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Case Series

Submental intubation as an alternative to tracheostomy for patients with panfacial fractures: a case series

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ABSTRACT

Maxillofacial surgical procedures for panfacial trauma present unique challenges for both surgeons and anesthesiologists. In cases of such injuries, the choice of intubation method becomes critical, especially when temporary airway management is needed intraoperatively due to difficult oral and nasal access and frequent dental occlusion. This study highlighted our experience with submental intubation as an alternative to tracheostomy for airway management in three adult male patients with complex panfacial fractures. The technique of submental intubation involves redirecting the proximal end of an endotracheal tube through the floor of the mouth and the submental region. This approach offers a nontraditional means of airway maintenance with minimal complications and increased safety margins. This study aimed to evaluate the efficacy of submental intubation in managing the airway of patients with complex maxillofacial fractures, assessing factors such as duration of intubation, the incidence of accidental extubation, postoperative complications, as well as a review of literature available previously highlighting the indications, contraindications, advantages, and disadvantages associated with submental intubation. A study of three cases involving panfacial fractures where submental intubation was performed between December 2023 and January 2024 was done. On completion of the procedure, all three patients were successfully extubated on the table without any major intraoperative or postoperative complications.

Keywords: Panfacial fracture, Le Fort's fracture, Submental intubation, Tracheostomy

INTRODUCTION

Panfacial fractures involve injuries to the cranium, midface, and the mandible. Early reconstruction through open reduction and rigid internal fixation is the standard approach in managing these patients. However, maintaining the airway during surgery poses a challenge, as both the anesthesiologist and surgeon require unobstructed access. Typically, maxillomandibular fixation is necessary for adequate facial fracture reconstruction, leading to a debate over the preferred method of intubation. In such cases, a choice often arises between different intubation techniques when surgical access to fractured nasal bone and the simultaneous establishment of dental occlusion is required. Nasotracheal intubation may hinder nasal fracture management and may lead to meningitis or intracranial tube passage in patients with fronto-basilar fractures. Orotracheal intubation may compromise the reduction and stabilization of maxillary and mandibular fractures. Neither nasal nor oral intubation is often suitable for trans-facial approaches to the cranial base. Additionally, the tube may become clamped between the teeth, reducing the airway lumen.

In scenarios where neither oral nor nasal intubation is feasible, tracheostomy has been the default method for securing the airway. However, tracheostomy carries a risk of complications, making it less desirable unless prolonged intubation post-surgery is necessary for airway maintenance. Submental intubation presents a good alternative to tracheostomy, especially when short-term

airway control is needed. Access to both oral and nasal airways is unimpeded, with satisfactory dental occlusion. This technique allows for uninterrupted reduction and fixation of complex maxillofacial fractures, eliminating the need for tracheostomy, particularly in cases where elective post-operative ventilation is not required.

Our study highlighted three cases, discussing preoperative considerations, outcomes, indications, contraindications, advantages, disadvantages, and potential complications associated with submental intubation for surgical correction of panfacial fractures.

CASE SERIES

We presented a case series of three adult male patients who underwent submental intubation for the management of complex panfacial fractures. Data collected included personal demographics, specifics of the maxillofacial fracture, duration of intubation, as well as any intraoperative and postoperative complications associated with submental intubation.

Figure 1: A 1.8 to 2 cm submental incision made.

All patients were males aged between 28 and 35 years, with no comorbidities. The mechanism of injury in all cases was road traffic accidents. Each patient underwent a CT scan of the brain, and neurophysician clearance for surgery was obtained. Routine investigations and systemic examinations revealed no abnormalities. The procedure and anesthesia technique were thoroughly explained to the patients and their relatives. Written consent was obtained after ensuring they were well-informed, and the patients were prepared for surgery. After confirming nil by mouth status, standard ASA monitoring was used after taking the patients on the operating table.

Figure 2: Muscle layers traversed using artery forceps.

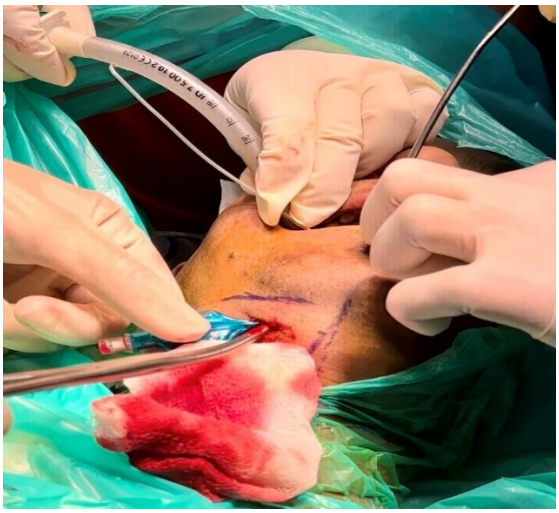

Figure 3: Cuff deflated and removed through surgical tunnel.

