Pediatric Airway Management: Congenital Anomalies that Can Make Your Life Difficult!

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Congenital anomalies in children can be devastating to the families as well as the infants. Most of these congenital anomalies are diagnosed intrauterine and the anticipation for these difficulties are usually recognized well in advance of the delivery. However, there are some anomalies, which lead to greater difficulty in later life especially as the child is growing. We will discuss in this refresher course common congenital anomalies that lead to potential difficulties in airway management either in emergencies or in an elective setting. In the perioperative cardiac arrest database (POCA), it was noted that airway and respiratory compromise lead to greater number of perioperative cardiac arrest in children.\(^1\)

There are 3 major areas of compromise with airways

(i) Difficult airway with potential syndromes etc that lead to an inability to conventionally ventilate or intubate by skilled practitioners.
(ii) Difficult ventilation with an inability to maintain oxygen saturation due to potential difficulty in maintaining a good mask airway and
(iii) Difficult intubation with an inability to intubate with a minimum of 3 attempts using different techniques.

Common airways changes in children: The tongue is larger in relation to the oral cavity; the epiglottis is large and floppy making it difficult to visualize the airway. The larynx is located higher in infants than in adults hence requiring a straight blade to intubate; the cricoid is the narrowest portion in an infant and hence larger endotracheal tubes may lead to airway compromise. In addition, infants have large heads with an inability for them to breathe through their mouths being obligate nasal breathers. It is then imperative to understand that if there is obstruction to the nasal passages, these infants may not be able to maintain their airway. We will discuss common congenital anomalies that lead to airway obstruction or difficulties in children. It is important to get a good history including potential difficulties in intubation with previous anesthetics, radiological evaluation of the neck if available and examination of the airway including checking the Mallampati score for airway intubation ease. After a brief description of the airway anomalies, we will then describe methods for securing the airways.

Pierre Robin sequence: The characteristic presentation is a combination of mandibular hypoplasia, glossoptosis and possible cleft palate. These infants have a potential for airway obstruction and potential hypoxic injury. It is imperative to secure an airway in the best possible clinical setting possibly in an operating room setting with an option for emergency airway access in the event there is difficulty. Options will be discussed in the section below.\(^2\)

Treacher Collins Syndrome: This is a syndrome which may present at birth with difficulty in airway access and respiratory distress. The syndrome is characterized by mandibular hypoplasia, sunken eyes, large nose and deformity of the ears with microtia being a common associated abnormality. Occasionally they may be associated with a choanal atresia. These children usually come in for major plastic surgery procedures that require airway intervention.\(^3\) (Figure-1)

Goldenhar syndrome: Another anomaly that involves facial asymmetry due to mandibular hypoplasia, prominent forehead, hypoplasia of the zygomatic region and a receding chin. They present for mainly plastic surgery procedures that may require airway intervention.\(^4\)

Hurlers & Hunters syndrome: This is an autosomal recessive mucopolysaccharide storage disease. It leads to development of facial dysmorphism, short stature, dementia and corneal clouding. This also leads to progressive airway obstruction. Children usually require anesthesia for central line placement or for imaging of their spine or airway.\(^5\) (Figure-2)

There are other common syndromes including Down’s syndrome patients who may have airway compromises especially larger tongues, smaller airway diameter which may lead to obstruction on induction of anesthesia.

Equipment: It is essential that the practitioner have several laryngoscope blades including straight blades, and curved blades of various sizes. In addition the use of an oxiscope, a laryngoscope blade with the ability for oxygen to be delivered while performing a laryngoscopy can be of additional help. Additional equipment including laryngeal mask airways, fiberoptic scopes as well as other airway instrumentation devices are important to have expertise on prior to attempting a difficult intubation. It is also important to remember the fact that airway instrumentation after multiple attempts especially with an optical device can be very difficult. A full description of all the available airway devices will be provided in the lecture.
The ASA difficult airway algorithm is used for all difficult airways and can be used effectively in children. The suggested method that we use in our practice is as follows:

1. Reposition patient and try to access the airway using a different blade (straight blade)
2. Place LMA to facilitate airway access. The use of the AirQ LMA has been demonstrated in our experience to facilitate easier access to the airway in children.6
3. Attempt to intubate using the LMA as a conduit.
4. If this fails then attempt direct fiberoptic intubation.
5. Cricothyrotomy or tracheostomy if needed.

In addition to the above steps, it is important to keep in mind that each scenario is different and may necessitate a different modality of access to the airway.

CONCLUSION

Pediatric airway emergencies due to congenital anomalies can be devastating and difficult to manage. A concerted effort to use judgment prior to anesthetizing infants and children and to use available technology to secure an airway can be rewarding. Careful evaluation of the patient’s history and performing an adequate physical exam is crucial in securing the airway.

REFERENCES