-evaluations and surveys. The assessment results shown through a visual tracking method, faculty feedback, perceived learning progress and future goals are among discussed items with each resident during an end rotation debriefing. Each individual's progress is followed objective and subjectively through residency.

RESULTS: Overall CA3 performance in the ITE pediatric items in 2009, 2010 and 2011 are 6%, 2% and 9% above the national average. Favored learning methods are textbook (41%), discussion (19%) and lecture (18%) with podcast being only 2%. Self- perceived knowledge level in the Likert scale showed an expected jump in the CA3 year. The residents expressed satisfaction with current curriculum and especially with debriefing session. Noncompliance with taking the pre/post self- evaluations was present.

DISCUSSION: This comprehensive program allows improved resident knowledge management. The graduating class's pediatric ITE score, although now higher, cannot confirm this curriculum's utility yet. Learning preferences remained with textbook, discussion and lectures despite available podcasts and online resources. The debriefing allows for reflection on state of their knowledge and encourages self-directed learning. This program facilitates subspecialty knowledge and skills assessment throughout the entire residency for both program director and resident. It allows early identification and self -recognition in struggling residents, and consequently it seems to encourage effort and independence for managing their individual learning.

REFERENCES: N/A

Equipment / Monitoring

S-242.

ENDOTRACHEAL INTUBATION USING AIRTRAQ® LARYNGOSCOPE VERSUS LMA FASTRACH™ IN ADULT PATIENTS: A COMPARATIVE STUDY

AUTHORS: M. Z. Ali, R. Saeed, M. Abdel-Bar, H. Helmy

AFFILIATION: Anesthesia & S-ICU, Theodor Bilharz Research Institute, Giza, Egypt

INTRODUCTION: Airtraq® (Fig.1) is a single-use direct laryngoscope designed to provide a view of the glottis without alignment of the oral, pharyngeal and tracheal axes.[1] LMA-Fastrach™ (Fig.2) is introduced as a prototype of the laryngeal mask airway for blind endotracheal intubation & does not require head and neck manipulations on insertion.[2] This randomized, single blind, controlled clinical trial was designed to evaluate the usefulness of Airtraq® laryngoscope for use in patients with anticipated normal airways requiring tracheal intubation in comparison to LMA Fastrach™.

METHODS: After Ethical Committee approval and patients' written informed consents, 60 ASA I & II, middle-aged patients of both sexes, scheduled for surgical procedures requiring tracheal intubation, were randomly divided into two groups; group I (n=30) were intubated using Airtraq® and Group II (n=30) were intubated using LMA Fastrach™. Anesthesia was induced & maintained using fentanyl, propofol, isoflurane & atracurium. Number of insertion attempts, ease of insertion, overall success rate, intubation difficulty score, duration of intubation, lowest SpO2, heart rate (HR), mean arterial pressure (MAP) & complications were all recorded.

RESULTS: All patients were successfully intubated. First attempt for intubation succeeded in (80%) of group I and in (60%) of group II. The duration of intubation was significantly shorter in group I ($p<0.001$). Lowest SpO2 during intubation was significantly lower in group II ($p<0.01$). Both groups showed hemodynamic stability, despite a significant increase in the HR and MAP immediately postintubation which continues to rise after 1- minute in comparison to preintubation level ($p<0.01$). This rise was significantly higher in group II in comparison to group I ($p<0.05$). Only 3 patients (10%) of group II showed a statistically but not clinically significant desaturation. 10% of patients in both groups had soft tissue trauma with blood on the device and postoperative sore throat using VAS. No recorded other complications.

DISCUSSION: These results go in accordance with Maharaj et al.[3] in the superiority of the Airtraq® compared to the Macintosh laryngoscope and with Uria A et al.[4] in that the Airtraq® allows glottis visualization during intubation, so damage can be minimized. In conclusion, compared to LMA Fastrach™, tracheal intubation with the Airtraq® is easy and safe in patients with anticipated normal airways showing shorter duration of intubation and maintained hemodynamic stability.

Figure 1: The Airtraq® laryngoscope with an endotracheal tube in place in the side channel

Figure 2: The intubating laryngeal mask airway (ILMA; LMA-Fastrach™) with a silicon armored endotracheal tube in place.

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S-243.

PERIPHERAL NERVE SIIMULATOR INDUCED ELECTROSTIMULATION AT P6 POINT REDUCES POST SPINAL ANESTHESIA INDUCED HYPOTENSION DURING SURGERY

AUTHORS: K. Al Rawahi, R. Khan, N. Kaul

AFFILIATION: Al Harthy Complex, Oman

INTRODUCTION: Hypotension and bradycardia are a commonly encountered undesirable effect of spinal anesthesia.[1] Electrostimulation of the P5 and P6 acupoints by TENS has been demonstrated to augment sympathetic tone, alleviating hypotension after spinal anesthesia in patients undergoing Cesarean section.2 that could be helped by readily available peripheral nerve stimulator in the operation theatres.

METHODS: After approval by the hospital ethical committee, 32 ASA I and II young adult patients scheduled for elective post-trauma orthopedic surgery under spinal anesthesia were randomized into two groups. The control group (Group A, n=16) received no P6 stimulation while the study group (Group B, n= 16) received Train-of-four (TOF) electrical stimulation (10 mA) at the acupoint using the PNS from just prior to spinal anesthesia till completion of surgery. This acupoint is situated between the tendons of palmaris longus and flexor carpi radialis,[2] Chinese inches from the distal skin crease of the wrist. One Chinese inch equals width of the interphalyngeal joint of the thumb.[3] A second electrode was placed one inch proximal to this point.

RESULTS: We noted that electrostimulation at P6 point in Group B patients by a PNS decreased the fall in mean arterial pressure (MAP) from pre-spinal level by a mean of 10.0 mmHg as compared to 16.0 mmHg in the control group. Also, the onset of significant fall ($p<0.05$) in MAP was not only delayed (20 min versus 10 min) but was also of shorter duration (10 min versus 50 min) in group B patients as compared to non-stimulated group (group A) patients respectively. P6 stimulation also prevented any significant bradycardia during the study period. Number of patients needing ephedrine or atropine to control hypotension or bradycardia respectively was reduced by 66% in the stimulated group (Group B) as compared to the control group patients.

DISCUSSION: Induced TOF stimulation of P6 point successfully attenuates the severity and duration of hypotension and bradycardia after spinal anesthesia in patients undergoing orthopedic surgery.

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S-244.

A COMPARISON BETWEEN NOVICE AND TRAINED PERSONNEL WHEN USING THE MACINTOSH LARYNGOSCOPE, THE PENTAX AWS®, THE C-MAC™ AND THE BONFILS INTUBATION FIBERSCOPE: A MANIKIN STUDY

AUTHORS: C. Liaw[1], S. Lye[2], E. Seet[2], K. Koh[2]

AFFILIATION: [1]MOHH, Singapore, Singapore; [2]Department of Anaesthesia, Khoo Teck Puat Hospital, Singapore, Singapore

INTRODUCTION: Indirect laryngoscopes have been used to improve the view of laryngeal structures, facilitate faster intubation, and increase intubation success rate, particularly in difficult airways[1]. Few studies have compared these devices, and investigated the ability of novice compared with trained personnel to learn and successfully use these devices. In this study, we evaluate trainee doctors versus skilled anaesthetists when using the Macintosh laryngoscope, the Pentax AWS®, the C-MAC™ and the Bonfils intubation fiberscope to intubate a manikin.

METHODS: Thirteen trainee doctors and thirteen anaesthetists participated in this study. A high fidelity simulation manikin was used to simulate both normal and difficult airway scenarios. Each participant had 8 intubation attempts on the manikin. The sequence of device selection and airway scenarios were randomised. The time taken for intubation, success rates of intubation, and subjective ease of intubation were analysed, making comparisons between the 2 groups of physicians and between the 4 airway devices.

RESULTS: There was no significant difference with regards to the success rate of intubation between trainee doctors and skilled anaesthetists. Intubation time with the Pentax AWS® was faster for skilled anaesthetist in the difficult airway situation (22s vs 33s, $p=0.047$) (Table 1). The mean time for intubation in a difficult airway scenario for the C-MAC™ and Pentax AWS® were faster than for the Macintosh laryngoscope and Bonfils intubation fiberscope (24s, 28s vs 80s, 61s respectively, $p<0.001$). The mean time for intubation in a normal airway scenario for the C-MAC™ and Pentax AWS® were faster than for the Macintosh laryngoscope and Bonfils intubation fiberscope (17s, 19s vs 39s, 38s respectively, $p=0.002$). The ease of intubation was more favourable for all 3 indirect laryngoscopes compared to the Macintosh laryngoscope ($p<0.001$).

DISCUSSION: Both the C-MAC™ and Pentax AWS® achieved faster intubation times compared to the Macintosh laryngoscope and Bonfils intubation fiberscope for the normal and difficult airway scenarios. Skilled anaesthetists were 33% faster in achieving a successful intubation compared to trainee doctors in the difficult airway scenario with the Pentax AWS®. Indirect laryngoscopes were easier to use than the Macintosh laryngoscope.

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S-246.

AN ALGORITHM FOR COMPUTER CONTROL OF DRUG DELIVERY BY CONTINUOUS INTRAVENOUS INFUSION: REDUCTION OF DELIVERY ONSET LAG TIME IN A LABORATORY MODEL

AUTHORS: M. J. Parker[1], M. A. Lovich[2], N. M. Sims[3], R. A. Peterfreund[4]

AFFILIATION: [1]Division of Pulmonary, Critical Care, and Sleep Medicine, Beth Israel Deaconess Medical Center, Boston, MA; [2]Department of Anesthesiology and Pain Medicine, St. Elizabeth's Medical Center, Boston, MA; [3]Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA; [4]Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA

INTRODUCTION: Critically ill or anesthetized patients commonly receive pump-driven continuous infusions of short acting drugs in the OR or ICU. Laboratory studies show conventional drug delivery to a patient's circulation may substantially lag behind the clinician's intent, especially with restricted fluid volume delivery[1]. Therapy may be suboptimal, with significant clinical impact. We sought to enhance drug delivery onset using algorithms based on mathematical models of infusion to control syringe pumps. We focused on low fluid volume infusions via a central venous catheter (CVC).

METHODS: Based on Taylor dispersion[2] we modeled drug delivery by continuous infusion through a manifold/CVC system. We assumed delivery of one drug plus carrier fluid. Model outputs include drug concentration in the fluid path and drug delivery to the distal end of the CVC over time. The model incorporated factors including dead volume, flow rates and diffusion coefficient.

A hardware apparatus used computer algorithms based on the model to drive infusion pumps to achieve desired drug delivery. One algorithm aimed to reduce the lag time between infusion initiation and delivery of the intended dose to the distal end of a CVC. The algorithm was tested in a laboratory model of clinical infusions using a tracking dye, clinical infusion components, and quantitative spectrophotometry. Baseline flow rates reflected fluid volume conservation practices for ICU patients. Algorithm-based methods also conserve fluid volumes while aiming to speed drug delivery onset. We measured the time to reach half of the predicted steady state of drug delivery (t1/2).

RESULTS: Delivered through an adult 16g CVC, conventional infusions reach t1/2 at ~6 minutes. Algorithm driven infusions reach t1/2 at ~2.5 minutes. Conventional infusions through a 9Fr introducer reach t1/2 at ~21 minutes; algorithm driven infusions reach t1/2 at ~4.5 minutes. With a pediatric 4Fr CVC, time to reach t1/2 was ~16 minutes for the conventional infusion and ~3 minutes for the algorithm driven infusion.

DISCUSSION: We show for the first time that an algorithm grounded on principles of fluid flow can serve as the basis of a computer controlled drug delivery system. Laboratory data confirm reductions of delivery lag time predicted by the mathematical models. From the data, we predict that an algorithm system will significantly reduce the lag time to achieve the desired steady state of clinical drug delivery. This will impart new precision to managing drug delivery by continuous infusion with implications for safety and efficacy of drug therapy.

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S-247.

AN AFFORDABLE MINIATURE MACHINE FOR PEDIATRIC ANESTHESIA OUTSIDE THE OPERATING ROOM

AUTHOR: A. Targ

AFFILIATION: Targ Mobile Anesthesia, Palo Alto, CA

INTRODUCTION: In running a pediatric sedation practice for dental facilities, one of the biggest hurdles is efficiently transporting, rapidly assembling, and putting away everything needed to create a surgery center in as many as three different facilities in one day. I designed and built an anesthesia machine because there was none commercially available that transported on wheels in a fully assembled, ready-to-use state, integrated two E-cylinders, a table, an I.V. pole, as well as all required safety monitors, and could be laid flat for transport.

METHODS: The machine is made of FDA approved parts, DISS O2 and N2O standard fittings, and various medical-grade one way valves and hoses. It was welded together at a custom fabrication shop, inspected, and certified.

- It is designed for maximum safety and portability. The core structure is a steel, two E-cylinder transport cart welded to a collapsible steel I.V. pole which supports an aluminum shelf with a back on it.
- The vaporizer manifold is screwed onto the vertical back of the shelf. The N2O/O2 mixer/flow meter assembly is bolted to the horizontal part of the shelf next to the vaporizer. The machine is kept upright by a collapsible tripod attached to the base of the shelf.
- I installed a pneumatic low pressure alarm, an electronic high pressure alarm, negative pressure alarm, sustained pressure alarm, and dual negative pressure release valves.
- There is a N2O/O2 interlock which eliminates the possibility of selecting a hypoxic fresh gas flow.
- There is a 12" x 12" steel table which collapses and is held down by a powerful magnetic latch.
- The table swivels 270 degrees to different sides of the machine for different dental setups.
- There is a refillable calcium hydroxide CO2 absorber with popoff, two one way valves, and analog manometer.
- There is a scavenging system for N2O and a charcoal scavenger for the sevoflurane.
- It lies flat for car transport. The Drager Vapor 2000 uniquely does not leak any sevoflurane even when inverted.
- The unit when collapsed is the size of a golf bag and weighs about 70 lbs. including the aluminum E-cylinders.

RESULTS: Since 2002, the machine above has provided sedation for 8,000 patients at more than 4,000 locations.

DISCUSSION: The total cost of the parts for this machine was less than $2,200. The other portable machines marketed in the United States for mobile sedation (OBA-1, Magmedix/Magellan 2200, Anmedic MIE Hawk, D.R.E. Integra VSO2) all are much more expensive, cannot be tilted, need padded boxes, and require extra trips to bring in the oxygen, table, and I.V. pole

REFERENCES: The image below identifies the supplier and price for all major components of the machine.

COMPONENT	SUPPLIER	PRICE
Vaporizer	Drager Vapor 2000 Fixed	Loaner
(Bracket)	Drager ¼" Barb	$200
CO2 Absorber	King KAB-02 (Refillable)	$200
(Bracket)	King/D.R.E.	$150
Pressure Monitor	Ohmeda 5500	$150 (Used)
O2 Tank Cart	Hull Anesthesia	$40
Table & Handle	I.V. League Medical	$150
Tripod	Camera Type	$30

COMPONENT	SUPPLIER	PRICE
N2O/O2 Mixer	Fraser	$400 (Used)
O2 Regulator	Mada CGA-870	$100
O2 Reg./DISSx2	LSP Rhino	$250
Manometer	Anesth. Assoc.	$100
Welding	All Fab	$200
I.V. Pole	Alimed	$50
Low O2 Alarm	VeriFlo	$100
(-) Press. Valve	Porter	$100

S-248.

AMOUNT OF ACCIDENTAL MEDICATION FLUSH BY SYRINGE PUMP DUE TO INAPROPRIATE RELEASE OF OCCLUDED INTRAVENOUS LINE

AUTHORS: H. Kawakami, T. Miyashita, R. Yanaizumi, H. Sato, T. Kariya, T. Goto

AFFILIATION: Department of Anesthesiology, Yokohama City University, Yokohama, Japan

INTRODUCTION: Unintended medication bolus is given by a syringe pump if intravenous line occlusion is released in an inappropriate manner after occlusion alarm of a syringe pump, and this is a potential harm to the patient. It has been demonstrated that the amount of bolus given in such situations is smaller with smaller syringes[1]. Terufusion® syringe pump TE332S (Terumo, Japan) has a special function for this particular problem. It makes the plunger endplate withdraw after an occlusion alarm and reduces the pressure within the syringe. It is still not well known how the amount of accidentally injected medication is affected by different flow rate of syringe or different type of syringe pump and we investigated in vitro.

METHODS: A syringe was inserted into a syringe pump, and connected to a 100cm infusion tube with priming volume of 1.0ml. A stopcock was placed to the other end of the tube. The syringe and the tube were filled with normal saline and the stopcock was closed. Then infusion was started at different rate (3ml/hr or 10ml/hr), or with different syringe pump model (Terufusion® TE312 or TE332S, Terumo, Japan), or different syringe size (Nipro® 10ml or 50ml, Nipro, Japan), or at different alarm setting (High(800±200 mmHg) or Low(300±100 mmHg)). After occlusion alarm went off, the occlusion was released by rotating the stopcock and the amount of fluid coming from the stopcock was measured. Measurements were made twice for each setting and the average was used for the statistical analysis.

RESULTS: Eighteen syringe pumps (9 of TE312 and 9 of TE332S) are recruited and total 288 measurements was made. Flow rate; no significant difference was seen between 3ml/hr and 10ml/hr.

Alarm setting; bolus was significantly lower with low alarm setting than High. (0.132±0.013 vs 0.268±0.013 with TE332S, 10ml syringe, 3ml/hr. $p<0.001$)

Size of syringe; bolus was significantly lower with 10ml syringe compared with 50ml syringe (0.268±0.013 vs 0.674±0.116 ml with TE332S, 3ml/hr, alarm High. $P<0.001$)

Syringe pump model; Significant difference was seen only when 50ml syringe was used. (TE312: 1.99±0.16 vs TE332S: 0.674±0.116, alarm High. $p<0.001$)(Figure)

DISCUSSION: To minimize the amount of accidentally injected medication when releasing occlusion, smaller size syringe pump and low alarm setting is important. Using a syringe pump which has a function to decrease the amount of bolus, such as TE332S, may be helpful, but does not completely solve the problem.

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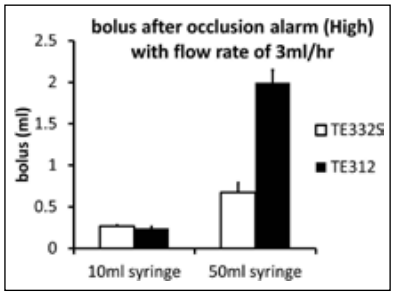

S-249.

COMPARISON OF AIRWAY SCOPE® AND AIRTRAQ® FOR TRACHEAL INTUBATION IN INFANT WITH AND WITHOUT CHEST COMPRESSIONS - A MANNEQUIN STUDY

AUTHORS: A. Tampo[1], A. Suzuki[1], S. Sako[2], T. Kunisawa[2], H. Iwasaki[2], S. Fujita[1]

AFFILIATION: [1]Emergency, Asahikawa Medical University, Asahikawa, Japan; [2]Anesthesiology & Crical Care Medicine, Asahikawa Medical University, Asahikawa, Japan

INTRODUCTION: Asphyxia causes cardiac arrest more commonly in infants and children than in adults, and thus, airway management and ventilation are very important in paediatric resuscitation[1]. A Pentax-AWS Airway Scope® (AWS) is a video laryngoscope with an integrated tube guide that improves laryngeal visualization and provides easy intubation[2]. We compared intubation profiles between AWS with new neonates blade and Airtraq® (ATQ) in an infant mannequin.

METHODS: Following institutional approval and obtaining written informed consent, twenty-three anesthesiologists were percitipated. Each participant performed four different settings: (a) intubation with AWS, (b) intubation with ATQ, (c) intubation with AWS during chest compressions, and (d) intubation with ATQ during chest compressions. The success rate, modified Cormack and Lehane classification, the time to visualize the vocal cords, and the time to place the endotracheal tube were recorded. Data are shown as mean ± SD. Unpaired Student's t-tests were used to analyze the data between the devices, and $P < 0.05$ were considered significantly different.

RESULTS: Success rate and obtained laryngeal view were not different between AWS and ATQ. The time to visualize the vocal cords was significantly shorter with AWS compared with ATQ without chest compressions (5.1 ± 2.5 and 7.3 ± 2.3 s, respectively). The time to place the endotracheal tube was also significantly shorter with AWS compared to the time with ATQ without chest compressions (8.8 ± 3.7 and 12.1 ± 3.9 s, respectively). While performing chest compressions, AWS allowed for a significantly shorter time to visualize the vocal cords compared with ATQ (5.7 ± 2.6 and 9.2 ± 5.5 s, respectively). Intubation time with chest compressions was significantly shorter with AWS compared to the time with ATQ (9.9 ± 3.6 and 14.0 ± 6.9 s, respectively). However, the time to visualize the vocal cords, and the time to place the endotracheal tube with AWS and ATQ were not affected by chest compressions.

DISCUSSION: Both AWS and ATQ were effective for performing tracheal intubations with and without chest compressions. However, AWS provided faster tracheal intubations in infants than ATQ, probably due to the built-in monitor that allowed operators to continuously visualize the airway. In addition, thinner and narrower design of the new AWS blade may provide faster access to the larynx.

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S-250.

TOTAL INTRAVENOUS ANESTHESIA USING EITHER BISPECTRAL INDEX MONITORING OR TARGET CONTROLLED INFUSION IN MAJOR ABDOMINAL SURGERY

AUTHORS: S. El-Hadi[1], M. M. Omran[2]

AFFILIATION: [1]Anesthesia, Faculty of Medicine, Alexandria, Egypt; [2]Anesthesia, Royalehayat Hospital, Kuwait, Kuwait

INTRODUCTION: The bispectral index (BIS) monitor is advocated to prevent anesthesia awareness while allowing a reduction in the administration of anesthetic agents. Titrating the primary anaesthetic agent using BIS value of 40 to 60 has been demonstrated to improve drug administration and perioperative outcomes.[1] Target controlled infusion (TCI) systems give the potential for improving both speed and accuracy in achieving and maintaining a desired level of anesthesia. TCI systems, enable automatic precise and rapid control of the blood concentration and are therefore popular with many anaesthetists.[2] The aim of this work was to determine whether a bispectral index (BIS)-based protocol is better than a protocol based on target controlled infusion (TCI) in total intravenous anesthesia (TIVA) on control of anesthetic depth, consumption of anesthetics and postoperative recovery.

METHODS: Thirty patients received TIVA of propofol and remifentanil together with cisatracurium for general anaesthesia with tracheal intubation for abdominal surgery. They were randomly divided into two equal groups. Group I (15 patients): TIVA was administered using TCI of propofol and remifentanil to achieve an effect site concentration of 7.5 ng/ml. Group II (15 patients): TIVA was maintained to keep BIS values 50 ± 10 by modifying the infusion rates of propofol and remifentanil. Propofol and remifentanil consumption (mg/hr), Time to achieve an Aldrete score of ten and postoperative pain was assessed.

RESULTS: The BIS-based protocol for administration of TIVA decreased the consumption of anaesthetics. Propofol consumption was 435.0 ± 125.07 mg/hr for group I and 267.13 ± 77.51mg/h for group II ($P<0.001$). Remifentanil consumption was 3.34 ± 0.94 mg/h for group I and 1.87±0.78 mg/h for group II ($P<0.001$). Time to achieve an Aldrete score of ten was shorter for BIS-based TIVA group (24.33 ± 4.88 mins) than for the TCI group (17.53 ± 2.95 mins) ($P<0.001$). There were no differences as regards postoperative pain and analgesic requirement.

DISCUSSION: Using the bispectral index as an endpoint to maintain depth of anaesthesia resulted in lesser consumption of intravenous propofol and remifentanil, hastened recovery with no difference in postoperative pain.

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S-251.

WITHDRAWN.

S-252.

A NEW JACKSON TABLE AUGMENTS TISSUE INTERFACE PRESSURE IN THE PRONE POSITION

AUTHORS: Y. Miyake[1], H. Kinoshita[2], H. Maeda[1], M. Yamashita[1], M. Hirayama[2], M. Kawakami[3]

AFFILIATION: [1]Nursing, Wakayama Medical University Kihoku Hospital, Katsuragi-cho, Japan; [2]Anesthesiology, Wakayama Medical University, Wakayama, Japan; 3Orthopedic Surgery, Wakayama Medical University Kihoku Hospital, Katsuragi-cho, Japan

INTRODUCTION: The Jackson spine table demonstrates the least effect on hemodynamics in the prone position, indicating an advantage in the anesthetic management[1]. We have recently noticed precordial pressure ulcers after prolonged spinal surgery requiring prone positioning on a newly developed Jackson table, Axis JacksonTM system model 6977 (MIZUHO OSI, Union City, CA). It is unclear whether this system is well fit for the population with short stature. Therefore, the current study was designed to compare the tissue-pad interface pressure at the precordial skin in Japanese volunteers positioned in the prone fashion on conventional and new Jackson tables.

METHODS: The institutional review board approved this study and written informed consent was obtained from each enrolled volunteer. Eight volunteers with an average body constitution as the Japanese population (height, weight, body mass index or chest circumference was 169.5±3.8 cm, 68.4±7.8 kg, 23.8±2.3 and 91.1±6.9 cm, respectively), were studied on Jackson (Jackson Spinal Surgery and Imaging TableTM and Axis Jackson (Axis JacksonTM system model 6977) tables. Twenty-four sensors attached to a pressure mapping system, Force Sensitive ApplicationsTM (Vista Medical Ltd., Winnipeg, Manitoba, Canada), were placed on the precordial pad of each table at 2 cm intervals. The precordial pressure in each volunteer was randomly measured 10 min after a standard prone position using Jackson and Axis Jackson tables at 60 min intervals with the subject's face resting on ProneViewTM protective Helmet System (Dupaco, Inc., Oceanside CA). Data are shown as means ± SD. Statistical analysis was performed using repeated measures of analysis of variance or chi-square test.

RESULTS: The tissue-pad interface pressure at the precordial skin in the prone position was significantly higher in the Axis Jackson table at both maximum and mean values than the Jackson table (Figure). Consistently with this finding, the precordial pressure was distributed higher in the Axis Jackson compared with the Jackson (Figure).

Groups	Maximum Pressure (mmHg)	Mean Pressure (mmHg)
Axis Jackson	111.9 ± 6.7*	74.0 ± 28.1*
Jackson	85.0 ± 18.5	42.4 ± 29.0

*: P<0.05 vs. Jackson

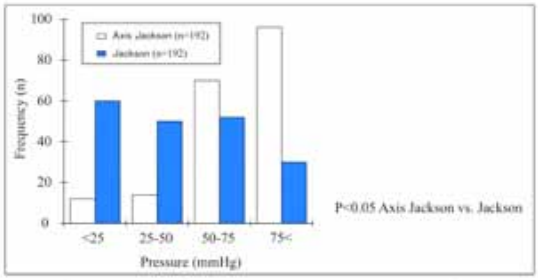

Figure. The tissue-pad interface pressure at the precordial skin of volunteers in the prone position on the Jackson tables

DISCUSSION: The use of newly developed Axis Jackson table demonstrated higher precordial pressure in male volunteers with short stature, compared with the Jackson table. In contrast, the conventional Jackson table appears more appropriate to avoid the skin ulcer since its use showed mostly lower precordial pressure to preserve skin perfusion[2]. All personnel involved in anesthetic management for patients with prone position should acknowledge such difference between tables although further studies are needed to clarify the reason.

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S-253.

THE EFFECT OF BEACH CHAIR POSITION ON BIS VALUES DURING GENERAL ANESTHESIA

AUTHORS: S. Kawanishi[1], M. Matsumi[2], H. Morimatsu[3], T. Takahashi[4], K. Morita[3]

AFFILIATION: [1]Emergency and Critical Care Center, Tsuyama Central Hospital, Okayama, Japan; [2]Department of Anesthesiology, Ryusoh Orthopedic Hospital, Okayama, Japan; [3]Department of Anesthesiology and Resuscitology, Okayama University Graduate School of Medicine and Dentistry, Okayama, Japan; [4]Faculty of Health and Welfare Science, Okayama Prefectural University, Okayama, Japan

INTRODUCTION: The effect of postural change during surgery under general anesthesia has not been described. The aim of this study was to evaluate whether a beach chair position in shoulder surgery could have some influence on the values of bispectral index (BIS) in shoulder surgery.

METHODS: We observed two groups of patients scheduled for surgery, one was supine position group (n = 27), and the other was beach chair position (n = 27). Anesthesia was induced with propofol and rocuronium, and maintained with sevoflurane (end tidal concentration 1.0 - 1.2 %). The BIS values were recorded manually until 120 minutes after the onset of positioning and compared with each time point at 30 min interval.

RESULTS: There was no time-dependent difference in BIS values during supine position. In contrast, BIS values in beach chair position group showed a marked downward-trend through the measurement period. End-tidal anesthetic gas concentration and mean blood pressure did not significantly differ between the groups consistently.

This result indicates that beach chair position causes time-dependent decrease in BIS under general anesthesia.

Discussion: N/A

References: N/A

S-254.

EVALUATION OF THE AMBU ASCOPE 2 VIDEO BRONCHOSCOPE FOR ELECTIVE AND EMERGENCY AWAKE INTUBATION

AUTHORS: K. P. Rothfield[1,2], M. Ewing[1], N. Htut[1], S. Langlois[1], K. Lopez[1], M. Winik[1,2]

AFFILIATION: [1]Anesthesiology, Saint Agnes Hospital, Baltimore, MD; [2]Nurse Anesthesia Training Program, University of Maryland, Baltimore, MD

INTRODUCTION: Fiberoptic intubation (FOI) remains the gold standard for securing the difficult airway. This technique, however, requires a high degree of operator skill. FOI is complicated by human factors, primarily the use of a monocular eyepiece to acquire a miniaturized image. Steering the scope tip requires awkward body twisting by the operator to maintain orientation. When a video camera is attached to a conventional optical bronchoscope, visualization is improved at the expense of increased device bulk, weight and technical preparation. Recently, Ambu (Glen Burnie, MD) introduced a second-generation, lightweight, single-use video bronchoscope for intubation. The aScope 2 features a solid-state imager and LED light source, and a dedicated, detached LCD display. The aim of this study was to evaluate the efficacy of this device in patients requiring awake intubation.

METHODS: After IRB approval, 7 patients were enrolled in the study. Informed consent was obtained from 5 patients undergoing elective surgery. Waiver of consent was permitted by the IRB in 2 patients who required emergency intubation, including a patient with severe angioedema, and a patient who was awakened after failed intubation attempts with other techniques under general anesthesia. Other indications for awake intubation included massive goiter[2], ankylosing spondylitis with morbid obesity[1], severe spinal cord compression[1], and history of difficult intubation[1]. Measured variables included overall and first pass success rates, complications, time to intubation, and a visual analog intubation difficulty score. Intubators included MDs and CRNAs with no previous experience with the device aside from brief simulator training. Airway topicalization was achieved with a combination of 5% lidocaine ointment, and 4% lidocaine solution.

RESULTS: All patients were successfully intubated with the aScope. 5 patients were intubated on the first attempt. 1 patient required 2 attempts, and another patient required 3 attempts. Time from introduction of the aScope to intubation averaged approximately 110 seconds. Average difficulty on a visual analog scale from 0-100 (0=easy, 100=impossible) 21. The intubators in this study agreed that the aScope was subjectively easier to use and preferred it to a conventional bronchoscope. There were no issues with fogging, device failure, or patient injury.

DISCUSSION: The Ambu aScope 2 functions like an optical bronchoscope. However, from a human factors perspective, it simplifies the procedure by virtue of being lighter and shorter, with LCD screen imaging rather than an eyepiece, without additional attachments and setup time.

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S-255.

THE SENSASCOPE: A LEARNING CURVE DEPENDING OF THE USERS' EXPERIENCE

AUTHORS: F. Dimache, N. Stojeba, M. Baron, A. Nastasie, P. Diemunsch

AFFILIATION: Anesthesiology and Intensive Care, Strasbourg University Hospital, Strasbourg, France

INTRODUCTION: The SensaScope® (Swiss Acutronic, Zurich, Switzerland) is a hybrid steerable semirigid S-shaped video stylet that can assist in difficult airway management. It has a flexible distal end and a LED screen. The maintenance is easier in comparison with a fiberscope and the device is readily usable in case of emergency[1].

As a follow up to a previous study[2], our aim is to establish a learning curve and assess the handling of the SensaScope® on a difficult intubation manikin (Karl Storz, Tuttlingen, Germany) by anesthetists with various degrees of experience.

METHODS: With oral informed consent, 34 anesthetists were included in 4 groups according to their experience with fiberoptic bronchoscopy assisted intubation (FOI): senior anesthetists having previously performed ≥20 FOI (n=7), senior anesthetists having performed <20 FOI (n=16), trainees in anesthesia (FOI=0, n=5) and anesthesia nurses (FOI=0, n=6).

After detailed explanations, each operator performed six successive SensaScope assisted intubations (SAI) on the manikin.

The time taken to complete intubation (t) was defined as the time between picking up the device and removing it from the manikin with the tube in place. We recorded t, the final tracheal tube position and the degree of difficulty of the procedure. An user satisfaction score on a 1 to 10 scale was also recorded.

The mean times for each of the six attempts were compared by the Mann - Whitney test.

RESULTS: The thirty four subjects performed 204 SAI. The average intubation time diminished rapidly and the time for the 2nd to 6th SAIs were significantly lower than the 1st SAI. From the 3rd attempt on, the mean intubation time was constantly lower than 30 seconds. There were 5 esophageal intubations attributed to rushing.

The operators experienced in fiberoptic intubation constantly performed better than those in other groups ($p<0.035$). No other differences across groups were observed.

The average user satisfaction score was 6.67 and was not correlated with experience or performance.

DISCUSSION: The SensaScope® is easy to handle and SAI has a fast learning curve with good operator satisfaction.

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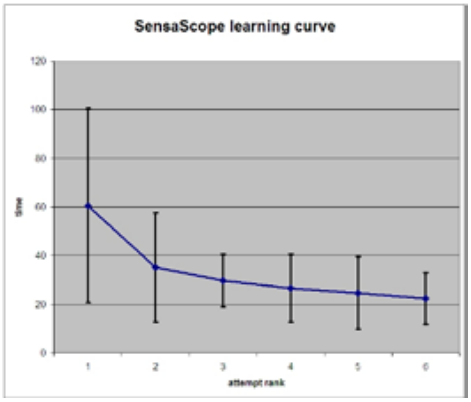

S-256.

U.S. ADOPTION OF ANESTHESIA INFORMATION MANAGEMENT SYSTEMS (AIMS): RESULTS FROM A NATIONAL SURVEY

AUTHORS: I. S. Stol, W. S. Sandberg, J. M. Ehrenfeld

AFFILIATION: Vanderbilt University, Nashville, TN

INTRODUCTION: AIMS are a specialized form of electronic health record (EHR) that facilitate reliable acquisition, storage, and display of patient data during the perioperative time frame. (1) Widespread adoption of AIMS, which have been in existence since the 1970s, has been hindered primarily by the financial barriers associated with their implementation (2). As a result, only an estimated 5% of U.S. operating rooms had an AIMS in 2006 (3). Adoption rate of AIMS has increased recently, driven primarily by a need to address increased regulatory reporting requirements. Furthermore, programs such as the 2009 Federal EHR Incentive Program, which provides a financial incentive for the "meaningful use" of certified EHRs, are designed to speed adoption. In this study, we determined the trends in adoption of AIMS from a nationally representative survey of U.S. hospitals.

METHODS: We compiled and distributed a nationwide survey to 200 hospitals to evaluate trends in U.S. hospitals' adoption of AIMS. We chose a representative sample of U.S. hospitals based on the following variables: Size, Geography, Urban/Rural, and Teaching/ Non-Teaching. Twenty possible combinations of these variables were identified as representative of all hospitals. Ten hospitals were then randomly selected to be surveyed in each category, totaling 200 hospitals.

RESULTS: 106 surveys were returned. 33% of the hospitals reported using an AIMS, and 67% reported no AIMS use. Of those hospitals who reported using an AIMS, 67% reported installing AIMS within the past 5 years. Geographically, 6.1% were located in the Southwest, 24.2% were located in the Midwest, 27.2% were located in the Northwest, and 21.2% were located in the West and Southeast. In terms of academic status, 81.8% were teaching hospitals, and 21.2% were non-teaching hospitals. Additionally, 9.1% of the hospitals were small, while 90.9% were large. Only one hospital with an AIMS was rural, while the other 96.9% were urban.

DISCUSSION: The survey identified AIMS adoption as disproportionately high in teaching hospitals over nonteaching hospitals, large hospitals over small hospitals, and urban hospitals over rural hospitals. Additionally, AIMS use seems more sparse in the Southwest region, but more evenly distributed among the other 4 geographical regions in the United States. The 67% of hospitals who had installed an AIMS within the last 5 years are likely indicative of the effects of the increased regulatory and reporting requirements driving adoption of EHR technology.

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S-257.

NON-INVASIVE HEMOGLOBIN MONITORING DURING CARDIOVASCULAR SURGERY

AUTHORS: D. Nabor[1], B. Ekstrom[1], P. S. Pagel[1],2, M. L. Riess[1,2]

AFFILIATION: [1]Medical College of Wisconsin, Milwaukee, WI; [2]Anesthesiology, VA Medical Center, Milwaukee, WI

INTRODUCTION: Hemoglobin (Hb) is frequently monitored intraoperatively to optimize oxygen-carrying capacity and -delivery. A new multi-wavelength spectrophotometric method offers continuous, non-invasive hemoglobin monitoring (SpHb). In this observational study, we compared SpHb CO-oximetry values with arterial hemoglobin blood samples in cardiovascular surgery patients (n=8).

METHODS: The Radical-7™ Pulse CO-Oximeter (Masimo, Irvine, CA) measurements of SpHb were recorded concurrent with Hb results from arterial blood samples at regular intervals throughout the operation at the discretion of the anesthesiologist. Linear regression analysis and Bland-Altman plots were used to compare the results.

RESULTS: In vascular patients (n=5), SpHb was highly correlated with Hb (SpHb = 1.01±0.10 x Hb - 0.05±1.14, R2 = 0.91) when the pulse oximeter was set to arterial; in contrast, venous setting introduced a bias of +3.04 g/dl in SpHb over Hb. In addition, preliminary results from cardiac surgery patients (n=3) suggest that SpHb overestimates Hb by 3 to 4 g/dl, even when set to arterial.

DISCUSSION: Continuous SpHb monitoring may offer advantages over traditional arterial blood gas sampling by avoiding complications from invasive catheter placement and maintenance, frequent blood draws and by providing real-time resolution, thus decreasing overall costs and risks and increasing patient comfort and safety. Our data suggest a reasonable agreement between non-invasive SpHb and Hb in major vascular surgery patients within 1 g/dl. Its accuracy during cardiac surgery remains to be determined. In contrast to ICU patients,[1] the need for improved accuracy and validation in different surgical patients is in line with studies in healthy volunteers,[2] emergency room patients[3] and patients undergoing Cesarean sections,[4] abdominal,[5] cardiac[6] or spine surgery[7] where decreased peripheral perfusion was identified as an important limitation to obtain reliable SpHb values, and overestimation of Hb by SpHb was noted at lower Hb levels.[7,8] At this point, SpHb may serve as an useful adjunct to other clinical monitoring, provided that its current limitations are understood and addressed. Further studies are necessary to determine its usefulness in different patient populations.

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S-258.

PULSE TRANSIT TIME CAN PREDICT THE HEMODYNAMIC EFFECTS OF POSITIVE PRESSURE VENTILATION

AUTHORS: K. Yamashita, T. Kawano, T. Yatabe, H. Abe, M. Yokoyama

AFFILIATION: Anesthesiology and Critical Care Medicine, Kochi Medical School, Nankoku, Japan

INTRODUCTION: Application of positive end-expiratory pressure (PEEP) was known to lead a decreasing in cardiac output (CO). Therefore, we should pre-evaluate the hemodynamic status before application of PEEP. For predicting CO changes, stroke volume variation (SVV) and pulse pressure variation (PPV) has been a useful less-invasive parameter. Pulse transit time (PTT), measured as the interval from the ECG R wave to the pulse plethysmograph upstroke, is recently introduced to non-invasively assess cardiovascular response including CO. We hypothesized that PTT variation (PTTV) might be a useful parameter to predict CO change. The present study, therefore, examined the ability of SVV, PPV and PWTTV for estimated CO change.

METHODS: After approval of the institutional Ethics and obtaining written informed consent, twenty-five patients who underwent elective orthopediac surgery (ASA PS2) were enrolled in this study. During anesthesia, ECG, the plethysmograph and the radial arterial pressure wave were obtained from standard monitoring equipment and FloTracTM Vigileo sensor (Edwards LifeScience). The rise point of the pulse wave was defined as the point at which the differentiated pulse wave reached 30% of its peak amplitude. The measurement was made under controlled ventilation (tidal volume 8 ml/kg, respiratory rate 8/min). We changed positive end-expiratory pressure (PEEP) from 0 to 15 cmH2O step by step by 5 cmH2O interval and calculated PPV and PTTV every 32 beats. SVV was obtained from FloTracTMVigilleo monitor. Receiver Operating Characteristics curve was used to compare the predictive ability for >15% estimated changes in CO.

RESULTS: Area under the curve were 0.789 in SVV, 0.825 in PPV and 0.772 in PWTTV respectively. Cut off point were 10% (74 %; sensitivity, 85%; specificity) in SVV, 11% (73%, 85%) in PPV and 8% (73%, 67%) in PWTTV respectively.

DISCUSSION: PTTV might be a useful parameter to estimate the >15 % changes in CO induced by PEEP in accordance with SVV and PPV under clinical setting.

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S-259.

40 CASES OF TRACHEAL INTUBATION USING BOTH STYLETSCOPE AND GLIDESCOPE (THE TAKUMI METHOD)

AUTHOR: K. Dote

AFFILIATION: Ehime, Japan

INTRODUCTION: Even though the tracheal intubation using Stylet scope (following SS) or Glide scope (following GS) is useful for the case of difficult airway, it does not spread in Japan. Therefore we attached a camera for endoscope to SS and made an image of the SS in a monitor display. And, we also used GS at the same time. Because we made a new method of tracheal intubation using both images of SS and GS, we report it.

METHODS: [subject] 30 cases that tracheal intubation was urgently required for the general anesthesia and 10 cases that tracheal intubation needed for the respiratory distress in the ward. [method] We connected SS to a camera for endoscope and showed 8 inches of monitor. And the left of the monitor, the monitor of GS was placed. We performed the tracheal intubation using both SS and GS. We measured successful / failure of this intubation, the intubation time, Cormack Grade, and the number of trial.

RESULTS: 38 of 40 success, two failure. Two cases of the failure was gave it up with not being obtained images by massive bleeding. They were patients who needed intubation for respiratory tract hemorrhage in the ward. In other 38 cases, intubation time was required from 5 to 75 seconds (an average of 20.1 seconds). Cormack Grade in 38 cases is C1:16, C2:16, C3:6. All 30 cases in the operation room required only once trial, but 3 of 8 cases in the ward required twice trial.

DISCUSSION: (1) The Takumi Method, tracheal intubation using both Stylet scope and Glide scope, is useful for tracheal intubation. (2) It may be useful for tracheal intubation in the ward, especially for the cases of difficulty airway.

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S-260.

COMMON INDICATIONS OF HYPERBARIC OXYGEN (HBO2) THERAPY IN THE UNITED STATES: A SURVEY OF HBO2 THERAPY FACILITIES

AUTHORS: P. Saththasivam, M. Pell, K. Voralu, G. Mychaskiw

AFFILIATION: Anesthesiology and Perioperative Medicine, Hahnemann University Hospital/Drexel University College of Medicine, Philadelphia, PA

INTRODUCTION: HBO2 therapy has been documented to be beneficial as a primary or an adjunct treatment modality for many medical conditions. The Food and Drug Administration (FDA) has approved 14 indications for this treatment modality but the off label use of HBO2 therapy has been rising in response to public demand.

METHODS: Hospital affiliated and free standing clinics that offer HBO2 therapy in the USA were searched online and contacted via telephone. Survey questionnaires were sent through fax or email to the HBO2 therapy facilities which were willing to participate in this study.

RESULTS: A total of 115 HBO2 therapy facilities agreed to participate in this survey. The response rate was 80%, where 92 facilities completed and returned the survey questionnaires. Almost all the facilities were staffed with physicians (98.9%) and trained personnel (79.3%). Most of the facilities were equipped with mono-place chambers (81.5%) and also administered adjunct therapies (91.3%) (Table 1).

Wound healing and delayed radiation tissue damage were the most common indication for HBO2 therapy in adults. Meanwhile, compromised skin grafts and flaps and other acute traumatic peripheral ischemia were the most common indications for HBO2 therapy among patients aged less than 16 years old. The results also indicated a wide range of other conditions treated with HBO2 therapy. The number of patients received HBO2 therapy for ischemic stroke and traumatic brain injury (in adults) and cerebral palsy, autism and Rett syndrome (in patients aged less than 16 years old) (Table 2) were above the average range.

DISCUSSION: HBO2 therapy is being administered for many other medical conditions besides the currently approved indications. Clinical research and support from the scientific community is required to further investigate the potentials of this therapy.

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S-261.

INFLUENCES OF METHANE IN CONCENTRATION DETERMINATION OF VOLATILE ANESTHETICS IN HUMAN AND GOATS

AUTHORS: Z. Li[1,2], J. Liu[2,3]

AFFILIATION: [1]Department of Pharmacology, West China School of Pharmacy, Sichuan University, Chengdu, China; [2]Lab of Anesthesia and CCM, West China Hospital, Sichuan University, Chengdu, China; [3]Department of Anesthesiology, West China Hospital, Sichuan University, Chengdu, China

INTRODUCTION: It is very important to real-timely and accurately measure concentrations of volatile anesthetics for properly anesthetic depth evaluation, both in operating rooms and animal researches. In the 1970's, Anesthetic Gas Module (AGM) which used infrared absorption technology began being used to measure commonly used volatile anesthetics. However, methane, which could be produced in digestive tracts of human and ruminant animals with a large intestinal fermentation compartment such as goats[1,2], might influence concentration determination of volatile anesthetics. It is induced by many AGMs using 3.3μm infrared ray in volatile anesthetics concentrations determination and methane also absorbed at 3.3μm infrared ray[3]. Therefore, we design this study to investigate if methane could affect concentrations determination of the commonly used volatile anesthetics.

METHODS: In vitro study, different concentrations isoflurane and sevoflurane, were randomly mixed with different concentrations methane gas (Fig.1). The concentrations of the mixed gases were measured by Datex-ohmeda AGM-103 (10.3-13μm infrared ray), Philips M1026B (3.3μm infrared ray) anesthetic gas module and Aglient 4890D Gas Chromatograph, respectively[4]. In vivo study, methane concentrations in end tidal gas of goats and human were measured by the gas chromatograph to determine whether this concentration range of methane affect the concentrations determination of volatile anesthetics.

RESULTS: No differences were found in the concentrations determination of the mixed gases measured by Datex-ohmeda AGM-103, Philips M1026B anesthetic gas module and Aglient 4890D Gas Chromatograph (Fig.1). The concentration measurement of volatile anesthetics would not be affected by methane when the methane concentration was less than 500ppm in using Datex-ohmeda AGM-103, compared to 1000ppm (isoflurane) or 250ppm (sevoflurane) for Philips M1026B (Fig.1). In goats, the methane concentration of the end tidal gas was much higher than that of esophageal gas (280.8±53.8ppm vs. 2.70±0.7ppm, Fig.2); In healthy human volunteers, there is a very low methane concentration of the end tidal gas. (1.06±0.05ppm)

DISCUSSION: When using the two Anesthetic Gas Module, concentrations determination of isoflurane and sevoflurane were dose-dependently influenced by methane. In general, in clinical and experimental states, concentrations determinations of isoflurane and sevoflurane were not affected by methane for their low concentration range. Goats produced methane and primarily excreted via the lungs.

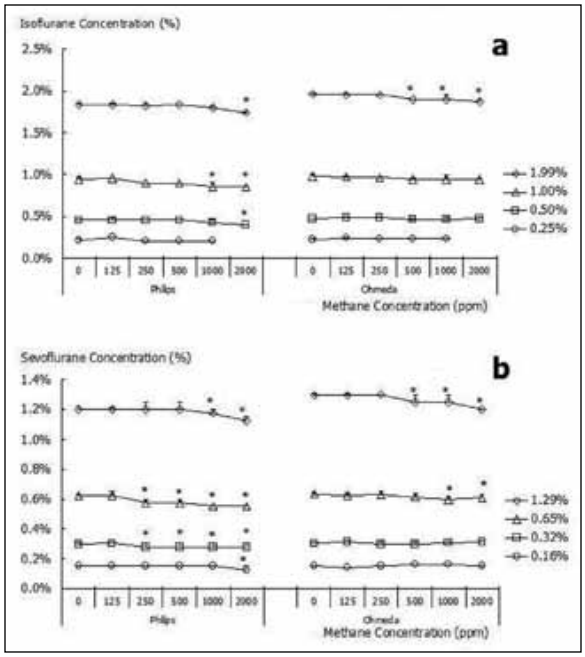

Figure 1 The concentrations of the mixed gases which were measured by Datex-ohmeda AGM-103, Philips M1026B anesthetic gas module and Aglient 4890D Gas Chromatograph. * P < 0.05 vs. 0 ppm methane.

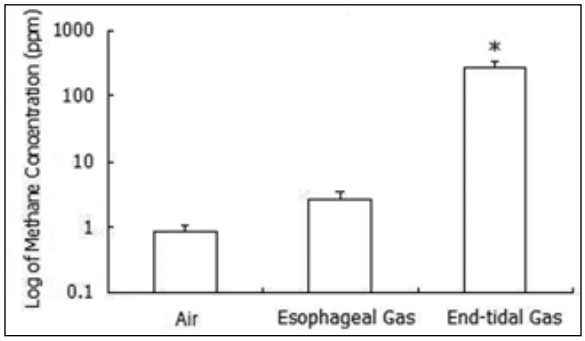

Figure 2 Comparision of the methane concentration of the end tidal gas and esophageal gas. * P < 0.05 vs. Air.

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S-262.

GENERAL ANESTHESIA PROLONGS MODIFIED PULSE WAVE TRANSIT TIME

AUTHORS: A. Yoshida, T. Terada, S. Okino, R. Muto, N. Sato, R. Ochiai

AFFILIATION: Anesthesiology, Toho University Medical Center Omori Hospital, Tokyo, Japan

INTRODUCTION: Modified pulse wave transit time (m-PWTT), which is defined as the interval between the R wave of the electrocardiogram and the arrival of pulse wave at the peripheral artery, consists of the left ventricular pre-ejection period (PEP) and the pulse wave propagation time along the large and peripheral arteries.

m-PWTT reflects both cardiac performance and the physical properties of blood vessels, and it is theoretically correlated with stroke volume (SV).

In support of this theory, a novel and minimally invasive method for continuous cardiac output (CO) monitoring has been developed, and a good correlation between CO determined based on m-PWTT and that determined using the thermodilution technique has already been reported.

However, the effect of general anesthesia on PWTT is still unclear, and thus, in the present study, we investigated the changes in m-PWTT in patients under general anesthesia.

METHODS: After obtaining approval from the institutional review board and informed consent from the patients, 30 ASA 1-2 women undergoing gynecological laparoscopic surgery were enrolled.

Descriptive statistics (mean +/- SD) were obtained for age (37.8 +/- 8.0 years), height (158.4 +/- 5.7 cm), and weight (54.8 +/- 5.7 kg).

Patients underwent propofol induction, followed by maintenance with sevoflurane and remifentanil.

m-PWTT was recorded at the following 5 time points using electrocardiography and fingertip pulse oximeter: 1) before induction (control), 2) immediately after induction, 3) operative time, 4) end of surgery, and 5) after extubation.

Data were analyzed using one-way ANOVA with Bonferroni post hoc test. $P < 0.05$ was considered statistically significant.

RESULTS: The m-PWTT (mean +/- SD) at each time point was as follows: 1) 183.4+/- 16.8 ms, 2) 196.5 +/- 18.5 ms, 3) 209.3 +/- 16.1 ms, 4) 211.2 +/- 18.4 ms, and 5) 184.2 +/- 16.5 ms. At time points 2-4, m-PWTT was significantly prolonged more than the control.

DISCUSSION: Our study shows that the induction of general anesthesia prolongs m-PWTT, which persists throughout anesthesia.

The increase in PEP and delay in pulse wave propagation are considered to be a result of the cardiodepressant and sympathoinhibitory effects of the general anesthetics, respectively.

In addition, the dispersion of m-PWTT at each time point is within 10% of the mean value, suggesting that m-PWTT may be an alternative parameter to estimate SV or CO, without correcting for age or physique.

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S-263.

CORRELATION OF BISPECTRAL INDEX SCORES TO MEMORY FORMATION FOLLOWING PREMEDICATION WITH MIDAZOLAM

AUTHORS: X. Zheng, M. Feng, P. O'Connor, M. King, P. Lyons, D. Glick

AFFILIATION: Anesthesia and Critical Care, University of Chicago, Chicago, IL

INTRODUCTION: The Bispectral Index (BIS) has been marketed as a tool to help reduce awareness by measuring the patient's level of consciousness as a score from 0 (no brain activity) to 100 (full consciousness). This study explored the correlation between BIS scores and memory formation after preoperative sedation with midazolam.

METHODS: After IRB approval and informed consent 60 benzodiazepine naïve adult subjects were enrolled. A BIS Quatro™ Monitor was placed on patients' foreheads, preoperatively. BIS scores were recorded at 5, 3, and 1 minute before administration of midazolam, immediately after administration, and at 1 and 3 minutes after midazolam. At each recording, patients were given a word and instructed to remember it. A total of 6 words were given, 3 before and 3 after midazolam. Patients were interviewed at 2 hours and 24 hours postoperative to assess recall of the cued words. A word was considered recalled if patients remembered it without prompting at either interview.

RESULTS: Statistically significant differences were found between the number of recalled words before and after midazolam (2.3 and 0.9, respectively). The average BIS score for recalled words was 96.2 versus 93.7 for unrecalled words, a difference that was again statistically significant. Focusing on consecutive words, 70% of patients recalled word 3 (the last given pre-midazolam) whereas only 50% recalled word 4 (the first given post-midazolam). The corresponding BIS scores decreased an average of only 0.41 points from word 3 to word 4. Interestingly, there was no statistically significant difference in BIS scores between patients who recalled both words 3 and 4 and those who only recalled word 3. There was a 25% reduction in recall from word 4 to word 5 and a relatively large 2.9-point drop in overall BIS scores between those two words. A smaller proportion of patients lost recall from word 5 to word 6 (9%) with an overall BIS score reduction of 0.69 points.

DISCUSSION: These data suggest that BIS score reductions lag behind initial loss of recall. This may partly be explained by the 30 second running averaging technique used by the BIS monitor, although the actual time between readings was 2 minutes. It is also possible that the BIS score does not capture the most immediate effects of benzodiazepines on memory, or that memory loss under mild sedation is initiated by a route different from that which BIS monitors. Additionally, while the decreases in recall rates were large, the drop in BIS scores was relatively small (only 4 points, overall) suggesting that even statistically significant changes in BIS readings might not be clinically relevant.

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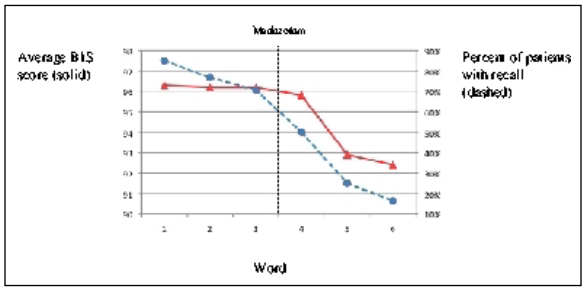

S-264.

THE HEMODYNAMIC CHANGES DURING PERCUTANEOUS CLOSURE OF ATRIAL SEPTAL DEFECT USING AMPLATZER SEPTAL OCCLUDER

AUTHORS: S. Okino, T. Terada, A. Yoshida, R. Muto, N. Sato, R. Ochiai

AFFILIATION: Anesthesiology, Toho University, Tokyo, Japan

INTRODUCTION: Since percutaneous closure of atrial septal defect (ASD) using Amplatzer septal occluder (ASO) is less invasive than surgical repair, this procedure has become popular. However, the hemodynamic change during the procedure has not been well understood. In the present study, we examined the hemodynamic change by using a novel monitoring system, estimated continuous cardiac output (esCCO) which is derived from modified pulse wave transit time (mPWTT) between R wave of electrocardiogram and the pulse wave arrival at the finger tip by pulseoximetry.

METHODS: 5 adult patients, who underwent ASD closure by ASO under general anesthesia were studied with a written informed consent in October and November 2011.

Mean arterial pressure (MAP), heart rate (HR), stroke volume index (SVI) and cardiac index (CI) were continuously recorded throughout the procedure. 5-minute-data were averaged immediately prior to the closure of ASD as control, 5 minutes after closure (A), and 10 minutes after closure (B). SVI and CI were obtained by using mPWTT (esCCO system, Nihon Kohden, Tokyo, Japan), which was calibrated by cardiac output measured by transesophageal echocardiography. % changes from control values were obtained, and statistical analysis was done by Wilcoxon signed-rank test, where a p value less than 0.05 was considered as statistically significant.

RESULTS: Demographics of the patients: 2 males and 3 females; age 49-64 years, height 153-171 cm, weight 45-65 kg, BSA 1.41-1.77 m2, ASA PS 1-2, left-to-right intracardiac shunt; Qp/Qs= 1.6-3.3. The hemodynamic changes were: mBP; (A) 108±6 %, (B) 104±5 %, HR; (A) 97±3 %, (B) 90±5 %, SVI; (A) 108±3 %, (B) 107±6 %, CI; (A) 105±4 %, (B) 98±8 %. HR decreased significantly after the procedure but MAP, SVI and CI showed no significant change. It is suggested that ASD closure by ASO is a safe procedure because of the minimal hemodynamic changes.

DISCUSSION: Since less invasive procedures have become popular in various settings, less monitoring system is required. It is suggested that esCCO system is minimally invasive and suitable for such procedures to monitor cardiac performance, but further study with larger number of patients is needed to clarify its feasibility.

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S-265.

RELATIONSHIP ACCURACY OF ESTIMATED CONTINUOUS CARDIAC OUTPUT AND HEMODYNAMIC PARAMETERS

AUTHORS: T. Terada, S. Okino, A. Yoshida, R. Muto, N. Sato, R. Ochiai

AFFILIATION: Anesthesiology, Toho University, Tokyo, Japan

INTRODUCTION: The use of a pulmonary artery catheter (PAC) is a standard technique for measuring cardiac output in acute-care settings. However, this technique is invasive, and the efficacy of PACs in improving clinical outcomes is controversial. Therefore, noninvasive cardiac output monitoring is required in the perioperative period. Estimated continuous cardiac output (esCCO) is based on pulse-contour and m-PWTT analyses. m-PWTT is defined as the interval between the R wave of the electrocardiogram and the pulse at the peripheral artery, and consists of the pre-ejection period (PEP) and pulse wave transit time (PWTT). When PEP plays a larger role in the m-PWTT, the accuracy of determining esCCO might be poor because of unexpected changes in PEP, but the reason for this is not clear. In this study, we investigated the relationship accuracy of esCCO and the following hemodynamic parameters: mean blood pressure (mBP), heart rate, cardiac output, and systemic vascular resistance (SVR).

METHODS: After obtaining approval from the institutional review board and informed consent from the patients, PAC therapy was used during the perioperative period. The patients underwent propofol induction, followed by maintenance therapy with sevoflurane and remifentanil. After induction, a PAC was placed for measuring injection cardiac output (ICO). ICO and esCCO were simultaneously measured at 1-hour intervals during the operation. The relationship between the differences in the ICO and esCCO, which were simultaneously measured, and hemodynamic parameters was analyzed.

RESULTS: Descriptive statistics (mean ± SD) were calculated for age (38.4 ± 13.5 years), height (158.4 ± 5.7 cm), weight (54.8 ± 5.7 kg), and gender (men, 12; women, 5). The differences in the simultaneous measurements of ICO and esCCO increased with increase in the ICO and decrease in the SVR.

DISCUSSION: When PEP plays a larger role in the m-PWTT, the accuracy of estimating esCCO might be poor. esCCO is noninvasive and can be useful if we understand the properties of this device.

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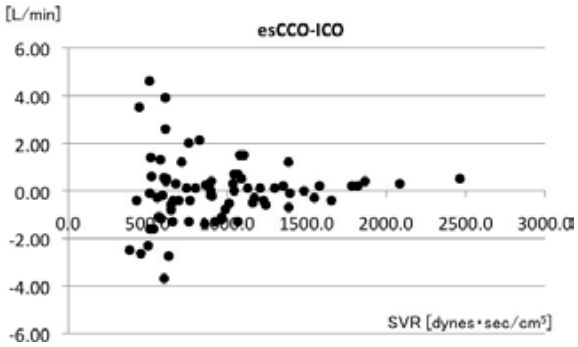

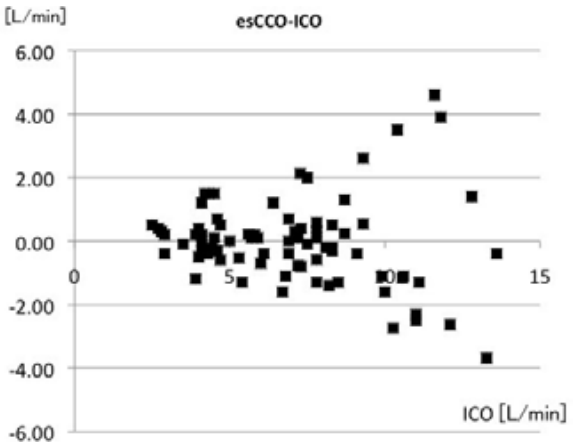

S-266.

SUCTION DEVICE UTILIZATION STRATEGIES TO REDUCE OPERATING ROOM NOISE

AUTHORS: M. J. Sharpe, J. P. Anderson, S. McNulty

AFFILIATION: Anesthesiology, Thomas Jefferson University Hospital, Philadelphia, PA

INTRODUCTION: The World Health Organization recommends noise levels in operating rooms do not surpass 35 dB. The Environmental Protection Agency recommends noise not exceed 45 dB in hospitals. Anesthesia providers routinely use suction intraoperatively. There are a variety of permutations of suction device utilization which may produce varying degrees of noise. The extent of noise produced by this equipment, as well as the least noisy means of operating suction devices is unknown. This study seeks to describe the noise produced by various permutations of suction device apparatuses.

METHODS: A Extech Digital Datalogging Model HD600 sound meter was placed 10cm from suction devices in operating rooms. It was noted whether device was a portable suction unit or one connected to institution's "wall" suction, and whether the suction unit was connected to a bronchoscope, a Yankaeur tip or left open to the environment. Acoustic data were acquired once per second for one minute and stored in an MS-Excel spreadsheet. Average noise level, minimum, maximum, and 95% confidence levels were calculated.

RESULTS: 48 total noise measurements from 25 different operating rooms revealed average noise for all suction devices measured was 71.53 dB(A) (95%CI: 71.26-71.79 dB(A), avg max: 74.42 dB(A)).

45 wall suction devices produced average noise of 71.17 dB(A) (95%CI: 70.91-71.44 dB(A), avg max: 74.10 dB(A)). Of the devices connected to wall suction, 21 were attached to a Yankaeur and measured 67.82 dB(A) (95%CI: 67.71-67.92 dB(A), avg max: 69.32 dB(A)). 11 wall suction devices were connected to bronchoscopes and measured 73.07 dB(A) (95%CI: 73.00-73.13 dB(A), avg max: 73.71 dB(A)). 13 wall suction canisters were left open to the environment and measured 75.00 dB(A) (95%CI: 74.29-75.70 dB(A), avg max: 82.16 dB(A)).

3 portable suction devices connected to a Yankaeur tip produced average noise 76.81 dB(A) (95%CI: 76.54-77.07 dB(A), avg max: 79.10 dB(A)).

DISCUSSION: All measured suction devices produced levels of noise above accepted thresholds. Portable suction devices produced statistically significantly more noise than wall suction devices and should be avoided wherever possible. Wall suction units produce the least amount of noise when connected to a Yankauer tip, and more noise when connected to a bronchoscope. Wall suction devices produce the most noise when connected to an open canister. When not actively suctioning patients, wall unit suction devices should either be turned off or remain attached to Yankaeur tip to produce the least amount of noise.

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S-267.

SCALING EXPONENT OF DFA FOR HRV AS AN ASSESSMENT OF ACTIVITY OF ANS DURING SURGICAL OPERATION

AUTHORS: J. Yeh[1], S. Fan[2]

AFFILIATION: [1]Research Center for Adaptive Data Analysis, National Central University, Taoyuan, Taiwan; [2]Anesthesiology, National Taiwan University Hospital, Taipei, Taiwan

INTRODUCTION: The present studies showed the scaling exponent (α1), scales of 4-11, of detrended fluctuation analysis (DFA) reflects the short-term fractal organization in heart rate variability (HRV) as an assessment for sympathovagal modulation of cardiac systems. Furthermore, activity of autonomic nerve system (ANS) acts differently form consciousness in anesthesia. In this investigation, DFA α1 was used as an assessment for the activity of ANS during surgical operations.

METHODS: Heartbeat time series of 10 patients who accepted surgical operations were analyzed using DFA to evaluated the activities of ANS during surgical operations. The events of induction, intubation, drugs injections, and the actions of operations were marked for the purpose to address the probable changes of ANS activity. Values of DFA α1 varying with time were used to be compared with the probably event-driven changes of ANS activity for the purpose of evaluating the performance of α1. During the surgical operations, state entropy and response entropy were maintained at stable states with values from 30 to 50 on the maintenance stage of anesthesia.

RESULTS: Average of the corresponding short-term scaling exponent of DFA is 0.97 ± 0.07. Referring the correlated studies about of DFA α1 for different stages during sleep: value of DFA α1 is 0.9-1.0 for stages 1 & 2; 0.8-0.9 for stage 3; and 1.1-1.2 for REM stage. The average of DFA α1 for patients under anesthesia is similar to that of subjects during light sleep stage. Moreover, DFA α1 also signifficiently responded to the effects of stimuli, such as intubation, surgical stresses, and the drugs.

DISCUSSION: The activities of ANS are signifficiently independent from the consciousness. Even under anesthesia, ANS still works to take responses to surgical stresses and the effects of drugs. To maintain ANS activity within an appropriate dynaimc range is an important part of anesthesia. So far, the short-term scaling exponent of DFA to human heartbeat time series is considered as a good assessment of ANS activity. More details of the connections between DFA α1 and ANS activity should be investigated in the following works.

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S-268.

