Case Report

Airway management of postburn neck contracture in pediatric patient – A challenge for anesthesiologist!

ABSTRACT

Pediatric difficult airway management is more challenging for an anesthesiologist due to anatomical and physiological differences as compared to adults. Moreover, the familiarity with the use of difficult airway equipment in adults does not equate to proficiency for the same in children. So, here we are presenting the management of a unique case of a difficult airway due to postburn neck contracture in a 4-year-old child, which was managed successfully with the help of a video laryngoscope after the failure attempt with a flexible fiberoptic bronchoscope.

Key words: Flexible fiberoptic laryngoscope, pediatric airway, postburn neck contracture, succinylcholine, video laryngoscope

Introduction

Pediatric anesthesia is itself very challenging in day-to-day practice but one of the greatest challenges for an anesthesiologist is the management of treatment in a child with a difficult airway. Due to anatomical and physiological differences in children, the technique of mask ventilation, laryngoscopy and endotracheal intubation is relatively more difficult than in adults. Moreover, safe apnea time is also very much limited in the pediatric group. The existing literature demonstrates that respiratory complications are one of the most common causes of perioperative morbidity and mortality in children.[1,2] In cases of difficult airway management in neonates and young children, the mortality rate is 30–40% of all deaths related to anesthesia practice.[3]

Postburn contracture involving the face and neck impairs neck extension in pediatric patients making airway management more difficult and challenging at the same time. The data on the unique challenges of airway management in recovered pediatric burn patients with distorted airway anatomy is very sparse. Hence, we are presenting a unique case of difficult airway management in a small child posted for the release of postburn neck chest, and left arm contracture.

Case Report

A 4-year-old male child weighing 15 kg, presented with chief complaints of restricted neck and left arm movements due to contracture caused by scald burns about 6 months before admission. Now, it was planned for the child to undergo contracture release and skin grafting. During

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pre-anesthetic evaluation, the child was playful and alert. Tight contracture skin bands extended from the chin to the anterior chest wall and from the shoulder to the right axilla with restricted mouth, neck and arm movement. Airway examination revealed mouth opening of about two fingers, severe restriction of neck extension (fixed flexion deformity) [Figures 1 and 2] and Mallampati grade 4. All the blood investigations were within normal limits including the serum electrolytes. Informed written consent was taken from parents regarding difficult airway management options, tracheostomy and their related complications. We planned to check mask ventilation under sedation and if mask ventilation was possible then for securing the airway, the use of a pediatric flexible fiberoptic bronchoscope (FFB) or video laryngoscope (VL) under general anesthesia was planned.

On the day of surgery, a pediatric difficult airway trolley carrying all the equipment was kept ready. After confirmation of nil per orally for 6 hours, the child was taken inside the operation theater (OT) and American Standard of Anesthesiologist (ASA) standard monitors such as electrocardiography (ECG), pulse oximetry (SpO_2) and non-invasive blood pressure (NIBP) were attached and baseline vitals recorded. An intravenous (IV) line with a 22 G venous cannula in the left hand was secured and as a premedication only glycopyrrolate 0.08 mg IV was given without any sedative due to a difficult airway. After preoxygenation with 100% oxygen, induction of anesthesia was performed with ketamine 20 mg IV, fentanyl 15 µg IV and 2% of sevoflurane with oxygen. After establishing the assisted spontaneous ventilation with a face mask, propofol 15 mg IV was given to increase the depth of anesthesia. After confirming the ability to ventilate, succinylcholine 20 mg IV was given to attain muscle relaxation. Thereafter, we attempted flexible fiberoptic oral intubation with a cuffed endotracheal tube of size 5.0 mm [Figure 3]. We were able to visualize the epiglottis through the fiberscope, but going below the epiglottis and visualization of vocal cords was not possible. Since safe apnea time was limited in our case due to the pediatric age group, we abandoned this plan and ventilated the patient again with a face mask to use plan B for intubation. Using camera macintosh laryngoscope blade (C MAC) VL with a pediatric blade, we were able to intubate the patient with a 5 mm cuffed endotracheal tube. After confirming the correct position of the endotracheal tube with chest auscultation and capnography, cisatracurium 2.5 mg IV was given. Maintenance of anesthesia was performed with 50:50 nitrous oxide and oxygen, 1% isoflurane and 0.5 mg of cisatracurium as intermittent boluses. After the completion of the surgical procedure, the residual neuromuscular blockade was reversed on the return of spontaneous respiration. The child was extubated only when he was fully awake and on the return of adequate airway reflexes. The postoperative period remains uneventful.

Figure 1: Showing difficult mouth opening

Figure 2: Showing limited neck extension

Figure 3: Showing attempting FFB for intubation

Discussion

Recently pediatric difficult airway management has become the center of discussion as airway management of these patients is a critical skill to have and it can rapidly

become a disaster situation. Although a difficult airway management algorithm for adults exists, its complete application in the pediatric age group especially for small children is questionable due to various anatomical and physiological differences.[4] Anatomical differences include larger occiput, anterior and cephalad larynx, and large floppy omega-shaped epiglottis, which is more likely to obstruct views of the vocal cords. The physiological factors in the pediatric group are higher oxygen consumption, lesser functional residual capacity and presence of type 2 respiratory fibers that result in rapid desaturation as compared to adults. The younger the child, the shorter the apnea time. Fortunately, the incidence of an unexpected difficult pediatric airway is very low.

