Review Article

Submental Intubation in Panfacial Trauma- A Review

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ABSTRACT:
Submental orotracheal intubation is a simple, quick and effective alternative to oral and nasal tracheal intubation or tracheostomy in the surgical management of selected patients with craniomaxillofacial injuries. It has a low morbidity and it does not impede the surgical field, allowing for temporary maxillomandibular fixation intra-operatively, and nasal assessment, manipulation and bone grafting, either simultaneously or as an independent procedure. The techniques and indications for submental tracheal intubation are described.
Keywords: Craniomaxillary trauma, Anaesthesia equipment, Endotracheal tube, Intubation tracheal, submental.

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Introduction

Airway management in complex craniomaxillofacial traumas and in oncological cranial base surgery is often difficult. The choice of intubation technique requires good assessment from a multidisciplinary team that includes maxillofacial surgeons and neurosurgeons as well as good communication between the surgeons and anaesthetist.[1] In many conditions such as craniomaxillofacial trauma, neither nasal nor orotracheal intubation is possible. In fact, nasotracheal intubation precludes the treatment of nasal fractures. It can result in meningitis or the tube can be passed intracranially in patients with frontobasilar fractures.[2-6] Conversely, an orotracheal tube interferes with maxillomandibular fixation, compromising the reduction and stabilization of maxillary and mandibular fractures.[7] Often neither nasal nor orothracheal intubation is suitable for transfacial approaches to the cranial base.[8] In these situations, which require teamwork from several disciplines, tracheostomy is considered the technique of choice for airway control by many anaesthetists and surgeons.[9] In such cases tracheostomy is the choice for airway management for anesthetists. An alternative for tracheostomy was first described by Hernandez Altemir in 1986. The submental route for endotracheal intubation consists of pulling the free end of an endotracheal tube (universal connector removed) through a submental incision, after a usual orotracheal intubation has been performed. The use of submental intubation with Altemir's technique and its modifications has been

used in a large number of patients with maxillofacial injuries. The term transmylohyoid intubation was given by Gadre and Kushte. Since the path of exit of the endotracheal tube is across the mylohyoid muscle and not restricted to the submental triangle. Many studies have compared the disadvantages and risks of tracheostomy and submental intubation for the treatment of facial fractures.[10-14]

Technique

To perform this technique, the patient's trachea is intubated orally using an armoured tracheal tube. Prior to this the universal connector must be removed or cut off and replaced with a removable connector to allow easy detachment. Using an aseptic technique, the skin of the neck, lower face and the end of the tracheal tube are cleaned with an appropriate antiseptic solution. Care must be taken not to dislodge the tube at this stage. A 1.5-cm skin crease incision is made in the submental region, just medial to the lower border of the mandible, approximately one third of the way from the symphysis to the angle of the mandible. The side of the mandible that is used may be dictated by the presence of a concurrent mandibular fracture. Mouth opening is maintained using a gag or dental prop and the tongue is retracted, exposing the floor of the mouth. A medium-sized curved artery forceps is then introduced into the submental incision and blunt dissection is carried out towards the floor of the mouth, staying as close as possible to the inner (lingual) aspect of the mandible to avoid damaging the sublingual gland, submandibular duct and lingual nerve. The tissue layers encountered are subcutaneous fat, platysma, investing layer of deep cervical fascia and mylohyoid muscle until the tip of the artery forceps tents the mucosa of the floor of the mouth, at the junction of the attached lingual mucosa. The tented oral mucosa is then incised allowing easy delivery of the tip of the artery forceps into the oral cavity. The blades of the forceps are then separated to a distance equating the diameter of the tube and gently passed in an oral-to-skin direction to reduce any soft tissue resistance for subsequent passage of the tube. The patient's lungs are then ventilated with 100% oxygen for several minutes and the tracheal tube briefly disconnected from the breathing circuit. The universal connector is removed and the pilot tube cuff (deflated) is grasped by the artery forcep and pulled through the passage in the floor of the mouth. Then a trocar is quickly inserted through the submental incision to grasp the end of the tracheal tube, which is also pulled through in a similar way.

The connector is then re-attached, the cuff re-inflated and the tracheal tube reconnected to the breathing circuit. The tracheal tube then lies in the sulcus in the floor of the mouth between the tongue and the mandible. The position of the tracheal tube is checked using capnography and chest auscultation and a careful note made of the distance marking on the tube at the skin exit site. The tube is then secured to the skin of the submental region with adhesive tape circumferentially applied to the tube and a heavy (2 ⁄ 0) black silk suture. The elastoplast in addition prevents accidental inward displacement of the tube during manipulation of the mandible. A throat pack can then be inserted if required.