THE ACCURACY OF NONINVASIVE AND CONTINUOUS TOTAL HEMOGLOBIN MEASUREMENT BY PULSE CO-OXYMETRY UNDERGOING HEMODILUTIONAL AUTOLOGOUS TRANSFUSION

AUTHORS: J. Saito[1], M. Kitayama[1], T. Kudo[1], H. Hashimoto[2], K. Hirota[1]

AFFILIATION: [1]Anesthesiology, Hirosaki University Graduate School of Medicine, Hirosaki, Japan; [2]Surgical Center, Hirosaki University Graduate School of Medicine, Hirosaki, Japan

INTRODUCTION: Monitoring of total hemoglobin levels is one of the most essential indicator of the need for blood management during surgery. Recently new technology, pulse CO-Oxymetry with SpHbTM (SpHb) provides noninvasive and continuous hemoglobin measurement. The SpHb may enable a more rapid detection of clinically significant blood loss. However few studies showed accuracy of the SpHb during acute Hb change, normovolemic hemodilution or rapid blood transfusion[1,2]. We then evaluated the accuracy of SpHb compared with invasive laboratory CO-Oxymetry (tHb) undergoing acute normovolemic hemodilution and the following autologous blood transfusion

METHODS: After receiving IRB approval and written informed consent, twenty four patients were enrolled in this study. They were scheduled to undergo urological or gynecological surgery, in which a blood loss of about 500 ml or more was anticipated. After induction of general anesthesia, two units of blood, approximately 800 ml were drawn and stocked in pair of blood correction bags through a central venous catheter. Replacement of the corrected blood was done with 1,000 ml of lactate Ringer solution included 3% dextrane40 taking care that normovolemic state was maintained all the time. Blood samples were obtained from a radial artery catheter three times, pre-, during and post- of each phase, hemodilution and autologous transfusion, in which acute tHb level changed dramatically. During surgery blood samples were obtained every 30 min. In the same point, SpHb, Perfusion index and Pulse variability index were continuously monitored and manually recorded.

RESULTS: Two hundred twenty eight bloods samples for tHb measurement were corrected with equal number of paired SpHb measurements. Liner regression analysis of all SpHb and tHb values is shown in Figure 1. A Bland-Altman plot is shown in Figure 2. Mean bias and precision of 228 SpHb and tHb values were 1.12 g/dl and 1.25 g/dl, respectively. There was no significant difference in SpHb accuracy parameter between acute hemodilutional phase and autologous transfusion phase.

DISCUSSION: Compared to previous studies in healthy subjects, this study revealed the tendency of SpHb values higher than tHb values. This discrepancy in SpHb may be affected by several factors, peripheral digital perfusion, intravascular volume and acute changes in tHb3). Furthermore this study indicates that general anesthesia may also affect accuracy of SpHb measurement. In future investigations, we could use this new noninvasive monitor as clinical decision making to guide transfusion therapy with to gain better insights into these limitations.

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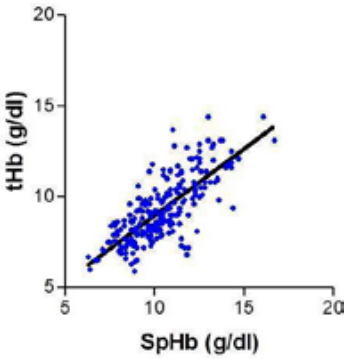

Figure 1. A scatterplot of 228 hemoglobin values as determined by SpHb and tHb collected from 24 patients (r2=0.56, n=228, p<0.0001).

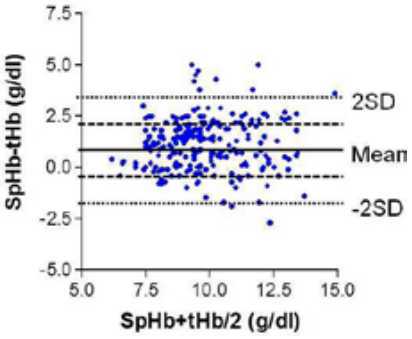

Figure 2. A Bland-Altman plot of 228 hemoglobin values as determined by SpHb and tHb collected from 24 patients (Bias=1.12 g/dl, Precision=1.25 g/dl).

S-269.

USE OF FIBER OPTIC SPECTROSCOPIC TECHNOLOGIES TO MONITOR SPINAL CORD ISCHEMIA IN REAL TIME

AUTHORS: A. Emanuel[1], R. Galler[3], A. D'Souza[4], R. Mesquita[5], A. Yodh[5], T. Floyd[1,5]

AFFILIATION: [1]Dept. of Anesthesiology, Stony Brook University Medical Center, Stony Brook, NY; [2]Dept. of Surgery, Stony Brook University Medical Center, Stony Brook, NY; [3]Dept. of Neurosurgery, Stony Brook University Medical Center, Stony Brook, NY; [4]Dept. of Biomedical Engineering, Stony Brook University, Stony Brook, NY; [5]Dept. of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA

INTRODUCTION: Spinal cord injury remains a devastating complication of aortic surgery. Spinal cord ischemia may be amenable to treatment if detected early. Failure to rapidly detect spinal cord ischemia can result in permanent paresis and paraplegia, depending on the severity of the loss of perfusion. Current methods employed to detect spinal cord ischemia are indirect, temporally insensitive, and nonspecific. Our objective was to develop a device to monitor changes in spinal cord blood flow and oxygenation, in real-time.

METHODS: A thin fiber optic probe, implementing Diffuse Optical Spectroscopy (DOS) to measure tissue oxygenation and Diffuse Correlation Spectroscopy (DCS) to measure blood flow, was designed and tested in adult Dahl sheep. The device was tested after placement in the mid-thoracic spinal cord region, after both open (laminectomy) and percutaneous approaches were employed. The device was further tested in intrathecal and epidural locations. Spinal blood flow and oxygenation, along with mean arterial pressure (femoral & carotid) were measured during blood pressure manipulations via sodium nitroprusside, neosynephrine or vasopressin administration, and after intra-aortic balloon inflation in the superior descending thoracic aorta.

RESULTS: Changes in spinal cord blood flow tracked closely changes in MAP elicited by all interventions. Patterns of changes in blood flow after interventions were consistent with rapid autoregulation. Significant changes in tissue oxygenation were not elicited. Results were not impacted by positioning in either epidural or subdural space, nor by manner of placement.

DISCUSSION: Our data confirms the novel application of DCS and DOS technologies to appropriately and in real-time monitor changes in blood flow and oxygenation that occur in the spinal cord during various hemodynamic perturbations.

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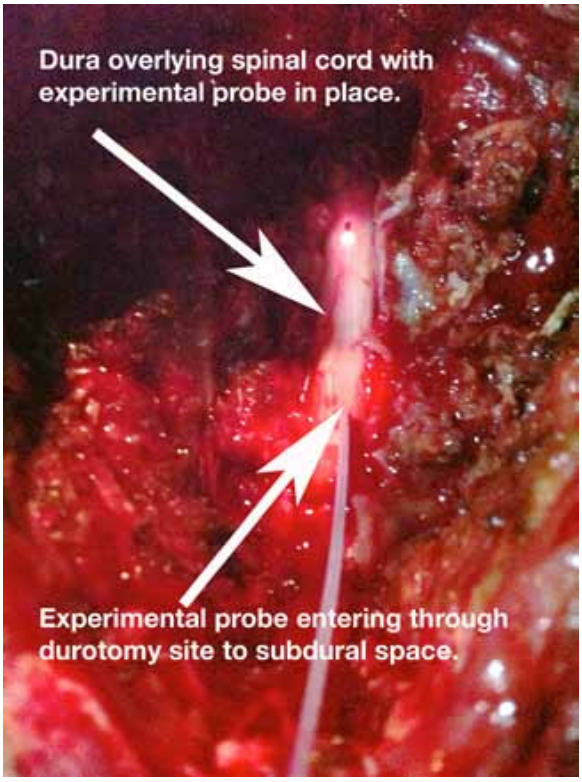

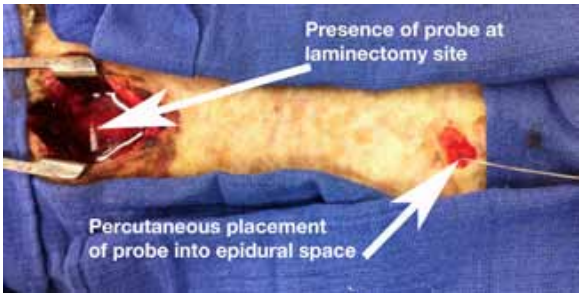

S-270.

DETERMINATION OF POSTOPERATIVE AND INTRAOPERATIVE PREDICTORS OF POST-OPERATIVE DETERIORATION

AUTHORS: K. Gebre-Amlak[1], L. M. Weavind[2], J. M. Ehrenfeld[2]

AFFILIATION: [1]Vanderbilt University School of Medicine, Nashville, TN; [2]Vanderbilt University Medical Center, Nashville, TN

INTRODUCTION: While the morbidity and mortality attributed to anesthesia is low, there continues to be a high post-operative complication rate (23.5-27.6% all complications; 14.9-18.4% major complications)(1). Failure to rescue was associated with a higher mortality rate (12.5-21.4% death after major complication)[1]. These findings suggest that early identification and management of patients who have post-surgical complications can significantly affect morbidity and mortality. We set out to identify pre- and intra-operative characteristics that may be predictive of an adverse event in the immediate post-operative setting (ie within 48 hours post surgery).

In order to address this, we previously reported a pilot study of post surgical patients comparing those who had an unanticipated transfer to the ICU from a surgical ward within 48 hours (n=422) with a second cohort who weren't transferred to an ICU within 48 hours (n=389)[2]. Having found that preop beta blocker usage, intraop vasopressin usage, maximal intraop heart rate, and PRBC transfusion predicted both increased ICU transfer and a two-fold increase in mortality at 30 days (8% vs 4%; p=0.04), we now report our subsequent efforts to extend our predictive modeling.

METHODS: Our work expands upon our original effort to include (1) a larger cohort of patients from 12/04 to 8/11, (2) additional predictor variables (including patient characteristics - PMH, home meds, preop labs, etc.; and a series of intraop physiologic markers - vital sign variability, intraop drug admin patterns, etc.), and (3) a set of secondary outcomes including post-surgical acute kidney injury and cardiac ischemia. We are in the process of utilizing both traditional statistical analysis and advanced machine learning algorithms to model our dataset.

RESULTS: We identified a cohort of 62,830 adult patients who had a surgical procedure and were admitted to a surgical ward post-op; of these, 735 had an unanticipated transfer to the ICU within 48 hrs in comparison to 57,543 who did not have a post-surgical ICU stay. This is summarized in Table 1. We are now in the process of modeling the differences with regards to preoperative patient characteristics and intraoperative conditions between these patient populations.

DISCUSSION: We have developed an approach to provide a novel multivariate analysis of risk for post-operative adverse events and in the process of building a predictive model for risk assessment for operative patients. We will ultimately integrate our model into an AIMS for prospective testing and validation of the risk score to provide real-time post-operative deterioration predictions.

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Table 1

	Surgical Ward	Floor deterioration with ICU transfer in 48 hours	No post-op ICU stay during hospitalization
Number of pts (%)	62830	735 (1.17)	57543 (91.59)
Average Age (SD)	52.7 (16.4)	58.4 (15.1)	52.1 (16.4)
Length of Stay (SD)	5.2 (7.2)	14.0 (13.4)	4.7 (6.4)
% Male	55.1	55.1	54.4
% Female	44.9	44.9	45.6

S-271.

HOW FAST DOES THE CUFF PRESSURE RISE WHEN USING NITROUS OXIDE?

AUTHOR: R. Marks

AFFILIATION: Miami, FL

INTRODUCTION: It is well know that administering general endotracheal tube anesthesia (GETA) with nitrous oxide may cause the endotracheal tube (ETT) cuff pressures to increase.1. However, it is not clear how rapidly this takes place and how high the pressures will increase, especially with the common use of high volume -low pressure endotracheal tubes. The purpose of this study will be to measure these values in a laboratory model of GETA.

METHODS: We placed a 7.0 I.D. Mallinckrodt Hi-lo ETT (Coviden LLC, Mansfield, MA) in a simulated trachea and inflated the cuff with 9 ml of air to achieve an initial cuff pressure of 20 cm water. When then connected the ETT to a patient ventilator and the trachea to an artificial lung. We instituted CMV at a rate of 10 and tidal volume of 700 ml with a 50% mixture of nitrous/oxygen. We measured the cuff pressure every 5 minutes until reaching a steady plateau. We then measured the amount of volume required to remove from the cuff in order to return to the starting cuff pressure. We then repeated the experiment with a starting pressure of 30 and 40 cm water. We also measured the incremental increase in cuff pressure from injecting air in increments of 0.1 ml from a starting pressure of 20 cm water to a final pressure of 100 cm water. The cuff pressures were all measured using a standard cuff pressure gauge (King System Corp, Germany).

RESULTS: The cuff pressures all reached an equilibrium plateau in about 45-60 minutes with cuff pressures of 60, 64 and 70 from a starting pressure of 20,30 and 40 cm water respectively, The amount of gas removed from the cuff in order to return to the baseline cuff pressures was 0.95, 0.7 and 0.65 respectively. The measurement of cuff pressure as a function of cuff volume exhibited a linear relationship and was found to be approximately 5 cm of water for every 0.1 ml increase in volume between the ranges of 20 - 100 cm water.

DISCUSSION: The experiment showed that the high volume - low pressure cuffs behave quite differently in vivo than expected. Once the cuff has been inflated to the point where the compliance is reduced by contact with the tracheal lumen, the cuff no longer behaves as expected, but rather exhibits linear behavior. In addition, the study shows how rapidly nitrous oxide can elevate the cuff pressure, and we therefore recommend that cuff pressure should always be continuously monitored in patients undergoing GETA with nitrous oxide.

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S-272.

WITHDRAWN.

S-273.

A RADIO SYSTEM FOR RELAYING THE PATIENT MONITOR AUDIO OUTPUT TO THE ANESTHESIOLOGIST DURING PEDIATRIC SEDATION

AUTHOR: A. Targ

AFFILIATION: Targ Mobile Anesthesia, Palo Alto, CA

INTRODUCTION: The anesthesiology motto of "vigilance" reflects the need to be aware of a problem in order to correct it timely. The need for vigilance is particularly acute in the care of children in dental facilities where staff may have no experience with sedation. Pediatric dental facilities usually have distractions not seen in the typical sedation location such as crying children in neighboring operatories, questions from worried parents observing the procedure on their child, the whine of the 500,000 RPM dental drill, helicopter landings, running water, cell phone calls, and the need to leave the area for numerous x-rays to name a few.

To make sure that I hear my monitor's audio output, I built a transmitter into the monitor stand and a receiver into my stethoscope. The system has worked well and comfortably for over 8,000 cases with only rare instances of radio interference.

METHODS: The monitor is a 900 MHz Wireless Camcorder Transmitter/Receiver[1]. The transmitter requires a 1.5V input from an AA battery and has a 150 foot range. It is integrated into the monitor stand, so I installed a 1.5V DC transformer and ran the wires into the battery case of the transmitter and attached each lead to a screw inserted in the appropriate end of a ½" dowel cut to the proper size to act as a permanent "dummy" AA battery. Both transmitter and receiver are 2.0"x2.5"x0.5" and 1.5 ounces without the battery.

RESULTS: N/A

DISCUSSION: N/A

REFERENCES:

1. Sony Model WCS-999 Camera Mountable 900 MHz Lavalier Microphone System, $99.99
2. EmTech Laboratories, Inc., 7745 Garland Circle, Roanoke, VI 24019, $70.00
3. Merk Mini Nano Speakers, Merkury Innovations, 2006 Model: MI-SPNN, $19.99

The transmitter has a long wire attached to its microphone, and, after locating the speaker on my monitor, I permanently mounted the microphone on the stand such that it is as close as possible the speaker. I adjust the monitor volume to control the intensity of the sound I hear with my earpiece. A low monitor volume setting works fine which keeps the beeping and alarms inaudible to the dental staff to not distract them. This should work with any monitor.

The receiver is powered by a single AA battery and can be set to one of three channels which needs to match that of the transmitter. To hear the sounds, I use a custom molded earpiece with a tiny powered speaker built into it (2). This connects to the audio out 1/8" jack of the receiver. If I do not want to wear the earpiece, I use a AAA battery powered speaker (designed for an iPod Nano) (3) that plugs into the audio jack.

The receiver sits in a BBC brand "belt pager pouch" with a Velcro closure that is attached to my stethoscope.

The earpiece needs to have a handle built into it to prevent the power wires from being used as a handle and eventually failing. To manufacture the earpiece, an audiologist needs to make an ear impression (EmTech will want you to send them the 1/8" mono jack and some cable. This can be cut from the bottom of the receiver since it is provided to interface with recording equipment which will never be used in this application).

S-274.

PERIPHERAL NERVE STIMULATION AND RESIDUAL NEUROMUSCULAR BLOCKADE: INTERIM ANALYSIS OF THE RECITE STUDY

AUTHORS: L. Fortier[1], D. M. McKeen[2], K. Turner[3], B. Warriner[4], A. J. Chaput[5], A. Galarneau[6]

AFFILIATION: [1]Hôpital Maisonneuve-Rosemont, Montréal, QC, Canada; [2]IWK Health Centre, Halifax, NS, Canada; [3]Queen's University, Kingston, ON, Canada; [4]Vancouver General Hospital, Vancouver, BC, Canada; [5]The Ottawa Hospital, Ottawa, ON, Canada; [6]Merck Canada, Kirkland, QC, Canada

INTRODUCTION: Residual neuromuscular blockade (rNMB) is common at tracheal extubation (TE) and in the post-anesthesia care unit (PACU). Residual blockade at the time of TE may be associated with an increased risk of hypoxemia, impaired pharyngeal function and risk of aspiration, and airway obstruction.[1] Full recovery of neuromuscular function (TOF ratio ≥0.9) at the time of TE is strongly recommended.[2,3] Use of peripheral nerve stimulation (PNS) and reversal of neuromuscular blocking agents (NMBA) with acetylcholinesterase inhibitors may help to prevent rNMB, but the extent and impact of their use has not been documented in Canadian clinical practice. The RECITE (REsidual Curarization and its Incidence at Tracheal Extubation) study prospectively examined the incidence of rNMB during routine anesthesia practice.

METHODS: RECITE is an ongoing prospective, multicenter trial assessing the incidence of rNMB in ASA class 1-3 adults undergoing elective open abdominal or laparoscopic surgery. All subjects provided written informed consent. Neuromuscular function was assessed using acceleromyography (TOF-Watch® SX). The attending anesthesiologist and PACU nurses were blinded to the TOF-Watch monitoring. NMBA dosing, administration of NMB reversal and the decision to extubate were at the discretion of the anesthesiologist in accordance with local practices. The impact of PNS monitoring on the incidence rNMB at TE and at arrival at the PACU were assessed.

RESULTS: The interim analysis was performed on a total of 141 evaluable subjects recruited at 8 centers between June 2011 and December 2011. The study population was mainly female (74%) and median age 45 years old. Procedures included laparoscopic (54%) and open abdominal (46%) surgeries. Rocuronium was used in 99% of cases. PNS was used in 94% of cases. Overall, the incidence of rNMB at TE and at arrival in the PACU was 57% and 45%, respectively. These findings are independent of PNS monitoring (Table 1).

DISCUSSION: These interim data suggest that despite extensive subjective PNS monitoring in Canadian clinical practice, rNMB was identified in a majority of patients at the time of TE and in a high proportion of patients at arrival in the PACU. Additional intervention(s) other than PNS monitoring are warranted to predict or diagnose rNMB.

REFERENCES:

1. Anesth Analg 2010;111:120
2. Anesthesiology 2003;98:1042
3. Anesth Analg 2004;98:854

Table 1: Incidence and Relative Risk of rNMB

	PNS (TE - N=132) (PACU - N=117)	No PNS (N=9)	Relative Risk [95% CI]*	p Value**
TE (N=141)	75 (57%)	5 (56%)	0.9778 [0.535 - 1.787]	1.000
PACU (N=126)	52 (44%)	5 (56%)	1.2500 [0.673 - 2.320]	0.730

* using SAS Proc FREQ ** using Fisher's exact test (two-sided test)

Geriatric Anesthesia

S-280.

PARADOXICAL FEATURES OF NITROUS OXIDE-OXYGEN-REMIFENTANIL ANESTHESIA

AUTHORS: M. Uchida, N. Fukuhara, A. Maruyama, K. Ishii, M. Tamura, T. Jinma

AFFILIATION: Anesthesiology, Social Insurance Chuo General Hospital, Shinjyuku, Japan

INTRODUCTION: Fentanyl (Fen) alone provides sufficient anesthesia without sevoflurane (SeV), when used with 66% N2O in O2[1]. This study aimed to investigate the features of N2O-O2-remifentanil (Rf) anesthesia, which is largely unknown.

METHODS: Eighteen patients (49±18 years old) with ASA I-II who underwent general anesthesia were included in this study. Anesthesia was induced by a bolus of 1.0 mg/kg propofol and 0.6 mg/kg rocuronium. Rf infusion at 0.3 or 0.4 μg/kg/min was started 5 min before induction. Before starting operation, pure O2 was changed to 50% O2 in air and 1.2 vol% SeV was started. Fifteen min after SeV in expired gas reached 1.2 vol% (same MAC as 66% N2O), we measured heart rate viability for 5 min and calculated the ratio of low-frequency to high-frequency component (LF/HF) of the power spectra using CheckMy Heart® (DailyCare BioMedical Inc., Chungli, Taiwan) (control). Then SeV was stopped and 66% N2O in O2 was started. Fifteen min after SeV concentration in expired gas declined to 0.1 vol%, we measured LF/HF again. Then Rf infusion rate was increased to 0.7 μg/kg/min at increments of 0.1 μg/kg/min, and we measured LF/HF at every increment 15 min after the Rf infusion rate was changed. Rocuronium was infused at 20 mg/h during anesthesia. Non-invasive systolic (SBP) and diastolic (DBP) blood pressure, and heart rate (HR) were measured every 2.5 min. BIS and EEG were monitored using a BIS apparatus.

RESULTS: LF/HF, sympathetic nerve activity decreased as Rf infusion rate increased to 0.5 μg/kg/min and then made a plateau as Rf infusion rate was over 0.6 μg/kg/min. SBP increased depending on Rf concentration. DBP increased as Rf infusion rate increased to 0.5μg/kg/min and then decreased as Rf infusion rate was over 0.6 μg/kg/min. HR decreased depending on Rf concentration. After the beginning of N2O, EEG became sign wave-like, BIS decreased to nearly 30 and the suppression ratio number began to appear on the BIS apparatus in most cases. There was no awakening during anesthesia.

DISCUSSION: Akata et al[2] reported that SeV induced inhibition of norepinephrine-induced contractions probably caused by reduction of [Ca2+]i and suppression of myofilament Ca2+ sensitivity of vascular smooth muscle cells. The blood/gas partition coefficient of N2O is similar to that of desfulurane, so theoretically there is no delay of awakening using N2O-O2-Rf anesthesia. Our study showed that the optimal Rf infusion rate is 0.5 μg/kg/min with respect to stable circulation dynamics. Overall N2O-O2-Rf anesthesia is very safe and is particularly suitable for older patients.

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1. Anesthesiology 1999;90:398-405
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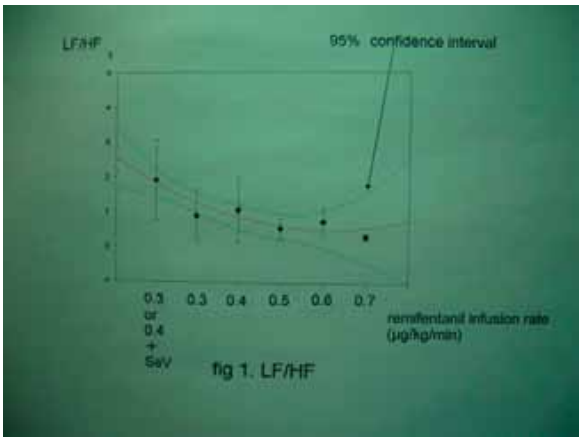

fig 1. LF/HF

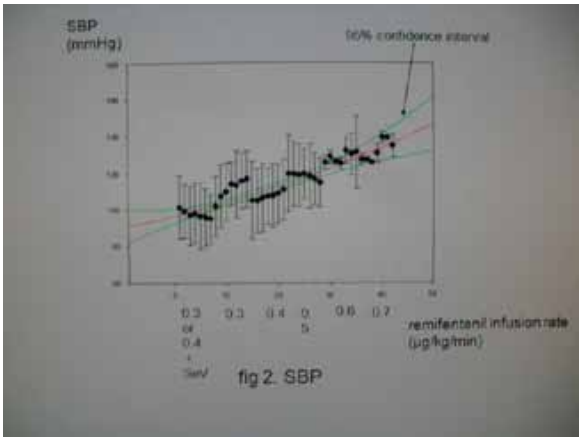

fig 2. SBP

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S-283.

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S-284.

PRE-OXYGENATION WITH A NO-COST TSE "MASK" PREVENTS SEVERE DESATURATION AND REDUCES THE NEED FOR BAG-MASK VENTILATION IN ELDERLY PATIENTS UNDER DEEP PROPOFOL SEDATION DURING UPPER GI ENDOSCOPY

AUTHORS: J. Tse, K. Dauphinee, T. Mehta, C. W. Hunter, L. Spina, S. Cohen

AFFILIATION: Dept. of Anesthesia, UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ

INTRODUCTION: Patients undergoing upper GI endoscopy (EGD) routinely receive nasal cannula (NC) O2 and sedation. NC delivers minimal O2 when the mouth is kept open by a bite-block. Sedation may cause respiratory depression, especially in elderly patients. A plastic sheet was shown to improve oxygenation by transforming NC to a face tent (TSE "Mask") in patients during EGD(1). We examined its effectiveness in preventing severe desaturation in elderly patients during EGD.

METHODS: Review of patients who underwent EGD, EUS, PEG or ERCP identified 2 groups. Group 1 (NC, n=43) received only NC O2. Group 2 (TM, n=168) received NC O2 and a TSE "Mask" using a clean specimen bag (Photos)(1-3). Patients received NC O2 (3-6 l/min) and only propofol. Student t-test and Chi Square test were used for analysis. A p value <0.05 was considered as significant. (Mean±S.D.)

RESULTS: Among elderly (>70 y/o) patients, there were no differences in age, BMI, ASA Status (NC:2.6±0.7; TM:2.7±0.7), room air (RA) O2 Sat, propofol dose, duration and highest NC O2 flow (Table). There were significant differences in O2 Sat after 5 min pre-oxygenation (NC:99±1%; TM:100±1%5), lowest O2 Sat (NC:92±8%; TM:97±4%) (Fig 1), severe desaturation (O2 Sat <85%) (NC:4/13; TM:1/51) (Fig 2) and bag-mask ventilation (NC:1/13; TM: 0/51) (Fig 3). In 3 NC patients, NC was converted to TSE "Mask" due to severe desaturation (O2 Sat:81±3%). Their O2 Sat was increased to 86±5%, 93±3% and 97±2% at 5 min intervals.

Among younger patients (<70 y/o), there were no differences in age, BMI, ASA (NC:2.0±0.7; TM:2.1±0.7), RA O2 Sat, propofol dose, duration, highest NC O2 flow and O2 Sat after 5 min pre-oxygenation (Table). There were significant differences in lowest O2 Sat (NC:89±10%; TM:97±4%)(Fig 1), severe desaturation (O2 Sat <85%) (NC:13/40; TM:2/117)(Fig 2) and bag-mask ventilation (NC: 4/40; TM:1/117)(Fig 3). In 13 NC patients, NC was converted to TSE "Mask" due to severe desaturation (O2 Sat:84±6%). Their O2 Sat was improved to 97±4%, 98±3% and 100±0% at 5 min intervals.

Among 9 NC and 102 TM patients, there were significant differences in FiO2 (NC: 0.36±0.18; TM: 0.49±0.12), and FeO2 (NC: 0.46±0.17; TM: 0.72±0.16).

DISCUSSION: Data show that pre-oxygenation with TSE "Mask" prior to deep propofol sedation for EGD prevents severe desaturation and reduces the need for assisted bag-mask ventilation in elderly as well as younger patients. It increases O2 delivery without raising NC O2 flow. It can also be used as a rescue technique when patient's oxygenation deteriorates. However, it appears that oxygenation of elderly patients would not recover as quickly as that of younger patients.

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1. Anesth 107:A922, 2007
2. Anesth 102:484, 2005; 3. www.TSEMask.com

Effects of TSE "Mask" on Oxygenation during Upper GI Endoscopy

Elderly (>70 y/o)	Age (years)	BMI (kg/m2)	Duration (min)	RA O2 Sat	Highest NC O2 Flow (l/min)	O2 Sat 5-min O2	Lowest O2 Sat	Sev Desat (<85%)	Bag-Mask Vent	Propofol dosage ug/kg/min
NC Group (n=13)	81±6 -	26±6	43±22	97±3%;	5.6±2.7	99±1%	92±8%	4/13	1/13	147±65
TM Group (n=51)	79±6 n.s.	26±5 n.s	41±21 n.s.	97±2% n.s.	4.9±1.2 n.s.	100±1% *p<0.05	97±4% *p<0.001	1/51 *p<0.001	0/51 *p<0.05	160±61 n.s.
Younger (<70 y/o)										
NC Group (n=40)	53±13	28±4	34±14	98±2%	5.0±1.2	99±1%	89±10%	13/40	4/40	216±74
TM Group (n=117)	53±12 n.s.	28±7 n.s.	39±15 n.s.	98±2% n.s.	4.8±1.2 n.s.	100±1% n.s.	97±4%* p<0.0001	2/117 * p<0.001	1/117 *p<0.01	192±62 n.s.

Mean±S.D.; NC: Nasal Cannula; TM: TSE "Mask"; RA: room air; Sev Desat: severe desaturation; Vent: assisted ventilation; n.s. Not significant different; *Significantly different from NC group

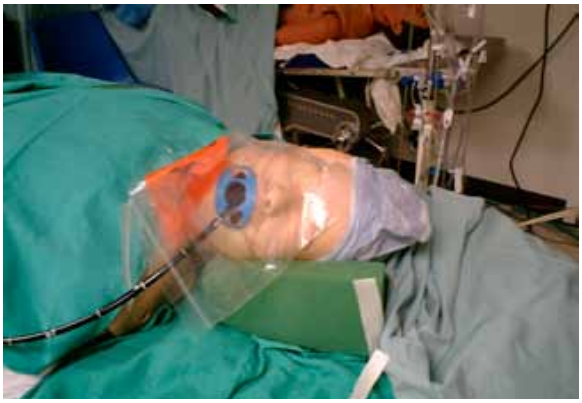

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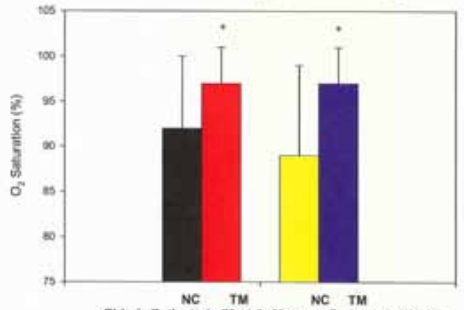
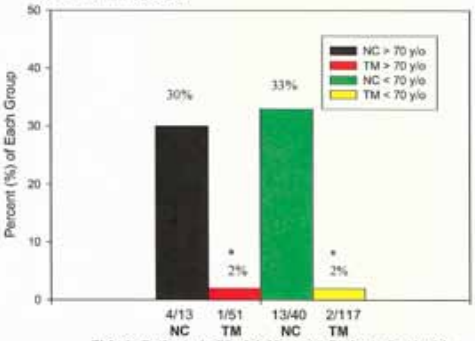
Fig 1. Effects of TSE "Mask" on the Lowest O_2 Saturation in Elderly (>70 y/o) and Younger Patients (<70 y/o) during Upper GI Endoscopy



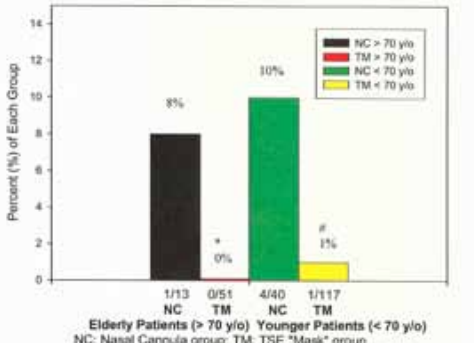
NC: Nasal cannula group; TM: TSE "Mask" group
*Significantly different from Nasal Cannula Group, p<0.0001.

Fig 2. Effects of TSE "Mask" on Severe Desaturation (O_2 Sat <85%) in Elderly (> 70 y/o) and Younger (< 70 y/o) Patients during Upper GI Endoscopy



NC: Nasal Cannula group; TM: TSE "Mask" group
*Significantly different from Nasal Cannula group, p<0.001.

Fig 3. Effects of TSE "Mask" on the Need for Assisted Bag-Mask Ventilation in Elderly (> 70 y/o) and Younger (< 70 y/o) Patients during Upper GI Endoscopy



NC: Nasal Cannula group; TM: TSE "Mask" group
*Significantly different from Nasal Cannula group, p<0.05.
#Significantly different from Nasal Cannula group, p<0.01.

S-285.

PRE-OXYGENATION WITH A NO-COST TSE "MASK" PREVENTS SEVERE DESATURATION AND REDUCES THE NEED FOR ASSISTED BAG-MASK VENTILATION IN PROPOFOL-SEDATED ELDERLY PATIENTS DURING CARDIOVERSION/AICD TESTING

AUTHORS: T. Mehta, P. Patel, G. George, S. Cohen, S. Barsoum, J. Tse

AFFILIATION: Dept. of Anesthesia, UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ

INTRODUCTION: Patients undergoing cardioversion or AICD testing routinely receive IV sedation and O2 via nasal cannula (NC). Deep sedation or airway obstruction may cause severe desaturation, especially in elderly patients (> 70 y/o) with multiple cardiopulmonary diseases. A simple plastic sheet has been shown to improve oxygenation by transforming NC to a face tent (TSE "Mask") in propofol-sedated patients during EGD in a prospective study(1). This technique has been used in the Cardiac Cath Lab. We examined its effectiveness in improving oxygenation and preventing severe desaturation in elderly patients during cardioversion or AICD testing.

METHODS: Retrospective review of patients who underwent cardioversion or AICD testing identified 2 groups. Group 1 (NC, n=47) received only NC O2. Group 2 (TM, n=121) received NC O2 and a TSE "Mask" using a clean clear plastic specimen bag to cover patient's nose and mouth as described (Photos)(1-3). Patients received NC O2 (3-5 l/min or higher as needed) and only IV propofol. Student t-test and Chi Square test were used for analysis. A p value <0.05 was considered as significant. (Mean±S.D.)

RESULTS: Among the elderly patients (>70 y/o) (NC: n=24; TM: n=47), there were no differences in age, BMI, ASA Physical Status (III), room air (RA) O2 Sat and propofol dose (Table). There were significant differences in O2 Sat after 5 min pre-oxygenation (NC: 99±1%; TM: 100±1%), the highest NC O2 flow (NC: 7.3±2.8 l/min; TM: 4.7±1.5), the lowest O2 Sat (NC: 84±13%; TM: 97±4%)(Fig 1), severe desaturation (O2 Sat <85%) (NC: 10/24; TM: 1/47)(Fig 2) and bag-mask ventilation (NC: 9/24; TM: 0/47)(Fig 3).

Among the younger patients (<70 y/o) (NC: n=23; TM: n=74), there were no differences in age, BMI, ASA Status (III), room air (RA) O2 Sat and propofol dose (Table). There were significant differences in O2 Sat after 5 min pre-oxygenation (NC: 99±1%; TM: 100±0%), the highest NC O2 flow (NC: 7.3±3.0 l/min; TM: 5.0±.7), the lowest O2 Sat (NC: 87±9%; TM: 95±6%)(Fig 1), severe desaturation (O2 Sat<85%) (NC: 9/23; TM: 4/74)(Fig 2) and bag-mask ventilation (NC: 9/23; TM: 2/74)(Fig 3).

DISCUSSION: These data show that pre-oxygenation with TSE "Mask" prior to propofol sedation for cardioversion/AICD testing prevents severe desaturation and reduces the need for assisted bag-mask ventilation in both elderly and younger patients. It improves oxygenation without raising NC O2 flow rate. This face tent takes only a few seconds to prepare at no cost and may improve patient safety. It also reduces procedure interruptions and should be routinely used for pre-oxygenation prior to sedation during cardioversion/AICD testing.

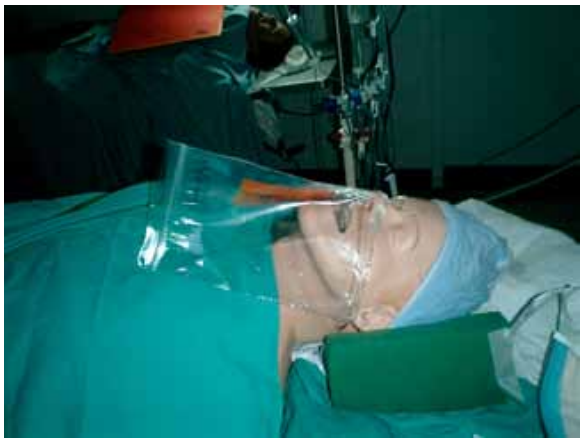
REFERENCES:

1. Anesth 107:A922, 2007
2. Anesth 102:484, 2005
3. www.TSEMask.com

Effects of TSE "Mask" on Oxygenation during Cardioversion/AICD Testing

Elderly (>70 y/o)	Age (years)	BMI (kg/m2)	RA O2 Sat	Highest NC O2 Flow (l/min)	O2 Sat 5-min O2	Lowest O2 Sat	Sev Desat (<85%)	Bag-Mask Vent	Propofol Dose (mg/kg)
NC Group (n=24)	80±6	27±6	99±2%	7.3±2.8	99±1%	84±13%	10/24	9/24	0.97±0.23
TM Group (n=47)	78±5 n.s.	28±8 n.s.	98±2% n.s.	4.7±1.5* p<0.0001	100±1%* p<0.05	97±4%* p<0.0001	1/47* p<0.001	0/47* p<0.001	0.94±0.29 n.s.
Younger (<70 y/o)									
NC Group (n=23)	60±8	30±7	99±2%	7.3±3.0	99±1%	87±9%	9/23	9/23	0.98±0.41
TM Group (n=74)	58±10 n.s.	31±8 n.s.	98±3% n.s.	5.0±.7* p<0.0001	100±0%* p<0.0005	95±6%* p<0.0001	4/74* p<0.001	2/74* p<0.001	0.96±0.35 n.s.

Mean±S.D.; NC: Nasal Cannula; TM: TSE "Mask"; RA: room air; Sev Desat: severe desaturation; Vent: assisted ventilation; n.s. Not significant different; * Significantly different from NC group



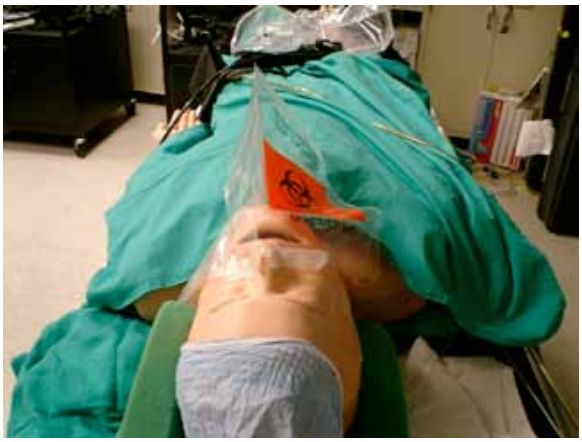


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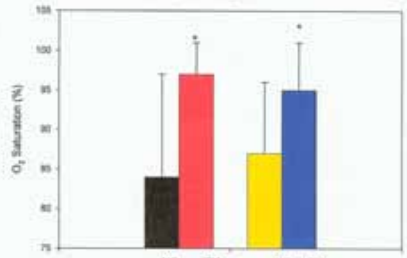
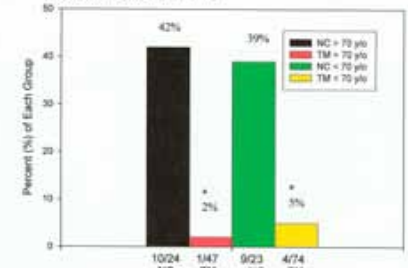
Fig 1. Effects of TSE "Mask" on the Lowest O_2 Saturation in Elderly (>70 y/o) and Younger Patients (<70 y/o) during Cardioversion/AICD Testing



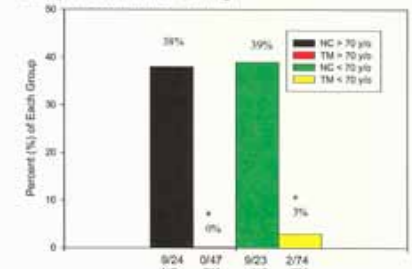
NC: Nasal cannula group; TM: TSE "Mask" group
*Significantly different from Nasal Cannula Group, p<0.0001.

Fig 2. Effects of TSE "Mask" on Severe Desaturation (O_2 Sat <85%) in Elderly (> 70 y/o) and Younger (< 70 y/o) Patients during Cardioversion/AICD Testing



NC: Nasal Cannula group; TM: TSE "Mask" group
*Significantly different from Nasal Cannula group, p<0.001.

Fig 3. Effects of TSE "Mask" on the Need for Assisted Bag-Mask Ventilation in Elderly (> 70 y/o) and Younger (< 70 y/o) Patients during Cardioversion/AICD Testing



NC: Nasal Cannula group; TM: TSE "Mask" group
*Significantly different from Nasal Cannula group, p<0.001.

S-286.

AN INCREASING INTEREST IN ANESTHESIA AND ALZHEIMER'S DISEASE: PAST, PRESENT, AND FUTURE

AUTHORS: S. Kendale, C. Scher

AFFILIATION: Anesthesiology, New York University, New York, NY

INTRODUCTION: Alzheimer's disease (AD) is a neurodegenerative disorder that causes dementia, with a relatively high post-diagnosis mortality. It is pathologically characterized by deposits of beta-amyloid protein plaques and tangled Tau protein. There is a potentially congruous link between anesthesia and AD, which may allow research in anesthesia to further elucidate mechanisms of AD, and vice versa. We hypothesize that that there is an increasing interest in anesthesia and Alzheimer's disease.

METHODS: Literature search was performed using Web of Science query [Topic=(Alzheimers) AND Topic=(anesthesia), sorted by 'Times Cited -- highest to lowest', limited to Subject Area of Anesthesiology] to obtain the most cited articles, and sorted by 'Publication Date' to obtain a measure of how many articles on the subject have been published per year. A literature review revealed aspects that are most often investigated and have garnered the most interest. Citation information was used to trend the overall academic interest in AD and anesthesia. Comparison was performed using unpaired t-test.

RESULTS: Using the aforementioned methods, a total of 110 articles on anesthesia and AD were found. The number of unique articles published in the last decade is statistically significantly greater than in the previous decade ($p<0.05$). The topics most often cited include relation of anesthetics to AD pathophysiology, involvement of neurotransmitters or receptors, postoperative cognitive dysfunction, genetic predisposition, and relation of AD to anesthesia exposure.

DISCUSSION: Our results suggest that there has been an increasing interest in the relationship between anesthesia and Alzheimer's disease within the last decade, as there has been a significantly greater number of publications on the topic. Most studies focus on the effect of anesthetics on the proliferation of beta-amyloid plaques, phosphorylation of Tau protein to form tangles, and neurotransmitter pathways, in addition to memory impairment and postoperative cognitive dysfunction.

Current recommendations on perioperative care are limited much of the study on the subject having been conducted in vitro or in vivo rodent models precludes generalization to a human population. Given the increased interest in anesthesia and Alzheimer's disease, it may be prudent, when reasonable, to direct further research with a focus on obtaining human data that can be applied in clinical practice.

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S-287.

WAIT TIMES TO SURGERY, POST-FRACTURE AUTONOMY & IN-HOSPITAL MORTALITY IN A SUBSET OF HIP FRACTURE PATIENTS

AUTHORS: M. Kaspervacius[1], M. McMullen[2], J. Murdoch[2], J. Rudan[3], R. Allard[2], V. Shyam[2]

AFFILIATION: [1]School of Medicine, Queen's University, Kingston, ON, Canada; [2]Anesthesiology & Perioperative Medicine, Kingston General Hospital/ Queen's University, Kingston, ON, Canada; [3]Surgery, Division of Orthopedic Surgery, Kingston General Hospital/ Queen's University, Kingston, ON, Canada

INTRODUCTION: More than 264,000 elderly people suffered hip fractures in the U.S during 2007 alone.[1] Morbidity and mortality rates are high in these patients, particularly when the wait times to surgery exceed 48 hours.[2] Reducing wait time is important for improvement in patient care and reducing healthcare costs. The current investigation examined wait times from emergency presentation to surgical fixation and alterations in level of autonomy following hip fracture in 207 patients.

METHODS: Following IRB approval, data was gathered retrospectively on all hip fracture admissions to a mid-sized teaching center in 2010. Demographic information, time from emergency presentation to surgery/discharge, pre-and post-fracture functional level (as defined by level of living independence), and in-hospital mortality rates were recorded.

RESULTS: Of the 220 hip fracture patients admitted, charts of 13 were excluded due to missing data for precise presentation time. Of the 207 remaining, the average age was 81 ± 9 years and 70% were women. 79% underwent surgery within 48 hours and the average time to discharge was 15 days. 61% of all patients lived at home independently prior to fracture, while only 18% returned to this functional level upon discharge. 29% lived in a long-term care (LTC) facility prior to the fall while 44% were discharged to LTCs; 7% died in-hospital.

DISCUSSION: Consistent with other centers, the majority of patients at our center underwent surgery within 48 hours.[3] Our in-hospital mortality rate was also comparable to that of other centers.[4] Further prospective investigations may be warranted to comprehensively determine the impact of time to fixation on long-term autonomy, morbidity, mortality and cost-efficacy of healthcare delivery. Our preliminary study suggests a need to focus resources on regaining pre-operative autonomy and living status. This would not only greatly improve the quality of life for these patients but also reduce healthcare costs.

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S-288.

INFECTION PROMOTION THE DEVELOPMENT OF POSTOPERATIVE COGNITIVE DYSFUNCTION IN ELDERLY RATS

AUTHORS: J. Yang, L. Chen, H. Zhang, Z. Li, X. Wang, H. Wang

AFFILIATION: Chengdu, China

INTRODUCTION: Although postoperative cognitive dysfunction (POCD) is being increasingly studied as an important postoperative complication of the elderly, the pathogenesis of POCD still remains unknown. Anesthesia or operation themselves has been thought to closely relate to POCD. This study was designed to investigate the association between POCD and anesthesia or/and nephrectomy.

METHODS: 96 aged male SD rats were randomly assigned to four independent experimental proceedings. 50% oxygen inhalation (group C), 1.7% isoflurane anesthesia (group I), left nephrectomy under 1.7% isoflurane anesthesia (group S), and left nephrectomy and LPS injection (250ug/Kg) after surgery (group L). Y maze was applied to assess cognitive function, while locomotor activity was tested daily in an open filed. A MILLIPLEX MAP Rat Cytokine Panel was used to quantify levels of TNFa and IL-6 in hippocampus and plasma on 0.25, 1, 3, 7 days post-intervention.

RESULTS: Cognitive function of group L was severely impaired on postoperative 3 and 4 day, locomotor activity was also depressed of group L on postoperative 0.25 day, while no significant differences have been found in other three groups (Fig.1). On postoperative 0.25 day in group L, there were significant increases in plasma concentrations of TNF-αand IL-6 compared to those in control group, isoflurane group and surgery group ($P < 0.05$), especially plasma concentration of IL-6 which was about 56 times higher than that of control group, and recovered to the normal on postoperative 1 day (Fig.2,3). No significant difference in cytokines was found in other groups. Though no statistical significance of cytokines in hippocampus was found, increased levels of cytokines in hippocampus of group L on postoperative 0.25 day were detected.

DISCUSSION: LPS leads to a significant increase of plasma IL-6 on postoperative 0.25 day and an impaired cognition function on postoperative 3, 4 day, suggesting the close relation between pro-inflammatory cytokines and impaired cognitive function. Isoflurane inhalation or left nephrectomy may be not enough to impair cognition function.

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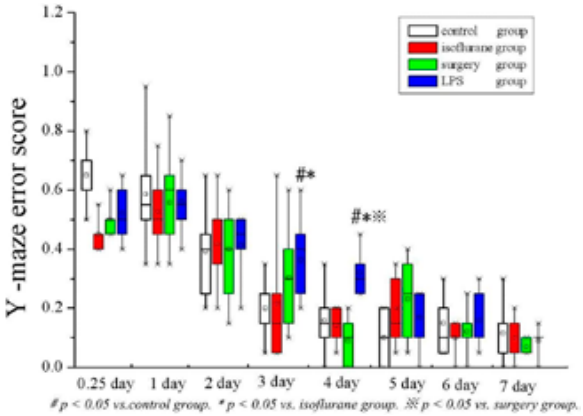

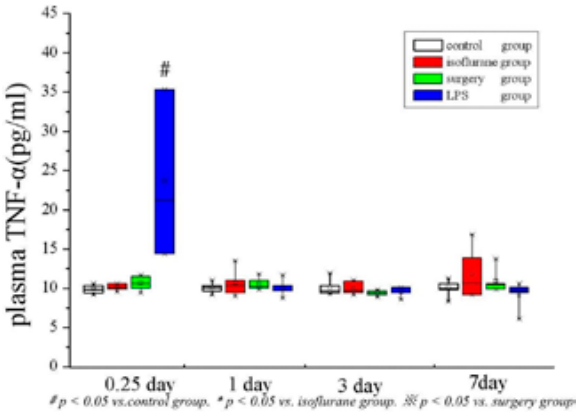

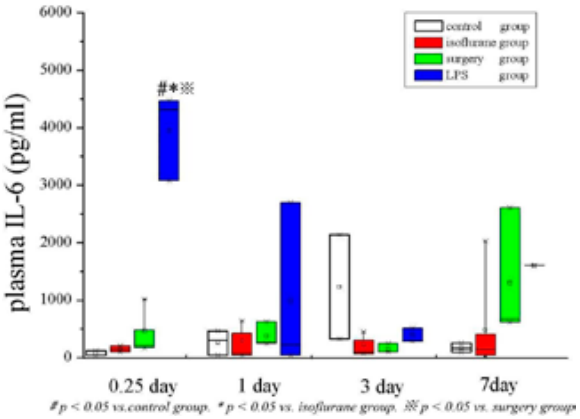

S-289.

PERIOPERATIVE MANAGEMENT OF ELDERLY HIP FRACTURE PATIENTS WITH CONCOMITANT AORTIC STENOSIS

AUTHORS: S. Tierney[1,2], M. McMullen[2], J. Murdoch[2], J. Rudan[3], R. Allard[2], V. Shyam[2]

AFFILIATION: [1]School of Medicine, Queen's University, Kingston, ON, Canada; [2]Anesthesiology & Perioperative Medicine, Kingston General Hospital/Queen's University, Kingston, ON, Canada; [3]Department of Surgery, Division of Orthopedic Surgery, Kingston General Hospital/Queen's University, Kingston, ON, Canada

INTRODUCTION: Hip fractures in the elderly are common and associated with increased morbidity and mortality, particularly when surgery is not achieved within 48 hours.[1,2] As a result, guidelines have been set to ensure surgical repair in 48 hours or less. Addressing co-morbidities in this population has been shown to be equally important. Thus a balance is required to identify patients who will benefit most from efficient preoperative optimization practices.[3] The purpose of the current investigation was to identify those hip fracture patients with aortic stenosis (AS), and examine the practices surrounding their perioperative care

METHODS: Following IRB approval, we reviewed charts of all patients who underwent surgical hip repair at a mid-sized academic center during 2010. We documented the time from admission to surgery, the clinical description of any murmur, the echocardiographic results and/or prior diagnosis of AS, anesthetic technique, and postoperative complications.

RESULTS: Charts of 220 patients were reviewed. In total, 63 patients (29%) had a documented murmur. Of these, 29 (46%) received an echocardiogram on current admission. The echocardiogram was associated with a delay to surgery (2.6 days versus 1.5 days; p =0.05) but served to diagnose new moderate to severe AS in 6 cases (21%). In total, AS was identified in 26 patients (12%). Of those with AS, 69% (n=18/26) were given general anesthesia compared to 38% of non-AS patients (n=74/194). 8% of patients with AS (n=2) were postoperatively admitted to the ICU compared to 5% of patients without AS (n=9). In-hospital mortality was elevated in AS patients (15%, n=4)) compared to (5%, n=10) those without AS.

DISCUSSION: Our study describes the prevalence of AS in elderly hip fracture patients. These findings may have important implications for perioperative management of this patient population. Further prospective investigations may be warranted to determine the costs & benefits of instituting standardized perioperative guidelines incorporating both early anesthesia assessment and focused echocardiographic studies to facilitate the timely management in this complex patient population.

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S-290.

POSTOPERATIVE COGNITIVE DYSFUNCTION AFTER FAST-TRACK HIP AND KNEE ARTHROPLASTY

AUTHORS: L. Krenk[2,3], L. S. Rasmussen[1], H. Kehlet[2,3]

AFFILIATION: [1]Department of Anaesthesia, Centre of Head and Orthopaedics, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark; [2]Section of Surgical Pathophysiology, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark; [3]The Lundbeck Centre for Fast-track Hip and Knee Arthroplasty, Copenhagen, Denmark

INTRODUCTION: Postoperative cognitive dysfunction (POCD) is a significant problem after major surgery and associated with increased mortality. Increasing age, low level of education, and preoperative cognitive deficits may predispose to the development of POCD but otherwise the pathophysiology is not clear.[1]

We hypothesized that a fast-track approach with reduced surgical stress, use of opioid-sparing multimodal analgesia and a quick return to patients' own home may reduce incidence of early POCD. The primary aim of this study was to evaluate the incidence of POCD one week after fast-track hip or knee arthroplasty (THA or TKA) and compare this to the previous found incidence in the ISPOCD study of 25% after 1 week.[2] The possible role of inflammatory reponse (CRP), pain, opioid use, and sleep quality was also evaluated.

METHODS: In a prospective multicenter study we included 225 non-demented patients > 60 years undergoing fast-track THA or TKA. Anesthesia and postoperative analgesia were standardized with limited opioid use. All patients underwent neuropsychological testing preoperatively, 1 week and 3 months postoperatively with a well-established test battery.

CRP was determined preoperatively, on postoperative day (POD) 1, 2 and at the postoperative test session. Visual Analogue Score (VAS) for pain and the Pittsburg Sleep Questionnaire (PSQI) were administered at the preoperative and postoperative test sessions. Opioid use during hospitalisation was recorded.

A z-score was calculated for each test, and POCD was defined as the presence of 2 z-scores of more than 1.96 or a cumulated z-score of more than 1.96.[3]

RESULTS: At 1 week POCD was found in 20/220 patients (9.1% [CI 95%: 5.6-13.7%]). Mean length of stay was 2.6 days (range 1-8). Patients with POCD tended to be older with a mean age of 71.4(range 60-85) versus non-POCD patients 68.9(range 60-86) years, (p=0.07). POCD patients showed a tendency to have a higher MMSE score (p=0.06) and less education compared to non-POCD patients (p=0.09). CRP, PSQI, VAS score, opioid use, duration of anesthesia and surgery were not significantly different (p > 0.2). The risk of developing POCD at 3 months was significantly increased in patients with POCD at 1 week (23.6% versus 6.7%), (p=0.02).

DISCUSSION: A marked reduction of POCD 1 week compared to previous findings from the ISPOCD group after major surgery was seen after fast-track THA and TKA. No significant role of inflammation, pain response, sleep quality or opioid use was found.

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S-291.

EXPOSURE OF TG2576 MICE TO ISOFLURANE RESULTS IN NO DETECTABLE INCREASE IN Aβ AMYLOID LOAD VIA [18F]AV45 PET IMAGING CONFIRMED WITH AUTORADIOGRAPHIC INVESTIGATION

AUTHORS: C. Rowan[1], S. Kennel[2], R. M. Craft[1], J. Wall[2], E. Martin[2]

AFFILIATION: [1]Department of Anesthesiology, University of Tennessee Graduate School of Medicine, Knoxville, TN; [2]Preclinical and Diagnostic Molecular Imaging Laboratory, Department of Medicine, University of Tennessee Graduate School of Medicine, Knoxville, TN

INTRODUCTION: Isoflurane may increase deposition of Aβ amyloid, and thus may accentuate diseases such as Alzheimer's[1-3]. Tg2576 mice have a genetic predisposition to amyloid deposition, which may increase with isoflurane exposure[3]. The specific aim of this study was to examine the longitudinal effect of isoflurane via a novel PET tracer for amyloid, [18F] AV45 (florbetapir), as compared to histological methods. The hypothesis was that exposed mice would demonstrate an increased plaque burden over time.

METHODS: This protocol was approved by the Institutional Animal Care and Use Committee at our University in Knoxville. Twenty Tg2576 mice were aged 8 months, then randomly selected to receive exposure (E) to 2% isoflurane for 2 hours or air only (C). One exposed mouse died, and was replaced with a control, for a total of 10 exposed mice.

After 24 hours, mice (5 E, 4 C) were injected with 200-300 μCi (dosimeter corrected) of [18F] AV45 and sacrificed 20 minutes later by isoflurane overdose for PET/CT scans. After scanning, half of the brain was fixed in formalin. After 3 months, the remaining 10 mice (5 E, 5 C) were processed as before. One paraffin slide from each brain was exposed to I-125 labeled amyloid reactive peptide p5 for autoradiography.

RESULTS: Plaque number increased in both groups, but only the increase in the control group was significant ($p < 0.05$). The groups (E,C) were not statistically different from each other at either the 24 hour or 3 month time points (Fig. 1). The radiologic images at 24 hours and 3 months are shown in Figures 2 and 3. There were no statistically significant differences in the T:M ratio of AV45 uptake at any time point (Fig. 4).

DISCUSSION: Our results show no difference in amyloid deposition in isoflurane-exposed versus control Tg2576 mice using the tracer AV45 and confirmed with autoradiography. This result is in contrast to previous work[3]. The number of plaques was small, though it did increase over time. If this represents early neurodegeneration, isoflurane may have little effect on amyloid deposition. Longitudinal studies using [18F] AV45 may be useful in elucidating the effect of isoflurane on Aβ amyloid deposition.

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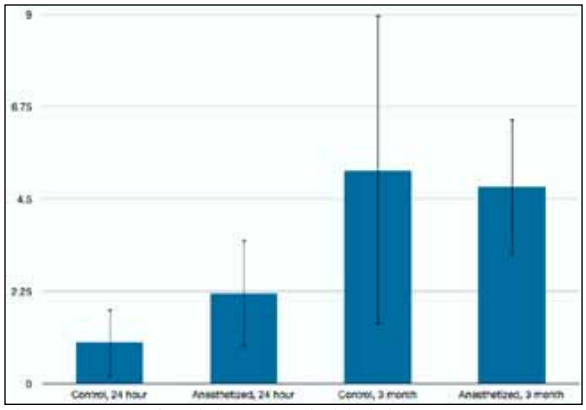

Figure 1. Mean number of plaques (standard deviation).

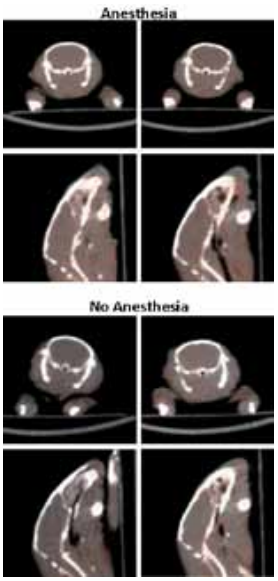

Figure 2. PET scan using AV45 at 24 hours post-exposure to isoflurane, vs. control.

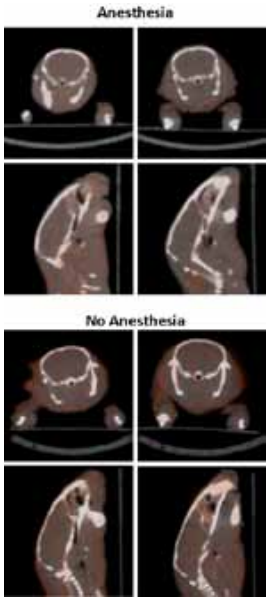

Figure 3. PET scan using AV45 at three months post-exposure vs. control.

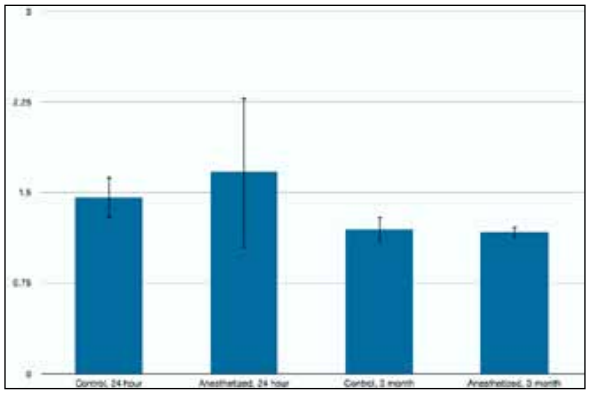

Figure 4. Mean T:M at 20 minutes post-injection of [18F]AV45 (standard deviation).

Liver / Transplantation

S-297.

CISATRACURIUM DOSE-RESPONSE RELATIONSHIP IN PATIENTS WITH LIVER DISEASE

AUTHORS: M. Z. Ali, R. Saeed, M. Abo Sedera

AFFILIATION: Anesthesia & S-ICU, Theodor Bilharz Research Institute, Giza, Egypt

INTRODUCTION: Cisatracurium is approximately 3 times more potent than atracurium, devoid of histamine release and cardiovascular side effects[1] Hofmann degradation plays an important role in cisatracurium elimination than that of atracurium.[2] Patients with liver disease exhibit abnormal response to most of muscle relaxants. This study was designed to evaluate the dose-response of cisatracurium in patients with mild-moderate liver impairment in comparison to healthy subjects.

METHODS: After Ethical Committee approval and patients' written informed consents, 80 ASA I & II patients of both sexes, scheduled for surgical procedures requiring general anesthesia, were divided into two groups; Group I (control group, n=40) and Group II (Liver dysfunction group, Child's classification A or B, n=40). Anesthesia was induced & maintained using fentanyl, thiopentone, isoflurane & a small initial dose (10µg.kg-1) of cisatracurium, the 1st dose-response point was recorded to estimate ED80. Supplemental dose was administered and the neuromuscular response was observed until achievement of maximum block (2nd dose-response point). The dose-response curve was constructed, ED50 & ED95 were estimated. Preoperative laboratory parameters, 1st dose-response, estimated ED80, calculated 2nd dose, 2nd dose-response, measured ED50 & measured ED95 were recorded.

RESULTS: The preoperative laboratory parameters (Table 1) showed statistical significant differences (p=0.001) between the two groups regarding serum albumin, total bilirubin, ALT, AST, PT, PC & INR. The operative data (Table 2) showed statistically insignificant difference between the two groups regarding the 1st dose response (p=0.152), the estimated ED80 (p=0.886) & the calculated 2nd dose (p=0.886) & statistically significant differences between the two groups regarding the 2nd dose response (p=0.006), the measured ED50 (p=0.010) & the measured ED95 (p=0.001). Figure 1 &2 show the dose-response curves.

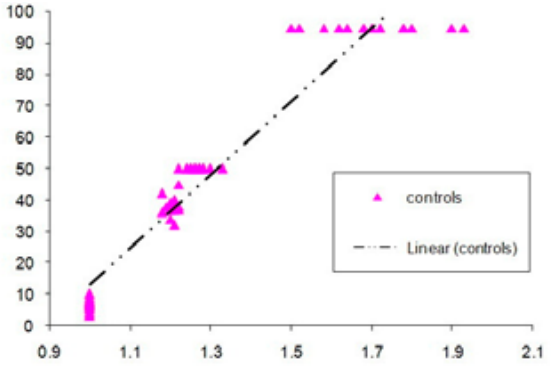

Figure (1): The measured dose response curve of the control group.

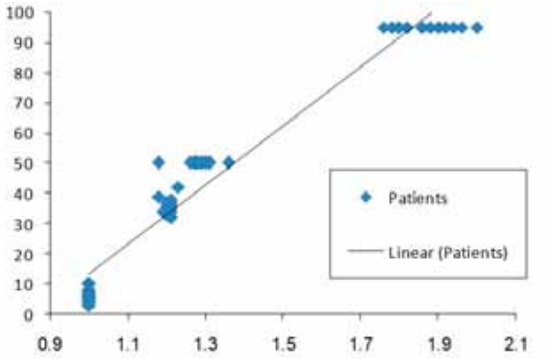

Figure (2): The measured dose response curve of the hepatic group.

DISCUSSION: These results meet those of Dahaba et al.[3] in the measured ED95 of the control group and do not go in accordance with Cammu et al.[4] who found that cisatracurium requirement during liver transplantation was higher than in healthy patients & recovery appeared prolonged. In conclusion, the measured ED50 & ED95 through two-doses dose-response curve technique were clinically insignificant from using the single-dose technique. The dose-response curve of cisatracurium in patients with liver disease was clinically insignificant in comparison to healthy subjects.

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S-298.

OPTIMISING THE POST OPERATIVE PAIN CONTROL FOR LIVER DONORS - A COMPARATIVE ANALYSIS

AUTHORS: J. Shah, J. Pasnak, J. Butterworth

AFFILIATION: Anesthesiology, Virgnia Commonwealth University Medical Center, Richmond, VA

INTRODUCTION: Liver transplant remains the only curative treatment for end-stage liver diseases. Among other concerns in the early post-operative period after a living liver donation are pain, pain induced stress. There are limited options for post operative pain control in these patients with impaired heaptic function and coagulopathy. This retrospective study compares the quality of pain management, when local anesthetic blocking the pain pathway in the wound (OQP) or in EPI with PCA in both groups.

METHODS: After approval from IRB we reviewed the charts of patients(1998 - 2007). From a total of 76 charts with needed data points for review, the two groups were identified: EPI n =42 and OQP n= 34. These groups were in chronology. We created a comprehensive tracking tool (TT) to document the PS, SS at each 12 hours and narcotic/ non-narcotic rescue medications with amount and time administered for the first 48 hours postoperatively. Overall post operative management was standard per institutional protocol.

Results: PS was significantly higher first 12 hours in OQP group. Nevertheless total narcotic consumption for 48 hours was no difference. SS was significantly higher EPI group as the were sedated.

DISCUSSION: The drawbacks of epidural technique in this subset of patients include: delay of retrieval of the epidural catheter, delay of ambulation,delay for prophylaxis for DVT, a risk of peri- spinal hematoma (all due to coagulopathy of partial neo liver), hypotension (overzealous fluid resuscitation). Thus we regard the epidural technique to have relative drawbacks in this population. Relative to EPI the OQP with I/V PCA provided adequate pain relief(except for for first 12 hours) and permitted early ambulation and initiation for DVT prophylaxis. A functionally compromised lobe of liver can metabolize small dose of narcotic with LA but we avoided acetaminophen and NSAIDs. A compromised (function,enzymatic, metabolic) liver may have unpredictable metabolism and clearance of these drugs. The study recommends, a simple.safe, effective alternative with OQP with I/V PCA for upper abdominal post operative pain relief. Avoiding central axis catheter is feasible for these patients.

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Comparison For The Two Groups : Z Test And Standard Deviation

Categories compared EPI vs. OQP	P = < 0.05 is Consider significant*.	Standard Deviation SD
The narcotic requirement (total in mg.) post op. 48 hours	P = 0.053	SD =0.035
Average Progressive Pain Score(PS) @ each 12 hours period for 48 hours	P= 0.039*	SD =0.035
Average Progressive Sedation score (SS) @ each12 hours period for 48 hours	P= 0.02*	SD= 0.56

S-299.

