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Submental intubation in complex craniomaxillofacial trauma cases

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ABSTRACT

Background: Airway management in patient with craniomaxillofacial trauma is challenging due to disruption of components of upper airway. In complex panfacial trauma cases, especially involving naso-orbito-ethmoidal complex, the airway is shared between the maxillofacial surgeon and anaesthesiologist. Often in such severe trauma cases, both nasotracheal and orotracheal intubation are contraindicated. Previously in such situation tracheostomy was the method of choice. Though tracheostomy is time tested it has its fair share of complications, some even life threatening. Other methods were used such as retromolar intubation as an alternative, but it may not be suitable for all such cases. Another approach is submental intubation but not so much in routine practice. A retrospective study was designed to evaluate clinical criteria's airway management in complex craniomaxillofacial trauma cases using submental intubation.
Methods: Datasheets of 14 craniomaxillofacial trauma cases who were intubated with submental intubation method were reviewed. The factors like: ease of anaesthesiologist for carrying out general anaesthesia, ease of surgeon for performing surgery and average time taken during the procedure, intraoperative and postoperative complications were evaluated and charted.
Results: Submental intubation provides intraoperative airway control, avoids use of both oral and nasal routes, and allows intraoperative manipulation of occlusion, intramaxillary and intermaxillary fixation. This technique has minimal complications and has better patient, anaesthetists and surgeons acceptability. The limitations of this technique include longer preparation time, inability to maintain long term postoperative ventilation and unfamiliarity of technique itself.
Conclusions: This submental intubation can be used with little modifications in a variety of complicated panfacial trauma cases.

Keywords: Panfacial trauma, Craniomaxillofacial trauma, Submental intubation, Orotracheal intubation

INTRODUCTION

Due to its prominent location in face the mandible and zygomatic bones are commonly involved in facial trauma.[1] About 21.8% of all maxillofacial injuries need open reduction and internal fixation.[2] Panfacial injuries, especially involving naso-orbito-ethmoidal complex along with maxilla and mandible usually leads to severe derangement of the anatomy, involving both soft and hard tissues, even when there is little evidence of deformity externally. In these situations, neither oral nor nasal intubation is appropriate during surgical repair. Sharing of airway is common occurrence in maxillofacial surgeries but in panfacial trauma cases, the conventional orotracheal intubation is inappropriate as it interferes with surgical procedure, in reduction of various fractures, in rigid internal fixation of fractures, to verify occlusion intraoperatively and an overall soft tissue evaluation

during surgery, as in naso-orbito-ethmoidal fracture cases.

Nasotracheal intubation is not recommended in presence of severe panfacial fracture, cervical spine injury, skull base fracture with or without cerebrospinal fluid rhinorrhoea, distorted nasal anatomy, when nasal packing is indicated and certain orthognathic surgeries. The complications encountered are mucosal dissection, adenoid injury, meningitis, sepsis, sinusitis, epistaxis, dislodgement of fracture fragments and rarely intracranial intubation.

Elective short term tracheostomy was the conventional and time tested method for airway access in these patients. Tracheostomy is associated with many immediate and late complications such as hemorrhage, emphysema, mediastinitis, cannula blockage, traceocutaneous fistula, recurrent laryngeal nerve injury, tracheal stenosis, tracheal erosions, dysphagia, decanulation problems, scarring.[3-6] It is also technically difficult in obese patients, children and patients with neck swelling.[7] However, a slight shift in paradigm has started towards alternative methods of intubation like submental intubation, submandibular intubation, retromolar intubation or transmylohyoid intubation in the last two decades as these methods are safe, effective and less morbid than conventional tracheostomy.

In this article a complete follow up of 14 panfacial trauma cases (intubated with submental intubation method) was recorded for following observations: ease of anaesthesiologist for carrying out general anaesthesia, ease of surgeon for performing surgery and average time taken during the procedure, intraoperative and postoperative complications.

METHODS

Panfacial a trauma cases, in which submental intubation was used to secure the airway, were retrospectively reviewed at ADC (R & R, Army Hospital, Delhi) from May 2011 to Jan 2014. The study consisted of 14 male patients. Average age was 36.5 years (ranging from 22-61 years old) (Table 1). Data which were recorded included personal particular, type of maxillofacial fracture, time required for intubation, intraoperative and post-operative time/ease of performing procedure for the surgeon/complication related to submental intubation procedure were observed.

