

Role of Submental Intubation in Maxillofacial Trauma – A Retrospective Study

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Abstract:

Background: Ensuring a secure airway is crucial for patients undergoing general anesthesia. The two primary techniques for airway management are orotracheal and nasotracheal intubation. Nasotracheal intubation is not recommended in cases of naso-orbito-ethmoidal or pan-facial fractures, while orotracheal intubation is unsuitable when intraoperative and short-term postoperative intermaxillary fixation is required. Tracheostomy is the only other option, but it carries a higher risk of complications. Submental intubation offers an alternative to tracheostomy. **Purpose:** Our hypothesis was to evaluate the use of submental intubation in patients with maxillofacial injuries in whom nasal or oral endotracheal intubation was not possible. **Materials and methods:** Patients who were treated in a tertiary care centre during the period December 2020–March 2024 for facial bone fractures and for whom both orotracheal and nasotracheal routes of intubation were contraindicated, were chosen for this study. The demographic data (age and gender), the required period of intubation and intra-operative and post-operative complications associated with the submental route of intubation were recorded. **Results:** A total of 45 patients (29 males and 16 females) with maxillofacial trauma were surgically treated with submental intubation. The mean age was 27.1 years (range: 19–52 years). Of these patients, 22% of patients had suffered panfacial trauma, 42% of patients had midface with mandible fracture, 31% patients had midface fracture alone and 5% had suffered zygoma, NOE and midface fracture. The mean time to convert orotracheal intubation to submental intubation was 6–12 minutes. The mean duration of surgery was 4 hours 15 minutes (range: 2.5–8 hours). **Conclusion:** Submental intubation is an easy procedure and one that can be completed very rapidly, where there is no risk of morbidity arising. Therefore, it can be used as a viable alternative in selected cases of maxillofacial trauma to avoid invasive procedures such as tracheostomy.

Key words: Airway, submental intubation, trauma

Introduction:

Management of the airway during the surgical reduction in patients with pan facial or midface fractures is challenging. The surgeon must discuss with the anaesthetist various available options for maintaining the airway and managing the reduction of fractures with occlusion. Nasotracheal intubation is not suitable in all cases because it impedes the assessment procedure

and reduction of nasal fractures. In addition, nasotracheal intubation poses the risk of causing damage to the meninges, leading to meningitis and CSF leakage in patients who have skull base fractures. It is also very essential to ascertain the presence of occlusion and perform intermaxillary fixation while reducing and fixing the fractures, which contraindicates the use of orotracheal intubation. Such circumstances necessitate that the patients are treated either by performing a tracheostomy or by changing from nasotracheal to orotracheal intubation during the surgery by taking certain steps. Also, tracheostomy causes various complications and increases the risk of morbidity.

As an alternative, in cases where only short-term ventilatory support is required, submental intubation may be performed. In 1986, first ever submental intubation done in maxillofacial trauma patient to minimize the risk of tracheostomy. It is performed by making an incision in the submental region in the oral cavity to provide an alternative passage for a secure airway using an endotracheal tube while maintaining occlusion and allowing undisturbed surgical access to the fracture sites in the oral and midfacial regions. It also avoids the complications related to nasotracheal intubation and tracheostomy. The purpose of this retrospective study was to evaluate the effectiveness of the submental route of intubation in maxillofacial surgeries where orotracheal and nasotracheal intubation was contraindicated. The assessment of the indications, technique used, duration of the procedure and its associated complications were noted. We have also discussed various modifications in the procedure and the availability of new techniques.

Materials and methodology:

The data used was of patients in our tertiary care centre who had sustained maxillofacial injuries and were operated on by oral and maxillofacial surgeons, using submental intubation technique because both orotracheal and nasotracheal intubations were contraindicated, during the period Dec 2020–March 2024. The collected data pertained to demographic (age and gender), type of facial fracture, associated fractures, the time required for converting orotracheal intubation into submental intubation and intra-operative and postoperative complications associated with the submental route of intubation. Patients who had to be put on mechanical ventilation for over three days post-surgery and patients with incomplete data were excluded from the study. The patients underwent submental intubation as shown in the figure 1.

