Original Article

International Journal of Dental and Health Sciences
Volume 04,Issue 05

SUBMENTAL ENDOTRACHEAL INTUBATION IN MAXILLOFACIAL TRAUMA: A CLINICAL ASSESSMENT

Suresh Babu P[1], Bindu R[2], Arun T J[3], Saurabh Kumar Rawat[1]

[1] Department of Oral and Maxillofacial Surgery, Government Dental College, Thiruvananthapuram, Kerala
[2] Department of Oral and Maxillofacial Surgery, Medical College Hospital, Parippally, Kollam, Kerala
[3] Department of Oral and Maxillofacial Surgery, Raihan Institute of Medical Sciences(RIMS), Kottayam, Kerala

ABSTRACT:

Aim: Our aim was to assess the indications of submental route of endotracheal intubation in maxillofacial trauma and if there is any intra or post -operative complications with this technique.

Materials and method: For the purpose of this study 8 patients with pan-facial trauma were selected (, 7 patients with history of road traffic accident and 1 patient with history of fall from height) who required intraoperative maxillo-mandibular fixation. Patients with multiple facial bone fractures including nasal bone or skull base of whom required intra operative evaluation of dental occlusion. Oro-endotracheal intubation was performed by using a flexometallic tube. Standard submandibular intubation technique was used. The procedure was assessed intra-operatively and post-operatively. Time taken for the procedure, oxygen saturation levels, ventilatory obstruction, associated hemorrhage and damage to any anatomical structures were noted if any. postoperative complications were checked over a follow up period of 2 months.

Results: All the cases were severe midfacial fractures with associated fracture of mandible in 4 cases, and associated skull base fracture in 2 cases. Mallampatti score was class II for 6 patients and class III for 2 patients. Majority of our submental intubation procedures took 10-15 minutes. For one case intra operative tube obstruction occurred and oxygen saturation decreased due to kinking of the tube. Post-operatively, 2 patients with fracture mandible developed oedema of floor of mouth ,so tube retention become necessary. One patient with diabetes developed a superficial infection of submental wound, which healed by local measures.

Conclusion: Submental intubation should be chosen whenever possible in cases of maxillofacial trauma. It demands a certain surgical skill, but it is simple, safe and quick to execute.

Keywords: submental intubation, maxillofacial trauma.

INTRODUCTION:

Alexander Monro, Professor of anatomy at Edinburgh, in 1774 described his method of inserting a tube through the larynx in order to ventilate the lungs with a bellows. The technique of naso-endotracheal intubation was first developed by Sir Ivan Magill during first world war (1914 -1918), who was an anesthetist in the facio-maxillary unit at Sidcup, U.K. Since then the development of intubation technique has been erratic, long periods of stagnation being occasionally broken by improvements and advancements. In the 1980's naso-endotracheal intubation was the recommended method for poly trauma

*Corresponding Author Address: Dr. Saurabh Kumar Rawat. E-mail: saurabhrawatskr@gmail.com

patients, as it provided good access to the facial skeleton.

Modern technique for surgical treatment of mid-facial and pan-facial fractures in maxillofacial trauma lead to special problems for airway management. The surgeon needs to access to an unobstructed field and in most instances maxillo-mandibular fixation is required intra-operatively for adequate reduction of facial fractures. Hence such patients cannot be managed with oro-endotracheal intubation. Usually, the next alternative is naso-endotracheal intubation. However, it is frequently contraindicated because of concurrent skull base fractures with the associated risk of passage of tube in to cranium. In addition, the presence of a naso-tracheal tube can interfere with the surgical reconstruction of fractures of the naso- ethmoidal-orbital complex.

This study was conducted to assess submental route of endotracheal intubation and associated complications with this technique in maxillofacial trauma patients.

Aims and objectives

(I) To assess the indications of submental route of endotracheal intubation in maxillofacial trauma.

(II) To assess if there is any intra or post - operative complications with this technique.

MATERIALS AND METHODS:

Study design and setting: The study has been conducted in the department of oral and maxillofacial surgery Govt. Dental College, Thiruvananthapuram and in the Department of Anaesthesiology, Government Medical College , Thiruvananthapuram. The patients with maxillofacial trauma benefited from submental endotracheal intubation were studied. For the purpose of this study 8 patients with pan-facial trauma were selected, who required intra-operative maxillo-mandibular fixation.

Inclusion criteria:Patients with multiple facial bone fractures including nasal bone or skull base of whom required intra operative evaluation of dental occlusion.

