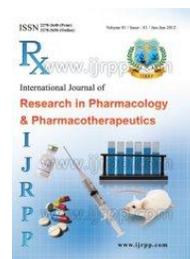




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Case report

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Airway management in a patient with traumatic disfigured facial injury - A case report

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ABSTRACT

Traumatic facial injuries usually presents with extremely disfigured appearances. Managing airway in these patients remain a significant challenge to the Anesthesiologist. A detailed assessment of extent and severity of facial injury and a careful way of formulating a proper airway management plan in the preoperative period will be essential for avoiding any major catastrophe during the Intraoperative and postoperative period. Advanced Trauma Life Support Protocol is utilised in evaluating the trauma patient. Only after securing airway, stabilizing the cervical spine, and restoring hemodynamic stability, the definitive treatment of the maxillofacial injury should be considered. A patent airway in the patient should be established immediately with the help of difficult airway cart. The anaesthetic technique should include rapid induction, maintenance with minimal physiological changes and rapid emergence. In procedures involving inter maxillary fixation, oral intubation is excluded and alternative routes of intubation should be planned. Extubation requires an awake patient, who can maintain his airway and the emergence should be smooth. In this case, we report the airway management of a patient who had de-gloving and disfiguring facial soft tissue injury.

Keywords: Traumatic facial injury, facial soft tissue injury, Maxillofacial trauma, Conventional/Modified laryngoscopy in facial injury.

CASE REPORT

A 23 year old male (175cm, 78kg), presented to the emergency department with a disfiguring facial injury following a road traffic accident. While driving his two wheeler, he skidded and bumped his face into a heap of rocks. He had extensive

lacerations and de-gloving soft tissue injury involving his entire face.

His face was edematous, had full thickness laceration of forehead, over left zygoma and lower lid of left eye. His left eye was exposed due to lid laceration. He showed avulsion of nasal cartilage exposing the

nasal passages associated with deep midline cut of upper lip exposing the underlying dento-alveolar fracture of maxilla. His dental occlusion was deranged and mouth opening was restricted to one finger width. His tongue was lacerated and bifid with occult blood intra-orally. He had multiple abrasions all over the body involving the both legs and arms, forearms, and left shoulder. Results of CT face also revealed multiple facial fractures, which included the lateral wall of maxillary sinus, left zygomatic arch, and a comminuted fracture of the left lateral orbital wall. The other facial fractures included bilateral nasal bone fracture, right mandibular condyle fracture. Primary and secondary survey of this patient

ruled out any other fractures anywhere in the body. It also revealed no other major internal organ injury. His past medical history was not significant for any major medical illness. His previous surgical history showed that he had a surgery in his spine for a traumatic fracture at L2 – L3 level, six months before. He had history of loss of consciousness. His CT brain showed normal study. His x-ray neck ruled out any cervical spine injury. His basic routine blood investigations, chest radiography and Electro cardiogram were within normal limits. The patient was taken to the operating theatre for wound debridement and primary soft tissue injury repair.



Fig 1 - Extensive laceration and de-gloving injury of the entire face

On admission, the patient was conscious and oriented; his blood pressure was 138/90mmhg, heart rate 96 beats per min, and oxygen saturation via pulse oximetry showed 99% in room air. He received Inj. Diclofenac sodium 50mg IM, in the emergency

department. His airway could not be assessed due to limited mouth opening. His NBM status was found to be five hours for solids.



Fig 2 - Avulsed nasal cartilage and exposed dento-alveolar fracture of maxilla

ANESTHETIC MANAGEMENT

After obtaining informed high risk consent, medical personnel and difficult airway cart were made ready. Equipment to perform an emergency tracheostomy in case if trial laryngoscopy in spontaneous breathing was unsuccessful were also kept ready.