THE PERIOPERATIVE CHANGES OF OXIDATIVE STRESS AND ANTIOXIDANT CAPACITY IN PATIENTS UNDERGOING LIVING DONOR LIVER TRANSPLANTATION

AUTHORS: J. Kosaka, H. Morimatsu, N. Obata, T. Matsusaki, R. Kaku, K. Morita

AFFILIATION: Anesthesiology and Resuscitology, Okayama University Hospital, Okayama, Japan

INTRODUCTION: Oxidative stress defined as imbalance between oxidants and antioxidants. The involvement of oxidative stress in the pathogenesis of several liver diseases has been extensively investigated.

We previously demonstrated that the antioxidant capacity of patients underwent living donor liver transplantation (LDLT) was higher than the value of donors after induction of general anesthesia. Simultaneously, we also showed that serum total bilirubin level had a negative correlation with oxidative stress level and a positive correlation with antioxidant capacity in LDLT recipients.

In addition to these results, we measured the perioperative oxidative stress level and biological antioxidant potential in LDLT recipients.

METHODS: We identified 7 adult patients underwent elective LDLT at our University Hospital between June and November 2011.

The metabolites by reactive oxygen species (d-ROMs) and the plasma biological antioxidant potential (BAP) were measured at 4 points, start of operation, 1 hour after ischemia/reperfusion(I/R), end of operation, postoperative day 1. We measured these factors using the free radical specific evaluator FREE®.

The d-ROMs test provides a measure of the whole oxidant capacity of plasma against the N,N-diethylparaphenylendiamine in acidic buffer. Such oxidant capacity is mainly due to hydroperoxides with the contribution of other minor oxidant factors. The BAP test allows evaluating the plasma antioxidant biological potential as the capacity of the plasma sample to reduce ferric ions to ferrous ions. Simultaneously, serum total bilirubin level was measured in the central laboratory.

RESULTS: The perioperative changes of the d-ROMs value, the BAP value, and serum total bilirubin level were shown in Figure.

The d-ROMs value at 1 hour after I/R obviously decreased compared to the value at start of operation and remained the same level. On the other hand, the BAP value at 1 hour after I/R obviously increased and after that the value decreased slowly. Serum total bilirubin level had no significant correlation with the d-ROMs value and the BAP value.

DISCUSSION: As a result, oxidative stress level significantly decreased and biological antioxidant potential significantly increased after I/R in LDLT recipients. Serum total bilirubin level had no correlation with the perioperative changes of oxidative stress and antioxidant capacity. These results suggested that oxidative stress level and antioxidant capacity after ischemia/reperfusion might compose of several factors rather than bilirubin.

REFERENCES: N/A

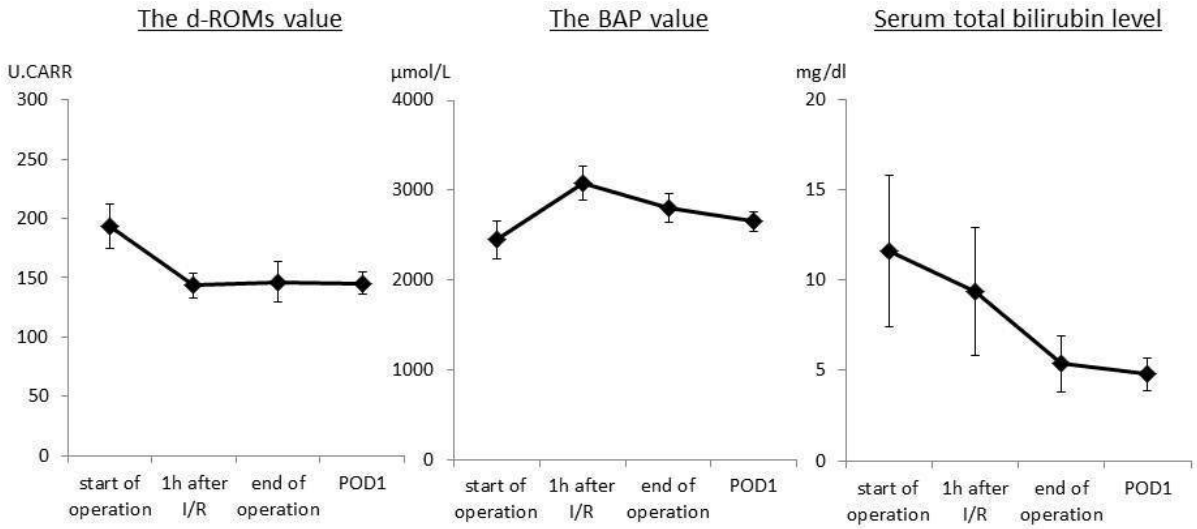

Figure. The perioperative changes of the d-ROMs value, the BAP value, and serum total bilirubin level. The data were reported as mean ± SEM.

S-300.

INTRACTABLE SEVERE PULMONARY EDEMA DURING ORTHOTOPIC LIVER TRANSPLANT (OLT)

AUTHORS: Y. Morita, K. Fukazawa, B. Ashrafi, E. A. Pretto

AFFILIATION: Department of Anesthesiology, University of Miami, Miller School of Medicine, Miami, FL

INTRODUCTION: Intractable severe pulmonary edema during OLT can be a fatal complication. Massive production of secretions can rapidly fill the lungs and endo-tracheal tube leading to hypoventilation and hypoxia. We sought to characterize the incidence, timing, and related risk factors of intractable severe pulmonary edema during OLT.

METHODS: After IRB approval, we performed a retrospective observational survey of OLT cases performed between 2007 and 2011 at Miami Transplant Institute. Demographics of recipient and donor, as well as intraoperative and postoperative data were collected from patient records. We defined intractable severe pulmonary edema as any sudden clinically significant decrease in oxygen saturation (SpO2<90%) with or without visible pink, frothy secretions in the endotracheal tube requiring immediate treatment, without any radiographic evidence of pulmonary edema prior to OLT.

RESULTS: Of all 632 OLT patients identified, a total of 9 patients (1.4%) had severe PE during OLT. (Table) All patients received blood transfusions before and after reperfusion (pRBC 8.9 ± 2.6 units, FFP 12 ± 3.7 units, Platelets 5.4 ± 8.6 units). Eight cases occurred in the neo-hepatic phase (89%) and 1 case before reperfusion (11%). Median time interval from last blood transfusion to PE was 79 min (25-257 min). In the 8 cases that developed PE post reperfusion, median time interval from reperfusion to PE was 34 min (15-85 min). Perioperative mortality among PE cases was 11% (1 in 9), from refractory hypoxia.

DISCUSSION: We found that severe PE during OLT is rare (1.4%) albeit a life threatening complication (11% mortality) and temporally related to reperfusion. Despite a large dose of steroids given as immunosuppressant at reperfusion, 89% of PE cases in our study occurred within 2.5 hours of reperfusion. These results suggest an association between PE and reperfusion but warrant further investigation into other contributing factors such as TRALI.

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S-302.

WITHDRAWN.

Neuroanesthesia

S-308.

WITHDRAWN.

S-309.

WITHDRAWN.

S-310.

CEREBRAL ANEURYSM SURGERY AS AMBULATORY DAY SURGERY

AUTHORS: N. Goettel, L. Venkatraghavan, P. Manninen

AFFILIATION: Anesthesia, UHN Toronto Western Hospital, Toronto, ON, Canada

INTRODUCTION: In the neurosurgical treatment of patients with intracranial lesions, such as unruptured cerebral aneurysm, a need for postoperative hospital admission has generally been assumed.

Ambulatory day surgery is an evolving specialty in line with demands of modern medicine and economics. When hospital stays are shortened, there less chances of complications such as nosocomial infections, medical errors and thromboembolic events[1,2,3].

From the anesthetic point of view, the important areas of consideration for day surgery include the choice of an suitable anesthetic technique, assuring maximum standards of anesthetic security, quality of care, and patient safety[4,5].

The purpose of this study is to review the anesthetic management of the patients who underwent a craniotomy for clipping of a cerebral aneurysm on the basis of day surgery in our institution.

METHODS: In this retrospective, observational study, the medical records of all patients who were scheduled for craniotomy for clipping of a cerebral aneurysm on the basis of day surgery were analyzed. The data included the preoperative assessment of the patient, the intraoperative anesthetic management, postoperative care, and the presence of perioperative complications.

RESULTS: In this initial report, 20 patient scheduled for day surgery aneurysm repair were reviewed. Basic patient demographics were similar among study groups (fig. 1).

Distribution of patients is demonstrated in Figure 2.

Reasons for unplanned postoperative hospital admission varied, ranging from changes in level of consciousness in PACU, bradycardia, postoperative fever, severe PONV, and generalized motor weakness.

DISCUSSION: Our data demonstrates that surgical repair of unruptured cerebral aneurysms can be safely performed in an ambulatory day surgery setting. However, the presence of an adequate infrastructure and a backup strategy for unplanned admission are required, since complications occur and remain highly unpredictable.

Anesthetic care for these patients should be individually orientated, including a thorough preoperative assessment and screening for eligibility of day surgery, personalized intraoperative anesthetic management, and a close collaboration of involved medical teams into the postoperative period in order to identify and treat complications, that may lead to unplanned hospital admission.

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S-311.

INHIBITION OF BECLIN-1/CLASS III PI3K DEPENDENT AUTOPHAGY BY PROPOFOL PREVENTS NEURONAL PC12 CELLS DEATH DURING GLUCOSE AND OXYGEN DEPRIVATION IN VITRO

AUTHORS: D. Cui[1], L. Wang[1], A. Qi[2], Q. Zhou[1], X. Zhang[1], W. Jiang[1]

AFFILIATION: [1]Anesthesiology, Shanghai Sixth People's Hospital Affiliated with Shanghai Jiaotong University, Shanghai, China; [2]Postgraduate School, Soochow University, Suzhou, China

INTRODUCTION: Autophagic cell death is a type of programmed cell death that plays elusive roles in controlling neuronal damage and metabolic homeostasis[1]. The present study was to investigate the effects of propofol on autophagic neuronal cell death after OGD in vitro, and to explore the molecular mechanisms by which propofol affect autophagy processes.

METHODS: Hypoxia in cultured neuronal PC12 cells was induced by the oxygen-glucose deprivation (OGD) in vitro. The ultrastructural changes in neuronal PC12 cells were examined with transmission electron microscopy (TEM). The expression of autophagy-related proteins were examined with immunoblotting. The role of autophagy in OGD induced death of neurons was assessed by propofol(10, 20 or 50 μM) and pharmacological inhibition of autophagy with 3-methyladenine (3-MA, 20 mM), LY294002(50 μM) or Bafilomycin A1 (Baf, 4 μM) using cytotoxicity assay and cell viability assay. To further confirm the influence of propofol on the response of the class III PI3K-Beclin-1-Bcl-2 interaction to OGD-induced autophagy in the presence of propofol, the cells were transiently transfected with small interference RNA (siRNA) against Beclin1 for 48h before OGD.

RESULTS: OGD induced activation of autophagy in PC12 cells as evidenced by the increased formation of autophagosomes and autolysosomes; the increased production of microtubule-associated protein 1 light chain 3; the upregulation of Beclin 1, class III PI3K expression; and the decreased levels of cytoprotective Bcl-2 protein in PC12 cells. Furthermore, propofol slightly but significantly attenuated OGD-induced death of PC12 cells in a dose-dependent manner . We also observed a significantly increased interaction between Beclin-1 and class III PI3K, leading to Beclin-1-dependent autophagic cell death, while the administration of propofol promoted Bcl-2 protein expression and significantly decreased Beclin 1, class III PI3K, LC3- II protein expression in the OGD-injured PC12 cells.

DISCUSSION: Our data suggest that autophagy might represent a novel mechanism by which OGD damage induces cell death, and the inhibition of the autophagy activation and maturation by propofol might reduce OGD injury. These results suggest that propofol prevent autophagic neuronal cell death via down-regulation of class III PI3K, Beclin-1, LC3- II and up-regulation of Bcl-2 signal in vitro .Our findings suggest a novel strategy for the development of a novel therapy for hypoxia damage.

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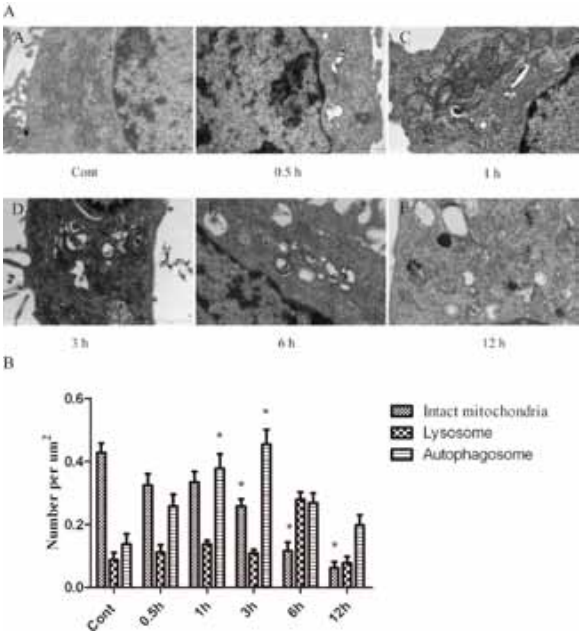

Figure 1. Ultrastructural changes in PC12 cells after OGD injury.

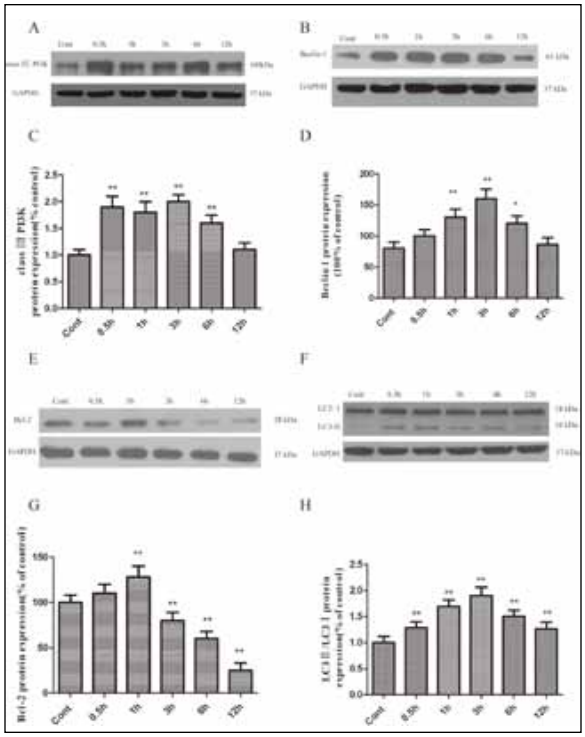

Figure 2. Increased class III PI3K (A and C), Beclin-1 (B and D), Bcl-2 (E and G) and LC3-II (F and H) expression in PC12 cells after OGD injury.

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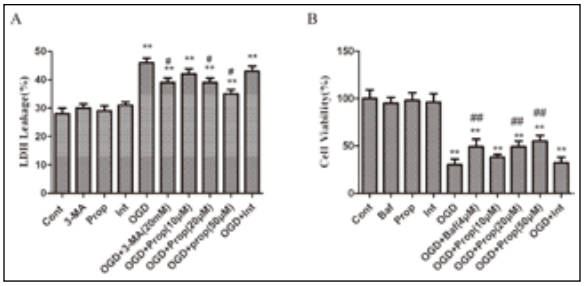

Figure 3. Inhibition of autophagy by propofol reduced OGD-induced PC12 cell injury.

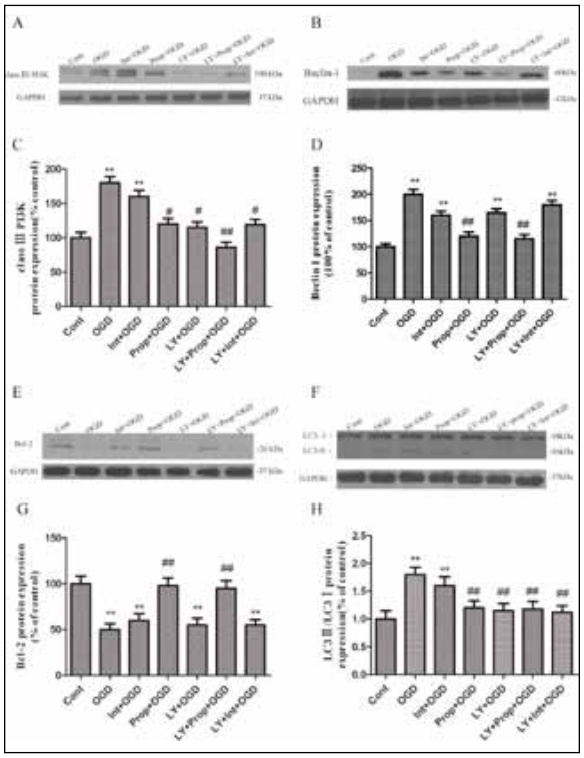

Figure 4. The effect of propofol on the expression of autophagy-related proteins in PC12 cells following OGD.

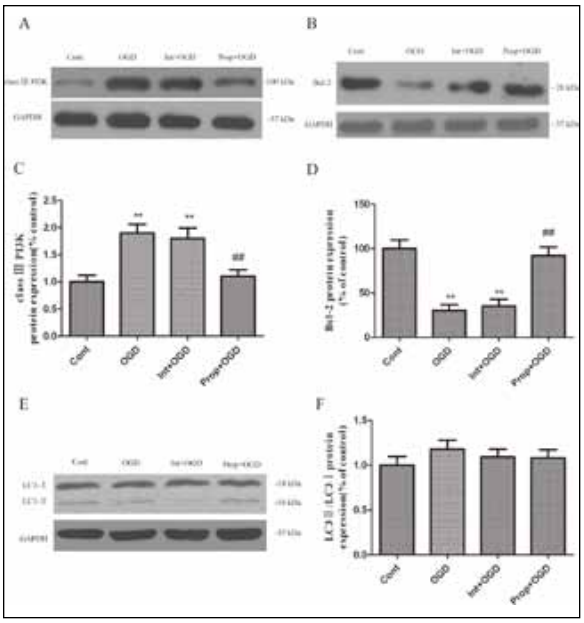

Figure 5. The expression of autophagy-related proteins during 6 h of OGD after transfection with Beclin-1 siRNA at specific concentration (100 nM) for 48 h.

S-312.

INTRAOPERATIVE DEXMEDETOMINE INFUSION ENHANCES QUALITY OF RECOVERY AND MODULATES CYTOKINE LEVELS AFTER MAJOR SPINE SURGERY

AUTHORS: A. Y. Bekker[1], S. Didehvar[1], M. Urban[2], R. P. Kline[1], M. M. Haile[1]

AFFILIATION: [1]Anesthesiology, New York University School of Medicine, New York, NY; [2]Anesthesiology, Hospital for Special Surgery, New York, NY

INTRODUCTION: Surgery induces a variety of endocrine and immune changes collectively known as the "stress response" which, in turn, results in post-operative sickness behavior[1]. Anesthetic management may modulate this physiological response thus affecting the postoperative course. We hypothesized that intra-operative administration of dexmedetomidine (DEX), a symphatolytic agent, would reduce the stress response and improve the quality of recovery in patients undergoing major surgery.

METHODS: We conducted a prospective randomized study on 54 patients undergoing multilevel spinal fusion. Anesthesia was maintained with either propofol/fentanyl/DEX (PFD) or propofol/fentanyl/placebo-saline (PFS). The quality of recovery was assessed using a 40-item questionnaire (QoR40) and a 9 question fatigue scale (FFS) administered preoperatively, in the PACU and on postoperative days (POD) 1, 2 and 30. Blood samples were collected at baseline, in the PACU and POD 1 and analyzed for levels of cytokines IL-6, IL-8 and IL-10,. Data was analyzed with SPSS 19 software using mixed model analysis of variance or rank analysis.

RESULTS: QoR40 Scores were significantly lower compared to baseline (BSL) on POD1 and POD 2 for both groups combined (-18.78, $p<0.001$; -9.61, $p<0.001$). QoR-40 values returned toward BSL on POD3 (-4.389, $p=0.229$). Although patients in PFD group reported superior recovery at all time points, these scores were significantly lower in the PFS group by pairwise comparison only on POD3 (-13.74, $p=0.005$). No behavioral assessments were significantly different on POD 30. All patients reported significantly higher level of fatigue postoperatively, but intergroup difference in FSS was detected on POD2 only (50.0(PFS) vs 36.3(PFD), $p=0.035$). Levels of cytokines Il-6, Il-8, and Il-10 levels were significantly higher immediately after surgery and at POD 1. DEX significantly reduced postoperative rise in IL-10, but not in IL-6 or IL-8.

DISCUSSION: DEX infusion during multilevel spinal fusions improved the quality of recovery and reduced fatigue in the early postoperative period. Moreover, it reduced plasma levels of IL-10 in comparison to the control group. Our sample size was not sufficient to detect differences in either the incidence of complications or clinically relevant outcomes (e.g. hospital length of stay).

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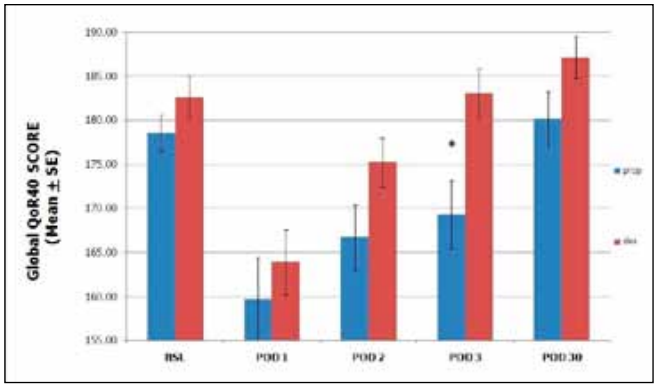
Peri-Operative Cytokine Levels

Variable	Group	Baseline (pg/ml)	PACU (pg/ml)	POD1 (pg/ml)
Cytokine		Median (25-75%), N	Median (25-75%), N	Median (25-75%), N
IL-6	PFS (28) PFD (26)	L (L - L), 6 L (L - 3.93), 8	3.71 (1.21-19.90), 17 9.36 (1.44-22.13), 21	49.95 (11.2-82.10), 27 60.80 (27.33-122.75), 24
Il-8	PFS (28) PFD (26)	4.07 (1.12-6.28), 20 6.89 (4.01-14.03), 23	11.27 (2.10-23.05), 23 11.85 (7.55-23.78), 25	16.40 (6.23-24.60), 27 20.85 (12.60-31.20), 23
IL-10	PFS (28) PFD (26)	L (L - 3.62), 8 L (L - L), 5	19.8 (5.58-55.48), 23 L (L -9.00), 12	9.27 (1.81-28.93), 23 13.30 (1.11-17.10), 17

"L" indicates values below the resolution of the cytokine measurement.



Peri-Operative Quality of Recovery Scores

S-313.

INHIBITION OF AUTOPHAGY BY PROPOFOL INCREASES NEURONAL CELL SURVIVAL FOLLOWING CEREBRAL ISCHEMIA-REPERFUSION INJURY IN RATS

AUTHORS: D. Cui[1], L. Wang[1], A. Qi[2], Q. Zhou[1], X. Zhang[1], W. Jiang[1]

AFFILIATION: [1]Anesthesiology, Shanghai Sixth People's Hospital Affiliated with Shanghai Jiaotong University, Shanghai, China; [2]Postgraduate School, Soochow University, Suzhou, China

INTRODUCTION: Propofol exerts protective effects on neuronal cells, in part through the inhibition of programmed cell death. Autophagic cell death is a type of programmed cell death that plays elusive roles in controlling neuronal damage and metabolic homeostasis[1]. We therefore studied whether propofol could attenuate the formation of autophagosomes, and if so, whether the inhibition of autophagic cell death mediates the neuroprotective effects observed with propofol.

METHODS: The rat cerebral ischemia model was induced by both clamping the common carotid arteries and inducing hypotension for 10min. The ultrastructural changes in rat hippocampal pyramidal neurons were observed by transmission electron microscopy (TEM) at 1-24 h after ischemia/reperfusion (I/R). we measured the number of pyramidal neurons in the CA1 region of the hippocampus following severe ischemic insults at various time points using histochemical techniques. The expression of autophagy-related proteins were examined with immunoblotting. We also examined the effects of propofol on the pyramidal neurons of the hippocampus using TEM, histochemical and immunohistochemical techniques at 12 h after I/R.

RESULTS: TEM revealed that the formation of autophagosomes and autolysosomes in pyramidal rat hippocampal neurons after ischemia/reperfusion insults. The number of hippocampal pyramidal neurons was reduced in the ischemic CA1 hippocampus at 3 h and was further decreased at 6-24 h after ischemia. There was a significant increase in the number of LC3 II-labeled vesicles at 1 h, which peaked at 3-6 h after I/R treatment. A western blot analysis revealed that the autophagy-related proteins, such as microtubule-associated protein 1 light chain 3 (LC3-II), Beclin-1 and class III PI3K, were also increased accordingly, but cytoprotective Bcl-2 protein was decreased. The negative effects of I/R, including the formation of autophagosomes and autolysosomes, the increase in LC3-II, Beclin-1 and class III PI3K expression and the decline in Bcl-2 production were all inhibited by propofol as well as these specific inhibitors of autophagy, such as 3-methyladenine (3-MA) at 12 h after I/R.

DISCUSSION: Our data suggest that propofol can markedly attenuate autophagic processes via the decreased expression of autophagy-related proteins. This inhibition improves cell viability, which provides a novel explanation for the pleiotropic effects of propofol that benefit the nervous system. Our results are the first to show propofol-attenuated autophagic cell death in hypoxic neuronal PC12 cells and the rat hippocampus after I/R insult.

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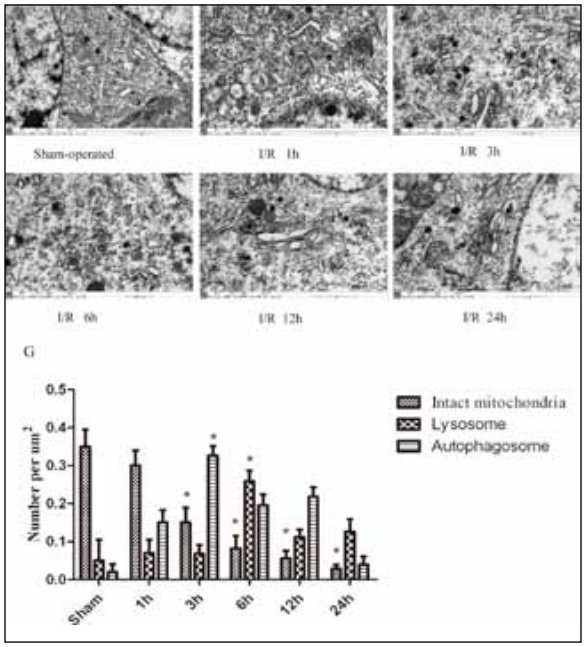

Figure 1. Ultrastructural changes in rat hippocampal pyramidal neurons at 1 (AB), 3 (AC), 6 (AD), 12 (AE) and 24 h (AF) after I/R.

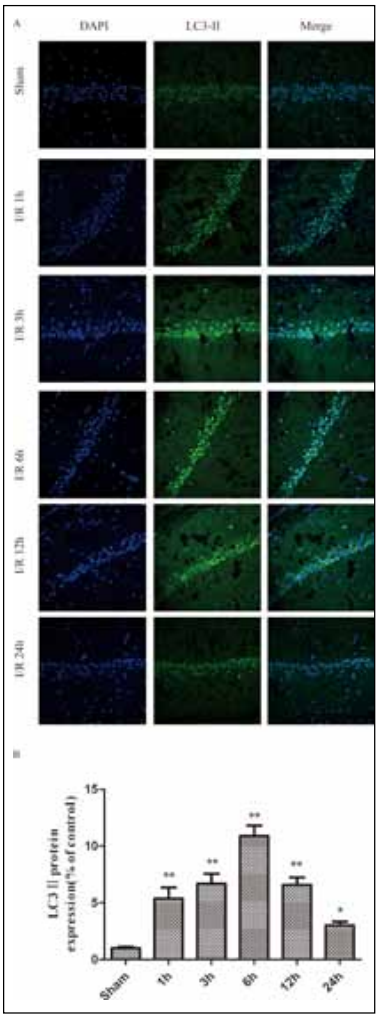

Figure 2. LC3-II was detected with a monoclonal anti-LC3-II-FITC antibody (green).

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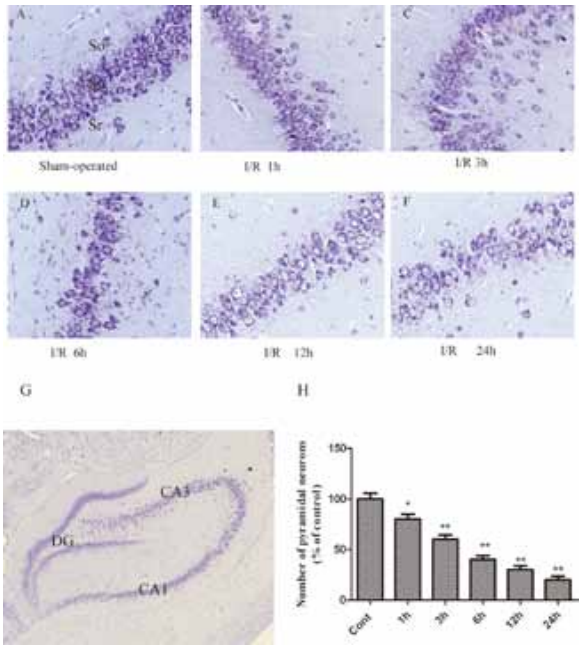

Figure 3. The neuronal damage and histological characteristics of necrotic neurons were assessed by a histological examination.

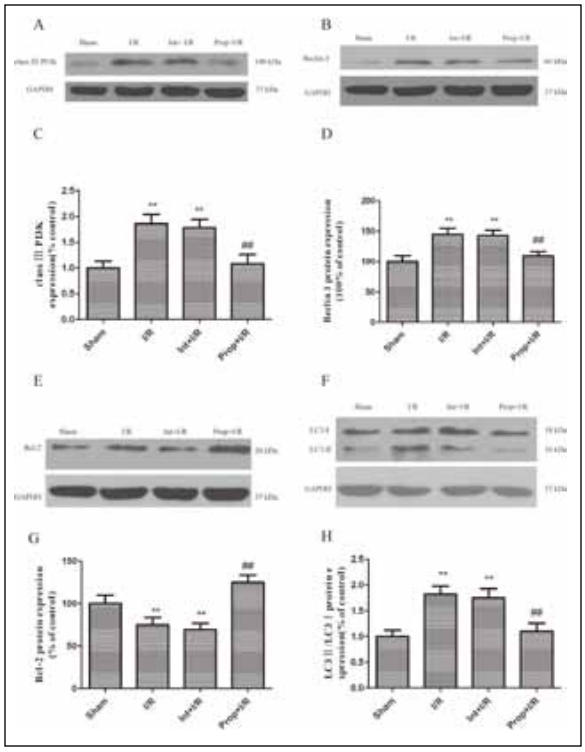

Figure 5. Effect of propofol on the expression of autophagy-related proteins during I/R.

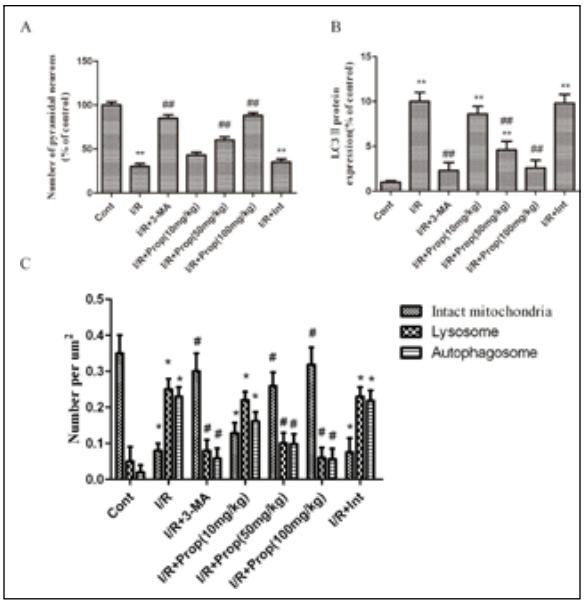

Figure 4. Propofol increased the number of the hippocampal pyramidal neurons and decreased the expression of the LC3-II protein and the number of lysosomes and autophagosomes in the ischemic hippocampus after I/R in the rats.

S-314.

WITHDRAWN.

S-315.

A COMPARATIVE STUDY BETWEEN DEXMEDETOMIDINE AND CLONIDINE ON HEMODYNAMIC RESPONSES DURING INTUBATION AND EXTUBATION FOR INTRACRANIAL SURGERY

AUTHORS: G. S. Tomar, A. K. Tiwari, S. Ganguly

AFFILIATION: Dept. of Anaesthesiology & Critical Care, St. Stephen's Hospital, New Delhi, India

INTRODUCTION: Evaluation and comparison between the efficacy of clonidine and dexmedetomidine on hemodynamics and stress responses during intubation and extubation in intracranial surgery in humans.

METHODS: 60 ASA (I) and (II) patients of age group 20-60 of either sex, presenting for intracranial surgeries with Glasgow coma scale score 14 or 15 divided in three groups of 20 each.

Group (1) – (Dexmedetomidine group): Two doses each of 0.5 mcg/kg dexmedetomidine iv over 60 seconds; the first one immediately just before induction of anaesthesia and other at the end of the surgery with the last skin suture.

Group (2) – (Clonidine group): Two doses each of 3-5 mcg/kg clonidine iv over 60 seconds the first one immediately just before induction of anaesthesia and other at the end of surgery with the last skin suture.

Group (3) – (Control group): Only 1-2 mcg/kg fentanyl as an induction agent.

OBSERVATIONS: Systolic, diastolic and mean arterial pressure (MAP), heart rate (HR),02 saturation (SpO2) and end-tidal CO2 concentration will be recorded 1min before intubation/extubation, at intubation/extubation and at 1, 3, 5, 10, 20 and 30 min after intubation/extubation; recovery time after anaesthesia.

RESULTS: Hemodynamic stability was better seen in both group 1 and group 2 during intubation/extubation as compared with control group 3 ($p<0.05$). Although fall in blood pressure (systolic, diastolic, mean) and heart rate were maximum in group 2 after intubation/extubation after 10 min ($p<0.05$) as compared with other groups 1 & 3. Recovery time was shorter with Group 1($p<0.05$). SP02 and ETC02 values were remain invariable among all groups.

DISCUSSION: Patients in group 1(dexmedetomidine) were subjected to more hemodynamic stability in terms of lesser fall in BP & heart rate at and after intubation/extubation along with faster recovery than Group 2(clonidine) and control group 3.

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S-316.

ANESTHESIA FOR DEEP BRAIN STIMULATION

AUTHORS: J. N. Monteiro[1], M. Sankhe[2]

AFFILIATION: [1]Anesthesiology, PD Hinduja National Hospital & Medical Research Centre, Mumbai, India; Neurosurgery, PD Hinduja National hospital & Medical Research Centre, Mumbai, India

INTRODUCTION: The aim of this study was to evaluate the safety, efficacy and patient acceptance of the technique conscious sedation and the scalp nerve block in our patient population undergoing "Deep brain stimulation" surgery.

METHODS: After hospital ethics committee approval was obtained written informed consent was obtained from the patients undergoing an elective "Deep Brain Stimulation" surgery. 70 consenting patients were enrolled in our prospective observational study that commenced in 2001 and continues through to date.

ANESTHETIC CONSIDERATIONS: The challenge for the anesthesiologist is to provide adequate analgesia, sedation, hemodynamic stability in an "awake", cooperative patient for neurological testing.The essential components of success outlined are establishing rapport with the patient, careful patient positioning and coordinated teamwork. Attention directed toward maintenance of peri-operative drug therapy, associated physiological disturbances and potential adverse drug interactions.

ANESTHETIC TECHNIQUE: General anesthesia is administered in uncooperative patients; while local anesthesia as a scalp nerve block with conscious sedation is an option in adults. After surgery, patients spend the first postoperative night in the ICU (intensive care unit) for precautionary purposes. This is followed by the programming of the stimulators.

RESULTS: The indications, contraindications, patient selection criteria, demographic profiles, patient preparation and intraoperative complications encountered are described. 70 patients underwent the procedure since 2001 when the first case was performed in our institution the data was collected till date.

DISCUSSION: Conscious sedation combined with a scalp block is an extremely effective, safe anesthetic technique with a low complication rate, uniform patient tolerance and it facilitates awake neurological testing. It carries low morbidity and mortality rates and minimizes ICU and total hospital stay. Safe anesthesia depends on team work, well designed protocols and systems not just individual competence and care.

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S-317.

INCIDENCE AND RISK FACTORS FOR ACUTE KIDNEY INJURY AFTER MULTILEVEL SPINE SURGERY

AUTHORS: D. Colquhoun, W. McKinney, A. Smith, M. Durieux, J. Raphael, B. Naik

AFFILIATION: Charlottesville, VA

INTRODUCTION: Acute kidney injury (AKI) is a risk factor for perioperative morbidity and mortality.[1] Risk factors for developing AKI are varied and include the presence of pre-existing kidney disease and the nature of the surgery. The identification of even mild degrees of postoperative renal dysfunction is important, as it is associated with both short and long term morbidity and mortality.[2] Complex spine surgery is associated with significant perioperative hemodynamic and hemostatic perturbation. These changes can compromise renal perfusion and increase the risk of developing AKI. We conducted a retrospective study to determine the incidence of and risk factors for AKI in multilevel spine surgery

METHODS: After IRB approval, Current Procedural Terminology (CPT) codes were used to identify subjects undergoing two or more levels of spine surgery with or without instrumentation between June 2008 and July 2011. Demographic data included age, gender and race. Subjects with pre-existing chronic kidney disease (CKD) requiring renal replacement therapy were excluded. The presence of preoperative CKD, hypertension, diabetes and amount of intra-operative blood loss were recorded. Operative extent was defined as < 4, 4-8 and > 8 surgical levels. AKI was defined by the RIFLE classification using the glomerular filtration rate (GFR). The GFR was calculated using the Modified Diet In Renal Disease formula. A baseline preoperative and the lowest postoperative GFR in the first seven days were recorded. The risk of AKI was analyzed by a Fisher exact test where appropriate. Statistical significance was defined as $P<0.05$.

RESULTS: Six hundred and fifty four patients, with 63%, 17% and 20% having <4, 4-8 and > 8 levels of surgery respectively were identified. Out of the 654 patients, 27 (4.1%) developed AKI as defined by the RIFLE classification. Of these, 23 (3.5%) fell in the RIFLE-risk category while 4 (0.6%) developed RIFLE-injury (Graph 1). No patient developed RIFLE-failure or required renal replacement therapy. Preoperative hypertension was associated with an increased risk of developing postoperative AKI (p=0.029). Gender, CKD and diabetes were not associated with postoperative AKI (Table1). No association was found between age, surgical levels and intraoperative blood loss and the risk of developing AKI.

DISCUSSION: This study demonstrates a low incidence of AKI in complex spine surgery. The majority decrease in GFR fell into the RIFLE-risk category with only a small percent of patients in the RIFLE-injury group. Hypertension was the only risk factor associated with postoperative AKI. Complex spine surgery carries a low risk of postoperative AKI.

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S-318.

WITHDRAWN.

S-319.

POST-SPLENECTOMY SHORT-TERM MEMORY DYSFUNCTION IN MICE IS ATTENUATED BY DELAYED TREATMENT WITH SLK, A NOVEL ANTI-PLATELET ANTIBODY

AUTHORS: D. Shilo[1], Y. Li[2], A. Y. Bekker[1], T. M. Wisniewski[2], M. M. Haile[1]

AFFILIATION: [1]Anesthesiology, NYU Langone Medical Center, New York, NY; [2]Neurology, NYU Langone Medical Center, New York, NY

INTRODUCTION: Post-splenectomy mice demonstrate a delayed loss of short-term memory (STM) possibly associated with neuro-inflammation[1]. The anti-GPIIIa49-66 antibody, SLK (derived from patients with HIV immune-related thrombocytopenia), induces the fragmentation of activated platelets[2] which play a role in the inflammatory response. We hypothesized that post-splenectomy SLK would attenuate CNS dysfunction.

METHODS: After IACUC approval, 60 Swiss-Webster mice (30-35gms, 6-8wks) were randomized into 2 groups that underwent splenectomy and IV injections 3h post-op: (1) Control Group received Saline & (2) Experimental Group received 400ug SLK. Splenectomy was performed under 2.5% Isoflurane with a 1 cm incision, ligation with 6-0 silk, and closure with 4-0 silk. Controls had Object Recognition Testing (ORT) once on either day 1, 5, 9, or 14.Experimental mice had ORT once on either Day 5 or 9. ORT measures STM by exploiting the tendency of mice to explore novel objects in the presence of a familiar object. During learning, mice are placed in an arena with two identical objects for 15m. 1h later a familiar object is replaced with a novel object for a 3m testing trial. When STM is impaired, equal time is devoted to both objects. When STM is intact, more time is spent exploring the novel object. The Recognition Index (RI) is the ratio of time spent exploring the novel object to the total time spent exploring both objects.

RESULTS: Saline mice demonstrated impaired STM on Day 5 and normal STM at other time points. Using ANOVA, we rejected the null hypothesis that the distribution of STM values for all control were equal ($F=6.195$, $p=0.002$). In pairwise comparisons of controls, day 5 was different than all other days (d1,d9, d14; $p<0.05$) after Tukey's correction for multiple comparisons. Examining both groups (SLK, con) on days 5 & 9, we found SLK different than control on day 5 ($p=0.006$, Tukey's correction; Anova, $F = 4.4$; $p=0.01$). Thus, SLK mice showed intact STM on Days 5 & 9.

DISCUSSION: Post-operative CNS dysfunction may be secondary to platelet-mediated neuro-inflammation. Post-splenectomy treatment with SLK, which inhibits activated platelets, prevented short term memory loss. SLK warrants further investigation in the treatment of inflammation-associated cognitive dysfunction.

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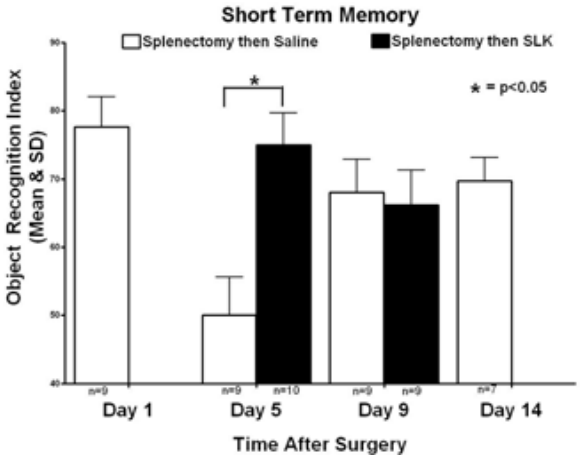

Figure 3. Effects of the central (intracisternal) administration of propofol (PROP - 100 µg; solid arrows, first and second injection) or intralipid (LIPID; solid arrows, first and second injection) on the mean arterial pressure before and after central (intracisternal) opioid receptor blockade with naloxone (NAL - 100 µg; dashed arrow) in pentobarbital-anesthetized Wistar rats. *P <

S-321.

MICRORNA-181 REGULATES BOTH CHAPERONE GRP78 AND BCL-2 FAMILY PROTEINS CHANGING OUTCOME FROM ISCHEMIC BRAIN INJURY IN VITRO AND IN VIVO IN MICE

AUTHORS: R. Giffard[1], Y. Lu[1,2], L. Xu[1], L. A. Volobouева[1], Y. Ouyang1

AFFILIATION: [1]Department of Anesthesia, Stanford University School of Medicine, Stanford, CA; [2]Department of Anesthesia, Beijing Tiantan Hospital, Capital Medical University, Beijing, China

INTRODUCTION: The discovery of microRNAs (miRNAs) has added a new level of posttranscriptional regulatory control to our understanding of the regulation of gene expression. Previous studies indicate that members of the HSP70 family of molecular chaperones and pro-survival members of the Bcl-2 apoptosis regulatory family are major cellular protective mechanisms that can prevent stress induced cell death. Chaperones function in all cellular compartments and reduce oxidative stress and maintain correct folding of proteins. When stress is more severe cells decide whether to undergo apoptotic cell death or not, with the balance between pro-death and pro-survival members playing a critical role in determining cell fate. Using computational miRNA target prediction algorithms, we found that miR-181 could potentially target the 3'UTRs of both HSP70 and Bcl-2 family members.

METHODS: The luciferase assay used renilla luciferase reporter vector phRL-TK[1]. Primary astrocytes were prepared from mouse brain, injury was induced by glucose deprivation (GD). One day after intracerebroventricular injection of plasmid or antagomir adult male mice were subjected to transient suture occlusion of the middle cerebral artery, infarct volume assessed by cresyl violet staining and protein levels by western[1].

RESULTS: We cloned miR-181 and its mutant into a miRNA vector and the 3'UTRs of HSP70 and Bcl-2 family members into the reporter vector. Targets GRP78, Bcl-2, Mcl-1, and Bim showed reduced luciferase activity with wild type but not with mutated miRNA sequence. While Bcl-2 and Mcl-1 are anti-apoptotic, Bim is a BH3 only proapoptotic protein. We altered endogenous miR-181 levels in primary astrocyte cultures and found reduction of miR-181 provides protection against GD-induced brain cell death, accompanied by an increase in GRP78, Bcl-2, and Mcl-1 proteins. mir-181a thus suppressed 3 well known protective proteins, consistent with overall worsened survival. We did not detect Bim protein in our cells. When we modulated miR-181 levels in mice prior to transient cerebral ischemia, we observed decreased infarct volumes when we reduced levels of miR-181a.

DISCUSSION: Our results show that miR-181 can target both a member of the HSP70 family, the endoplasmic reticulum molecular chaperone GRP78, and 3 members of the Bcl-2 apoptotic regulatory family and thereby contribute to the regulation of ischemic brain cell injury. Overall increased miR-181 increases injury, while reduction leads to reduced injury. Manipulating levels of miRNAs provides a novel approach to neuroprotection.

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Obstetric Anesthesia

S-327.

EXIT PROCEDURE ON-CALL: A CASE OF SUCCESSFUL INTERDISCIPLINARY COMMUNICATION

AUTHORS: K. Stiles, G. Shih

AFFILIATION: Anesthesiology, University of Kansas Medical Center, Kansas City, KS

INTRODUCTION: The ex utero intrapartum treatment (EXIT) procedure is performed in cases of life threatening fetal airway anomalies. It allows for airway management of the fetus prior to separation from maternal circulation. It is an uncommon procedure that demands coordination between multiple specialties.

Many challenges to effective communication exist in medicine. Health care teams are dynamic in nature with membership often changing on a daily basis. Failures in communication are often the root cause in sentinel events. Lack of communication increases the risk of surgical errors. Coordination of an EXIT procedure requires communication not only between specialties, but also among colleagues on each team.

METHODS: n/a

Results: Our patient was a 35 yo G2P0100. She presented to MFM with history of a cesarean delivery at 31 weeks in Indonesia and neonatal death within hours after delivery due to a presumed airway anomaly. The current pregnancy was complicated by AMA, GDM, polyhydramnios and fetal retrognathia. She was admitted for an amnioreduction at 33 6/7 weeks.

Consultations were made to ENT, plastic surgery, pediatrics and anesthesiology. Along with MFM, ENT and nursing, the obstetrical anesthesiologist was present for discussion and planning of the EXIT procedure. Cesarean delivery at 36 2/7 weeks was scheduled as a first case on a weekday. All other anesthesia staff were informed of this patient and the upcoming procedure.

The patient presented with PROM at 35 4/7 weeks on a weekend morning. The primary MFM and OB anesthesiologist were out of town. On-call staff from each of the specialties were aware of this case because of prior communication. Although this particular team had never met, they were able to formulate a plan the morning of the procedure. The patient underwent c/s under general anesthesia. The infant was unable to be intubated by direct laryngoscopy and tracheostomy was successfully performed. The baby girl was delivered 26 minutes after incision, with APGARS 5 & 8. She was transported to the NICU in stable condition.

DISCUSSION: This case illustrates successful interdisciplinary communication. Deliberate attempts at communication among specialties turned a potentially emergent situation into a controlled procedure with a positive outcome for both patients. This case also demonstrates how communication within our specialty allowed for delivery of a successful anesthetic for both mother and infant.

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S-328.

THE EFFECT OF PROPHYLACTIC ADMINISTRATION OF DEXAMETHASONE FOR NAUSEA OR VOMITING IN GYNECOLOGICAL OR OBESTETRIC SURGERY:A SYSTEM REVIEW AND META-ANALYSIS IN RANDOMIZED CONTROLLED TRIALS

AUTHORS: F. Z. Hua

AFFILIATION: Nanchang, China

INTRODUCTION: Dexamethasone has been commonly used in gynecological and obstetric surgery to prevent postoperative nausea or vomiting (PONV). However, the optimal dose and time of administration has not been comprehensively quantitative analysis yet. To assess the influence of prophylactic administration of dexamethasone on PONV for patients undergoing gynecological or obstetric surgery

METHODS: We searched the databases of MEDLINE (from January 1966 to November 2011), EMBASE (from January 1985 to November 2011), and the Cochrane Central Register of Controlled Trials (up to November 2011). Selection criteria: Randomized controlled trials (RCTs), which compared the influences between the single dose dexamethasone group and placebo group on PONV, were included in this study. Data collection and analysis: the primary data of the incidence of postoperative nausea (PON), postoperative vomiting (POV), PONV, rescue antiemetic and adverse events was extracted. Three authors independently extracted the data, and evaluated the quality of studies by Jadad scale.

RESULTS: Twenty-four RCTs with 2,246 patients met the eligibility criteria, and were included in this meta-analysis eventually. The results of the system review suggested that: (1) less than 4.0 mg dose of dexamethasone did not have substantial effects on preventative PONV; (2) the dose-range of 5-10 mg had effects on preventative PONV; (3) the 8-10mg dose dexamethasone preoperatively administrated in patients who had history of PONV or motion sickness, and underwent general anesthesia or laparoscopic surgery had better effect on PONV than postoperatively, but the effects of 5mg dose dexamethason in post-operation was better than in the period of pre-operation; (4) The risk of adverse events was not significantly different between dexamethasone groups and control group.

DISCUSSION: The 5mg dose of prophylactic dexamethasone administration was the minimal effective dose for preventing PONV for gynecological and obstetric surgery; the 8-10mg dose of dexamethaosne for patients who were high risk, general anesthesia, or laparoscopic surgery was optimal and recommended.

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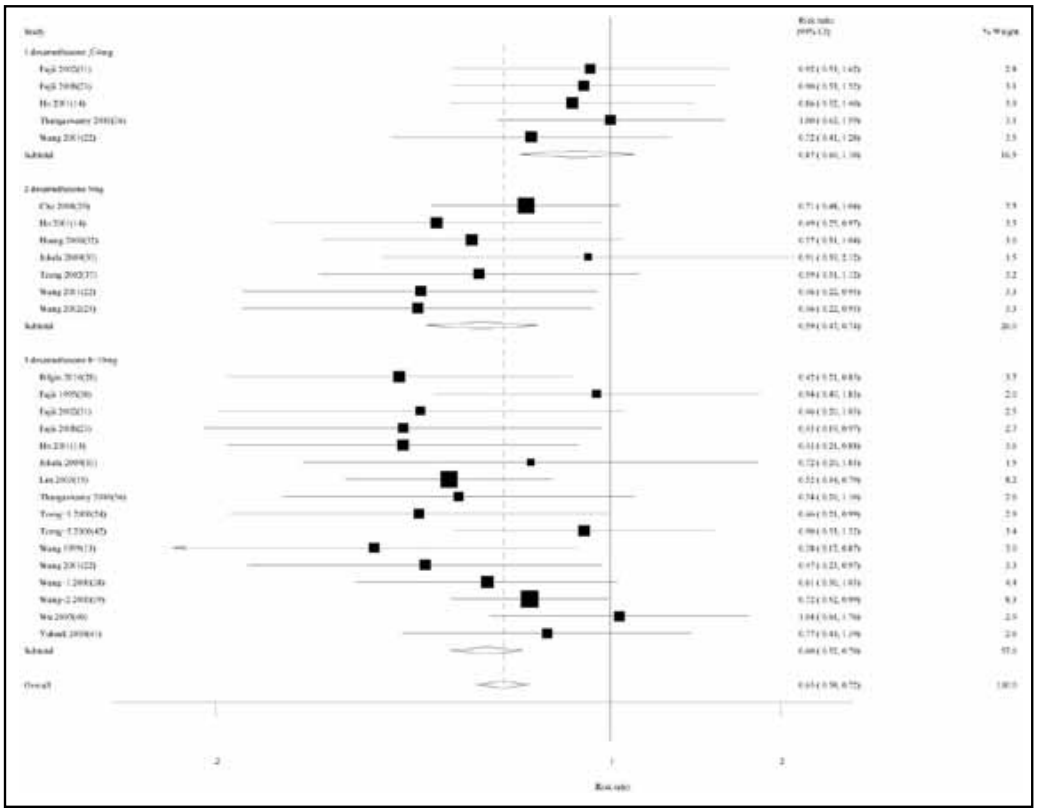

The forest plot showed the effect of prophylactic administration of different doses of dexamethasone on the postoperative nausea or vomiting (PONV). It indicated that less equal 4mg dose did not have any effects on PONV; 5mg and 8-10mg dose had significantly effect on PONV. Fixed effect model was used. The squares and horizontal lines corresponded to the study-specific RR and 95% CI. The area of the squares reflected the study-specific weight. The diamond represented the pooled RR and 95% CI.

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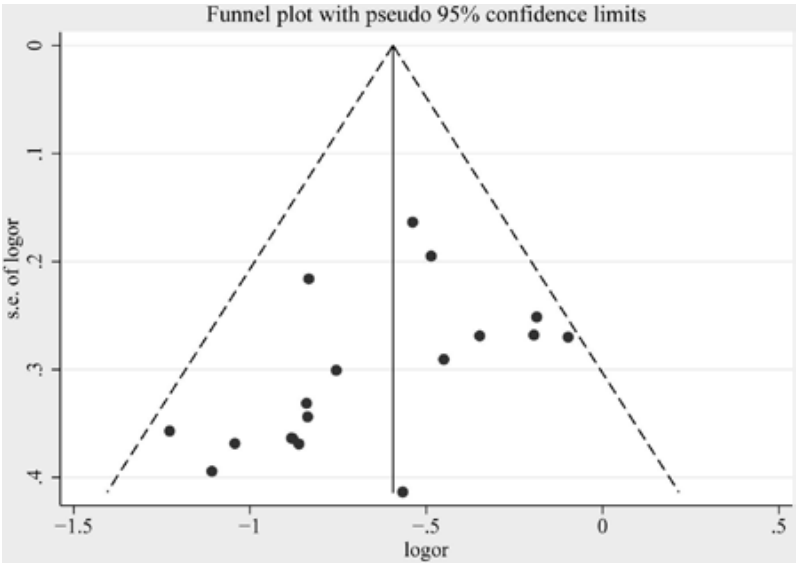
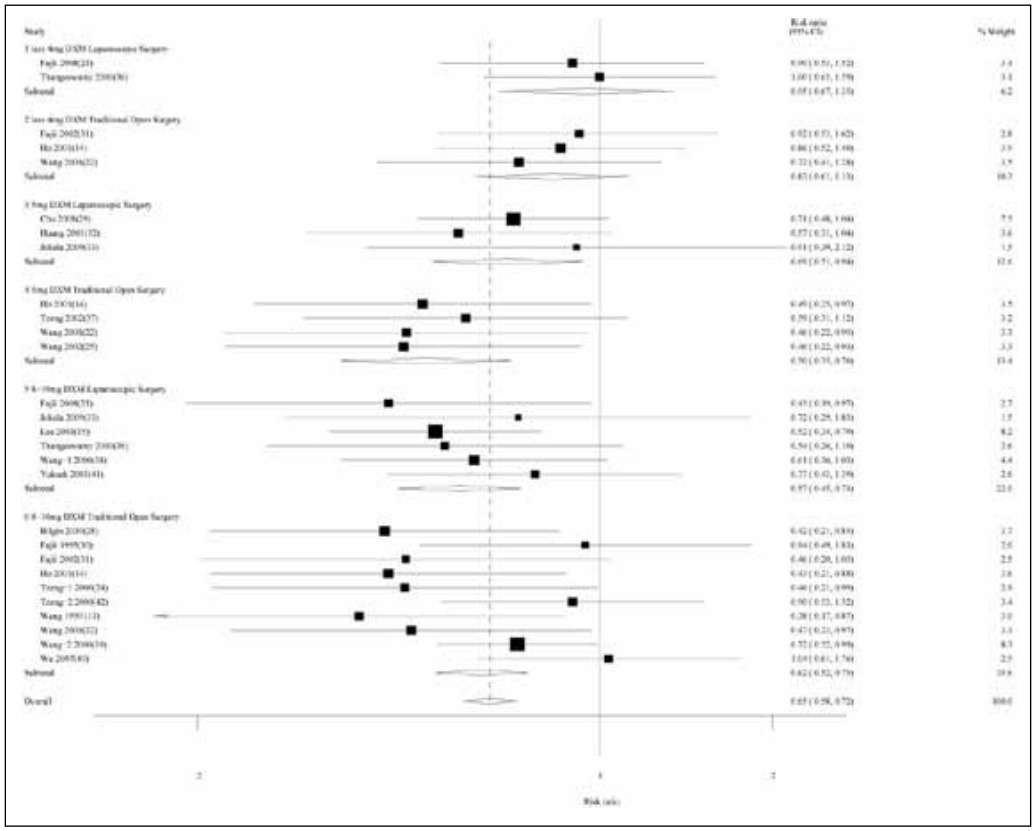


PONV at different dose funnel plot examining the publication bias. Each point represented a trial. SE=Standard Error, RR=Relative Risk. The funnel plots were relatively symmetrical, suggesting the absence publication bias.



The forest plot showed the effect of prophylactic administration of different doses of dexamethasone on PONV between Laparoscopic surgery and traditionally open surgery. It indicated that less equal 4mg dose did not have substantially effect on PONV; the single 5mg dose had effect by traditionally open surgery on PONV; and 8-10mg dose had significantly effect on PONV. Fixed effect model was used. The squares and horizontal lines corresponded to the study-specific RR and 95% CI. The area of the squares reflected the study-specific weight. The diamond represented the pooled RR and 95% CI.

S-329.

EPIDURAL AND INTRATHECAL DRUG INJECTION ERRORS IN OBSTETRIC ANESTHESIA AND ANALGESIA (1981-2011)

AUTHORS: S. Patel[1], S. Patel[2]

AFFILIATION: [1]Anesthesia, The Pennine Acute Trust, Rochdale, United Kingdom; [2]Obstetrics and Gynaecology, The Royal Bolton Hospital, Bolton, United Kingdom

INTRODUCTION: Drug admnistration errors can lead to devastating consequences. Our aim was to review reported cases of wrong drug given into epidural (ED) or intrathecal (IT) route during pregnancy or immediate postpartum period.

METHODS: We searched medline database and google scholar using the search terms 'epidural drug error', 'accidental epidural drug injection', 'inadvertent epidural drug injection' for the period of 1981-2011. Search was also done using intrathecal word. Drugs involved, clinical settings and possible reasons for error were recorded. Maternal immediate, short (< 24 hrs) and longterm (post postpartum period) consequences were noted. Where applicable, labour and neonatal outcome were noted.

RESULTS: 13 case reports met the criteria (table 1). No direct effects on the course of labour, mode of delivery or neonatal outcome were reported. In two cases spinal failed and GA was needed. On three occasions, ED 'failed' to work and was recited in 2 cases before realizing the error. Epidural infusions of magnesium sulphate (MgSO4) (3 cases) and paracetamol were given for few hours (table 1). Flaccid paraplegia and autonomic disturbances (1 case) and severe cardiomyopathy requiring IPPV and IABP (1 case) occurred after potassium chloride (KCL) was injected into ED space. In a case of Tranexamic acid woman developed convulsions, refractory VF and died in few hours. There were no long term residual neurologic or systemic consequences in any other case.

Drugs involved in mishap

Drug (reference)	Clinical setting	Drug supposed to be given/used
2ml 50% MgSO4 bolus (1)	spinal for cervical suturing	heavy xylocaine 2% 2ml
3 g MgSO4 over 2 hrs (2)	ED for LP	infusion was piggy backed with LA infusion
10 ml 15% KCL (3)	end of elective LSCS	NS
50 mg Ephedrine in 10 ml bolus (4)	soon after ED test dose for LP	LA with fentanyl
50 mg Ephedrine in 10 ml bolus (5)	during top up 11 hrs after ED for LP	Ropivacaine with fentanyl
Unspecified amount of 0.5 ml Metchlopramide (6)	spinal for elective LSCS	Fentanyl. (LA was injected separately)
14.5 mg of Labetalol (7)	immediate postpartum tubal ligation via spinal catheter	IV labetalol to treat intraoperative high BP
1 ml Ondansetron (8)	ED for emergency LSCS	Fentanyl (with LA)
8.7 g and 9.6 g MgSO4 over few hrs - 2 different patients (9)	soon after ED test dose for LP	LA with Fentanyl
Unspecified amount of15% KCL (10)	ED for elective LSCS	NS
Unspecified amount of Tranexamic acid (11)	spinal for emergency LSCS	LA
400 mg of paracetamol over 3 hrs (12)	soon after test dose ED infusion started for LP	Levobupivacaine

LP- labor pain, ED=epidural, LA=Bupivacaine, NS=normal saline

DISCUSSION: Ampoule error[1,3,6,10,11], failure to check drug[8,9], syringe swap[4,5], infusion bags confusion[9,12] and catheter mistaken for IV line[2,7] were the main causes for the mistake. In addition, other factors such as lack of education, junior staff, fatigue, poor lighting, hospital supply and storage were reported as contributory factors. Distraction during the procedure (e.g. during labour) and urgent and unpredictable nature of work might have played the role. When epidural is not working, wrong drug administration should be included in differential diagnosis. High vigilance could have prevented errors. Some other measures advocated for prevention include use of coloured labels for drugs and infusion bags, separate drug trays, prefilled syringes labelled with electronic barcodes, different connectors for epidural and intravenous injections, policies or protocols for checking anaesthetic and other drugs.

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S-330.

BETA-2 ADRENERGIC RECEPTOR POLYMORPHISMS AFFECT LABOR PAIN IN NULLIPAROUS WOMEN

AUTHORS: A. S. Terkawi[1], W. M. Jackson[2], S. Hansoti[1], R. Tabassum[1], P. Flood[3]

AFFILIATION: [1]Department of Anesthesiology, King Farad Medical City, Riyadh, Saudi Arabia; [2]Department of Anesthesiology, Columbia University, New York, NY; [3]Department of Anesthesiology, University of California, San Francisco, San Francisco, CA

INTRODUCTION: Labor pain differs substantially among parturients. It varies secondary to demographic, clinical, and psychological factors. Genetics may play an important role in baseline sensitivity to pain[1]. β-2-adrenergic receptor genotype is a risk factor for chronic pain and influences sensitivity in human experimental pain testing[2]. We hypothesized that polymorphisms in this gene may influence the development and intensity of labor pain.

METHODS: 250 parturients were prospectively enrolled with written informed consent and IRB approval. Obstetrical and anesthesia treatment data were recorded with respect to time. DNA was prepared from blood samples and genotyped at two common non-synonymous SNPs in the β-2AR gene (Sequenom; Danvers, MA). Labor pain was recorded as an NRS score and modeled as a sigmoidal function with respect to cervical dilation. The effect of demographic, genetic, and clinical covariates on labor pain was assessed with NONMEM using PLTTools with previously described methods[3].

RESULTS: Parturients who carry G at the 27th amino acid β2AR developed labor pain more rapidly that parturients with the common allele (Fig. 1). Induction was associated with more pain in early labor. Artificial rupture of membranes, augmentation with oxytocin and younger age were associated with more rapid development of labor pain (Fig. 2). Patients treated with meperidine had a more rapid development of pain than patients who received no analgesic (Table 1).

DISCUSSION: Parturients who express at least one minor allele at β2AR-27 develop pain more rapidly than other parturients. This polymorphism is associated with lower levels of receptor expression and greater sensitivity to pain in quantitative sensory testing. These factors can be separated from expected effects of labor induction, augmentation, membrane rupture and analgesic treatment using mixed effects models. These finding suggest that autonomic tone may play a role in labor pain.

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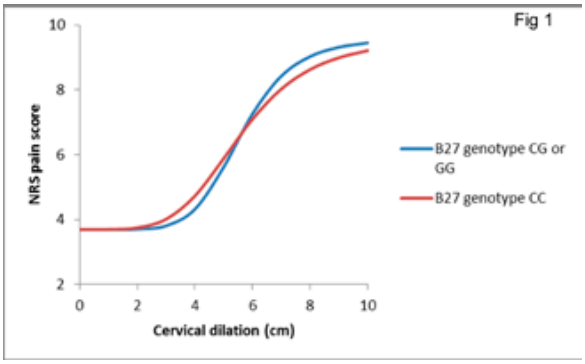

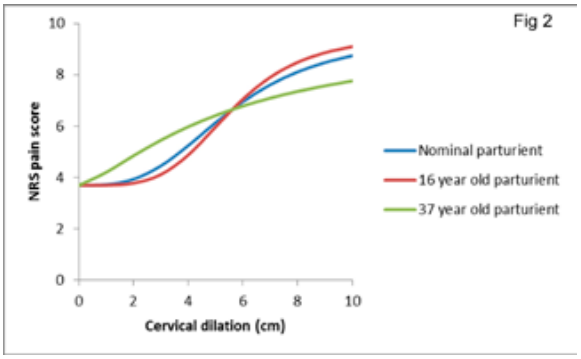

Parameter	Parameter Value	95% CI	P	MPE*	MAPE**
Initial Model				0.07	1.12
E_0	3.42				
E_{max}	9.55				
C_{50}	5.04				
γ	5.37				
Final Model			7.68E-22	0.05	1.02
E_0 (without induction)	3.69	3.22 - 4.12			
E_0 (Induction)	5.01				
E_{max} (no analgesia or meperidine)	9.6	9.44 - 9.78			
E_{max} (neuraxial analgesia)	4.18	2.50 - 5.94			
C_{50} (without oxytocin, without AROM)	5.61	5.12 - 6.01			
C_{50} (with oxytocin, without AROM)	4.8	4.43 - 5.15			
C_{50} (without oxytocin, with AROM)	5.16	4.84 - 5.48			
C_{50} (with oxytocin, with AROM)	4.56	4.21 - 4.86			
γ (no meperidine)	3.06	2.09 - 4.30			
γ (meperidine and B27 CG or GG)	6.3	5.27 - 7.55			
γ (meperidine and B27 CC)	4.58	3.98 - 5.28			
Effect size of age on γ (yr^{-1})	-0.13	(-0.22, -0.04)			

MPE: median prediction error (MPE), = Median ("measured – predicted" / predicted). It is a tool to calculate the Bias in the model. **MAPE****: median absolute prediction error (MAPE), MAPE = Absolute value (Median ("measured – predicted" / predicted)). Is a measure of how close the typical observation is to the predicted value.*

S-331.

EPHEDRINE VS PHENYLEPHRINE FOR THE MANAGEMENT OF HYPOTENSION DURING SPINAL ANESTHESIA FOR CESAREAN SECTION: AN UPDATED META-ANALYSIS

AUTHORS: F. Lin[1], M. Qiu[2,1], X. Ding[2], Q. Li[1]

AFFILIATION: [1]Department of Anesthesiology, Shanghai Tenth People's Hospital of TongJi University, Shanghai, China; [2]First Clinical College, Nanjing Medical University, Nanjing, China

INTRODUCTION: Anna Lee[1] performed a systematic review comparing the efficacy of ephedrine and phenylephrine for management of hypotension in 2002, and there a lot of well-designed trials with controversial results have been published. Therefore, an updated meta-analysis is necessary.