Surgical technique

A temporary draping of the mouth and chin was done with standard skin preparation with cutacept (0.5 benzalkonium chloride) and sterile dressings. A standard submental intubation technique involves establishing an orocutaneous communication through which the proximal end of the ETT is removed and secured. Proposed incision site is infiltrated with Lignocaine 2% with adrenaline. A 1.5-2 cm skin incision is made 01 cm below and parallel to the lower border of mandible, on the right side. The choice of right side was guided by anaesthetist, because it usually permits a unhindered view of the intraoral part of the ETT by left hand guided laryngoscopy. Blunt dissection was carried out with a medium sized artery forceps along the lingual surface of mandible. The lingual mucosa is tented with artery forceps and a paramedian incision was made over it. Tongue is retracted for better visualization. The orocutaneous communication is widened by opening the beaks of the artery forceps. A 1.5 -2 cm wide incision is usually adequate for passing a ETT of 7.5 mm diameter. The patient is ventilated with oxygen for 3 mins, the universal connector removed, before passing the tube through the incision. Always the deflated pilot balloon is pulled first followed by the ETT. While pulling the ETT through the tube, the intraoral part of ETT is stabilized by the anaesthetist with Magill forceps. The connector is reattached to ETT and ETT to breathing circuit. ETT tube position is confirmed by direct laryngoscopy, chest auscultation and capnography. Once anaesthetist confirms the correct tube position, ETT is now secured with 1-0 silk using purse string suturing. Throat pack was placed to seal off pharynx. At completion of surgery, the stay sutures were removed from around the tube, pilot balloon deflated, and ETT were pulled intraorally, converting the submental intubation into orotracheal intubation. Intraoral wound were closed in 5 cases with 3-0 vicryl sutures. Extraoral skin incision closed with simple interrupted sutures using 4-0 prolene.

Table 1: Details of patients included in the study.

S.No	Age	Sex	Diagnosis
1	22	M	RTA
2	31	M	RTA
3	28	M	RTA
4	61	M	GSW
5	47	M	RTA
6	24	M	RTA
7	26	M	Assault
8	38	M	RTA
9	30	M	RTA
10	32	M	RTA
11	44	M	RTA
12	36	M	Blast Injury
13	58	M	RTA
14	34	M	RTA

RESULTS

Submental intubation was carried out in all the 14 cases. The mean time was 8 mins. The procedure had a declining curve seen over the time of this study. The least amount of time which was taken to carry the procedure was 5 mins. In this study no severe complication was encountered like severe hemorrhage except one patient

where bleeding was noticed while intubation and was managed by cauterisation. No lingual gland injury, Wharton duct damage, lingual nerve damage was seen. Postoperative scar was visible only in one case however it was acceptable by the patient. Intra-orally healing was good and no long term complications like rannula or mucocel in any of the cases (Table 2).

Table 2: Clinical findings noticed for 14 patients of complex craniomaxillofacial trauma for whom submental intubation approach was used.

S. No	Type of maxillofacial fracture	Average time taken for intubation (mins)	Damage to pilot tube cuff while intubation	Intraoperative complications	Postoperative complications	Post-Operative intraoral healing at intubation site	Post-operative extraoral healing at intubation site	Duration of post op ventila-tion
1	LeFORTE IVc #*	13	-	-	-	Satisfactory	-	-
2	LeFORTE III with Paramedian Palatal Split #	14	Yes	-	-	Satisfactory	-	-
3	LeFORTE II With MANDIBLE #	12	-	-	-	Satisfactory	-	-
4	LeFORTE III #	12	-	Bleeding	-	Satisfactory	-	1 day
5	LeFORTE II With MANDIBLE #	10	-	-	-	Satisfactory	-	-
6	NOE+ #, LeFORTE II #	9	-	-	-	Satisfactory	-	-
7	LeFORTE III with MANDIBLE #	7	-	-	-	Satisfactory	-	-
8	NOE, LeFORTE II #	7	-	-	-	Satisfactory	-	-
9	LeFORTE II with MANDIBLE#	6	-	-	-	Satisfactory	-	-
10	LeFORTE Iva with NOE #	5	-	-	-	Satisfactory	-	-
11	LeFORTE II with Paramedian Paltal Split, MANDIBLE #	6	-	-	-	Satisfactory	-	-
12	LeFORTE II with MANDIBLE	6	-	-	-	Satisfactory	-	-
13	NOE, LeFORTE II #	6	-	-	-	Satisfactory	scar	-
14	NOE, LeFORTE II, Paramedian Palatal Split #	6	-	-	-	Satisfactory	-	-