Inside the operating theatre, monitors were hooked to the patient and baseline parameters were recorded. The peripheral intravenous cannulation was secured in addition to the one secured in the emergency department. Adequate pre-oxygenation with 100% oxygen, was done with anatomical face mask over a gauze piece soaked in Vaseline, covering the face, with a hole made in the middle of the gauze for the mouth and the nose. Anti-sialagogue, Inj.Glycopyrrolate 0.2 mg was given intravenously. Then the patient was induced with Inj.Propofol 150mg IV, spontaneous breathing was maintained. The cricoid pressure applied simultaneously during induction. Once adequate depth was achieved, trial laryngoscopy with conventional laryngoscopy done with Mc-Intosh blade size 4. On direct laryngoscopy, the tip of the epiglottis was visualized with cricoid pressure in situ. The laryngoscopy was removed and

pre-oxygenated again for 5 minutes. Now Inj.Succinylcholine 1.5mg/kg given IV. Repeat laryngoscopy was done, now with Mc-Coy blade size 4. On lifting the epiglottis, the posterior commissure was visualized, then Bougie guided intubation was done, with 8 mm cuffed endotracheal tube, with cricoid pressure in-situ. Once the cuff of the endotracheal tube was inflated, connected to the circuit and ventilated. After confirming the bilateral air entry through the auscultatory method, the cricoid pressure released and the patient was paralyzed with Inj.Atracurium. Anesthesia was maintained with Nitrous Oxygen mixture, with Isoflurane. Intraoperative blood loss was 550ml, which was adequately replaced with crystalloids. After an uneventful three hour surgery, the neuromuscular blockade was reversed with Inj.Neostigmine and Inj.Glycopyrrolate. The patient was fully awake and extubation was done. He was shifted to the post surgical intensive care unit and intravenous Inj.Tramadol 100mg every 8th hourly was prescribed. His subsequent hospital course and recovery were uneventful.



Fig 3 - Successful intubation with conventional laryngoscopy using Mc-coy blade and under bougie guidance



Fig 4 - Endotracheal tube secured and fixed



Fig 5 - Intra- operative soft tissue repair



Fig 6 - Intra- operative soft tissue repair



Fig 7 - The patient was extubated successfully at the end of the procedure, after complete regain of awareness and control of airway

DISCUSSION

Airway management is always a challenge in patients with facial trauma. Not only does the trauma directly involve the airway itself, but there are also associated injuries and conditions such as cervical fracture, full stomach, hypoxemia, alcohol, and/or drug intoxication. There is often some degree of compromised airway due to the presence of loose teeth, blood, and displaced fragments of all the fractures.

Based on the current ATLS guidelines, the foremost priority in these patients are airway management along with the cervical spine control. The ATLS concept states that the cause of immediate death is due to loss of an airway rather than other circulatory

problem in any trauma patient. Indeed, any problem with airway can increase morbidity and mortality in trauma patient as well as in general surgical procedures. Hence life-saving interventions should begin with securing an airway when required. [1]

Early and immediate management of maxillofacial injuries are required especially when there is existing upper airway compromise. Hutchinson et al [2] enumerated six specific situations in a maxillo-facial injury, that can produce adverse effects on the airway;

1. Anywhere along the airway, - blood, secretions, soft tissues, debris, fragments may produce airway block.

2. A fractured maxilla, which is displaced posteriorly, parallel to inclined plane of the skull base, may produce nasopharyngeal airway block.
3. In case of a bilateral fracture of the anterior mandible, the fractured symphysis may slide posteriorly along with the tongue, thus blocking the oropharynx.
4. Severe hemorrhage, either from nose or from any distinct vessels, may also contribute to airway obstruction.
5. Delayed compromise of the airway can occur due to soft tissue swelling and edema resulting from head and neck trauma.
6. Cervical or upper airway obstruction may be a risk if there is associated injury to larynx and trachea, which may displace structures like vocal cords and arytenoids.

Once airway management is completed, and other life threatening injuries are properly managed, then definitive management of bone and soft tissue injuries resulting from maxillofacial trauma may be deferred at a later date.

The maxillofacial trauma patient usually presents a problem of both difficult mask ventilation and difficult intubation. The normal anatomy is disrupted due to bleeding and edema of the oral cavity. Effective mask ventilation may be difficult, as the mask cannot be fitted properly to the face. In addition, an injured airway may prevent efficient transfer of air from the mask to the lungs. Since the oral cavity, pharynx and larynx may be filled with blood, secretions, debris, soft tissue and bone fractures, all of which preclude good visualization of the vocal cords, performing the intubation and visualizing the vocal cords with conventional laryngoscopy remains a challenge to the Anesthesiologist.

