Original article:

Submental intubation in maxillofacial injuries

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Abstract:

Aim: To evaluate the indications and outcomes of airway management by submental intubation in patients with maxillofacial trauma, and to describe the technique of submental intubation in detail and discuss its latest refinements.

Materials and methods: Of 161 patients admitted from January 2014 through December 2014 with maxillofacial trauma, 102 were operated on under general anaesthesia. Seven patients underwent submental intubation for airway management.

Results: All patients were intubated safely. No desaturation episodes were noticed intra-operatively. At the end of the procedure, extubation was done without any complications. None of them required tracheostomy postoperatively. Postoperatively one patient developed fistula. There were no other postoperative complications in any patient.

Conclusion: Submental intubation is a safe method of endotracheal intubation with minimal morbidity. It is an effective alternative of tracheostomy in patients of faciomaxillary injuries in whom prolonged ventilatory support is not required.

Key words: Submental intubation, maxillofacial injuries

Introduction:

Airway management in patients with faciomaxillary injuries is challenging due to disruption of components of upper airway. In most maxillofacial trauma cases the airway is secured by nasotracheal intubation (NTI) without interfering with the maxillomandibular fixation and surgical approach [(1)]. But patients with associated nasal fractures rules out possibility of nasal intubation and orotracheal intubation is also not feasible as operating surgeon needs to check occlusal alignment, may opt for maxillomandibular fixation or prefer intraoral surgical intervention to have access to fractured fragments. Nasotracheal intubation can also be problematic in patients with skull base fractures, potentially creating communication between nasal cavity and anterior cranial fossa. Accidental passage of the tube into the cranial cavity is a very rare complication, however a catastrophic one, dreaded by anaesthesiologists [(2,3)]. Communication between nasal cavity and anterior cranial fossa may cause brain damage, leakage of cerebrospinal fluid.

Tracheostomy in such situations is conventional and time-tested. Despite being one of the most common surgical procedures, the tracheostomy has a 14% to 45% complication rate documented in the literature and its use should be judiciously considered [(4,5)]. This holds true especially in otherwise healthy patients, who would require tracheostomy only during faciomaxillary procedure by virtue of impossibility or contraindication of nasal intubation. It has iatrogenic complications such as tracheal stenosis, internal emphysema, damage to laryngeal nerves, tracheoesophageal fistula, and scarring. Hence increases patient morbidity, it needs special postoperative care, lengthens hospital stay, adds to expenses and also

psychological trauma to patient. Submental intubation has emerged to be a safe alternative in almost last $2^{1/2}$ decades, especially when long-term postoperative ventilation is not planned. This technique has minimal complications and has better patients' and surgeons' acceptability. The limitations are longer time for preparation, inability to maintain long-term postoperative ventilation and unfamiliarity of the technique itself.

Aims and objectives:

To evaluate the efficacy, indications and outcomes of airway management by submental intubation in patients with faciomaxillary injuries and to evaluate it as a safe alternative of tracheostomy.

Materials and methods:

Seven patients with faciomaxillary injuries who reported to the Oral and Maxillofacial Surgery department at Government Dental College & Hospital, Ahmedabad were selected for submental intubation. Out of seven, six patients were male and one female. Age ranged from 21-35 years. Description of injuries sustained by patients who underwent submental intubation is described in Table 1.

Surgical technique: After the induction of general anaesthesia, the patient's trachea is intubated orally by standard laryngoscopy with tracheal tube. It is important to release the sealed connector from the proximal end of the tube before intubation so that it can be easily disconnected during the procedure. A skin incision of approximately 2 cm is made parallel to the inferior border of the mandible in the submental area lateral to the midline. Blunt dissection progressing from outside to inside through the subcutaneous fat, platysma, deep cervical fascia, and mylohyoid muscle was carried out. A closed strong curved artery forceps is then inserted into the mouth through the dissected canal. At this point, the endotracheal tube is briefly disconnected from the breathing circuit and the tube connector is removed. The deflated pilot tube cuff followed by the endotracheal tube are grasped by artery forceps and pulled outside. During this manoeuvre, the tube is fixed in the mouth to prevent slipping from the trachea either manually or with McGill's forceps. The tube is then reconnected and secured to the skin of the submental area by silk suture after verifying unchanged tracheal insertion of the tube by auscultation of the chest. At the end of the procedure, the deflated pilot tube cuff and the tube are pulled back in the reverse order and the skin and layer wise primary closure is done involving intraoral and extraoral sites.

There have been many modifications in the original surgical technique. These have been enlisted in Table 2.

Observations & Results:

All patients included in our study were safely intubated. No complications were encountered during the procedure. Average time needed for submental intubation was 5.9 minutes. At the end of operative procedure, all patients were safely extubated. No major desaturation episodes were noted. All patients maintained optimum oxygen levels postoperatively and none required tracheostomy. Postoperatively one patient developed fistula which was treated with excision under local anaesthesia under antibiotic coverage and healed uneventfully.

