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Research Article

SUBMANDIBULAR INTUBATION IN PAN-FACIAL TRAUMA PATIENTS: AN ALTERNATIVE APPROACH FOR INTRAOPERATIVE AIRWAY MANAGEMENT

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ABSTRACT

Introduction: Treatment of panfacial injuries or panfacial fractures often requires tracheostomy or alternating intubation through the nose and the mouth to keep the field free during the operation [1]. The oral route for tracheal intubation can interfere with some maxillofacial surgical procedures and the nasal route can be contraindicated or impossible. Tracheostomy is the usual solution in these circumstances but it carries a high incidence of complications [2].
Methods: We used submandibular route for tracheal intubation as an alternative to tracheostomy in panfacial fracture patients. Submandibular intubation technique was performed in 20 patients.
Result: During and after the procedure we had no complications and no increase in operative time.
Conclusion: The apparent ease in performing the technique with minimal or no complication made it our choice of securing the airway in selected patients undergoing maxillofacial surgical procedures.
Keywords: Panfacial trauma; Submandibular intubation.

INTRODUCTION

Oral & Maxillofacial surgical patients present a specific challenge to the anaesthetist. The surgical procedure is just around the upper airway, which is critical to the patient safety during and after operation. The surgeon and the anaesthetist have to operate using good teamwork in order to attain maximum patient safety with minimal interruption to the surgery which provides good access to the facial skeleton. Modern technique for surgical treatment of panfacial fractures lead to special problems for airway management. The surgeon needs access to an unobstructed field and in most instances maxillo-mandibular fixation is required intra-operatively for adequate reduction of facial fractures [3]. Oral intubation can interfere with assessment of occlusion and nasotracheal intubation may lead to complications such as brain damage, leakage of cerebrospinal fluid etc when there are also fractures of the base of the skull.[4,5] In addition the presence of a

nasotracheal tube can interfere with the surgical reconstruction of fractures of the naso-orbital-ethmoid-complex. Also, naso-tracheal intubation is contraindicated in patients with fractures in the cribriform plate of ethmoid which frequently accompany Le-Fort II and III maxillary fractures, because of the potential complications of infection and the possibility of cranial intubation [6-8]. Panfacial injuries often require tracheostomy to ensure a free operative field¬ [9] but tracheostomy is associated with complications such as haemorrhage, pneumothorax, injury to the recurrent laryngeal nerve, and tracheal stenosis especially in children, obese patients and in patients with an enlarged thyroid gland[10]. So in our study we used an alternative method to introduce the tracheal tube through a submandibular incision[11] in panfacial fracture patients by-passing the surgical area to avoid the complications of tracheostomy.

MATERIALS AND METHODS

The study was done and concluded at a tertiary care hospital in Kanpur from May 2009 to January 2012. Submandibular technique was performed in 20 patients who included cases of pan-facial trauma where intermaxillary fixation had to be done and a clear nasal field was required. After approval of institute's ethics committee an informed consent was discussed, approved and signed by each patient or from the parents / legal guardian in the case of minors (children or incompetent patients). Standard operating room instrumentation was required for performing the technique. The patient is first anesthetized using routine techniques. Initially oral endotracheal intubation was performed with a flexometallic endotracheal tube. After packing the throat, the connector was checked for proper fit into the tube so that it can be easily removed and re-attached in the next step. Surgical skin preparation of the perioral submandibular region is done using betadine scrub and pre-operative occlusion is checked (Fig 1 and 2).

Operative procedure

A 1.5 cm transverse skin incision is made in the submandibular area, about 1 inch below and ½ inch anterior to the angle of the mandible (The incision could be made on the right or left side depending on the site of fracture). This distance from the lower border of the mandible was to avoid an injury to the mandibular branch of the facial nerve (Fig.3). Using a medium-sized curved artery forceps (pedicle clamp), blunt dissection was carried out through the skin incision (Fig 4) in an upwards direction towards the mouth cavity as close as possible to the inner side of the mandible. The tissue layers dissected were subcutaneous fat, platysma, investing layer of deep cervical fascia and the mylohyoid muscle. The tip of the artery forceps is then tented at the mucous membrane of the mouth cavity just medial to the second molar tooth. Incision of the mucous membrane over the tip of the artery forceps enables the forceps to be introduced into the oral cavity (Fig 5). The end of the cuff inflation tube (pilot tube) was grasped with the tip of the artery forceps (Fig 6) and then pulled through the dissected track to come out through the submandibular incision. The tube is supported in the oropharynx throughout to prevent accidental extubation or inward pushing of the tube as its end is being pulled out through the track. Any blood that might have intruded into the proximal part of the tube was suctioned immediately and the tube connector was then firmly re-attached to the tube before reconnecting to the anaesthetic ventilator (Fig7). After checking the tube position with chest auscultation, a mark was made on the tube at the skin exit site. A strong silk stay suture was then made fixing the tube to the skin of the submandibular region. The tube was further secured to the skin with adhesive tape circumferentially applied to the tube over the threads of the stay suture. Occlusion is checked intra-operatively after the fixation (Fig. 8). At the end of the operation, the stay suture and the adhesive plaster fixing the tube were removed and the tracheal tube was pulled back to the oral cavity after removal of the tube connector, followed by the pilot tube (Fig 9). Then, the oro-tracheal tube was reconnected to the anaesthetic ventilator and the submandibular skin incision was sutured. All patients received routine perioperative and postoperative antibiotics for a minimum of 5 days. Oral irrigation with chlorhexidine was carried out for all intraoral procedures on a routine basis. The procedure was assessed for both the surgeons and the anaesthetist's convenience of performing surgery and the patient monitoring respectively. Postoperatively the site was checked both extra orally and intra orally for secondary haemorrhage. The patients were reviewed over a period of 1 month postoperatively. The resultant scar tissue was also evaluated in terms of its acceptability by the patient and for