Exclusion criteria:

1. Tracheostomised patients
2. Maxillofacial trauma patients in which intra-operative control of dental occlusion not necessary
3. Maxillofacial trauma patients in which airway maintained by naso-endotracheal Intubation
4. Patients not willing for surgery

Armamentarium: *(Figure 1)*

1. Flexometallic tube
2. Lignocaine hydrochloride with adrenaline
3. Bard-Parker blade No.15
4. Curved artery forceps
5. Small Langenbeck retractor
6. Mouth props

7. Tongue depressor
8. Silk (2-0)
9. Vicryl (3-0)
10. Needle holder
11. Adson's forceps
12. Suture cutting scissors

Technique: Intubation was performed in standard operating room instrumentation. Oro-endotracheal intubation was performed by using a flexometallic tube , as difficulties were experienced with conventional plastic and rubber tubes like kinking in our pilot study. Skin preparation of the peri-oral and submental region was performed using Betadine solution. A temporary draping of the mouth and chin was carried out.

A 2-cm skin incision was made in the median region of the submental area directly adjacent to the lower border of the mandible. The muscular layers were traversed by blunt dissection using a curved hemostat that always in contact with the lingual cortex of the mandible. Tongue was retracted to opposite side for better visualization of the floor of the mouth. The mucosal layer on the floor of the mouth incised over the distal end of the forceps, which is located in front of the sublingual caruncle and the forceps are then opened, creating a tunnel. After the surgical access has made, the deflated pilot cuff was grasped first and passed through the floor of the mouth to be brought in to the neck using the same hemostat. The endotracheal tube was briefly disconnected from the breathing circuit and the tube connector is removed from the tube. The endotracheal tube was gently pulled out through the incision using the hemostat.

The tube connector was reattached, and the endotracheal tube reconnected to anesthesia breathing circuit. Bilateral air entry was rechecked and tube was secured using 2-0 silk suture.

At the termination of surgery extubation was performed as per any routine intubation. The tube was pulled through the submental incision after usual extubation criteria are met. Submental skin incision and the intra-oral wound were closed with sutures. (Figure 2)

RESULTS:

Total of 8 patients were included in our study, 7 patients with history of road traffic accident and 1 patient with history of fall from height. (Table 1) Out of 8 patients, 2 were females and 6 were males.

All the cases were severe midfacial fractures with associated fracture of mandible in 4 cases, and associated skull base fracture in 2 cases.

Airway of patients have been assessed pre-operatively by Mallampati Classification. Class II airway was noted in 6 patients and Class III in 2. (Table 2)

All the patients have been analysed pre-operatively by ASA classification, one patient with systemic hypertension and one with type II diabetes were included in ASA class II. (Table 3)

Majority of our submental intubation procedures took 10-15 minutes. (Table 4)

Assessment of complications:

The intra and post-operative complications of the procedure has been assessed. For one case, the intubation was done with the normal ET tube as the anaesthetist preferred it. In that case, there was an intra-operative tube obstruction and oxygen saturation decreased due to kinking of the tube. So the patient had to be extubated and re-intubated with flexometallic tube. (Table 5)

Post-operatively, 2 patients with fracture mandible developed oedema of floor of mouth ,so tube retention become necessary. One patient with diabetes developed a superficial infection of submental wound, which healed by local measures. (Table 6)

DISCUSSION:

Classical endotracheal intubation is not always feasible in cases of craniofacial trauma especially when the nasal pyramid or the anterior skull base were involved or when intra-operative control of the occlusion is necessary .The orotracheal intubation makes control of the interdental occlusion impossible. Nasotracheal intubation is contra-indicated in cases of trauma of the skull

base because of possible iatrogenic meningitis, difficult intubation and difficulty in performing treatment for fractures of the nasal pyramid at the same time.

Tracheostomy is currently the standard procedure in cases of such craniofacial trauma but may lead to many complications. The potential complications associated with a tracheostomy include haemorrhage, surgical emphysema, pneumomediastinum, pneumothorax, recurrent laryngeal nerve damage and injury to cervical vessels or the thyroid gland. Later complications include tracheal stenosis, stomal and respiratory infections, tracheoesophageal fistula, stomal and tracheal erosions, dysphagia, problems with decanulation and excessive scarring.

