

## Transmylohyoid Submental Intubation in complex maxillofacial trauma: The easiest method is also the safest method

Ashutosh Kumar Singh<sup>1</sup>, Sanad Dulal<sup>1</sup>, Rajesh Yadav<sup>2</sup>, Ajay Singh Thapa<sup>2</sup>

<sup>1</sup>Department of Oral & Maxillofacial surgery

<sup>2</sup>Department Of Anaesthesiology and critical care

College of Medical Sciences, Bharatpur, Nepal

### Correspondence

Dr. Ashutosh Kumar Singh,  
Department Of Oral &  
Maxillofacial surgery,  
COMS-TH, Bharatpur, Chitwan,  
Nepal  
Email:  
drashutoshkumarsingh@gmail.com

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### ABSTRACT

**Background & Objectives:** Complex maxillofacial trauma is a common occurrence with high velocity road traffic accidents. Multiple facial bone fracture with loss of reference point for bony reduction requires use of intra-operative intermaxillary fixation to obtain good occlusion which precludes oral intubation. Fractures of nasal bones and ethmoid bones with complex distorted anatomy lead to inability to perform a nasal intubation. In such cases sub-mental intubation can be a safe and easy method of securing the intra-operative airway thus avoiding tracheotomy and its complications. **Materials & Methods:** Retrospective clinical analytical study was planned in which 25 patients were included. Patient's age, sex, type of trauma, time taken for procedure and complications were taken as study variables. **Results:** Average time taken for the procedure was nine minutes and only four out of 25 cases had complications. **Conclusion:** Sub-mental intubation requires simple skills, less time and is relatively complication free compared to tracheotomy in securing intra-operative airway during surgeries for complex maxillofacial trauma.

**Key words:** Airway management; Panfacial fracture; Sub-mental intubation

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### INTRODUCTION

Maxillofacial injuries and fractures are nearly always associated with moderate to severe road traffic accidents (RTA). Mandible and zygomatico-maxillary complex are commonest sites of fracture.<sup>1</sup> About 21.8% of all the maxillofacial injuries need open reduction and internal fixation.<sup>2</sup> Pan-facial or maxillofacial injuries may lead to derangement of the architecture and disruption of different components of the upper airway, often with little external evidence of the deformity. In many such situations, neither oral nor nasal route for intubation is appropriate during the surgical repair. Recent advancements in the discipline of oral and maxillofacial surgery and availability of new techniques and technologies have made rigid fixation with mini and microplate osteosynthesis possible in almost all facial fractures. Conventional orotracheal intubation leads to inability to close the occlusion which is a pre requisite to obtain reduction of facial bones especially in complex panfacial trauma where multiple fractures of both upper and lower jaw renders the surgeon dependent

on dental occlusion as a reference point for reduction of fractured bones. Nasotracheal intubation may be impossible as deformity or fracture of nasal bones, cribriform plate of ethmoid or naso-orbital ethmoid complex are often associated. Efficacy of topical anesthesia over traumatized and inflamed mucosa is uncertain. Moreover, even a small bleed in presence of altered anatomy may lead to complete loss of vision through a fiberscope and may lead to an emergent situation. Potential complications of nasotracheal intubation are mucosal dissection, injury to adenoids, meningitis, sepsis, sinusitis, epistaxis, dislodgement of bony fragments, and obstruction of the tube by the distorted airway anatomy or rarely intracranial intubation.<sup>3</sup> In patients requiring simultaneous nasal or nasoorbital ethmoid reconstruction after the rigid fixation of mandible and/or maxilla, intraoperative switching over of the endotracheal tube (ETT) from nasal to oral route is required which may compromise the surgical field sterility and may increase the possibility of pulmonary aspiration. Possible difficulty in airway

management, disruption of surgical repair, and obstruction to the operative field are additional limitations.<sup>4</sup>