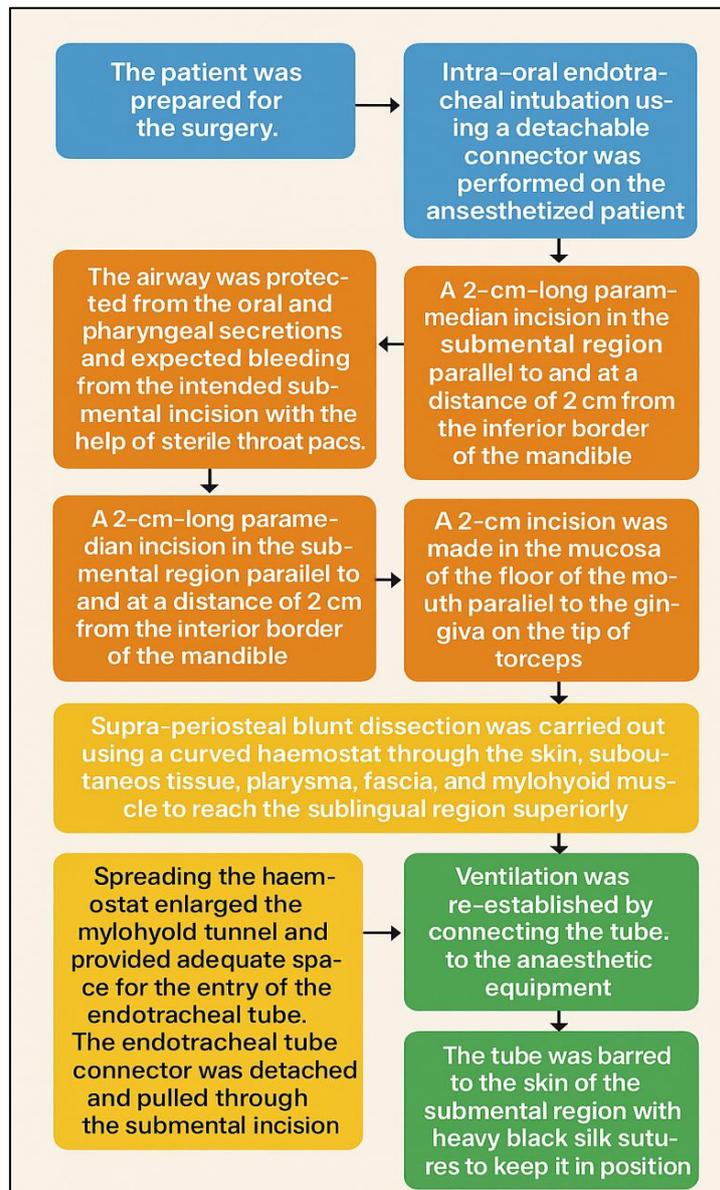


Fig 1: Shows the details of the procedure carried for the submental intubation

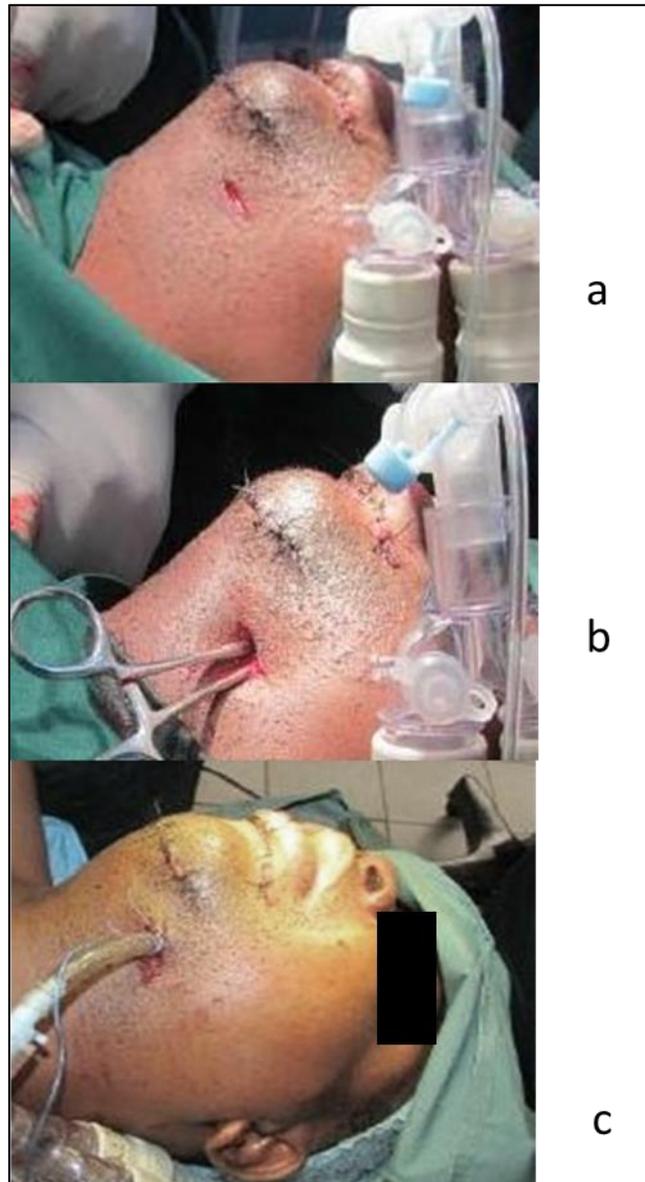


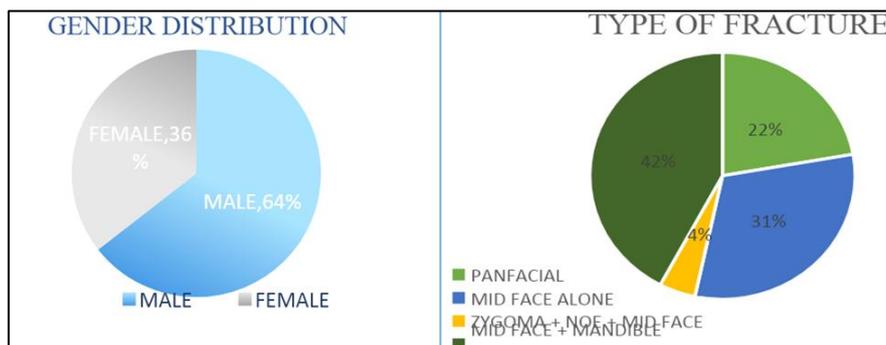
Figure 2a shows Site of incision, **2b** shows dissection of submental tissues, **2c** shows dissection of submental tissues

Results:

Of the 45 patients with maxillofacial trauma who were surgically treated using submental intubation, 29 were male and 16 were female (Graph 1). Their mean age was 27.1 years (range: 19–52 years). The most frequent cause of trauma was road traffic accidents. The types of fractures sustained by the patient were pan-facial trauma (22% patients), midface with mandible fracture (42% patients), midface fracture alone (31% patients) and zygoma, NOE and midface fracture (5% patients) (Graph 2). The time needed to convert orotracheal intubation into submental intubation was 6–12 minutes. The mean duration of surgery was 4 hours 15 minutes (range: 2.5–8 hours).

Without any disruption from the submental intubation during the operation, all patients got sufficient reduction and fixation of all maxillofacial fractures as well as intermaxillary fixation

during the perioperative phase. The submental intubation region's anatomical features were unaltered. During the perioperative period, no instances of hypoxemia or desaturation (episodes with oxygen levels below 90%) were seen. There was no damage to the sublingual or submandibular salivary glands in any of the patients. Intraoperative problems included infection in one patient, postoperative hypertrophic scarring in two cases, and unintentional tube dislodgement in four cases (Table 1). The patients had conservative care, and any problems were precisely removed.



Graph 1a and b shows gender distribution and types of fracture.