Recovered burn patients often have significant scarring and contractures in the face, mouth, nares, neck, arms and chest, which can make airway management more challenging. These can also lead to a "cannot intubate, cannot ventilate" situation.

In our case, securing the airway was difficult and challenging due to the pediatric age group and postburn neck contracture. Airway assessment in children unlike adults is not easy. The gold standard technique as mentioned in the adult difficult airway management algorithm, that is, an awake flexible fiberoptic intubation, was not possible in our case as it demands cooperation from the patient, which was not possible with the 4-year-old child. So, we formulated plan A of using pediatric flexible fiberoptic oral intubation after induction of anesthesia and plan B with C MAC VL with pediatric blade for securing the airway.

FFB through the mouth, nose or supraglottic airway device (SAD) under sedation or anesthesia is also considered the gold standard of difficult airway management in pediatric patients.[5] With FFB, we were not able to negotiate below the large and floppy epiglottis and vocal cords could not be visualized. Moreover, familiarity with FFB in adults does not equate to proficiency in FFB in children as there are technical challenges in navigating an ultra-thin FFB with a small camera, along with inherent small airway size. As pediatric patients also have less oxygen reserve, hindering lengthy anesthetized flexible fiber optic video bronchoscope intubations,[6] we rapidly moved to use C MAC VL to secure the airway. Video laryngoscopy has been shown to successfully aid in difficult intubations in children as its angled blades can obtain indirect glottic views without having to align oral, pharyngeal and tracheal axes.[7] Several studies comparing fiberoptic intubation through supraglottic devices and video laryngoscopy techniques had found similar first-attempt success rates in all children with difficult airways.[8]

There is no clear consensus regarding the use of muscle relaxants especially succinylcholine in difficult airways with postburn neck contracture in pediatric patients. However, we used succinylcholine because inadequate relaxation in children can cause dreadful complications such as laryngospasm and can also result in a "cannot ventilate" situation.[9] The Association of Pediatric Anaesthetists of Great Britain and Ireland (APAGBI) favors the use of succinylcholine as the first-line relaxant to facilitate ventilation and intubation. Moreover, securing the airway in a burn contracture patient is much more important than the complications of succinylcholine such as hyperkalemia. There are also studies suggesting the maximum risk of succinylcholine causing hyperkalemia is in the first 3–4 weeks of postburn state.[10]

To conclude, management of a difficult airway in children requires adequate planning and training. An anesthesiologist must be proficient in the use of difficult airway management equipment in pediatric patients. Moreover, further studies and data are required to formulate an effective algorithm for difficult airway management in pediatric patients.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

1. Jimenez N, Posner KL, Cheney FW, Caplan RA, Lee LA, Domino KB. An update on pediatric anesthesia liability: A closed claims analysis. Anesth Analg 2007;104:147-53.
2. Ramamoorthy C, Haberkern CM, Bhananker SM, Domino KB, Posner KL, Campos JS, *et al*. Anesthesia-related cardiac arrest in children with heart disease: Data from the Pediatric Perioperative Cardiac Arrest (POCA) registry. Anesth Analg 2010;110:1376-82.
3. Miglani H, Vashist M. Approach to difficult and compromised airway in neonatal and paediatric age group patients. Indian J Anaesth 2008;52:273-81.
4. Jagannathan N, Asai T. Difficult airway management: Children are different from adults, and neonates are different from children! Br J Anaesth 2021;126:1086-88.
5. Huang AS, Hajduk J, Rim C, Coffield S, Jagannathan N. Focused review on management of the difficult paediatric airway. Indian J Anaesth

2019;63:428-36.
6. Paterson NA. Management of an unusual pediatric difficult airway using Ketamine as a sole agent. Pediatr Anesth 2008;18:785-8.
7. Mundotiya S, Palta S, Saroa R, Chhabra S. C-MAC® videolaryngoscope in difficult paediatric airway: Need to update our perspective. Airway 2020;3:144-7.
8. Burjek NE, Nishisaki A, Fiadjoe JE, Adams HD, Peeples KN, Raman VT, *et al*. Video laryngoscopy versus fiber-optic intubation through a supraglottic airway in children with a difficult airway: An analysis from the multicenter pediatric difficult intubation registry. Anesthesiology 2017;127:432-40.
9. Orliaguet GA, Gall O, Savoldelli GL, Couloigner V, Riou B. Case scenario: Perianesthetic management of laryngospasm in children. Anesthesiology 2012;116:458-71.
10. Gronert GA. Succinylcholine hyperkalemia after burns. Anesthesiology 1999;91:320-2.