METHODS: Databases of MEDLINE, EMBASE and the Cochrane Central Register of Controlled Clinical Trials were searched (updated on September 26th 2011). Pooled risk ratio (RR) or standard mean difference (SMD) and their 95% confidence intervals (95% CI) were calculated for the incidence of intra-operative hypotension or umbilical blood pH values. And, a RR<1 or an SMD>0 represents that ephedrine is associated with less hypotension or higher umbilical blood pH values compared with phenylephrine.

RESULTS: A number of 15 trials and 742 parturients under elective caesarean section were analyzed. With prophylactic intravenous use, ephedrine and phenylephrine did not differ significantly in the incidence of hypotension (RR = 1.08, 95% CI: 0.66, 1.75), umbilical arterial pH values (SMD = -0.38, 95% CI: -1.67, 0.92) or venous pH values (SMD = -0.14, 95% CI: -0.50, 0.21). The same results were achieved when given intramuscularly. When used to treat hypotension, ephedrine and phenylephrine did not differ significantly in hypotension (RR = 0.79, 95% CI: 0.40, 1.56), while parturients received phenylephrine had neonates with higher umbilical arterial pH values (SMD = -1.32, 95% CI: -2.33, -0.31) (Figure 1) and venous pH values (SMD = -0.79, 95% CI: -1.09, -0.49) (Figure 2) than those given ephedrine.

DISCUSSION: Prophylactic use of ephedrine and phenylephrine were equally effective for the prevention of maternal hypotension in cesarean section under spinal anesthesia; when used to treat hypotension, phenylephrine was superior to ephedrine with higher umbilical blood pH values.

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Meta-analysis Results Summary

		Prevention		Treatment
		Intravenous	Intramuscular	
Hypotension	RR (95% CI)	1.08 (0.66, 1.75)	1.24 (0.71, 2.18)	0.79 (0.40, 1.56)
	Heterogeneity	<0.01	0.39	0.7
Umbilical Arterial pH	SMD (95% CI)	-0.38 (-1.67, 0.92)	N/A	-1.32 (-2.33, -0.31)
	Heterogeneity	<0.01	N/A	<0.01
Umbilical Venous pH	SMD (95% CI)	-0.14 (-0.50, 0.21)	-0.23 (-0.59, 0.14)	-0.79 (-1.09, -0.49)
	Heterogeneity	0.79	0.79	0.48

RR: risk ratio; SMD: standard mean difference; a RR<1 or an SMD>0 represents that ephedrine is associated with less hypotension or higher umbilical blood pH values compared with phenylephrine.

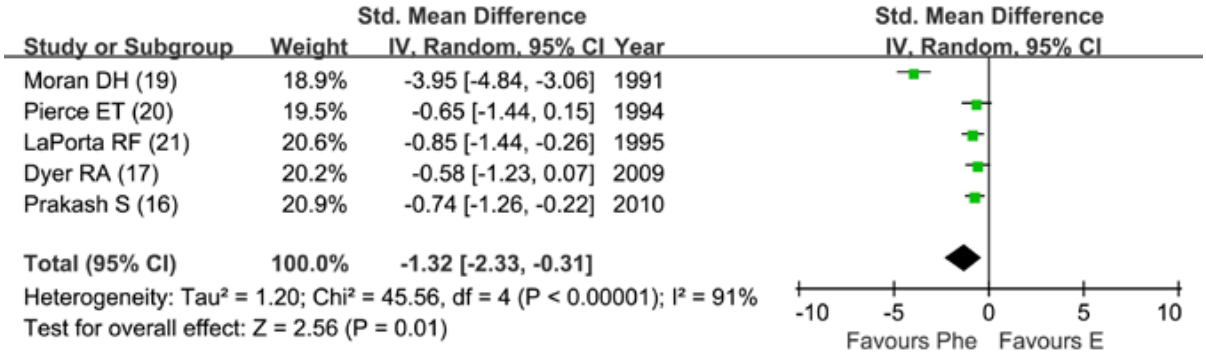

Figure 1 Comparison of Umbilical Arterial pH Values

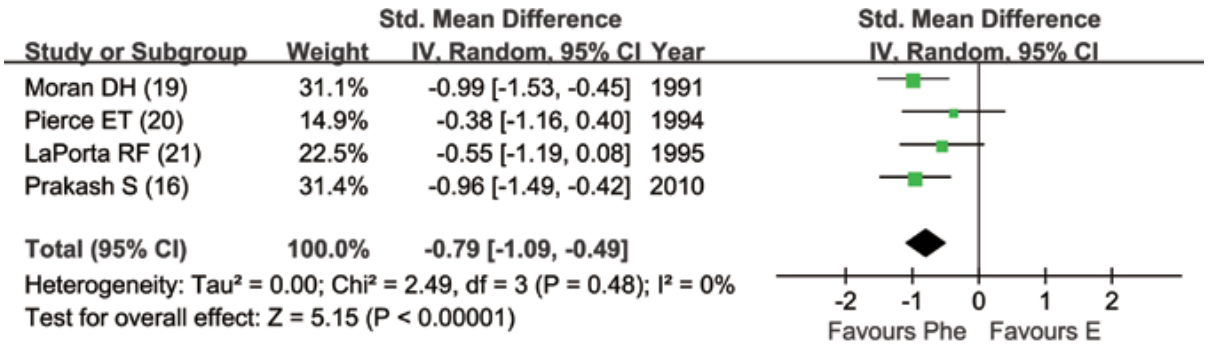

Figure 2 Comparison of Umbilical Venous pH Values

S-332.

INTRAUTERINE FETAL KETAMINE FOR IMMOBILITY DURING CORDOCENTESIS AND FETAL TRANSFUSION

AUTHORS: S. K. Patteson, M. Graham

AFFILIATION: Anesthesiology, University of Tennessee Medical Center, Knoxville, TN

INTRODUCTION: N/A

METHODS: N/A

CHALLENGING CASE REPORT: A 21 yo G4P2 at 31 weeks gestation presented for percutaneous umbilical cord sampling and transfusion secondary to fetal anemia. The patient was taken to the operating room and placed supine with left lateral uterine displacement. Standard ADA monitors were applied and fetal monitoring utilized throughout the procedure. Ultrasound identified fetal position, umbilical cord, and a posterior placenta. The abdomen was prepped and draped in sterile fashion and the skin and subcutaneous tissue infiltrated with local anesthetic. The obstetrician attempted cordocentesis. Despite local anesthetic the patient expressed extreme discomfort and intense cramping at the insertion site. Patient received fentanyl 100 mcg IV without relief, promethazine 12.5 mg IV for nausea, and an additional 200mcg fentanyl IV incrementally. Maternal movement and discomfort became more pronounced. In total, 500 mcg fentanyl was incrementally administered without effect on the patient's pain or discomfort. In addition, fetal movement impaired proper needle placement. The obstetrician requested fetal immobility to facilitate fetal transfusion. After considering options, a decision was made for the obstetrician to administer IM ketamine to the fetus at 7.5 mg/kg estimated weight via cordocentesis needle. Maternal anxiety and pain prevented completion of the procedure and general anesthesia was induced. Blood sample was not obtained as the obstetrician elected to proceed with fetal transfusion by transperitoneal approach. Mother and fetus tolerated the procedure well after general anesthesia.

Multiple large cordocentesis studies have been conducted evaluating technique, insertion site, gestational age, and complications[1,2]. Although some mention fetal movement, none address intervention for it. Fetal analgesia with IV fentanyl has been implicated in use for intrauterine procedures.[3] FDA package insert labeling of vecuronium and rocuronium approve IV use only. In our case, an active fetus prevented safe access to placental vessels and fetal intraabdominal cavity. Ketamine's excellent safety profile and rapid onset may provide a viable option in a similar clinical situation.

RESULTS: n/a

DISCUSSION: n/a

REFERENCES:

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S-333.

DOES THE ADDITION OF ONDANSETRON TO IV-PATIENT CONTROLLED NALOXONE FURTHER IMPROVES POST C/S EPIDURAL -FENTANYL INDUCED PRURITUS TREATMENT?

AUTHORS: Shruti Shah[1], Shaul Cohen[1], Salvatore Zisa[1], Branson Collins[1], Purvi Patel[1], Sylvia Barsoum[1]

AFFILIATION: Anesthesiology, RWJMS-UMDNJ, New Brunswick, NJ

INTRODUCTION: Patient-administered IV naloxone has been applied routinely for the treatment of epidural-fentanyl-induced pruritus after C/S. Ondansetron is effective to treat epidural opioid-induced pruritus[1].

METHODS: OBJECTIVE: We determine whether the addition of ondansetron to our IV-patient controlled naloxone solution can further improve the treatment of post C/S pruritus. METHODS: Fifty women scheduled for elective C/S under epidural lidocaine 2%, fentanyl 5 mcg/ml and epinephrine 5 mcg/ml without parentral opioids were studied. Upon arrival at PACU, patients received epidural-PCA fental-ropivacaine-epinephrine and were randomized to one of two groups. Group I: (n=25) received patient-administered IV naloxone via PCA device (Abbott Life-Care, Abbott Laboratories, Chicago IL). Each patient could receive naloxone IV-patient controlled dose of 0.04 mg (in 5 ml) and a lockout time interval of 5 min. Group II: (n=25) received patient-administered IV naloxone mixed with ondansetron via PCA device (Abbott Life-Care, Abbott Laboratories, Chicago IL). Each patient could receive naloxone IV-patient controlled dose of 0.04 mg mixed with 0.5 mg ondansetron (in 5 ml) and a lockout time interval of 5 min. Patients were evaluated at 1, 2, and 4 hrs, then every 4 hrs or sooner, if needed, for a total of 48 hrs for the following: fentanyl, naloxone total doses, fentanyl side effects, VAS pain scores, itching scores, overall satisfaction and satisfaction from the pruritus treatment. Pain intensity at rest and the incidence and type of side effects were assessed by using a 10-point scale (0 = none, 10 = worst ever experience). Overall satisfaction with the infusion was assessed by using a 10-point scale (0 = no satisfaction, 10 = best satisfaction). Data is expressed as mean + SD or % incidence. $P < 0.05$ was considered significant.

RESULTS: There were no differences among the groups with respect to age, height, parity, pain scores, incidence of sedation, nausea, or vomiting, and satisfaction from itching treatments.

CONCLUSION: The addition of ondansetron to our IV-patient controlled naloxone solution for the treatment of post C/S pruritus, reduced the maximum pruritus scores and increased the overall satisfaction from this pruritus treatment.

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Table 1

	I-Naloxone	II-Naloxone/ Odensetron
Sedation	5(20%)	2(8%)
Itching	21(84%)	20(80%)
Vomiting	3(12%)	0(0%)
Max Itching Score	4.2±3.3*	5.9±2.5
Max Pain	3.9±2.6	3.5±2.6
Total Naloxone dose	9.1±11.1*	6.5±7.5
Max Sedation Score	0.9±1.7	0.9±2.1
Max Nausea Score	0.9±2.5	0.2±1.2
Overall Satisfaction	8.7±1.2**	9.7±0.5
Overall Narccan Satisfaction	9.5±1.0	9.6±0.6

* $p<0.05$; ** $p<0.003$

S-334.

HEMODYNAMIC PROFILE OF PATIENTS HAVING CESAREAN DELIVERY UNDER SPINAL ANESTHESIA OBTAINED BY CONTINUOUS MEASUREMENT OF CARDIAC OUTPUT AND STROKE VOLUME

AUTHORS: Y. Liu, M. M. Pian-Smith, L. R. Leffert, R. Minehart, R. M. Kacmarek, Y. Jiang

AFFILIATION: Massachusetts General Hospital, Boston, MA

INTRODUCTION: There are 1.5 million Cesarean deliveries (CD) annually in the United States. Most are performed under spinal or epidural anesthesia. Dramatic hemodynamic instability occurs frequently with SA which may be associated with adverse effects on the mother and baby. Hemodynamic control has been traditionally guided by blood pressure. However, this approach has been questioned since vasoactive agents may keep blood pressure in the target range, while cardiac output (CO), which is a determinant of O2 delivery, can be markedly reduced. The aims of this study were to 1) continuously measure CO and stroke volume (SV) and establish the hemodynamic profile of patients having CD under spinal anesthesia, and 2) determine if real-time awareness of the CO and SV by the care-team translates into an improved hemodynamic profile.

METHODS: Thirty elective CD patients receiving spinals were randomized into 2 groups (A and B). CO and SV were measured in all patents with a non-invasive monitor (ICON, Cardiotronic). In Group A (n=15), the anesthesia care providers were unaware of the CO and SV measurement and standard of care was given to patients. In Group B (n=15), the anesthesia care providers were aware of real-time CO and SV measurements.

RESULTS: There was no significant difference in demographics between groups. Even though we hypothesized that the care team would treat patients based on changes in their CO and SV, there was no difference in the total dosage of phenylepherine (A: 2.36±1.88mg vs. B: 1.89±1.61mg, P=0.51) and ephedrine (A; 8.5±11.6mg vs. B: 20.6±33.9mg, P=0.3). Hemodynamic stability evaluated by the maximum, minimum and mean value of MAP, CO, SV, and HR were not significantly different between groups. The incidence of intra-operative nausea and vomiting was the same in both groups (46.7%). Hypotension developed in 80% and MAP decreased by 29.9±13.2% from baseline at 8.5±5.2 min after spinal anesthesia. However, CO changes did not correlate to MAP and varied from -35% to 67% of baseline (3.53 to 12.57 L/min) at the nadir of MAP. With treatment of hypotension, 61% had CO reduction of more than 20% from baseline within 3 min of phenylephrine bolus (80-160mcg).

DISCUSSION: In this sample, real-time awareness of CO and SV did not affect the treatment of CD patients by the care team. Importantly, there was poor correlation between CO and MAP in patients having CD under spinal anesthesia. Thus, treating hypotension per se, as opposed to diminished CO and SV, may represent a missed opportunity to optimize O2 delivery.

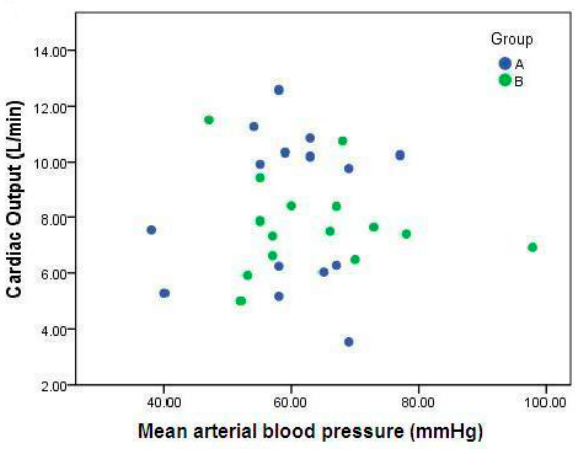

Figure 1. Cardiac output and mean arterial blood pressure plot at the nadir of mean arterial blood pressure after spinal anesthesia.

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S-335.

WITHDRAWN.

S-336.

WITHDRAWN.

Pain – Basic Science

S-342.

ANTINOCICEPTIVE INTERACTION BETWEEN INTRATHECALLY ADMINISTERED BUPIVACAINE AND EPIBATIDINE IN RATS

AUTHOR: T. Nishiyama

AFFILIATION: Anesthesiology and Critical care, Higashi Omiya General Hospital, Saitama, Japan

INTRODUCTION: A nicotinic acetylcholine receptor agonist, epibatidine has strong antinociceptive effects, but also toxic. To have effective antinociception with decreasing toxicity, synergistic effects might be useful. The interaction between intrathecal epibatidine and midazolam or clonidine showed some antagonistic effects, while morphine had synergistic antinociception with epibatidine. The present study investigated the interaction between intrathecally administered bupivacaine and epibatidine in two different nociceptive models in rats expecting synergistic effects.

METHODS: Sprague-Dawley rats with lumbar intrathecal catheters were tested for their thermal tail withdrawal response using the tail flick test and for their paw flinches by formalin injection after intrathecal drug administration. The combination of each 1/2, 1/4, 1/8, or 1/16 50 % effective dose (ED50) was administered. The ED50s of epibatidine[1]and bupivacaine[2] were derived from our previous studies. The interaction was tested by an isobolographic analysis. Eight rats were used in each dose group. Behavioral side effects were also investigated.

CHALLENGING CASE REPORT: N/A

RESULTS: The ED50 of the combination could not be obtained in the tail flick test even when each dose was increased to 2ED50. In both phase 1 and 2 of the formalin test, the combination had a tendency of synergistic effect, while not statistically significant due to big variations. The combination of 2ED50 induced motor disturbance.

DISCUSSION: Intrathecal bupivacaine and epibatidine might be antagonistic for thermal nociception, while they might be synergistically antinociceptive for formalin induced acute and chronic inflammatory nociception.

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ED50

	Tail flick	Formalin phase 1	Formalin phase 2
Bupivacaine (μg)	7.1 (3.5-13.8)	5.7 (3.5-8.8)	3.2 (1.7-6.3)
Epibatidine (ng)	32.0 (22.0-46.5)	38.0 (21.5-65.1)	27.1 (10.4-43.5)
Bupivacaine in combination (μg)	N/A	1.2 (0.00-14x106)	0.3 (0.02-5.81)
Epibatidine in combination (ng)	N/A	9.8 (8.8x10-7-1.1x108)	2.6 (0.15-45.8)

ED50 values are shown as mean and 95% confidence interval (in parenthesis).

S-343.

LUMBAR FACET JOINT OSTEOARTHRITIS AND PAIN IN THE RAT

AUTHOR: J. Kroin, J. Kim, H. Im, J. Li, K. J. Tuman, A. Buvanendran

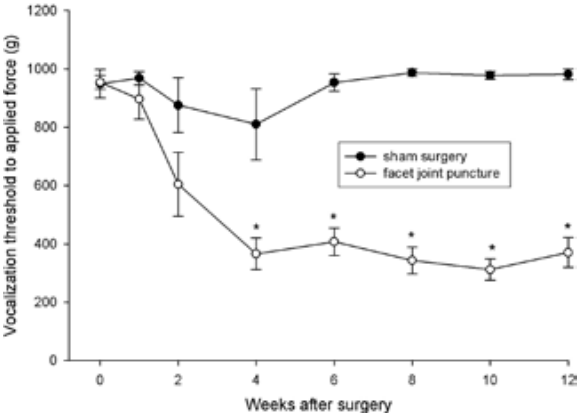
AFFILIATION: Rush Medical College, Chicago, IL

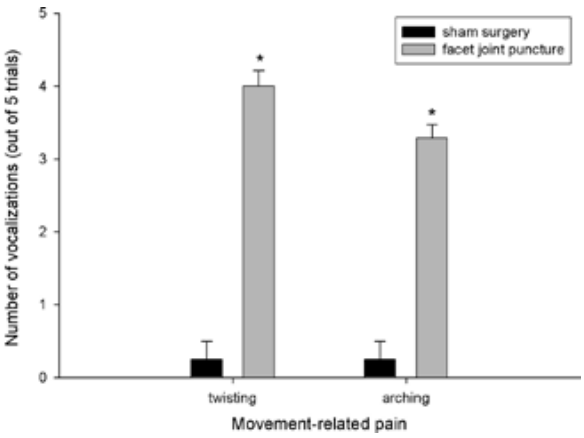
INTRODUCTION: The etiology of lower back pain in patients is often complex. Osteoarthritis of the lumbar facet joints have been implicated as a potential causative factor, but that is still controversial.[1-3] The present study examines pain-related behaviors in a facet joint osteoarthritis animal model.

METHODS: With IACUC approval, facet joint osteoarthritis was produced in male Sprague-Dawley rats (325-350g; n=6) by percutaneous puncture of the right lumbar facet joints at L3/L4, L4/L5, and L5/L6 levels. Facet joints were located and punctured by two-needle protocol, beginning with a 21G hypodermic needle inserted through the skin of the right lower back until the sacrum and L6/S1 joint were located. The needle was then removed and reinserted 7 mm more rostral until the tip lodged firmly into the L5/L6 facet joint. A 26G Hamilton needle was inserted into the 21G needle and lowered until it could be felt puncturing the facet joint capsular tissue. This procedure was then repeated for the L4/L5, and L3/L4 facet joints. For sham surgery animals (n=6), the 21G needle was inserted through the skin, and advanced in succession to the L5/L6, L4/L5, and L3/L4 facet joints, but without lodging firmly in the facet joint (and no 26G needle inserted). Pressure hyperalgesia in the lower back was measured using an applied force gauge (algometer). With the animal gently held, the applied force was slowly increased at 100 g per sec until an audible vocalization was heard. Movement-related pain was evaluated by the number of vocalizations in 5 trials to twisting or arching of the back. Osteoarthritis in the lumbar facet joints was assessed with Safranin-O staining, and foraminal changes by micro-CT scanning. Behavioral pain measures over the 12 weeks after facet joint or sham surgery were compared with repeated measures general linear model.

RESULTS: Facet joint puncture produced primary pressure hyperalgesia and movement-related pain in the lower back, and this was maintained for at least 12 weeks (figures). Histological examination showed loss of facet joint proteoglycan in cartilage ground substance in facet joint puncture rats, but no intervertebral foraminal stenosis.

DISCUSSION: Lumbar facet joint puncture causes pressure hyperalgesia and movement-related pain in the lower back of rats, and cartilage degeneration in the facet joint. In this model, there was no foraminal stenosis suggestive of nerve root involvement. These observations suggest this model may have utility in evaluating interventions used to treat facet joint osteoarthritis.





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S-344.

REPEATABILITY OF PERCUTANEOUS INTRATHECAL INJECTIONS IN MICE

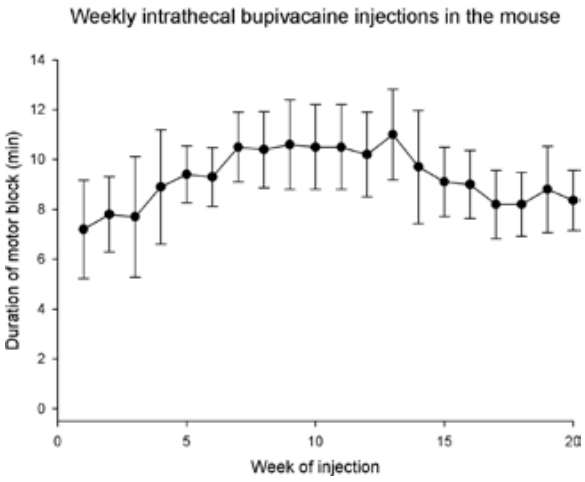
AUTHORS: J. Kroin, J. Li, M. Moric, A. Buvanendran

AFFILIATION: Rush Medical College, Chicago, IL

INTRODUCTION: Weekly intrathecal injections of methylprednisolone have been reported to reduce pain from postherpetic neuralgia,[1] and intrathecal injections of insulin-like growth factor (IGF)-1every 2 weeks have had a modest but significant beneficial effect in ALS patients.[2] To study these and similar therapeutic protocols it would be desirable to test these concepts in mice. While there have been studies with repeated intrathecal injections of drugs in mice over a few days,[3] the feasibility of performing these injections over long periods of time has not been examined.

METHODS: After IACUC approval, C57BL/6 mice of both genders (9 male, 13 female) were briefly anesthetized with 1.5% isoflurane in oxygen. The skin around the lower back was shaved, wiped with alcohol and prepped with chlorhexidine. The hip bones were lifted slightly, and a 30-G needle attached to a 50 µL syringe inserted through intact skin into the spinal subarachnoid space at approximately the level or the 5th or 6th lumbar vertebrae.[4] Puncture of the dura was indicated reliably by a flick of the tail. Then, 5 µL of 0.75% bupivacaine was injected over 2 sec. Prior to each injection, the animal's gait was observed visually while walking on a metal grid on the table. Immediately after injection the mice were removed from the anesthesia nose cone, and placed on a horizontal wire grid on the table. Their gait was then re-evaluated at 2 min intervals. A spinal block is indicated by the animal moving with the front limbs only, while dragging the hind limbs. This gait inhibition has been demonstrated by other investigator's using 5 µL of 0.75% bupivacaine.[5,6] Animals were injected weekly for 20 weeks. Duration of motor block over the 20 weeks was analyzed with repeated measures mixed procedure (SAS software).

RESULTS: 96% (22/23) of the mice completed the 20-week protocol without any morbidity or long-term gait abnormality. One animal was sacrificed at week 14 due to skin erosion at the injection site. While there were some fluctuation in the motor block duration over time (figure), there was no difference between the first injection and the 20th injection (P=0.9739).



DISCUSSION: Weekly percutaneous intrathecal injections of local anesthetics are feasible in the mouse over months without loss of potency or long-term motor dysfunction. This suggests that research studies with long-term therapeutic intrathecal injections (e.g. growth factors) can be tested in this model.

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S-346.

ROLE OF SPINAL VOLTAGE SENSITIVE CALCIUM CHANNELS ON NOCICEPTIVE BEHAVIOR AND EXCITATORY NEUROTRANSMISSION

AUTHORS: T. Takasusuki[1], K. Nemoto[1], S. Yamaguchi[1], T. Yaksh[2]

AFFILIATION: [1]Anesthesiology, Dokkyo Medical University, Mibu, Japan; [2]Anesthesiology, University of California, San Diego, La Jolla, CA

INTRODUCTION: The release of substance P, an excitatory neurotransmitter from small primary afferents is mediated by voltage sensitive calcium channels (VSCCs) that are expressed at presynaptic nerve terminals. The auxiliary α2δ1 subunit of VSCCs regulates both excitatory and inhibitory spinal neurotransmission via a presynaptic mechanism. The role of VSCCs and α2δ1 subunit to the nociceptive transmission remains uncertain. In the present study, we determined the effects of intrathecal (IT) N-type (ziconotide), T-type (mibefradil), L-type (diltiazem and verapamil) VSCCs blockers and α2δ1 subunit binding agent (gabapentin) on nociceptive behaviors and small primary afferent substance P release evoked by intraplantar injection of formalin.

METHODS: Formalin-induced flinching behavior was measured using an automated detection system. Rats with chronic intrathecal catheters received IT pretreatment with saline, ziconotide (0.3, 0.6 or 1μg), mibefradil (50 or 100μg), diltiazem (300 or 500μg), verapamil (50, 100 or 200μg) or gabapentin (100 or 200μg) 10min before i.p.l. injection of formalin (5%, 50μl) into the left hindpaw. Immediately after the formalin injection, nociceptive flinching was quantified. In separate rats, to assess the release of substance P, animals underwent transcardial perfusion with 4% paraformaldehyde 10 min after the formalin injection and the incidence of neurokinin 1 receptor (NK1r) internalization in the ipsilateral superficial dorsal horn was determined in immunofluorescent stained tissues.

RESULTS: IT ziconotide (0.3, 0.6 and 1μg), mibefradil (100μg), diltiazem (500μg), verapamil (200μg) and gabapentin (100 and 200μg) significantly reduced formalin-induced paw-flinching in phase II ($P < 0.05$), but not phase I. Ziconotide (0.3, 0.6 and 1μg) and gabapentin (200μg, but not 100μg) significantly inhibited evoked NK1r internalization ($P < 0.05$). In addition, NK1r internalization induced by exogenous substance P (IT) was not blocked by IT ziconotide (0.6μg) and gabapentin (200μg).

DISCUSSION: IT ziconotide and gabapentin attenuated formalin-induced paw flinching behavior and, at corresponding doses, substance P release in lamina I. N-type VSCCs and VSCCs α2δ1 subunit presynaptically mediate nociceptive transmission in the spinal cord dorsal horn. Supported by NIH-DA02110

REFERENCES: N/A

S-348.

HYPERBARIC OXYGENATION ALLEVIATES CCI-INDUCED NEUROPATHIC PAIN THROUGH INHIBITING PRO-APOPTOSIS GENES OVER-EXPRESSION IN THE SPINAL CORD

AUTHORS: J. Du, R. Yousif, D. Foster, F. Li, Z. Yang

AFFILIATION: Anesthesiology, Upstate Medical University, Syracuse, NY

INTRODUCTION: Increased apoptotic changes in the spinal cord may be responsible for chronic constriction injury (CCI) induced neuropathic pain. We previously reported that hyperbaric oxygen (HBO) alleviated CCI-induced neuropathic pain by reducing endoneuronal TNF-α production. In the present study, we investigated apoptosis-relative genes expression in the spinal cord 3 days after CCI.

METHODS: The proposed study was approved by the Institutional Committee for the Humane Use of Animals.Rats were randomized into: CCI (n=16), CCI + HBO (n=16) and Sham (n=16) groups. Mechanical allodynia was tested daily following surgery. CCI+HBO rats were treated with HBO for 1 hr once a day. 3 days post-CCI, 8 rats in each group were sacrificed and the spinal cords harvested. The another 8 rats in each group were observed for 7 days. The expression of TNF-α, Caspase-3 and SOD and NF-κB genes was detected by RT-PCR.

RESULTS: 7 days post-CCI, mechanical allodynia had developed compared to sham animals (4.31 ± 0.10 vs. 5.17 ± 0.08, $p < 0.05$). HBO significantly alleviated mechanical allodynia (4.69 ± 0.11 vs.4.31 ± 0.11, $p<0.05$). Compared to Sham, CCI-induced neuropathic pain was associated with higher mRNA levels of TNF-α (16.92±0.87 vs.11.96±1.50, $p<0.05$), Caspase-3 (17.74±3.45 vs. 12.75±3.01, $p<0.05$) and SOD (3.32±0.54 vs. 1.43±0.37, $p<0.05$), and lower mRNA levels of NF-κB (2.56±0.33 vs. 4.16±0.27, $p<0.05$) 3 days post-CCI. HBO significantly decreased CCI-induced mRNA levels of TNF-α (11.67±1.89, $p<0.05$ vs. CCI), Caspase-3 (11±1.02, $P<0.05$ VS. CCI), and SOD (1.21±0.147, $P<0.05$ VS. CCI). CCI-induced neuropathic pain is also associated with more apoptotic cells in the spinal cord, being 19.25 ± 2.44 vs. 10 ± 0.45, $p<0.05$. HBO significantly reduced CCI-induced apoptosis to the level of sham animals, being 8.25 ± 0.90 vs. 10 ± 0.45, p=ns. The apoptotic cells were neurons verified by Nissl stain.

DISCUSSION: The present study suggests that the overly expressed pro-apoptosis genes and the subsequent spinal apoptotic changes may contribute to the development of CCI-induced neuropathic pain. The inhibitory role of HBO on spinal pro-apoptosis genes may be responsible for it's beneficial effect on CCI-induced neuropathic pain.

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S-349.

THE INVOLVEMENT OF OPIOID RECEPTORS IN THE EXERCISE-INDUCED CARDIOPROTECTION AGAINST ISCHEMIA-REPERFUSION INJURY IN VIVO

AUTHORS: J. Borges, L. Paes, E. Tibirica, M. Lessa

AFFILIATION: Laboratory of Cardiovascular Investigation, Oswaldo Cruz Foundation, Rio De Janeiro, Brazil

INTRODUCTION: In vitro studies of the myocardial tolerance against ischemia-reperfusion (I-R) injury induced by exercise has suggested the involvement of the Opioid system1. However, the link between exercise-induced cardioprotection and the opioid system remains an area where further clarification of the mechanisms involved is needed2. This first phase of the study aims to verify a vivo model of exercise-induced cardioprotection against I/R injury in rats.

METHODS: Male Wister rats (250-300g) were first divided into 2 groups: trained and sedentary. The trained group underwent 4 consecutive days of treadmill training (60 min at 70% of maximal velocity obtained in a graded exercise test). In the sedentary group the rats were placed on a non-moving treadmill 60 min during 4 consecutive days. The trained rat group were then divided into 2 groups: an Exercise I-R group (Exe I-R; n = 7) and a Naloxone (a non-selective opioid receptor antagonist) + Exercise I-R group (Nal + Exe I-R; n = 7). Non-trained animal were also divided into 2 groups: Sedentary I-R (Sed I-R; n = 10) and Sedentary Sham I-R (S-Sed I-R; n = 9). To induce the I-R injury, anesthetized animals were submitted to a left thoracotomy and a 30 min interventricular coronary occlusion followed by 60 min of reperfusion. The hemodynamic parameters were recorded and the infarct size was determined by double staining using triphenyltetrazolium/Evans blue and expressed as a percentage of the area at risk (AAR).

RESULTS: The Sed I-R group had a 43.5% larger infarct area when compared to the Exe I-R group (38.6 ± 5.0 and 21.8 ± 4.5% of the AAR respectively, p<0.05, Fig. 1). Naloxone pretreatment completely blocked the exercise-induced cardioprotection (37.6 ± 3.1% of the AAR, Fig 1). Hypotension elicited by the I-R injury was not seen in the Exe I-R group. The S-Sed I-R group showed no infarct.

DISCUSSION: Our results indicate that opioid system is involved in cardioprotective effects of the aerobic exercise in the anesthetized rat. New protocols are ongoing to determine the role of the opioid receptors subtypes in this exercise-induced cardioprotection.

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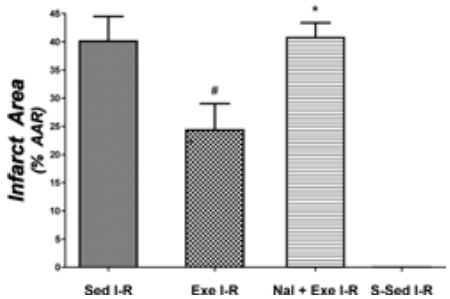

Figure 1. Trained or sedentary anesthetized Wistar rats submitted to ischemia-reperfusion (I-R) injury with or without pretreatment with naloxone. Sed I-R, Sedentary I-R; Exe I-R, Exercise I-R; Nal + Exe I-R, Naloxone (a non-selective opioid receptor antagonist) pretreatment + Exercise I-R; S-Sed I-R, Sedentary Sham I-R; % AAR, percentage of the area at risk. # p < 0.01 vs Sed I-R * p< 0.05 vs Exe I-R

S-350.

GLYCEMIC CONTROL AND SCIATIC NERVE BLOCK DURATION IN DIABETIC RATS

AUTHORS: J. Kroin, K. J. Tuman, A. Buvanendran

AFFILIATION: Rush Medical College, Chicago, IL

INTRODUCTION: Short-term (perioperative) glycemic control is currently practiced in diabetic patients to prevent poor wound healing, and to reduce incidence of infection.[1] In diabetic rats, the duration of local anesthetic sciatic nerve block is prolonged.[2] This study investigates if blood glucose control affects duration of sciatic nerve block arising from local anesthetic injection in diabetic rats.

METHODS: With IACUC approval, rats were injected with 50 mg/kg streptozotocin (STZ) to destroy pancreatic beta cells, and induce diabetes.[3] At 28 days after STZ injection, diabetic rats were randomly divided into 3 treatment groups: tight long-term glucose control (s.c. insulin implant 3U/day for 14 days), tight short-term glucose control (2 inj/day of 6U NPH insulin for 3 days); moderate long-term glucose control (s.c. insulin implant 1.5U/day for 14 days). Diabetic control rats received placebo implants or injections. After the end of the of the insulin treatment, sensory and motor responses in leg were recorded, and then 0.1 mL of 1% lidocaine hydrochloride with 5 μg/mL epinephrine hydrochloride was percutaneously injected onto the sciatic nerve. Animals were then evaluated for the duration of nerve block.

RESULTS: With tight long-term glucose control, tail blood glucose levels were 62±14 mg/dL in insulin-treated diabetic rats vs. 480±17 mg/dL in untreated diabetic rats (P<0.001). The local anesthetic solution produced a longer mean duration of sensory nerve block in untreated diabetic rats (148±16 min) vs insulin-treated diabetic rats (84±4 min) (P=0.005). Similarly, motor block was 148±16 min vs 86±2 min (P=0.005). With moderate long-term glucose control, levels were 120±7 mg/dL in insulin-treated diabetic rats versus 386±12 mg/dL in untreated diabetic rats (P<0.001). Sensory nerve block duration was 135±2 min vs 85±3 min (P=0.001); and motor block was 138±4 min vs 85±3 min (P=0.001).With tight short-term glucose control, levels were 70±8 mg/dL in insulin-treated diabetic rats versus 408±12 mg/dL in untreated diabetic rats (P<0.001), but there was no reduction in nerve block duration with insulin treatment.

DISCUSSION: With long-term glucose control in diabetic rats, the duration of nerve block was about 60 min shorter than in the untreated diabetic rats, and similar to that of normal rats.[2] However, tight short-term glucose control did not affect nerve block duration, suggesting that this neuropathy cannot be rapidly reversed.

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Pain – Clinical – Acute

S-356.

MULTIMODAL ANALGESIA IMPROVES THE MANAGEMENT OF BRACHYTHERAPY

AUTHORS: N. Eipe[1], R. Boscariol[1], J. Penning[1], R. Samant[2], C. Ee[2]

AFFILIATION: [1]Anesthesiology, The Ottawa Hospital, Ottawa, ON, Canada; [2]Radiation Oncology, The Ottawa Hospital, Ottawa, ON, Canada

INTRODUCTION: High-dose-rate (HDR) brachytherapy is a radiation treatment technique that involves the application of localized internal radiation to the cervix. Outpatient HDR brachytherapy performed with sedation administered by registered nurses under the supervision of a radiation oncologist is becoming increasingly popular. We report the first study comparing the effect of premedication with multimodal analgesia on the treatment of carcinoma cervix with brachytherapy done under sedation.

METHODS: The present retrospective study included 15 consecutive patients who underwent a total of 39 HDR brachytherapy treatments. 22 treatments were done with oral multimodal analgesia (study group) consisting of acetaminophen, tramadol and pregabalin. These were compared to the preceding 17 treatments (control group) from the same center where no premedication was given. The outcome measures studied were- total midazolam dose, total opioid dose, pain scores, recovery scores, duration of procedure and of stay.

RESULTS: The results show a statistically significant decrease in the amount of sedation required by those patients who had received multimodal analgesia. Decreases were also seen in analgesic requirements, pain scores and duration of procedure were also seen in the study group, though these differences did not achieve statistical significance. No operative or treatment complications occurred in either group.

DISCUSSION: The need for Anesthesiology presence during HDR brachytherapy of the cervix has been previously studied. With the rational use of different analgesic medications, these procedures requiring sedation may be safely performed with increased patient comfort and satisfaction.

HDR brachytherapy for carcinoma cervix may be a pain model where radiation induced hyperalgesia and other pro-nociceptive mechanisms may play an important role. Pregabalin may be useful adjunct to treat these patients and together with tramadol and acetaminophen may provide adequate foundational analgesia for sedation. We will discuss the possible mechanisms by which these drugs are effective in this pain model.

This quality assurance study demonstrates that pre-emptive multimodal analgesia improves the management of HDR brachytherapy for carcinoma cervix in a statistically significant and clinically relevant manner.

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S-357.

POSTOPERATIVE PAIN EXPERIENCE: RESULTS FROM A HOSPITAL ACUTE PAIN SERVICE

AUTHORS: A. Buvanendran, C. M. Zook, S. C. Toleikis, J. Kroin

AFFILIATION: Rush Medical College, Chicago, IL

INTRODUCTION: Pain control is considered a mandated part of the comprehensive surgical postoperative experience. The acute pain service comprises a multidisciplinary group of clinicians specialized in pain management and who apply an ever-increasing array of modalities to attenuate postoperative pain. In a survey based on telephone questionnaire data from 1998-2002, 73% of patients that had surgery as inpatients experienced pain before discharge, with almost half of those pain patients reporting severe to extreme pain.[1] These patient outcomes are not that different from an earlier 1995 study,[2] indicating that postoperative pain management had not improved from 1995 to 2002. In this study, we evaluate a more recent experience to assess the effectiveness of a hospital acute pain service in managing postoperative pain.

METHODS: With IRB approval, postoperative inpatient pain records for 3552 patients were obtained from the Acute Pain Service at our Medical Center for the years 2008-2009. Pain Intensity on a 11-point Numerical Rating Scale (NRS) (0=No Pain,10=Worst Imaginable Pain) were recorded until discharge from the Acute Pain Service. These data were analyzed for the maximum pain, minimum pain, and pain at discharge. Adverse events such as nausea, vomiting, and itching were also analyzed.

RESULTS: Epidural analgesia was used at some time in 72.9% of the patients, and 32.4% had IV PCA. At discharge from the Acute Pain Service the NRS score was 3.47 ± 0.04 (mean ± SE). Over the postoperative period the maximum NRS was 5.52 ± 0.05, and the minimum NRS was 2.11 ± 0.04. 80.2 % of patients had pain (NRS ≥ 1), which is close to the 73% with pain (using verbal categories) before discharge in the telephone questionnaire data.1 However in that 1998-2002 study, 48% of the inpatients with pain had severe to extreme pain before discharge from the hospital,1 while only 16.8% of the patients with pain in our Acute Pain Service records had severe to extreme pain (NRS ≥ 7) at discharge from the Acute Pain Service. The incidences of nausea and vomiting were less in the Acute Pain Service records than in the 1998-2002 study: nausea (5.8% vs. 28%), vomiting (1.2% vs. 21%); but itching was similar (7.4% vs. 10%).

DISCUSSION: While we cannot precisely compare verbal pain category data from telephone questionnaires to NRS scores obtained at the patient bedside, our analysis suggests that the incidence of severe to extreme pain at discharge from the Acute Pain Service has been greatly reduced over the last 10 years. In addition, postoperative nausea and vomiting have also been considerably reduced.

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S-358.

SUPERFICIAL CERVICAL PLEXUS BLOCKS IMPROVE ANALGESIC OUTCOMES FOLLOWING THYROID SURGERY: A META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

AUTHORS: K. Doi[1], H. Hoshijima[1], N. Kuratani[2], R. Takeuchi[1], N. Matsumoto[1]

AFFILIATION: [1]Anesthesiology, Saitama Medical University Hospital, Moroyama/Saitama, Japan; [2]Anesthesiology, International University of Health and Welfare Hospital, Nasushiobara, Japan

INTRODUCTION: Thyroid surgery can cause mild to moderate postoperative pain. Recently, the use of superficial cervical plexus blocks (SCPBs) as an analgesic technique for thyroid surgery has been reported[1,2]. There has, however, been little information about the efficacy of SCPBs in terms of postoperative analgesia following thyroid surgery. In this study, we performed a meta-analysis of randomized controlled trials to assess the analgesic efficacy of SCPBs combined with general anesthesia (GA).

METHODS: A comprehensive search of the literature was conducted to identify clinical trials comparing a placebo with SCPBs following thyroid surgery. Two reviewers independently assessed each report to confirm that all reports met our inclusion criteria. The primary outcomes were determined to be acute postoperative pain scores. Visual analogue pain scores and numerical rating scales were converted to a standardized 0-10 scale.

The data from each trial were combined using the randomized-effects model to calculate the weight mean difference (WMD) and their corresponding 95% confidence intervals (CIs). Funnel plots were used to assess publication bias.

RESULTS: Eight randomized controlled trials met our inclusion criteria. Overall, 350 patients received SCPBs and 344 received placebos. The use of SCPBs reduced pain scores at 0 hrs (WMD -0.94, 95% CI -1.81 to -0.07; P=0.03), at 2 hrs (WMD -1.04, 95% CI -2.01 to -0.07; P=0.04), and at 6 hrs (WMD -0.45, 95% CI, -0.88 to -0.03; P=0.04), but did not reduce pain scores at 12 hrs (WMD 0.05, 95% CI, -0.38 to 0.49; P=0.81), postoperatively. The heterogeneity of the data was not statistically refuted. Publication bias was evident in a funnel plot.

DISCUSSION: Our analysis revealed that the use of SCPBs in addition to GA provides a better postoperative pain control compared with the use of GA alone during the acute postoperative period.

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S-359.

IS POSTOPERATIVE PAIN UNDERMANAGED AFTER INPATIENT SURGERY?

AUTHORS: A. Buvanendran, S. Rybak, C. M. Zook, S. Jha, M. Moric, J. Kroin

AFFILIATION: Rush Medical College, Chicago, IL

INTRODUCTION: In the United States, 45 million inpatient surgeries are performed annually.[1] However, pain after surgery remains an under-recognized clinical problem. In a survey based on data from 1998-2002, 66% of patients had moderate-to-extreme pain in the first few days after surgery.[2] These patient outcomes are not that different from a previous study,[3] indicating that postoperative pain management had not improved from 1995 to 2002. However, in recent years there has been increased attention to pain management in the hospital setting, and so the patient outcomes in recent years may be more encouraging.

METHODS: With IRB approval, written informed consent was obtained in the patient's room before hospital discharge. The patient was then asked questions about their postoperative pain experience:[2,3] (1) Pain intensity on verbal categorical scale; (2) Patient satisfaction with pain medication. Sample size was based on power estimates using 1998-2002 data,[2] on incidence of severe-to-extreme pain after surgery (35%). Our hypothesis is based on demonstrating a 20% reduction in that incidence (to 28%) with 2011 practice protocols. For α=0.05, Power =0.8, we estimate sample size to be 365 patients.

RESULTS: Data from our 428 inpatients were compared with the 129 inpatient surgeries in the 2003 paper.2 Overall the two ordinal trends were significantly different (P=0.0004), with the earlier data displaying larger proportions of "Extreme pain" (18% v 2%, p<0.0001) and "Severe Pain" (17% v 10%, p=0.0380) but correspondingly lower proportions of "Moderate Pain" (30% v 41%, p=0.0184), "Slight Pain" (9% v 30%, p<0.0001), with more patients reporting "No Pain" (27% v 16%, p=0.0064). The histograms of the pain categories for our study are approximately normal (Figure). Patient satisfaction with pain medication was not significant overall between the 2 studies (p=0.1154), as most categories were similar: Very dissatisfied (1% v 1% p=0.7033), Dissatisfied (3% v 2%, p=0.5134), Slightly dissatisfied (3% v 3%, p=0.9204), slightly satisfied (10% v 6%, p=0.1204), Satisfied (40% v 33%, p=0.1704), but current satisfaction data reflected a higher rate of Very Satisfied (43% v 54%, p=0.0289).

DISCUSSION: Although we cannot exactly compare data from telephone questionnaires to interviews at patient bedside, the results suggest that the incidence of severe-to-extreme pain after inpatient surgery has been greatly reduced in the last 10 years, perhaps due to more consistently applied pain management protocols.

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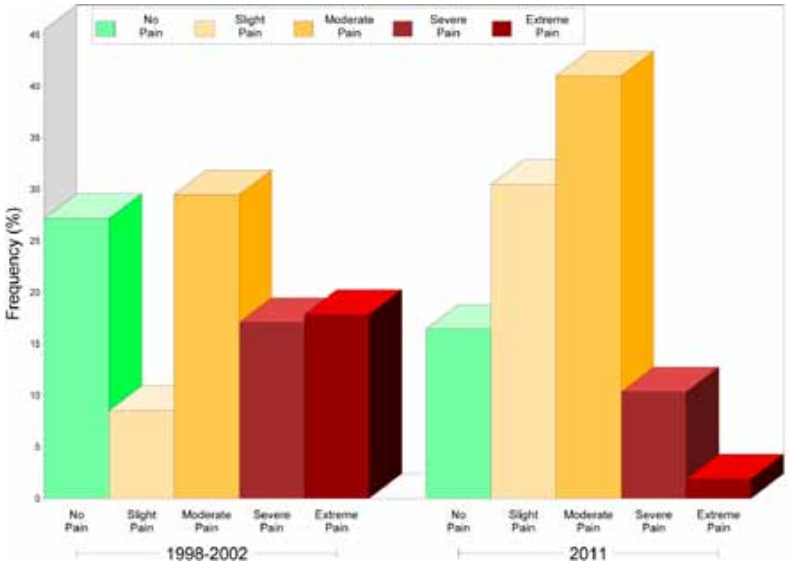

S-360.

PROSPECTIVE COMPARATIVE STUDY OF ANALGESIC EFFICIENCY OF PARAVERTEBRAL BLOCK WITH ROPIVACAINE (0.2%) AND DEXMEDETOMIDINE + ROPIVACAINE (0.2%) IN RENAL SURGERIES

AUTHORS: G. S. Tomar, A. K. Tiwari, S. Ganguly

AFFILIATION: Dept. of Anaesthesiology & Critical Care, St. Stephen's Hospital, New Delhi, India

INTRODUCTION: We aim to compare the efficacy of the paravertebral block with 0.2% ropivacaine and 0.2% ropivacaine with dexmedetomidine. We also compare hemodynamic changes in both the groups and total requirement of ropivacaine in first 24 hours in the two groups.

METHODS: 60 adults patients of ASA physical status I and II, scheduled for unilateral renal surgeries were included in this prospective randomized open label parallel group double blind study. After placing 18G epidural catheter through 18G tuohy needle 3cm inside T12-L1 paravertebral block was activated in group I patients by 18ml of ropivacaine(0.2%) + 1mcg/kg dexmedetomidine. Next in both the groups general anaesthesia with endotracheal intubation and controlled ventilation was instituted with injection propofol, lignocaine 2% (preservative free), rocuronium intravenously. Anaesthesia was maintained with isoflurane 0.5-1% in N20 and 02. Hemodynamic parameters were noted down at the time skin incision and if pulse rate and blood pressure exceeded 20% of the baseline value in any patient, he/she was excluded from the study as block failure and was offered systemic opioid analgesia. At the end of surgery anaesthetic agents were discontinued and neuromuscular blockade was reversed with 50mcg/kg neostigmine along with 10mcg/kg glycopyrrolate. When patients were able to communicate properly their pain was assessed by the VAS score and hemodynamic parameters. The patients were administerd the first top up dose (12 ml of ropivacaine 0.2%) in group I and (12 ml of ropivacaine 0.2%+0.5mcg/kg of dexmedetomidine) in group II for the paravertebral blockade for continuation of postoperative analgesia as soon as VAS exceeds 3 and the time was noted down. This was the primary end point of our study. Subsequently top ups will be given according to vas score and the total requirement of ropivacaine in first 24 hour will be noted down in both the groups. Total requirement of ropivacaine in 24 hours is our second end point of our study.

RESULTS: Group II patients experienced significantly greater pain free hours than group I($p<0.05$). Also total ropivacaine consumption in much lower in group II ($p<0.05$).

DISCUSSION: Paravertebral ropivacaine along with dexmedetomidine prolongs the duration of analgesia in unilateral renal surgeries than ropivacaine alone. Also, the total requirement of ropivacaine is less in dexmedetomidine group.

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S-361.

PERIOPERATIVE SYSTEMIC LIDOCAINE FOR POSTOPERATIVE ANALGESIA AND RECOVERY AFTER ABDOMINAL SURGERY A META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

AUTHORS: Y. Sun[1], T. Li[1], T. Gan[2], N. Wang[3], Y. Yue[4]

AFFILIATION: [1]Anesthesiology, Beijing TongRen Hospital, Capital Medical University, Beijing, China; [2]Anesthesiology, Duke Medical Center, Durham, NC; [3]Pediatrics, Stanford University School of Medicine, San Francesco, CA; [4]Anesthesiology, Beijing ChaoYang Hospital, Capital Medical University, Beijing, China

INTRODUCTION: Postoperative pain management remains a significant challenge after abdominal surgery. Opioid, as a mainstay for postoperative analgesia, can exacerbate postoperative ileus and further delay patient recovery.[1] Systemically administrated lidocaine has analgesic, anti-inflammatory and anti-hyperalgesic effects.[2-3] The aim of this meta-analysis was to evaluate the efficacy of systemic lidocaine for postoperative pain management and recovery after abdominal surgery.

METHODS: We searched the databases of Medline (1966 -2010), CINAHL, The Cochrane Central Register of Controlled Trials, and Scopus for randomized controlled trials investigating the use of systemic lidocaine for postoperative pain management and recovery after abdominal surgery. We extracted data about postoperative opioid consumption, postoperative pain intensity, opioid-related side-effects, time to first flatus and length of hospital stay.

RESULTS: Twenty one trials comparing systemic lidocaine with placebo or blank control for postoperative analgesia and recovery after abdominal surgery were included in this review. Weighted mean difference for cumulative opioid analgesic consumption after surgery was -6.48 mg (95% confidence interval, CI: -9.66,-3.31). Postoperative pain intensity at rest (visual analogue scale, 0-100 mm) was significantly decreased in the lidocaine group at 6 and 24 h compared with the control group. Postoperative pain score during activity was also significantly decreased in the lidocaine group 6h after surgery. Moreover, the mean time to first flatus and bowel movement was significantly shortened by 6.65 hours (95%CI: -10.51,-2.78) and 11.74 hours (95%CI:-16.97, -6.51), respectively, with lidocaine intervention compared with control.

DISCUSSION: In this meta-analysis, we demonstrated that perioperative systemic lidocaine was an effective adjunct for postoperative pain management and improves postoperative recovery profile after abdominal surgery. Most widely used regimen consists of a bolus of lidocaine 1.5 mg/kg followed by an infusion of 2 mg/kg/hr.Further large, well-designed studies are required to confirm these findings and to determine the most efficacious regimen.

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Postoperative pain intensity

VAS pain score	No of trials	Lidocaine Group (n)	Control Group (n)	WMD (95%CI)
pain Postoperative score at rest				
6 h	11	335	345	-7.65 (-13.56, -1.74)
24 h	13	390	400	-4.29 (-7.58, -1.00)
72 h	8	206	206	-2.52 (-6.91, 1.87)
Postoperative pain score during activity				
6 h	7	210	210	-10.36 (-16.45, -4.27)
24 h	9	254	254	-3.77 (-7.55, 0.00)
72 h	8	206	206	-1.72 (-7.55, 1.35)

WMD: weighted mean differences CI: confidence interval

S-362.

APPLICATION OF TRAMADOL ANALGESIA AFTER OFF-PUMP CORONARY ARTERY BYPASS GRAFT SURGERY

AUTHORS: H. Zhao, Y. Feng, Y. Jiang

AFFILIATION: Anesthesiology, Peking University People's Hosptial, Beijing, China

INTRODUCTION: The analgesic action of tramadol is based on a multimodal mechanism of action. Potential advantages of administering tramadol for postoperative pain relief include earlier recovery and less sedation than opiates. This prospective randomized controlled study aimed to investigate the analgesic efficacy and safety of tramadol used after off-pump coronary bypass graft surgery (OPCAB).

METHODS: Sixty-two consecutive patients undergoing OPCAB under standard sufentanil-based general anesthesia in Peking University People's Hospital were randomly allocated to receive tramadol 1 mg/kg or sufentanil 0.1 ug/kg at the end of sternal closure, followed by patient-controlled analgesia (bolus tramadol 0.2mg/kg, or sufentanil 0.02ug/kg, lockout time being 10min) with background infusions (tramadol 0.15mg/kg/h or sufentanil 0.015ug/kg/h). Patients were transferred to cardiac surgery intensive care unit (CSICU) directly after surgery. Pain intensity was rated by the patients with visual analogue scale (VAS) at 12, 24 and 48 hours after surgery. The level of sedation was assessed by using a 5-point score (1=fully awake, 5 =asleep, not arousable) at the same time interval.

RESULTS: Demographic and surgical data were comparable between two groups. Patients in Tramadol group were less painful and sedated compared with patients in Sufentanil group. Patients in Tramadol group tended to have an earlier awakening from general anesthesia and an earlier tracheal extubation than patients in Sufentanil group, but the difference was not statistically significant. Patients were more satisfied with pain management in Tramadol group.

DISCUSSION: Postoperative cardiac surgical patients need good pain relief for hemodynamic stability, early extubation, cooperation for chest physiotherapy and prevention of pulmonary dysfunction. Patients in Tramadol group were less painful and sedated compared with patients in Sufentanil group. Patients in Tramadol group tended to have an earlier awakening from general anesthesia and an earlier tracheal extubation than patients in Sufentanil group. This could be explained by discontinuing use of sufentanil after large amount of sufentanil during surgery and providing equally effective analgesics. In summary, tramadol could attenuate postoperative pain after OPCAB effectively and has a tendency to accelerate patients awakening and weaning from mechanical ventilation.

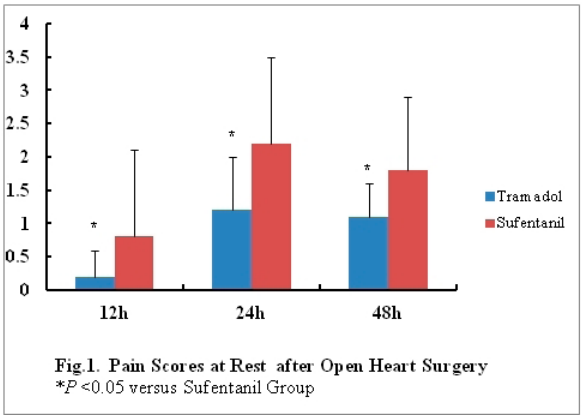

Fig.1. Pain Scores at Rest after Open Heart Surgery
*P <0.05 versus Sufentanil Group

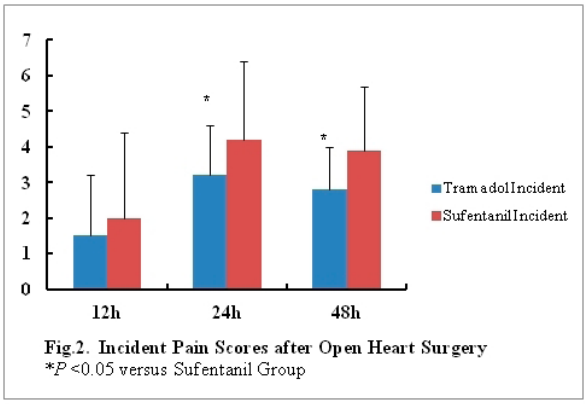

Fig.2. Incident Pain Scores after Open Heart Surgery
*P <0.05 versus Sufentanil Group

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S-363.

THE ASSOCIATION OF ATP-BINDING CASSETTE B1 (ABCB1) SINGLE-NUCLEOTIDE POLYMORPHISM TO MORPHINE CONSUMPTION IN POSTOPERATIVE PAIN

AUTHORS: Y. Rodriguez, Z. Yang, Y. Zhang, O. Rodriguez, K. Candiotti

AFFILIATION: Anesthesiology, University of Miami School of Medicine, Miami, FL

INTRODUCTION: ABCB1 gene, the single-nucleotide polymorphism (SNP) C3435T, has been frequently associated with different P-gp expression and activities[1].This altered activity may result in increased absorption from the intestine, a reduced renal clearance, and an increased brain concentration, leading to a decrease in dosage requirements or a possible increase in clinical effects for some opiates that are P-gp substrates , especially morphine[2,3]. No previous studies have clear evidence that an association between SNPs of ABCB1 (C3435T) and morphine consumption in acute pain treatment. The aim of this study was to test the association of the common SNP of ABCB1 and morphine consumption in postoperative pain in patients undergoing nephrectomies.

METHODS: IRB approval and signed informed consent were obtained. DNA was extracted from blood of 138 patients undergoing a nephrectomy. The C3435T SNP of ABCB1 was analyzed. Opioid consumption and pain scores were evaluated in these patients postoperatively.

RESULTS: We found statistically significant differences in cumulative morphine consumption among the various genotypes in the 6 hrs (p=0.009), 12hrs (P=0.004), and 24 hrs (P=0.008) post-operative period. The TT genotype (n=25) had significant lower morphine consumption compared with CT (n=63) and CC (n=50) genotypes. No statistically significant differences among the three genotype groups were noted for postoperative pain scores.

DISCUSSION: Our results clearly demonstrated an association of the ABCB1 polymorphism to inter-individual variations in morphine consumption in the acute postoperative period after patients underwent nephrectomies. The ABCB1 polymorphism may be served as an important factor to predict acute morphine consumption in postoperative patients.

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S-364.

PREOPERATIVE GABAPENTIN IS ASSOCIATED WITH REDUCED OPIOID CONSUMPTION IN LAPAROSCOPIC DONOR NEPHRECTOMY: A PILOT STUDY

AUTHORS: G. B. Cierny[1], B. J. Wolf[2], W. D. Stoll[1], W. Hand[1], M. D. McEvoy[1]

AFFILIATION: [1]Anesthesia and Perioperative Medicine, Medical University of South Carolina, Charleston, SC; [2]Biostatistics and Epidemiology, Medical University of South Carolina, Charleston, SC

INTRODUCTION: Preoperative gabapentin has been shown to decrease post-operative opioid consumption in a number of laparoscopic surgical procedures. However, this has not been investigated in laparoscopic living donor nephrectomy (LDN). Accordingly, we sought to test the hypothesis that a single preoperative dose of gabapentin 1200mg (GABA) is associated with reduced opioid consumption in the postoperative period.

METHODS: A retrospective chart review examined patients who received GABA compared to age, sex, and BMI-matched controls and followed them throughout their hospitalization. Patients were excluded from the analysis if they had any pain syndromes for which they were on chronic analgesics. The primary outcome was cumulative opioid consumption (morphine equivalents) in PACU and at 6, 12, 24, and 36 hours after surgery. A mixed linear regression model was used to assess differences in cumulative opioid use. The model included a random subject effect with a first-order autoregressive covariance structure to account for correlation among individual subjects' five repeated measurements. $P < 0.05$ was considered significant.

RESULTS: There was no difference between groups in age, sex, BMI, or ASA class (N=9 in each group). There was a significant reduction in cumulative morphine equivalents through PACU (0.496 vs 0.725 mg/kg, p=0.019), 6 hours (0.563 vs 0.853 mg/kg, p=0.003), 12 hours (0.629 vs 0.949 mg/kg, p=0.001), 24 hours (0.755 vs 1.13 mg/kg, p<0.001), and 36 hours (0.897 vs 1.32 mg/kg, p<0.001) (see Figure 1).

DISCUSSION: Excellent pain control for any surgical patient is of paramount concern. However, pain control for LDN patients is a double-concern because making the process as pain-free as possible can affect the experience of the donor and the likelihood of recipients to receive a kidney transplant in this manner. For this patient population, our findings suggest that the use of a single, preoperative dose of gabapentin (1200mg PO) may be a associated with a 30% reduction in opioid consumption for up to 36 hours postoperatively. Future research will need to address this issue in a prospective, randomized controlled trial.

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S-365.

PERIOPERATIVE PAIN AND MORPHINE CLEARANCE IN CHILDREN: DOES RACE MATTER?

AUTHORS: S. Sadhasivam[1], E. Krekels[2], P. Ngamprasertwong[1], V. Chidambaran[1], A. A. Vinks[2,1]

AFFILIATION: [1]Anesthesiology, Cincinnati Children's Hospital Medical Center, Cincinnatti, OH; [2]Clinical Pharmacology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

INTRODUCTION: Inter-individual variability in analgesic response and adverse effects and narrow therapeutic indices of opioids is a major problem in perioperative practice. Morphine is a commonly used perioperative opioid in children. We observed high between subjects variability in the analgesic response to morphine; African-American children experienced more postoperative pain and Caucasian children had more morphine related adverse effects[1]. In this prospective study, we aimed to address underlying pharmacokinetic and pharmacogenetic mechanistic factors contributing to the racial differences in perioperative pain and morphine related adverse effects.

METHODS: Prospective genotype-blinded observational clinical study evaluating pharmacokinetics, pharmacogenetics and pharmacodynamics of intravenous morphine during tonsillectomy and adenoidectomy (T&A), among 150 Caucasian and African-American children aged 6 to 18 years. All participants received standard perioperative care with an intraoperative dose of 0.2 mg/kg morphine (children with obstructive sleep apnea received 0.1 mg/kg of morphine). Serial blood samples (3 or 4 blood samples per patient) were obtained for morphine, morphine-3-glucuronide and morphine-6-glucuronide levels and for pharmacogenetic testing. UGT2B7, the major Uridine Glucuronyl Transferase isoform responsible for 3- and 6-glucoronidation of morphine was tested for genotype.

RESULTS: Of the 146 children evaluable for analysis, 29 were African-American and 113 were Caucasian. African-American children have significantly higher morphine clearance (23%) than Caucasian patients (Figure 1). Although the wild type of the UGT2B7 isozyme is more prevalent in the AA patients, common UGT2B7 genetic variations (-161C>T and 802C>T) were not associated with observed racial differences in morphine clearance.

DISCUSSION: Race of the child is an importance factor in perioperative intravenous morphine clearance, which can partly explain an unequal burden of increased perioperative pain in Caucasian and increased opioid adverse effects in African-American children. Its role in personalizing analgesia with morphine needs further investigation.

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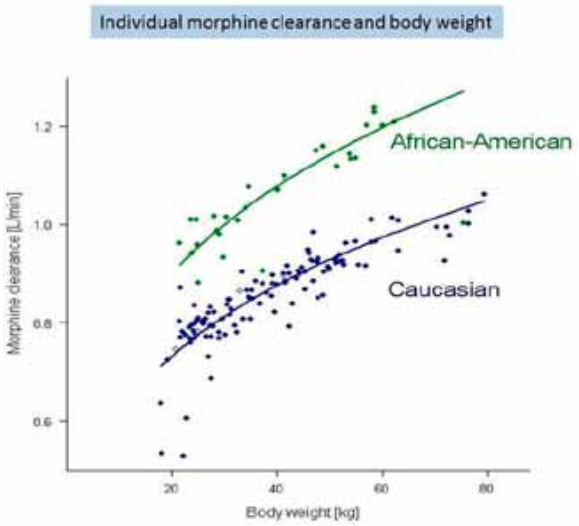

Individual morphine clearance values (symbols) and the covariate relationship describing the change in population morphine clearance (lines) versus bodyweight, the most predictive covariate. Green symbols and line represent the African-Americans, blue symbols and line represent the Caucasians and other races (with children from other races represented by open symbols).

S-366.

KIDNEY INJURY AFTER PERCUTANEOUS AND OPIOID-RELATED ADVERSE EVENTS INCREASE LENGTH OF STAY AND DRIVE UP TOTAL COST OF CARE IN A NATIONAL DATABASE OF POSTSURGICAL PATIENTS

AUTHORS: T. Gan[1], G. Oderda[2], S. Robinson[3]

AFFILIATION: [1]Anesthesiology, Duke University Health System, Durham, NC; [2]Pharmacotherapy, University of Utah, Salt Lake City, UT; [3]Premier Research Services, Charlotte, NC

INTRODUCTION: The primary objective of this retrospective study was to identify the relationship between opioid use and related adverse drug events (ADEs) with increased length of stay (LOS) and total cost in patients undergoing some of the more common surgeries in hospitals in the United States.

METHODS: The de-identified Premier database was queried for this study. Selection criteria included the following inpatient surgeries: open colectomy, laparoscopic colectomy and cholecystectomy, total abdominal hysterectomy and hip replacement surgery in patients 18 years of age and older between 2008 and 2010. ADEs were defined using ICD-9 diagnosis codes. LOS and total cost outliers were defined as ≥1 standard deviation above the mean values. Patients with ADEs in the population were matched (1:3) to patients without ADEs on age, severity of illness (SOI) and gender. Descriptive statistics and regression were used to analyze the outcomes of LOS and total cost. A p-value of <0.05 was considered statistically significant.