S. No	Type of complication	No. of cases	Management
1	Accidental tube dislodgement	4	Repositioning of tube
2	Hypertrophic scar	2	Steroid injection
3	Infection	1	Oral antibiotics

Table 1: Shows the type of complication and how it was managed during submental intubation

Discussion:

The face is the most uncovered part of the body and is highly susceptible to trauma. Inappropriate treatment of maxillofacial injuries can have functional, cosmetic, and psychological effects on the patient. When a patient has maxillofacial injuries, it can be difficult to provide an airway using traditional nasotracheal or orotracheal intubation during surgery. For example, due to anatomical limitations following trauma, nasotracheal intubation is not feasible in patients with pan facial or midface fractures; this would hinder the reduction of fractured segments or raise the risk of fracturing the base of the skull through which the tube transits into the cranium. Complications like sinusitis, meningitis, sepsis, and epistaxis are also possible outcomes.^[1] Orotracheal intubation primarily disrupts intermaxillary fixation of time. In such condition, tracheostomy is desirable for maintaining the airway. But this technique requires special perioperative care, as it may result in several complications such as haemorrhage, tracheal stenosis, pneumothorax, air embolism, emphysema, dysphagia, hypercapnic shock, pulmonary oedema, extensive granulation, inaeesthetic scar and even cause death.^[2,3] The reported incidents of complications resulting from tracheostomy range from 5–45%, with a mortality rate of 2%.^[4] Therefore, great care during the use of this technique is needed to prevent complications. Tracheostomy is performed in surgeries that require prolonged airway management, such as head and neck trauma cases. Other indications include

trauma patients where, postoperatively, the airway is compromised, pan facial fracture cases where midface and bilateral mandibular fractures are present and mandibular fracture sites are approximated via extraoral approach. Hence, tracheostomy is not a preferable technique in maxillofacial injuries.

Retromolar intubation is a technique where, after intraoral intubation, the endotracheal tube (ETT) is positioned in the retromolar area. The ETT is placed behind the last molar using fingers and the tube is drawn out through the corner of the mouth. An advantage of this technique is its ease in achieving occlusion, as the tube is distal to the molars. On the other hand, it carries the risk of damage to the tube due to intermaxillary fixation (IMF) wires and displacement from the retromolar area.^[5]

Therefore, in such cases also submental intubation may be preferred as an alternative. This technique provides access to nasal areas, occlusion and intermaxillary fixation. However, there is a lack of information about the indication and contraindication of submental intubation in maxillofacial injuries, which leads to surgeons preferring tracheostomy over it. Thus, this study intent to evaluate retrospectively the consequences of submental intubation as a secondary procedure to tracheostomy in maxillofacial surgeries.

Mr Hernandez Altemir was the first person to describe submental intubation in the year 1986.^[6] Many modifications were made to the procedure in the later years. This technique can be performed easily and is used only when short-term airway management is required; it is contraindicated in situations where long-term airway maintenance is needed.

Altemir's original procedure has been modified by several surgeons. In our hospital, we follow a technique similar to the original one, with minor modifications such as performing supra-periosteal dissection instead of subperiosteal dissection on the lingual side of the mandible. This was done to prevent damage to important structures present on the floor of the mouth. The complications observed were minimum. C. Taglialatela Scafati et al. has also carried out the submental intubation with supra-periosteal dissection on 107 patients. They stated that this modification reduced the rate of intraoperative and postoperative complication.^[7]

E.MacInnis used a midline incision approach in 15 patients; he claimed that using this approach, all major anatomical structures, including Wharton's ducts, lingual nerves and sublingual glands, may be avoided. There is minimal vascularity in the midline, resulting in minimum bleeding as opposed to the haemorrhage encountered with a lateral sulcus approach.^[8] But in our hospital, we followed a lateral incision 2 cm off the midline and 2 cm from the inferior border of the mandible. The midline technique was not followed, as it would injure the lingual perforating vessels, leading to sublingual hematoma and disruption in the attachment of muscles on the midline (genioglossus and geniohyoid).^[9]

Green et al. suggested a variation of the standard method to avoid desaturation. After performing orotracheal intubation, he used a second tube to pass through the submental incision to reach the floor of the mouth. This tube was then placed into the trachea after removing the original orotracheal tube. This technique can be risky and can cause damage to the second tube.^[10] In our study, there were no reports of difficulties during intubation, and adequate oxygen saturation levels were maintained.

