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Anaesthetic Management of A Patient with Pan Facial Trauma with Restricted Mouth Opening Posted for Open Reduction and Internal Fixation of Facial Bone Fractures

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Abstract

Airway management of patients with maxillofacial trauma remains a challenging task for an anaesthesiologist in emergency and perioperative settings due to anatomical distortion. Appropriate planning and a team based approach is mandatory for establishing the airway during elective surgical procedures and in postoperative period. Here we report a 24 year old male with alleged history of road traffic accident who sustained injury to face. Patient had restricted mouth opening of 1 finger breadth due to pain and multiple facial bone fractures. Patient was posted for Open reduction and Internal fixation of facial bone fractures. In view of anticipated difficult intubation airway management was discussed as team and planned. In OR, before induction, USG guided bilateral maxillary and mandibular block was given, which improved patient's mouth opening. This approach facilitated easy intubation and thereby avoiding airway related complication. The tube was fixed submentally so as to allow good intraoral work space for the surgeons. This case report suggests that use of USG guided maxillary and mandibular blocks facilitated in airway management in this patient with restricted mouth opening. Proper preemptive planning for difficult airway cases and multimodal analgesia helps in managing facial trauma cases successfully without complications.

Keywords: *Difficult Airway, Facial Trauma, Mandibular Block, Ultrasound.*

Introduction

Airway management of patients with maxillofacial is challenging for an anaesthesiologist due to anatomical distortion [1, 2]. Majority of patients present with multiple trauma that requires coordinated management between various specialties. Appropriate planning is mandatory for establishing the airway during elective surgical procedures and in postoperative period. Multimodal anaesthetic approach with appropriate airway management are necessary for successful management of pan facial trauma cases [3].

The team must take into account a number of factors when preparing to secure the airway like the type of trauma and how it affects the airways as it can pose challenges with mask ventilation or endotracheal intubation. Anaesthetist must also take into account the potential cervical spine trauma involved in accidents [4]. The type maxillofacial operation also needs to be taken into account as a empty oral cavity provides easier and better access during maxillary and mandibular fixations.

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Trismus is characterized by a restriction in the ability to open the mouth as a result of decreased mandibular mobility brought on by a variety of etiologies. It can be brought on by variable factors like pain and muscular spasm brought on by trauma, infection, or localised inflammation. The other permanent causes of trismus can be fibrosis, neoplasm, and trauma [5,6].

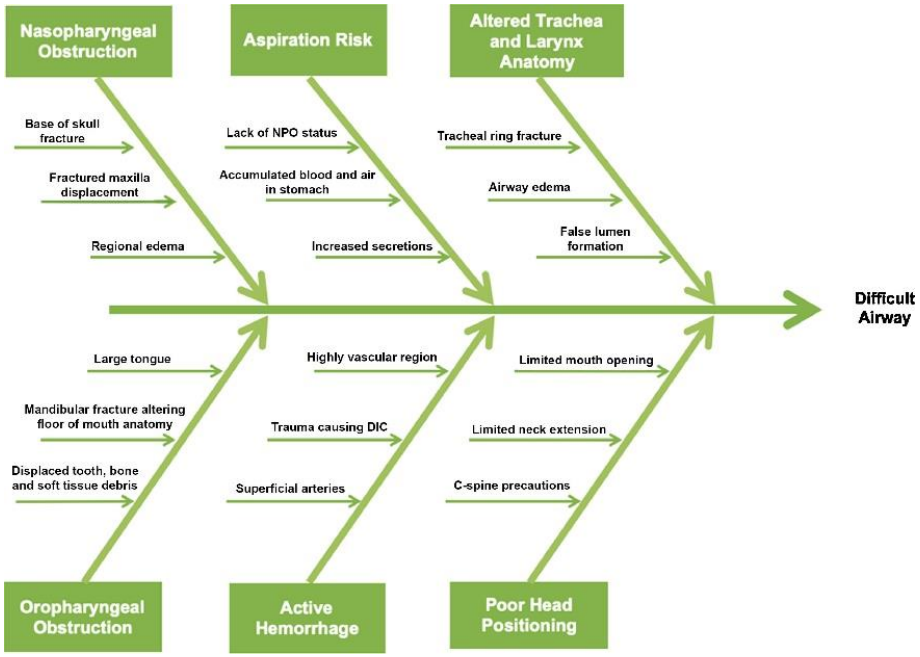

Figure 1. Factors Predisposing to Difficult Airway in Facial Trauma

A patient with maxillofacial injuries has a compromised airway, thus a complete and expeditious airway assessment is necessary. In order to determine the appropriate course of action for managing the patient's airway, the attending physicians should also familiarize themselves with each aspect of the trauma and recognize the challenges involved. Managing the patient requires collaboration amongst the trauma specialists, anaesthesiologists, and surgeons.

