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A Challenging Case of Airway Management in Paediatric Panfacial Fracture for Emergency Neurosurgery

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ABSTRACT
Securing the airway is crucial for the survival of a patient in case of pan-facial fracture. As per Advance Trauma Life Support recommendations airway management is of utmost importance in such cases[1]. The challenge faced here is an anatomically distorted airway with active bleeding. Most often these patients might be in respiratory distress due to their compromised breathing or at times due to the massive blood loss due to associated injuries. An additional concern of cervical spine injury must be kept in mind while handling the airway and also during positioning and transport of the patient. All these put the patient at risk of regurgitation and aspiration.
These challenges become more intense in apaediatricpatient with pan-facial fracture. A proper surgical and anesthetic plan needs to be devised before performing any an operative procedure in such cases, taking into consideration the surgical access and imminent threat to survival. In this case report we discuss the difficulties encountered while securing the airway of a 10 year old child with pan-facial fracture posted for an emergency neurosurgical procedure and how comprehensive safe and practical airway management plan helped in successful management of the case.

I. INTRODUCTION-

Maxillofacial trauma for surgical repair poses significant challenges for an anesthesiologist. Several points need to be carefully considered while managing the airway in such cases which include the nature and extent of the trauma,the involvement of the airway, potential difficulties in mask ventilation and endotracheal intubation, supraglotticairway insertion. Video laryngoscope and flexible fibre optic scope of appropriate size should be kept ready. Possible trauma of the cervical spine, the risk of regurgitation of gastric contents, obscured view of the airway due to bleeding. Time sensitivity of the situation was the most important factor in decision making in our case as it was an emergency procedure.

We present below a case of securing the airway in a pediatric patient with panfacial displaced fracture with difficult mask ventilation successfully managed in an emergency situation. A 10yr old male child who sustained a road traffic accident and had a severe maxillofacial fracture with frontal bone involvement and exposed brain tissue underneath (Figure 1) was referred from primary health centre to our tertiary care setup for emergency neurosurgical management.

On examination he was conscious, oriented but irritable due to the pain. Glasgow coma scale had a score of 14/15. He was adequately starved for surgery. General systemic examination was normal. Birth history and family history were also normal. There was no history of previous surgery or any known comorbidities.

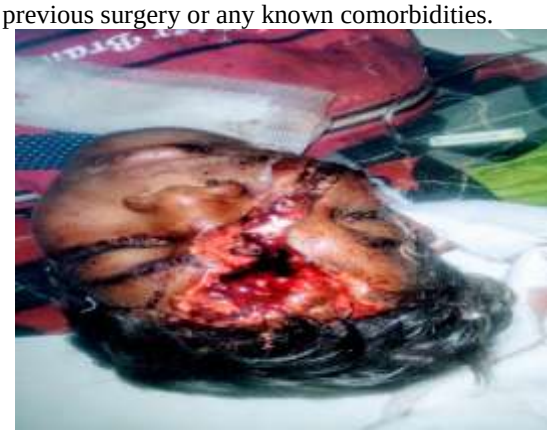

Figure 1

Airway assessment

Patient had a severe laceration with contusion of 15×2.5x8cms with edema and swelling over the face.(Figure 1) Mouth opening and Mallampatti grading could not be assessed because patient was in pain and uncooperative. Neck movements were normal.

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Radiological imaging [CT brain and orbit] showed comminuted and displaced fracture of the frontal bone on right side, fracture of the right maxillary sinus, superior and inferior wall of the orbit, fracture of ethmoid and cribriform plate and medial pterygoid plate. Emergency Neurosurgery for closure of skull defect was planned. All investigations were within normal limits.

Anaesthesia management

After informed consent of the parent, child was taken up for surgery.

Difficult airway cart was kept ready with appropriate sizes of face masks, supraglottic airway device, endotracheal tubes, video laryngoscopes, ventilating bougie, cricothyroidotomy set. ENT surgeon was kept standby with tracheostomy cart ready in case of failure of airway management.Basic standard monitors as per American Society of Anesthesiologists (ASA) guidelines were attached, intravenous access was present pre-operatively. Injection glycopyrrolate 4 micrograms/kg was given for premedication as an anti-sialagogue.