Anesthesia technique

All necessary preparations for managing a difficult airway were meticulously executed. Before intubation, each patient received premedications with Inj. glycopyrrolate and injection fentanyl, followed by preoxygenation with 100% oxygen for three minutes. Anesthesia was induced using injection propofol. After confirming mask ventilation, injection atracurium was administered. After ventilating with oxygen and nitrous oxide for 2.5 minutes followed by 100% oxygen for 30 seconds, for intubation, a flexometallic endotracheal tube (ETT) number 7.5 was selected due to its reinforced metallic spring material, providing flexibility, kink resistance, and retention of patency, particularly crucial for navigating acute angles in the airway, such as those encountered in submental intubation. Initially, standard orotracheal intubation was performed in each case, with the help of a direct laryngoscope. The ETT was

connected to the breathing circuit. The universal connector at the proximal end of the tube was loosened before intubation to facilitate disconnection during the procedure. Approximately 8 ml of air was used to inflate the cuff, ensuring a secure airway against oropharyngeal secretions and bleeding. Subsequently, the orotracheal intubation was converted to a submental intubation with the help of the surgical team.

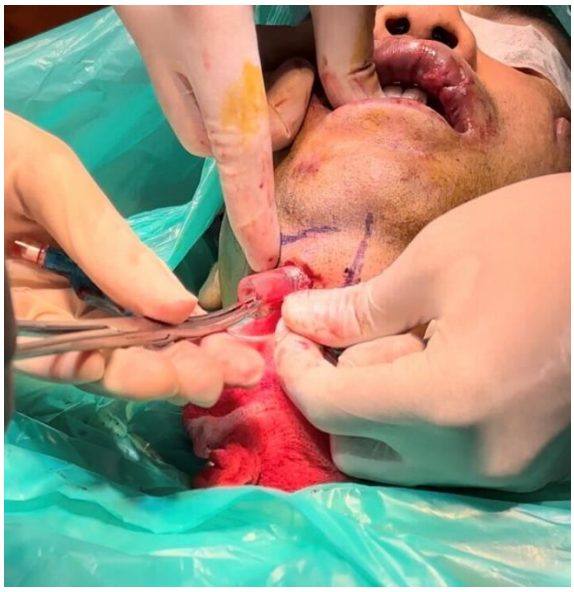

Figure 4: Proximal end of ETT removed through the tunnel.

Figure 5: Cuff re-inflated and circuit attached.

Surgery technique

The submental area was meticulously prepared by scrubbing with aqueous povidone-iodine solution, followed by draping the site. A 1.8 to 2 cm incision was made in the paramedian submental region, adjacent to the medial aspect of the lower border of the mandible.

Using artery forceps, the muscular layers were traversed, followed by an incision of the mucosal layer in the floor of the mouth over the distal end of the forceps. Opening the forceps created a wide tunnel to facilitate easy passage of the tube.

The cuff of the ETT was initially introduced into the mouth and deflated. Then, a closed artery forceps was inserted intraorally through the surgically created tunnel. The tube cuff was grasped with the forceps and pulled inferiorly to traverse the tunnel, emerging through the submental incision.

The endotracheal tube was momentarily disconnected from the breathing circuit, and the tube connector was removed. The same procedure was repeated with the proximal end of the ETT.

Figure 6: Checkscopy done.

After emerging submentally through the tunnel, the connector was reattached, and the tube was reconnected to the anesthesia breathing circuit.

To prevent oxygen desaturation during the interruption of ventilation while passing the ETT across the floor of the mouth, the patient was ventilated with 100% oxygen for approximately 3 minutes. Confirmation of the final ETT position was ensured by doing a check-scopy with the help of a video laryngoscope and by auscultation. Adjustments were made to ensure equal bilateral air entry.

A throat pack was inserted to seal the pharynx from blood and debris during the surgery, which was later removed by the surgeons before dental occlusion. Stay sutures using 3-0 silk were placed around the ETT to secure it,

minimizing perioperative movement and preventing accidental extubation.

Upon completion of the procedure, the stay sutures around the ETT were removed. The patients were well reversed and extubated following a standard extubation protocol without the need to re-convert submental intubation to an oral one. The ETT was removed after deflating the cuff through the submental incision.

Figure 7: Extubation.

The skin wound was closed with simple interrupted sutures using 3-0 prolene, while the intraoral wound was left to heal secondarily. The patients were shifted to post-operative ICU for observation in a vitally stable condition.

Submental intubation was successfully performed in three adult male patients with complex panfacial fractures. The passage of the tube through the floor of the mouth was smooth, and the total duration of the submental intubation procedure ranged from 10-12 minutes. During disconnection from the ventilator, the interruption lasted approximately 2 minutes, and none of the patients experienced oxygen desaturation. Submental intubation allowed for the simultaneous treatment of all fractures without the need to alter the intubation method, and there was no interference from the tube during the surgery. In addition to providing surgeons with the convenience of assessing frequent occlusion due to inter-maxillary fixation, there were no anesthesia-related issues observed. No intraoperative complications arose from the intubation method. There was no damage to the pilot balloon of the cuff in any case. Additionally, no major complications such as hemorrhage or injury to the sublingual glands, lingual nerve, or development of oro-cutaneous fistula were observed. Postoperatively, the patients were followed up and no deficits in salivation were noted. Normal healing of the mucosa in the floor of the mouth was observed in all cases and the skin scar healed well without any keloid formation.