CHALLENGING CASE REPORT: N/A

Results: Prior to matching, the incidence of opioid-related ADE was 19.4%. There were 45,342 patients with an opioid-related ADE matched to 135,941 without an opioid-related ADE. The mean unadjusted LOS for patients with an opioid-related ADE was statistically significantly longer than for patients without an opioid-related ADE; 5.2 days (SD 3.5) versus 4.1 days (2.8) ($p<0.0001$). The mean unadjusted total cost that included an opioid-related ADE compared to the total cost without an opioid-related ADE was $18,309 (SD 11,267) and $17,281 (SD 10,209), respectively. Patients who experienced an opioid-related ADE had a larger percentage of LOS and total cost outliers compared to patients who did not experience an opioid-related ADE; 8.3% versus 5.3% and 13.0% vs. 5.3%, respectively. The adjusted cost variation from the baseline cost was $1,614 comparing opioid-related ADE to non-ADE and an adjusted LOS variation from baseline LOS of 0.70 days.

DISCUSSION: From this large national database, postsurgical patients who experienced an opioid-related ADE had a statistically significantly longer LOS and a higher total cost than those without an opioid-related ADE. Reducing the incidence of opioid-related ADEs by reducing opioid dosages and overall consumption may in turn reduce LOS and total hospital costs. Further investigations regarding the impact of opioid dosage on the incidence of related ADEs would shed additional light on how to reduce LOS and hospitalization costs.

REFERENCES: N/A

Pain – Clinical – Chronic

S-372.

SPINAL CORD STIMULATION FOR INTRACTABLE METASTATIC SPINAL TUMOR RELATED PAIN

AUTHOR: S. Hattori, T. Igarashi, J. Takarada, H. Sano, M. Yokota

AFFILIATION: Anesthesiology and Pain Service, The Cancer Institute Hospital of JFCR, Tokyo, Japan

INTRODUCTION: Roughly 10 to 20% of cancer pain patients fail to achieve satisfactory pain relief with conventional management. Spinal cord stimulation(SCS) has been widely used in non-malignant chronic pain but seldom in cancer pain. Author will present two cases of intraspinal metastases with severe pain successfully treated by SCS that relieved intermittent pain attacks and improved activity of living and QOL.

METHODS: Case 1: 60-year-old male who underwent cyberknife treatement to intraspinal metastases of lung cancer. He was experiencing intractable, raging, and seizure-like pain attacks striking his lower back and lower extremity intermittently(15min interval). All conventional pain medication and interventions failed to relieve his pain. SCS was scheduled.

Case 2: 50-year-old female with intraspinal metastases of thyroid cancer. She was experiencing continuous and intermittently raging back and thigh pain. All convetional pain medication had failed to relieve her pain and suffering with side-effects. SCS was considered and performed.

RESULTS: In Case 1, intrathecal adminsitration of morphine and bupivacaine gave somewhat satisfactory pain relief but for only two weeks. SCS was then considered due to the recurrence of pain attacks that resembled the symptom of spinal injury and made him paralyzed supine on bed. SCS successfully relieved his pain and enabled to sit up, eat and reduce systemic dose of opioids.

In Case 2, spinal attack and intractable continuous pain forced her to hospitalize. Life expectancy was estimated 3 to 5 years. Test injection of spinal morphine did not give any pain relief. Trial stimulation gave sufficient pain relief, diminished pain attacks, and reduced opioid dose down to 20%.

DISCUSSION: Spinal cord stimulation is the most commonly used implantable neurostimulation modality for management of non-malignant pain syndromes. There are only few reports in cancer pain management.As SCS blocks afferent fibers by inhibiting transmission through spinothlamic tract, we speculate that our two cases was successfully relieved from pain by this theory. SCS was the only option in case 1, and SCS was preferred because of long life expectancy in case 2. In conlusion, although further accumulation of case reports and investigation is necessary, SCS may be a therapeutic alternatives for intractable pain in spinal related metastases.

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S-373.

CHANGES IN SALIVARY AMYLASE ACTIVITY BEFORE AND AFTER TRANSCUTANEOUS XENON LIGHT IRRADIATION AROUND THE STELLATE GANGLION

AUTHOR: K. Mamiya, N. Abe, Y. Onodera, A. Sugawara, M. Kanao, H. Iwasaki

AFFILIATION: Anesthesiology and Critical Care Medicine, Asahikawa Medical University, Asahikawa, Japan

INTRODUCTION: Stellate ganglion block (SGB), using local anesthetics, inhibits cervical sympathetic innervation, temporarily. Some studies have shown that SGB inhibits secretion of stress hormones in humans.On the other hand, transcutaneous Xenon light (Xe-light) irradiation around the SG has been utilized instead of SGB because it sometimes causes serious adverse effects.Besides, a Daeki Amylase Monitor® (DAM) (NIPRO, Osaka, JAPAN) measures salivary amylase activity and displays it numerically.We previously proved that salivary amylase activity drops minimum 5 minutes after SGB and this results indicate that SGB has a relieving effect on patients' stress. (Fig 1) In this study, we assessed salivary amylase activity in patients underwent the Xe-light irradiation around the SG.

METHODS: With IRB approval and informed consented, 14 healthy volunteers participate in this study. After the stabilization period, 10 minutes of the Xe-light irradiation was performed with a Xe-light treatment device (Excel-Xe, Nihon Ito, Tokyo, Japan). We measured the salivary amylase activity in four conditions: (1) after lying on a bed for 5 minutes before the irradiation (control value), (2) immediately, (3) 5, and (4) 15 minutes after the irradiation. Additionally, we measured the patient's stress before and after the irradiation using visual analogue scale (VAS). Data are expressed as means ± SD. ANOVA followed by Mann-Whitney U test was used and P values of less than 0.05 were considered to be statistically significant.

RESULTS: Salivary amylase activity in each condition were (1) 11.8±5.8, (2) 11.1±5.5, (3) 11.6±5.9 and (4)11.1±5.9IU/L. There were no difference in amylase activity before and after the irradiation (P=0.2191). But VAS value was significantly decreased after the irradiation.(24±18.3 v.s.13.8±10.6mm,P=0.04). (Fig.2)

DISCUSSION: In SAM system, there exists two regulatory mechanism, hormonal regulation and direct innervations. The change of the serum norepinephrine level by hormonal regulation is delayed by 20-30 min in response to loading stress. In contrast, when secretion of Salivary alpha amylase is stimulated by direct innervation, its response is within one to a few minutes. Our data showed that there were no difference in amylase activity before and after the irradiation, although VAS value was significantly decreased. Therefore, Xe-light irradiation might have a relieving effect on patient's stress, although it have not blocked the sympathetic nerve system and anti-stress effect of Xe-light irradiation might be different from SGB.

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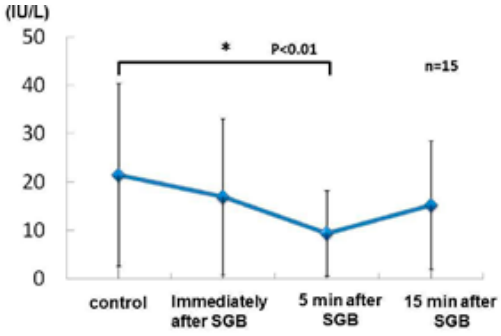

Figure 1. Comparison of salivary amylase activity in each condition with SGB.
Amylase activity was decreased significantly five minutes after the SGB compared with the control (P<0.01).

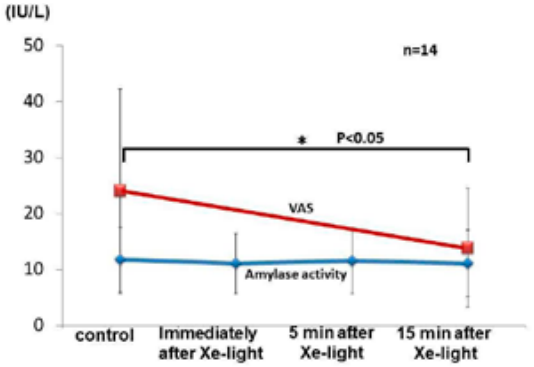

Figure 2. Comparison of salivary amylase activity and VAS in each condition with Xe-light irradiation .
There were no difference in amylase activity before and after the Xe-light irradiation around the right SG . But VAS value was significantly decreased after the Xe-light irradiation.

S-374.

PERSISTENT POSTSURGICAL PAIN AFTER T OTAL KNEE REPLACEMENT: PREOPERATIVE HEALTH STATUS AS A RISK FACTOR?

AUTHORS: A. Buvanendran, M. Moric, J. Kroin, K. J. Tuman

AFFILIATION: Rush Medical College, Chicago, IL

INTRODUCTION: Total knee replacement (TKR) is regarded as a safe, cost-effective treatment for osteoarthritis providing substantial improvements in functional status and quality of life. However, for the 15% of patients dissatisfied after TKR, persistent postsurgical pain (PPP) of the operated knee is their most frequent complaint.[1]

METHODS: With IRB approval, we assessed PPP at 6 months after surgery in 38 patients undergoing primary TKR performed using standard techniques.[2] PPP was defined as "pain in the operated knee at six months after TKR, with other causes of pain excluded and reported intensity on 0-10 NRS scale of ≥4". Pre- surgical SF-36 measures of health status were also evaluated. The SF-36 consists of 36 questions relating to the patient's physical and mental health. The possible risk factors were evaluated using a stepwise logistic regression (entry p-value of 0.30 and retention p-value of 0.10). The clinicians recording and assessing PPP at 6 months were blinded to pre and intraop information for that subject, in particular they were blinded to presence or level of risk factors for the respondents.

RESULTS: At 6 months after TKR surgery, 9/38 (24%) patients had PPP. Lower preoperative total SF-36 score is an independent risk factor for the development of PPP. The preoperative SF-36 total score was predictive of PPP at 6-months (P=0.0142) with an odds ratio of 0.866 (95% confidence interval: 0.772, 0.971), indicating that a lower SF-36 total score (indicating poorer functional and psychosocial state) is associated with PPP. The SF-36 subscale of mental health was also predictive of PPP at 6-months (P=0.0396). In particular, the role-emotional component was individually significant (P=0.0312). Finally, the preop SF-36 subscale of physical health was predictive of PPP at 6-months (P=0.0449). In addition, higher acute postoperative NRS pain intensity independently predicts increased incidence of PPP. The acute postoperative NRS pain intensity is significantly higher, by 1.3 NRS, for the PPP than the non-PPP group (repeated measures test, P=0.0358) and the predictive model trended towards significance (logistic regression, P=0.064) with an odds ratio of 1.86 (95% CI: 0.97, 3.58).

DISCUSSION: The results indicate that broadly defined mental and physical functioning at preop (SF-36 scores) independently predict the development of persistent knee pain at 6 months post TKR surgery. A larger prospective study is needed to explore all of the risk factors and mechanisms, including relative importance (weighting) and interactions.

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S-375.

PAIN, FUNCTIONAL AND MOOD STATUS IN PATIENTS WITH NEUROGENIC CLAUDICATION BEFORE AND AFTER MINIMALLY INVASIVE LUMBAR DECOMPRESSION

AUTHORS: B. Durkin[1], J. Romeiser[1], R. Peyster[4], A. W. Shroyer[2], R. Davis[3], H. Benveniste[1,4]

AFFILIATION: [1]Anesthesiology, Stony Brook University, Stony Brook, NY; [2]Surgery, Stony Brook University, Stony Brook, NY; [3]Neurosurgery, Stony Brook University, Stony Brook, NY; [4]Radiology, Stony Brook University, Stony Brook, NY

INTRODUCTION: Chronic low back pain from lumbar spinal stenosis (LSS) is a common cause of pain and impaired mobility. A new quality assurance program (Q/A) was designed and implemented to assess the safety of the "Minimally Invasive Lumbar Decompression" (MILD®) procedure and the impact on changes in LSS patient's pain, functional and mood status over time. Here we report the QA safety and outcomes data from 32 MILD patients.

METHODS: QA Project Quality Plan was approved by the Anesthesia and Surgery QA committees and the Hospital's Chief Quality Officer; and the IRB notified as per standard operating procedures. The LSS patients were evaluated after careful determination of eligibility for the MILD Procedure via interview and MRI evaluation. For this QA program, patient demographic, social, medical, surgical, functional (Oswestry Disability Index (ODI), pain (11-point numerical rating scale and self-reported sketches of radiculopathy patterns) information were collected as well as mood status evaluated by the NIH Patient-Reported Outcomes Measurement Information System (PROMIS).

RESULTS: The patients were elderly (72.6±9.9) with baseline pain scores of 7.0±2.0 and all had neurogenic claudication. Functional status evaluated by the ODI scores at baseline was 43.1±18.0 indicating moderate disability in daily living. In regards to mood status, the NIH PROMIS Depression Item Bank score was 48 indicating slightly better than average mood status in comparison to the norm prior to surgery. All patients underwent the MILD procedure without complications. When comparing baseline pain scores to 1, 3 and 6-months follow-up values the patients showed at least 30% improvement (Table 1). At 3 and 6-months the ODI was improved by 26% and 45%, respectively, suggesting that the patients did better over time. Interestingly, the frequency of self-reported lower extremity 'radiculopathy' was still present in 73% of the patients (N=15) at 3-months but its overall distribution was decreased.

DISCUSSION: Based on our preliminary QA program findings, we conclude that functional improvements and pain reduction were demonstrated for the majority of the MILD patients up to 6 months following the procedure. However, the patient's self-reported lower extremity radiculopathy after the procedure revealed remaining areas of radiculopathy in spite of improvement in overall pain and functional scores.

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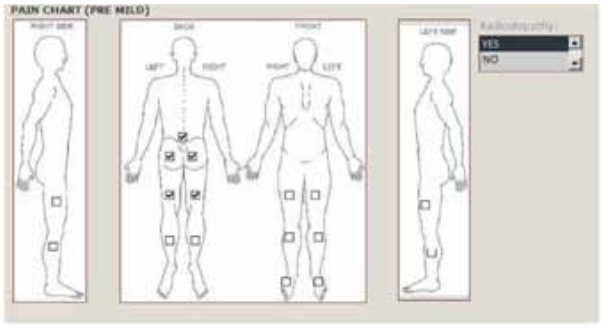
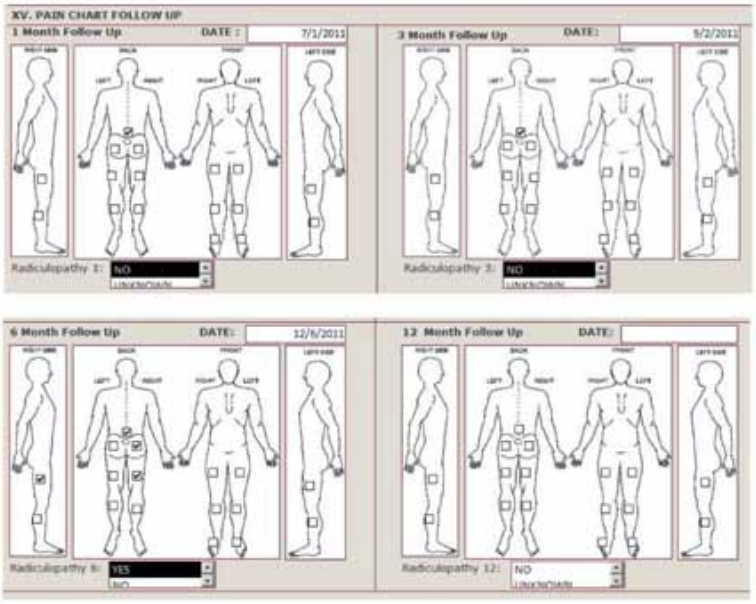


Example of a patient's self-reported lower extremity radiculopathy patterns before and after the MILD procedure. It is clear that the radiculopathy disappeared at 1 and 3 month after the procedure but partially returned at 6-month.



S-376.

WITHDRAWN.

Pediatric Anesthesia
General Topics

S-382.

ANESTHETIC CONSIDERATIONS IN LEIGH DISEASE;CASE REPORTS AND LITERATURE REVIEW

AUTHOR: A. S. Terkawi[1], T. M. Wani[1], K. M. Al-Shuaibi[1], J. D. Tobias[2]

AFFILIATION: [1]Department of Anesthesiology, King Farad Medical City, Riyadh, Saudi Arabia; [2]Department of Anesthesiology, Nationwide Children's Hospital, Columbus, OH

INTRODUCTION: N/A

METHODS: N/A

CHALLENGING CASE REPORT: Leigh disease is an extremely rare disorder, characterized by a progressive neurodegenerative course with a sub-acute necrotizing encephalomylopathy. It usually present in infancy with developmental delay, seizures, dysarthria and ataxia. These patients may also develop episodes of lactic acidosis that usually lead to deterioration of the disease, respiratory failure and death. The prognosis is usually generally poor as there is no definitive therapy. Due to rarity of the condition, the most appropriate anesthetic plan remains unclear. Understanding of the pathophysiology of the disease combined with a careful preoperative assessment are keys in ensuring a safe and effective perioperative course which may significantly improve the quality of care for these patients. We present two patients with Leigh disease who required anesthetic care. The perioperative course of both patients was uneventful with the first patient being discharged home after two days without complications. The second patient remains hospitalized because of his co-morbid condition and its sequelae including respiratory failure and an altered level of consciousness. The important points regarding the perioperative care of such patients are presented, the pathophysiology of the disorder is discussed, and previous reports regarding the anesthetic care of such patients are reviewed.

RESULTS: N/A

DISCUSSION: N/A

REFERENCES: N/A

S-383.

THE EEFFECT OF DEXMEDETOMIDINE ON HEMODYNAMICS AND ELECTROCARDIOGRAPHY OF DEXMEDETOMIDINE IN CHILDREN WITH CONGENITAL HEART DISEASE

AUTHOR: S. Fujii[1], M. Nagashima[2], S. Kitamura[1], S. Fujioka[1], S. Kawasaki[1], T. Nagaro[1]

AFFILIATION: [1]Anesthesiology and Resuscitation, Ehime University Hospital, Toon City, Japan; [2]Pediatric Cardiovascular Surgery, Ehime University Hospital, Toon City, Japan

INTRODUCTION: Dexmedetomidine (DEX), a highly selective α2 agonist, is used for sedation in the intensive care unit (ICU)[1]. Although DEX has a wide safety margin in the respiratory system, there have been concerns related to hypertension, hypotension, and bradycardia. The aim of this study is to determine the hemodynamic, sedative, respiratory, and electrocardiographic (ECG) effects of DEX in children with congenital heart disease (CHD) and who have undergone cardiac surgery.

METHODS: This study was a prospective, observational, and institutional study. DEX (0.5 μg/kg/h) was continuously administered in the ICU for postoperative sedation in 34 children (age range, 0-14 years; median age, 10 months) who underwent cardiac surgery with cardiopulmonary bypass. Hemodynamic, sedative, and respiratory variables were measured at pre-administration, 10 min, 1 h, and 3 h after DEX administration. Two ECGs per children were obtained at pre-administration (T1) and 6 h after the administration (T2).

RESULTS: Heart rate (HR) significantly decreased from 139 ± 24 bpm at pre-administration to 132 ± 23 bpm after 1 h ($p < 0.01$) and to 125 ± 22 bpm after 3 h ($p < 0.01$) of DEX administration. Arterial systolic and diastolic pressure significantly decreased after only 1 h from 96 ± 14 mmHg to 90 ±13 mmHg ($p < 0.05$) and 56 ± 9 mmHg to 52 ± 9 mmHg ($p < 0.01$). Sedative status (Richmond Agitation Sedation Scale) was well maintained, and we observed no respiratory depression. ECGs showed that the HR significantly decreased from 131 ± 26 bpm at T1 to 113 ± 24 bpm at T2 ($p < 0.01$). In accordance, QT duration was significantly prolonged from 337 ± 55 msec to 356 ± 57 msec ($p < 0.05$). However, PR, corrected PR, corrected QT, and QRS duration did not differ between T1 and T2. Atrioventricular block occurred in 2 children after DEX administration. One of these children already had prolonged PR duration at T1; however, the other had normal PR duration at T1. In both the children, the atrioventricular block was recovered by reducing or discontinuing the DEX infusion rate.

DISCUSSION: Postoperative continuous low-dose administration of DEX did not suppress respiration and maintained good sedative status. Administration of DEX in children with CHD was not associated with any significant ECG interval abnormalities other than a trend of bradycardia and a temporary reduction in blood pressure in the early stages. DEX can be used safely for postoperative sedation in children who have undergone cardiac surgery; however, the ECG should be closely monitored during DEX administration.

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S-384.

A RANDOMIZED COMPARISON OF THE I-GEL WITH THE PROSEAL LARYNGEAL MASK AIRWAY IN PEDIATRIC PATIENTS

AUTHORS: A. Fukuhara, R. Okutani, Y. Oda

AFFILIATION: Department of Anesthesiology, Osaka City General Hospital and Children's Hospital, Osaka, Japan

INTRODUCTION: The i-gel is a supraglottic airway device with a noninflatable cuff. Despite numerous studies comparing the i-gel with laryngeal mask airways, there are few reports comparing these devices in children (1,2). This prospective, randomized, controlled trial compares the performance of the pediatric i-gel with the Proseal laryngeal mask airway (PLMA) in anesthetized and ventilated children.

METHODS: The authors included 128 children, aged 3 month to 15 yr, scheduled for elective surgery under general anesthesia. Anesthesia was induced with propofol or sevolflurane, muscle relaxants were not used before insertion of the devices. The primary outcome variable was the ease of insertion. Other outcome variables were time for insertion, oropharyngeal leak pressure, first-attempt and overall success rates and fiberoptic findings.

RESULTS: Demographic data did not differ between the groups except the size 2.5 i-gel and PLMA. Insertion of the i-gel was significantly more difficult than PLMA ($P = 0.046$). Fiberoptic score was significantly better in the i-gel group than in the PLMA group ($P < 0.01$), although there were no differences in leak pressure between the groups. First attempt success rate was 96% and 95% in the i-gel and PLMA groups, respectively; overall success rate was 100% in both groups. There were no major side effects with either device.

Discussion: Insertion of the i-gel was more difficult than PLMA, whereas the fiberoptic view was better through the i-gel than PLMA. Both the i-gel and PLMA were successfully used in children.

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S-385.

SAFETY AND EFFICACY OF PROSEAL LMA VERSUS CLASSIC LMA IN CHILDREN - A RANDOMIZED CONTROLLED TRIAL

AUTHORS: S. Gombar, A. Jafra, D. Kapoor

AFFILIATION: Department of Anesthesia & Intensive Care, Government Medical College & Hospital, Chandigarh, India

INTRODUCTION: There are well known limitations of the CLMA in paediatric patients, in particular size 1 and 2.(1) Its low pressure seal might be inadequate for positive pressure ventilation (PPV). Its modification, Proseal LMA has higher oropharyngeal leak pressures with feasibility of PPV.(2) This study was designed to compare the safety and efficacy of the PLMA versus the CLMA in children undergoing elective ambulatory procedures.

METHODS: Following Institutionall ethics committee approval, one hundred children aged 6m to 10 years were randomly allocated to either PLMA or CLMA groups.After induction of general anaesthesia, atracurium besylate 0.5 mg.kg-1 was used to facilitate muscle relaxation with fentanyl 2 µg kg-1 for analgesia. A size 1.5, 2, or 2.5 (depending on the weight), PLMA/ CLMA was chosen as per group allocation of the patient.The primary outcome was the oropharyngeal leak pressure (OLP). Secondary outcomes were the time and number of attempts for insertion, quality of airway, & fibreoptic placement.The quality of the initial airway was assessed during manual ventilation, as: excellent, good, or poor. The OLP was determined by closing the expiratory valve of the circle system at a fixed gas flow of 3 liters.min-1. A flexible fibreoptic scope was introduced into the airway tube for viewing and scoring the laryngeal structures as 1,2,3 & 4.(3)

RESULTS: The primary variable tested was OLP. The baseline demographic data were comparable. The mean OLP in PLMA (30.02 ± 3.21 cmH2O) was significantly higher than CLMA 21.62 ± 2.49 cmH2O. ($p < 0.001$). There was significant difference in the time taken for insertion of PLMA versus CLMA 21.90 ± 4.93 seconds vs 19.46 ± 5.99 seconds ($p<0.05$) In group I, all patients had an excellent quality of airway, while in group II, 30(60%) patients had an excellent quality of airway. ($p<0.001$). There was no statistically significant difference in the fibreoptic grading between the two groups (31,14,5 vs 31,15,4) ($p>0.05$) (Table 1).

DISCUSSION: The PLMA has higher oropharyngeal leak pressures compared to the CLMA. The success of the 1st attempt insertion was higher for the PLMA. Hence PLMA is a safe, efficacious, and easy-to-use supraglottic airway device in children undergoing elective ambulatory procedures providing a better quality of airway as compared to CLMA during controlled ventilation. Also, the results show that correct fibreoptic anatomic placement of the LMA cannot be considered as a valid end point for assessing the satisfactory placement of the device.

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Results

	PLMA (n=50)	CLMA (n=50)	
Time taken for insertion(sec)	21.90 ± 4.93	19.46 ± 5.99	P<0.05
1st attempt success rate (%)	92%	90%	
Quality of initial airway: Excellent/good, n(%)	50 (100%),0	30(60%), 20 (40%)	P<0.001
Oropharyngeal leak pressure (cmH_2O)	30.02 ± 3.21	21.62 ± 2.49	P<0.001
Ease of OGT insertion	100%	-	
Fibreoptic scoring Grade 4,3,2,1	31,14,5,0	31,15,4,0	
Blood on LMA (%)	4%	6%	

S-386.

KIDNEY INJURY AFTER PERCUTANEOUS AND A RANDOMIZED TRIAL OF INTRA-NASAL DEXMEDETOMIDINE AND SUFENTANIL COMPARED TO ORAL MIDAZOLAM FOR PEDIATRIC DENTAL SEDATION

AUTHORS: A. Maru[1], C. Heard[2,3], R. Mireles[2], M. Yarussi[2], P. Creighton[1]

AFFILIATION: [1]Pediatric Dentistry, Women & Children's Hospital of Buffalo, Buffalo, NY; [2]Pediatric Anesthesiology, Women & Children's Hospital of Buffalo, Buffalo, NY; [3]Pediatric Critical Care, Women & Children's Hospital of Buffalo, Buffalo, NY

INTRODUCTION: Conscious or moderate sedation is routinely used to facilitate the dental care of an uncooperative child. There are many different drugs and routes of administration available for sedation. IN Dexmedetomidine has previously been used as a premed to general anesthesia, but not as a sedative for a surgical treatment. The aim of this study is to assess the effectiveness in our dental clinic of two drug regimens, oral Midazolam (POM), our routine sedative, and intranasal Dexmedetomidine/Sufentanil (INDS). We will compare the two regimens for efficacy, duration of affect and incidence of any complications such as respiratory events, nausea or excess sedation.

METHODS: After FDA approval (IND# 112699) for the use of IN Dexmedetomidine in children and IRB approval, patients were recruited and randomized to receive either POM (1 mg/kg, max 20mg) or INDS (DEX 2mcg/kg, max 40mcg & SUF 1 mcg/kg, max 20mcg). The quality of sedation was assessed by a blinded observer using the RASS, UMSS, and OSBRS, as well as an assessment by the attending and resident dentist (also blinded) on a score of 1-10 (poor - excellent sedation).

RESULTS: We have recruited 15 subjects so far. Average age and weight and number of procedures per case was 4.9 years, 19.9kg and 4.13 respectively. Sedation used: 6 children received POM and 9 received INDS with average doses of 19mg POM, 34 mcg IN DEX and 17mcg IN SUF. The mean procedural time was 38 minutes and time to discharge 57 minutes (no difference between groups). The mean sedation rating by dental resident and attending was 3.3 & 3.6 for the POM sedation and 8.3 & 7.6 for the INDS sedation respectively ($p < 0.05$). The mean RASS for the procedure was 1.00 for POM & 1.44 for INDS (p value 0.07) and for the end was 0.50 for POM & -1.78 for INDS (p value 0.02). OSBRS average for the procedure was 3.33 for POM & 2.00 for INDS (p value 0.01) and for the end was 2.83 for POM & 2.00 for INDS (p value 0.01). UMSS average for the start was 1.17 for POM & 1.89 for INDS (p value 0.06) and for the end was 0.83 for POM & 1.67 for INDS (p value 0.02). There was 1 episode of nausea in the INDS group and 2 INDS patients required supplemental nasal cannula oxygen at 2L/min. Both techniques were rated highly (> 9/10) by the parents on a follow-up phone call and the IN administration was well tolerated.

DISCUSSION: Data collection is ongoing. Preliminary data obtained thus far shows INDS appears to be a better regiment for dental sedation procedures by providing significantly effective dental sedations at the start, during the procedure, and end as shown by the assessment scores. The incidence of airway complications and nausea was not different (underpowered at present).

REFERENCES: N/A

S-387.

KIDNEY INJURY AFTER PERCUTANEOUS AND POPULATION PHARMACOKINETICS (PK) OF DEXMEDETOMIDINE (DEX) IN PEDIATRIC INTENSIVE CARE

AUTHORS: J. Fiedler-Kelly[1,3], E. Ludwig[1], D. Stalker[2]

AFFILIATION: [1]Pharmacometric Services, Cognigen Corporation, Buffalo, NY; [2]Global Medical Affairs, Hospira, Inc., Lake Forest, IL; [3]Pharmaceutical Sciences, University at Buffalo, Buffalo, NY

INTRODUCTION: Although the pharmacokinetics (PK) of dexmedetomidine (DEX) in children have been described, published reports include limited subjects without consideration of neonates.[1] A population PK analysis of DEX was performed using pooled data from 4 studies of pediatrics aged > 28 weeks to 17 years.

METHODS: Pediatric subjects were mechanically ventilated, requiring sedation in an intensive care setting. DEX loading doses ranging from 0.05 - 1.00 μg/kg were administered over 10-20 minutes, followed by maintenance infusions of 0.05 - 2.00 μg/kg/h for 2 - 24 hours. Blood samples for PK analysis were obtained during and post-DEX infusion (up to 13) in patients other than neonates (up to 8). A population nonlinear mixed effects modeling approach was used to characterize DEX PK. Other factors potentially contributing to inter-subject PK variability were evaluated using forward selection/backward elimination (α=0.05/0.001). The PK model was evaluated using a simulation based prediction corrected visual predictive check (VPC).

CHALLENGING CASE REPORT: N/A

RESULTS: DEX PK parameters were estimated using a 2 compartment disposition model with CL, Q, Vc, and Vp parameters, fixed allometric exponents on clearance (CL), intercompartmental CL (Q) (0.75 for CL and Q) and distribution volumes for the central (Vc) and peripheral (Vp) compartments (1.0 for Vc and Vp), an additional shift on the CL exponent for neonates most likely related to lack of maturation of drug metabolizing enzymes, and age effects on Q and Vp (both decrease with increasing age). Population mean (%SEM) values for CL, Vc, Q, and Vp were 10.7(3.4) L/h, 8.49(10.5) L, 63.5(23.8) L/h, and 14.7(7.2) L, respectively. Model-based simulated concentrations were in close agreement with the observed data. Weight-adjusted CL and Vc estimates decrease with increasing age, and approach values expected in adults.[2] The 95% confidence intervals for the geometric mean DEX CL were within the targeted bounds of 60% to 140% of the point estimates for all age groups. All intervals for Vc were within the targeted bounds, except for the 6 to 17 year age group (0.70, 1.43).

DISCUSSION: The PK of DEX were characterized using the largest patient population with the broadest age range, DEX maintenance doses and infusion durations reported to date. The model evaluation results indicate that PK are predicted well over the range of DEX concentrations occurring during and immediately after maintenance infusion. Overall, these results will support improved DEX dosing recommendations in this critically ill population of children.

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S-388.

WITHDRAWN.

S-389.

GLIDESCOPE REDUCES LARYNGOSCOPY ASSOCIATED LARYNGOSPASM IN 1,200 CONSECUTIVE PEDIATRIC NASAL INTUBATIONS WITHOUT MUSCLE RELAXANT

AUTHORS: T. West, A. Targ, N. Noone

AFFILIATION: Targ Mobile Anesthesia, Palo Alto, CA

INTRODUCTION: Children experience perioperative laryngospasm at twice the adult rate[1]. Laryngospasm (LS), defined in this study as partial or complete vocal cord closure preventing the passage of an appropriately sized* endotracheal tube (ETT), risks oxygen desaturation, pulmonary edema, aspiration, bradycardia, and cardiac arrest[1]. Many studies have shown the GlideScope video laryngoscope (GVL) equal or superior to direct laryngoscopy (DL) for glottic visualization and ETT insertion[2], yet none have examined GVL assisted pediatric nasal intubation.

METHODS: Records of 1,290 consecutive ASA I elective dental procedure patients under 12 years of age (all anesthetized by one anesthesiologist experienced with 5,000 pediatric nasal intubations) were retrospectively surveyed. In each case, a standardized induction had been performed. Sevoflurane (8%) was administered followed by placement of supraglottic airway device(s) as needed (Guedel oral airway and/or laryngeal mask airway). At an end tidal sevoflurane concentration of 3.0%, a mean of 6.1 ± 1.9 mg/kg propofol was given to induce apnea, thus avoiding anesthetic exhalation and undesired reduction of anesthetic depth during nasal intubation. An 18 F red rubber catheter guided the Nasal RAE ETT through the nasopharynx to decrease trauma[3], and tracheal intubation was completed with a tube bender. The first 637 cases were performed by Miller laryngoscope and the second 653 by GVL. In every case of LS during laryngoscopy, succinylcholine was administered and resulted in immediate resolution and ETT passage. Ninety cases were excluded due to deviation from protocol (42 no propofol given, 37 no intubation desired, 8 LS prior to laryngoscope insertion, 3 other), leaving 1,200 cases for analysis (600 DL, 600 GVL).

RESULTS: LS during laryngoscopy occurred in 16 of 600 DL patients and 4 of 600 GVL patients. The log odds of LS increases by 1.45 with DL (95% C.I. 0.43-2.7) and is significant at α=0.01 (see table 1). Propofol was significantly lower in the GVL group ($p \leq .01$).

DISCUSSION: This previously unreported finding supports routine use of GVL for children undergoing nasal intubation when muscle relaxation is not desired. It is unlikely the GVL group's lower propofol dose would reduce LS, as propofol has been reported to resolve LS[4]. The significant reduction in LS with GVL may result from reduced stimulation with video laryngoscopy (less force applied and improved laryngeal view).

* ETT size (mm i.d.) = 4 + patient age/4 (±0.5 mm based on patient size)

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Coefficient:	Estimate	Std. Error	z value	p-value
(Intercept)	1.81	6.72	0.270	0.787
Age	-0.006	0.218	-0.029	0.977
Gender (M)	0.180	0.456	0.395	0.693
Weight	0.043	0.069	0.624	0.533
Sevoflurane %	0.235	2.19	0.107	0.915
Dexamethasone	1.13	4.55	0.249	0.804
Ketorolac	0.056	2.36	0.024	0.981
Laryngoscopy method (DL)	1.45	0.565	2.57	0.010*

Table 1: A logistic regression was used to assess the effects of demographics, preoperative medication, and DL vs GVL on laryngoscopy associated LS. DL was found to be associated with an increase in LS.

S-390.

CAUDAL ANESTHESIA FOR PEDIATRIC CARDIAC CATHETERIZATION

AUTHORS: J. Bjerregaard, R. Williams

AFFILIATION: Department of Anesthesiology, Fletcher-Allen Healthcare, University of Vermont, Burlington, VT

INTRODUCTION: A wide variety of anesthetic techniques have been utilized over the years for cardiac catheterization in children. The diagnostic success of the procedure relies on obtaining stable hemodynamics with as little perturbation from the patient's baseline as possible. We review our experience over the last 15 years using caudal anesthesia in combination with either light propofol sedation or light planes of sevoflurane anesthesia in children undergoing cardiac catheterization. We believe this technique provides the cardiologist with an immobile and insensate patient while causing limited negative physiological impact.

METHODS: A retrospective descriptive case series of patients receiving caudal anesthesia for cardiac catheterization. Demographics, anesthetic use, and hemodynamic data were retrospectively assessed for the efficacy and hemodynamic stability of the technique.

RESULTS: Fifty-four records were reviewed, consisting of patients ages 2 months to 10 years old, who had caudal anesthesia attempted. In the 50 patients successfully blocked, 39 patients received propofol at an average infusion rate of 128 mcg/kg/min. Eleven intubated patients received sevoflurane at an average minimum alveolar concentration (MAC) depth of 0.6. All patients maintained systolic blood pressures within 20% of the mean at selected time points. All patients were at some point maintained on FiO2 less than or equal to 30%.

DISCUSSION: The use of caudal anesthesia as an integral part of the anesthetic plan for pediatric cardiac catheterization appears to be a practical technique with a high success rate. Caudal anesthesia may offer a number of potential benefits to patients undergoing cardiac catheterization including minimal alterations in the patient's native physiology and the ability to extend analgesia and motor blockade into the post catheterization period.

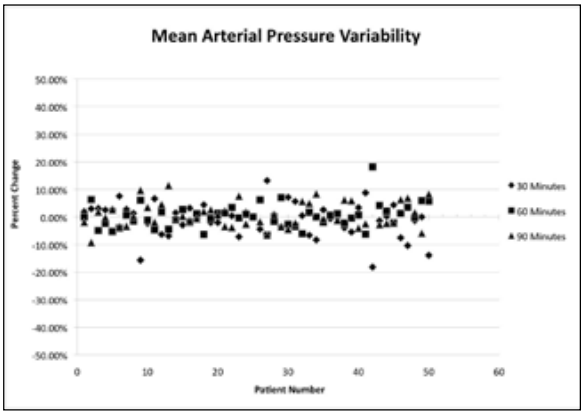

Figure 1. Hemodynamic profile of patients during procedure with a caudal anesthetic block at 30, 60, and 90 minute intervals. Presented as mean arterial pressure variability.

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S-392.

A PHASE II/III, OPEN-LABEL, MULTICENTER, SAFETY, EFFICACY AND PHARMACOKINETIC STUDY OF DEXMEDETOMIDINE IN NEONATES AGES ≥ 28 WEEKS TO ≤ 44 WEEKS GESTATIONAL AGE

AUTHORS: C. Chrysostomou[1], S. Schulman[2], M. Polak[3], M. Herrera[4], B. Cofer[5], L. Gramlich[6]

AFFILIATION: [1]Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]Duke University Medical Center, Durham, NC; [3]West Virginia University, Morgantown, WV; [4]Roosevelt Hospital, Guatemala City, Guatemala; [5]Greenville Hospital System, Greensville, SC; 6Loyola University Medical Center, Maywood, IL

INTRODUCTION: Dexmedetomidine (DEX), a highly selective alpha-2 adrenergic agonist with sedative, analgesic and anxiolytic effects, has been used successfully in pediatric patients during and after mechanical ventilation. To date, the pharmacokinetics (PK) of DEX has only been characterized across limited pediatric populations. The present study investigated the PK, pharmacodynamic, safety and efficacy profile of DEX in premature and full-term neonates ages ≥28 wks to ≤44 wks gestational age admitted to an intensive care unit.

METHODS: 36 initially intubated and mechanically ventilated patients were grouped by age: group I patients (N=12) were premature neonates ≥28 wks to <36 wks, and group II patients (N=24) were term neonates ≥36 wks to ≤44 wks gestational age. Within each age group, there were 3 escalating DEX dose levels that included a loading dose (LD, mcg/kg) over 10 mins followed by a maintenance dose (MD, mcg/kg/hr) for 6-24 hrs duration: level 1: 0.05 LD/0.05 MD; level 2: 0.1 LD/0.1 MD; and level 3: 0.2 LD/0.2 MD.

RESULTS: All patients who enrolled to receive DEX completed the treatment. The mean gestational age for group I-level 1 and 2 was 30.3 and 32.5 wks, and 38.7 wks for group II levels 1-3. Adequate sedation was seen in most patients and rescue sedation with midazolam (0.22 ± 0.26 mg/kg) was given in 4 patients (17%) in group II. Rescue analgesia with fentanyl was given in 2 (17%) patients in group I and 11 (46%) patients in group II. 5 (21%) patients in group II received rescue morphine. In group I, level 1 and 2, DEX weight adjusted clearance (CLw) was 0.41 and 0.29 L/hr/kg, maximum plasma concentration (Cmax) was 102 and 107 pg/mL, volume of distribution (Vssw) was 2.7 and 3.8 L/kg, and elimination t½ was 3 and 8 hrs respectively. In group 2, level 1, 2 and 3 CLw was 0.61, 0.64 and 0.73 L/hr/kg, Cmax was 78, 122 and 326 pg/mL, Vssw was 1.4, 2.8 and 2.1 L/kg, and t½ was 3, 5 and 3 hrs respectively. A lower CLw was observed in group I and total exposure (AUC) was 4.5 times larger than group II. The safety profile observed was typical of the critically ill, high risk pediatric population and post-operative surgical patients. Adverse events (AEs) were reported in 8 (67%) patients in group I and 15 (62%) patients in group II; only 3 (8.3%) patients reported AEs related to DEX. In group I bradycardia and diastolic hypotension were each reported by 1 (8.3%) patient and hypertension was reported by 1 (4.2%) patient in group II. None had serious AEs related to DEX or AEs needing DEX discontinuation.

DISCUSSION: DEX is effective at sedating premature and term neonates and is well tolerated without significant AEs. Premature neonates appear to have lower CLw and longer elimination t½.

REFERENCES: N/A

S-393.

A PHASE III, RANDOMIZED, DOUBLE-BLIND, DOSE-CONTROLLED, MULTICENTER STUDY OF THE SAFETY AND EFFICACY OF DEXMEDETOMIDINE IN MECHANICALLY VENTILATED CHILDREN

AUTHORS: G. B. Hammer[1], D. E. Soliman[2], C. Newth[3], J. Boriosi[4], S. Schulman[5]

AFFILIATION: [1]Stanford University, Stanford, CA; [2]Children's Hospital of Pittsburgh, Pittsburgh, PA; [3]Children's Hospital Los Angeles, Los Angeles, CA; [4]University of Wisconsin, Madison, WI; [5]Duke University Medical Center, Durham, NC

INTRODUCTION: Sedation and analgesia are important therapies in the pediatric intensive care unit (PICU). Prolonged administration of benzodiazepines and opioids may result in delirium, physical dependence, tolerance and withdrawal upon discontinuation. Dexmedetomidine (DEX), a highly selective alpha-2 adrenergic agonist, is used in pediatric patients for sedation during and after mechanical ventilation. The safety and efficacy of DEX for sedation in intubated, mechanically ventilated children in the PICU was investigated.

METHODS: 175 PICU patients were randomized to receive either low-dose (LD) DEX (n=89) or high-dose (HD) DEX (n=86). In the LD group, cardiopulmonary bypass (CPB) patients received 0.2 mcg/kg followed by 0.025-0.5 mcg/kg/hr; non-CPB patients received 0.3 mcg/kg followed by 0.05-0.5 mcg/kg/hr. In the HD group, post-CPB patients received 0.5 mcg/kg followed by 0.1-0.7 mcg/kg/hr; non-CPB patients received 0.6 mcg/kg followed by 0.2-1.4 mcg/kg/hr. Patients were also grouped by age: group 1 was ≥1 to <24 months; group 2 was ≥24 months to <17 years. The primary endpoint was the percent of patients that did not require rescue midazolam (MDZ) to achieve adequate sedation, measured by a University of Michigan Sedation Scale (UMSS) score of 1-3 while intubated. Total amount of rescue MDZ was summarized by descriptive statistics and difference between groups was assessed by PROC NPAR1WAY.

RESULTS: 77 patients in the LD group and 76 patients in the HD group completed treatment. The LD group had a mean age of 10.7 months versus 14.7 months in the HD group. A nonsignificant (p=0.28) dose response effect was observed with more patients in the HD group (54.3%) not requiring rescue MDZ to maintain the target sedation than in the LD group (44.6%), irrespective of age. The difference in the median amount of rescue MDZ between LD and HD groups was not statistically significant. There was a nonsignificant trend toward increased efficacy in HD, post-CPB patients, wherein more patients did not require supplemental MDZ rescue compared to patients in the LD group (27.3% vs 50.0%; p=0.10). No clinical difference in safety profile of LD and HD was found. There did not appear to be an increased incidence of DEX-related adverse events in this pediatric population.

DISCUSSION: DEX was effective at sedating critically ill infants and children following major cardiac surgery with CPB as well as non-cardiac surgery. DEX was well-tolerated in children at all doses studied in both groups. A limitation of this study was the overlap in DEX dosing in the HD and LD groups. Future studies are needed to determine if DEX administration reduces the amount of MDZ needed for sedation in children following major surgery.

REFERENCES: N/A

Pediatric Anesthesia
Neonatal Safety & Anesthetics

S-399.

ISOFLURANE EXPOSURE IS ASSOCIATED WITH DECREASED MIGRATION AND ALTERED ACTIVATION MORPHOLOGY IN CULTURED RODENT MICROGLIA

AUTHORS: R. Zhu, C. D. Bub, J. M. O'Donnell, V. L. Jacobs, S. C. Hillier, E. A. Romero-Sandoval

AFFILIATION: Anesthesiology, Dartmouth-Hitchcock Medical Center, Lebanon, NH

INTRODUCTION: Neurotoxicity is associated with anesthetic exposure during critical phases of brain development in animals, resulting in persistent adverse neurobehavioural effects. However, the mechanisms underlying the long-term neurocognitive deficit occuring after a discrete anesthetic exposure remain uncertain. Because microglia serve important neuromodulatory, neurotrophic, and neurodevelopmental roles, the effects of anesthetic exposure on microglial survival and function may be significant and relevant. Thus, we evaluated survival, migration, morphology, and inflammatory mediator release in immortalized microglial cultures after exposure to isoflurane.

METHODS: Murine-derived BV-2 immortalized microglia were cultured as described previously[1]. Viability was confirmed by trypan blue staining prior to exposure to 3% isoflurane in 21% O2 / 5%CO2 / 74%N2 for 0, 1, or 3 hours. The following elements of microglial function were evaluated. ADP-stimulated microglial migration using Boyden Chambers, microglial death and early apoptosis were quantified using Flourescence Activated Cell Sorting (FACS) with Propidium Iodide and Annexin V labeling respectively. Microglial morphology was graded by a blinded observer using medium power microscopy and a 4-point glial activation scale (1 = reactive, condensed and elongated cytoplasm with processes, to 4 = quiescent, speading cytoplasm with few processes), as described previously[2]. Finally, LPS-stimulated release of inflammatory mediators IL-6 and TNF-α were measured using ELISA of cell culture supernatant.

RESULTS: Microglial exposure to either 1 or 3 hours of isoflurane had no effect on LPS-stimulated IL-6 or TNF-α release. Similarly, microglial apoptosis and/or cell death were not significantly increased by isoflurane exposure. However, a 3 hour exposure to isoflurane was associated with a significant decrease in microglial migration. Isoflurane exposure was also associated with significantly altered microglial morphology, reflecting increased glial activation.

Discussion: Microglia are abundant, highly motile, non-neuronal cells with important roles in synaptic maintenance, maturation, and elimination[3,4]. Alterations in microglial function, particularly motility, may adversely affect neurodevelopment. Further work is ongoing to characterize the mechanisms underlying these isoflurane-induced alterations in microglial motility and morphology. However, it remains to be determined if there are neuro-maturational consequences associated with these phenomena.

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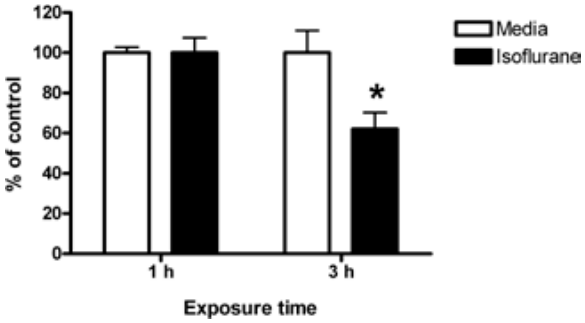
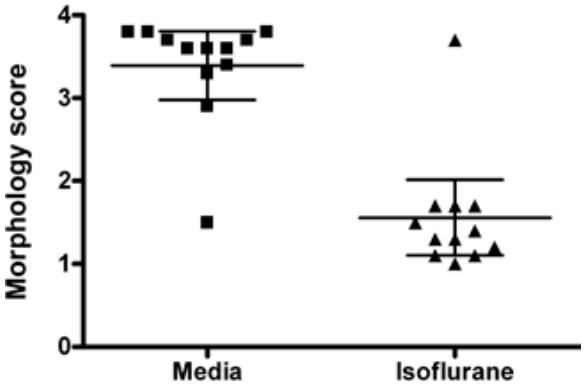


Microglial Migration. 3 h exposure to isoflurane inhibited migration in BV-2 cells. 1 h and 3 h exposed BV-2 cells migrated towards 0.1 uM ADP for 2 h. Results are shown as mean cell counts per 20x field as percentage of control +/- SEM for all treatment groups. *p<0.01



Activation Morphology. 3 h exposure to isoflurane alters migrated microglial morphology. Multiple 20x field images were scored on a scale of 1-4. Results displayed as mean score with 95% C.I., p<0.01.

S-400.

INCREASING CUMULATIVE EXPOSURE TO VOLATILE ANESTHETIC AGENTS AND NARCOTICS IS ASSOCIATED WITH POORER NEURODEVELOPMENTAL OUTCOMES IN PATIENTS WITH HYPOPLASTIC LEFT HEART SYNDROME

AUTHORS: L. K. Diaz[1], S. Koh[2], M. Gerdes[3], X. Luan[3], M. Rehman[1], J. W. Gaynor[2]

AFFILIATION: [1]Anesthesiology and Critical Care Medicine, The Children's Hospital of Philadelphia, Philadelphia, PA; [2]Cardiothoracic Surgery, The Children's Hospital of Philadelphia, Philadelphia, PA; [3]Pediatrics, The Children's Hospital of Philadelphia, Philadelphia, PA

INTRODUCTION: Despite improved survival with staged reconstruction neurodevelopmental (ND) dysfunction is common in patients with hypoplastic left heart syndrome (HLHS)[1,2]. Animal and human studies suggest that repeated exposures to anesthetic agents may be toxic to the immature brain[3,4]. The role of cumulative exposure to volatile anesthetic agents (VAA), and fentanyl in ND disability in patients with HLHS is not known.

METHODS: In a study of genetic polymorphisms and ND outcome after cardiac surgery, 96 children with HLHS underwent assessment of ND status at 4 years of age including cognition, processing speed, language, attention, impulsivity, memory, executive function, social competence, academic achievement, visual-motor and fine-motor skills. Total exposure to VAA and fentanyl for cardiac and noncardiac surgeries from birth to 4 year testing was derived from an anesthetic database and intensive care unit (ICU) flowsheets. Exposure to halothane, isoflurane, sevoflurane and/or desflurane was converted to age-adjusted minimum alveolar concentration-hours (MAC-hrs) and summed to yield total VAA exposure. Total intravenous fentanyl dosage (bolus and continuous infusion) was calculated in micrograms/kg (μg/kg). The effect of exposure to VAA and fentanyl on ND outcomes was evaluated using multivariate logistic regression.

RESULTS: All patients had intraoperative fentanyl and VAA exposure, and all received fentanyl in the ICU. 537 anesthetic exposures were evaluated; 478 had VAA, with total VAA exposure ranging from 0.9-35.3 MAC-hrs (median 7.54). There were 337 intraoperative fentanyl exposures. Cumulative intraoperative and ICU fentanyl dosage ranged from 118.59 to 3998.28 μg/kg (median 309.87). After adjustment for patient and operative confounders (including stage 1 length of stay and number of cardiac operations), increasing VAA exposure was associated with worse full-scale IQ, total language, executive function, memory, reading and math skills (all $p< 0.05$). Increasing fentanyl exposure predicted worse full scale IQ, total language, processing speed, memory, fine motor skills and math skills (all $p< 0.05$). (See supp data)

DISCUSSION: These findings support the hypothesis that in HLHS patients increased cumulative exposure to both VAA and fentanyl results in worse ND outcomes. Anesthetic and postoperative sedative management are modifiable. Clinical trials are indicated to confirm these findings and to determine if other anesthetic and analgesic/sedative strategies are associated with less impaired outcomes.

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S-401.

CARBON MONOXIDE PREVENTS ANESTHESIA-INDUCED NEUROAPOPTOSIS IN NEWBORN MICE

AUTHORS: R. Levy, Y. Cheng

AFFILIATION: Washington, DC

INTRODUCTION: Volatile anesthetics cause wide-spread neuro-apoptosis in the developing brain[1]. Carbon monoxide (CO) has ant-apoptotic properties and exhaled endogenous CO is commonly re-breathed during low-flow anesthesia in infants and children resulting in sub-clinical CO exposure[2,3]. We hypothesized that low concentrations of CO inspired during volatile anesthetic exposure would prevent anesthesia-induced neuroapoptosis. We aimed to quantify the number of activated caspase-3 cells and TUNEL positive nuclei in the developing brain following concomitant exposure to CO and isoflurane.

METHODS: 7 day old male CD-1 mice underwent 1-hour exposure to 0 ppm (air), 5 ppm, or 100 ppm CO in air with or without isoflurane (2%). Thus, six different cohorts were evaluated. Five hours after exposure, brains were harvested and immunohistochemistry for activated caspase-3 and TUNEL assays were performed. Three to four slices per animal were assessed and three mice per cohort were evaluated. In a separate cohort, carboxyhemoglobin levels (COHb%) were measured immediately after exposure. Change in COHb% was assessed with T-test and significance set at $P<.05$. The number of caspase-3 positive cells and TUNEL positive nuclei were determined in primary somatosensory neurocortex, hippocampus, and hypothalamus/thalamus. Significance was assessed with ANOVA and post hoc Tukey's test.

RESULTS: COHb% increased significantly following exposure to 5 ppm and 100 ppm CO in a concentration-dependent manner compared to air exposed controls. Isoflurane significantly increased the number of activated caspase-3 positive cells and TUNEL positive nuclei in all regions of the brain examined in air-exposed mice. CO exposure abrogated isoflurane-induced increases in activated caspase-3 and TUNEL positive nuclei in each brain region in a dose-dependent manner.

DISCUSSION: Consistent with prior reports, 1-hour isoflurane exposure increased neuroapoptosis in several regions of the developing brain[4]. Exposure to 5 ppm and 100 ppm CO increased COHb% confirming time-weighted exposure. Both concentrations of CO prevented isoflurane-induced neuroapoptosis in each brain region in a dose-dependent manner. Thus, low-flow anesthesia designed to result in re-breathing of specific concentrations of CO may be a desired strategy to prevent anesthesia-induced neurotoxicity in infants and children.

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S-402.

COMPARATIVE NEUROTOXIC EFFECTS OF DEXMEDETOMIDINE AND KETAMINE IN PRENATAL MONKEY BRAINS

AUTHORS: E. Koo[1], T. Oshodi[2]

AFFILIATION: [1]Research and Development - Preclinical, Hospira, Inc., Lake Forest, IL; [2]Maccine Pte Ltd, Singapore, Singapore

INTRODUCTION: Previous studies have demonstrated that ketamine induced apoptosis and degeneration in developing monkey brains (Slikker 2007, Zou 2009). Dexmedetomidine (Dex) is a general anesthetic with a different mechanism of action from ketamine. The present study compared the neurotoxic effects of the two drugs in prenatal Cynomolgus monkeys.

METHODS: Twenty pregnant monkeys at approximate gestation day 120 (±7days) were divided into 4 groups. Group 1 animals were cage controls and did not receive any treatment. Group 2 animals were dosed with Ketamine at 20mg/kg IM followed by a 12-hour infusion at 20-50mg/kg/hr. Group 3 animals received Dex at 3µg/kg IV over 10 minutes followed by a 12-hour infusion at 3µg/kg/hr (HED). Group 4 animals received Dex at 30µg/kg IV over 10 minutes followed by a 12-hour infusion at 30µg/kg/hr (10X HED). Six hours following end of infusion, all animals were anesthetized with Ketamine (20mg/kg IM) and each fetus was removed by C-section. The entire duration of the C-section was no longer than 1 hour to minimize the exposure of ketamine to the fetus (especially the control and Dex-treated animals). Blood samples from both the dams and fetuses were measured for the concentration of Dex. Each fetus was perfusion-fixed with 10% NBF and the brains were then removed from all fetuses, stored in 10% NBF and processed for paraffin sections. Serial sections were cut through the frontal cortex and were stained to detect for apoptosis (Caspase 3 and TUNEL) and neurodegeneration (silver stain). The slides were evaluated by a board-certified veterinary pathologist and the incidences of neuroapoptotic and neurodegenerative cells were quantified.

CHALLENGING CASE REPORT: N/A

RESULTS: There were no significant neuroapoptotic lesions present in untreated fetal brains. In-Utero treatment with Ketamine resulted in marked apoptosis and degeneration primarily in Layers I and II of the frontal cortex, thus reproducing previous findings reported by Slikker and Zou. In contrast, fetal brains from animals treated with Dex showed none to minimal neuroapoptotic or neurodegenerative lesions at both the low- and high-dose levels; lesion incidence for both groups were similar to untreated controls. PK samples confirmed systemic exposure of Dex in both dams and fetuses.

DISCUSSION: The current study showed that unlike ketamine, Dexmedetomidine at both the low-dose (HED) and at 10X HED; did not induce apoptosis in the developing brain of Cynomolgus monkeys.

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S-403.

EFFECTS OF EXPOSURE TO GENERAL ANAESTHESIA IN INFANCY ON ACADEMIC PERFORMANCE AT AGE 12

AUTHORS: C. L. Bong[1], J. Tan[1], I. W. Koh[2], J. Soo[3], S. Lum[3]

AFFILIATION: [1]Department of Paediatric Anaesthesia, KK Women's and Children's Hospital, Singapore, Singapore; [2]Singapore Polytechnic, Singapore, Singapore; [3]National University of Singapore High School of Mathematics and Science, Singapore, Singapore

INTRODUCTION: Studies in animal models have shown that exposure to general anaesthetic (GA) agents in neonatal life cause irreversible damage to the developing brain.[1,2] Human cohort studies also suggest that children exposed to GA in early childhood were more likely to have behavioral problems[3] and learning disabilities[4].

We aimed to determine if exposure to GA during infancy for minor surgery in otherwise healthy children would predispose them to poorer academic achievement at age 12, based on aggregate scores achieved in the Primary School Leaving Examination (PSLE), when compared to children with no previous exposure to GA.

METHODS: From our hospital database, children born in 1998-1999 with no pre-existing medical conditions, who were exposed to general inhalational anaesthesia for minor surgical procedures (herniotomies, circumcision, pyloric stenosis) before age 1 were compared to age-matched controls with no previous exposure to GA. Exclusion criteria: prematurity, genetic disorders, central nervous system disorders, major congenital cardiac defects, severe renal disorders and family history of developmental delay, intellectual disability and psychological disorders. Parents of participants completed a 20-minute telephone interview with questions on their medical history, school and home environment. Primary outcome measure was the aggregate score achieved in the standardized PSLE exam taken at age 12, a surrogate measure of functional outcome. Secondary outcome measure was the diagnosis of learning disability at age 12.

RESULTS: 103 subjects and 119 controls completed the study. (Subjects: 257 identified, 182 contactable, 24 declined, 46 excluded per exclusion criteria, 103 recruited. Controls: 322 identified, 197 contactable, 49 declined, 19 excluded, 119 recruited.) The incidence of learning disability was 16.8% higher in subjects relative to the controls(21.9% vs 5.1% $P<0.001$). After correcting for number of previous GAs, race, gender, maternal education, housing and learning disability, there was a mean reduction of 4.4 points in PSLE aggregate scores in the subjects relative to the controls ($P=0.414$; effect size = 0.11 SD; $P=0.414$).

DISCUSSION: Exposure to GA in otherwise healthy children for minor surgery before their first birthday was associated with a significantly higher incidence of learning disability at age 12. However, in the absence of any learning disability, there was no significant difference in the academic achievements of these children at age 12 relative to children who had never been exposed to anaesthesia.

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S-404.

METABOLIC STATUS IN NEONATAL RAT BRAIN IN RESPONSE TO GENERAL ANESTHESIA DIFFERS FROM THE YOUNG RAT BRAIN: THE ROLE OF GLUTAMATE

AUTHORS: R. Makaryus, H. Lee, Z. Jacob, M. Yu, T. Feng, H. Benveniste

AFFILIATION: Anesthesiology, Stony Brook University Medical Center, Stony Brook, NY

INTRODUCTION: Proton magnetic resonance spectroscopy (1HMRS) can be used to detect abnormalities in the brain, which may reveal neuronal injuries, ischemia, inflammation, and even possibly neurogenesis and apoptosis. We previously showed that cerebral metabolomic patterns depend on anesthetic regimen used.[1] The main differences seen in adult animals are an increase in the levels of glutamate and lactate in response to inhalational agents as compared to intravenous agents.[1] We sought to determine if these differences would also be seen in younger animals, particularly those undergoing synaptogenesis (PND 6 - 11) and slightly older animals (PND 21 - 36).

METHODS: Following approval by the local IACUC, rats were divided into four groups based on age and anesthesia exposure: Neonatal Sevoflurane (n=11), Neonatal Propofol (n=10), Weaned Sevoflurane (n=8), and Weaned Propofol (n=9). All animals were monitored for respiratory rate, heart rate, temperature, and O2 sats while breathing 60% O2. The sevoflurane groups received 1 MAC Sevoflurane, while the propofol groups received 1 MAC equivalent doses. Total anesthesia duration for all animals was 6 hours; 1HMRS was performed in the hippocampus and thalamic regions using a 9.4T MRI.

RESULTS: Age and body weights were matched across groups. Metabolite milli-molar values attained via LCModel were compared across all four groups using two-way ANOVA analysis. Multiple metabolites differed by animal age; however, glutamate [glu] was the only one that differed by type of anesthesia with $p < 0.0001$ for both brain regions. Post-hoc analysis revealed that glutamate was significantly higher in the weaned group; however, for the neonatal animals, there was no significant difference in glutamate between the two anesthetics. PLS-DA analysis showed a clear separation between the four groups with a significant Q2 value of >0.3 for both regions, and confirmed our ANOVA results.

DISCUSSION: Although [Glu] trended to increase in the neonatal brain with sevoflurane, the baseline [glu] was lower compared to the young animals, which is probably related to brain maturity. Glutamate is the primary excitatory neurotransmitter in the brain and is also an essential intermediary in energy metabolism. Clearly from the point of view that [Glu] is representing metabolism, lower [Glu] in neonatal brain signifies lower metabolism and/or neuronal activity in agreement with neurophysiological data. The significance of the metabolic profiles in relation to potential neurotoxicity is currently being investigated

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Animal Groups – Age and Weight

	Average Age (days)	Average Weight (grams)
Neonatal Sevoflurane	8.3	20.6
Neonatal Propofol	8.7	24.9
Weaned Sevoflurane	28.0	87.6
Weaned Propofol	27.2	92.7

Temperatures were kept strictly at 36.9±0.29°C

S-405.

EMBRYONIC STEM CELL BASED INSIGHTS INTO ANESTHESIA INDUCED COGNITIVE DEFICIT: A ROLE FOR ALTERED NEUROGENESIS

AUTHORS: O. Johnson-Akeju[1], K. Eggan[2]

AFFILIATION: [1]Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA; [2]Stem Cell and Regenerative Biology, Harvard Stem Cell Institute, Cambridge, MA

INTRODUCTION: Evidence from animal studies suggesting that anesthetic agents induce neuronal degeneration has prompted the proposal of a direct causal link between anesthesia induced neuronal degeneration and cognitive decline. However, anesthetic related cognitive decline has a delayed onset and is progressive in nature suggesting that alteration of hippocampal-dependent neurogenesis is a likely contributing factor[1]. Since most agents implicated in cognitive decline are ubiquitous in their receptor targets, a precise understanding of the alterations induced by these agents is challenging. In this study, we describe the use of a mouse embryonic stem cell (MESC) approach to study this problem.

METHODS: An in vitro motor neuron differentiation model was used to circumvent the lack of robust and sub-type specific generation of cortical neuronal generation from stem cell models.The effects of candidate receptor modulators were systematically screened via immunofluorescence microscopy during HB9::GFP transgenic MESC directed neuronal differentiation. Quantification was performed by flow cytometry (BD LSRFortessa). Immunostaining for pan-neuronal markers was also performed. Forced expression of defined transcription factors in HB9::GFP embryonic mouse-fibroblasts generated functional induced motor neurons (iMN's) that do not traverse through a progenitor intermediate. We then tested the promising result from our initial screen in this model. Finally, a micro-array analysis (illumina MouseRef-8 v2) to elicit a candidate gene list was performed.

RESULTS: Ketamine had a significant time and concentration dependent detrimental effect on neurogenesis ($p<0.05$, Tukey's HSD), distinct from the direct toxic effect of the various drug/drug combinations screened. MK-801 also had a similar effect on neurogenesis, implicating the NMDA receptor ($p<0.05$, Tukey's HSD). Immunostaining for neuronal markers confirmed that the effect we observed was not specific to motor neuron generation. We found that ketamine had non-significant effects on iMN generation even at toxic doses, likely because iMN's do not transition through a neural progenitor state. Finally, transcriptional profiling helped characterize candidate genes for further analyses.

DISCUSSION: In summary, through a systematic approach, we provide evidence that prolonged NMDA receptor antagonism of a progenitor pool is sufficient to impair neurogenesis. Furthermore, to propose a principled mechanistic account of this phenomenon, we have elicited candidate downstream targets for functional studies. Further studies are underway to assess whether these observations can be recapitulated in a human in vitro model.

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S-406.

CHRONIC MORPHINE ADMINISTRATION LEADS TO INCREASED NEUROAPOPTOSIS IN NEWBORN RATS

AUTHORS: D. Bajic, K. G. Commons, S. G. Soriano

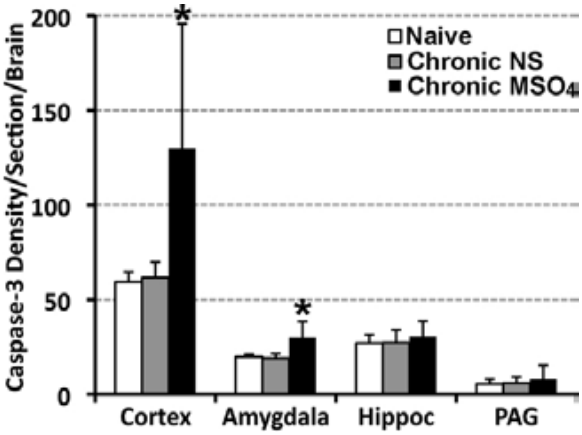
AFFILIATION: Department of Anesthesiology, Perioperative and Pain Medicine, Children's Hospital Boston, Boston, MA

INTRODUCTION: Prolonged neonatal opioid exposure has been associated with faster onset of opioid analgesic tolerance[1], and a long-term neurodevelopmental delay, cognitive and motor impairment[2]. We hypothesized that neurotoxicity in the form of apoptotic cell death would be increased in association with development of antinociceptive tolerance to morphine in developing rat.

METHODS: The Institutional Animal Care and Use Committee at our institution approved the experimental protocol for the use of animals in this study. Three groups of newborn rats were analyzed: (1) naïve group (n=6) that did not receive any treatment; (2) control group (n=5) that received only normal saline (NS); and (3) chronic morphine group (n=8) that received only morphine. Morphine sulfate or equal volume of NS was injected subcutaneously twice daily for 6.5 days starting on the postnatal day 1 (PD1). Apoptotic neurons were labeled using immunohistochemical technique against caspase-3. Apoptotic cells were counted in different anatomical regions: somatosensory cortex, amygdala, hippocampus, and periaqueductal gray of the midbrain. The mean density (#Caspase-3 immunolabeled cells/section/brain ± SD) was counted for each anatomical region. We have used ANOVA to determine statistical difference between treatment groups. Behavioral study using Hot Plate Test confirmed development of antinociceptive tolerance to chronic morphine in separate groups of animals (n=6/group).