Pre-oxygenation was done with circular silicon face mask of size 1 (smaller than usual) as anatomical mask was difficult to fit over the face due to distorted anatomy. A sterile gauze piece was placed over the area of the laceration and mask was placed on top of it to form a seal. Injection propofol 1 mg/kg was given.

Our goal was to sedate the child to facilitate a quick laryngoscopy to check the anatomy of the mouth and lower airway without inducing apnoea in the child. Once the child was sedated a quick video laryngoscopy with C-MAC was done to avoid excessive airway manipulation. The lower airway anatomy was confirmed as intact and undistorted. This was followed by giving Injection Succinylcholine 2mg/kg and propofol supplementation to intubate with a 5.0 cuffed endotracheal tube under vision of the video laryngoscope. Successful endotracheal intubation was confirmed by capnography. Long acting neuromuscular blocking agent was then given to the patient for the rest of the surgery.

Figure 2

Surgery lasted uneventfully for three and a half hours with both neurosurgery and plastic surgery intervention. At the end of surgery patient was extubated after reversal of neuromuscular blockade and return of spontaneous ventilation and shifted to the recovery room for further observation.

II. DISCUSSION

Facial trauma patients present in emergency room with complex and frightening appearance and threatened airway scenario which is complicated further by distorted facial anatomy, associated cervical and head injury, full stomach, presence of blood, secretions, vomitus, foreign objects and avulsed teeth and edema[2].

Posteroinferior displacement of fractured maxilla parallel to the inclined plane of the base of the skull can block the nasopharyngeal airway[3].

A bilateral fracture of the anterior mandible can cause the fractured symphysis and the tongue to slide posteriorly and block the oropharynx in a supine patient[3].

Fractured or exfoliated teeth, bone fragments, vomitus, blood, and secretions as well as foreign bodies, such as dentures, debris, and shrapnel etcmay block the airway anywhere along the oropharynx and larynx[3].

Hemorrhage from distinct vessels in open wounds or severe nasal bleeding from complex blood supply of the nose may also contribute to airway obstruction[3].

Soft tissue swelling and edema from trauma of the head and neck may cause delayed airway compromise[3].

Trauma of the larynx and trachea may cause swelling and displacement of structures, such as the epiglottis, arytenoid cartilages, and vocal

cords, thereby increasing the risk of cervical airway obstruction[3].

Complexity of the situation with distorted anatomy present with difficult mask ventilation and also difficult intubation due to distorted anatomy of the face caused by severe injury.

Patients with maxillofacial injury have associated cervical spine injury. Cervical spine movement during intubation is prevented by manual inline stabilization by an assistant throughout the procedure. Use of McCoy laryngoscope, bougies and video laryngoscope found to have less cervical movement during intubation and should be preferred.

Emergency management of a trauma patient with maxillofacial injury starts with airway maintenance with cervical spine control. Airway assessment is done as quickly as possible to prevent hypoxia and hypoxemia.

Our concerns in this case were as follows

1. Patient was conscious ?Yes , but still sedative premediactions were avoided due to risk of losing the airway.
2. Breathing spontaneously?– yes. Adequate time for surgical and anaesthetic planning
3. Hypoxemic ? emphasize the importance of preoxygenation
4. Details and extent of injury and the time since injury – Only soft tissue involvement makes mask ventilation easy
5. Identification of factors predisposing to difficulty in mask ventilation and intubation-guidelines for difficult airway management and their applicability in this case
6. Mouth opening is adequate? look for temporo-mandibular joint involvement
7. Additional factors that need to be considered – C spine involvement, obesity, active bleeding in the airway
8. Paediatric airway and appropriate size equipments
9. Surgical requirements – In case of plastic surgery repair, the oral cavity needs to be free for surgical access. In this case as there was a fracture of the cribriform plate, nasal intubation was excluded from the available options.

Indirect view of the vocal cords with FOB was impractical in this patient as blood and secretions in the airway obscure the view. ENT surgeon was also ready for tracheostomy standby.

These cases also pose difficulty in extubation due to airway and soft tissue edema. They need to be monitored closely and extubation should be deferred until the edema subsides. A skilled anaesthesiologist and appropriate techniques and equipment are crucial in optimal airway management of such cases.

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