Discussion:

Difficulty in securing an airway is often associated with the management of complex maxillofacial trauma. Essentially, the anaesthesiologist and the surgeon are competing for the same space. Traditional orotracheal or nasotracheal intubation is not always feasible in cases of craniomaxillofacial trauma, especially when the nasal pyramid or the

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anterior skull base are involved and also when intraoperative manipulation of altered dental occlusion is necessary. Orotracheal intubation hampers maxillomandibular fixation (MMF) in complete dentate patients. Nasotracheal intubation is contraindicated in cases of skull base fractures and makes treatment of nasal bone impossible at the same time [(6)].

In such circumstances, when both oral and nasal routes for intubation cannot be chosen, tracheostomy is the next, standard route to the trachea [(7)]. Tracheostomy has often been reported to lead to numerous complications complications such as bleeding, injury to adjacent structures, emphysema, pneumothorax or pneumomediastinum, blockage or displacement of cannula, tracheitis, cellulitis, tracheal stenosis, tracheoesophageal fistula, and major scarring, among others [(8)]. Although skilful and precise surgical management helps in avoiding most of these complications, absolute indications for tracheostomy must be carefully considered. Tracheostomy is indicated for patients who need prolonged time of ventilatory support. It is also indicated for patients who have sustained neck injuries and the airway is compromised or in selected patients in whom a submental intubation is not feasible such as bilateral fractures of the mandible treated with an extra-oral approach, associated fractures of the middle third of the face. Hence tracheostomy is generally avoided unless the patient needs to be kept intubated, for maintaining airway, even after the surgery [(9)].

Submental intubation, thus as a safe alternative to tracheostomy, can be used when short-term control of airway is desirable with the presence of undisturbed access to oral as well as nasal airways and a good dental occlusion. Submental intubation was first described by Altemir [(10)], which allows access to frontonasal fractures, while avoiding the risks of iatrogenic meningitis, tracheal stenosis, injury to cervical vessels or the thyroid gland, related to tracheostomy (MacInnis and Baig, 1999.) There are certain disadvantages of submental intubation which are easily avoidable by taking proper precautions, like infection in the floor of the mouth, risk of submental fistulae and anomalous scars. The route of the tube does not need to be in the submental region; it can be in the anterior submandibular region few centimetres further along the masseter muscle (Stoll *et al.,* 1994). For these reasons, several authors prefer to call the technique "submento-submandibular intubation".

Submental intubation is relatively easy procedure with lower morbidity which allows free intraoperative access to the dental occlusion as well as to nasal pyramid. We were able to manage complete dentate patients who sustained mandible fractures associated with nasal fractures by intermaxillary fixation during surgery for reduction of the facial fractures of the dentate segment. The intermaxillary fixation is removed before extubation; the tube is switched to the oral cavity, and the skin incision is closed. All of our patients were extubated in the operating room with no need of postoperative airway maintenance. Our objective in this case series was to present an alternative technique to manage airway problems and avoid potential morbidity associated with tracheostomy. The sample is small because the necessity of submental intubation was small.

Complications of submental intubation could include damage to the cuff balloon, infection of submental wound, abscess formation in the floor of the mouth, salivary fistula, development of mucocele, and hypertrophic scarring. All these complications are comparatively rare and can be avoided with meticulous technique [(11)].

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Conclusion:

Submental intubation is a relatively simple, safe, and very low morbidity technique for operative airway management in craniomaxillofacial trauma patients and is apt to replace tracheostomy in cases where long-term ventilation is not required.

Fig 1: Incision in Submental region

Fig 2 : Dissection

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Fig 3: Submental Intubation done

Table 1: Patients managed by submental intubation

Patient	Maxillofacial injuries	Other associated injuries
Male, 24 years	Nasomaxillary complex and dentoalveolar fracture	None
Female, 21 years	Le Fort II, nasomaxillary complex, unilateral mandibular angle fracture	Femur fracture
Male, 28 years	Le Fort I and nasal fracture, saggital split of palate, mandibular body fracure	Radius fracture
Male, 30 years	Nasomaxillary complex, orbital floor and mandibular dentoalveolar fracture	None
Male, 22 years	Le Fort I-II, nasomaxillary complex	Brain contusion
Male, 35 years	Nasomaxillary complex, bilateral mandibular angle fracture and laceration of the nose	None
Male, 29 years	Nasomaxillary complex, Le Fort I and mandibular dentoalveolar fracture	None

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Table 2: Modifications of submental intubation

Author	Year	Modification	Reason of modification
Altemir et al	1986	2 cm paramedial incision in a subperiosteal plane. Nasal speculum facilitates tube passage through submental region	First report
Green and Moore	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	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	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	2001	2 cm laterosubmental incision	Attempts to avoid significant floor of mouth Structures
MAHMOOD & LELLO	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	2003	Utilized a reinforced Combitube in the submental approach	Assists in tamponade of pharyngeal Haemorrhage

BALL et al	2003	Flexible tracheal tube with an intubating laryngeal mask	Connector easily removed and refitted and tube tip design eases intubation
LIM et al	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	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	2006	Percutaneous tracheostomy dilatational kit facilitates exteriorization of the endotracheal tube through the submental route	Reduction of tube damage complications

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