RESULTS: Chronic morphine administration was associated with (1) analgesic tolerance, and (2) statistically significant increase in density of apoptotic cells in somatosensory cortex and amygdala, but not in hippocampus or periaqueductal gray. Caspase-3 immunoreactive cells exhibited morphology analogue to different types of neurons.

DISCUSSION: Although several reports have demonstrated neuroapoptosis following opioid administration in vitro[3] and in vivo at the spinal cord level in adult rats[4], our study demonstrates increased supraspinal apoptosis in developing brain (PD7). Increased apoptosis is selectively found in distinct anatomical regions important for sensory processing (somatosensory cortex) and memory of emotional processing (amygdala), and did not affect brain areas important for learning (hippocampus) or nociceptive processing (periaqueductal gray). Future studies should examine apoptosis following chronic opioid administration in the context of pain.



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Pharmacology – Basic Science

S-412.

A CENTURY IN PURSUIT OF THE UNITARY IDEAL: CAUSES AND CONSEQUENCES

AUTHOR: M. Perouansky

AFFILIATION: Anesthesiology, University of Wisconsin SMPH, Madison, WI

INTRODUCTION: Why scientists sought for so long a single universal mechanism to explain how a diverse group of agents caused a behavioral state as complex as anesthesia is far from obvious. An accepted truism among clinicians and researchers attributes this perseverance in the search for a unitary mechanism in general and the long-standing domination of lipoid theories in particular to the influence of Hans Meyer and Ernest Overton. Their independent work, published at the turn of the 19th to the 20th century, is typically presented as being at the root of the quest for the holy grail of a unitary mechanism of anesthetic action.

METHODS: A thorough review of the original literature published in that period was conducted and the results challenge this view.

RESULTS: Meyer and Overton inherited the paradigm of a 'unitary' explanation of anesthetic action from earlier work where both the likely target (lipids) and the underlying mechanism (universal) are concerned. Their work was targeted at systematizing existing knowledge, not at the discovery of novelty.The paradigm was formulated by Claude Bernard, arguably the greatest scientific authorities in the life sciences of the 19th century. Bernard firmly believed that the sensitivity to anesthesia was fundamental criterion that separated true 'life' from mere 'chemistry'. If true, this would have been an invaluable argument in the then raging debate between physicalists and vitalists about the nature of life. His belief paired with his scientific authority are largely responsible for establishing universality as the overarching paradigm of anesthetic mechanisms.

DISCUSSION: Bernard's paradigm determined for over a century both the nature and, more importantly, the interpretation of experiments that addressed mechanisms of anesthetic action.

The experiments that led to the Meyer-Overton rule were a consequence of the unitary paradigm, not its source. Lipids, in turn, rose to prominence against the likes of protagon and colloids only decades later - much like mammals succeeded the dinosaurs: not by virtue of inherent strength but as a result of their competitors' weakness.

Time has shown that it has been easier to shed an individual target (lipids) than to abandon the paradigm (universality).

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S-413.

WITHDRAWN.

S-414.

WITHDRAWN.

S-415.

PHAXANCD™, A CAPTISOL®-ENABLED WATER SOLUBLE PREPARATION OF ALPHAXALONE FOR INTRAVENOUS ANESTHESIA AND SEDATION: COMPARISON OF TOXICITY WITH PROPOFOL AND ALTHESIN® IN RATS

AUTHORS: C. S. Goodchild[1,3], A. Kolosov1, B. Boyd[2], J. M. Serrao[3]

AFFILIATION: [1]Monash Institute of Medical Research, Monash University, Clayton, VIC, Australia; [2]Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Parkville, VIC, Australia; [3]Drawbridge Pharmaceuticals Pty Ltd, Malvern, VIC, Australia

INTRODUCTION: Alphaxalone is a neuroactive steroid anesthetic. This water-insoluble drug, initially formulated using CremophorEL (Althesin®)(1), was found to be a versatile and safe intravenous anesthetic that was used in clinical practice in many countries from 1972-1984. Its therapeutic index (LD50 ÷ AD50) was 15-20(2). By comparison the therapeutic index of propofol is reported to be 6(3). Althesin® was withdrawn from clinical practice because of hypersensitivity to the CremophorEL. Subsequent attempts to make an aqueous formulation of alphaxalone suitable for human use have failed. PhaxanCD™ is a solution of alphaxalone 10mg/ml dissolved in 0.9% saline and 13% Captisol® (7-sulfobutylether β-cyclodextrin; a molecule with a lipophilic cavity that enables drug dispersal in water for human use).

OBJECTIVES:

1. measure the doses of PhaxanCD™ that cause anesthesia and lethality in rats and

2. compare the therapeutic index of PhaxanCD™ with propofol and Althesin®

Methods: The studies below were approved by our University IRB.

Alphaxalone (10mg.ml-1) was prepared using 13% Captisol® and saline (PhaxanCD® - PHAX). An "Althesin®-like" solution of alphaxalone was prepared in 20% CremophorEL (ALTH) as described previously(2). Jugular intravenous catheters were implanted in male Wistar rats (150-200g). Separate groups of ten rats each were given intravenous injections of PHAX, ALTH or propofol emulsion [10mg.ml-1; PROP] from 1.25 mg.kg-1 to lethal doses. Doses of each agent that caused anaesthesia (loss of righting reflex) and lethality in 50% of rats (AD50 and LD50) were calculated by probit analysis.

RESULTS: Intravenous PHAX, ALTH and PROP caused dose-related sedation and anesthesia, AD50 values being 2.79, 2.95 and 4.63 mg.kg -1 respectively. Propofol was 100% lethal at doses greater than 30 mg.kg-1 (LD50 = 27.7 mg.kg-1). At doses of alphaxalone between 50 and 60 mg.kg-1 all rats given Althesin® died (LD50 = 43.6 mg.kg-1) whereas none died when given the same doses of alphaxalone as PhaxanCD™ which caused no more than 20% lethality even at the maximum dose tested of 84 mg.kg-1. Control experiments with the vehicles of the three preparations given alone showed no toxicity but the presence of Captisol® increased the therapeutic index of alphaxalone in PHAX compared with ALTH.

DISCUSSION: The alphaxalone formulations (PhaxanCD™ and Althesin®) are equipotent anesthetics, causing fast onset anesthesia with 1.6 times the potency of propofol. PhaxanCD™ is less toxic than the propofol lipid formulation and also the alphaxalone formulation in CremophorEL (Althesin®).

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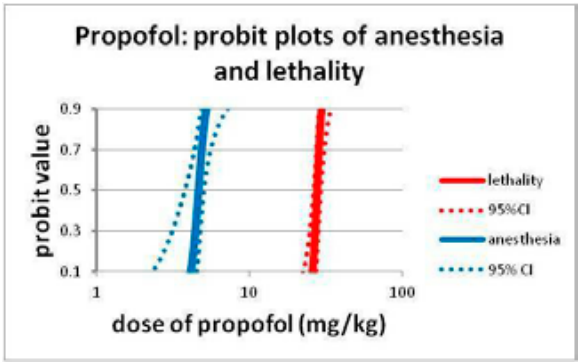
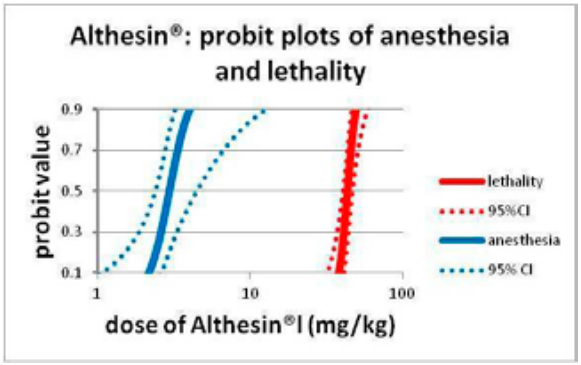
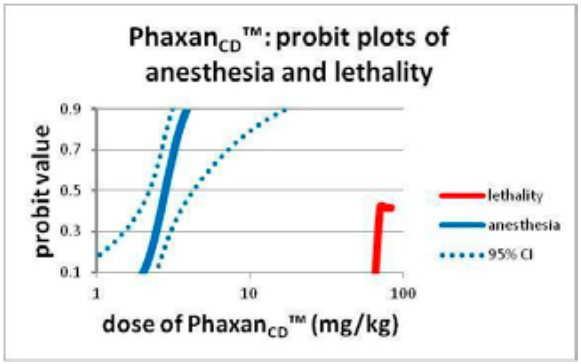
Therapeutic Index of Anesthetic formulations of alphaxalone and propofol

Anesthetic formulation	AD50 (mg.kg-1)	LD50 (mg.kg-1)	Therapeutic Index
PHAX (alphaxalone in Captisol®)	2.79	>84	**>30**
ALTH (alphaxalone in CremophorEL)	2.95	43.6	**14.8**
PROP (propofol in lipid emulsion)	4.63	27.7	**5.98**

The alphaxaolone preparations are equipotent as anesthetics and less toxic than the lipid formulation of propofol. The Captisol® preparation of alphaxalone is also less toxic than the Cremophor preparation of the same compound







Probit regression on PhaxanCD™ lethality data could not be completed because increasing dose of PhaxanCD™ caused a maximum death rate of 20%; further increase in dose led to no further increase in lethality - there was a ceiling effect for lethality

S-416.

EFFECT OF BRAIN LIDOCAINE CONCENTRATION ON PROPOFOL SEDATION IN RATS

AUTHORS: H. Ma[1,2], J. Mao[1], J. Meng[1], X. Chen[1], N. Zhang[1], Y. Saito[2]

AFFILIATION: [1]Anesthesiology Department, General Hospital of Ningxia Medical University, Yinchuan, China; [2]Anesthesiology Department, Shimane University Faculty of Medicine, Izumo, Japan

INTRODUCTION: It is reported that spinal anesthesia and epidural anesthesia has sedative effect. However, the underlying mechanism of sedative effect is not clear. Several studies supported that deafferentation is the main possible mechanism, but Pollock reported that possibly favouring direct action on the brain by the spread of cerebrospinal fluid. This study was to investigate the effect of brain lidocaine concentration on propofol sedation in rats.

METHODS: With our institutional approval, Sprague-Dawley male rats were used in this study. After intrathecal catheterization, 40 Sprague-Dawley rats were randomly assigned to one of four groups and ten rats in each group: intrathecal lidocaine group (IT-L group), intravenous lidocaine group (IV-L group), intrathecal normal saline group (IT-NS group) and controls which were respectively received lidocaine (2%, 15 microliter) intrathecal injection, lidocaine (2%, 15 microliter) intravenous injection, normal saline 15 microliter intrathecal injection and without any injection. And then intravenously infused propofol and the dosage of propofol required to ablate the eyelid reflex were recorded and compared among four groups. After propofol requirements measurement, the rats were sacrificed with an overdose of propofol in IT-L group and IV-L group for determination of brain lidocaine concentrations by RP-HPLC and compared between two groups. Propofol dose was compared using ANOVA followed by Scheffe's tests, and brain lidocaine concentrations was compared by paired t-test, and $p<0.05$ was considered statistically significant.

RESULTS: The dose of propofol required to ablate the eyelid reflex were significantly decreased in IT-L group (8.20±0.95 mg/kg) compared with that in IV-L group (10.61±0.92 mg/kg), IT-NS group(11.65±0.91 mg/kg) and controls (11.26±1.23 mg/kg) ($P<0.001$) (Fig.1). No significant difference was found in the propofol requirement between IV-L group, IT-NS group and controls ($P>0.05$). The brain lidocaine concentration was not significantly different between IT-L group(1.83±0.50 μg/g) and IV-L group(1.68±0.46 μg/g) ($P>0.05$)(Fig.2).

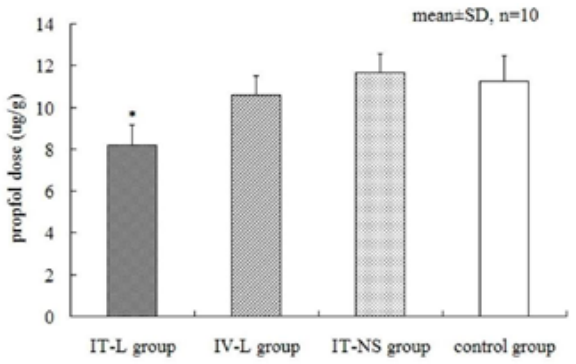


Figure 1. Effect of intrathecal lidocaine and intravenous lidocaine on propofol requirements. * Significant difference compared with other three groups

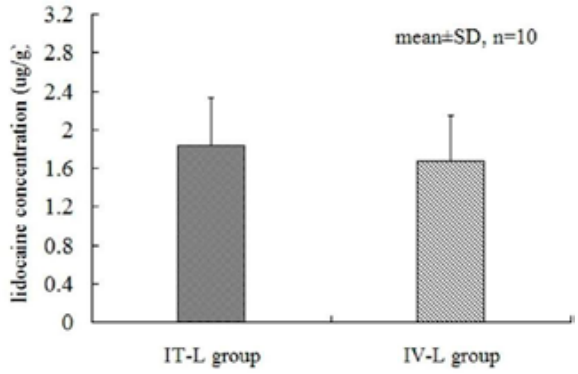


Figure 2. The lidocaine concentration in the brain between intrathecal lidocaine group and intravenous lidocaine group

DISCUSSION: The results showed that brain lidocaine concentration was not significantly different between IT-L group and IV-L group , however lidocaine subarachnoid block can reduce propofol requirement for sedation in rats. So the mechanism for sedation during subarachnoid block would be not the direct effect of local anesthetic to the brain by the spread of cerebrospinal fluid. Deafferentation would be a reasonable mechanism.

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S-417.

LIDOCAINE AND ROPIVACAINE, BUT NOT CHLOROPROCAINE, ATTENUATE TNF-ALPHA INDUCED SRC ACTIVATION, ICAM-1 PHOSPHORYLATION AND MIGRATION OF HUMAN LUNG CANCER CELLS INDEPENDENTLY FROM SODIUM CHANNEL INHIBITION

AUTHORS: T. Piegeler[1,2], E. Votta-Velis[2], B. Beck-Schimmer[1], D. E. Schwartz[2], R. D. Minshall[2,3], A. Borgeat[4]

AFFILIATION: [1]Institute of Anesthesiology, University Hospital Zurich, Zurich, Switzerland; [2]Department of Anesthesiology, University of Illinois Hospital & Health Sciences System, Chicago, IL; [3]Department of Pharmacology, University of Illinois Hospital & Health Sciences System, Chicago, IL; [4]Division of Anesthesiology, Balgrist University Hospital Zurich, Zurich, Switzerland

INTRODUCTION: Retrospective analysis of patients undergoing cancer surgery suggests the use of regional anesthesia may reduce cancer recurrence and improve survival[1]. Amide-linked local anesthetics (LA) were demonstrated to have anti-inflammatory properties[2], e.g. in experimental lung inflammation or in patients undergoing colorectal surgery[3]. There is increasing evidence that similar inflammatory processes involving Src tyrosine protein kinase (Src) and intercellular adhesion molecule-1 (ICAM-1) are important in tumor growth and metastasis[4,5]. We hypothesized that amide-, but not ester-linked LA may inhibit inflammatory cytokine-signaling and migration of a human lung cancer cell line.

METHODS: NCI-H838 lung cancer cells were incubated with Tumor Necrosis Factor-α (TNF-α) in absence/presence of ropivacaine, lidocaine or chloroprocaine (1nm - 100μM). Cell lysates were analyzed for Src-activation (pY419 Src) and ICAM-1-phosphorylation (pY512 ICAM-1) via Western blot. Experiments using the agonist veratridine and the antagonist tetrodotoxin evaluated the role of the voltage-gated sodium channel (VGSC). Additionally, cell migration through a polycarbonate membrane at 4 hours in presence of the LA was assessed.

RESULTS: Basal Src-activity was decreased by 48% (p=0.022) by ropivacaine treatment (10μM) of H838 cells for 20 minutes. Ropivacaine and lidocaine co-administered with TNF-α decreased Src-activation (52% by 1μM ropivacaine, p=0.022; 73% by 10μM lidocaine, p=0.016) and ICAM-1-phosphorylation (32% by 1μM ropivacaine, p=0.031; 50% by 1μM lidocaine, p=0.016) compared to TNF-α alone, whereas chloroprocaine had no such effect. The inhibitory effects on Src- and ICAM-1-phosphorylation were independent from the VGSC. Migration at 4 hours was inhibited by 28% (p=0.046) in presence of 1μM ropivacaine and by 24% by 1nM lidocaine (p=0.01). Chloroprocaine and a shorter exposure (15 minutes) of ropivacaine did not alter cancer cell migration.

DISCUSSION: Inhibition of Src-activity, ICAM-1-phosphorylation, and migration of NCI-H838 lung adenocarcinoma cells by amide - but not ester - local anesthetics provide a molecular mechanism by which local anesthetics could exhibit a beneficial effect in cancer progression and metastasis.

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S-418.

CARBOETOMIDATE INHIBITS α4β2 NEURONAL NICOTINIC ACETYLCHOLINE RECEPTORS AT CLINICALLY RELEVANT CONCENTRATIONS

AUTHORS: D. W. Pierce, E. Pejo, M. Haburcak, D. E. Raines, S. A. Forman

AFFILIATION: Anesthesia Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA

INTRODUCTION: Carboetomidate is an etomidate-like sedative/hypnotic drug that replaces the imidazole ring of etomidate with a pyrrole, greatly reducing inhibition of adrenal corticosteroid synthesis (Ref 1). Like etomidate, carboetomidate modulates GABAA receptors to produce hypnosis. However, carboetomidate effects on other ion channels that mediate general anesthetic actions are unknown. Here, we compare the effects of etomidate and carboetomidate on human N-methyl-D-aspartate receptors (NR1B/NR2A) or neuronal nicotinic receptors (alpha4/beta2), which are cationic ligand gated ion channels that are thought to mediate effects of some sedative/hypnotic drugs.

METHODS: Animals were used with approval of the institutional IACUC. Receptors were recombinantly expressed in Xenopus oocytes, and sensitivity to drugs was measured using two micro-electrode voltage clamp electrophysiology. Concentration-dependent inhibition was analyzed by fitting combined data from multiple oocytes (normalized to each oocyte's response) to logistic (Hill) equations, providing best-fit estimates for IC50 and Hill slope. We also measured the olive oil: water partition coefficients for etomidate and carboetomidate, using calibrated high performance liquid chromatography to measure compounds in different phases.

RESULTS: Etomidate did not significantly inhibit either type of receptor at concentrations up to 100 μM, whereas carboetomidate inhibited neuronal nicotinic receptors with an IC50 of 13 μM (95% CI: 9.9 to 18 μM). The oil:water partition coefficients for etomidate and carboetomidate were 2200 and 7700, respectively.

DISCUSSION: Carboetomidate at concentrations near its EC50 for loss of righting reflexes in tadpoles (5 μM) significantly inhibits alpha4/beta2 neuronal nicotinic receptors. Compared with etomidate, carboetomidate's higher hydrophobicity is associated with inhibition of neuronal nicotinic receptors, consistent with other studies of general anesthetics that inhibit these channels (Ref 2). Carboetomidate may affect more ion channel targets associated with general anesthesia than etomidate.

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Supported by grants from NIH to SAF (R01GM89745) and DER (R01GM87316)

S-419.

WITHDRAWN.

S-420.

THE APPLICATION OF MIDAZOLAM ON DEVELOPING NEURONS INDUCES PROFOUND CHANGES IN GABAA RECEPTOR EXPRESSION

AUTHORS: B. Sinner[1], O. Friedrich[2], B. M. Graf[1]

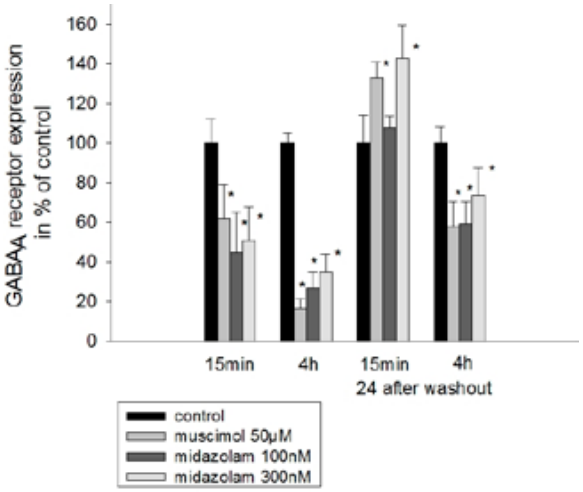
AFFILIATION: [1]Department of Anesthesiology, University of Regensburg, Regensburg, Germany; [2]Medical Biotechnology, University of Erlangen-Nueremberg, Erlangen, Germany

INTRODUCTION: In the immature brain, the NMDA- and GABAA receptors play an important role in neuronal development and differentiation. The application of NMDA receptor antagonists led to an increase in NMDA receptor expression[1] By activating important transcription factors like cAMP element binding protein, GABA promotes synaptogenesis[2]. Here we investigated the effects of the GABAA receptor agonists muscimol or midazolam on GABAA receptor expression, CREB-phosphorylation and NFkB expression in developing neurons.

METHODS: After approval of the IRB for animal research, hippocampal cell cultures from embryonic Wistarrats were incubated on day 15 in culture either with muscimol (50µM) or midazolam (100 or 300nM) for 15 min or 4h, respectively. In our culture the GABAA receptor is inhibitory at this time point but the neurons are still developing[3]. Western blots were performed immediately and 24h after washout of the drug to determine the expression of GABAA receptors, CREB, p-CREB and NFkB. Statistical analysis was performed using one-way ANOVA. * $p < 0.05$ was regarded as statistically significant.

CHALLENGING CASE REPORT: N/A

RESULTS: The application of muscimol (50µM) or midazolam (100 or 300nM) for 15min or 4h resulted in a significant, concentration- and time-dependent decrease in the GABAA receptor expression [Fig.]. After incubating the developing neurons for 15min a dose-dependent decrease of CREB phosphorylation and a reduction of the NFkB expression could be detected. 24h after washout of the drug, the GABAA receptor expression was restored back to baseline levels in the neurons that were exposed to midazolam or muscimol for only 15min. In contrast, in the 4h group, the GABAA receptor expression was still reduced 24h after washout. 24h after washout of the respective drug, NFkB and CREB phosphorylation was increased in both groups. This increase was more pronounced in the neurons with the shorter exposure time.



DISCUSSION: The application of midazolam or muscimol had a significant concentration- and time-dependent impact on GABAA receptor expression. The long-term incubation for 4h does not restore GABAA receptor expression back to baseline levels and influences gene transcription factors. The reduction of the inhibitory receptor might increase the excitability and therewith the vulnerability of the developing neurons. This could explain the neurotoxic effects of midazolam on the developing brain.

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S-421.

ANESTHETIC EFFECTS ON SYNAPTIC GABAA RECEPTORS CONTAINING β3 SUBUNITS ARE QUANTITATIVELY SIMILAR TO RECEPTORS CONTAINING β2

AUTHORS: M. Haburcak, D. Stewart, Y. Jounaidi, S. A. Forman

AFFILIATION: Anesthesia Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA

INTRODUCTION: Both etomidate and propofol act via GABAA receptors containing β2 or β3 subunits. Molecular studies of etomidate and propofol have mostly been performed on recombinant α1β2γ2 receptors, the most abundant GABAA subtype in mammals. However, knock-in animal studies have shown that the major actions of etomidate and propofol are mediated by receptors containing β3 subunits. Here we quantitatively compare the interactions of GABA, etomidate, and propofol at human α1β3γ2L versus α1β2γ2L GABAA receptors, using the framework of allosteric co-agonism.

METHODS: Animals were used with approval of the institutional IACUC. Recombinant α1β3γ2L human GABAA receptors were expressed in Xenopus laevis oocytes and currents evoked with GABA, anesthetics, or combinations of the two were measured using two electrode voltage clamp electrophysiology. We measured GABA concentration responses with and without etomidate or propofol, maximal GABA efficacy, spontaneous activation, and direct receptor activation by the two anesthetics. Results were compared to our published results with α1β2γ2L receptors, and analyzed by global fitting with an established co-agonist model[1].

RESULTS: GABA EC50 in α1β3γ2L receptors was 14 μM and, while GABA-evoked currents were sensitive to picrotoxin, there was no evidence of spontaneous receptor activity in the absence of GABA. Maximal GABA (3 mM) responses of the α1β3γ2L receptors are enhanced 10-15% by propofol, indicating GABA efficacy similar to α1β2γ2L receptors. Both etomidate and propofol produced leftward shifts of the GABA concentration-response curve, similar to those observed in α1β2γ2L receptors. Direct activation of α1β3γ2L receptors by propofol or etomidate is also equivalent to results known for α1β2γ2L receptors. Overall, the effects of GABA, etomidate, and propofol in α1β3γ2L receptors were similar to those previously reported in α1β2γ2L receptors. A co-agonist model fitted to α1β3γ2L data for GABA and etomidate also resulted in parameters similar to those for α1β2γ2L[1].

DISCUSSION: The interactions of GABA, etomidate, and propofol with α1β3γ2L GABAA receptors are remarkably similar to α1β2γ2L. These data suggest that additional molecular studies of the anesthetic sites in these two receptors are likely to show congruency. The differential impact of β2 and β3 mutations on anesthetic sensitivity in animals is likely due to differential localization within critical neural circuits.

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Supported by grants from NIH (R01GM89745 and P01GM58448)

S-422.

ALPHA-E432: A NOVEL TORPEDO NICOTINIC ACETYLCHOLINE RECEPTOR AZI OCTANOL PHOTOLABEL SITE

AUTHORS: P. Dershwitz[1], Z. Dostalova1, K. Parker[2], D. Stewart[1], K. W. Miller[1], S. A. Forman[1]

AFFILIATION: [1]Anesthesia Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA; [2]Virgin Instruments Corp., Sudbury, MA

INTRODUCTION: Azi-octanol is a photo-activatable anesthetic alcohol similar to octanol. Torpedo nicotinic acetylcholine receptors (TnAChRs) are an abundant natural ligand-gated ion channel model for anesthetic target channels in the mammalian nervous system. Several TnAChR residues interacting with azi-octanol have been identified using radio-photo-labeling, proteolysis, and Edman degradation. Mass spectroscopy is another approach to identifying photo-labeled residues that requires less protein and no radioactivity.

METHODS: Animals were used with institutional IACUC approval. TnAChRs in native membranes were photolabeled with azi-octanol. Subunits were purified by SDS gel electrophoresis, digested with chymotrypsin, and analyzed with high performance liquid chromatography-mass spectroscopy (HPLC-MS). The functional role of the αE432 residue was investigated by incorporating mutations that altered sidechain size, hydrophobicity, and charge. Wild-type and mutant receptors were heterologously expressed in Xenopus oocytes. Two-microelectrode voltage clamp electrophysiology was used to assess both acetylcholine concentration-responses and octanol-dependent inhibition. Normalized concentration-response data sets for each type of channel were analyzed by non-linear least squares fits to logistic (Hill) equations to determine acetylcholine EC50s and octanol IC50s.

RESULTS: HPLC-MS identified an 11-residue peptide with molecular weight 1172.63 Da, corresponding to the α subunit sequence A427-GRLIELSQEG. About 10% of this peptide was photolabeled, with a mass (1300.75 Da) corresponding to addition of one azi-octanol. MS-MS sequencing identified αE432 as the photo-incorporation site. Octanol inhibition studies in wild-type and αE432 mutant (C, L, Q, and K) channels showed no significant difference between the fitted global IC50 (23 μM; 95% CI 12 - 42 μM) and individual channel IC50s. Acetylcholine EC50s were: WT: 105 μM; αE432Q: 15μM; αE432K: 51 μM; αE432L: 123 μM; and αE432 C: 152 μM. EC50s for αE432Q and αE432K mutants significantly differed from wild-type ($p < 0.0001$).

DISCUSSION: Large hydrophobic peptide fragments of membrane proteins are difficult to analyze with mass spectroscopy. Here, MS was used to identify a novel azi-octanol labeling site, αE432, at the extracellular end of the TnAChR α-M4 domain that was inaccessible to Edman sequencing. Mutating αE432 alters ACh sensitivity, indicating allosteric linkage to channel gating[1]. The αE432 residue does not contribute to the octanol inhibitory site in the ion pore, but could play a role in anesthetic-induced desensitization.

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Supported by NIH grants P01-GM58448 and R01-GM89745

S-423.

WITHDRAWN.

S-424.

SELECTIVE INHIBITION OF PROPOFOL IN CORTICAL SINGLE NEURONS IN THE MACAQUE BRAIN

AUTHORS: Y. Ishizawa[1], A. Uchida[1], J. T. Gale[2], E. N. Brown[1], E. N. Eskandar[2]

AFFILIATION: [1]Anesthesia, Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA; [2]Neurosurgery, Massachusetts General Hospital, Boston, MA

INTRODUCTION: The mechanisms underlying general anesthetic-induced unconsciousness remain poorly understood. Here we propose a non-human primate model to determine anesthetic effects at the single neuronal level and at the higher level of behavior simultaneously.

METHODS: Two adult macaque monkeys were trained to perform a multisensory task in which the animal was required to press a button to participate each trial and received a combination of tactile and auditory stimuli (airpuff to face, sound, simultaneous airpuff+sound, or no stim). Propofol infusion (200mcg/kg/min, 60min) was performed in an alert behaving condition and single neuron activities and local field potentials (LFPs) were acquired from the primary somatosensory cortex (S1) and a frontal association cortex (ventral premotor area, PMv) through surgically implanted arrays. The animal's trial-by-trial behavioral response was recorded. All experiments were performed in compliance with the APS/NIH guidelines.

RESULTS: Baseline neural firing rates were significantly decreased under propofol anesthesia in all cortical areas. In S1, 44 neurons (61%) were responsive only to airpuff and the response remained throughout anesthesia (Fig.A). The response to airpuff (green traces) and the response to airpuff and sound (dark blue traces) were almost identical, indicating unimodal function of these neurons. In the S1 bimodal neurons (n=28, 39%), the response to sound stimulus (red traces) appeared to be smaller than the response to airpuff (Fig.B). At 60 min of anesthesia (center column) the sound response was completely inhibited while the response to airpuff remained. The recovery of these bimodal neurons appeared to be slow. At the animal's loss of response (11.7±0.7 min of the propofol infusion), the baseline firing rates were significantly decreased and the response to sound appeared to diminish. In PMv, the majority of the airpuff-responsive neurons showed bimodal response (n=27, 60%, Fig.C). In these neurons the sound response was nearly completely inhibited during propofol anesthesia. At 60 min of recovery, the response to both puff and sound were still significantly smaller than the awake level.

DISCUSSION: Cortical neurons in S1 and PMv were well characterized depending on their response to multisensory stimuli. A general anesthetic propofol predominantly inhibited auditory response in bimodal neurons in S1 and PMv and the recovery of these bimodal neurons appeared to be prolonged. The air-puff response remained at a deep anesthetic level producing burst suppression in most of the S1 neurons. Advanced analysis on neural connectivty will further elucidate the neural mechanisms of anesthetic-induced loss of responsiveness.

References: None

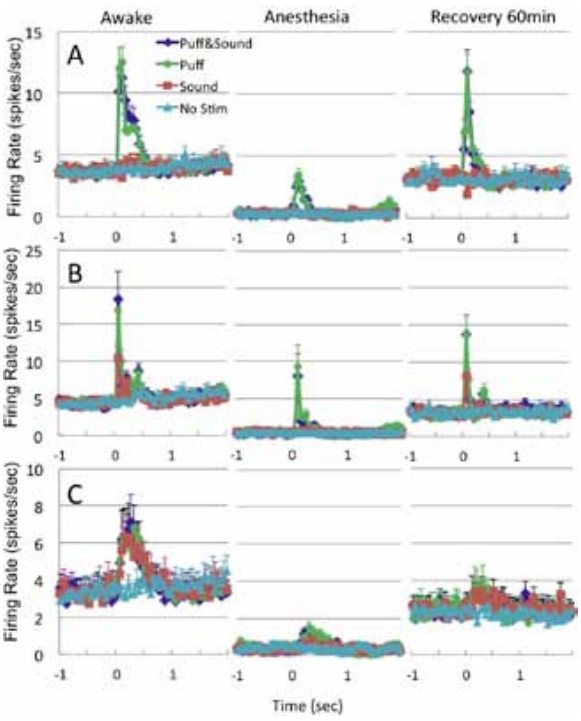

Figure 1. Population response of cortical single neurons during awake, anesthesia (at 60min of propofol infusion) and recovery. The sensory stimulation was presented at time 0 for 250 msec. A. S1 puff-responsive (unimodal) neurons. B. S1 bimodal neurons. C. PMv bimodal neurons. Error bar = s.e.m.

S-425.

VOLATILE ANESTHETIC ISOFLURANE INHIBITS INTEGRIN LEUKOCYTE FUNCTION-ASSOCIATED ANTIGEN-1(LFA-1)

AUTHORS: K. Yuki[1], M. Shimaoka[1], R. Eckenhoff[2], T. Springer[1]

AFFILIATION: [1]Department of Anesthesiology, Perioperative and Pain Medicine, Children's Hospital Boston, Boston, MA; [2]Department of Anesthesiology, University of Pennsylvania, Philadelphia, PA

INTRODUCTION: In ex vivo leukocytes treated with isoflurane exhibited decreased cell adhesion to endothelium. LFA-1 is an important adhesion molecule in the process of leukocyte arrest. We hypothesized that isoflurane would show functional interaction with LFA-1.

METHODS: In vitro binding assay The binding of ICAM-1 to LFA-1 was tested in the cell-based and cell-free assays. For the cell-based assay, flow cytometry was used to detect the binding of soluble ICAM-1-IgA/ IgA-FITC multimers to LFA-1 on LFA-1 expressing cells with or without isoflurane. For the cell-free assay, soluble LFA-1 was immobilized indirectly on ELISA plates with its capturing antibody. ICAM-1-IgA fusion protein was added with or without isoflurane, and then bound ICAM-1 was detected by HRP anti IgA and substrate.

Binding sites analysis Azi-isoflurane is photo-activating isoflurane to examine the binding sites of isoflurane on proteins. After the incubation of LFA-1 protein with azi-isoflurane and exposure to 300 nm illumination, SDS-PGE purification, band excision, and trypsinization was followed by nano-LC/MS to identify peptides and residues that had been modified.

Functionality of azi-isoflurane binding site(s) Various sites on a1 helix of b2 subunit were mutated into alanine . Wild-type aL plasmid and wild-type or mutant b2 plasmid were co-transfected into 293T cells. The binding of soluble ICAM-1 to LFA-1 and LFA-1 expression on the cell surface were examined using flow cytometry.

RESULTS:

In vitro binding assay

In K562 cells transfected with LFA-1, PBMCs and Jurkat cells, isoflurane inhibited LFA-1/ICAM-1 binding. Also in the cell-free system, isoflurane inhibited LFA-1/ICAM-1 interaction in a dose-dependent fashion.

Binding sites analysis

The binding site analysis of azi-isoflurane on LFA-1 demonstrated that this compound binds to aL and b2 subunits. The binding site(s) of azi-isoflurane on aL subunit correlated with the binding site(s) demonstrated by I domain crystal. This binding site(s) on b2 subunit was on a1 helix.

Functionality of a1 helix of b2 subunit

Since the function of a1 helix on b2 subunit was not determined yet, we performed alanine-scanning mutagenesis on this region. Some of alanine scanning mutants on the helix were constitutive active mutants, and some was constitutive deactivating mutant, suggesting that this helix is functionally important for LFA-1/ICAM-1 binding.

DISCUSSION: LFA-1 was inhibited by isoflurane at cell and cell-free levels. The binding site analysis suggested that isoflurane binds both a and b subunits, which could be part of mechanism for isoflurane induced suppression of neutrophils extravasation.

REFERENCES: none

S-426.

PHARMACOLOGICAL MECHANISMS INVOLVED IN THE ANTINOCICEPTIVE EFFECTS OF INTRAVENOUS DEXMEDETOMIDINE IN MICE

AUTHORS: R. S. Rangel[2], B. Marinho[3], R. Soares de Moura[3], M. Lessa[1]

AFFILIATION: [1]Laboratory of Cardiovascular Investigation, Oswaldo Cruz Foundation, Rio de Janeiro, Brazil; [2]Pharmacology, State University of Rio de Janeiro, Rio de Janeiro, Brazil; [3]Pharmacology, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

INTRODUCTION: Dexmedetomidine (DEX) is a α2-adrenergic receptor (α2-AR) agonist mainly used as an anesthetic adjuvant and as a sedative in critical care settings[1,2]. Typically, α2-AR agonists release NO and subsequent activate NO-GMPc pathway[3,4] and have been implicated with antinociception. In this study, we investigate the pharmacological mechanisms involved in the antinociceptive effects of DEX, using an acetic acid-induced writhing assay in mice.

METHODS: Saline or DEX (1, 2, 5 or 10 μg/kg) was intravenous injected 5 min before ip administration of acetic acid and the resulting abdominal constrictions (writhes) were then counted for 10 min. To investigate the possible mechanisms related to antinociceptive effect of DEX (10 μg/kg), the animals were also pretreated with one of the following drugs: 7-nitroindazole (7-NI; 30 mg/kg i.p.); 1H-[1,2,4] oxadiazole [4,3-a] quinoxalin-1-one (ODQ; 2.5 mg/kg, i.p.); yohimbine (1 mg/kg, i.p.); atropine (2 mg/kg, i.p.); and naloxone (0.2 mg/kg, i.p.). A rota-rods and open field performance test were performed with DEX at 10 μg/kg dose.

RESULTS: DEX demonstrated its potent antinociceptive effect in a dose-dependent manner (Fig. 1). The pretreatment with 7-NI, ODQ, atropine and glibenclamide significantly reduced the antinociceptive affects of DEX (Fig. 2 and 3 A and B). However, naloxone showed no effecting DEX-induced antinociceptive (Fig. 3 C) . The rota-rod and open field tests confirmed there is no detectable sedation or even significant motor impairment with DEX at 10 μg/kg dose (Fig. 4 and 5).

DISCUSSION: Our results suggest that the α2-AR and NO-GMPc pathways play important roles in the systemic antinociceptive effect of DEX in a murine model of inflammatory pain. Furthermore, the antinociceptive effect exerted by DEX appears to be dependent on KATP channels, independent of opioid receptor activity.

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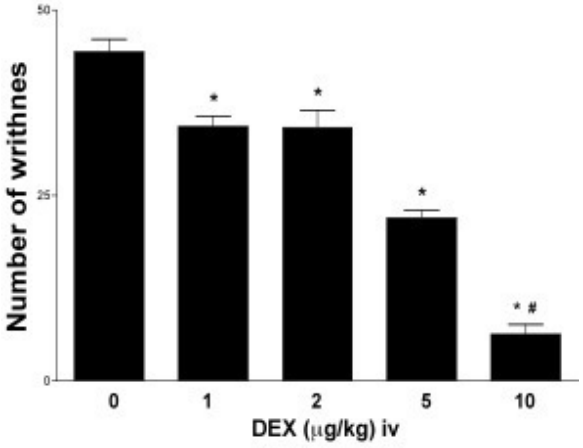

Figure 1. The antinociceptive effect of dexmedetomidine, assessed by the writhing test in mice. Mean ± S.E.M.; n = 6 *P < 0.05 vs. saline #P < 0.05 vs. DEX 0, 1, 2 and 5 μg/kg.

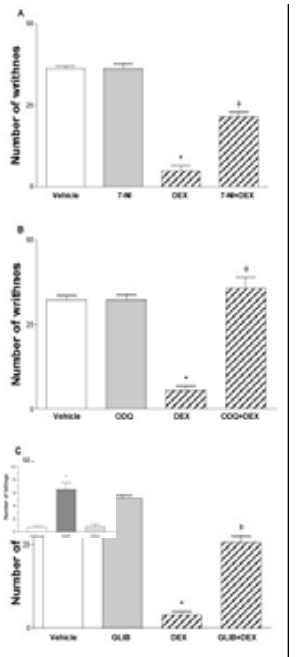

Figure 2. The effect of pretreatment with 7-NI (A), ODQ (B) and glibenclamide (C) on dexmedetomidine-induced antinociception in mice, as assessed by the writhing test. Mean ± S.E.M.; n = 6 *P < 0.05 compared to vehicle φP < 0.05 compared to dexmedetomidine.

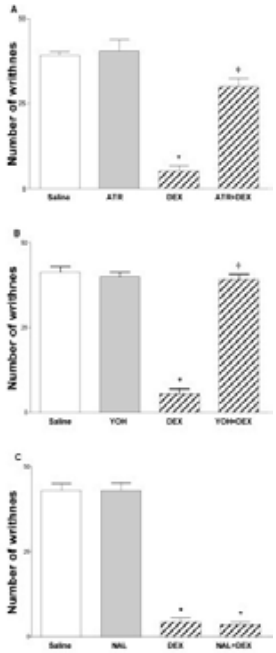

Figure 3. The effect of pretreatment with atropine (A), yohimbine (B) and naloxone (C) on dexmedetomidine-induced antinociception in mice, as assessed by the writhing test. Mean ± S.E.M.; n = 6. *P < 0.05 compared to vehicle φP < 0.05 compared to dexmedetomidine.

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S-426 • continued

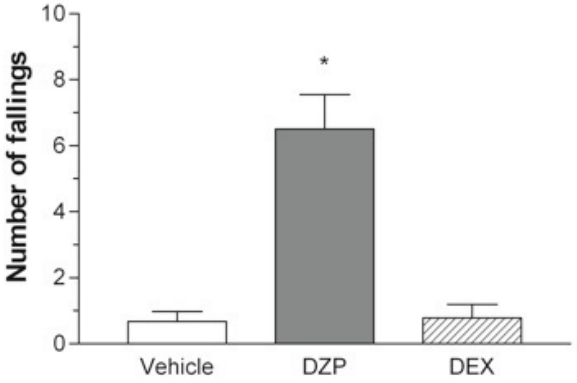

Figure 4. The effect of dexmedetomidine (DEX - 10 μg/kg), diazepam (DZP - 1 mg/kg) and the vehicle on the mice in the rota-rod test. Mean ± S.E.M.; n = 6 *P < 0.05 vs. diazepam

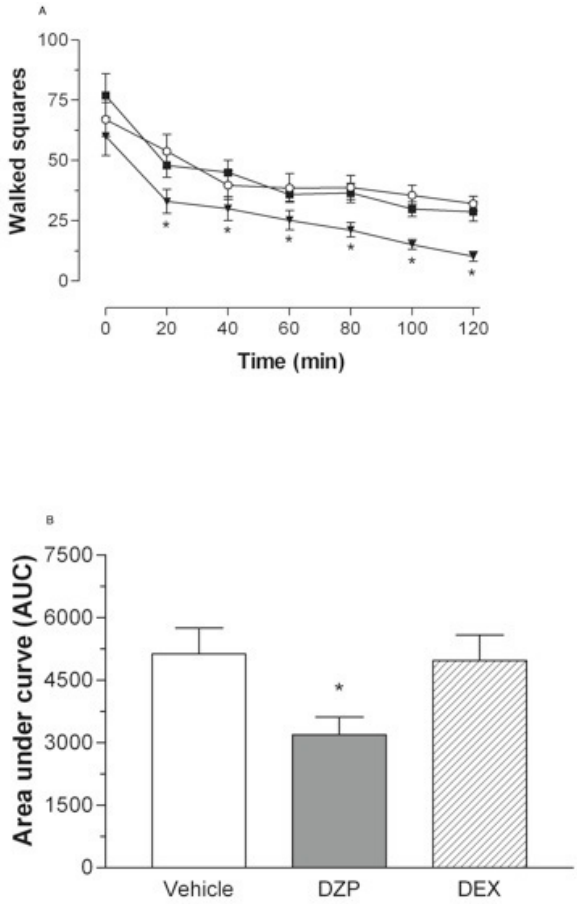

Figure 5. The effect of dexmedetomidine (DEX), diazepam (DZP) and the vehicle on the mice in the open field test. The mice received DEX (closed square,10 μg/kg), DZP (closed triangle, 1 mg/kg) or the vehicle (open cicle). In A, the graph represents the number of walked squares against time. In B, the graph represents the area under the curve (AUC) calculated for each time-effect curve. Mean ± S.E.M.; n = 6. *P < 0.05 vs. vehicle.

S-427.

MODULATION OF δ SUBUNIT-CONTAINING GABAA RECEPTORS BY ETOMIDATE DEPENDS ON SUBUNIT ARRANGEMENT

AUTHORS: H. Feng, Y. Jounaidi, S. A. Forman

AFFILIATION: Anesthesia Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA

INTRODUCTION: GABAA receptors are allosterically modulated by a variety of compounds including neurosteroids and the general anesthetic etomidate. GABAA receptors containing α, β, and δ subunits are localized extrasynaptically and mediate GABAergic tonic inhibition. Evidence from studies of neurosteroid modulation of concatenated subunit assemblies suggests that the subunit arrangement of αβδ may vary[1]. Here, we compare the modulation by etomidate and tetrahydrodeoxycorticosterone (THDOC) on α1β3δ receptors with different subunit arrangements.

METHODS: Plasmids encoding concatenated GABAA receptor subunit assemblies for β3-α1-δ, β3-α1, and α1-β3, along with free subunits, were obtained from Prof. Erwin Sigel (Bern, Switzerland). We injected messenger RNAs encoding concatenated β3-α1-δ trimer with either β3-α1 or α1-β3 dimer into Xenopus oocytes to express β3-α1-δ/β3-α1 and β3-α1-δ/α1-β3 receptors. The effects of etomidate (3 μM) or THDOC (1 μM) on maximal (1 mM) GABA-activated receptor currents was measured using two-microelectrode voltage-clamp electrophysiology. Enhancement was compared using one-way ANOVA.

RESULTS: Both dimer/trimer combinations produced small oocyte currents after 24-48 hours of incubation. THDOC produced similar large enhancements of currents from β3-α1-δ/β3-α1 and β3-α1-δ/α1-β3 receptors. However, etomidate produced a greater maximal current enhancement in β3-α1-δ/α1-β3 receptors than in β3-α1-δ/β3-α1 receptors. GABA currents from oocytes injected with mRNAs encoding free α1, β3, and δ subunits were larger, showed less THDOC and etomidate enhancement, and did not differ from currents elicited with only α1 and β3.

DISCUSSION: There is uncertainty in the subunit arrangement of αβδ GABAA receptors, in part due to difficulty in assuring incorporation of δ when free subunits are expressed in Xenopus oocytes. Using concatenated receptor constructs helps assure δ subunit incorporation. Our data confirm that GABA behaves like a weak partial agonist in δ-containing GABAA receptors, and that etomidate and THDOC modulate GABAA receptors via different mechanisms. The greater enhancement in β3-α1-δ/α1-β3 receptors vs. β3-α1-δ/β3-α1 suggests that etomidate interactions at β3/β3 interfaces may be more efficacious than those at β3/α1 interfaces.

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S-429.

THE EFFECT OF PROPOFOL ON ANANDAMIDE-INDUCED INJURY IN HUMAN UMBILICAL VEIN ENDOTHELIAL CELLS

AUTHORS: Y. Mishima, A. Ito, T. Ito, N. Kameyama, K. Ushijima

AFFILIATION: Anesthesioloy, Kurume University, Kurume, Japan

INTRODUCTION: Anandamide (AEA) is present at low levels and is quickly degraded by fatty acid amide hydrolase (FAAH). However, serum AEA levels are highly elevated during endotoxic shock[1], thereby inducing cell death. Propofol, a short-acting intravenous hypnotic and general anesthetic agent, has several unique properties such as inhibiting FAAH, reducing cytokine-induced apoptosis, and scavenging free radicals. This study aimed to examine whether propofol inhibits FAAH against AEA-induced cell injury.

METHODS: Human umbilical vein endothelial cells (HUVECs) were treated with propofol or URB597, a potent FAAH inhibitor, and incubated for 30 min prior to AEA administration. After 24 h incubation with AEA, the survival and viability of HUVECs were determined by the trypan blue exclusion test and cell proliferation assay (MTT assay). Residual AEA concentration in the propofol- or URB597-treated culture media was measured by liquid chromatography/mass spectrometry (LC/MS). The magnitude of FAAH inhibition by propofol and URB597 was evaluated using an FAAH inhibitor screening assay.

RESULTS: Evaluation of cell viability by the MTT assay 24 h after AEA administration showed that propofol significantly inhibited, whereas URB597 significantly deteriorated, AEA-induced cell death in a dose-dependent manner (Fig 1A, B).

AEA did not affect cell viability at 1-5 μM. Importantly, pretreatment with 10 μM URB597 significantly deteriorated the viability of cells exposed to 1-5 μM AEA. In contrast, 50 μM propofol had no effect on the viability of cells exposed to 1-5 μM AEA (Fig 2A, B).

AEA concentration in the culture media 24 h after exposure to 10 μM AEA co-incubated with 50 μM propofol was 7.9 μM, whereas that in the culture media 24 h after exposure to 10 μM AEA co-incubated with 10 μM URB597 was 1.6 μM.

The FAAH inhibitor screening assay showed that both propofol and URB597 inhibited FAAH activity in a dose-dependent manner. However, propofol did not inhibit FAAH activity at clinical concentrations (Fig 3).

DISCUSSION: FAAH inhibition caused cell death even at low AEA concentrations; however, propofol did not cause a significant deterioration of AEA-induced cell death. In addition, the residual concentration of AEA co-incubated with propofol was much higher than that of AEA co-incubated with URB597. Although the protective mechanism of propofol against AEA-induced cell death is unclear, these findings suggest that propofol does not act as an FAAH inhibitor in clinical situations and may prevent AEA uptake by cells.

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Fig 1

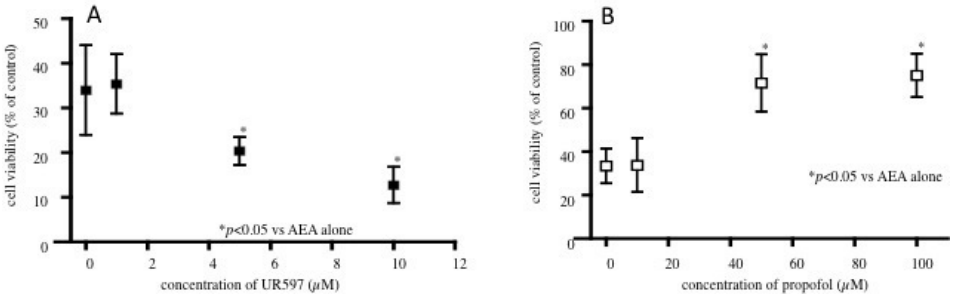


Fig 2

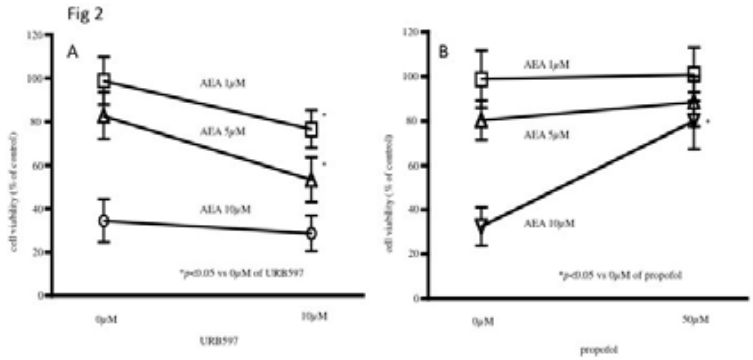
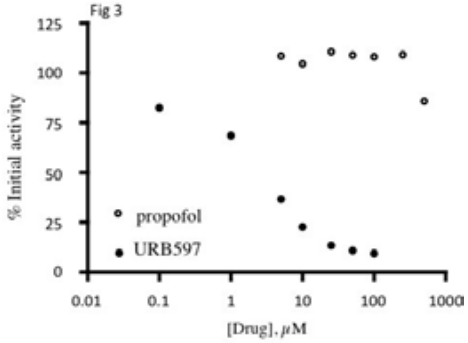


Fig 3



S-430.

EVALUATION OF A PROPOFOL-REMIFENTANIL RESPONSE SURFACE MODEL IN PATIENTS UNDERGOING ULTRASONIC ENDOSCOPY

AUTHORS: T. Evans[1], C. LaPierre[1], P. Gambus[2], K. B. Johnson[1], T. Egan[1], D. Westenskow[1]

AFFILIATION: [1]Department of Anesthesiology and Biomedical Engineering, University of Utah, Salt Lake City, UT; [2]Anesthesiology Department, Universidad de Barcelona, Barcelona, Spain

INTRODUCTION: Prior work in our laboratory characterized the interaction between propofol and remifentanil for two effect measures in healthy volunteers: loss of responsiveness (LOR) and loss of response to esophageal instrumentation (LREI). This data was used to build response surface models for both effects. The aim of this study was to compare model predictions of LOR and LORI with observed responses in 110 patients undergoing a propofol-remifentanil anesthetic for upper endoscopy. Our hypothesis was that model predictions would be consistent with observations.

METHODS: Patients received target controlled infusions of propofol and remifentanil. Predicted propofol and remifentanil effect site concentrations were used to predict the probability of LOR and LREI. The Ramsay Sedation Scale (RSS) was measured in all patients before during and after the procedure at random times to ensure factors correlated with time would not confound the assessment. Model predictions of LOR were compared to observed instances of RSS > 4. Model predictions of LREI were compared to (i) observed assessments of a gag response and (ii) insertion of an endoscope. Model predictions were compared to observations using a Kolmogorov -Smirnov test. A p-value less than 0.05 indicated that predictions and observations were not from the same population.

RESULTS: Model predictions of LOR and RSS>4 are presented in Figure 1. Predictions of LOR were not consistent with observed instances of RSS>4 ($p = 0.002$). Patients' level of sedation was less than predicted by the model. Model predictions of LREI without gag are presented in Figure 2 with endoscope insertion independent of gag in Figure 3. Predictions of LREI were consistent with observed gag responses ($p = 0.059$) but not with observed endoscope insertions ($p = 0.014$). The LREI model predicted that patients would respond when the endoscope was placed.

DISCUSSION: Our results in part confirmed our hypothesis. The LOR model under predicted unresponsiveness compared to observations. The poor performance of the LOR model may be due to the presence of a stimulus when patient responses were recorded, which was present in volunteers when building the LOR model. The LREI model predicted gag responses well but performed poorly by over predicting a response to esophageal instrumentation when endoscopes were successfully placed. This may be a function of endoscopist willingness to tolerate some gag response when inserting an endoscope.

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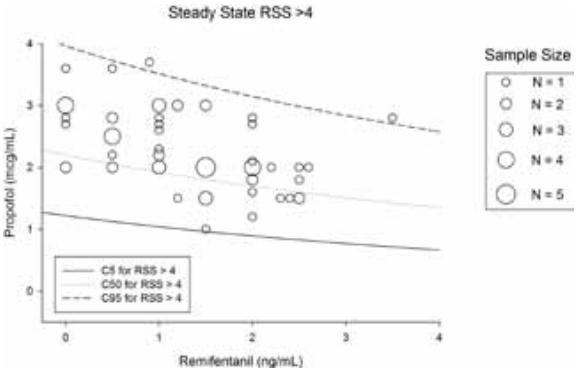
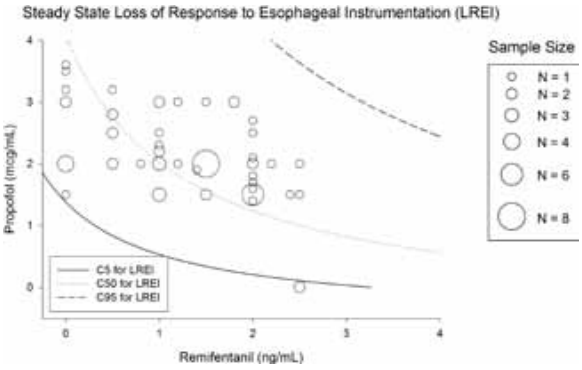
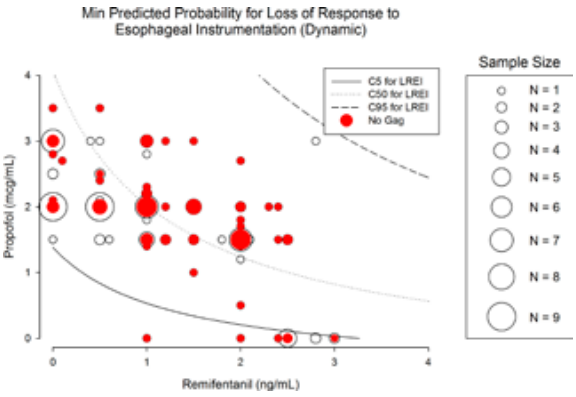
Anesth Analg. 2011 Feb;112(2):331-9







S-431.

SYSTEMIC ENDOTOXINAEMIA-INDUCED ALTERATIONS OF SUBSTANCE P-LIKE IMMUNOREACTIVITY IN DIFFERENT ORGANS OF MICE

AUTHORS: O. Lengl[1], E. Pintér[2], Z. Helyes[2], T. Bagoly[2], J. Quinn[3], K. Sándor[2]

AFFILIATION: [1]Departments of Anaesthesiology and Intensive Care, University of Pécs, Pécs, Hungary; [2]Pharmacology and Pharmacotherapy, University of Pécs, Pécs, Hungary; [3]School of Biomedical Sciences, Liverpool University, Liverpool, United Kingdom

INTRODUCTION: Substance P (SP) encoded by the preprotachykinin A (TAC1) gene predominantly in sensory neurons evokes neurogenic inflammatory responses via neurokinin 1 (NK1) receptors localized on vascular endothelial, immune and smooth muscle cells. Hemokinin-1 (HK-1) derived from the TAC4 gene in non-neural, inflammatory cells is structurally and functionally very similar. SP and HK-1 are immunologically identical, they are both detected with radioimmunoassay. Therefore, we aimed to investigate systemic endotoxin-evoked alterations of SP and HK-1 in different mouse organs, and to differentiate between the expression of these two peptides using TAC1 gene-deficient (TAC1-/-) animals.

METHODS: Lipopolysaccharide (LPS, 400 ug) was injected i.p. to male TAC1-/- mice and their C57Bl/6 counterparts (n=9-10/group) to induce a systemic inflammatory response characteristic of early human sepsis. Saline-treated mice of the same age served as intact controls. The lung, heart, liver and kidney were excised 4 h after the treatment following exsanguination in deep sodium-thiopenthal anaesthesia. SP-like immunoreactivity (SP-LI) of these organ homogenates was measured with sensitive and specific radioimmunoassay.

RESULTS: In intact mice the highest SP-LI, 113.3+28.2 fmol/, was measured in the kidney. 61.5+4.7 fmol/mg was detected in the liver, 12.3+2.2 fmol/mg in the myocardium and 4.04+0.45 fmol/mg in the lung. SP-LI in the kidney and the liver of non-inflamed TAC1-/-mice lacking SP was approximately half of what was measured in wildtypes, but in the heart and the lung the concentrations were almost the same. Four hours following the systemic LPS challenge a 4-fold increase was observed in the myocardium in wildtype mice, but only a 2-fold elevation occurred in the TAC1-/- group compared to the respective intact controls. There was no significant change in the lung in either group. In contrast, SP-LI markedly decreased in the liver and the kidney by about 40% and 70%, respectively, in wildtypes. In TAC1-/- mice there was no change in the liver and about 40% decrease occurred in the kidneys.

DISCUSSION: The highest SP-LI is measured in the kidney and liver, the half of which is SP predominantly of sensory neural origin and the other half is HK-1 derived from non-neural cells. However, the small concentration in the heart and the lung is HK-1, since the same level is measured in TAC1-/- animals. Systemic endotoxinaemia significantly increases SP concentration in the heart, which is likely to be due to its release from peripheral peptidergic sensory nerve terminals. SP levels markedly decrease in the liver and the kidney presumably due to its depletion by the 4-h timepoint.

REFERENCES: N/A

S-432.

THE DELTA OPIOID RECEPTOR ANTAGONIST NALTRINDOLE IMPROVES SPLANCHNIC PERFUSION IN PIGS DURING CARDIOPULMONARY BYPASS

AUTHORS: M. M. Theisen[1,2], T. Iden[5], T. P. Weber[3], H. Nagase[4], M. Maas[1], K. Kaerlein[1]

AFFILIATION: [1]Department of Anesthesiology and Intensive Care, Münster University Hospital, Münster, Germany; [2]Department of Anaesthesia and Intensive Care, Raphaelsklinik Münster, Münster, Germany; [3]Department of Anesthesia and Intensive Care, St. Joseph Hospital Ruhr University Bochum, Bochum, Germany; [4]Laboratory of Medical Chemistry, School of Pharmacy, Kitasato University, Tokyo, Japan; [5]Department of Anesthesiology and Intensive Care, Schleswig-Holstein University Hospital, Campus Kiel, Kiel, Germany

INTRODUCTION: The use of cardiopulmonary bypass (CPB) is increasingly common in modern cardiothoracic surgery[1]. However, one of the major postoperative complications and leading causes of mortality is visceral hypoperfusion. Studies performed in conscious dogs have demonstrated that NTI significantly improves splanchnic perfusion (SP)[2]. The aim of this study was to investigate if NTI also improves SP in pigs undergoing CPB and thus might reduce the rate of gastrointintestinal complications.

METHODS: Ethics approval for this study was obtained from the Bezirksregierung Muenster. In this study 21 pigs (mean 35 kg) were anaesthetized and intubated and received a CVC and arterial catheter. Cardiac output was measured using a transit time flowprobe positioned around the pulmonary trunk. A fluid filled catheter in the left atrium was used to infuse fluorescent microspheres. After establishing baseline measurements either placebo or 4mg/kg NTI were infused and measurements were repeated (compound). The pigs were then exposed to electrically induced VF and cardioplegia as well as hypothermia (28°C for 90 min, ischemia). Following re-establishment of normal body temperature the animals were re-perfused for 30 minutes. The last measurements were taken 30 minutes after successful weaning from ECC. Any care given to the pigs during CPB followed a standardized protocol. After euthanasia tissue specimens were taken for analysis of fluorescent microspheres.

RESULTS: Hemodynamic parameters such as mean arterial pressure [MAP] and cardiac output [CO] were comparable at all data acquisition points. We have successfully demonstrated that splanchnic perfusion is clearly reduced by CPB. NTI improves rates of perfusion before, during and after cross-clamp time (Ischemia). More detailed data are presented in the table.

DISCUSSION: This study clearly demonstrates that NTI increases SP before, during and post CPB. This effect is also independent of the hemodynamics. We propose that visceral hypoperfusion and the resultant gastrointestinal morbidity and mortality resulting from CPB could be significantly improved with the use of NTI. Further investigations are needed to elucidate this topic of high importance.

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= p<0.05 Placebo versus NTI

	Baseline		Compound		Ischemia		End	
	Placebo	NTI	Placebo	NTI	Placebo	NTI	Placebo	NTI
MAP [mm Hg]	80,3 [73,6;94,4]	88,4 [82,0;93,6]	70,4 [63,5;79,8]	67,3 [64,6;74,5]	68,4 [64,7;87,7]	76,4 [68,2;85,6]	63,7 [54,7;73,6]	72,2 [67,2;79,0]
CO [ml/min]	2467 [2220;3031]	2533 [2007;2897]	2311 [2093;2704]	1792 [1560;2861]	10 [-49;36]	79 [23;126]	2662 [2093;2948]	1928 [1535;3015]
Duodenum p [ml/g/min]	0,20 [0,16;0,27]	0,24 [0,15;0,33]	0,11 [0,06;0,19]	0,26 # [0,16;0,45]	0,24 [0,18;0,37]	0,46# [0,31;0,69]	0,12 [0,08;0,17]	0,15 # [0,11;0,23]
Duodenum d [ml/g/min]	0,30 [0,16;0,43]	0,26 [0,19;0,41]	0,13 [0,08;0,24]	0,29 # [0,19;0,38]	0,29 [0,16;0,67]	0,49 # [0,39;0,77]	0,16 [0,10;0,18]	0,21 # [0,17;0,34]
Jejunum p [ml/g/min]	0,24 [0,18;0,38]	0,34 [0,27;0,39]	0,12 [0,09;0,22]	0,34 # [0,24;0,50]	0,19 [0,12;0,56]	0,51 # [0,29;0,69]	0,18 [0,11;0,22]	0,29 # [0,21;0,37]
Jejunum d [ml/g/min]	0,13 [0,12;0,19]	0,23 # [0,18;0,39]	0,06 [0,04;0,09]	0,20 # [0,16;0,34]	0,08 [0,05;0,14]	0,15 # [0,11;0,23]	0,10 [0,07;0,12]	0,15 # [0,10;0,19]
Ileum p [ml/g/min]	0,21 [0,16;0,25]	0,22 [0,18;0,38]	0,07 [0,04;0,09]	0,25 # [0,18;0,38]	0,09 [0,06;0,14]	0,19 # [0,13;0,30]	0,10 [0,09;0,12]	0,17 # [0,13;0,20]
Ileum d [ml/g/min]	0,20 [0,16;0,28]	0,22 [0,18;0,27]	0,05 [0,04;0,08]	0,26 # [0,19;0,34]	0,08 [0,06;0,10]	0,25 # [0,13;0,29]	0,10 [0,09;0,11]	0,16 # [0,10;0,18]
Colon p [ml/g/min]	0,22 [0,18;0,29]	0,25 [0,18;0,32]	0,10 [0,06;0,14]	0,29 # [0,21;0,34]	0,06 [0,05;0,13]	0,14 # [0,12;0,16]	0,12 [0,08;0,16]	0,17 # [0,14;0,25]
Colon d [ml/g/min]	0,15 [0,11;0,22]	0,22 # [0,17;0,29]	0,08 [0,05;0,12]	0,27 # [0,18;0,29]	0,06 [0,05;0,11]	0,16 # [0,11;0,20]	0,11 [0,07;0,13]	0,19 # [0,11;0,23]

S-433.

ACID SENSING ION CHANNEL CURRENTS REGULATED BY TETRACAINE

AUTHORS: J. Lin[1], T. Leng[2], Z. Xiong[2]

AFFILIATION: [1]Anesthesiology, SUNY Downstate Medical Center, Brooklyn, NY; [2]Neuroscience, Morehouse School of Medicine, Atlanta, GA

INTRODUCTION: Acid-sensing ion channels (ASICs) are proton-gated cation channels activated by protons. They conduct sodium and calcium influx resulting in membrane depolarization and neuronal excitation. ASIC1a channels are expressed in central nervous system and involved in various physiological processes, such as synaptic plasticity, learning and memory[1], and acidosis mediated induced injury[2]. Our recent observation that β-amyloid, an important player in the pathology of Alzhermer's disease, significantly inhibits the ASIC currents in CNS neurons, suggests that inhibition of the function of ASIC1a channels contributes to the impairment of cognitive functions[3]. The primary action of local anesthetics is to block sodium channel. However, it has been shown that they have multiple pharmacological effects on other ion channels in central nerve system. Here we show that local anesthetic tetracaine significantly suppress the ASIC1a currents in a use-dependent manner.

METHODS: The experiment protocol was approved by Animal Use and Care Committee at our institution. CHO cells were transfected with ASIC1a channels as described[2]. Whole-cell patchclamp and fast perfusion techniques were employed to record the ASIC currents induced by pH drops from 7.4 to 6.0. Fast perfusion was achieved with a multibarrel perfusion system. ASIC currents were recorded with Axopatch-200B amplifier and pClamp 8.2 software.