its perceptibility within the submandibular shadow, so as to be considered as cosmetically acceptable or unacceptable.

RESULTS

This study was concluded to evaluate the efficacy of submandibular intubation technique and the convenience in performing the surgical procedure. 20 patients who underwent major surgical procedures under general anaesthesia for panfacial fractures were subjected to Submandibular intubation and were analysed in this study. Among these, 12 patients were males and 8 patients were females with age ranging from 17-45 years and an average age of 32 yrs (Table No.1). The distribution of these patients based on diagnosis and treatment includes 7 male and 4 female patients had post traumatic occlusal deformity Lefort I & Lefort II fracture with midpalatal split associated with fracture of base of skull; 2 male patients with Lefort I/II, nasal bone and right ZMC fracture; 1 male patients of Lefort II, fracture nasal bone, right ZMC fracture; 1 male patients of bilateral Lefort III, right Lefort I, high Lefort I and NOE fractures; 1 male patient with bilateral Lefort II fracture, mandibular left parasymphysis and left subcondylar fracture; 2 female patients with bilateral Lefort III, left ZMC fracture, 2 female patients with bilateral parasymphysis fracture, right subcondyle fracture and nasal bone fracture. The following observations were made during the study:

1. The submandibular intubation was successfully performed in each case using No. 7 Portex flexometallic tube. The mean time taken was 6.75 mins (range 5-8 minutes) starting from incision placement to the extraoral tube placement and securement (Table No.2).

2. In none of the cases damage to the tube or pilot cuff occurred and the problem of the tube kinking was not encountered. The airway was not compromised in any case and ventilation was only interrupted for a few seconds. There was no episode of arterial desaturation during the procedure in any case. Only minor bleeding was encountered during the procedure and no damage to any anatomical structure such as the facial artery, submandibular and sublingual glands and their ducts and the lingual nerve had occurred.

3. Minor postoperative complications were encountered in our study. 2 patients had developed haematoma on the seventh postoperative day in the submandibular region which presented as an asymptomatic swelling with the bluish discoloration. The haematoma resolved in 2 weeks in both cases without requiring further surgical intervention. Postoperative infection of the submandibular wound was observed in one case on the 8th postoperative day which subsided in a week time without further complications. Intraoral wound healing appeared satisfactory in all the cases. (Table No. 3).

4. Intubation was easily performed in all the cases and the tube was easily accessible to the anaesthetist throughout the surgical procedure which aided in the patient monitoring. Extubation through the extraoral incision was easily done at the termination of surgery. In one case the tube was passed back orally and extubated as for any normal oral intubation.

5. The technique was relatively easy to perform and provided good access to the face. The planned reconstructive surgery could be completed in every patient with the tube not hindering the procedure in any surgical maneuver. The extraoral incision was closed easily using 2 interrupted silk sutures.

6. In all cases, the scar was well accepted by patients without any complications.

All patients were treated by open reduction and internal fixation under general anesthesia. The technique was found to be easy and convenient. No problems were encountered during the procedure of intubation and submandibular exteriorization. Intraoperative and postoperative periods were uneventful. It provided a secure airway and an uninterrupted surgical access to the nose and to the oral cavity and allowed intraoperative control of dental occlusion.