DISCUSSION

Securing an airway in management of panfacial trauma surgery has advanced since the ages of tracheostomy procedure. Various alternative procedures were introduced, such as use of retromolar space for endotracheal intubation. It is the space from distal aspect of last standing molar and anterior part of ascending ramus of mandible. Le forte II and III fracture, involving both naso-orbito- ethmoidal complex disruption with occlusal change are ideal cases for this method.[8,9] Its use in craniofacial and orthognathic surgeries was documented by Mertinez- Lage et al.[10] The primary indication is space availability in retromolar area, if less then more chances of accidental extubation of ETT.

Submental intubation was first introduced by a Spanish faciomaxillary surgeon, Francisco Hernandez Altemir in 1986.[11] Indications for submental intubations are elective craniomaxillofacial, maxillary and nasal surgery, orthognathic surgery and aesthetic face surgery, trauma cases with distorted midface anatomy, need for checking of occlusion intra operatively, adequate mouth opening with failed nasal intubation and when ETT is required outside operating field.[12] Submental intubation has now considered an alternative technique for tracheostomy. It is indicated in complex craniomaxillofacial and panfacial trauma cases, allows maxilla-mandibular fixation and an unhindered nasal-orbito-ethmoidal complex, overcomes majority of complications previously faced with tracheostomy. In their study between submental intubation and tracheostomy by Schutz and Hamed, concluded that submental intubation is a better option as it is associated with low morbidity.[13] It is usually a preferred method of intubation in cases of orthognathic surgeries with rhinoplasty.[14,15] It allows better soft tissue

evaluation and unhindered rhinoplasty surgery, and transfacial cranial base surgeries.[16] "Rule of 2-2-2" – a 2 cm incision, 2 cm away from the midline, 2 cm medial and parallel to the mandibular margin was advocated by Nyarady et al.[15] Contraindication to submental intubation are few, like patients who may require prolonged post-surgery intubation, including patients with severe neurological or thoracic trauma.[12]

Over the last two decade various modifications to the original technique of submental intubation have come up. All modifications were broadly divided under two categories; anatomical and anaesthetic. Anatomical modifications were on various path of exit of intubation tube. Stoll gave the submandibular approach, MacInnin and Baig emphasised on the complication of stoll technique.[17,18] Taglialatela et al advocated a close contact with lingual periosteum rather than a subperiosteal dissection.[19]

Anaesthetic modifications includes, nylon guiding tubes, use of dilator for widening orocutaneous tunnel, using Sheridan tube, covering the tip of ETT with surgical glove finger to prevent blood from entering the tube during passage through orocutaneous communication, use of LMA (laryngeal mask airway) especially in patients with laryngeal trauma and unstable cervical fracture, using silicone wire reinforced tube, and retrograde intubation in cases with restricted mouth opening.[15,20-25]

All cases in this study were intubated using flexo-mettalic ETT, as it is reinforced with shape memory material, making it flexible and kink resistant, allowing it to maintain its patency. We didn't experience any complications in our 14 cases. A learning curve was evident from evaluation of time taken for the procedure, which slowly reduced to around 5 mins by 11 case operated using this technique. Although literature is rife with various intraoperative and postoperative complications, we didn't encounter any of it.

CONCLUSION

As with our experience, as well as in accordance to literature, submental intubation technique is a rapid, simple, quickly learned and mastered skill, performed with no extra specialized equipment and with considerably very low morbidity associated. It provides unhindered access to surgical field, evaluation of occlusion and allowing MMF to be carried, soft tissue evaluation intraoperatively by staying away from surgical field. This approach allows the anaesthetist to monitor the airway unhindered and has good patient acceptability. Ease of maintenance of anaesthesia, unhindered surgical site greatly helps in reduction of overall surgery time. Submental intubation is thus a recommended elective approach, especially for panfacial trauma cases.

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