RESULTS: Lowering the extracellular pH to 6.0 results in an inward ASIC1a current in transfected CHO cells. Co-application of tetracaine (1-3 mM) with acid pulse (4 sec duration, every 2 min) progressively inhibited the amplitude of the ASIC currents (Figure 1, n=3-5). The degree of inhibition is more pronounced with higher frequency of ASIC activation.

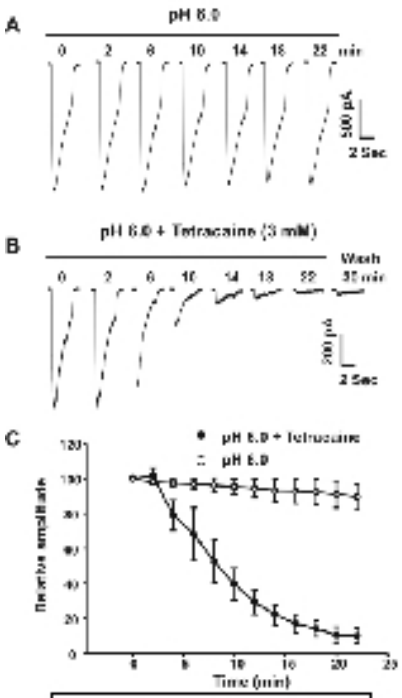

Figure 1. Inhibition of the ASIC1a current by tetracaine (3 mM, n=3).

DISCUSSION: It has been shown that ASICs can be modulated by various endogenous and pharmacological agents[4]. ASICs may represent a mechanism for anesthetics mediated pharmacological effects. Our result shows that tetracaine inhibits the ASIC1a currents, which represents a new pharmacological effect of tetracaine in the central nerve system.

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S-434.

THE INHIBITORY EFFECTS OF KETAMINE ON SUBSTANCE P RECEPTOR IN U373 MG HUMAN ASTROCYTOMA CELLS

AUTHOR: K. Yamaguchi

AFFILIATION: Tokyo, Japan

INTRODUCTION: The neuropeptide substance P (SP) is an important mediator of neurogenic inflammation within the central and peripheral nervous system, but the effects of ketamine on SP receptor (SPR) are not clear. The mitogen-activated protein kinase (MAPK) family of proteins are involved in many cellular signaling functions. Extracellular signal-regulated kinase 1/2 (ERK1/2), a member of the family, is involved signaling through epidermal growth factor (EGF) receptor. In this study, we investigated the effects of IV anesthetics on SPR function in the human astrocytoma cell line U373 MG cells which express high levels of SPR and chosen as an astrocytoma in vitro model to investigate. We examined the effects of ketamine on SP-induced ERK1/2 activation in U373 MG cells.

METHODS: U373 MG human astrocytoma cells were stimulated with substance P (100nM) for 10 min at 37C. Prior to stimulation, cells were treated with ketamine (1μM to 1mM) for 30 min. ERK activity was assessed by immunoblotting with phosphorylated ERK antibody followed by enhance chemifluorescent detection. Immunoreactive bands were quantified using computer assisted densitometry. All data are expressed as mean ± SD. Statistical analysis was performed using ANOVA.

RESULTS: Ketamine caused a dose dependent inhibitory effect of SP-induced ERK1/2 phosphorylation ($p < 0.01$ for ketamine concentrations 10 μM to 1 mM). Ketamine did not reduce EGF-mediated ERK1/2 activation.

DISCUSSION: Our results suggested that ketamine inhibits SP induced ERK1/2 activation. This finding suggests that the inhibition of SPR function by these compounds may be important in the analgesic effects of ketamine.

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S-435.

THE KAPPA OPIOID RECEPTOR ANTAGONIST NOR-BINALTORPHIMINE INCREASES SPLANCHNIC PERFUSION WHILE DECREASING VASOPRESSOR REQUIREMENTS BOTH DURING AND POST EXTRACORPOREAL CIRCULATION IN SWINE

AUTHORS: M. M. Theisen[1,2], J. Blumenstiel[1], J. Stypmann[3], T. P. Weber[4], M. Fobker[6], F. Ploner[5]

AFFILIATION: [1]Department of Anesthesiology and Intensive Care, Münster University Hospital, Muenster, Germany; [2]Department of Anaesthesia and Intensive Care, Raphaelsklinik Münster, Muenster, Germany; [3]Department of Cardiology and Angiology, Münster University Hospital, Münster, Germany; [4]Department of Anesthesia and Intensive Care, St. Joseph Hospital Ruhr University Bochum, Bochum, Germany; [5]Department of Anesthesiology and Critical Care Medicine, Vipiteno Hospital, Vipiteno, Italy; [6]Department of Laboratory Medicine, Münster University Hospital, Münster, Germany

INTRODUCTION: The use of extracorporeal circulation (ECC) is increasingly common in modern cardiothoracic surgery. Although rare, one of the major postoperative complications and leading causes of mortality is splanchnic hypoperfusion[1]. Studies performed in conscious dogs have demonstrated that opioid receptor antagonists (ORA) significantly improve splanchnic perfusion (SP)[2,3]. This study aims to investigate if the κ-ORA nor-BNI is able to improve SP in pigs undergoing ECC.

METHODS: In this study 21 pigs (weight 35 ± 2.5 kg) were randomized and 24 hours prior to surgery received either nor-BNI (3,7mg/kg) or placebo according to[3]. The anaesthetized and intubated pigs were hemodynamically monitored using approved invasive techniques including cardiac output (CO). Regional SP was determined using fluorescent microspheres (FMS) infused via a fluid filled catheter, placed in the left atrial appendage. Following induction of ECC and baseline measurements (compound) pigs were exposed to VF and cardioplegia as well as hypothermia (28°C for 90min, ischemia). After normal body temperature was obtained pigs were re-perfused for 30min and weaned off ECC strictly according to a weaning protocol. 30min after completed weaning process (End) animals were euthanized and tissue specimens were taken from the whole splanchnic bed for analysis of retained FMS content, results of all specimen were averaged. Time points used to determine SP post application of FMS were after instrumentation (compound), ischemia and experimental end. Mean arterial pressure (MAP), and cardiac output (CO) were kept constant initially by fluid replacement, followed by infusion of norepinephrine (NE).

RESULTS: Cardiac output was comparable at all data points. Nor-BNI significantly increases mean arterial pressure (MAP) at the experimental end when compared to placebo study group but interestingly without altering CO at all time points measured.

Nor-BNI improved SP significantly at any data point. Surprisingly this effect was combined with a significant decrease of vasopressor requirements (see table).

DISCUSSION: SP was significantly improved in the nor-BNI study group with significantly reduced NE requirements in pigs. The negative side effects associated with vasopressors were thus also reduced. However, if nor-BNI also reduces the rate of both gastrointestinal complications and deaths in patients undergoing ECC needs to be further investigated. Again, the increase of MAP by administration of nor-BNI was demonstrated again[5].

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	Placebo			nor-BNI		
	Compound	***Ischemia***	***End***	***Compound***	***Ischemia***	***End***
MAP [mm Hg]	70 (64; 80)	68 (64; 87)	64 (55; 74)	98 # (88,116)	65 (59; 69)	76 # (71; 86)
CO [ml/min]	2311 (2093; 2704)	10 (-49; 36)	2662 (2093; 2948)	2429 (2135; 2801)	-30 (-77; -6)	2308 (1686; 2430)
SP [ml/g/min]	0,077 (0,038; 0,163)	0,129 (0,057; 0,274)	0,104 (0,053; 0,166)	0,254 # (0,134; 0,473)	0,214 # (0,114; 0,450)	0,174 # (0,098; 0,308)
NE [µg]	0 (0; 0)	281 (168; 778)	130 (13; 222)	00 (0; 0)	253 (101; 417)	0 # (0; 3)

# $p < 0.05$; Placebo versus nor-BNI. NE displayed in cumulative doses up to the next data point.

S-436.

MEMORY IMPAIRMENT AND REDUCED SYNAPTIC PLASTICITY AFTER ISOFLURANE ANESTHESIA IS MEDIATED BY α5GABA-A RECEPTORS IN MICE

AUTHORS: A. Zurek[2], E. M. Bridgwater[2], B. A. Orser[1,2]

AFFILIATION: [1]Anesthesia, Sunnybrook Health Sciences, Toronto, ON, Canada; [2]Physiology, University of Toronto, Toronto, ON, Canada

INTRODUCTION: General anesthetics cause cognitive deficits that persist much longer than would be expected on the basis of their pharmacokinetics. γ-Aminobutyric acid type A receptors containing the α5 subunit (α5GABAAR) are targets for most anesthetics and have been implicated in memory deficits in the early postoperative period. We sought to determine whether working memory and short-term memory are impaired 24 h after isoflurane anesthesia and whether memory deficits can be reversed by reducing the function or expression of α5GABAARs. Also, to identify the network substrates that underlie memory deficits, synaptic plasticity was studied in the CA1 region of the hippocampus 24 h after isoflurane.

METHODS: The study was approved by the institutional Animal Care Committee. Wild-type (WT) and α5GABAAR null-mutant (Gabra5-/-) mice were treated with isoflurane (1.3%; 1 MAC) or vehicle for 1 h. Memory was assessed with an object recognition task 24 h after isoflurane. Working memory and short-term memory were tested 1 min and 1 h after training, respectively. To determine whether inhibition of α5GABAARs reverses memory deficits, mice were treated with L-655,708 (0.35 mg/kg) 23.5 h after isoflurane and 30 min before behavioral training. For electrophysiological recordings, hippocampi were harvested 24 h after exposure to vehicle or isoflurane. Long-term potentiation (LTP) and long-term depression (LTD) of synaptic transmission were studied by measuring the percent change from baseline in field postsynaptic potentials (fPSPs) after stimulation. Brain slices were stimulated with high theta frequency (TBS) and 20 Hz protocols.

RESULTS: Short-term memory was impaired in WT mice after isoflurane (Iso) as evidenced by a decrease in the discrimination ratio (Control 0.66 ± 0.03 vs. Iso 0.51 ± 0.03, $P = 0.0005$). In contrast, working memory was intact (Control 0.68 ± 0.05 vs. Iso 0.67 ± 0.04, $P = 0.979$). Short-term memory loss was reversed by L-655,708 (effect of Iso × L-655,708, $F_{2,102} = 3.59$, $P = 0.032$; Iso 0.51 ± 0.03, vs. Iso + L-655,708 0.67 ± 0.03, $P < 0.05$) and Gabra5-/- mice showed no memory deficits (effect of Iso $F_{1,47} = 0.375$, $P = 0.544$). LTP induced by TBS was reduced in isoflurane-treated mice (Control 53.90 ± 16.38% vs. Iso 29.36 ± 12.65%, $P = 0.006$). Stimulation at 20 Hz caused LTP in controls and LTD in isoflurane-treated mice (14.20 ± 16.22% vs. -17.33 ± 9.12%, $P < 0.0001$).

DISCUSSION: A brief exposure to isoflurane impairs short-term but not working memory for 24 hours. These deficits are reversed by inhibiting α5GABAARs. Plasticity in the hippocampus is impaired after isoflurane suggesting a possible network substrate for the memory deficit.

REFERENCES: N/A

S-437.

TWO HOURS OF ANESTHESIA DOES NOT IMPAIR SUSTAINED ATTENTION IN RATS TESTED 24 HOURS LATER

AUTHORS: K. Murphy[1], T. Veuthey[1], A. Bates[2], J. McGaughy[2], M. Baxter[1]

AFFILIATION: [1]Friedman Brain Institute, Mount Sinai School of Medicine, New York, NY; [2]Department of Psychology, University of New Hampshire, Durham, NH

INTRODUCTION: Cognitive impairments may occur after general anesthesia including post-operative cognitive dysfunction. Rats given two hours of isoflurane-nitrous oxide anesthesia are impaired in the acquisition of a radial arm maze task when training is begun 48 hours after anesthesia[1]. To extend the characterization of cognitive deficits after general anesthesia, we trained rats on the 5-choice serial reaction time task (5CSRTT)[2] and an operant test of sustained attention (SAT)[3].

METHODS: In the 5CSRTT task, one of five operant box response ports is illuminated briefly. If the rat makes a nose-poke to the port that was illuminated, a reward is delivered. Rats were trained on a version of the task, which included a variable ITI to increase attentional demands. In the SAT, rats were trained to distinguish between signal (presence of visual stimulus) and non-signal (absence of visual stimulus) trials by pressing the appropriate one of two levers extended 2s after presentation of the stimulus. Rats were tested on a version of the task, which included distractors. Signal duration varied and all trials were presented in a temporally unpredictable fashion to heighten attentional demands. Rats trained in the 5CSRTT received either 2 hours of 1.2% isoflurane anesthesia in 70% nitrous oxide/30% oxygen (N=9) or 2 hours of medical air (FiO2 0.3) (N=8). Following post anesthetic behavioral testing for 1 week the control group (N=8) then received 2 hours of propofol (0.6 mg/kg/min) and fentanyl (15 µg/kg/hr) anesthesia, followed by a second period of post anesthesia testing. Rats trained in the SAT received either 2 hours of 1.2% isoflurane anesthesia in 70% nitrous oxide/30% oxygen (N=11), 2 hours of propofol (0.6 mg/kg/min) and fentanyl (15 µg/kg/hr) anesthesia (N=12) or 2 hours of medical air (FiO2 0.3) (N=12).

RESULTS: No performance parameters in either task were affected by anesthesia treatment in the first test session 24 hours after anesthesia, or in the subsequent week post-exposure. This indicates that 2 hours of isoflurane/nitrous oxide or propofol/fentanyl anesthesia is insufficient to produce attentional impairments in adult rats, as assessed by performance in the 5CSRTT and SAT.

DISCUSSION: Thus, previously reported impairments in spatial learning following anesthesia treatment probably cannot be ascribed to generalized attentional or motivational deficits, but likely reflect specific hippocampal system dysfunction.

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S-438.

ALLYL TFD-MEPHOBARBITAL : POTENT ENANTIOSELECTIVE PHOTOREACTIVE BARBITURATE GENERAL ANESTHETICS THAT INTERACT WITH HUMAN GABA(A) RECEPTORS

AUTHORS: P. Y. Savechenkov[2], D. Stewart[1], X. Zhang[1,3], R. Ge[1], K. S. Bruzik[2], K. W. Miller[1,3]

AFFILIATION: [1]Department of Anesthesia, Critical Care & Pain Medicine, Massachusetts General Hospital, Boston, MA; [2]College of Pharmacy, University of Illinois at Chicago, Chicago, IL; [3]Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School, Boston, MA

INTRODUCTION: Barbiturates exert many actions and likely have many sites of action. In addition to their well-known anesthetic action, they act as sedative hypnotics, anticonvulsants, anxiolytics, respiratory and cardiorespiratory depressants, and muscle relaxants. Paradoxically, some agents can cause excitation and convulsions and this property is very sensitive to small changes in structure. For example, one enantiomer may be an anesthetic and the other a convulsant.

METHODS: We have synthesized allyl mTFD-mephobarbital (1-methyl, 5-allyl, 5-m-trifluoromethyldiazirinyl barbituric acid) and separated its enantiomers. With institutional approval, anesthetic potency was determined as loss of righting reflexes in tadpoles. With prior institutional approval, oocytes were obtained from adult, female Xenopus laevis and studied by two-electrode voltage clamp experiments. Human GABA(A)Rs containing $\alpha1\beta2\gamma2L$ subunits were expressed in oocytes. Human $\alpha1\beta3\gamma2L$ GABA(A)Rs were expressed in HEK293 cells, and [3H]ligand binding to membrane preparations determined by filtration assay.

CHALLENGING CASE REPORT: N/A

RESULTS: R(-)allyl mTFD-mephobarbital is one of the most potent barbiturates ever synthesized with an EC50 of 4 uM, comparable to R(+)etomidate. However, S(+)allyl mTFD-mephobarbital is ten-fold less potent as a general anesthetic. In human GABA(A) Rs containing $\alpha1\beta2\gamma2L$ subunits expressed in oocytes, the R-, but not the S-enantiomer enhanced currents elicited by low GABA concentrations and robustly shifted the GABA concentration-response curve to the left. The underlying mechanisms were characterized using ligands that bind to three different sites on the GABA(A)R: the agonist site, the benzodiazepine site and the cage convulsant site. In human $\alpha1\beta3\gamma2L$ GABA(A)Rs expressed in HEK293 cells, the enantiomers exhibited distinct patterns in modulating each of these sites. Both enantiomers enhanced agonist ([3H]muscimol) binding by 2 to 3-fold with half-effect concentrations differing by ten-fold and being close to their anesthetic EC50s. At the benzodiazepine site [3H]flunitrazepam binding was weakly enhanced with the R(-) enantiomer again being more potent than the S(+). However, the two enantiomers differed strikingly in their ability to modulate [3H]EBOB binding at the cage convulsant sites. Whereas S(+) caused only slight variations in [3H]EBOB binding at concentrations up to 150 uM, the R(-) enantiomer almost completely inhibited binding in the physiological concentration range.

DISCUSSION: Thus R(-) and S(+) allyl mTFD-mephobarbital are effective general anesthetic photolabels that modulate human GABA(A)R function enantioselectively and may be useful for identifying binding sites on the GABA(A)R and other targets.

REFERENCES: Funded by GM 58448

S-439.

ACTIVATION OF THE CB2 RECEPTOR SYSTEM ALLEVIATES AMYLOID-INDUCED MEMORY DEFICIENCY

AUTHORS: J. Wu, B. Bie, H. Yang, J. Xu, D. Brown, M. Naguib

AFFILIATION: Cleveland, OH

INTRODUCTION: Amyloid fibrils induce significant neuroinflammation, characterized by the activated microglia and astrocytes, in the brains of patients with Alzheimer's disease. Emerging studies suggested the roles of cannabinoid receptor 2 (CB2) in the pathogenesis of Alzheimer's disease. Our previous work established MDA7, 1-((3-benzyl-3-methyl-2,3-dihydro-1-benzofuran-6-yl)carbonyl) piperidine, as a novel potent selective CB2 agonist . In this study, we demonstrate that MDA7 blunts neuroinflammation and ameliorates the memory deficiency in the rat model of Alzheimer's disease.

METHODS: Adult male Sprague-Dawley rats (200-250 g) were applied and all animal procedures were approved by the Institutional Animal Care and use Committee. Abeta1-40 fibrils (10 microg/side) was microinjected into the hippocampal CA1 area to establish the rat model of Alzheimer's disease. Same volume of saline was used in the control group. MDA7 (15 mg/kg) was intraperitoneally (i.p.) administered daily for 14 days in both modeled and control groups. Immunostaining and immunoblotting were performed to exam the expression of CB2, CD11b, glial fibrillary acidic protein (GFAP), and IL-1beta. Whole-cell recordings in hippocampal slices and Morris water maze were performed to test the effect of MDA7 on amyloid fibrils-impaired synaptic plasticity and memory function.

RESULTS: Significant increases of CD11b and GFAP immunoreactivity, enlarged cell mass, and increased cell complexity were noted in the microglia and astrocytes respectively in the hippocampal CA1 of the modeled rats (Figs. 1 & 2). Immunoblotting study revealed an increased IL-1beta level in the hippocampal CA1 tissue in the modeled rats. The expression of CB2 receptor was also increased in the hippocampal CA1 tissue in the modeled rats. Meanwhile, systemic administration of MDA7 significantly attenuated amyloid fibrils-induced upsurge of CB2, CD11b and GFAP expression and IL-1beta synthesis in hippocampal CA1. Furthermore, MDA7 significantly recovered amyloid fibrils-impaired electric stimuli-induced long term potentiation, and improved the performance in the water maze test in the modeled rats.

DISCUSSION: Activation of central microglial CB2 receptor by MDA7 significantly attenuated the glia activation, improved the impaired synaptic plasticity in hippocampus as well as memory deficiency induced by Abeta1-40 fibrils. The CB2 receptors in microglia may serve as a novel target for the treatment of Alzheimer's disease.

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Nature 346(6284), 561-4.

Pharmacology – Clinical

S-445.

THE INCIDENCE OF THE PROPOFOL-INDUCED YAWNING RESPONSE IS HIGHER IN POSTMENOPAUSAL WOMEN

AUTHOR: K. Terasako

AFFILIATION: Shobara Red Cross Hospital, Shobara-City, Japan

INTRODUCTION: I have experienced two cases of the temporo-mandibular joint dislocation due to forceful yawning during induction with propofol.

Although yawning occurs frequently during the intravenous (IV) induction of general anesthesia, the significance of this response remains unknown.

I reported that the incidence of the propofol-induced yawning response is higher in male than in female and that the falls in arterial blood pressure seen following IV-administrated propofol have nothing to do with the occurrence rate of yawning[1].

The increased probability of the yawning response in male patients in the past study is consistent with the finding that yawning was found to be an androgen-dependent sexually dimorphic behavior, occurring in males more frequently than in females in adult rhesus monkeys[2,3].

The purpose of the present study is to examine whether postmenopausal women yawn more often than young women.

METHODS: Ninety female patients [each of the American Society of Anesthesiologists physical status 1-2 and scheduled for elective surgery under general anesthesia] over 13 years old participated in this study. There were seventy women aged over fifty years old and they were allocated to postmenopausal female group. After obtaining baseline values and oxygenation through the mask, IV injection of 1.5mg/kg propofol was administered by the investigator over a 5-s period. As the only clinical end point, the occurrence of the yawning response (characterized by mouth opening) was observed continuously after the start of the anesthetic infusion. The end of the 1-min observation period represented termination of this study. Then, rocuronium (0.6mg/kg) was administered IV, and mask-assisted ventilation with 97% oxygen and 3% sevoflurane was applied until tracheal intubation.

RESULTS: The incidence of the propofol-induced yawning response was higher in postmenopausal female group (27%) than in younger female group (5%) ($P<0.05$).

There were no significant differences among the postmenopausal female-yawning(+), postmenopausal female-yawning(-), younger female-yawning(+) and younger female-yawning(-) groups in baseline MAP, baseline HR ,MAPGAP, MAP after induction, HR after induction and body weight.

DISCUSSION: The incidence of the propofol-induced yawning response is higher in postmenopausal women than in younger women. Estrogen may prevent yawning response in younger women.

The falls in arterial blood pressure seen following IV-administrated propofol have nothing to do with the occurrence rate of yawning.

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S-446.

WITHDRAWN.

S-447.

MONOAMINE OXIDASE INHIBITORS AND THE OCCURRENCE OF INTRAOPERATIVE HEMODYNAMIC EVENTS

AUTHORS: I. Van Haelst[1,2], T. Egberts[2,3], H. Doodeman[1], C. Kalkman[4], W. van Klei[4]

AFFILIATION: [1]Clinical Pharmacy, Medical Center Alkmaar, Alkmaar, Netherlands; [2]Clinical Pharmacy, University Medical Center Utrecht, Utrecht, Netherlands; [3]Pharmacoepidemiology and Pharmacotherapy, Utrecht Institute for Pharmaceutical Sciences, Utrecht, Netherlands; [4]Perioperative Care and Emergency Medicine, University Medical Center Utrecht, Utrecht, Netherlands

INTRODUCTION: Although Monoamine Oxidase Inhibitors (MAOIs) have been available for more than 50 years, the perioperative management of patients treated with MAOIs is still under discussion. From the point of view of appropriately treating the psychiatric illness, perioperative continuation is recommended. However, potentially fatal drug interactions have been reported in patients where (ir)reversible MAOIs were used concurrently with opioids or sympaticomimetic agents during anesthesia. There are no evidence-based guidelines and experts disagree whether to continue the use of MAOIs before surgery or not[1-3]. The aim of this study was to investigate the occurrence of intraoperative hemodynamic events, such as hypertension and tachycardia, when MAOIs were continued during anesthesia.

METHODS: A retrospective observational cohort study was conducted among patients who were admitted for elective surgery requiring anesthesia in eight Dutch hospitals (2004-2010). The index group included current users of MAOIs. The reference group included a sample of nonusers matched to the index group on hospital, type of surgery and anesthesia (ratio 1:3). The outcome was the occurrence of the following intraoperative hemodynamic events: hypo- or hypertension and tachy- or bradycardia. The incidence of the serotonergic syndrome was also registered.

RESULTS: Approximately 280,000 surgical procedures were performed in the participating hospitals in the observed 33 years. The index group included 51 current users of a MAOI. The reference group included 149 nonusers. Intraoperative hypotension occurred less frequently in users of a MAOI (49%) than in nonusers (69%) ($p = 0.01$). The occurrence of hypertension, brady- and tachycardia during anesthesia was not different between users of a MAOI (28%, 57% and 20%, respectively) and those of the reference group (26%, 56% and 26%, respectively). In none of the study patients the serotonergic syndrome was diagnosed.

DISCUSSION: Severe adverse hemodynamic events, such as hypertension and tachycardia, did not occur more frequently in users of MAOIs – who continued their use during anesthesia – compared to nonusers. Intraoperative hypotension occurred even less frequently in users of a MAOI than in nonusers. These findings suggest that there is no longer much justification to discontinue (ir) reversible MAOIs before surgery, with the attendant considerable risk of compromising their psychiatric status.

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S-448.

INFLUENCES ON GLUCOSE METABOLISM OF PRIOR AMINO ACID ADMINISTRATION AFTER STARTING PREOPERATIVE FASTING AND THE USEFULNESS OF AMINO ACID INTAKE COMBINED WITH CARBOHYDRATE LOAD

AUTHORS: M. Tanno, H. Fukushima, S. Ohara, Y. Tanaka

AFFILIATION: Mito Medica center National Hospital Organization, Ibaraki-machi Iaraki-ken, Japan

INTRODUCTION: Intraoperative amino acid administration beneficially elevates intraoperative temperature, shortesns intensive care hospitalization, inhibits postoperative protein catabolism, etc.

Influences on glucose metabolism of prior amino acid administration after starting preoperative fasting and the usefulness of amino acid intake combined with glycemic load were examined in healthy volunteers.

METHODS: Two experiments were conducted in the same volunteers using a randomized sequential crossover design. Both groups started fasting at 21:00. The amino acid group received an amino acid supplement (Amino Vital®) 3.6 g with 250 mL water at 22:00 and 7:00. Then, a 250 mL carbohydrate solution (Arginade Water®) was consumed at 8:00. The carbohydrate group drank 250 mL of water at 22:00 and 7:00 without receiving the amino acid supplement. Then, the same carbohydrate solution amount was consumed at 8:00. Blood tests were conducted at 8:00 and 10:00 to measure blood sugar (BS), insulin (IRI), free fatty acid (FFA), total ketone body concentration (ketone), glucagon (GU) and growth hormone (GH).

Amino Vital® contains 18 kcal, leucine 0.54g, isoleucine 0.43g, valine 0.36g, glutamine 0.65g, and others 1.72g (Ajinomoto CO., INC., Tokyo).

Arginade Water® contains 200 kcal, with 45g carbohydrate per 200 mL (Nestle Nutrition Institute, Tokyo).

CHALLENGING CASE REPORT: N/A

RESULTS: Results of 10 volunteers. Blood test results at 8:00 (amino acid vs carbohydrate group): BS, 83 ± 19 vs 89 ± 23 mg/dL; IRI, 5.1 ± 2.3 vs 5.0 ± 2.3 IU/mL; FFA, 444 ± 143 vs 550 ± 143 μEq/L; ketone, 57 ± 52 vs 91 ± 64 μmol/L. Blood test results at 10:00: BS, 89 ± 19 vs 83 ± 18 mg/dL; IRI, 11.6 ± 12.9 vs 6.0 ± 4.0 IU/mL; FFA, 215 ± 117 vs 163 ± 87 μEq/L; ketone, 18 ± 8 vs 17 ± 8 μmol/L. In intra-group comparisons, FFA, Ketone and GH levels were significantly reduced due to carbohydrate load ($p<0.05$), whereas BS, IRI and GU levels did not change significantly. There was no significant difference in any other data between the 2 groups.

DISCUSSION: Administration of amino acid supplements during the early period after initiation of fasting was expected to inhibit protein catabolism via the following process: branched-chain amino acids activate pyruvate dehydrogenase complexes, and arginine enhances secretion of GH and GU. This would lead to rapid glycogenolysis and then rapid gluconeogenesis, thereby stabilizing BS. However, we found that amino acid intake after initiation of fasting does not affect glucose metabolism. Moreover, it was suggested that intake of amino acid supplements combined with a carbohydrate load as preoperative rehydration therapy may not exert intraoperative nutritional efficacy.

REFERENCES: N/A

S-449.

OPTIMAL CONTROL OF MUSCLE RELAXATION FOR ELECTROCONVULSIVE THERAPY: A COMPARISON OF SUCCINYLCHOLINE VERSUS ROCURONIUM-INDUCED NEUROMUSCULAR BLOCKADE

AUTHORS: H. Mirzakhani[1,3], C. A. Welch[2,3], E. George[1,3], T. O. MacDonald[1,3], A. Nozari[1,3], M. Eikermann[1,3]

AFFILIATION: [1]Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, MA; [2]Psychiatry, Massachusetts General Hospital, Boston, MA; [3]Harvard Medical School, Boston, MA

INTRODUCTION: Muscle relaxation is required to avoid excessive muscle contractions during electroconvulsive therapy (ECT). Succinylcholine (Sux) is most commonly used. The optimal dose of neuromuscular blocking agent (NMBA) for ECT minimizes evoked muscle contractions without undue prolongation of recovery from NMBA effects. In a cross-over, assessor-blinded, prospective, randomized study, we evaluated the optimal dose of rocuronium (Roc) and succinylcholine (Sux) for ECT.

METHODS: We included 20 patients, aged 24-80 years (ASA: I-III), scheduled for a series of ECT. Patients received in a random order either Sux or Roc by utilizing the staircase technique[1]. Doses were incrementally increased or decreased by 10% based on the assessment of a psychiatrist blinded to dose. Following induction of general anesthesia, the TOF-Watch SX was calibrated (mode 1, 50 mA), and 1 Hz single twitch was initiated. Blood pressure, heart rate, SpO2, and time to recovery of spontaneous breathing were measured throughout. Data are reported as Mean±SD.

RESULTS: 84 treatments were conducted in 20 patients. ECT was initiated at nadir T1, 1.5±0.4% and 4±0.9% for Sux and Roc, respectively, $p<0.05$. The optimal doses of Sux and Roc for ECT, as defined by smallest dose of NMBA that provides acceptable ECT condition, were 0.8±0.2 mg/kg, and 0.4±0.08 mg/kg respectively. In patients receiving the optimal NMBA dose, onset of action (figure 1A) and time to T1 recovery to 100% (figure 1B) were significantly shorter following Sux compared with Roc, $p<0.05$. Similarly, time to return of spontaneous breathing was significantly shorter for Sux 4.6±1 min compared with Roc 6.5±1 min, $p<0.05$.

The mean difference in recovery time from adequately attenuated muscle strength for ECT using Roc compared with Sux was 1.9±1.2 minutes (endpoint: spontaneous breathing) and 4.2±3.5 min (endpoint: T1 recovery).

There was no significant difference in patients' anesthesia regimen (compounds and dose), and ECT parameters. Of note, duration of motor seizure activity was significantly longer following Roc compared with Sux (30±12 vs. 22±8s, respectively, $p<0.05$.

DISCUSSION: Almost complete T1 suppression is required to optimize muscle relaxation for ECT. Both rocuronium (with neostigmine reversal) and succinylcholine can be safely used. The optimal doses of succinylcholine and rocuronium for ECT were 0.8±0.2 and 0.4±0.08 mg.kg-1 for rocuronium respectively. The mean increase in time required for recovery using rocuronium compared with succinylcholine was 2-4 minutes, depending on the criteria used to define adequate recovery from NMDAs.

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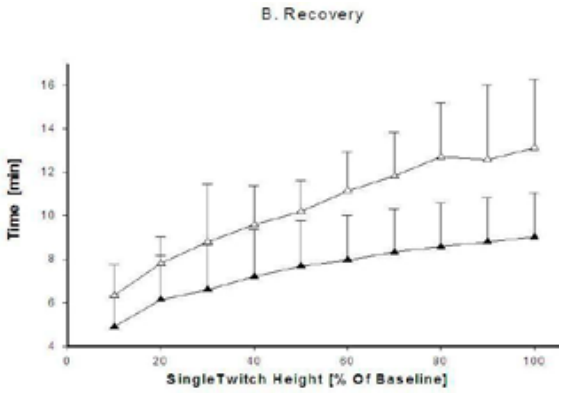
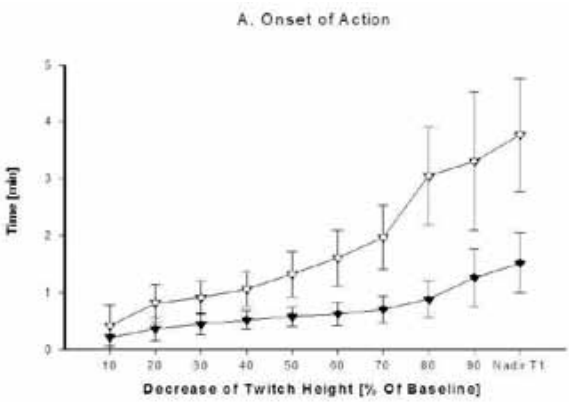


Figure 1. A & B: Time course of action of twitch height (1 Hz stimulation frequency) following succinylcholine and rocuronium injection. Twitch height is given in per cent of post-calibration baseline. A: Onset of action. B: Recovery of twitch height. Means and standard deviations of values taken from patients who received a neuromuscular blocking agent dose that optimized ECT-induced motor activity. *p<0.05



S-450.

WITHDRAWN.

S-451.

DEEP SEDATION FOR COLONOSCOPY IN OVERWEIGHT PATIENTS: A COMPARISON BETWEEN PROPOFOL ALONE VERSUS PROPOFOL AND KETAMINE

AUTHORS: S. Amornyotin, S. Kongphlay

AFFILIATION: Bangkoknoi, Thailand

INTRODUCTION: The aim of this study was to evaluate and compare the clinical efficacy of propofol alone and propofol and ketamine for deep sedation (DS) for colonoscopy in overweight (BMI>25) patients in a teaching hospital in Thailand.

METHODS: We undertook a retrospective review of the sedation service records of overweight patients who underwent colonoscopic procedures from December 2007 and May 2009. All patients were premedicated with intravenous midazolam before the procedure. The primary outcome variable was the successful completion of the endoscopy. The secondary outcome variables were sedation and procedure-related complications during and immediately after the procedure, and mortality rate.

RESULTS: There were 98 overweight patients who underwent colonoscopic procedure by using deep sedation technique during the study period. After matching age, gender, ASA physical status and indications of procedure, 38 patients were sedated by using propofol alone (group P) and 42 patients were sedated with propofol and ketamine (group PK). All sedation was given by residents or anesthetic nurses directly supervised by staff anesthesiologist in the endoscopy room. There were no significant differences in patients' characteristics, sedation time, indication, anesthetic personnel, mortality rate, success rate and sedative agents used between the two groups. Sedation-related complication including hypotension in group P was significantly higher than in group PK. However, all complications were easily treated, with no adverse sequelae.

DISCUSSION: Deep sedation in both regimens for colonoscopy in overweight patients provided effective and safe. No serious adverse events were observed. However, the combination of propofol and ketamine used for DS had significantly lower complication than the propofol alone.

REFERENCES: N/A

S-452.

PREDICTION OF ADDITIONAL SUGAMMADEX IN A SHORT RECOVERY PHASE IN PEDIATRIC PATIENTS

AUTHORS: H. Iwasaki[1], K. Takahoko[1], S. Otomo[1], T. Sasakawa[2], T. Kunisawa[1], H. Iwasaki[1]

AFFILIATION: [1]Department of Anesthesiology and Critical Care Medicine, Asahikawa Medical University, Asahikawa, Japan; [2]Department of Anesthesiology, Shriners Burns Institute Shriners Hospital for Children, Massachusetts General Hospital, Harvard Medical School, Boston, MA

INTRODUCTION: Sugammadex (Sug) can reverse successfully even a profound rocuronium-induced neuromuscular block (NMB). It is reported that muscle relaxation rebound can occur for doses of Sug in a limited critical range[1]. The aim of this study is to determine the necessity of additional Sug administration in a short period by observing the recovery in the twitch height and TOF ratio.

METHODS: Twenty-three scheduled pediatric surgical patients (ASA class 1-2, age 1-10yr, BW 7.6-27kg) undergoing general anesthesia were randomly divided into four groups at the end of surgery ; (T2-1.0) group (n=7) : received Sug 1.0 mg/kg, (T2-0.5) group (n=6) : received 0.5 mg/kg for reversal of NMB at the level of T2. (PTC-1.0) group (n=4): received Sug 1.0 mg/kg, (PTC-0.5) group (n=6): received 0.5mg/kg for reversal of NMB at the level of PTC1~4. All patients received additional Sug (0.5~1mg/kg), five minutes after first administration of Sug and then evaluated the change of T1 height and train-of -four (TOF) ratio. Total recommended dose of Sug were administered before extubation.

Neuromuscular monitoring was performed using the TOF Watch SX® accelermyograph and stimulated the ulnar nerve.

RESULTS: After the second administration of Sug, the patient was classified into (insufficient) group if T1 height had increased more than 10% of control. And if no change in T1 height was observed, the patients were classified into (sufficient) group.

All patients in the (T2-1.0) group and one patient in the (T2-0.5) group were classified into (sufficient) group. All patients in the (PTC-1.0) group and (PTC-0.5) group, and five patients in the (T2-0.5) group were classified into (insufficient) group.

Recoveries of T1 height at 1-3min and TOF ratio at 1-5min were significantly faster in (sufficient) group compared to sufficiency group after initial dose of Sug administration.

However, it has been demonstrated that TOF ratio only in the (sufficient) group recovers over 90% within 3 minutes after initial Sug administration. (Figure1,2)

DISCUSSION: TOF ratio >0.9 measured at the adductor pollicis muscle had been accepted to be an index showing sufficient recovery from neuromuscular block.[2]

It is demonstrated that the necessity of Sug administration can be decided to observe the TOF ratio after Sug injection. It should be administered an additional Sug for adequate NMB recovery when TOF ratio 3 min after initial Sug is shown under 0.9.

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S-453.

THE IMPACT OF PROTEIN BINDING AND HEPATIC BLOOD FLOW ON SUFENTANIL PHARMACOKINETICS DURING CARDIAC SURGERY WITH CARDIOPULMONARY BYPASS

AUTHORS: C. Jeleazcov, T. Saari, H. Ihmsen, J. Schuettler, J. Fechner

AFFILIATION: Anesthesiology, University Hospital Erlangen, Erlangen, Germany

INTRODUCTION: It has been shown that the pharmacokinetics of sufentanil are changed during cardiopulmonary bypass (CPB)[1], but little is known about the unbound sufentanil concentrations. Therefore, we investigated the pharmacokinetics of total and unbound sufentanil during CPB.

METHODS: After IRB approval and written informed consent, 13 male patients (53-71 yr, 70-96 kg) undergoing coronary artery bypass surgery received total intravenous anesthesia with propofol and target controlled infusion (TCI) of sufentanil using Gepts model[2] and targeting plasma concentrations of 0.4 ng/ml (n=6) or 0.8 ng/ml (n=7). Arterial blood samples were taken at skin incision, 5 min before start of CPB, 15 min and 45 min after start of CPB, 15 min after stop of CPB and at last suture. Total and unbound sufentanil concentrations were measured by ultra HPLC with tandem mass spectrometry. Pharmacokinetics were determined by population analysis (NONMEM) using linear multicompartment models. The goodness of fit of the model was assessed by both median prediction error (MDPE) and median absolute prediction error (MDAPE).

RESULTS: Sufentanil was administered over 221±57 min with a mean dosis of 0.56±0.05 and 1.03±0.06 µg/kg/h for the target concentrations of 0.4 and 0.8 ng/ml, respectively (mean±SD). The total sufentanil concentrations were consistently higher than targeted (Ctotal/Ctarget > 1), particularly in the pre-bypass phase, and decreased subsequently (table), whereas the unbound sufentanil concentrations remained fairly constant. Free fraction of sufentanil increased significantly during CPB. Pharmacokinetics were adequately described by a two-compartment model (MDPE=-2.2%, MDAPE=21.2%). The elimination clearance CL1 was significantly higher during and after CPB when compared to the pre-bypass phase. Volumes of distribution increased slightly during and after CPB. CL1 could be modeled as a function of hepatic blood flow and free fraction ("well-stirred" model). V1 and V2 could be modeled as a function of free fraction.

DISCUSSION: TCI of sufentanil with the Gepts model led to a distinct overdosing in the pre CPB phase. Protein binding and hepatic blood flow showed a clear effect on sufentanil pharmacokinetics.

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[Funding] This study was partly supported by a grant of the German Federal Ministry of Education and Research (BMBF, FKZ 01EX1015B)

	Pre-CPB	CPB	Post-CPB
Ctotal/target	2.45 ± 0.90	1.36 ± 0.47 *	1.35 ± 0.41 *
Free fraction (%)	8.6 ± 3.3	13.2 ± 4.7 *	11.8 ± 4.8 *
CL (L/min)	0.60 ± 0.20	1.33 ± 0.44 *	1.04 ± 0.34 *
V1 (L)	9.0 ± 0.7	9.8 ± 1.0 *	9.6 ± 0.7 *
V2 (L)	57.7 ± 8.8	68.4 ± 7.7 *	67.5 ± 8.8 *

Pharmacokinetics in the three periods (mean±SD), * $p<0.05$ compared to Pre-CPB (RM ANOVA, Tukey test).

S-455.

ROCURONIUM NEUROMUSCULAR BLOCKADE IS POTENTIATED BY ONDANSETRON

AUTHORS: O. Desjardins St-Jean, L. Fortier, F. Donati

AFFILIATION: Anesthesia, University of Montreal, Montreal, QC, Canada

INTRODUCTION: Ondansetron, a 5-HT3 receptor antagonist, is used commonly at the end of anesthesia and surgery to prevent postoperative nausea and vomiting (PONV). The 5-HT3 receptors belong to the same superfamily as the nicotinic receptors at the neuromuscular junction. Therefore, ondansetron could have an effect at the neuromuscular junction. The purpose of this study was to determine the effect of ondansetron on an already established rocuronium-induced neuromuscular block.

METHODS: This randomized double blind study involved 30 patients between the ages of 18 to 75 years undergoing elective surgical procedures under total intravenous anesthesia and tracheal intubation were recruited. Train-of-four (TOF) stimulation was applied at the ulnar nerve at the wrist and the response of the adductor pollicis muscle was recorded with a GE NMT MechanoSensor (GE Healthcare, Helsinki, Finland) device. After the beginning of recovery from a 0.6 mg/kg bolus, a rocuronium infusion was started at a rate adjusted to keep the value of the first twitch (T1) constant, between 20 and 30% of the control value. With the infusion rate unchanged, patients were randomized to receive ondansetron 4 mg, followed by saline 15 min later (O-S Group), or saline, followed by ondansetron 15 min later (S-O Group). The primary outcome measurement was T1 15 min after the first injection. Results are expressed as mean (SD).

RESULTS: The baseline T1 value was the same in both groups [23.7 (2.6) % in the S-O and 24.2 (2.3) % in the O-S Groups]. In the S-O Group (15 patients), T1 increased slightly to 27.1 (7.7 %) 15 min after saline and in the O-S Group (15 patients), there was a decrease to 20.5 (4.2) % 15 min after ondansetron, for a difference of 6.6 % (95 % CI 2.0 to 11.2 %) (P = 0.007 between groups). In the S-O group, injecting ondansetron at 15 min was followed by a 4.8 (3.4) % decrease during the next 15 min, and in the O-S Group, T1 continued to decrease during the same time period (Figure).

DISCUSSION: This study shows that ondansetron has a mild potentiating effect on rocuronium-induced neuromuscular blockade. Giving ondansetron 4 mg at the end of surgery could increase the degree of residual paralysis, especially in patients with borderline recovery.

REFERENCES: N/A

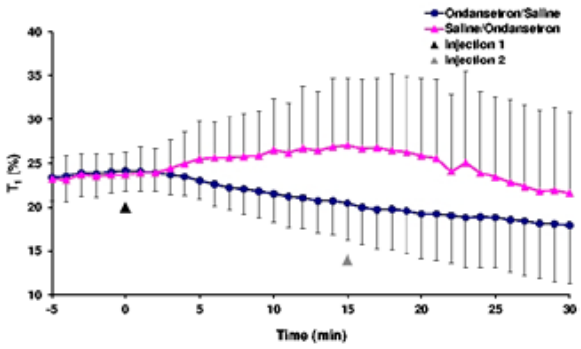

Figure: First twitch height (T1) against time with a constant background infusion of rocuronium. Injection of ondansetron or saline at 0 min and saline or ondansetron at 15 min.

S-456.

DEXMEDETOMIDINE INFUSION TIME CONSIDERATIONS FOR AWAKE FIBEROPTIC INTUBATION

AUTHORS: X. Zheng, J. Swaniker, D. Glick

AFFILIATION: Anesthesia and Critical Care, University of Chicago, Chicago, IL

INTRODUCTION: Sedation regimens for awake fiberoptic intubation (AFOI) typically include a benzodiazepine and an opioid, a combination that can result in hypoventilation and hypoxia. Dexmedetomidine is a sedative with few cardiovascular and ventilatory effects. Previous studies have elucidated the benefits of dexmedetomidine in reducing opioid requirements for intubation when added to the conventional sedation regimen. In this study, the effect of preoperative dexmedetomidine infusion time on opioid requirements for AFOI was explored.

METHODS: After IRB approval and informed consent 26 adult narcotic naïve patients undergoing elective surgical procedures with AFOI were enrolled. Patients were administered intravenous midazolam and a continuous infusion of dexmedetomidine. Hemodynamic markers were recorded at one-minute intervals until the completion of intubation. Fentanyl (1 mcg/kg, rounded to the nearest 25 mcg) was titrated as needed to achieve a Ramsay Sedation Score ≥ 2. Within 24 hours of surgery, patient satisfaction with the intubation procedure and any post-operative complications were assessed.

RESULTS: No overall correlation was found between dexmedetomidine infusion time and the amount of fentanyl needed, but there was a significant reduction in the amount of fentanyl required for patients infused with dexmedetomidine for 22 minutes or more ($P<0.05$). Patients receiving the infusion for at least 22 minutes required an average of 1.08 mcg/kg fentanyl compared to 1.76 mcg/kg for patients infused for less time, representing a 39% decrease in the opioid requirement. No correlation was found between the amount of dexmedetomidine administered per kilogram body weight and fentanyl given per kilogram of body weight. No significant difference between subjects receiving 22 minute or longer infusions compared to subjects receiving shorter infusions was found in terms of hemodynamic markers including systolic blood pressure and heart rate; in oxygen saturation; in post-operative complications; or in satisfaction.

DISCUSSION: Dexmedetomidine may be a useful adjunct sedative for decreasing the amount of opioid required during fiberoptic intubation, thus lowering the risk of hypoventilation. However, its usefulness may be limited by an infusion length requirement. Time must be given for the preoperative infusion to maximize the benefits of dexmedetomidine with regards to opioid requirements. Thus dexmedetomidine use for AFOI is ideally suited for elective procedures that allow sufficient infusion time, and use in emergent procedures may provide lesser benefits.

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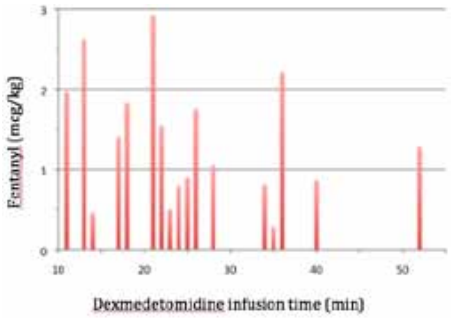

S-457.

THE EFFECT OF DIFFUSION OF 4% LIDOCAINE THROUGH THE MEDTRONIC EMG ENDOTRACHEAL TUBE CUFF ON NIM-RESPONSE®

AUTHORS: O. Asimolowo, A. Apostol, S. Jalou, K. Sundaram, M. Dela pena

AFFILIATION: Brooklyn, NY

INTRODUCTION: Thyroid and parathyroid surgery pose challenges to anesthesiologists. Lidocaine is injected into the cuff for smooth emergence.[1] It diffuses across endotracheal tube cuff and assist in the prevention of ETT-induced cough during emergence from general anesthesia.[2] The most common and serious complication after thyroid and parathyroid surgery is the risk of recurrent laryngeal nerve injury.[3] Several techniques of intraoperative neurophysiology testing (INT) have been developed. The Medtronic Xomed Nerve Integrity Monitor EMG Endotracheal tube is a flexible silicone endotracheal tube with electrodes on the main shaft, which makes contact with the patient's vocal cords to facilitate electromyographic (EMG) monitoring during surgery.[4] The objective of the study is to determine if lidocaine 4% placed in the Medtronic EMG ET tube cuff has an effect on the EMG monitoring of vocal cords

METHODS: Medtronic EMG ET tubes were used in 40 patients undergoing thyroid or parathyroid surgery; all received the same anesthetic management. As a control for each patient, the EMG recording with air was used. After obtaining consent, patients were randomized to have either lidocaine or saline injected into the cuff. After this, lidocaine 4% or saline (5mL) was injected into the EMG ET tube cuff. Blinding was done by giving the anesthesiologist either saline or lidocaine in a syringe, both colorless liquids. The stimulation of the recurrent laryngeal nerve produced amplitude and latency of the EMG curves tracing recorded on Medtronic NIM (Nerve Integrity Monitoring System). Lidocaine or normal saline (NS) was infused when the surgeon stimulates the recurrent laryngeal nerve for the first time at 1A, then 2 more times during the case at 0.8 A.

RESULTS: N/A

DISCUSSION: There was no statistically difference on the effect on the EMG monitoring of vocal cords between the two groups. Even though there was no statistical difference, there was a difference in the amplitude and latency of the EMG curves between the two groups at 5 minutes.

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S-458.

USEFULNESS OF ESTIMATED PLASMA CONCENTRATION (CP) FOR DECIDING THE TIMING OF REPEATED BOLUS ROCURONIUM ADMINISTRATION UNDER DESFLURANE ANESTHESIA

AUTHORS: K. Takahoko[1], H. Iwasaki[1], S. Otomo[1], T. Sasakawa[2], H. Iwasaki[1]

AFFILIATION: [1]Anesthesiology, Asahikawa medical college, Asahikawa, Japan; [2]Anesthesiology, Shriners Burns Institute Shriners Hospital for Children Massachusetts General Hospital Harvard Medical School, Cambridge, MA

INTRODUCTION: It has been suggested to administer sufficient doses of neuromuscular blocking drugs (NMBD) using a neuromuscular-blocking monitor during the surgery needed an absolute immobilization. However, it is difficult to find an optimal timing of relaxant injection in a clinical practice because the neuromuscular monitor sometimes shows inaccurate degree of neuromuscular blockade. In previous studies, we demonstrated that the Cp (estimated plasma concentration) of rocuronium was a useful parameter to administer an additional relaxant under sevoflurane anesthesia[1]. It has been reported that desflurane tend to have a greater potentiation effect of non-depolarizing relaxants than that of the other volatile anesthetics. Therefore, the aim of this study was to evaluate a clinical usefulness of Cp for deciding the timing of additional rocuronium administration during desflurane anesthesia.

METHODS: After obtaining IRB approval and informed consent, we recruited 10 patients who had received elective ophthalmic surgery. Anesthesia was maintained with 0.7 MAC of desflurane and remifentanil. The ulnar nerve was stimulated using TOF WatchR SX with supramaximal train-of-four stimulations. Tracheal intubation was performed after administration of 0.6 mg/kg of rocuronium. When the T1 height recovered to 25% of the maximum height, Cp was calculated (1stcalculation: Cp1) and recorded; the Cp values was calculated using Szenohradszky's parameter. Then, 0.15 mg/kg of rocuronium was administered to the patient. When the T1 height recovered to 25% again, the same calculation was performed (2nd calculation: Cp2), and the values from the 1st and 2nd calculations were compared. Data were analyzed by a paired t test. P values less than 0.05 were considered to be statistically significant.

RESULTS: Data were presented as mean ± SD. [figure1] Among the groups absolute Cp values varied widely, but it was demonstrated that inter-individual variability of the 1st and 2nd Cp values were not significantly different.

DISCUSSION: During repeated bolus administration of rocuronium under desflurane anesthesia, the Cp of rocuronium was a good predictor of recovery. Using both conventional neuromuscular-blocking monitor and Cp enables us a safer anesthetic management during desflurane anesthesia.

REFERENCES:

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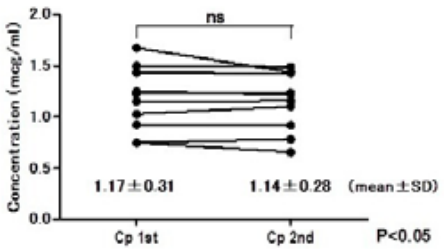
Figure 1 The estimated plasma concentration



S-459.

DOES REMIFENTANIL AFFECT THE INCIDENCE OF COLON CANCER RECURRENCE?

AUTHORS: H. Kurosaki, K. Fujii, K. Nishikawa

AFFILIATION: Anesthesiology, Wakayama Medical University, Wakayama, Japan

INTRODUCTION: Anesthetic technique during cancer surgery has been reported to have the potential to affect long term outcome. Although it is well known that morphine suppresses human Natural Killer cell cytotoxicity leading to harmful potential to cancer recurrence, the effect of synthetic opioids, such as fentanyl or remifentanil, on cancer recurrence has not been clarified. This study was aimed to evaluate the inhibitory effect of remifentanil on cancer recurrence in patients undergoing colon cancer surgery.

METHODS: We retrospectively reviewed the records of 157 patients undergoing radical colon cancer (stage IIIa/ IIIb) surgery performed in our hospital from January 2005 to December 2009. The follow-up period ended on October 2011. Prospective factors for cancer recurrence included preoperative complications, location of tumor, tumor stage, perioperative remifentanil use, and blood transfusion. Primary outcomes were the presence or absence of cancer recurrence and disease free interval. Kaplan-Meier method and Cox proportional hazards model were used. Data were represented as number (%) or Mean [95% confidence interval] and $P < 0.05$ was considered as significant.

RESULTS: Cancer recurrences were detected in 28 patients (17.8%) and remifentanil was used perioperatively in 77 patients (49.0%). Remifentanil could neither inhibit the incidence of cancer recurrence (13 (16.9%) vs. 15 (18.8%), P=0.84) nor prolong mean disease free interval (1238 [1159-1316] days vs. 1841 [1697-1985] days, P=0.70). Cox hazard analysis demonstrated that Stage IIIb was the only predictor of cancer recurrence (Odds ratio 2.2 [95% confidence interval 1.0-4.8], P=0.041) and remifentanil usage was not associated with cancer recurrence (Odds ratio 0.7 [95% confidence interval 0.2-2.1], P=0.52).

DISCUSSION: We found that intraoperative remifentanil usage during colon cancer surgery was not associated with cancer recurrence.

REFERENCES: N/A

S-460.

IMPACT OF SEVOFLURANE VS. PROPOFOL ON INCIDENT DELIRIUM AFTER NONCARDIAC SURGERY- A RANDOMIZED CONTROLLED TRIAL

AUTHORS: G. A. Lurati Buse[1], E. Seeberger[1], M. Filipovic[2,1], D. Bolliger[1], M. Seeberger[1]

AFFILIATION: [1]Anesthesiology, University Hospital Basel, Basel, Switzerland; [2]Anesthesiology, Kantonsspital St. Gallen, St. Gallen, Switzerland

INTRODUCTION: Animal studies suggest neuroprotection by sevoflurane. There is some evidence supporting this neuroprotective effect in patients undergoing cardiac surgery[1]. Our objective was to evaluate if sevoflurane compared to propofol reduced the incidence of postoperative delirium in patients undergoing major noncardiac surgery.

METHODS: This is a secondary analysis of a randomized controlled trial of sevoflurane vs. propofol to reduce perioperative ischemia. The occurrence of delirium was a prespecified secondary endpoint. We enrolled patients at cardiovascular risk in 3 centres between February 2006 and October 2010. Patients were randomized to maintenance of anesthesia with sevoflurane or propofol. Research staff previously trained by a neuropsychologist assessed the occurrence of delirium by the Confusion Assessment Method (CAM) at baseline, on postoperative day 1, 2 and day 7 or discharge day whatever occurred first. Postoperative delirium was defined as a CAM suggestive of delirium on postoperative day 1 or 2 or 7.

RESULTS: We enrolled 385 patients. Five patients dropped out (3 patients in the sevoflurane group); as such 181 patients received sevoflurane and 199 patients propofol. The CAM was missing in 1 patient (0.3%) on postoperative day 1, in 5 (1.3%) on day 2, and in 42 (11.1%) on postoperative day 7. Delirium was diagnosed in 50 (13.2%) patients, 21 (11.6%) after sevoflurane and 29 (14.6%) after propofol (p=0.392). Delirium decreased over time: 8.4% on day 1, 6.6% on day 2, and 2.1% on day 7.

DISCUSSION: Compared to propofol, sevoflurane did not reduce the occurrence of postoperative delirium in patients undergoing major noncardiac surgery.

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S-461.

RANDOMIZED CONTROLLED TRIAL OF SEVOFLURANE VS. PROPOFOL TO PREVENT MYOCARDIAL ISCHEMIA IN NONCARDIAC SURGERY PATIENTS

AUTHORS: G. A. Lurati Buse[1], P. Schumacher[2], W. Studer[3], E. Seeberger[1], D. Bolliger[1], M. Seeberger[1]

AFFILIATION: [1]Anesthesiology, University Hospital Basel, Basel, Switzerland; [2]Anesthesiology, Bürgerspital Solothurn, Solothurn, Switzerland; [3]Anesthesiology, Kantonsspital Liestal, Liestal, Switzerland

INTRODUCTION: Animal studies suggest cardioprotection by sevoflurane. There is evidence supporting this cardioprotective effect in patients undergoing cardiac surgery[1,2]. Our objective was to evaluate if sevoflurane compared to propofol reduces myocardial ischemia in patients undergoing major noncardiac surgery.

METHODS: We enrolled patients at cardiovascular risk in 3 centers between February 2006 and October 2010. Patients were randomized to maintenance of anesthesia with sevoflurane or propofol. We recorded continuous ECG (cECG) for 48 hours perioperatively and measured troponin T on postoperative day 1 and 2, and 12-lead ECG at 7 days. The predefined primary endpoint was a composite of myocardial ischemia in cECG and troponin elevation. Secondary endpoints were the single items of the primary endpoint and a composite of cECG ischemia, troponin elevation and Q-wave development. Patients and outcome assessors were blinded. We tested dichotomous endpoints by chi-squared on intention-to-treat basis.

RESULTS: We enrolled 385 patients. Five patients dropped out (3 patients in the sevoflurane group); as such 181 patients received sevoflurane and 199 patients propofol. cECG was missing in 2 (1.1%) patients in the sevoflurane and 6 (3%) in the propofol group. Troponin data on both postoperative day 1 and 2 were missing in 3 (1.7%) patients after sevoflurane and 3 (1.5%) after propofol. Simultaneous missing of troponin and cECG did not occur. The primary composite endpoint occurred in 75 (41.4%) patients after sevoflurane and 81 (40.7%) after propofol (relative risk 0.98, 95%confidence interval 0.76-1.27). None of the secondary endpoints differed between treatments.

DISCUSSION: Compared to propofol, sevoflurane did not reduce the occurrence of perioperative ischemia in patients undergoing major noncardiac surgery.

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1. Yu CH, Beattie WS. The effects of volatile anesthetics on cardiac ischemic complications and mortality in CABG: a meta-analysis. Can J Anaesth. 2006 Sep;53(9):906-18
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S-462.

DEVELOPMENT OF PROPOFOL-REMIFENTANIL DOSING MULTIOBJECTIVE OPTIMIZATION ALGORITHM FOR MODERATELY PAINFUL PROCEDURES REQUIRING ESOPHAGEAL INSTRUMENTATION

AUTHORS: C. LaPierre, K. B. Johnson, D. Westenskow, T. Egan

AFFILIATION: Bioengineering and Anesthesiology, University of Utah, Salt Lake City, UT

INTRODUCTION: Anesthesia for upper endoscopy balances drug requirements with patient safety. The ideal dosing scheme provides adequate analgesia and sedation while avoiding loss of responsiveness (LOR), respiratory depression (RD), and airway obstruction (AO). Clinicians often accept some RD, LOR, and/or AO to achieve their overall therapeutic goals. We hypothesized that optimization techniques applied to response surface drug interaction models can identify dosing regimens that minimize RD, AO, and LOR yet provides satisfactory conditions for upper endoscopy.

METHODS: Six experts in procedural sedation were asked to achieve a consensus on the allowable duration of LOR, AO, and RD during a 10 minute upper endoscopy procedure using propofol and remifentanil. Objective functions were developed that used this expert opinion to identify an optimal dosing regimen for propofol and remifentanil. Using previously developed propofol-remifentanil interaction models of LOR, RD, RC and loss of response to esophageal instrumentation (LREI), the objective functions were evaluated using 3840 different propofol-remifentanil dosing regimens. Each dosing regimen varied in terms of the propofol and remifentanil bolus sizes and infusion rates.

RESULTS: The expert consensus is presented in Table 1. The objective functions are presented below. Time to Ready for EI is the time from the beginning of the remifentanil infusion until a 70% probability of LREI. Placing Endoscope is the time from Objective 1 until the probability of LREI drops below 58%. Maintenance is the total time the probability of LREI is between 26% and 58%. Respiratory Depression is the time to reach either a 5% probability of RD or LOR, whichever is quicker, once the procedure ends. Airway Obstruction is the time to reach either a 5% probability of AO or LOR, whichever is quicker, once the procedure ends. Return of Responsiveness is the time to reach a 5% probability of LOR once the procedure ends. The optimal dosing regimen was a propofol bolus of 0.8 mg/kg and infusion rate of 40 mcg/kg/min and a remifentanil bolus of 0.2 mcg/kg and an infusion rate of 0.05 mcg/kg/min. Model predictions of probability of LOR, RD, RC and LREI are presented as isoboles in Figure 1. The resulting propofol-remifentanil effect-site concentrations are overlaid.

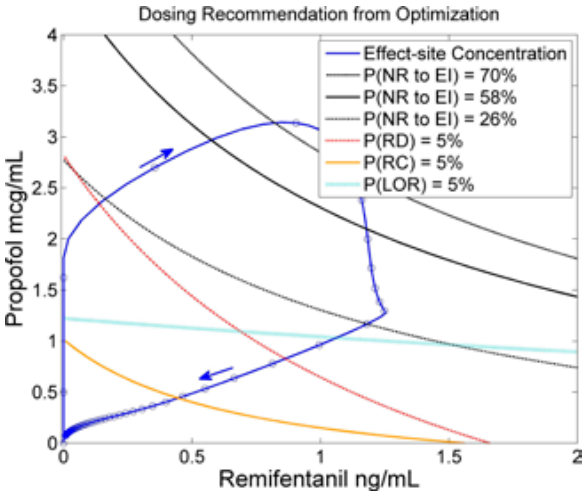
DISCUSSION: Our results confirmed our hypothesis. A remifentanil propofol dosing regimen exists that minimizes the duration of LOR, AO, and RD that, according to expert opinion, is acceptable AND provides conditions that will accommodate upper endoscopy procedures. This dosing regimen merits clinical validation in patients undergoing brief endoscopic procedures.

REFERENCES: none

Optimization targets and priorities

	Ideal	Min	Max	Priority
1) Time to Ready for EI	4	3	5	3
2) Placing Endoscope	2.25	2	4	5
3) Maintenance	6	5	10	6
4) Respiratory Depression	1.75	0	2	1
5) Airway Obstruction	1	0	2.5	2
6) Return of Responsiveness	2	0	4.5	4

Ideal = ideal objective time. Min = minimum allowable time. Max = maximum allowable time. Priority = relative importance of the objective.



P(NR to EI) = probability of no response to esophageal instrumentation. P(RD) = probability of respiratory depression. P(RC) = probability of respiratory compromise. P(LOR) = probability of loss of responsiveness.

S-463.

IMPACT OF SEVOFLURANE VS. PROPOFOL ON NT-PROBNP RELEASE AFTER NONCARDIAC SURGERY- A RANDOMIZED CONTROLLED TRIAL

AUTHORS: G. A. Lurati Buse[1], P. Schumacher[2], R. Schumann[1], J. Fassl[1], D. Bolliger[1], M. Seeberger[1]

AFFILIATION: [1]Anesthesiology, University Hospital, Basel, Switzerland; [2]Anesthesiology, Bürgerspital Soothurn, Solothurn, Switzerland

INTRODUCTION: Animal studies suggest cardioprotection by sevoflurane. There is evidence supporting this cardioprotective effect in patients undergoing cardiac surgery[1,2]. Our objective was to evaluate if sevoflurane compared to propofol reduces postoperative NT-proBNP release in patients undergoing noncardiac surgery.

METHODS: This is a secondary analysis of a randomized controlled trial of sevoflurane vs. propofol to reduce perioperative ischemia. Postoperative NT-proBNP concentrations were prespecified secondary endpoints. We enrolled patients at cardiovascular risk in 3 centres between February 2006 and October 2010. Patients were randomized to maintenance with sevoflurane or propofol. We measured NT-proBNP on postoperative day 1 and 2. Patients and laboratory staff were blinded. The distributions of NT-proBNP concentration on both postoperative days were skewed; as such, we tested for differences in the distribution of postoperative NT-proBNP concentrations (day 1 and day 2) of patients allocated to sevoflurane and to propofol by Mann-Whitney-test.

RESULTS: We enrolled 385 patients. Five patients dropped out (3 patients in the sevoflurane group); as such 181 patients received sevoflurane and 199 patients propofol. The NT-proBNP concentration was missing in 5.8% (22/380) on day 1 and in 4.2% (16/380) on day 2. The median NT-proBNP concentration on postoperative day 1 was 545.5 pg/mL (interquartile range [IQR] 260-545.5) after sevoflurane and 558.5 pg/mL (IQR 238.25-1,247.25) after propofol (p=0.844). On postoperative day 2, the median NT-proBNP concentrations was 937.0 pg/mL (IQR 483.0-937.0) and 931 pg/mL (IQR 422.5-2074.0) after sevoflurane and after propofol (p=0.858), respectively.

DISCUSSION: Compared to propofol, sevoflurane did not affect postoperative NT-proBNP release in patients undergoing major noncardiac surgery.

REFERENCES:

1. Yu CH, Beattie WS. The effects of volatile anesthetics on cardiac ischemic complications and mortality in CABG: a meta-analysis. Can J Anaesth. 2006 Sep;53(9):906-18
2. Yao YT, Li LH. Sevoflurane versus propofol for myocardial protection in patients undergoing coronary artery bypass grafting surgery: a meta-analysis of randomized controlled trials. Chin Med Sci J. 2009 Sep;24(3):133-41

S-464.

PREOPERATIVE CARBONHYDRATE ADMINISTRATION PREVENTS CATABOLISM OF FAT

AUTHORS: N. Morioka, R. Kanamori, K. Shimizu, T. Uno, M. Ozaki

AFFILIATION: Tokyo Women's Medical University, Yokohama, Japan

INTRODUCTION: Conventionally, before surgery, an intravenous solution not containing carbohydrates has been administered in patients. Recently, however, preoperative administration of carbohydrates such as glucose has been reported to prevent such clinical changes. Besides, the effects of preoperative fasting on patients, including an improvement of insulin resistance and effects of other nutrients on fat metabolism, have not been studied in detail. In the present study, we investigated the effects of preoperative carbohydrate administration (glucose load) on intraoperative and postoperative clinical conditions of patients undergoing elective laparoscopic colectomy.