That leaves us with elective short term tracheostomy which is associated with its own set of complications. The procedure is difficult in obese patients, children, and patients with thyroid swelling.<sup>5</sup> The incidence of immediate complications is six to eight percent and they include haemorrhage, surgical emphysema, pneumothorax, pneumomediastinum, and recurrent laryngeal nerve palsy. The incidence of delayed complications is 60% and they include stomal and respiratory tract infections, blockage of the tube, dysphagia, difficulty with decannulation, tracheal stenosis, tracheoesophageal fistula, and suboptimal visible scar.<sup>6</sup> Compared to tracheostomy, submental intubation is associated with lesser postoperative complications and requires minimal postoperative care resulting in shorter duration of hospitalization. This procedure can be carried out even in a set up with limited resources.<sup>7</sup> Preoperative submental intubation in craniofacial injuries was first proposed by a Spanish faciomaxillary surgeon, Francisco Hernandez Altemir in 1986.<sup>8</sup> He proposed it as an alternative to short-term elective tracheostomy, where both oral and nasal route for endotracheal intubation were not feasible. It is also used in surgeries where both nasal and oral passages are used by the surgeons (e.g., repair of postcancerum oris defects<sup>9</sup> oronasal fistula, selected cleft lip, and palate surgeries). Repair of congenital malformations, skull base surgery, multiple or complex facial osteotomies, transfacial oncologic procedures of the cranial base, and pediculated craniofacial surgeries are current indications for submental intubation.

## MATERIALS AND METHODS

This retrospective clinical analytical study of 185 patients of maxillofacial trauma spanning two years (August 2013 to July 2015), at College of Medical Sciences Bharatpur, Nepal was done out of which

**Table 1:** Distribution of anemic patients according to severity

Grading of anemia	Male	Female
Grade I	13	3
Grade II	1	3
Grade III	0	2
Grade IV	1	2

25 were intubated with submental intubation. The selection criteria for these patients was panfacial trauma involving nasal and nasoorbitomethoid bones with derangement of occlusion precluding conventional orotracheal or nasal intubation. Fiber-optic instrument was not available. Flexometallic tube was used in all cases. Data related to the type of fractures present in each case, sex, age, type of trauma, time required for the submental intubation procedure and the complications associated to it were considered analysis variables in this study.

### Surgical technique:

Materials:

- Flexometallic tube with a bulb or cuff and a detachable connector.
- Curved haemostatic pinches.
- Sheet no. 15 with the corresponding handle for it.
- 4-0 silk or nylon suture.

Surgical Steps:

1. A standard oroendotracheal intubation was performed after asepsis and antisepsis of the mouth and chin.
2. Subsequently, a 2 cm skin incision was made in the para- median submental region, adjacent to the lower edge of the mandible.
3. The muscle layers (neck cutaneous muscles and mylohyoid muscles) were removed using a pair of curved haemostatic pinches always in touch with the lingual cortex of the mandible. On the lingual floor mucosa, an intraoral incision was made using the distal end of the pinches as a reference, and the pinches were then opened using the sublingual caruncle as a reference and, as a consequence, a tunnel was created.
4. The tube was passed in 2 steps: the tube cuff was first introduced into the mouth and then it was passed through the tunnel using a clamp. The same manoeuvre was then carried out with the proximal end of the tube after disconnecting it from the breathing system of the anaesthesia machine.
5. Then, the tube was re-connected to the breathing system of the anaesthesia machine. The tube was

**Table 2:** Correlation between different parameters with hemoglobin level

Variables	Yes (Hb level gm%)	No (Hb level gm%)	P value
ART use	11.58	12.02	0.60
Malnutrition	10.93	11.86	0.39
Opportunistic infections	11.81	11.9	0.91

placed on the skin in the submental region. At the end of the surgery, the reversion is performed by replacing the tube and, subsequently, the cuff through the incision made; the tube was re-connected to the anaesthesia machine, and the intubation becomes a classic oral intubation.

## RESULTS

Out of 25 participants 17 (68%) were males and 18 (72%) were females. Age ranged from 9 to 62 with an average of 34.4. Time require to perform the procedure ranged from six to 14 minutes with an average of nine minutes. Complications were seen in four cases. Noticeable scar was noticed in two patients whereas bleeding from floor of mouth and submental hepatoma occurred in a case each. Bleeding from floor of mouth was controlled with homeostatic agents and electrocautery and submental hematoma was managed conservatively with pharmacotherapy without any untoward consequences.

