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Comparative study of right versus left sub mental intubation in maxillofacial trauma patients

Yogita Patil[1], Abhilasha Motghare[2*], Nirav Kotak[3], RD Patel[4]
[1, 3] Associate Professor, [2] Assistant Professor, [4] Professor
Department of Anesthesiology, Seth GSMC and KEM Hospital, Parel, Mumbai, Maharashtra , India
*Corresponding author : Dr Abhilasha Motghare, Assistant Professor, Department of Anesthesiology, Seth GSMC and KEM Hospital, Parel, Mumbai, Maharashtra, India

Abstract
The airway management in facial trauma is very crucial and difficult. The personnel dealing with airway should be aware and wellversed with all the available modalaties and techniques of handling the airway as requirement may differ from patient to patient. Among the various techniques available for intubating maxillofacial trauma we present the RDs modified submental technique of intubation which has been used in our institute and have been helpful for surgical procedure with minimal complications. We studied 15 patients using this technique and found it easy, simple to perform with advantages like minimal apnea time, uninterrupted surgical procedure and secure airway. Among the 15 patients studied nine had right sided submental intubation and six had left sided submental intubation. There were no complications seen with this procedure.

Keywords: submental intubation, maxillofacial trauma

Introduction
A good airway management is key in repair of complex maxillofacial traumas. The choice of intubation technique requires good assessment from a multidisciplinary team that includes anaesthesiologist and surgeons. Also, maxillofacial anesthesia incorporates unique airway problems which needs skillful handling of the airway with minimal interruptions in the surgical procedure [1, 2]. The choice of airway management technique may be complicated by injury to route of intubation [3, 4]. In many cases of maxillofacial traumas neither nasal nor orotracheal intubation is possible. In fact, nasal intubation precludes treatment of nasal fractures. It can result in meningitis and passing tube intracranialy in frontobasilar skull fracture [3, 5, 6, 7]. Also, an orotracheal tube interferes with maxillo-mandibular fixation, compromising reduction and stabilisation of maxillary and mandibular fractures [3]. The tube may get clamped between the teeth thus reducing airway lumen. In such situation's tracheostomy is considered as technique of choice by many anaesthesiologists and surgeons. An alternative promising approach to this is sub mental intubation described first by Hernandez Altemeir [8] in 1986. The sub mental route intubation consists of pulling free end of an orotracheal tube, after removing universal connector, through a sub mental incision. Many studies have been done to compare risks and disadvantages of tracheostmy and sub mental intubation for treatment of maxilla facial fractures. Here is our study of airway management in maxillo -facial trauma by RD'S modified technique of sub mental approach.

Materials and Methods
All patients of age 18-40 years of either sex who had maxillo facial trauma posted for surgery and intubated with RDs modified technique of submental intubation over a period of three years were included in the study. Most of the fractures were a combination of fractures affecting dental occlusion i.e. maxillary fractures of Lefort's type I, mandibular fractures or alveolar fractures and associated fracture dislocating anterior skull base i.e. Lefort's type II and type III or naso-orbito-ethmoidal fractures.
After taking patients consent, they were shifted to the operating room and standard monitors were attached. Patients were pre-medicated with inj. Glycopyrrolate 0.04mg/kg, inj. Midazolam 0.03mg/kg and inj. Buprenorphine 0.003 mg/kg intravenously. Patients were induced with inj. Propofol 2mg/kg and Inj Vecuronium 0.1mg/kg after checking adequacy of mask ventilation. Then the airway was secured using RD's modified technique of submental intubation, in which laryngoscopy was done and orotracheal intubation done using suitable size portex endotracheal tube. After orotracheal intubation a 2cm submental incision was made close to lower border of mandible around 3 to 4cm away from midline either on the left or right side. Blunt dissection was carried out as close as possible to inner aspect of mandible into floor of mouth taking care not to damage the vital structures. An incision was made in floor of mouth so as to allow passage of suitable size flexometallic tube (patient end). A long artery forceps was passed through floor of mouth to exterior to grasp patient end of flexometallic tube which was then withdrawn in floor of mouth taking care not to damage the cuff of flexometallic tube. During all this manipulation, patient was ventilated through the portex endotracheal tube. Now this second tube (flexometallic) was positioned in oropharynx. Laryngoscopy was performed either by molar approach or conventional approach, portex tube was withdrawn and trachea was intubated with flexometallic tube using Magill's forceps. The flexometallic tube was fixed to skin using sutures and skin marking was noted. In most of the cases, tube was fixed at 22 or 24 mark while in two cases it was fixed at 26 mark. The reason for this being

the tube getting curved over tongue while bringing it to opposite side. Cuff was inflated and throat packing was done. At the end of surgery, decision to keep flexometallic tube in situ or extubate was taken. If the patient was to be extubated process was reversed to re-establish oral route and closure of submental incision was done under local anesthesia. Neuromuscular blockade was reversed with inj Neostigmine 0.05mg/kg and inj. Glycopyrrolate 0.008mg/kg. Patient was extubated after confirmation of airway security. In cases of Inter maxilla-mandibular fixation (IMF) where surgeons wanted to keep the IMF during post-operative period to maintain the alignment of the maxillary fractures, tongue stich was taken to avoid tongue fall and subsequently the stich was removed while removing IMF. In these cases we needed to keep endotracheal tube in situ so we planned to extubate them on day two when patient were fully recovered from anaesthesia and all airway reflexes were intact. Before extubation the submental intubation site was infiltrated with local anaesthesia and after extubation the wound was closed under local anesthesia. Patients were given good antibiotic coverage to avoid local infection at incision site.

