

# Airway management using transmylohyoid oroendotracheal (submental) intubation in maxillofacial trauma

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## ABSTRACT

Successful management of airway in complex maxillofacial injuries is quite challenging. The complications and the post-operative care associated with tracheotomy makes it an unpopular choice for airway management meant solely for surgery in these patients. A retrospective analysis of 12 patients from June 2008 to December 2011, seeking treatment for pan facial fractures who underwent transmylohyoid oroendotracheal (submental) intubation is discussed here. The stepwise procedure is explained along with problems of intubation in pan facial fractures. The advantages, disadvantages and complications of transmylohyoid intubation are discussed and compared with alternative methods of air way management in such cases. This reliable, safe and easy method of airway management gives sterile surgical field without a change of tube.

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## INTRODUCTION


It has been almost three decades since the submental intubation technique was first proposed by Hernández Altemir<sup>[1]</sup> for managing airway in complex maxillofacial injuries. The term transmylohyoid oroendotracheal intubation was first coined by Gadre and Kushte,<sup>[2]</sup> they proposed that the transmylohyoid route and the term transmylohyoid oroendotracheal intubation is more apt as the path of exit of endotracheal tube (ETT) is across the mylohyoid muscle and not restricted to the submental triangle.<sup>[3]</sup> We here retrospectively evaluate 12 patients of complex maxillofacial trauma in which this technique was employed avoiding a tracheotomy. The advantages, disadvantages and complications of transmylohyoid

intubation are discussed and compared with alternative methods of air way management in such cases.

## MATERIALS AND METHODS

From June 2008 to December 2011, 12 patients [Table 1] underwent this technique avoiding a tracheotomy. All of them were male's age ranging from 19 to 45 years and were having an either one or a combination of leforte I, II, III, mandibular fractures, with nasal pyramid. The data recorded included the personal details of the patient, type of fractures sustained, duration of this technique and post-operative complications arising from this technique [Table 1].

The current technique that we use for transmylohyoid oroendotracheal intubation is the adaptation of the technique first described by Gadre and Kushte.<sup>[2]</sup> Prior to the oral intubation the sealed universal connector of the flexometallic ETT (Portex, Smith Medical ASD, USA), [Figure 1] is loosened, detached and gently re attached to facilitate regular oro-tracheal intubation. After

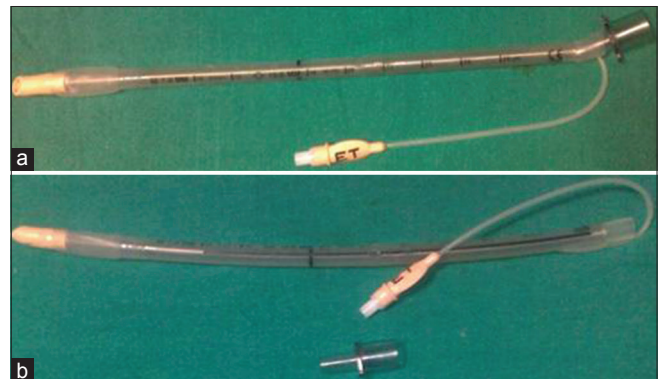
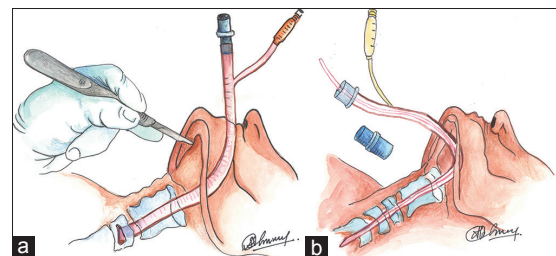
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**Table 1: Details of the cases in our series**

Case number	Leforte number 1	Leforte number 2	Leforte number 3	NOE number	Mandible number	Duration of the procedure (min)	Complications with this procedure
1		X			X	7	None
2	X			X	X	7	None
3		X	X	X	X	10	None
4	X	X		X		5	None
5		X		X	X	6	Abscess at floor of mouth
6		X	X	X		8	None
7	X	X		X	X	7	None
8		X			X	5	None
9	X				X	9	None
10	X	X			X	7	None
11		X		X	X	10	None
12	X			X		7	None
Total	6	9	2	8	9	7.3	