Apart from anticipating a difficult airway, several other factors complex the problem. The first problem is cervical spine injury. Any patient who sustained a supra-clavicular trauma may be considered to have a C-spine injury until proven otherwise. Until complete clearance of cervical spine injury, the patient's neck must be supported by a collar and all neck movements should be avoided [3]. During intubation, in order to support the head and neck in place, the assistant performs 'manual in-line stabilization', throughout the procedure. But manual

"in-line stabilization" may reduce the Laryngo-scopic view at the time of intubation. [4, 5]

As every trauma patient, the maxillofacial trauma patient is considered to have a "full stomach". Furthermore, in these patients, the risk of aspiration is high as they tend to swallow the bleeds from upper aero-digestive tract. The risk of regurgitation is also high. These risks can be minimized by prior evacuation of stomach contents, before attempting to manage the airway through a nasogastric tube. However, this itself may trigger vomiting and aspiration in a confused, uncooperative trauma patient. Alternate means of reducing the risk of aspiration is to use the Sellick's maneuver [6], a technique in which pressure is applied on the cricoid cartilage, thereby compressing the esophagus against the underlying vertebral body hence the regurgitated gastric contents into the mouth is occluded and aspiration is prevented. [7]

APPROACH TO THE MAXILLO FACIAL TRAUMA PATIENT'S AIRWAY MANAGEMENT

AIRWAY EVALUATION AND PREPARATION

Evaluation of the airway should be thorough and as quick as possible, in maxillofacial trauma patient, as there is compromised airway. When the exact difficulty in managing the airway is defined, it helps in planning the methods to secure an anticipated difficult airway.

The following questions that are to be answered on examining the patient are:

- Is the patient's level of consciousness adequate? This is to judge the use of sedation. If so, it should be done cautiously because the airway can be lost immediately following use of sedative drugs [9].
- Is the patient's breathing effort adequate? If so, there is time to arrive at the hospital, preferably to the operating room, and manage the airway under the best conditions and by the most experienced personnel. Failed attempts at endotracheal intubation by non-qualified caretakers could cause rapid deterioration. Indeed, according to the American Society of Anesthesiologists (ASA) Practice Guidelines for management of the difficult airway, spontaneous breathing should be preserved in patients with anticipated difficult endotracheal intubation [9].

- What is the extent, the composition and the anatomy of the injury? How extensive is the damage to the bony structures of the face? In cases of massive injuries, mask ventilation may be impossible, while injury limited to the soft tissues may enable mask ventilation.

- Is there a limitation in mouth opening? Is that limitation the result of pain and after sedation the mouth could be opened wider? The answer for this question depends on the clinical and radiological evidence of a Temporomandibular joint (TMJ) injury. If the limitation in mouth opening is due to a TMJ injury, sedation will not improve mouth opening and may even worsen the scenario.

- Is there soft tissue edema and pressure on the airway? A lateral x-ray of the neck will help in estimating the compression on the airway.

As with every difficult airway situation, the staff and equipment for difficult intubation should be prepared and ready to use. The approach should be chosen according to the patient's injuries, airway status and the care provider's experience with such equipment and procedures.

VARIOUS AIRWAY MANAGEMENT APPROACHES

In this case, our choice of plans were,

Plan A: Pre-oxygenate well, anesthetize with intravenous induction agents, perform direct and gentle laryngoscopy and intubate if the laryngoscopic view is good.

Plan B: Upfront tracheostomy and then proceed with procedure.

We preferred intravenous induction as against inhalational induction. Because, though inhalational induction maintains spontaneous breathing which is crucial in difficult airway, it may be difficult to induce when proper mask fitting cannot be achieved, as in our case and more importantly, it gives us less time for laryngoscopy. Intravenous induction with Propofol is smooth, easily accepted by the patient, we can easily control the speed of induction and the depth of anesthesia and thus gives us more time for laryngoscopy.

In this case, Blind nasal approach is a relative contraindication, as this patient have fractured nasal cartilage and distorted nasal passage, it can lead to

more trauma and worsen the situation further, hence avoided.

Indirect visualization of vocal cords by Flexible fiberoptic intubation under local anaesthesia is the technique of choice for management of the anticipated difficult intubation and difficult mask ventilation in the patient undergoing an elective procedure [8], but impractical in maxillofacial trauma patients. Blood, vomitus and secretions in the patient's airway preclude vision by fiberoptic instruments. In addition, accomplishing effective local anesthesia in the traumatized region is difficult. Furthermore, the patient's cooperation is essential for such an approach, but not always possible in the traumatized patient.