Observations

Table 1: Demographic data showing age, gender and type of fractures

Mean age of the study population	**27.33 years**
Male: Female ratio	10:5
Type of fracture	Naso ethmoidal -2 Panfacial - 7 Mandible - 3 Midface -2 Bilateral Leforts with CSF rhinorrhea -1

Table 2: Comparison of Right and Left sided submental intubation

Side of submental intubation	**Right submental intubation**	**Left submental intubation**
Number of cases and technique of intubation	Conventional – 4 Left molar intubation- 5	Conventional – 2 Right molar intubation- 4
Average time taken	1.2 mins	1.36 mins
Average length of tube fixation at skin	23.55 cms	23.66 cms
Total number of cases	9	6

Discussion

Treatment of maxillo facial trauma often implies problems with intra operative airway management. When neither naso tracheal nor orotracheal intubation is suitable, temporary tracheostomy often is an option of choice [9]. Tracheostomy, an alternate technique preferred by some surgeons and anaesthesiologists is associated with complications like haemorrhage, subcutaneous emphysema, pneuomediastinum, pneumothorax, recurrent laryngeal nerve damage, stomal and respiratory tract infection, tracheal stenosis, tracheal erosions, dysphagia, problems during decanulation and scarring [10, 11].

In panfacial fractures, which requires maxilla mandibular fixation, nasotracheal intubation is good option. Nevertheless, in patients of maxilllo facial trauma associated with frontobasilar fractures, nasotrcheal intubation can lead to major complications like sinusitis, epistaxis, meningitis, sepsis, CSF leakage and introduction of tube intra cranially leading to brain damage [12].

Another approach was described by Marhinez –Lage in 1998 called retro molar intubation [13]. In this approach, semilunar osteotomy was done in retro molar space and oro tracheal tube was placed in retromolar area, lying below occlusion plane. This offers unobstructed surgical field with good securement of airway. It allows intermaxillary fixation without any impediments. However bony anatomy needs to be destroyed to make space for tube and procedure is time consuming requiring about 30 minutes. Also, evaluation of the restoration of an individual occlusion can be partially impaired by the presence of the tube in the oral vestibule.

Altemeir in 1986 first described the technique of sub mental intubation, an alternative technique to all the above approaches [8]. This technique allows tracheal intubation for maxilla mandibular fixation and avoids nasotracheal intubation and tracheostomy. In his technique, he performed orotracheal intubation using flexometallic intubation with conventional laryngoscopy. An incision was done in submental region and tracheal tube connector was removed. Machine end of tube along with pilot balloon was then taken out through incision.

Maclnnis and Baig reported that standard technique as described by Altemir was less than satisfactory because of bleeding, difficult tube passage and sublingual gland involvement [14]. Instead of slight lateral exit wound submentally, they modified the technique to strict midline approach in 15 patients with satisfactory results in 14. However, we preferred to remain laterally either on left or right of midline and there was no difficulty in passing the tube through the incision and there was minimal bleeding.

In our modified technique, we used two tubes, first portex tube to secure airway with conventional laryngoscopy and flexo metallic tube to insert from exterior to interior through sub mental incision into oral cavity. Reason for this was as follows: first- apnoea time was reduced; second- no struggle to bring out machine end and pilot balloon of tube; third- procedure can be done with leisure time and fourth- connector of tube need not be removed which is recommended by some manufacturers.

There has been case report of patient where it was difficult to bring out machine end of tube and pilot balloon getting entangled in muscle plane [15]. Machine end was brought outside but pilot balloon was entangled in muscle plane. It was left in situ and at the end of surgery inflation line was cut and cuff was deflated. Pilot balloon was removed through separate incision.

In our study, we have taken tube on right or left side of midline, according to surgeon's preference. It was found that right submental intubation was easier since it can be done with conventional laryngoscopy as well as left molar approach of laryngoscopy and it was less time consuming. With left submental intubation, right molar approach was better than conventional laryngoscopy because the tounge was obstructing the tube in conventional laryngoscopy. Thus right molar approach was easier than left molar approach. We have done 15 cases out of which nine were of right side and six were of left side. The average time taken

was 1.2 minutes for right submental intubation and 1.36 minutes for left submental intubation.