NOE: Naso orbital ethmoid fractures

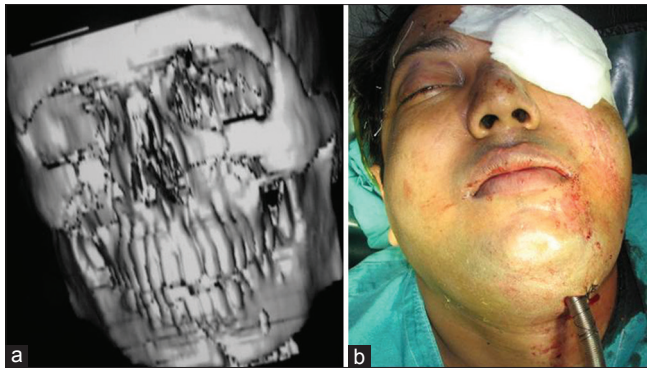
standard orotracheal intubation is accomplished the cuff was inflated with an adequate amount of air and throat pack inserted to avoid oral secretions in the airway. The site of exit of the ETT across the floor of the mouth was chosen away from the fractured mandible (if it was present). The proposed site of exit was then scrubbed by 10% povidone-iodine solution and then cleaned by surgical spirit. A provisional draping of the mouth and the chin was carried out. A skin incision about 1.5 cm in length is made on the medial aspect of the lower body of the mandible. This incision should be anterior to the attachment of the masseter and medial to the body of mandible to prevent damage to the facial artery.<sup>[2,3]</sup> The platysma, deep cervical fascia, mylohyoid muscle and the oral cavity were bluntly dissected with a heavy artery forceps always hugging the lingual cortex of the mandible. An entry to the oral cavity is made, now this entry is carefully widened to ensure smooth passage of the ETT through it. Before disconnecting the ETT to the ventilator the patient was ventilated with 100% oxygen to increase apneic reserves and to prevent desaturation during the passage of the tube. The ETT is now disconnected; the universal connector being detached from the ETT, the pilot balloon is deflated and tucked inside the lumen of the ETT. Next the lumen of the ETT is grasped by artery forceps in a way that the ETT is not damaged and it is drawn out extra orally through the passage made. Once the ETT is out, the universal connector is reattached the tube is reconnected to the ventilator. Bilateral air entry was checked by auscultation and the tube is readjusted accordingly with the pilot cuff now being inflated with adequate air. The ETT is then secured with silk sutures. Adhesive tape is used across the universal connector to increase the fixity of the connector to the ETT. The tube crossed the floor of the mouth, submucosal connective tissues, mylohyoid muscle, deep cervical fascia, subcutaneous tissue, platysma and the skin [Figure 2]. In all our cases extubation was done immediately after the surgery as there was no need to retain the ETT post-operatively. Once the operative procedure is over the stay sutures

**Figure 1:** (a) Flexometallic endotracheal tube, (b) Endotracheal tube with detached universal connector**Figure 2:** (a) Graphical depiction of transmylohyoid oroendotracheal (sub mental) intubation; (b) Graphical depiction of transmylohyoid oroendotracheal (sub mental) intubation

across the tube are removed, the ETT is brought back in to the oral cavity and the skin wound is closed by 3-0 nylon sutures while the intraoral wound was left to heal with secondary intention. The skin area is infiltrated by 0.5% bupivacaine to decrease post-operative discomfort and a pressure dressing is given on the skin [Figures 3 and 4].

## RESULTS

All patients underwent a successful transmylohyoid oroendotracheal intubation and all of them were extubated immediately after completion of the surgical procedure. There were no major intra operative or post-operative complications related to this procedure.

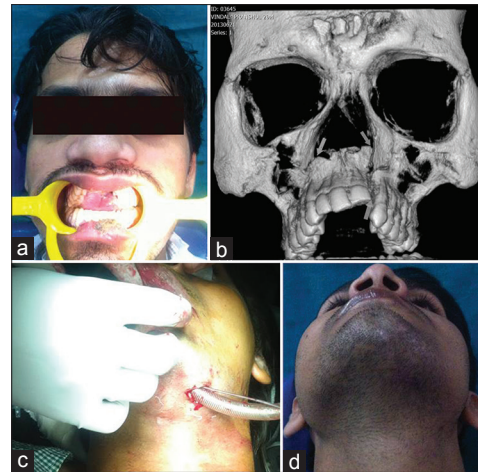


**Figure 3:** (a) 3 D Recon image of Patient with bilateral leforte II, NOE complex and mandibular fracture; (b) Transmylohyoid Oroendotracheal intubation depicted clinically

The mean time required for this procedure was 8 min and disconnection time of the ETT from the ventilator was less than 2 min approximately which hardly affected the oxygen saturation of the patient. Only one patient presented with an abscess at the floor of the mouth which was managed by dressing and antibiotic coverage. There was no neurosensory or motor deficit observed in any of the patients. All of the patients accepted the resultant scar without much complains.

## DISCUSSION

“Necessity is the mother of all inventions”. Probably simultaneous correction of fractures of the mid face, nasal pyramid with control over the dental occlusion led Hernández Altemir<sup>[1]</sup> to come up with the idea of this technique. Gadre and Kushte<sup>[2]</sup> separately published this technique as transmylohyoid oroendotracheal technique as they failed to acknowledge Hernández Altemir<sup>[1]</sup> article due to the difference in nomenclature and also due to limitations in accessing the literature in the pre-internet era.<sup>[3]</sup> Securing an airway in complex maxillofacial injuries is always a challenging job for an anesthetist and an oral and maxillofacial surgeon. The two most frequent route used to secure airway in these injuries are the oroendotracheal and the nasotracheal. The former technique hampers intraoperative control of dental occlusion, also fear of injury by the wire on to the ETT or its pilot is always there, whereas the latter is contraindicated in cases of skull base trauma<sup>[4]</sup> because of possible iatrogenic meningitis, it also creates difficulty in performing the treatment of the nasal pyramid. Due to the increased post-operative care, complication rate<sup>[5,6]</sup> and morbidity<sup>[7]</sup> associated with it tracheotomy is difficult to propose to patients suffering from an isolated facial trauma and who will not require prolonged air way management.<sup>[7]</sup> Other alternative techniques for avoiding tracheotomy have also been proposed one of them being the nasal tube switch technique<sup>[8]</sup> but interference from anesthetist is