Glide-Scope is a video laryngoscope, which relies on good vision of the inner airway, is precluded in the trauma patient, again, by blood and secretions.

Supraglottic airway- Laryngeal mask airway in the presence of tissue damage and disruption of anatomy, may cause further damage to the airway. Though LMA is inserted blindly and requires minimal experience, it does not provide a definitive airway, may cause stomach inflation and get displaced. Since, in our patient, due to limited mouth opening and the surgical correction involved intraoral region, we excluded LMA as a resort to secure airway.

Retrograde intubation technique, is an age old method to secure the airway in anticipated difficult airway. It involves passing a standard Tuohy needle through a cricothyroid membrane and feeding an epidural catheter cephalad into oropharynx/nasopharynx which is then brought out of the oral cavity/nasal cavity. The epidural catheter is then used as a stylet to guide the endotracheal tube into the trachea. But RI requires anesthetizing the airway by trans-laryngeal injection via crico-thyroid membrane puncture with 4ml of 2% of lidocaine supplemented with supra-laryngeal nerve block or with topicalization of the pharynx either by nebulization or spray of local anesthetics. However RI is time consuming and needs complete cooperation of the patient. Though our patient's neck was free of any external injuries, we could have tried awake RI, but

with an incomplete airway block and an uncooperative trauma patient. We also have to admit that we had little expertise in this technique, hence have not included in our plan in managing our patient. [9]

Post-operative management- The patient with a difficult airway is also at high risk for complications in the post-operative period. Following surgery, mucous membranes are edematous, soft tissue is swollen and the air pathway may be compressed. In intubated maxillofacial trauma patients, Extubation should be deferred until normal anatomy is restored or at least until the edema subsides. During Extubation the patient should be monitored closely and the care providers should be prepared for the possibility of re-intubation. In a case of tracheotomy tube, the patient may be awakened and allowed to breathe spontaneously through the tracheostomy tube for a few days, providing a safer recovery. [10]

But in our patient, we decided to extubate at the end of the surgery, after discussing with the surgeon and convinced that there would be relatively less edema intra-orally, so as to cause airway obstruction. After Extubation, the patient was monitored postoperatively in the intensive care unit. Following uneventful two POD, the patient was shifted to the ward and subsequently discharged from the hospital on fifth POD.

Mohiuddin et al reported a 30 year old Afgan lady with multiple mandibular and maxillofacial injuries, whose airway was managed with submental intubation. They concluded that submental intubation is a reliable and safe method of alternative airway management in maxillofacial injuries and it also provides a better access to the soft tissues of the nasal and the oral cavity.(12)

Geetha Mittal et al did a retrospective analysis of 487 cases of maxillofacial injuries managed over a period of 2 years based on the method of airway management and their complications. In 33.05% of patients, airway was managed with intra-operative

change of nasotracheal to orotracheal intubation. In 8.62% of patients, either submental or tracheostomy was done. They concluded that nasotracheal intubation is not a contraindication in the presence of fracture of base of skull and in CSF leak. They also have inferred that by changing the nasotracheal intubation to orotracheal intubation intra-operatively, tracheostomies and submental intubations can be avoided.(13)

Chetan raval et al conducted a retrospective study of 177 cases of maxillofacial trauma, of which 57% of patients were managed with nasal intubation followed by oral intubation in 17% of cases. Other airway management methods like tracheostomy and blind nasal intubations were avoided by FOB guided nasal intubation in 26% of patients. They have concluded that securing the airway by invasive procedures like tracheostomy can be avoided by FOB guided intubation.(14)

CONCLUSION

Airway management of the maxillofacial trauma patient is complex and requires both sound judgment and considerable experience. In our institute, we handle numerous trauma patients whose airway management remains challenging to the anesthesiologist. Though we are currently presented with multiple numbers of airway gadgets in the field to manage difficult airway, we could manage to secure the airway in this patient by simple conventional direct laryngoscopy, of-course with alternative plans, if we fail. When such situations are encountered in any rural hospital, a proper plan, and simple airway gadgets like Bougie, Mc-coy blade, emergency needle crico-thyroid kit, will help us allay the anxiety in handling these cases and to have an outcome with minimal risk and maximal success. It is important to remember that timely, decisive and skillful management of the airway can often make the difference between life and death or between ability and disability in such situations.

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