DISCUSSION

Airway management in patients with panfacial fracture is a challenge for both the anaesthetist and the surgeon, and it requires good rapport between them. Surgical repair of maxillofacial trauma requires modification of the standard anaesthesia technique. In most cases of maxillofacial region, the airway can be initially secured by oral / nasal endotracheal intubation. Nasal endotracheal intubation is often contraindicated in the presence of fracture of base of the skull. Comminuted midfacial fractures cause physical obstruction to the passage of nasotracheal tube. Further, the presence of nasotracheal tube can interfere with surgical

Table 1: Demographic data of patients

Gender	Males (n=12)	Females (n=8)
Age Range (in years)	17-45	20-38
Mean Age (in years)	33.17±7.15	31.12±6.29

Table 2: Intra-operative data of patients

S. No.		Males	Females
1.	Duration of Procedure	5-7 mins (6.08±0.9)	5-8 mins (6.75±1.17)
2.	Surgeon's satisfaction (%age)		
2. (a)	Occlusal Stability	91.7	87.5
2. (b)	Placing of mini plated at the fracture site	100	100
2. (c)	Interference of ET Tube	100	100
2. (d)	Visibility and Accessibility	100	87.5
3.	Anesthetic Complications (% age of Patients)		
3. (a)	Desaturation	16.67	0
3. (b)	Hypertension	16.67	0
3. (c)	Hypotension	8.33	25
3. (d)	Bradycardia	16.67	12.5
3. (e)	Tachycardia	8.33	25

Table 3: Post-operative data of patients

S. No.		Males	Females
1.	Anesthetic complications (% of patients)		
1. (a)	Postop Nausea & Vomiting	16.67	25
1. (b)	Desaturation	0	0
1. (c)	Laryngeal spasm	0	0
1. (d)	Hypertension	0	0
1. (e)	Hypotension	8.33	12.5
1. (f)	Tachycardia	8.33	12.5
1. (g)	Bradycardia	8.33	0
2.	Lingual Nerve paresthesia	Nil	Nil
3.	Wound healing complication at extraoral incision site (%)	Nil	Nil
4.	Duration of Ventilation	Nil	Nil

Fig 1: Preoperative picture

Fig 2: Preoperative occlusion

Fig 3: Incision for Submandibular intubation

Fig 4: The tip of an artery forceps seen dissected through the skin incision

Fig 5: Tip of an artery forceps seen in the oral cavity after blunt dissection through skin incision, as close as possible to the inner side of the mandible

Fig 6: Intraoral view of Flexometallic tube

Fig 7: Tube secured with ventilator

Fig 8: Dental occlusion intra-operatively

Fig 9: Postoperative view of suturing

reconstruction of fractures of the naso-orbital ethmoid (NOE) complex. Surgical reconstruction often involves maxillo-mandibular fixation in the intraoperative period to restore patient's dental occlusion. This precludes the use of oral endotracheal intubation in such cases. In these conditions tracheostomy may be indicated but it carries a significant morbidity. An airway management technique associated with a low morbidity would represent a significant improvement in the management of complex craniomaxillofacial trauma. Submandibular intubation is a modification of submental intubation, first described by Hernandez Altemir in 1986[12] in these conditions and Submandibular intubation was first described by H.M.F. Anwer in 2007[13].This technique provides a secure airway, an unobstructed intraoral surgical field and allows maxillomandibular fixation while avoiding the drawbacks and complications of nasotracheal intubation and tracheostomy[10]. There has been several modification of this technique, including a retromolar route of intubation [14] .The Transmylohyoid oroendotracheal intubation technique as proposed by Gadre K.S.and Kushte D., provided good results in their series of cases [15]. We agree with most authors that the subperiosteal passage of the tube is not essential, especially in the less cramped submandibular area. Injury to important structures in the floor of the mouth can be avoided by careful extraperiosteal blunt dissection of the passage as close as possible to the inner side of the mandible. The direction in which this passage is created is another point of concern [16, 17]. Stranc and Skoracki reported the development of mucocele attributed to inclusion of mucosal fragments while establishing the mucocutaneous track [18]. They, however, used blunt intraoral perforation of the mucous membrane of the mouth and dissected the track from the oral side to the skin. In the present study transmylohyoid intubation technique was used in patients with various craniomaxillofacial fractures and in those requiring complex osteotomies. The use of this technique while performing bimaxillary osteotomies has been well documented and proved to be advantageous as such procedures required intraoperative intermaxillary fixation and the hazards of tube damage during maxillary procedures was eliminated.

