CASE REPORT

Submental Approach for Tracheal Intubation - An Alternative to Short-Term Tracheostomy in Patients with Panfacial Fractures: A Case Report

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Intubating a patient with panfacial fractures is always a challenge to the anesthesiologist as both the anesthesiologist and the surgeon are essentially competing for the same space. The anesthetic management of a 19-year-old boy who presented with multiple maxillofacial injuries, pneumocephalus, and cerebral edema sustained during a road traffic accident has been described. He was posted for open reduction and internal fixation of the fractures, frontal sinus fracture elevation and basal repair which required access to scalp, mouth and the nose. As all the conventional modalities to secure airway seemed unsuitable, orotracheal intubation was done via submental route. Following intravenous induction the patient was intubated with a cuffed oral flexometallic tracheal tube. This was then modified to the submental route through a submental incision. The surgery proceeded uneventfully and the patient was extubated a day later in the ICU. He made a satisfactory recovery and the submental scar healed without complication or scarring. We briefly review the technique of submental intubation in adults which serves as an excellent alternative to tracheostomy.

Keywords: difficult Airway, panfacial fractures, submental endotracheal intubation

Patients with maxillofacial trauma who require surgical correction of complex fractures are especially difficult for anesthesiologists as they find themselves competing for the same space with the operating surgeon [1-2]. The anesthesiologist must ensure an unrestricted access to the airway, as well as allow continuous access of the surgical field for the surgeon. Thus, conventional oral endotracheal intubation cannot be practiced in such cases [3-4]. Nasal intubation is also usually contraindicated as complex facial fractures can cause physical obstruction to nasal intubation, and injuries to the base of skull fractures can lead to cranial intubation or infection. A submental route may be a better alternative for tracheal intubation in such cases. First described by Sir Hernandez Altemir in 1986, this technique involves the free end of the armored tube being exteriorized through submental incision, thereby providing the anesthesiologist with complete control of the airway and also ensuring the uninterrupted access to oral and nasal airways for the surgeons [5-6].

Case Description

A 19-year-old boy (ASA PS 1) was scheduled for surgical repair of facial bone fractures 14 days after sustaining multiple maxillofacial injuries along with a head injury in a road traffic accident. He was posted for open reduction and internal fixation of the fractures, frontal sinus fracture elevation, and basal repair.

The patient had an episode of epistaxis and was unconscious for less than five minutes. GCS was recorded to be E1V1M5. Shortly after his arrival, he was intubated orally in the trauma triage and was subsequently sedated and ventilated. Nasal packing, inter-dental wiring, and suturing of palate, lower lip and upper lip were also done in the trauma triage. Initial CT scan of the head showed diffuse cerebral edema and pneumocephalus with multiple facial bone fractures and base of skull fracture. However, there was no CSF rhinorrhea. The patient was started on anti-edema measures and was extubated on the second day once his GCS improved to E4V5M6.

The patient was scheduled for open reduction and internal fixation of the facial fractures along with frontal sinus fracture elevation and basal repair. The pre-anesthetic evaluation revealed no other significant medical or surgical illnesses in the patient. At the time of examination, he was conscious and oriented to time, place and person. Neurological assessment and systemic examination were normal. However, airway assessment showed a restricted mouth opening (22mm), possibly due to pain, and therefore Mallampatti scoring could not be done. The temporomandibular joint had restricted mobility. Hence, difficult airway was anticipated. Both the nares were patent, and cold spatula test showed bilaterally equal free flow of air on expiration. Laboratory investigations revealed normal blood picture, coagulation profiles, serum electrolytes, and liver and renal function.

Nasal endotracheal intubation was contraindicated due to the presence of base of skull fracture, epistaxis and fracture of nasal bone. Oral endotracheal intubation was also not

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favorable as the surgery involved intraoral approach for the fracture fixation, and retromolar intubation could not be done due to the presence of a third molar. Submental endotracheal intubation was therefore chosen as the route of intubation, thereby avoiding tracheostomy and providing a clear surgical field without oral intubation.

Figure 1- Marked are the midline and site of submental incision

After shifting the patient into the operating room, wide bore IV cannula was secured. Monitoring included ECG, pulse oximeter and non-invasive blood pressure. One of the main anaesthetic concerns was difficult airway due to the restricted mouth opening. The airway and surgical plans were discussed with the multidisciplinary team which included personnel for immediate tracheostomy. A difficult airway cart, with a fibreoptic bronchoscope, LMA and Airtraq, was kept ready. Injection glycopyrrolate 0.2mg was administered intravenously as premedication, and the patient was then preoxygenated with 100% oxygen for three minutes. Since difficult airway was anticipated, the patient was induced with sevoflurane in 100% oxygen and with propofol. After attaining a suitable depth of anesthesia while maintaining spontaneous ventilation, a direct check laryngoscopy was done which revealed no airway edema and showed a Cormack-Lehanne grade of 2A. Ability to facemask ventilation was confirmed and neuromuscular blockade was done using vecuronium. A reinforced 8 mm ID cuffed flexometallic endotracheal tube (Rush, Kemen-Rommelshausen, Germany) was used to perform an oral endotracheal intubation. Bilateral air entry was confirmed by auscultation and capnography, after which the throat was adequately packed. Anesthesia was maintained with oxygen, air and isoflurane.