METHODS: 35 patients aged 20 years or older who were scheduled to undergo elective laparoscopic colectomy. ASA Physical Status classification of 1 or 2 with no history of abnormal glucose tolerance or abnormal electrolyte metabolism the glucose administration group (G group, 10 patients) and the control group (GF group, 10 patients). In the G group, 1500 mL of a maintenance solution containing 10% glucose (glucose load: 150 g) was administered from the day before surgery, and in the GF group 1500 mL of a glucose-free extracellular fluid replacement solution was administered in a similar manner.

RESULTS: figure1

DISCUSSION: Changes in blood glucose and HOMA-IR, an indicator of insulin resistance, were within normal range because patients with diabetes were excluded from the study, and preoperative glucose administration in patients with normal glucose metabolism did not affect insulin resistance. In addition, glucose administration that started before surgery suppressed the excess of fat catabolism. In contrast, administration of the solution not containing glucose during surgery enhanced fat catabolism. These findings indicate that glucose loading, even a small amount, may be necessary before and during surgery. Furthermore, administration of a glucose-free solution significantly affects fat metabolism before and during surgery. Glucose administration did not affect protein catabolism. Changes in blood glucose due to stress hormone were negligible. Although further studies on protein and fat administration and administration in patients suspected of abnormal glucose tolerance are necessary in the future, the results suggest the administration of carbohydrates such as glucose before and during surgery may be essential to maintain perioperative metabolism.

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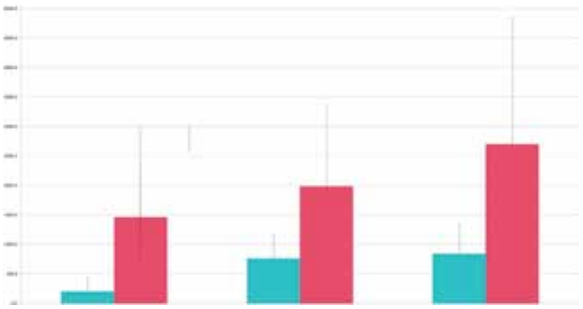

S-465.

UDP GLUCURONOSYLTRANSFERASE 2B7*2 (802C>T, RS7439366) INFLUENCES SERUM LEVELS OF MORPHINE AND MORPHINE GLUCURONIDES INVERSELY TO PUPIL EFFECTS AFTER I.V. CYCLOSPORINE IN A CROSSOVER VOLUNTEER STUDY

AUTHORS: K. Meissner[1,3], H. E. Meyer zu Schwabedissen[2], C. E. Göpfert[3], J. Blood[3], T. Kim[3], E. Kharasch[3]

AFFILIATION: [1]Klinik für Anästhesiologie und Intensivmedizin, Universitätsmedizin Greifswald, Greifswald, Germany; [2]Dept. of Pharmacology/Center for Drug Absorption and Transport, Universitätsmedizin Greifswald, Greifswald, Germany; [3]Dept. of Anesthesiology, Washington University in St. Louis, St. Louis, MO

INTRODUCTION: Morphine remains the most widely used intravenous opioid in the perioperative setting worldwide. Maintaining therapeutic CNS concentrations of many opioids is confounded by considerable variability in disposition. Several findings indicate a role for the UDP glucuronosyltransferase 2B7 for variability of substrate effects, attributed to genetic factors and changes in glucuronization. However, evidence for effect variation due to genetically determined UGT 2B7 activity and thus variable glucuronization of morphine in humans is lacking. In the context of drug transport inhibition by cyclosporine, serum levels as well as effect should be more predictable.

METHODS: We tested the hypothesis that variations of morphine levels and effects could be explained in part by genetic variation in the UGT2B7*2 locus (H268Y) by pupil diameter change in 12 healthy volunteers, who were given 0.1 mg/kg morphine i.v. for one hour with and without the infusion of 0.25 mg/kg/h cyclosporine for two hours (preceedeing and during the morphine infusion) in a crossover fashion. Here we report the results for the UGT2B7 (rs7439366) SNP on chromosome 4, coding for a histidine or a tyrosine at position 268, resulting in decreased enzyme activity.

RESULTS: Five subjects exhibited the wildtype (CC), and seven were heterozygous (CT) carriers of the mutant allele. Peak clinical effects, indicated by miosis, were measured between 1 and 3 hours after the start of injection. No major differences could be detected for the mutated variants after morphine only (CC vs. CT: peak 1.9/2.1 mm, 10 h AUC 11.1/11.3), but after cyclosporine intervention by means of an extended plateau phase (peak 2.8/2.8 mm, AUC 16.7/19.5). Surprisingly, these findings were accompanied by attenuated serum levels in CT carriers for morphine (CC vs. CT: control: 55.3 ± 8.3 vs. 36.5 ± 8.8 ng/ml; CsA: 55.8 ± 12.7 vs. 43.9 ± 9.5 ng/ml) as well as for morphine-3- (136.5 ± 20.6 vs. 106.5 ± 33.6 and 135.6 ± 21.5 vs. 107.9 ± 26.5) but not 6-(25.3 ± 6.2 vs. 22.3 ± 4.3 and 23.7 ± 5.6 vs. 22.0 ± 5.8) glucuronide.

DISCUSSION: We conclude that while morphine effects might be influenced in part by UGT2B7 genotype, there is no readily explainable increase in morphine or morphine-glucuronide serum levels in 2B7*2 subjects. As described before, drug transport inhibition seems to have far more influence on morphine effect - but without influencing serum levels, which warrants further investigation.

REFERENCES: n/a

S-466.

THE EFFECT OF APREPITANT FOR THE PREVENTION OF POSTOPERATIVE NAUSEA AND VOMITING IN PATIENTS UNDERGOING GYNECOLOGIC SURGERY WITH INTRAVENOUS PATIENT-CONTROLLED ANALGESIA USING FENTANYL

AUTHORS: K. Soon Im, L. Se Jin

AFFILIATION: Anesthesiolsy, Soonchunhyang University Hospital, Seoul, Republic of Korea

INTRODUCTION: The aim of this study was to evaluate the effect of an NK1 receptor antagonist (aprepitant) for reducing postoperative nausea and vomiting (PONV) for up to 24 h in patients undergoing gynecological surgery with iv patient-controlled analgesia (PCA) using fentanyl for postoperative pain control.

METHODS: In this prospective, randomized, double blinded study, a healthy 84 gynecological surgical patients receiving a standardized general inhalation anesthesia were investigated. Patients were randomly allocated to receive aprepitant 80 mg orally before 3 h operation (aprepitant group) or not to receive it (control group). All patients received ramosetron 0.3mg iv after induction of anesthesia. We assessed incidence of PONV, severity of nausea, use of rescue antiemetics and incidence of adverse events for up to 24 hours postoperatively.

RESULTS: During the first 24 h after operation, the incidence of nausea was lower in aprepitant group (50%) compared to the control group (81%), and the incidence of vomiting was lower in aprepitant group (5%) compared to the control group (43%) ($P < 0.05$). In addition, severity of nausea was lower in aprepitant group than in control group over 24 h postop ($P < 0.05$). Use of rescue antiemetics were lower in aprepitant group than control group over 24 h postop. ($p < 0.05$).

DISCUSSION: In patients regarded as high risk for PONV undergoing gynecological surgery with iv-PCA using fentanyl, the addition of aprepitant to ramosetron significantly decreases the incidence of PONV, use of rescue antiemetics and nausea severity for up to 24 hours postoperatively.

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Regional Anethesia

S-472.

CAN THE USE OF HIGH DOSE DEXMEDETOMIDINE WITH BUPIVACAINE ELIMINATE THE NEED FOR A PERIPHERAL NERVE CATHETER?

AUTHORS: W. Alrayashi, C. Scher, L. Capan

AFFILIATION: Anesthesiology, New York University Medical Center, New York, NY

INTRODUCTION: Dexmedetomidine (Dex) is gaining traction as an effective adjunct in regional and neuraxial analgesia.[1-3] Our aim was to determine the duration of motor and sensory blockade using bupivicaine (Bupiv) with high dose Dex in a popliteal nerve block (Dex-PB). We also compared that to Bupiv with epinephrine (Epi) in a saphenous nerve block (Epi-SB) on the same patient.

METHODS: A 29 year old male, NK, with a right bimalleolar ankle fracture presented for ORIF. A Dex-PB was done under ultrasound guidance and 20 cc of 0.5% Bupiv with 100mcg of Dex was injected. The Epi-SB was completed with 10cc of 0.5% Bupiv with 1:200,000 of Epi. After induction and LMA placement, he remained hemodynamically stable. NK was discharged the same day with follow up phone calls on post-op days 1, 2, 3, 7, and 14. Sensation, motor function, pain score, medication intake, and side effects were assessed.

RESULTS: The patient had 22.5 hrs of motor and 44.2 hrs of sensory blockade after the Dex-P block. In contrast, the Epi-S lasted 9 hrs and 13 hours, respectively. In the recovery room, there were no significant alterations in blood pressure (defined as a ≥20% change from baseline) or heart rate (≥10% change). One tablet of Norco 5mg-325mg was taken 8 hrs post-injection and then every 8 hrs the following day for a pain score of 3/10 along the medial side of his ankle. He had no pain along the lateral aspect of his ankle until 44.2 hrs later, subsequently increasing his narcotic intake. He noted tingling along the medial and then lateral side of his leg, 12hrs and 40hrs post-injection; both of which resolved within 2-3 hrs. NK denied lightheadedness, sedation, syncope, nausea, vomiting, and blurry vision.

DISCUSSION: Prior studies have demonstrated that the use of Dex is a safe and valuable adjunct in regional analgesia. A proposed mechanism is that it blocks a hyperpolarization-activated cation current, not by α2 receptor agonism.[3] Brummet et al. showed that the nerve axon and myelin of rats were not adversely affected after a Dex + Bupiv sciatic block.[1] Esmaoglu et al. confirmed that adding 100mcg of Dex to levobupivicaine extended the duration of an axillary block.[2] Our case differed in that we compared Dex + Bupiv versus Epi + Bupiv using two different blocks in one patient. We found an unexpected duration of sensory (>40 hrs) and motor blockade (>20 hrs) when Dex was used. This encourages the idea that peripheral nerve catheters may not be needed for select cases, which would presumably decrease the risk of infections, cut costs, and expedite discharge.

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S-473.

WITHDRAWN.

S-474.

THE EFFECT OF A PREOPERATIVE SCIATIC NERVE BLOCK IN ADDITION TO A FEMORAL NERVE BLOCK FOR AMBULATORY ACL RECONSTRUCTION: A RETROSPECTIVE ANALYSIS

AUTHORS: K. Kolodzie[1], J. M. Cohen[1], S. Shah[2], P. Aleshi[1]

AFFILIATION: [1]Department of Anesthesia & Perioperative Care, University of California, San Francisco, San Francisco, CA; [2]College of Medicine, University of Illinois at Chicago, Chicago, IL

INTRODUCTION: For patients undergoing ambulatory arthroscopic reconstruction of the anterior cruciate ligament (ACL) excellent postoperative analgesia with minimal systemic side effects is of critical importance for early recovery and discharge as well as patients' satisfaction. Regional anesthesia techniques might be able to contribute to these goals. The knee is innervated by the femoral nerve anteriorly and the sciatic nerve posteriorly; both of which could be potential targets for peripheral nerve blocks. Femoral nerve block (FNB) alone has not consistently been shown to improve postoperative analgesia[1,2] and data on the efficacy of combined nerve blocks are sparse. The aim of this study was to retrospectively compare patients receiving FNB to those undergoing femoral and sciatic nerve blocks (FSNB) preoperatively. We hypothesized that a combined FSNB would result in lower postoperative pain scores, decreased opioid consumption, and a shorter PACU duration.

METHODS: Upon IRB approval a retrospective chart review of patients undergoing arthroscopic ACL reconstruction at a single ambulatory center between 10/09 and 05/11 was performed. Patients receiving either FNB or FSNB preoperatively were included. Primary outcome variables were highest PACU pain score, total morphine equivalents (ME) and PACU time.

Relevant demographic and perioperative data were extracted and univariate group comparison between patients receiving FNB only versus patients receiving FSNB was performed. $\chi 2$ test and Mann-Whitney U-test were applied as appropriate. Due to an uneven distribution of baseline characteristics we developed multivariate linear regression models for each primary outcome.

RESULTS: A total of 191 patients were included. All patients received a FNB preoperatively. 93 patients additionally received a posterior sciatic nerve block (SNB). All patients underwent general anesthesia with placement of a laryngeal mask.

In multivariate linear regression higher PACU pain scores were found in patients receiving FNB vs FSNB and in patients receiving autograft vs allograft. Higher total ME were found in patients receiving FNB only and in patients with higher BMI scores. The need for a rescue block and the presence of PONV in PACU were identified as predictors for increased PACU time.

DISCUSSION: The addition of a preoperative SNB to a FNB was associated with lower postoperative pain scores and decreased opioid requirements. Further prospective studies are needed to confirm these positive results and to investigate additional important outcomes such as patients' satisfaction, time- and cost-effectiveness, and adverse event rates.

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S-475.

A PILOT STUDY TO COMPARE EPIDURAL IDENTIFICATION AND CATHETERIZATION USING A SALINE FILLED SYRINGE VERSUS A NOVEL CONTINUOUS HYDROSTATIC PRESSURE SYSTEM

AUTHORS: Y. M. Samhan, H. H. El Sabae, H. F. Khafagy, M. Mahert

AFFILIATION: Giza, Egypt

INTRODUCTION: We are introducing a novel continuous hydrostatic pressure system for identification and catheterization of epidural space and minimizing associated complications. Thus, we designed this prospective randomized study to compare the saline-filled syringe with the continuous hydrostatic system as regards the ease of epidural performance.

METHODS: Laboratory model: When various anesthetists introduced 18 G epidural needle through thick, closed-cell foam, the exerted pressure ranged between 250-300 mmHg. We started by a pressure of 20 mmHg then increased incrementally. The flowing saline at 40-60 mmHg was about 2-3 ml; the same volume while using saline-filled syringe so we settled this pressure as a standard during the procedure.

CLINICAL STUDY: After obtaining institutional ethical committee approval and informed written consents, 108 patients aged 25-65 years ASA I-II scheduled for elective endoscopic urological procedures were enrolled in the study. They were randomly assigned to perform loss of resistance epidural technique by either: the conventional method with saline-filled syringe (group C) or using the novel continuous hydrostatic pressure system (group P). The later technique depends on observing passage of free flow of pressurized normal saline connected by infusion set to epidural needle via the side channel of a three way stopcock during its advancement. Once the needle reached the epidural space, the epidural catheter was inserted from the back of stopcock and advanced in the epidural space to "float" easily while saline was flowing. In both groups, 10 ml of bupivacaine 0.5% with 50 ug fentanyl were injected. Time to identify epidural space, number of attempts and ease of epidural catheterization were assessed. Sensory and motor block after 20 min, surgical conditions and any side effects were recorded.

RESULTS: There were no significant differences in demographic data. In group P, time to identify epidural space is significantly shorter, number of attempts is significantly less and the motor block at 20 min is significantly lower compared with group C (P value 0.001, 0.023, 0.018 respectively). No significant difference in the catheterization, sensory block, surgical conditions and incidence of side effects.

DISCUSSION: Our results are similar to the Episure AutoDetect syringe[1] and Epidrum[2] concerning time to identify epidural space and number of attempts in the former. We concluded that this hydrostatic pressure technique is an easy way to identify epidural space using available tools in the operating room without recorded complications.

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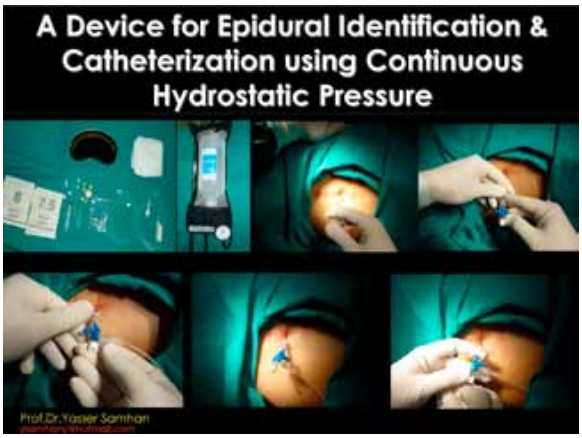

S-476.

EVALUATION OF PREDICTIVE POWER OF DIFFICULT SPINAL SCORE TO ACTUAL DIFFICULTY DURING SPINAL ANESTHESIA AND ITS COMPLICATIONS

AUTHORS: M. Al-Mahrami[1,2], M. J. Albahrani[2,1], S. Trehun[1,2], R. Khan[1,2], N. Kaul[1,2]

AFFILIATION: [1]Anaesthesia & ICU, Khoula Hospital, Al Harthy Complex, Oman; [2]Anaesthesia & ICU, Royal Hospital, Muscat, Oman

INTRODUCTION: Score for predicting difficult spinal anesthesia administration has been suggested by Atallah, Demian and Shorrab, 2004. However they made no attempt to correlate the difficulty in spinal anesthesia administration and complications associated during or after the procedure.

METHODS: After Hospital Ethical Committee approval, 64 ASA I & II patients of either sex undergoing surgical procedures under spinal anesthesia were randomly selected. The patients were graded into 4 grades of PDSS according to 4 different variables suggested by Atallah, Demian and Shorrab1.

Standard technique of spinal was used. Number of attempts and duration in minutes required for successful intra-thecal spinal needle placement, discomfort during the procedure, was successful or failed, and development of post spinal complications like backache, post spinal headache, or persistent neurological injury were recorded.

RESULTS: The results of this study demonstrate that as we progress from grade I to grade IV of PDSS the number of spinal needle pricks needed to perform successful spinal anesthesia increased from a mean of 1.0 to 2.2 and time to administer spinal anesthesia increased for a mean of 5.0 to 8.1 minutes. However we did not note any correlation between increasing grades of PDSS and post-spinal complications, possibly due to small sample size.

DISCUSSION: This clinical trial has demonstrated that an increase in grade of PDSS is directly correlated with an increase in number of spinal needle pricks and time to successfully perform spinal anesthesia. This may have clinical significance as these issues can be discussed with the patient and the surgeon prior to initiating spinal anesthesia. In addition, a quick assessment of PDSS can forewarn the attending anesthesiologist of the probable difficulty he/she may encounter in terms of needle pricks and time for successful spinal anesthesia with increasing grade of PDSS. This may be of great significance in situations where urgency is paramount as during LSCS.

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S-477.

CHARACTERISTICS OF TRANSIENT PARESTHESIA DURING EPIDURAL CATHETER PLACEMENT: THE INCIDENCE AND LOCATION OF PARESTHESIA ACCORDING TO THE VERTEBRAL LEVEL OF THE PUNCTURE

AUTHORS: A. Ogura[1,2], M. Zenfuku[2], Y. Nakajima[2], T. Inoue[3]

AFFILIATION: [1]Anesthesiology, Mizonokuchi Hospital, Teikyo University School of Medicine, Kawasaki, Japan; [2]Anesthesiology, Shizuoka Red Cross Hospital, Shizuoka, Japan; [3]Anesthesiology, Chiba-Hokusoh Hospital, Nippon Medical School, Chiba, Japan

INTRODUCTION: Several studies have reported the incidence of transient paresthesia during epidural catheter placement, but none have analyzed the characteristics including the location of paresthesia. We hypothesized that the characteristic of paresthesia including the location might be related to the vertebral level of epidural puncture.

METHODS: After obtaining IRB approval and informed consent, adult patients were divided into four groups according to the epidural puncture site: UT (upper thoracic, T3-4), MT (middle thoracic, T8-9), LT (lower thoracic, T11-12), and LB (lumbar, L3-4). The patient was positioned in right lateral decubitus position. Epidural puncture was performed via paramedian approach. After choosing the interspace, a skin wheel of local anesthetic was applied at a point 1 cm lateral to the edge of the spinous process. The Tuohy needle was inserted until the vertebral lamina was encountered. After advancing the needle to the ligamentum flavum, the epidural space was identified by the loss-of-resistance technique to normal saline. A closed-tip side-hole nylon catheter was inserted 5 cm cephalad in the epidural space. Transient paresthesia, technical difficulties and the occurrence of complications during the catheter placement were recorded. Data were analyzed by ANOVA test followed by Scheffe's post-test or Chi-square analysis as appropriate. $P < 0.05$ was considered significant.

RESULTS: There were no major complications noted in all groups. The incidences of paresthesia in the UT (n = 240), MT (n = 301), LT (n =302) and LB (n = 339) groups were 4 (1.7%), 13 (4.3%), 22 (7.3%) and 0 (0%), respectively, with significant differences among the groups ($P < 0.0001$). Paresthesia disappeared in all patients after epidural catheter placement. There were no permanent neurologic complications in all cases. The table shows locations of paresthesia according to the puncture level.

DISCUSSION: Paresthesia occurred unilaterally or bilaterally and the location of parethesia was also characteristic depending on the puncture level. Paresthesia is more frequently observed in the lower thoracic region than in the other regions. The lumbar enlargement of the spinal cord extends in the region. The cause of paresthesia might be due to the catheter-induced compression of the nerve root or the spinal cord. In the present study, we employed the original paramedian technique described by Bonica[1]. No cases in the lumber group observed paresthesia during the procedure. This might be attributable to straight advancement of the catheter having been easier in the epidural space, such that nerve root compression at the intervertebral foramen may be avoided.

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S-478.

THE EFFECT OF MUSIC ON PATIENTS' INTRA-OPERATIVE ANXIETY IN ORTHOPEDIC SURGERY UNDER SPINAL ANESTHESIA

AUTHORS: R. Traiyawong

AFFILIATION: Anesthetic Nursing Department, Maharat Nakhornratchasima Hospital, Muang, Thailand

INTRODUCTION: The purpose of this quasi-experimental research was to study effects of music on intraoperative anxiety and physiologic response of orthopedics' patient under spinal anesthesia

METHODS: Purposive sampling was used. Sixty-six patients scheduled for elective orthopedics surgery at our hospital during June to December 2009 were enrolled. The subjects were divided into two groups. The experimental group received conventional care plus the Thai light music while the control group received conventional care. The State Anxiety of Spielberger and physiologic response were assessed and analyzed as the study outcomes. Data were analyzed by means of percentage, means, standard deviation, t-test, and covariance.

RESULTS: The study revealed the level of anxiety was significantly lower than the control group ($P<0.05$) .No significant differences in blood pressure, heart rate, and respiratory rate were found between groups.

DISCUSSION: The results indicated that music can be used to decrease intraoperative anxiety and to promote relaxation in patients underwent surgery which is relevant to the strategy of the hospital for increasing patients' satisfaction.

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S-479.

WITHDRAWN.

S-480.

WITHDRAWN.

S-481.

KIDNEY INJURY AFTER PERCUTANEOUS AND DOSE RANGING EFFECTS OF INTRATHECAL EPINEPHRINE ON ANESTHESIA/ANALGESIA: A META-ANALYSIS AND META-REGRESSION OF RANDOMIZED CONTROLLED TRIALS

AUTHORS: G. S. De Oliveira, R. J. McCarthy

AFFILIATION: Chicago, IL

INTRODUCTION: Several opioids and non-opioids drugs have been used intrathecally in conjunction with local anesthetics in order to improve analgesia and anesthesia outcomes. Intrathecal epinephrine has been examined by clinical studies but its effects on analgesia/anesthesia outcomes as well as on undesirable side effects is not clearly defined. The objective of this study was to examine the effects of intrathecal epinephrine on intrathecal anesthesia/analgesia.

METHODS: We performed a Meta-analysis using a random-effect model. Effects of intrathecal epinephrine dose were evaluated by pooling studies into 3 dosage groups: low (1-100 mcg), intermediate (101-200mcg) and high (≥200mcg). Meta-regression analysis was also performed to examine the presence of a linear association between intrathecal epinephrine dose and effect size on evaluated outcomes.

RESULTS: Twenty-four randomized clinical trials with 1271 subjects were included. The mean (95% CI) combined effects favored intrathecal epinephrine over placebo for duration of analgesia, 27.0 (20.8 to 33.3) , sensory , 24.3(18.7 to 29.9) and motor block, 32.2 (26.2 to 38.2) minutes. The incidence of hypotension was greater in the epinephrine group compared to placebo, odds ratio (95% CI) of 1.5 (1.1 to 2.3). The increase incidence of hypotension was not detected for the intermediate dose group, 0.9 (0.5 to 1.7). The incidence of instrumental delivery/c-section was lower in the epinephrine group compared to saline, 0.63(0.41 to 0.95).

DISCUSSION: Intrathecal epinephrine has dose dependent clinical and adverse effects. Doses>100 mcg can reduce the incidence of hypotension while proving significant clinical benefits on sensory and motor block duration.

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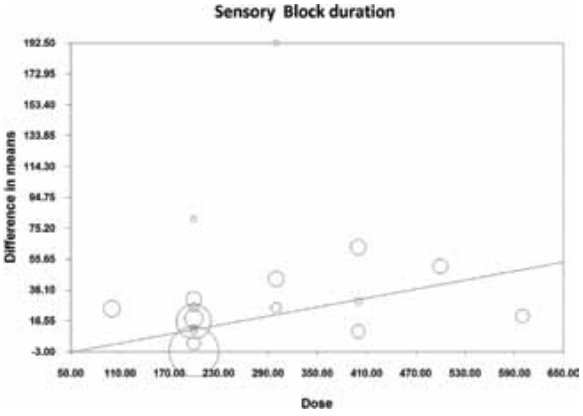

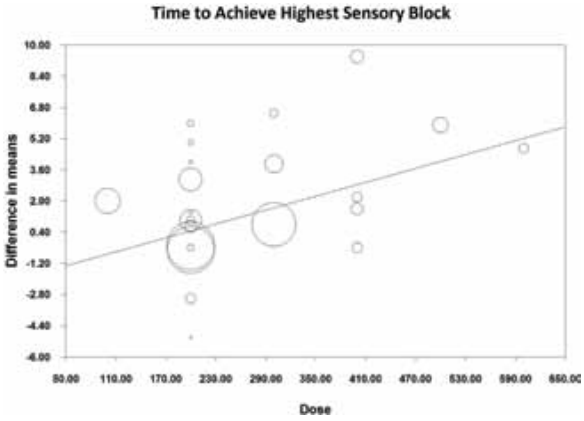

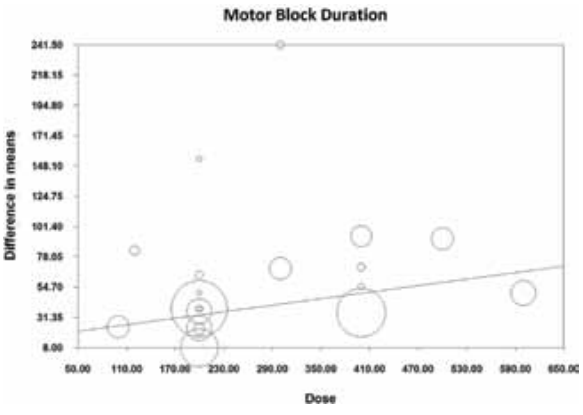

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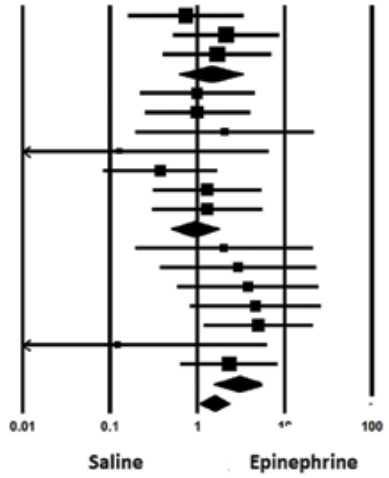
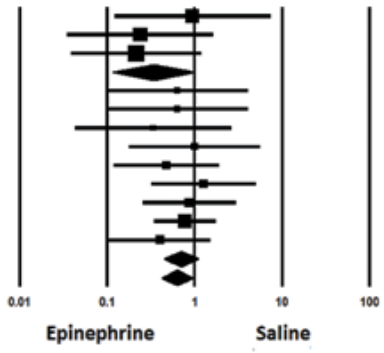
S-481 • continued

Group by Comparison	Study name	Comparison	Outcome	Peto odds ratio	Lower limit	Upper limit	Z-Value	p-Value
>200	Racle 4.1	>200	Hypotension	0.741	0.163	3.379	-0.387	0.699
>200	Racle 4.2	>200	Hypotension	2.123	0.530	8.514	1.063	0.288
>200	Racle 4.3	>200	Hypotension	1.676	0.410	6.858	0.719	0.472
>200				1.430	0.624	3.273	0.845	0.398
101-200	Inoue 1	101-200	Hypotension	1.000	0.223	4.492	0.000	1.000
101-200	Inoue 2	101-200	Hypotension	1.000	0.252	3.969	0.000	1.000
101-200	Fournier	101-200	Hypotension	2.046	0.196	21.361	0.598	0.550
101-200	Campbell	101-200	Hypotension	0.128	0.003	6.479	-1.026	0.305
101-200	Bostrom	101-200	Hypotension	0.379	0.085	1.690	-1.272	0.203
101-200	Acalovschi	101-200	Hypotension	1.300	0.314	5.379	0.362	0.717
101-200	Racle 4	101-200	Hypotension	1.308	0.311	5.498	0.366	0.714
101-200				0.935	0.506	1.730	-0.213	0.831
1-100	Gurbet 1	1-100	Hypotension	2.019	0.198	20.619	0.593	0.553
1-100	Gurbet 2	1-100	Hypotension	2.955	0.384	22.722	1.041	0.298
1-100	Gurbet 3	1-100	Hypotension	3.808	0.598	24.231	1.416	0.157
1-100	Gurbet 4	1-100	Hypotension	4.615	0.831	25.619	1.749	0.080
1-100	Okutamin	1-100	Hypotension	4.978	1.187	20.876	2.194	0.028
1-100	Vercauteren	1-100	Hypotension	0.123	0.002	6.226	-1.047	0.295
1-100	Gautier	1-100	Hypotension	2.309	0.650	8.203	1.294	0.196
1-100				3.021	1.547	5.900	3.237	0.001
Overall				1.559	1.048	2.319	2.189	0.029



Meta Analysis

Group by Comparison	Study name	Comparison	Outcome	Peto odds ratio	Lower limit	Upper limit	Z-Value	p-Value
101-200	Campbell	101-200	Instrumental/CS	0.946	0.123	7.295	-0.053	0.957
101-200	Grieco	101-200	Instrumental/CS	0.240	0.035	1.623	-1.464	0.143
101-200	Cammann	101-200	Instrumental/CS	0.217	0.039	1.203	-1.749	0.080
101-200				0.338	0.115	0.999	-1.961	0.050
1-100	Gurbet 1	1-100	Instrumental/CS	0.640	0.101	4.075	-0.472	0.637
1-100	Gurbet 2	1-100	Instrumental/CS	0.640	0.101	4.075	-0.472	0.637
1-100	Gurbet 3	1-100	Instrumental/CS	0.338	0.044	2.603	-1.041	0.298
1-100	Gurbet 4	1-100	Instrumental/CS	1.000	0.180	5.551	0.000	1.000
1-100	Goodman 1	1-100	Instrumental/CS	0.480	0.122	1.891	-1.049	0.294
1-100	Goodman 2	1-100	Instrumental/CS	1.277	0.324	5.029	0.350	0.727
1-100	Vercauteren	1-100	Instrumental/CS	0.869	0.258	2.932	-0.226	0.822
1-100	Okutomi	1-100	Instrumental/CS	0.778	0.349	1.735	-0.614	0.539
1-100	Gautier	1-100	Instrumental/CS	0.402	0.107	1.509	-1.350	0.177
1-100				0.701	0.449	1.095	-1.561	0.118
Overall				0.631	0.418	0.953	-2.190	0.028



Meta Analysis

S-482.

TROUBLE-SHOOT CONTINUOUS PERIPHERAL NERVE CATHETER, HOW MUCH SHOULD WE WITHDRAW?

AUTHOR: J. Liu

AFFILIATION: Department of Anesthesiology and Critical Care, University of Pennsylvania, Philadelphia, PA

INTRODUCTION: Continuous peripheral nerve catheter (CPNC) is a common practice to provide regional anesthesia. It provides great benefits of regional anesthesia, such as extending the duration of analgesia that could not be achieved by single shot nerve block, titrating effects with various concentrations and volumes, and etc. However, CPNC is more complicated to place and maintain than single shot nerve block. One frequent question is how to trouble-shoot peripheral nerve catheter. The practice is largely based on personal clinical experience.

We conducted this study to test the hypothesis that the position of the tip of the CPNC is not correlated with the bevel direction of the needle when the catheter is over-threaded. Our secondary hypothesis is that when withdrawing the over-threaded catheter, the tip does not start to move until it is only a few centimeters beyond the original position of needle tip.

METHODS: We used store bought pig hind leg as our model. Ultrasound-guided in plane sciatic nerve block was performed with 18G Contiplex Tuohy needle, 30 mL local anesthetics was injected after satisfactory needle placement. This procedure reflects our usual clinical practice when placing CPNC. Non-stimulating 20G CPNC was then threaded beyond the tip of the needle. The needle was subsequently removed from the hind leg with the CPNC remaining in place. The movement of the tip of CPNC was observed under fluoroscopy while CPNC was withdrawn one centimeter at a time. There were two groups in the study, catheter was threaded 5 centimeters beyond the tip of the needle in group one, and at least 10 centimeters beyond the tip of the needle in group two.

RESULTS: Our preliminary observation indicated that the position of the tip of the CPNC is less likely correlated with the bevel direction of the needle when the catheter is over-threaded. The tip of CPNC was not adjusting immediately when CPNC was over-threaded and then withdrawn. The tip only started to adjust after the CPNC is only a few centimeters beyond the original position of the tip of the needle.

DISCUSSION: In conclusion, we would recommend the following. First, we recommend against over-thread catheter. Second, in case of necessity of adjusting over-threaded catheter, we would recommend withdrawing catheter based on the original depth of needle so that the tip of the catheter will only be several centimeters beyond the original depth of needle. Currently, we are replicating our preliminary findings.

REFERENCES: None in the literature.

S-483.

A TIME STUDY OF NEURAXIAL REGIONAL ANESTHESIA TECHNIQUE FROM PATIENT POSITIONING TO NEEDLE INSERTION: IMPLICATIONS FOR CHLORHEXIDINE SKIN ANTISEPSIS

AUTHORS: E. Manis[1], P. Nystrom[2]

AFFILIATION: [1]Wright State University Boonshoft School of Medicine, Dayton, OH; [2]Anesthesiology, Pulmonary and Critical Care Medicine, Department of Veterans Affairs Medical Center, Dayton, OH

INTRODUCTION: When performing neuraxial regional anesthesia techniques, antiseptic skin preparation is necessary to minimize infectious complications. Although there is insufficient clinical data to support FDA approval of chlorhexidine use prior to lumbar puncture, chlorhexidine is recommended for skin preparation prior to spinal or epidural anesthesia[1,2]. To date, chlorhexidine skin antisepsis has not been associated with neurologic complications[3]. The manufacturer recommends up to three minutes of drying time after chlorhexidine prep. Most anesthesia providers apply skin antisepsis just prior to placing a sterile field drape and beginning the procedure. This practice limits the amount of time for antiseptic solution skin contact and drying. We propose that application of skin antiseptic solution immediately after patient positioning and identification of anatomical landmarks provides at least 3 minutes for solution contact and drying prior to needle insertion.

METHODS: The study is an observational, blinded operator, time study of neuraxial technique from patient positioning and anatomical landmark identification to needle insertion. All anesthesia staff and trainees were unaware of the time study while observed performing spinal and epidural anesthesia in routine practice. A hidden stopwatch recorded time from the moment the provider turned away from the patient after patient positioning and marking anatomical landmarks, i.e. start time. The time of skin antisepsis was noted (Tprep), and timing was stopped when the spinal or epidural needle contacted skin. Total time from start to stop was documented (Ttot) as well as skin prep to needle insertion (Tdiff=Ttot-Tprep). Descriptive statistical analysis was performed on the time results with SPSS 19.0.

RESULTS: See Table 1

Discussion: Approximately 5 minutes elapse from the time a patient is positioned to the time a spinal or epidural needle contacts skin. A substantial number of neuraxial procedures are performed in much less time by anesthesia providers highly skilled in neuraxial techniques. In this study, 20/45 (44%) neuraxial procedures had less than 3 minutes of skin antisepsis contact and drying time. To allow the most time for antiseptic solution skin contact and drying during neuraxial procedures, a single application of skin antisepsis should occur immediately after positioning the patient and identifying the relevant procedural anatomy.

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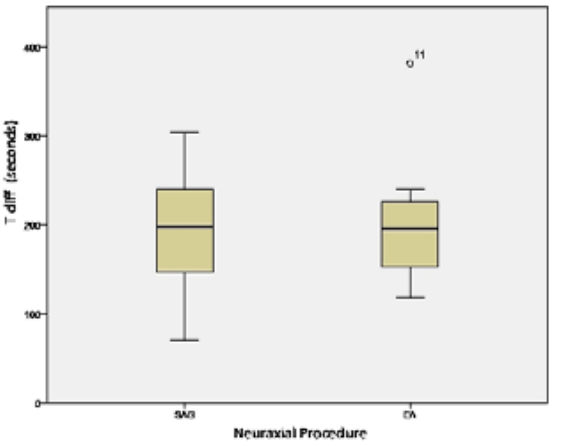
FIGURE 1: Time from skin antisepsis to needle insertion (Tdiff) by neuraxial technique



S-484.

A MODEL OF TAIL NERVE BLOCK IN CONSCIOUS RATS

AUTHORS: Z. Li[1,2], J. Liu[2,3]

AFFILIATION: [1]Department of Pharmacology, West China School of Pharmacy, Sichuan University, Chengdu, China; [2]Laboratory of Anaesthesia and Critical Care Medicine, West China Hospital, Sichuan University, Chengdu, China; [3]Department of Anesthesiology, West China Hospital, Sichuan University, Chengdu, China

INTRODUCTION: In resent years, interests in use of new local anesthetics and additives designed to enhance block duration and quality, have been developed. One of important works was preclinical testing in animals to determine safety, efficacy, and pharmacokinetics of those drugs. This study was designed to develop a simple and effective model of tail nerve block without general anesthesia and surgical incision assist for exploring and studying new local anesthetics.

METHODS: All the animal experiments in this study were approved by the Institutional Animal Care and Use Committee of our University. Tail nerves of adult male SD rats were blocked by respectively injecting 1% lidocaine (Lido group) and 0.5% bupivacaine (Bupi group) around tail nerves. The blocking procedures were performed as follows: two elastic rubber tourniquets were prior applied on the base of the tail and 4 cm distally to the base of tail respectively until 2 minutes after drugs injection. After local skin disinfection, tail nerve block was performed on the two sides of tail between two tourniquets, and the sites of injection were near the base of the tail (about Co5-8, Fig. 1[1]. With a 26 G needle connected to a microsyringe, 100 μL drugs were infiltrated near to the dorsal and lateral surface of the caudal transverse process in each injection, and each side of the tail received two blocks with an interval of about 1cm along the axis of the tail. For assessing the tail nerve block model, effects of tail nerves block induced by the two classical local anesthetics were assessed and compared by recording disappear and recovery time of thermal and mechanical nociception, which were measured by recording the latency in tail flick test and monitoring the response in tail clamp test with an alligator[2]. Pathological study of the rat-tail nerves was used to evaluate the potential influence of drugs.

RESULTS: The results showed that after drugs were administered around rat-tail nerves, thermal and mechanical nociception of rat-tail disappeared, while unchanged by normal saline. There was a faster disappearance and a shorter recovery of thermal and mechanical nociception in Lido group than Bupi group (Tab.1 and Fig.2). No abnormal results were found in both the 3-day observation and the pathological study (Fig.3), and pain threshold of all rats were fully recovered.

DISCUSSION: An easily operated, reliable and reversible model of tail nerve block was developed in conscious rats and could be used to evaluate efficacy, safety and pharmacokinetics of new local anesthetics and additives.

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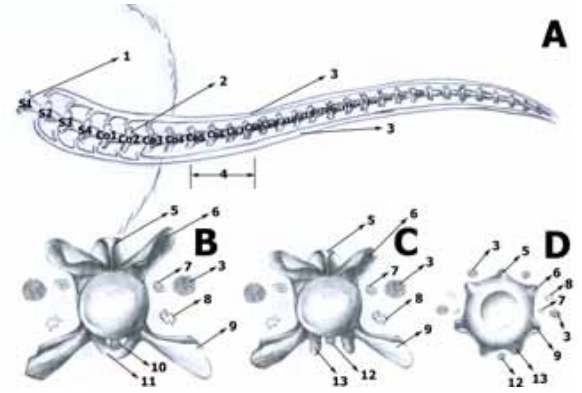

Figure 1. Schematic diagram summarizing the anatomy of the nerve, blood vessel and ossature in the rat tail. A: Diagram showing coronal plane of the rat tail (dorsal aspect); B, C and D: Diagrams orderly showing transverse plane of 3rd, 6th and 11th sections of coccygeal vertebra(Co3, Co6, Co11). 1, sacral vertebra (S1-S4); 2, coccygeal vertebra (Co1, Co2, Co3, etc.); 3, tail nerve cord; 4, drugs administered site (Co5-8); 5, spinous process; 6, prezygapophysis; 7, tail lateral artery; 8, tail lateral vein; 9, transverse process; 10, middle sacral artery; 11, haemal arch; 12, middle caudal artery; 13, haemal process.

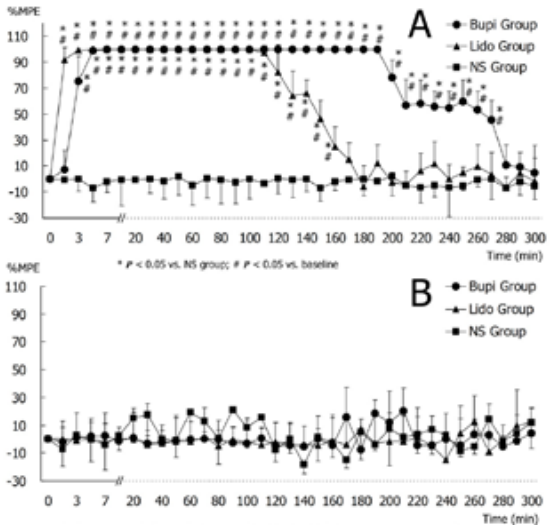

Figure 2. Comparison of pain threshold changes of rat-tails (presented by %MPE of tail flick latency) and pain threshold changes of rat paws (presented by %MPE of tail flick latency) among Lido, Bupi and NS group. (Mean ± SD, n = 10) *P < 0.05 vs. NS group; # P < 0.05 vs. baseline. Lido, Bupi and NS Group: 1% lidocaine, 0.5% bupivacaine or normal saline were administered around tail nerves of rats in these group, respectively.

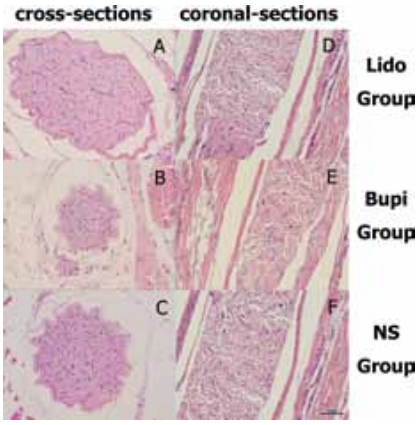

Figure 3. Typical histological cross-sections and coronal-sections of rat-tail nerves in Lido, Bupi, and NS groups. (Original magnification × 400) Lido, Bupi and NS Group: 1% lidocaine, 0.5% bupivacaine or normal saline were administered around tail nerves of rats in these group, respectively.

S-485.

ASSOCIATION OF BMI WITH POSTOPERATIVE PAIN AND QUALITY OF RECOVERY AFTER TOTAL HIP REPLACEMENT: ROLE OF INSULIN RESISTANCE

AUTHORS: R. Motaghedi[2], J. J. Bae[1], P. M. Shaw[1], S. G. Memtsoudis[1], S. S. Liu[1]

AFFILIATION: [1]Anesthesiology, Hospital for Special Surgery, New York, NY; [2]Pediatrics, NewYork-Presbyterian Hospital/Weill Cornell Medical Center, New York, NY

INTRODUCTION: In the United States, approximately 436,000 total hip replacements (THR) are performed with an expected 673% increase by 2030 due in part to increasing rates of obesity[1]. It is controversial whether severity of postoperative pain[2] is associated with obesity, and potential underlying mechanisms are unknown. A common complication of obesity is insulin resistance[3] which can lead to an inflammatory response amplified by the perioperative stress response. The severity of this underlying inflammatory response in the obese may play a mechanistic role in modulation of pain during the post operative period, as opposed to effect of weight per se. Thus we performed this prospective observational study to determine association of BMI and insulin resistance with postoperative pain and quality of recovery after THR.

METHODS: IRB approval and written consent were obtained from 60 patients undergoing unilateral THR. The intent was to enroll 20 normal weight, 20 overweight, and 20 obese subjects. Patients undergoing insulin, oral hypoglycemic, or systemic steroid treatment were excluded due to exogenous effects on glucose and insulin. Anesthesia and postoperative analgesia were standardized and consisted of spinal anesthesia followed by PCEA until 1200 POD1. Measurements included QoR40 questionnaire preoperative and on POD 1 and 2, verbal pain scores (0-10), and PCEA consumption. Insulin resistance was measured by Homeostatic Model Assessment of Insulin Resistance (HOMA-IR)[4]. Other measurements of interest included C reactive protein as a general marker of stress response, glucose-insulin ratio as a secondary measure of insulin resistance, and hemoglobin A1c.

RESULTS: Patients with increased BMI were more insulin resistant but had similar C reactive protein levels preoperatively (Table). On POD1, C reactive protein levels increased to a similar degree in all patients but again patients with increased BMI became more insulin resistant. Neither BMI nor markers of insulin resistance correlated with postoperative pain, PCEA consumption, or quality of recovery (Table, Figures)

DISCUSSION: Our findings suggest that obesity (BMI) is not associated with worse postoperative pain or quality of recovery after total hip replacement. Obesity is associated with increased severity of perioperative insulin resistance but not generalized surgical stress response; however insulin resistance does not appear to have a mechanistic role in postoperative pain or recovery.

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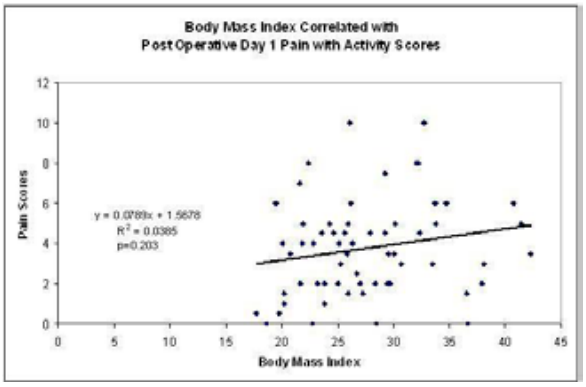

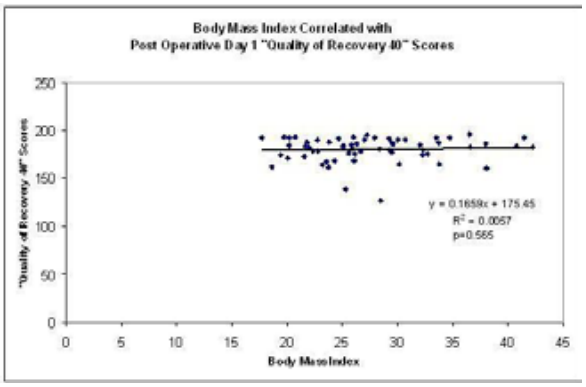

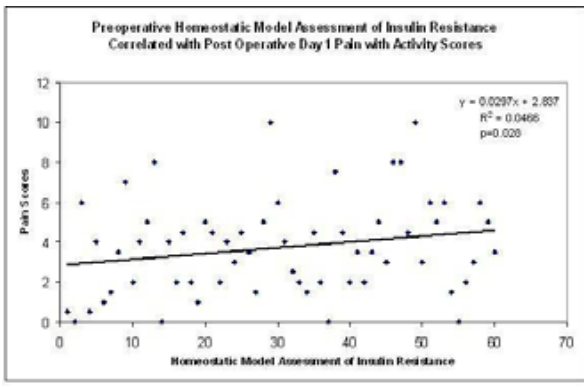

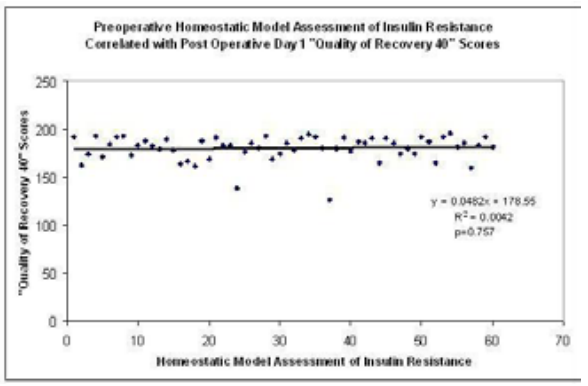

S-486.

WITHDRAWN.

S-487.

THE ADDITION OF NERVE STIMULATION TO ULTRASOUND GUIDANCE DOES NOT IMPROVE SUCCESS DURING PLACEMENT OF THE ARROW STIMUCATH AT THE POPLITEAL SCIATIC NERVE: A PROSPECTIVE RANDOMIZED TRIAL

AUTHORS: S. Porter[1], R. McClain[1], D. Wax[2], C. Robards[1]

AFFILIATION: [1]Anesthesiology, Mayo Clinic, Jacksonville, FL; [2]Anesthesiology, Mt Sinai Medical Center, New York, NY

INTRODUCTION: There is debate as to whether or not nerve stimulation (NS) is required to place peripheral nerve catheters when using ultrasound (US) guidance. There are data that indicate intraneural needle placement can fail to elicit an appropriate motor response[1]. There is also conflicting evidence as to whether stimulating catheters improve postoperative analgesia compared to non-stimulating catheters[2,3]. There has been evidence that US in combination with NS is superior to nerve stimulation alone in terms of popliteal nerve blockade[4,5]. Given the previously published reports, we hypothesized that there is improvement in sensory and motor blockade for stimulating popliteal perineural catheters placed under US guidance when NS is used.

METHODS: After IRB approval, 21 patients undergoing elective foot and ankle surgery were randomly assigned to either an US or US+NS guided continuous popliteal sciatic nerve block using a lateral approach. In both groups, the catheter was advanced 5 cm past the needle tip at which point, 30 milliliters of mepivacaine 1.5% was injected.

The primary end-point of the study was successful nerve blockade at 20 minutes. Secondary end-points included: block performance time, minimum stimulating current, pain scores on post-operative day 1 and day 2, and patient satisfaction.

RESULTS: There was no significant difference in successful nerve blockade at 20 minutes in the US versus US+NS groups (73 vs 80%, $p=1$). Procedure time was significantly shorter in the US only group (median 62 seconds vs 130.5 seconds , $p<0.01$). Postoperative pain scores and overall patient satisfaction were not significantly different between the two groups.

Discussion: In this small, randomized, blinded trial, we have found that the addition of NS provides no benefit over the use of US alone. US alone was associated with a significantly shorter block performance time. US+NS showed no significant difference in pain control, patient satisfaction, or block success. There were no apparent block-related complications. Of note, a minimum stimulating current as high as 3.77 milliAmperes in the US alone group yielded a successful nerve block. The study was terminated at 21 patients after we experienced complications with the Arrow Stimucath in patients undergoing brachial plexus blockade[6,7].

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S-488.

AN ULTRASOUND GUIDED TECHNIQUE FOR PERFORMING THE SUPERIOR LARYNGEAL NERVE BLOCK

AUTHORS: B. Kaur, R. Tang, A. Sawka, H. Vaghadia

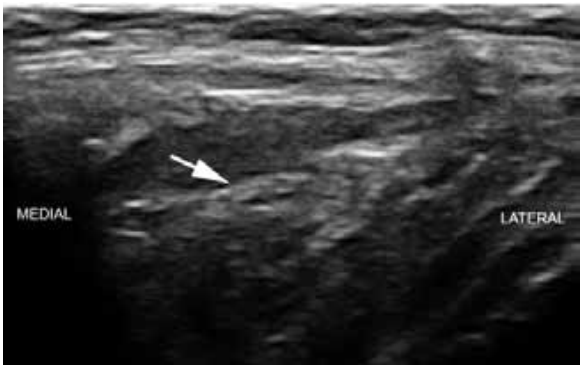
AFFILIATION: Department of Anaesthesia, University of British Columbia, Vancouver General Hospital, Vancouver, BC, Canada

INTRODUCTION: We investigated the feasibility of performing an ultrasound guided superior laryngeal nerve (SLN) block using a novel ultrasound technique. To date, only a single case report performed this block under ultrasound guidance, but the SLN was not visualized and surrogate landmarks were utilized.[1,2] We hypothesized that with the improvements in ultrasonographic technology, the SLN could be visualized to enable accurate placement of the needle.

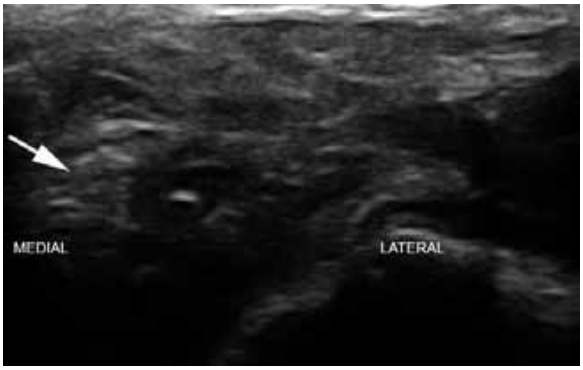
METHODS: After ethics and institutional approval, a 8-15 MHz transducer (HST15-8/20 linear probe (Ultrasonix, Richmond, BC, Canada) was used on 2 fresh unembalmed cadavers to identify the SLN nerve bilaterally. With cadavers in the supine position and neck in the extended position, we performed initial scans of the neck using the transducer placed in the transverse position relative to the skin, to identify the greater cornu of hyoid bone and the superior lateral aspect of the thyrohyoid membrane. By rotating the medial aspect of the probe cephalad, the SLN was identified. A needle was inserted in-plane to the ultrasound beam, advanced to the SLN and 1ml of green dye was injected. Correct dye placement was confirmed by a blinded anatomist and the dye spread was noted and photographed.

RESULTS: In both cadavers, we confirmed successful bilateral dye placement on the SLN by anatomical dissections.

DISCUSSION: Visualization of the SLN has not been consistently successful leading some authors to advocate use of the hyoid image or superior laryngeal artery as surrogate ultrasound landmarks for blockade of the nerve.[1,2] This may in part be due to technological limitations with previous generations of ultrasound systems.[4] Current ultrasound technology, which has improved image processing and resolution has now made it possible to identify and target the SLN under ultrasound guidance. We propose that this method may be used in humans to perform the block safely and successfully.



Pre Injection (SLN indicated by arrow)



Post Injection (SLN indicated by arrow)

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S-489.

REAL TIME PARAVERTEBRAL BLOCKADE USING A GPS GUIDED ULTRASOUND SYSTEM

AUTHORS: B. Kaur, R. Tang, A. Sawka, H. Vaghadia

AFFILIATION: Department of Anaesthesia, University of British Columbia, Vancouver General Hospital, Vancouver, BC, Canada

INTRODUCTION: We report the successful use of a novel Sonix GPS system to accurately place a needle tip in the paravertebral space of 2 cadavers using both, an in-plane and out-of-plane approach. Needle tip placement was confirmed by methylene dye injection into the space and dissection.

METHODS: After instituitional and ethics approval, 3 un-embalmed cadavers were used to perform in- plane thoracic paravertebral (TPVB) injections on one side of the cadaver and out of plane paravertebral injections on the other side at 4 levels: T5, T7, T9, T11. The C5-2/60 GPS convex probe on the Sonix Touch (Ultrasonix, Richmond, BC) was used to identify the TPVB space in the transverse plane. A Sonix GPS 19G 80mm needle (Ultrasonix, Richmond, BC) was advanced in an in- plane or out of plane fashion into the paravertebral space using the needle guidance system. 1 ml of methylene blue dye was injected, a guide wire left in situ, and blind dissections were performed to confirm dye placement. The study was repeated in 10 adults, with local anaesthetic. Block was assessed by sensory loss to temperature post procedure.

RESULTS: 8 in-plane and 12 out-of plane paravertebral injections were performed using this technique in cadavers. 5 in-plane and 9 out-of-plane injections were successful. Dissection into the thoracic cavity revealed no pleural punctures with either technique. In 10 patients 3 unilateral TPVB injections were placed at 3 levels for post operative analgesia. Successful block to ice was demonstrated in all.

DISCUSSION: TPVB block is a well described technique for unilateral analgesia of contiguous dermatomes after thoracic surgery.[1,2] Locating the paravertebral space using an ultrasound guided approach is challenging due to the acute insertion of the needle and poor visualization of needle tip. We used a novel approach with the Sonix GPS System (Ultrasonix, Richmond, BC) and demonstrated successful placement of TPVB block in cadavers and humans. We propose that this technology may be used to perform the TPVB block safely and successfully in patients.

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In plane paravertebral injection with needle in TPVB space

Out of plane injection with `x' in TPVB space

S-490.

KIDNEY INJURY AFTER PERCUTANEOUS AND EFFECTS OF NERVE BLOCK COMBINED GENERAL ANESTHESIA ON STRESS RESPONSE IN ELDER PATIENTS WITH LOWER LIMB SURGERY

AUTHORS: H. Ma, J. Yu, X. Chen, F. Ma, L. Deng, J. Meng

AFFILIATION: Anesthesiology Department, General Hospital of Ningxia Medical University, Yinchuan, China

INTRODUCTION: Neuraxial anesthetic blockade has a definite advantage in elderly patients over general anesthesia, as it reduces surgical stress by decreasing sympathetic efferent nerve activity and blocking nociceptive impulses from the operative site. In this study, we investigate the effects of combined lumbar plexus sciatic never block and general anesthesia on stress hormone in elder patients with lower limb surgery.

METHODS: With our institutional approval, 50 patients subject to unilateral lower limb operation were randomly assigned to 2 groups: combined lumbar plexus sciatic never block and general anesthesia (group C, n=25), general anesthesia (group G, n=25). All patients received midazolam 0.03 mg/kg after entering the operating room. Group C: Lumbar plexus block and sciatic never block was performed by ultrasound-guided, and then anesthesia was induced with 2-4 ug/kg fentanyl, 0.15~0.20 mg/kg cisatracurium besylate and 0.5~1.5 mg/kg propofol, and then the laryngeal mask airway (LMA) was inserted. Group G: Anesthesia induction was simmilar to Group C. Anesthesia was maintained with propofol and remifentanil infusion. Blood samples were taken before anesthesia (T0), at the beginning of the surgery (T1), 30 min after the beginning of surgery (T2), at the end of the surgery (T3), 1 h after the end of surgery (T4) for determination of IL-6, Cortisol (Cor), epinephrine (E) and norepinephrine (NE) and the mean arterial blood pressure (MAP) and HR were recorded at diferent time. Data were analyzed by using independent-Sample T test and one-way ANOVA between groups.

RESULTS: There was no significant differences in characteristics between 2 groups (Table 1). increased IL-6 was significantly increased at T4 in group C and at T2~T4 in group G compared to T0 ($P<0.05$). Cor was significantly increased at T2~T4 compared to T0. ($P<0.05$). E and NE was significantly increased at T1~T4 compared to T0 in group G ($P<0.05$). The levels of IL-6, Cor, E and NE were significantly increased at T2~T4 in group G than those in group C ($P<0.05$) (Fig.1). MAP and HR were significantly higher at T2 in group G than those in group C ($P<0.05$).

Discussion: Never block combined general anesthesia can attenuate the stress hormone responses in elder patients with lower limb surgery by blocking nociceptive afferent input signals from the traumatised site and prevents sympathetic as well as segmental efferent nerve activity.

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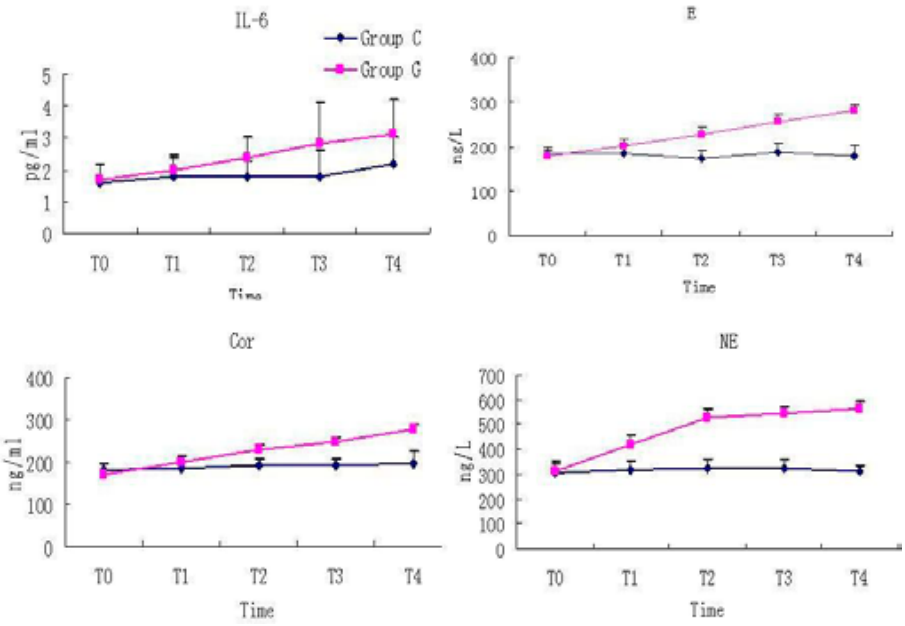
Table 1: Demographic Data

Characteristics	Group C, (n=25)	Group G, (n=25)	P-value
Age (year)	69.5±8.7	70.4±10.3	0.465
Male/Female	9/16	10/15	0.50
Weight (Kg)	59.4±11.6	63.3±9.3	0.364
OR time (min)	61.8±13.4	52.4±14.2	0.119

Fig. 1



S-491.

WITHDRAWN.

S-492.

INTERPATIENT VARIABILITY IN INTRATHECAL DRUG DISTRIBUTION: CEREBROSPINAL FLUID PULSATILE MAGNITUDE, FREQUENCY, SOLUTION BARICITY, AND TOXICITY RISKS

AUTHORS: Y. Hsu, A. Linninger

AFFILIATION: Department of Bioengineering, University of Illinois at Chicago, Chicago, IL

INTRODUCTION: Intrathecal drug delivery is frequently used to administer anesthetics to the central nervous system (CNS). However, even with identical dosage and administration mode, drug distribution in the spine is highly variable in different patients, leading to unpredicatble clinical outcomes. Drug biotransport in the spinal canal is strongly influenced by the pulsations of the cerebrospinal fluid (CSF), induced by cerebrovasculature expansions in the cranium. The frequency (heart rate) and magnitude of CSF pulsations vary greatly between subjects, which could influence drug transport speed in vivo. We hypothesize that the CSF pulsatility is a key factor for interpatient variability observed clinically. We also investigate the toxicity risks associated with solution baricity for different postures.

METHODS: We tested the hypothesis using medical image-based computational fluid dynamics. Magnetic resonance imaging (MRI) and CINE-MRI were performed to capture the subject's CNS anatomy and CSF pulsatile velocities. Drug biodistribution was computed using an anatomically consistent spine model reconstructed from MR images. The effects of CSF pulse frequency and magnitude on drug distribution were quantified for a simulated bolus injection at the second lumbar vertebra. Then, the variability in drug distribution after identical injections for three subjects with different physiological parameters was quantified. In addition, spatiotemporal drug distribution was computed for isobaric and hyperbaric solutions. Risk assessment was performed for different heart rates, CSF pulse magnitudes, and solution baricities.

CHALLENGING CASE REPORT: N/A

RESULTS: Results show that CSF pulse frequency, magnitude, and solution baricity strongly influence drug distribution. Peak concentration in CSF after injection for a heart rate of 120bpm is 26.4% lower than that for a heart rate of 60bpm. Doubling the CSF stroke volume per pulse lowered the peak concentration by 38.1%. The computed profiles of hyperbaric solution are a function of patient posture, and undesired high concentrations may result due to gravity.

DISCUSSION: Our computations identify key parameters -CSF pulse frequency and magnitude- for interpatient variability in drug distribution observed clinically. In addition, computations confirm the effect of solution baricity on drug distribution observed clinically. This study also has great potential for personalized medicine. The results show that the same infusion may cause different toxicity risks for different subjects. Personalizing infusion therapies according to the subject's physiological parameters is crucial for increasing the safety and efficiency of intrathecal infusions.

REFERENCES: N/A

S-493.

THREE TIMES DAILY SUBCUTANEOUS UNFRACTIONATED HEPARIN AND THORACIC EPIDURAL ANALGESIA: A RETROSPECTIVE REVIEW OF 928 CASES

AUTHORS: J. Davis, B. Bankhead, A. F. Wallace, E. Eckman, J. Strunk

AFFILIATION: Anesthesiology, University of Utah, Salt Lake City, UT

INTRODUCTION: Subcutaneous unfractionated heparin (SC UFH) given every eight hours (TID) is widely used for perioperative thromboprophylaxis. Limited data exist regarding the safety of epidural catheters in the presence of TID SC UFH. The 2010 American Society of Regional Anesthesia guidelines caution against using TID SC UFH in patients with indwelling epidural catheters. The aim of this retrospective study was to identify a diagnosis of epidural hematoma, deep vein thrombosis (DVT), or pulmonary embolism (PE) in patients who had a thoracic epidural catheter while receiving TID SC UFH. We hypothesized that none of the patients would have an epidural hematoma, the incidence of DVT/PE would be comparable to both national DVT/PE rates and our institution's overall DVT/PE rate, and the partial thromboplastin time (PTT) would be elevated in a subgroup of study patients.

METHODS: We queried our University's Hospital database to identify patients who had received TID SC UFH in the presence of an indwelling thoracic epidural from 7/1/2008 to 10/31/2010. Patients in this group who were diagnosed with an epidural hematoma, DVT, or PE were recorded. We also identified patients whose PTT measured greater than 40 seconds while receiving TID SC UFH.

RESULTS: During the 28 month period, 928 patients (study group) had an indwelling epidural catheter and received TID SC UFH. We found no epidural hematomas. 7 patients (0.75%) were diagnosed with a DVT/PE. There were 113 patients (12%) who had a measured PTT greater than 40 seconds at one point during therapy with TID SC UFH.

DISCUSSION: Given that epidural hematomas are so rare, our sample size was inadequate to make definitive conclusions regarding the safety of TID SC UFH in the presence of an indwelling thoracic epidural. However, the absence of epidural hematomas in our cohort is reassuring. We found that 12% of the patients in our study group had a PTT >40 seconds while on TID SC UFH. This demonstrates the importance of measuring the PTT during SC UFH thromboprophylaxis, particularly prior to epidural catheter removal. This also suggests that TID SC UFH could in fact be a safe thromboprophylactic regimen used in conjunction with thoracic epidural analgesia, assuming that PTT values are closely followed. Finally, our study group had a 0.75% incidence of DVT/PE, which is consistent with rates reported by the National Surgical Quality Improvement Program (0.73% in 2008) and is also consistent with our institution's overall DVT rate of 0.8%. In conclusion, no patient developed an adverse event while receiving TID SC UFH along with an indwelling epidural catheter, and the thromboprophylaxis appeared to be effective.

REFERENCES: None

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