DISCUSSION

Airway management in complex maxillofacial trauma poses significant challenges to the anesthesiologists, especially with modern surgical techniques for treating midfacial and panfacial fractures in one go. When neither nasotracheal nor orotracheal intubation proved suitable, the traditional method of tracheostomy was utilized to secure the airway. However, it carries a host of potential complications, ranging from hemorrhage subcutaneous emphysema, blockage of tracheostomy tube, tracheoesophageal fistula, tracheocutaneous fistula, pneumothorax, tracheal stenosis, problems with decanulation and excessive scarring to respiratory tract infections, necessitating meticulous perioperative care.[1-4] Sir Hernandez Altemir first introduced the technique of submental intubation in 1986. Its common indications are mid-facial and pan-facial fractures, including those involving the base of the skull, and rhinoplasty.[5,6]

In our study, submental intubation was preferred over oro-tracheal and naso-tracheal approaches to facilitate inter-mandibular fixation for maintaining occlusion and to mitigate the risk of intracranial tube placement due to naso-ethmoid complex fractures and potential complications like meningitis, and cerebrospinal fluid leak.[7-10] Compared to tracheostomy, submental intubation proved to be a suitable and straightforward alternative. Its advantages over tracheostomy include early extubation, bypassing the need for laborious post-operative tracheostomy tube management. The technique offers versatility, enabling intubation in polytrauma scenarios and facilitating simultaneous maxillomandibular fixation and access to nasal pyramid fractures. Beyond securing the airway, submental intubation provides a clear surgical field and minimizes intraoperative and postoperative complications. In our case studies, submental intubations were successfully performed in all three patients. Passage of the tube through the floor of the mouth was achieved without any difficulty, and the total duration of the submental intubation ranged from 10 to 12 minutes. None of the patients experienced any oxygen desaturation, and the approach facilitated the simultaneous treatment of all fractures without necessitating a change in the position of the tube. The ETT did not interfere during the operation, providing easy access for the surgeons and the anesthesia team. Moreover, extubation was very straightforward too.

A comparative study between submental intubation and tracheostomy concluded that submental intubation is associated with low morbidity and can replace tracheostomy in selected cases of maxillofacial trauma.[11] In orthognathic surgery, submental intubation allows a simultaneous rhinoplasty procedure without any interference and allows better assessment of soft tissue changes in the nose and lip.[12] Other studies have shown that submental intubation can be performed during transmaxillary approaches for the exposure of the clivus in which if orotracheal intubation is performed, the tube can obstruct the downward retraction of the maxilla after a Le Fort I osteotomy.[13]

However, submental endotracheal intubation is not without its share of complications.[14] There is always a

risk of arterial desaturation during the conversion from oral intubation to submental intubation and vice versa. The pilot balloon may also sustain damage during tube transfer, and difficulties may arise in passing the tube through the incision or reattaching the connector to the endotracheal tube. Complications such as accidental extubation, tube obstruction, and tube leakage are more challenging to manage via the submental route. Other potential complications include infection of the submental wound, trauma to the submandibular and sublingual glands and ducts, lingual nerve damage, fistula formation, development of mucocele, and facial scarring. However, meticulous attention to technique details, careful blunt dissection, and a thorough understanding of anatomy can help mitigate these complications. In our cases, no such complications occurred during intubation, tube transfer, re-transfer, or after extubation.

The submental intubation technique is not recommended for patients who require prolonged assisted ventilation, such as those with severe polytrauma accompanied by significant neurological damage or major thoracic trauma, as well as patients anticipated to undergo repeated surgical interventions.[15]

In our practice, we have found success with a single reinforced endotracheal tube via a paramedian submental approach. This technique allows simultaneous fracture reduction and fixation without compromising the surgical field or airway integrity. While submental intubation may not be suitable for all patients, it represents a valuable option in the armamentarium for managing complex maxillofacial trauma.

CONCLUSION

Drawing from both literature findings and our clinical observations, submental intubation emerges as a straightforward technique with minimal morbidity. Our case series highlights its efficacy as a valuable airway management alternative for patients with pan-facial fractures. Notably, this technique necessitates no specialized equipment, providing a distinct advantage over tracheostomy. By amalgamating the benefits of nasotracheal and orotracheal intubation, submental intubation allows access to both interdental occlusion and the nasal structures. It is effective in yielding favorable outcomes while minimizing surgical time. Moreover, the minimal operative and postoperative complications associated with it, along with the benefits of avoiding tracheostomy-associated risks and side effects make it a great choice. Hence, submental intubation can serve as a viable alternative to tracheostomy in select cases of maxillofacial trauma, particularly when nasotracheal or orotracheal intubation is unfeasible or contraindicated, and long-term ventilation support is unnecessary.

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