Endotracheal intubation by means of submental route was first described by Altemir[1] in 1986. This technique provides a secure airway, an unobstructed intra oral surgical field and allows maxillo-mandibular fixation avoiding the drawbacks and complications of nasotracheal intubation and tracheostomy. It has been described in the literature by other names such as submandibular, transmylohyoid intubations. The potential indications for submental intubation extend beyond craniomaxillofacial trauma to include orthognathic surgery and elective craniomaxillofacial procedures in which reference to the dental occlusion is required. This technique is rapid and safe.

The contraindications to this method of intubation are the likelihood that patients will require a long period of assisted ventilation, i.e. multi trauma patients presenting with severe neurological damage, major thoracic trauma or patients for whom repeated operations can be anticipated. In these cases, tracheostomy should remain the standard procedure. The same applies to patients presenting with severe traumatic wounds of the floor of mouth. A fracture of the symphyseal region of the mandible is not a contraindication but directs one to select the contralateral side to fashion the tunnel.

Adverse events can occur while the endotracheal tube is passed through the incision from interior to exterior. It may be difficult to pass the tube through the incision or reattaching the connector to endotracheal tube. These adverse events can be overcome by Green and Moore's[15] modification to the original technique. They used two endotracheal tubes in their technique.

MacInnis and Baig[18] reported that their experience with standard technique as described by Altemir[1] was less than satisfactory because of bleeding, difficult tube passage and sublingual gland involvement. Instead of slight lateral exit wound submentally, they modified the technique to strict midline approach in 15 patients with satisfactory results. The theoretical complications related to this method of intubation in the literature include ventilatory obstruction, hemorrhage, damage to anatomical structures, edema, neurological deficits, oro-cutaneous fistula, submental infection, sialocoele, wound dehiscence and hypertrophic scar. Regarding the mucocele reported by Stranc and Skoracki[4] as a complication of the technique, C. Taglialatela Scafati et al[27] stated that it is important to prepare the surgical route from the skin to the oral cavity to avoid introducing mucosal fragments in the oral floor that can form a mucocele. So mucocele as a complication is caused by an incorrect surgical technique.

Petr Schutz and Hussein H. Hamed[33], compared tracheostomy and submental intubation in maxillofacial trauma patients. He concluded that submental endotracheal intubation is a simple technique with very low morbidity and can replace tracheostomy in selected cases of maxillofacial trauma without indication for prolonged ventilation support.

Antonio Figueiredo Caubi et al[31], analysed 13 sufferers from facial trauma benefited from submental intubation and concluded submental intubation should be chosen whenever possible in cases of purely maxillofacial trauma.

I.Khan and K.S Gadre[29] , published experience with 250 cases of submental intubation and found out it as a reliable, safe and easy method of airway management which also gives sterile surgical field without a change of tube.

Malhotra N. et al (2002)20, presented a case of middle third fracture where

submental route of oro-endotracheal intubation has been tried. They found it very useful and relatively harmless alternative to tracheostomy for securing airway.

Amin M et al (2002)22, in the book of anesthesia mentioned the importance of submental route in the maxillofacial surgery as an alternative to tracheostomy. They reported 12 cases, 11 of pan-facial trauma and 1 case of orthognathic surgery. They described the technique, its indications and contraindications.

In our study, results were favourable with above studies. The procedure took about 10-15 minutes in 62.5% cases. The intra and post-operative complications of the technique had been assessed. In 87.5% cases, there were no intra-operative complications. In one case, our anaesthetist preferred cuffed endotracheal tube over flexometallic tube. In that case, there was intra-operative saturation fall and tube obstruction due to kinking. As a result the tube had to be changed to flexometallic tube, after which there were no problems. None of our cases required intra-operative tracheostomy to maintain the airway and there was no incidence of accidental extubation or tube damage.

Post-operatively, two patients developed oedema of floor of mouth. These patients had associated fracture of mandible and the oedema was probably due to the manipulation of fractured segments intra-operatively. These two patients required tube retention for about 8 hours post-operatively. One patient with diabetes mellitus developed a superficial infection of submental wound, which healed by local measures and antibiotics. There was no incidence of paresthesia, wound dehiscence, sialocele, orocutaneous fistula, hypertrophic scar or keloid formation. All the scar formed were acceptable.

So our experience with 8 patients proved that submental route is a quick, simple safe and acceptable alternative to tracheostomy for short term airway management in- patients with pan-racial trauma.

CONCLUSION:

We conclude that submental route for endotracheal intubation is the route of choice in patients with pan-facial trauma for short term airway management. It avoids complications inherited to naso-endotracheal intubation and tracheostomy for airway management in patients with pan-facial trauma. The technique has very low morbidity. Complications from this approach are rare and are more hypothetical than real.