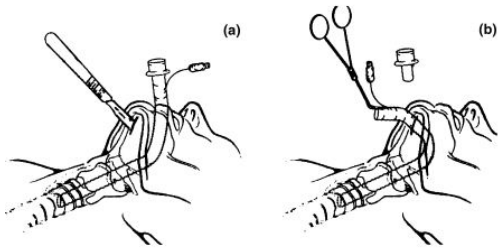

Figure 1: Schematic diagram showing the sub mental intubation procedure-

A. Submental incision in orally intubated patient
B. Detachment of connector and pulling of tube cuff and tube

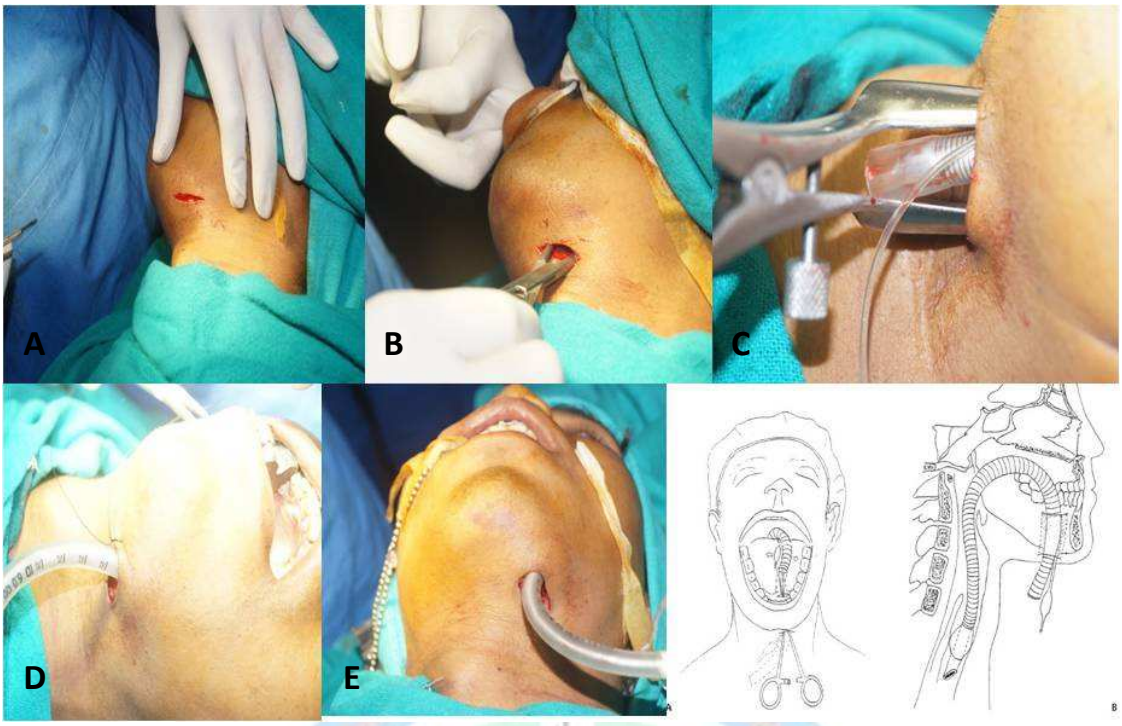

Figure 2: A) Submental incision; B) Blunt dissection to reach upto FOM; C) Pulling of cuffed ETT by trocar; D) ETT through submental route; E) Securing the tube by suturing

At the end of the operation the procedure is reversed. The skin sutures are cut and the tracheal tube is briefly disconnected from the breathing circuit. The universal connector is then removed and the deflated pilot cuff is pulled back through the passage in the floor of the mouth, followed by the tracheal tube. The connection is then re-established and the tube is secured. The submental incision is closed using 3-0 silk sutures that are removed after 10 days. Intraoral sutures were not taken and the site was allowed to heal by secondary healing.

Discussion

The treatment of oncological and traumatic diseases through cranio maxillofacial surgery often implies problems with intraoperative airway management. When neither nasotracheal nor orotrachel intubation is suitable, temporary tracheostomy is frequently the option of choice.[7] This technique however is associated with significant morbidity. Complications include hemorrhage, recurrent laryngeal nerve damage, subcutaneous emphysema, tracheal stenosis, and a cosmetically undesirable scar.[13] Different solutions have been proposed as an alternative to tracheostomy. In panmaxillofacial trauma, which requires maxillomandibular fixation and nasal fracture reduction, switching an endotracheal tube from the nasal route to the oral route without extubation can be a good option. This maneuver can be completed in less than 10 minutes.[15-16] Nevertheless, in patients with frontobasilar fractures associated with maxillofacial trauma, the nasotracheal intubation can lead to major complications such as meningitis, sepsis, and cerebrospinal fluid leakage. Furthermore, the nasal tube can be introduced intracranially, causing significant brain damage.4-5 Retromolar intubation has been advocated as a simple way to avoid Naso tracheal intubation as well as interference with dental occlusion. In this technique, a semilunar ostectomy is made in