The major reported complication of submental intubation was accidental extubation due to strain on the pilot balloon or the cuff of the tracheal tube when the tube was being pulled out. This, consequently, resulted in prolonged apnea.^[11-14] The other reported complications included the detachment of the pilot balloon, damage to the tube or the cuff during

externalization, skin infection, abscess formation, salivary fistula formation, hypertrophic scar formation, tube dislodgement, lingual nerve paraesthesia, venous bleeding and mucocele formation.^[15-19] The results of our study show that the submental intubation technique has low morbidity, because of a low perioperative complication rate. The complications included four incidents of accidental tube dislodgement and three incidents of late postoperative complications. Of these, two showed hypertrophic scar formation, which was managed by steroid therapy, and one showed postoperative infection in the region of submental incision. This was managed with oral antibiotics.

In a recent systematic review that included 111 articles, the most frequently reported complication was infection (2.4%) followed by tube apparatus damage (0.7%).^[20] In their systematic review of 41 articles, Mr J. S. Jundt et al. stated that the most common complication was superficial skin infection. It affected 23 out of 824 patients (2.79%). The other reported complications were fistula formation, damage to the tube, hypertrophic scarring, extubation in paediatric patients, lingual nerve paraesthesia, venous bleeding and mucocele formation.^[21] Comparable results were found in a study of submental intubation in 25 cases by Mr Christophe Meyer et al. The complications encountered were one case of post-operative hypertrophic scarring and two cases of abscess formation on the floor of the mouth.^[22]

The risk of infection may be due to the contamination during the surgical procedure or postoperative contamination of the submental tract with the oral cavity and its fluids. Therefore, it is important to maintain an aseptic condition during the surgery, prescribe postoperative use of antibiotics and provide instruction regarding proper oral hygiene. There was no statistically significant relationship between secondary outcome variables such as gender, age, fracture type, or the duration of surgery and the incidence of the complications. Surgical scar on submental intubation is barely perceptible and cannot be seen unless the head is extended out.^[9] Hence, it is easy for the patient to accept these scars.

It was observed in other studies that the disadvantages in this procedure were perioperative bleeding, damage to submandibular and sublingual glands or their ducts and injury to lingual nerve. The incidence of these complications was few because the surgical route was made from the extraoral to the intraoral path via a cautious, blunt supra-periosteal dissection to prevent damage to adjacent vital structures. The modification made to the original Altemir's technique was the avoidance of subperiosteal dissection and performing supra-periosteal dissection as close as possible to the mandible.^[6,7]

No episodes of arterial desaturation with oxygen levels falling below 90% and hypoxemia were noted during the perioperative period. The surgeries were performed without interruption, with clear surgical visibility; moreover, IMF was performed when required.^[20-22] After the reduction and fixation of fractures, the submental intubation was converted into standard orotracheal intubation in a similar way it was inserted and then extubated. Submental intubation procedure requires some amount of experience to prevent complications but, with practice, surgeons can master this technique. The time to complete the procedure was 6 to 12 mins in our cases, which was similar to the time noted in other studies.^[8] Hence this procedure is easy to perform, cost-effective, quick, and safe, and an effective method of intubation. It results in a scar that is cosmetically well-accepted by the patients. Because of this, it is used in other maxillofacial treatments like orthognathic and cosmetic facial surgeries.

The indications for submental intubations are, patients with minimal neurological deficit, craniomaxillofacial traumatic injuries, when short-term intraoperative IMF is required to establish reduction and rigid fixation of fractures, patients with large pharyngeal flaps, combined craniomaxillofacial surgeries and rhinoplasty cases where intermaxillary fixation is needed and tube in the surgical field impedes surgery, the deformities in congenital, pathological or post-surgery malformed symptomatic cases will cause disorder or added difficulties for the operators of nasotracheal or orotracheal intubation. Contraindications of submental intubation are, patients with a severe neurological deficit, patients with multisystem trauma, patients who need long-term respiratory support and care, patients with a known tendency for severe keloid formation. [23]

Conclusion:

Submental intubation is a simple, quick, and easy-to-perform procedure with exceptionally low morbidity. Furthermore, this technique allows reduction and fixation of frontonasal fractures and evaluation of occlusion. Therefore, it can be used as a viable alternative in selected maxillofacial trauma cases to avoid invasive procedures such as tracheostomy.

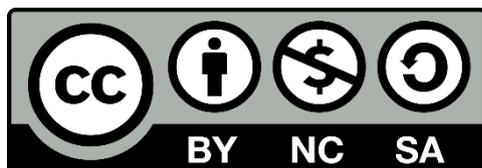
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