**Figure 4:** (a) Preoperative Image; (b) 3 D Recon image; (c) Transmylohyoid Oroendotracheal intubation depicted clinically; (d) 1 month post operative

required intra-operatively which might compromise the sterility of the surgical field. An ETT exchanger is also required for this technique to avoid accidental extubation. The retro molar intubation technique<sup>[9]</sup> was also proposed to avoid tracheotomy in these sort of injuries, but this technique involves more time, with removal of bone from the retromolar region for making space for the ETT, also damage to the lingual nerve is greatly increased by this technique.

In our cases, all patients underwent a successful transmylohyoid oroendotracheal intubation and all of them were extubated immediately after completion of the surgical procedure. There were no major intra-operative or post-operative complications related to this procedure. One patient presented with an abscess at the floor of mouth the most likely explanation to it is contaminated balloon during extubation for which he was prescribe antibiotics and subsequent dressing were carried out which resolved it. We propose that tansmylohyoid oroendotracheal intubation a superior technique when compared to the nasal tube switch technique<sup>[8]</sup> and the retromolar intubation technique<sup>[9]</sup> simply for its short duration time with no major injury scare to important adjacent structures without compromising the sterility of the operating field. Furthermore, no additional equipment is required to carry out this simple procedure as in the nasal tube switch technique where an ETT exchanger is also required for this technique to avoid accidental extubation. There have been reports of accidental injury to the ETT and the pilot balloon during this procedure<sup>[3,10]</sup> but in our series no such complication was noted. We recommend ideal widening of the passage created in medio lateral and antero posterior directions before disconnecting the tube and allowing it to be passed from the tunnel. We agree to Gadre and Waknis<sup>[3]</sup> that the term transmylohyoid oroendotracheal intubation more apt as compared to submental intubation as in this

route the ETT can pass across the mylohyoid anywhere between the mandibular first molar region on either side without being restricted to the submental triangle. In cases of compound comminuted fracture of the symphysis and parasymphysis a strict submental route can increase the possibility of compromise in the vascular supply of the mandible. Using the area between two mandibular first molars on either side particularly takes care of most clinical situation without fear of stripping the lingual periosteum of the mandible.<sup>[3]</sup> In all our cases, we achieved our goal of good anatomic reduction of fractures with intra-operative control of the dental occlusion and unhindered access to the surgical field. This technique can also be used in cases undergoing simultaneous orthognathic surgery with nasal correction.<sup>[11]</sup> With all the above mentioned indications and pack of advantages there are few shortcoming of this procedure which also needs to be addressed. First and foremost this procedure is not indicated where prolonged ventilatory support is required, thus in patients of polytrauma with neurological deficit with anticipated multiple and repeated surgeries this procedure is a contraindication. Tracheotomy can be preferred in such cases. Scar formation is another potential disadvantage but in all our cases the patients tolerated the scar well as it is less visible if we compare it with the tracheotomy scar. Furthermore in patients with a previous history of keloid formation this procedure can be avoided.

Certain modifications to the classical technique suggested by Hernández Altemir<sup>[1]</sup> have been proposed from time to time. Green and Moore<sup>[12]</sup> used two tubes for this technique in which the first tube secured airway with the conventional oral route, whereas the second tube was then passed through the submental route and oral tube is substituted with the submental tube with patient reintubated, with this modification ETT which do not come with a detachable universal connector can also be used. Macinnis and Baig<sup>[13]</sup> in their study suggested a strict midline modification in which they used a 2 cm midline incision posterior to the Wharton's duct between geniohyoid, genioglossus and the anterior belly of digastric muscle, according to them by this chances of injury to any major blood vessel is greatly reduced. Altemir and Montero<sup>[14]</sup> in their study have reported the use of submental route to facilitate laryngeal mask airway. Jundt *et al.*<sup>[15]</sup> in a literature review concluded that it is an underutilized technique, which can be safely used for establishing airway in patients requiring facial reconstructive surgery.

In our cases, all patients underwent a successful transmylohyoid oroendotracheal intubation and all

of them were extubated immediately after completion of the surgical procedure. In all our patients this technique facilitated simultaneous correction of facial fractures with good intra-operative control of dental occlusion without interference of the ETT in the surgical space.

## CONCLUSION

Transmylohyoid oroendotracheal intubation technique is a fast, simple, effective and a very reliable alternative to tracheotomy in managing complex craniomaxillofacial surgeries where prolonged ventilatory support is not required.

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