The surgery was initiated with a 2 cm long incision in right submental region, parallel and medial to inferior border of mandible. The incision was extended intraorally by careful blunt dissection using curved artery forceps. Blunt dissection was continued through the subcutaneous fat, platysma, investing layer of the deep cervical fascia and the mylohyoid muscle, until the tip of the artery forceps tented the mucous membrane of the oral cavity. The curved artery forceps were passed through the mucous membrane of the floor of the mouth, and were used to grasp the end of the pilot balloon of the endotracheal tube and then exteriorize through the dissected track through the submental incision. The endotracheal tube was then disconnected from the breathing circuit, the universal tube connector was disconnected from the flexometallic endotracheal tube, and the tube was gently pulled out through the incision by the surgeon. By grabbing the endotracheal tube using the artery forceps, the tube connector was reattached to the endotracheal tube and was reconnected to anesthesia breathing circuit. Throughout the procedure, the endotracheal tube was held firmly in the oropharynx to prevent accidental extubation or inward pushing of the tube. Adequate air entry and tracheal position was confirmed by capnography and bilateral auscultation of the lungs, and the tube was fixed on to the skin with a 2.0 silk suture. The tube was also secured by adhesive tape applied firmly to the skin, and was positioned between the tongue and the mandible intraorally for mobility to allow intraoral manipulation. There were no adverse events while passing the tube through the floor of mouth like bleeding, loosening of the connector after reattachment, damage to the pilot balloon, accidental extubation or oxygen desaturation while converting oral intubation to submental intubation. The total duration of submental intubation procedure was 6.5 minutes. Ease of disconnection of the universal connector from the tube was checked prior to the procedure and could be done easily. Endotracheal suction was done through the submental route. Intraoperative analgesia was provided with intravenous morphine (0.1 $mgkg^{-1}$) and muscle relaxation with of injection vecuronium.

Figure 2- Dissection through the incision

Figure 3- Final position of submentally placed ETT

Intraoperatively, the endotracheal tube was satisfactorily away from the surgical field. Surgery lasted twelve hours, with intraoperative blood loss being about 2500-2700 ml and the period being essentially uneventful.

At the end of surgery, the endotracheal tube was pulled back intraorally with the reinforced tube, followed by the

pilot tube cuff after disconnecting the tube connector, and the submental intubation was converted back to oral intubation. The sutures and adhesive plaster which were used for fixing the tube were removed, and the submental skin incision was closed with interrupted silk sutures and bandaged. Care was taken not to close the submental incision tightly to allow a certain degree of drainage. The intraoral incision was left open to heal by secondary intention. Direct laryngoscopy was performed again and showed no airway edema. Collected blood was suctioned and throat pack was removed thereafter.

Post-operative period was uneventful, and the endotracheal tube was retained orally in the intensive care unit and extubated the next day. Regular mouthwash with 0.2% chlorhexidine gluconate solution was done and good wound care was given. There were no immediate or delayed complications related to the submental incision.

Discussion

In cases where nasal and oral endotracheal intubations are contraindicated, preoperative elective short-term tracheostomy is usually opted for. However, tracheostomy is associated with a high risk of morbidity and is therefore not necessarily the best option. For just the perioperative period, the mortality rate associated with performing an elective tracheostomy has been reported to be between 0.5 to 2.7 % [7].

The high risk of morbidity associated with tracheostomy arises due to complications like bradycardia or cardiac arrest caused by vagal stimulation, air embolism, bleeding, subcutaneous emphysema, pneumediastinum, pneumothorax, recurrent laryngeal nerve damage and tube misplacement, which could lead to loss of airway and/or injury to surrounding structures or laceration of the posterior tracheal wall [8-9]. Tracheostomy procedure-related morbidities also include thyroid injury, subcutaneous emphysema and airway fires caused by either laser or electrocautery [9]. Late complications of tracheostomy include laryngeal or tracheal stricture, hemorrhage from large blood vessels, tracheo-oesophageal fistula, extensive granulation, respiratory tract infection, dysphagia, tracheal stenosis and excessive scarring. Following decannulation, the most clinically significant complication seen is possibly tracheal stenosis. Delayed closure of tracheostomy wound after decannulation, cosmetic deformities, tracheomalacia and tracheal granuloma, and voice changes may also be evident during this period [9].

Surgical proficiency is required for successful submental endotracheal intubation and it is not free of complications. Difficulties in passing the endotracheal tube through the incision and in reattaching the connector to the endotracheal tube are not uncommon [10]. Unexpected adverse events like accidental extubation, tube obstruction and damaged cuff are harder to manage in the submental route than in an oral endotracheal tube [3,2] Other potential complications are trauma to submandibular and sublingual glands or ducts, orocutaneous fistula, mucocoele and infection of the submental wound. However, these can be prevented. Surgery must be carefully planned such that there is enough time for the reduction of tissue edema and the development of malunion is simultaneously avoided. By providing an antibiotic cover preoperatively, applying effective surgical technique during the procedure, ensuring that the submental incision isn't closed too tightly, and with proper postoperative oral hygiene, the risk of morbidity can be reduced significantly.

Conclusion

The submental route for endotracheal intubation is a simple and less invasive procedure and is therefore a logical alternative to tracheostomy and other conventional oral endotracheal intubation procedures for complex maxillofacial repair. Moreover, submental intubation can also be used in many orthognathic and skull base surgical procedures [11]. Of course, submental endotracheal intubation requires surgical proficiency and is not free of complications.

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