Acknowledgment: We are thankful to Department of Anesthesiology, Government Medical College, Thiruvananthapuram for the help and support for conducting this study

REFERENCES:

1. Altemir F H : The submental route of endotracheal intubation; a new technique. Journal of Oral Maxillofacial Surgery; 1986 Feb;14(1):64-5.
2. Green .J D. and Moore U.J : "A Modification of Sub-mental intubation" British Journal of Anesthesia. 1996; 77: 789–791
3. MacInnis E. and Baig M : "A Modified Submental approach for oral endotracheal intubation" Int. journal of Oral maxillofacial Surgery, 1999 Oct 28(5): 344–346
4. Stranc MF, Skoracki R. A complication of submandibular intubation in a panfacial fracture patient. J Craniomaxillofac Surg. 2001 Jun;29(3):174-6.
5. C. Taglialatela Scafati , G. Maio, F. Aliberti , S. Taglialatela Scafati , P.L. Grimaldi : "Submento-submandibular intubation: Is the subperiosteal passage essential?: Experience in 107 consecutive cases". British Journal of Oral and Maxillofacial Surgery , 2006;44 :12–14
6. Petr Schütz, Hussein H. Hamed : "Submental Intubation Versus Tracheostomy in Maxillofacial Trauma Patients". Journal of Oral andMaxillofacial Surgery, July 2008;66(7): 1404–1409
7. Antonio Figueiredo Caubi , Belmiro Cavalcanti Do Egito Vasconcelos , Ricardo José De Holanda Vasconcellos , Hecio Henrique Araújo De Morais ,Nelson Studart Rocha : "Submental intubation in oral maxillofacial surgery:Review of the literature and analysis of 13 cases". Med Oral Patol Oral Cir Bucal.2008;13(3):E197-200
8. I.Khan, K.S.Gadre : "Transmylohyoid oroendotracheal (Submental) intubation: an alternative method to manage airway: experience of 250 cases". International Journal of Oral and Maxillofacial Surgery, 2007 Nov;36(11):1095
9. Naveen M., Neerja B. and Chari P : "Submental Endotracheal Intubation: A useful alternative to tracheostomy". Indian J. Anesthesia. 2002; 46(5): 400-402
10. Amin M., Dill- Russel P., Manisali M., Lee R. and SInton I : "Facial fractures and submental tracheal intubation" Book of anesthesia, 2002;57; 1195-1212

TABLES:

Table 1 – Distribution of Cause of maxillofacial trauma

No.of patients	RTA	Fall
8	7	1

Table 2- Distribution of Mallampati class

Mallampati	Frequency	Percent
Class II	6	75
Class III	2	25
Total	8	100

Table 3 – Distribution of ASA class

ASA	Frequency	Percent
Class I	6	75
Class II	2	25
Total	8	100

(ASA- American Society of Anesthesiologists)

Table 4- Distribution based on time taken

Time Taken	Frequency	Percent
5 - 10 min	1	12.5
10 - 15 min	5	62.5
15 - 20 min	2	25
Total	8	100

Table 5- Distribution of intra-operative complications

	No		Yes	
	Frequency	Percent	Frequency	Percent
Tube Damage	8	100	-	-
Accidental Extubation	8	100	-	-
Tube Obstruction	7	87.5	1	12.5
Tube Change	7	87.5	1	12.5
Tracheostomy	8	100	-	-
Saturation Fall	7	87.5	1	12.5

Table 6-Distribution of post-operative complications

	No		Yes	
	Frequency	Percent	Frequency	Percent
Oedema of Floor of Mouth	6	75	2	25
Paresthesia	8	100	-	-
Sialocele	8	100	-	-
Abscess	7	87.5	1	12.5
Wound Dehiscence	8	100	-	-
Keloid	8	100	-	-
Orocutaneous Fistula	8	100	-	-
Hypertrophic scar	8	100	-	-

FIGURES:

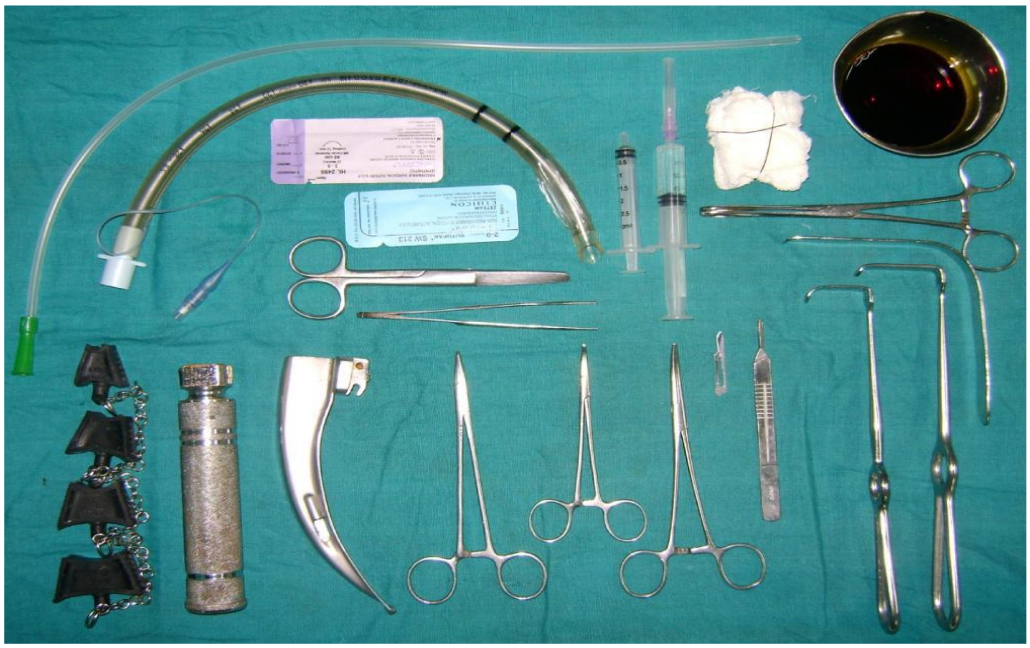

Figure 1. Armamentarium.

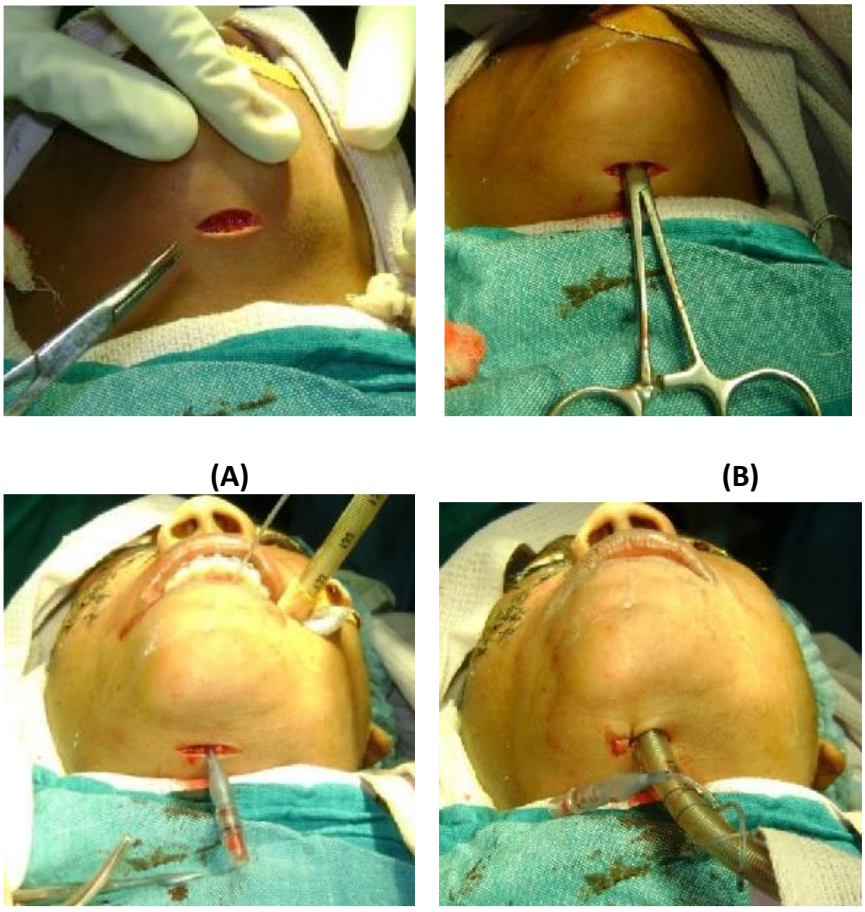

Figure 2. Surgical procedure. (A) Incision (B) Blunt dissection (C) Tube cuff taken out through incision (D) Tube secured.