The range of mouth opening is a good predictor of the difficulty faced during airway manipulation. It becomes challenging to ascertain if the patient's limited mouth opening is just pain-related or arises from additional issues such edema, spasms, or mechanical restriction [4]. When a patient's mouth opening is limited solely because of pain, good analgesia can help achieve a sufficient openness to evaluate the airway, giving insight into any challenging airway prediction and ultimately assisting in the planning of airway management during the induction of anaesthesia.

The mandibular nerve provides sensory input to the temporomandibular joint and motor innervations to the masticatory muscles. Muscle spasms and trismus have been effectively treated with mandibular nerve blocks [7]. Differentiating the cause of restricted mouth opening can be aided by it. If the reason is pain, mandibular nerve block can provide sufficient analgesia and the range of mouth opening may then be measured, which helps determine the best course of action for the required airway intervention [8,9].

A maxillary nerve block can anaesthetize a large portion of the face, including the Dural, temporal, and zygomatic areas; the hard and soft palate; the maxillary teeth and soft tissues; and the lateral nasal mucosa. Use of USG guided maxillary and mandibular blocks in airway management improves mouth opening in pan facial trauma patients making intubation relatively easy [9]. Ultrasound may help to

more reliably target the nerve, minimizing the quantity of local anaesthetic required and the risk of complications.

Sub-mental intubation is useful in securing the airways where orotracheal and nasotracheal intubation interferes with the surgical field. This procedure avoids the use of tracheostomy and bypasses its associated morbidities [10]. Here we report the successful management of a patient with pan-facial trauma where USG-guided blocks were used to facilitate mouth opening and sub-mental fixation of the tracheal tube to provide better surgical field. Here we report a case of multiple facial bone fractures and restricted mouth opening successfully managed, where the use of USG-guided maxillary and mandibular blocks facilitated smooth airway management without complications.

Case Presentation

The 24-year-old moderately built male came with a history of road traffic accidents 10 days and sustained injury to the face. The patient had a nasal bleed with right eye swelling with discoloration. The patient complained of significant pain while opening the mouth. No loss of consciousness, vomiting or seizures were noted. The patient had no other known comorbidities. Blood investigations revealed normal blood and coagulation parameters. On airway examination restricted mouth opening was noted, inter-incisor distance less than 1 finger breadth with severe pain in right TMJ. CT brain with facial bones shows multiple facial bone fractures with no evidence of hemorrhage. A team based evaluation regarding possible airway difficulties and the planned surgical procedure was done.

The patient was planned for Open reduction and Internal fixation of facial bone fractures. The anesthetic team planned for bilateral ultrasound-guided maxillary and mandibular block for facilitating mouth opening. The patient was shifted to OR. Routine ASA monitors were connected. All difficult airway equipment was checked and ready for use. Two wide-bore IV cannulas and a right radial artery cannula were secured. On the ipsilateral side of the fracture, a linear ultrasound probe was positioned transversely superior to the mandible. The mandibular nerve was found to be an oval to circular hyperechoic structure next to the alveolar artery and vein just anterior to the mandibular condyle. A maxillary nerve block is performed in front of the infratemporal crest by passing the needle above the coronoid process. The bilateral maxillary and mandibular nerve block was given with 15ml of 0.5% levobupivacaine along with 8mg dexamethasone, after which the patient's mouth opening improved facilitating airway assessment. Premedication was given and preoxygenated, induced with intravenous Propofol and Succinylcholine. The patient was intubated with a Flexo metallic tube using a video laryngoscope. Tube was placed orally, and later fixed at the submentum by the surgeon. Injection vecuronium was used as a muscle relaxant. Anesthesia was maintained with oxygen, Air, and isoflurane. Dexmedetomidine and ketamine infusion at 0.5mcg/kg/hr and intravenous propofol infusion were started on the TCI pump. The duration of surgery was 7 hours. The intraoperative period was eventful. Blood loss was around 600ml and 1 unit packed red cells was transfused. The patient was shifted to the ICU for elective postop ventilation and extubated the next day uneventfully.

Figure 2. Patient on Submental Intubation

Figure 3. CT Brain showing Multiple Facial Fractures

Figure 4. Ultrasound Guided Maxillary and Mandibular Block

Discussion

Airway management of patients with maxillofacial trauma remains a challenging task for an anesthesiologist in emergency and perioperative settings due to anatomical distortion. Detailed knowledge of maxillofacial

and airway anatomy is desired for the correct diagnosis of the extent and severity of the injury. Mandibular fractures in two or more locations may facilitate intubation due to the greater mobility of the mandible and accompanying soft tissues; concurrent condylar fractures, on the other hand, may result in mechanical obstruction [11]. Trismus, brought on by localised pain, restricts mouth opening and makes laryngoscopy and intubation more difficult.