We found that the marking of ETT at skin level was ranging from 22 to 26 cm which was confirmed by bilateral equal air entry and $EtCO_2$ as compared with the normal orotracheal tube which was at the level of 20-22 cm. This increased length may be probably due to the loop formation in oral cavity. In both right and left submental intubations the ETT marking at skin level remained same.

In our study, no case of accidental extubation occurred. Also, no major complication occurred. Only in two cases cuff was damaged during manipulations but since patient was getting ventilated through portex tube we had leisure time to replace it.

Submental intubation is also associated with complications like accidental extubation, tube obstruction, tube damage, superficial infection of submental wound, trauma to submandibular gland, sublingual gland, Wharton's duct, damage to lingual nerve, orocutaneus fistula and hypertrophic scar. Also, accidental extubation, tube obstruction and damaged tube (leaking cuff) are more difficult to manage in submental route. Endotracheal tube exchanger can be used successfully to replace the damaged tracheal tube by the submental approach.

If the patient is to be extubated, the above procedure is reversed at the time of extubation by removing flexometallic tube and patient reintubated orally with suitable size portex endotracheal tube by conventional laryngoscopy. Either patient is extubated and the incision is sutured under local anesthesia or tube kept in postoperative period and extubated next day after injecting local anesthetic in the incision wound and wound sutured after extubation.

However, no complications were reported in our study. Perioperative good antibiotic cover and good oral hygiene resulted in prevention of infectious complications.

The limitation of this technique is patients who also present a neurological deficit or thoracic trauma and need more than 7-14 days of postoperative ventilator support. In such cases a tracheotomy is known to be a safer procedure than endotracheal intubation. It is therefore difficult to propose it to patients suffering from an isolated facial trauma who will require prolonged airway management This method of intubation is contraindicated for patients who require a long period of assisted ventilation, i.e. poly-trauma patients presenting with severe neurological damage or major thoracic trauma, and patients expected to need repeated operations.

Steps for modified RD's submental intubation technique

1.Orotracheal intubation done with conventional laryngoscope and ventilation started

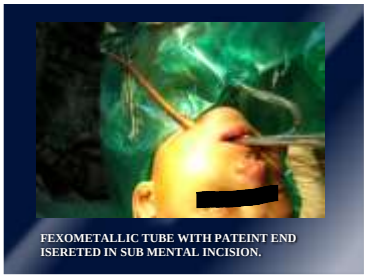
OROTRACHEAL INTUBATION WITH NO.6 SOUTH POLE ETT & CIRCUIT ATTACHED.

2. Submental incision (2cms) taken and dissection done till oral cavity

PLASTC SURGEON MADE 1.5 CM LT SUB MENTAL INCISION

SUB MENTAL INCISION EXTENDED IN ORAL CAVITY

3. Flexometallic tube (patient end) inserted from the submental incision and then taken in oral cavity with the help of long artery forceps

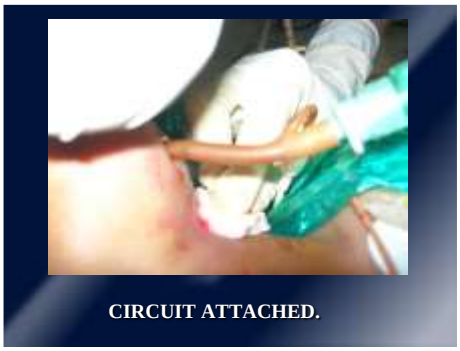


FEXOMETALLIC TUBE WITH PATEINT END ISERETED IN SUB MENTAL INCISION.

4. Either left or right molar laryngoscopy done and flexometallic tube inserted in the trachea with the help of Magill's forceps after removing portex endotracheal tube (during the above procedure patient was being ventilated though oral portex tube) Now the breathing circuit is removed and attached to flexometallic tube.Hence only this much is the apnea time i.e. removing the circuit from portex tube and attaching it to flexometallic tube

PORTEX TUBE REMOVED & FLEXOMETALLIC TUBE ADVANCED IN TRACHEA USING MAGILL'S FORCEPS

FLEXOMETALLIC TUBE IN TRACHEA



5. The flexometallic tube is now sutured to the neck skin and mark at the skin (length of the tube) is noted

6. If the patient is to be extubated , the above procedure is reversed at the time of extubation by removing flexometallic tube and patient reintubated orally with suitable size portex endotracheal tube by conventional laryngoscopy.

Either patient is extubated and the incision is sutured under local anesthesia or tube kept in postoperative period and extubated next day after injecting local anesthetic in the incision wound and wound sutured after extubation.

Conclusion

Hence, we conclude that RDs modified technique of submental intubation is better than the conventional technique as there is no time limit to do submental intubation and also the apnea time is very minimal. Also, we have used molar approach for intubation and found it relatively better than conventional laryngoscopy for submental intubation technique.

Limitations: The sample size was small so the results cannot be generalised to a large population.

Conflict of interest: Nil

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