Our experience with this technique was more than satisfactory. The procedure was relatively easy to perform and was associated only with minor bleeding as in accordance with the study of Gadre K.S. and Kushre D [15]. Access to all surgical fields was excellent, particularly in maxillary procedures where traditionally nasal and anaesthetic tubes were suspended over the surgical field making access to the mouth difficult or a nasal oral technique had to be utilized with tube switching. Submandibular 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 limitation of this technique is for patients who also present a neurological deficit or thoracic trauma and need more than 7-14 days of postoperative ventilatory 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 not require prolonged airway management. This method of intubation is contraindicated for patients who require a long period of assisted ventilation, i.e. multitrauma patients presenting with severe neurological damage or major thoracic trauma, and patients expected to need repeated operations The morbidity associated with submandibular endotracheal intubation is very low. In this study, no episode of compromised airway occurred during the procedure. Postoperatively uneventful healing took place at the site of incision and no signs of lingual nerve damage were seen in any of our patient.

Accidental extubation, tube obstruction and damaged tube (leaking cuff) are more difficult to manage in submandibular route. Other potential complications are superficial infection of the submandibular wound, trauma to submandibular and sublingual glands or ducts, damage to lingual nerve, orocutaneous fistula and hypertrophic scar. However, no complications occurred in our patient. Perioperative antibiotic cover, good oral hygiene and not so tight closure of submandibular incision resulted in prevention of infectious complications. Submandibular tracheal tube has been kept in situ for up to two to three days postoperatively. In such

cases, it is mandatory that an immediate access to oral airway is ensured at all times and maxillomandibular fixation should not be used until after extubation and confirmation of secure airway. In our patient we did not keep the endotracheal tube in situ as there was no airway oedema. Therefore, in selected group of patients with severe maxillofacial trauma, submandibular endotracheal intubation is a useful and relatively harmless alternative to tracheostomy for securing airway.

CONCLUSION

Submandibular 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. 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. The success of submandibular intubation lies in the correct application of this technique and good knowledge of the anatomy of that area. Finally, it presents a low incidence of operative and postoperative complications and eliminates the risks and side effects of tracheotomy.

REFERENCES

1. Taglialatela Scafati C, Maio G, Aliberti F, Taglialatela Scafati S, Grimaldi PL. Submento– submandibular intubation: is the subperiosteal passage essential? Experience in 107 consecutive cases. Br J Oral Maxillofac Surg 2006;44: 12-4.
2. Mphanza T, Jacobs S, Chavez M. A potential complication associated with percutaneous trachostomy with an endotracheal tube with a Murphy eye in situ. Anesthesiology 1998 May; 88(5):1418.
3. Haddock AR, Barnard NA. Maintaining the airway during the treatment of severe facial injuries. Br Dent J 1993;174: 56–7
4. Seebacher J, Nozik D, Mathieu A. Inadvertent intracranial introduction of a nasogastric tube, a complication of severe maxillofacial trauma. Anesthesiology 1975;42:100–2.
5. Prochno T, Dornberger I, Esser U. Management of panfacial fractures—also an intubation problem. HNO 1996;44:19–21.
6. Zmyslowski WP, Maloney PL. Nasotracheal intubation in the presence of facial fractures. JAMA 1989;262: 1327–8
7. Muzzi DA, Losasso TJ, Cucchiara RF. Complication from a nasopharyngeal airway in a patient with a basilar skull fracture. Anesthesiology 1991;74: 366–8
8. Goodisson DW, Shaw GM, Snape L. Intracranial intubation in patients with maxillofacial injuries associated with base of skull fractures? J Trauma 2001;50: 363–6
9. Lewis RJ, Tracheostomies. Indications, timing, and complications. Clin Chest Med 1992;13:137–49.
10. Durbin CG, Jr. Early complications of tracheostomy. Respir Care 2005;50: 511–5.
11. Stoll P, Galli C, Wachter R, Bahr W. Submandibular endotracheal intubation in panfacial fractures. J Clin Anesth 1994;6: 83–6
12. Altemir F.H.,Submental route for endotracheal intubation- A new technique, J max.fac.surg.1986;79:269-272
13. Anwer H.M.F.,Shehata E.A.A., Zeitoum I.M. Submandibular approach for tracheal intubation in patients with panfacial fractures. Br J Anaesth 2007;98: 835-40
14. Naveen Malhotra, Retromolar intubation: A technical Note, Indian Journal Anaesth. 2005;49(6):467-468
15. Gadre SK, Kushte D. Transmylohyoid oroendotracheal intubation: a novel method. The journal of craniofacial surgery 1992;3:39-40.
16. MacInnis E., Baig M. A modified submental approach for oral endotraeheal intubation. Int. J. Oral Maxillofac. Surg. 1999;28: 344-346.
17. Biglioli F, Mortini P, Goisis M, Bardazzi A, Boari N. Submental orotracheal intubation: an alternative to tracheotomy in transfacial cranial base surgery. Skull Base 2003;13: 189–95.
18. Stranc MF, Skoracki R. A complication of submandibular intubation in a panfacial fracture patient. J Craniomaxillofac Surg 2001;29: 174–6.