The range of mouth opening is an important indicator of difficulty encountered during airway manipulation. In those patients who have restricted mouth opening due to pain, adequate analgesia can help in achieving sufficient mouth opening eventually helping in planning of airway management during induction of anesthesia. The main problem in trismus is the increased muscle tone of masticatory muscles which are supplied via the mandibular nerve, blocking which could help increase the mouth opening thus, changing the whole of airway management. In our case, use of mandibular and maxillary nerve blocks improved the mouth opening of the patient thus making video laryngoscopic assisted intubation possible.

A study has conducted a study on sixty-eight patients with unilateral mandibular fracture, acute pain, and trismus who had relatively difficult airway predictors. When a USG-guided mandibular block was performed, it was discovered to reduce pain and reversible trismus, which increased inter-incisor distance more consistently. This made it possible for the anaesthetist to decide on a safe intubation method with precision [9].

In 2009 the inter-incisor gap was improved by a mandibular nerve block performed before beginning general anaesthesia [8]. The pain scores improved ($p = 0.027$), and no adverse effects were found. The trismus brought on by pain and muscle spasm looked to be reversed by pre-operative mandibular nerve blocking, enabling the anaesthesiologist to determine whether awake intubation is indeed necessary.

The extra oral technique for mandibular nerve block is a most commonly used method. For this technique, it is crucial to know the exact locations of the ultrasound probe and needle tip as well as to correctly identify the anatomical structures from the ultrasound images. In order to view the maxillary artery in the pterygomandibular region, the ultrasound probe was positioned caudal to the zygomatic arch. In our case mandibular nerve was found to be an oval to circular hyperechoic structure next to the alveolar artery and vein just anterior to the mandibular condyle. The injection site that was chosen was close to the alveolar artery to facilitate the anaesthetic drug's penetration of the mandibular nerve[12].

The most popular technique for maxillary nerve blocks guided by ultrasonography is the extra-oral method. The ultrasonography probe is often positioned behind the zygomatic arch during this process. Depending on where the puncture site is, the extra-oral method can be further separated into the supra-zygomatic and infra-zygomatic approaches [13]. In our study, a Maxillary nerve block was performed in front of the infratemporal crest by passing the needle above the coronoid process and the drug was injected suprazygomatic, into the pterygopalatine fossa under ultrasound guidance.

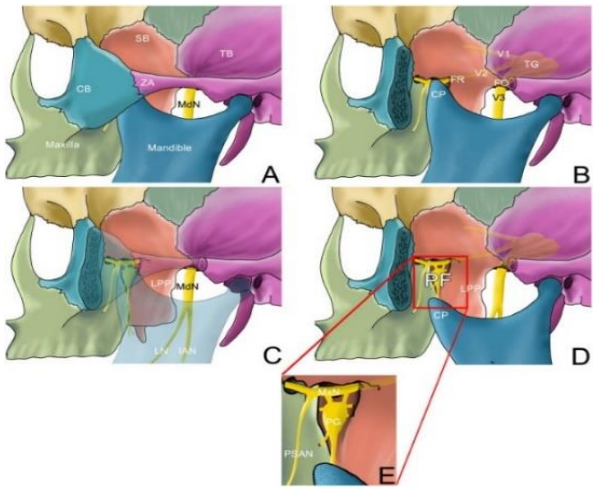

Figure 5. Lateral View of a Portion of the Skull's Anatomy.

The following images show different lateral views of the same part of the skull: (A) Lateral view with mouth closed; (B) Lateral view with mouth closed after the zygomatic arch is removed; the pterygopalatine fossa is covered with coracoid process; (C) Lateral view with mandible and zygomatic arch visible; (D) Lateral view with mouth opened after the zygomatic arch is removed; the pterygopalatine fossa is visible. (E) Pterygopalatine fossa enlarged picture.

For a surgeon, it is convenient to work in the field without an intubation tube; however, an anaesthesiologist places greater importance on the tube's safety and ventilation efficiency. Sub-mental orotracheal intubation avoids the need for tracheotomy and permits unfettered access to the oral region during surgery. Hence our patient, sub-mental intubation was preferred.

Conclusion

Successful airway management in maxillofacial trauma patients requires a skilled anesthesiologist with fully prepared difficult airway cart familiar to the anesthesiologist. A multidisciplinary approach is required for the management of trauma patients. Mandibular and maxillary nerve blocks decrease the pain and will aid in the decision-making by an anesthetist regarding airway management as it helps in increasing the inter-incisor distance significantly. The use of Ultrasound helps the anaesthesiologist deliver a minimum volume of anesthetic agent both safely and effectively.

Conflict of Interest

The authors declare no conflicts of interest related to the study.

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We acknowledge the contributions of all healthcare professionals and patients involved in the in this case study.

Consent Declaration

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

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