Table 1: Modifications of Submental Intubation

Author	Year	Modification	Reason for modification
ALTEMIR et al[10]	1986	2 cm paramedial incision in a subperiosteal plane. Nasal speculum facilitates tube passage through submental region	First report
GREEN & MOORE[20]	1995	1st tube: oral intubation 2nd tube: submental approach. Oral tube is substituted with submental endotracheal tube, patient is reintubated	Allows use of endotracheal tubes with nondetachable universal connectors
MACINNIS & BAIG[21]	1999	2 cm midline incision posterior to Wharton's ducts between geniohyoid, genioglossus and anterior belly of the digastrics muscles	Decreased bleeding
ALTEMIR et al[22]	2000	Utilized a reinforced laryngeal mask airway in the submental approach	Allows use in severe laryngotracheal trauma, singers and patients with unstable cervical fractures
NWOKU et al[23]	2001	2 cm laterosubmental incision	Attempts to avoid significant floor of mouth structures
MAHMOOD & LELLO[24]	2002	1 cm midline incision between Wharton's duct and the reflection of the lingual gingivae and the floor of the mouth	Decreased bleeding and avoidance of important structures
ALTEMIR et al.[25]	2003	Utilized a reinforced Combitube in the submental approach	Assists in tamponade of pharyngeal haemorrhage
BALL et al[26]	2003	Flexible tracheal tube with an intubating laryngeal mask	Connector easily removed and refitted and tube tip design eases intubation
LIM et al[27]	2003	1.5 cm submental and paramedial incision. A blue cap from a size 32 Fr thoracic catheter is placed over the distal end of the tube incorporating the pilot balloon and tube	Reduction of tube damage complications
NYARADY et al[28]	2006	A sterile nylon guiding tube is placed over the distal end of the tube incorporating the pilot balloon and tube	Reduction of tube damage complications
BISWAS et al[29]	2006	Percutaneous tracheostomy dilatational kit facilitates exteriorization of the endotracheal tube through the submental route	Reduction of tube damage complications

the retromolar area of the mandible to gain necessary space. Retromolar intubation without this additional surgical intervention, which is considered objectionable, is feasible only rarely and in short, uncomplicated procedures. In patients with multiple facial fractures, the presence of the oral tube is awkward and there is always a risk of dislodgement, especially if a change in head position is required during surgery.[16] Submental intubation was first described as an alternative route for oral or nasal intubation, especially in cases of major facial trauma. Other indications, such as systemic pathology or cases of simultaneous orthognathic and plastic surgery are reported.[17] since the first application of this technique, less than twenty years ago, many authors have studied the clinical use of this procedure. Very low rates of complications have been reported. Many trials have shown the submental route to be a simple, quick and safe approach to airway management. It is a versatile technique which allows intubation of patients in the presence of polytrauma and allows maxillamandibular fixation along with simultaneous access to nasal pyramid fractures.

The submental intubation technique apart from securing airway provides an unobstructed intraoral surgical field, avoids intraoperative and postoperative complications of tracheostomy, and overcomes disadvantages of NTI. Schutz and Hamed [18] in their comparative study between submental intubation and tracheostomy concluded that the submental intubation is associated with low morbidity and can replace tracheostomy in selected cases of maxillofacial trauma. Submental intubation combines the advantages of nasotracheal intubation, which allows the mobilization of the dental occlusion, and those of orotracheal intubation, which allows access to frontonasal fractures. It also avoids the risks of iatrogenic meningitis or trauma of the anterior skull base after nasotracheal intubation, as well as complications, such as tracheal stenosis, injury to cervical vessels or the thyroid gland, related to tracheotomy. The submental intubation technique is contraindicated in patients who require a prolonged period of assisted ventilation, that is, polytrauma patients presenting with severe neurologic damage or major thoracic trauma and patients expected to need repeated surgical interventions.[19]

It is an extraoral procedure and reported some complications in literature. They are as mentioned below:

- Infection
- Endotracheal tube damage
- Fistula
- Right mainstem intubation/obstruction
- Hypertrophic scarring
- Extubation (Paediatric)
- Venous bleeding
- Excessive bronchial flexion
- Transient lingual nerve paresthesia
- Throat pack sticker dislodged
- Mucocele formation

Conclusion

Submental intubation should be chosen whenever possible in cases of purely maxillofacial trauma. It demands a certain surgical skill, but it is simple, safe and quick to execute. Communication between the surgeon and anaesthesiologist is paramount. It also allows operative control of the dental occlusion and concomitant surgery of the nasal pyramid in major maxillofacial traumas and avoids iatrogenic placement of the tube in skull base fractures. Finally, it presents a low incidence of operative and postoperative complications and eliminates the risks and side effects of tracheotomy. Additional research is necessary to compare tracheostomy to submental intubation and larger studies are required to validate new modifications reported in the literature.

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