## DISCUSSION

Submental intubation allows unhindered approach to oral and nasal cavity sometimes simultaneously without any untoward complications. The need to do inter maxillary fixation during fracture reduction in panfacial trauma makes submental intubation a safe and easy method of securing the airway. Unavailability of fiberoptic transillumination instruments for intubation also makes it a very useful skill to have. The main purpose of submental intubation is to avoid tracheotomy where oral and nasal intubation cannot be performed. Tracheostomy risks are well documented and include the following: haemorrhage, subcutaneous emphysema, pneumomediastinum, tracheostomy cannula obstruction, tracheitis, cellulite, pulmonary atelectasis, tracheoesophageal fistula, tracheocutaneous fistula, pneumothorax, recurrent laryngeal nerve damage, stomal and respiratory tract infections, tracheal stenosis, tracheal erosions,

Table 1: Grouping of patients according to fracture pattern

Group	Fracture description	No
1	ZMC (unilateral) with nasal component	7
2	Bilateral Lefort II with nasal bone fracture	8
3	Pan-facial fractures	7
4	NOE type II and III	3

Table 2: Variables assessed in the study population

Case No	Age	Sex	Fracture Group	Time required	Complications
1	32	M	1	7	None
2	27	M	4	8	None
3	21	F	4	8	None
4	33	F	1	9	None
5	47	M	1	9	None
6	9	M	3	12	Hypertrophic scar
7	55	F	1	6	None
8	43	F	3	6	None
9	27	F	2	12	None
10	11	M	3	14	None
11	58	M	1	10	prolonged intra-oral bleeding
12	32	F	1	10	None
13	33	M	2	9	None
14	21	M	2	9	None
15	56	M	1	8	None
16	32	M	3	11	None
17	20	M	4	12	None
18	21	F	3	14	sub-mental hematoma
19	27	M	3	7	None
20	22	M	2	8	None
21	55	M	1	11	None
22	62	M	3	8	None
23	34	F	1	8	None
24	42	M	1	9	None
25	40	M	4	7	noticeable scar

dysphagia, problems with decannulation, excessive scarring, and careful surgical and perioperative handling requirements.<sup>10-13</sup>

The submental intubation does not imply a considerable risk for patients or a significant extension of surgical time. In our case, the minimum time was 6 min and the maximum time was 14 min, similar to the figures reported in the literature.<sup>14-16</sup>

It is noteworthy and worth mentioning that:

1. The incision and blunt dis- section are made in the paramedian area, in order to avoid the separation or injury of geniohyoid and genioglossus muscles, which are moved towards the middle area. Upon conducting this manoeuvre, the suture may only be performed on the subcutaneous tissue and skin, which enables the rest of the layers to heal by secondary intention.
2. The dissection is performed on the periosteum and not inside the subperiosteal space, as originally described by Hernández Altemir. This is to avoid excessive periosteal section of bone fragments that may already have compromised vascularity. This is based on the fact that periosteal irrigation will not be affected by the approach. The advantages of these modifications are reported in the literature.<sup>1, 3, 10-15</sup>
3. Though this method is a good option for the securing the airway of patients with multiple fractures in the maxillofacial region, it is not free of complications. The most important complications include damage to the tube bulb, submental injury infection, abscess formation in the floor of the mouth, injury to the submandibular salivary ducts or sub- lingual glands, mucocele formation, injury to the marginal branch of the facial nerve, injury to facial vessels (in some cases), and keloid or hypertrophic scarring in the submental region. We also encountered hypertrophic scarring in two cases which was not a major concern since the incision was small and was placed under shadow of mandible. In one case, we encountered hematoma in submental region presumably due to inadvertent injury to submental vessels. Bleeding from floor of mouth was encountered own one case which was easily controlled. Thus this method remains one of the safest and easiest to secure the airway in complex facial fractures if performed keeping in mind anatomical structures and safeguarding

them.

## CONCLUSION

Submental transmylohyoid intubation provides an easy and safe way to secure the airway in complex maxillofacial trauma where intraoperative IMF is required and simultaneous access to oral and nasal cavity is required. It is also adequate and minimally invasive in avoiding tracheotomy in such cases thus providing least complicated recovery to the patients. It also provides safe method of intubation in case of involvement of nasoorbitoethmoid bones and base of skull fractures where nasal intubation is contraindicated with least amount of complications and shortest intraoperative time required to perform.

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