



## SUBMENTAL INTUBATION FOR PANFACIAL FRACTURES- OUR EXPERIENCE AT TERTIARY CARE CENTRE.

|                             |                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dr. Palukuri Lakshmi</b> | Professor and 1st Lady HOD, M.Ch., Department of Plastic and Reconstructive Surgery, Osmania General Hospital, Osmania Medical College, Hyderabad, India |
| <b>Dr. P. Shivani*</b>      | M.S., Department of Plastic and Reconstructive Surgery, Osmania General Hospital, Osmania Medical College, Hyderabad, India. *Corresponding Author       |
| <b>Dr. Sana Banu</b>        | M.S., Department of Plastic and Reconstructive Surgery, Osmania General Hospital, Osmania Medical College, Hyderabad, India.                             |
| <b>Dr. Maseera Ambreen</b>  | M.S., Department of Plastic and Reconstructive Surgery, Osmania General Hospital, Osmania Medical College, Hyderabad, India.                             |

**ABSTRACT**

**Background:** Panfacial fractures involving the midface and mandible pose a unique challenge in airway management, especially when both oral and nasal intubation are contraindicated due to anatomical disruption, CSF rhinorrhea, or the need for intraoperative maxillo-mandibular fixation (MMF). Submental intubation offers a viable alternative, providing an unobstructed surgical field while ensuring safe airway access. **Methods:** A prospective clinical study was conducted at Osmania General Hospital from 2023–2025 on 10 patients presenting with panfacial fractures and compromised airways. Submental intubation was performed using a standard surgical technique involving the creation of an orocutaneous tunnel in the submental region to externalize the endotracheal tube (ETT). Patients were followed postoperatively for up to 6 months to assess functional outcomes, aesthetic results, and complications. **Results:** Submental intubation was successfully performed in all 10 patients without intraoperative complications such as ETT dislodgement, aspiration, or airway obstruction. The mean duration of the procedure was 15–20 minutes. All patients were extubated intraoperatively without the need for postoperative ventilation. Follow-up revealed normal healing of mucosa and skin, with no incidence of infection, wound dehiscence, nerve damage, or hypertrophic scarring. **Conclusion:** Submental intubation is a simple, safe, and effective technique for airway management in patients with panfacial trauma. It enables optimal surgical access, facilitates MMF, and avoids complications associated with tracheostomy or conventional endotracheal routes. This approach should be considered a reliable alternative in selected maxillofacial trauma cases.

**KEYWORDS :** Submental intubation, Panfacial fractures, Airway management, Maxillofacial trauma, Maxillo-mandibular fixation, Endotracheal tube.

**INTRODUCTION**

Pan-facial fractures involve more than two facial bones- midface and the **mandible**.<sup>[1]</sup> These injuries are associated with deformity of face, edema & injury to oral as well as nasal passages causing airway obstruction, restricted mouth opening etc. Early open reduction and rigid internal fixation is the standard treatment of choice for pan-facial fractures. This is done after achieving normal dental occlusion & application of intra-operative maxillo- mandibular fixation.<sup>[2,3]</sup> An important consideration at the time of surgery is the maintenance of airway. Mode of intubation, maintaining of un-interrupted anesthesia without interfering surgery is also a big challenge for the anesthesiologist. Essentially the surgeons and anesthesiologists are competing for the same space. Therefore, for this type of injuries, the mode of intubation is controversial. The surgeon will be happy if the ETT out of oral or nasal track & many anesthesiologists arguing against Naso-tracheal intubation / Oro- tracheal intubation.<sup>[6-8]</sup> Conventional Oro-tracheal intubation is inappropriate as it interferes with the surgical access & to attain the normal occlusion & application of maxillo-mandibular fixation. Naso-tracheal intubation is not recommended in patients with pan-facial fractures associated with cervical spine injury, fracture skull base with or without CSF rhinorrhea, patients with coagulation disorders, comminuted mid facial injury & may be impossible. In fracture of nasal bones, cribriform plate, the presence of Naso-tracheal tube can interfere with surgical reduction of fractures of the Naso-orbital ethmoid (NOE) complex & requires intra-operative switching over of the endotracheal tube (ETT) from nasal to oral route may compromise the surgical field sterility and may increase the possibility of pulmonary aspiration. Fiberoptic- guided Naso-tracheal intubation is also controversial as even a small bleed in presence of altered anatomy may lead to complete loss of vision through a fibroscope and may lead to an emergent situation. Hence there is a need for modification of standard anesthesia intubation technique for maintenance of anesthesia at the same time facilitating intraoperative MMF application when oral & Naso-endotracheal intubations are contraindicated.

The options available are 1) cricothyroidotomy, 2) retro-molar intubation, 3) tracheostomy and 4) sub-mento tracheal intubation.<sup>[4]</sup>

Retro molar intubation may be an option, but may not be adequate in all

adults.<sup>[12]</sup> Elective short-term tracheostomy is the conventional and time-tested method for airway access in these patients but associated with complications like hemorrhage, surgical emphysema, pneumothorax, pneumomediastinum and recurrent laryngeal nerve palsy.<sup>[7,9,10,11]</sup> Submental intubation requires minimal postoperative care & is associated with lesser postoperative complications, hence it is recommended procedure of intubation in managing pan-facial fracture cases.

**MATERIALS & METHODS:**

**Study Type:** Prospective Clinical Study

**Study Place:** Osmania General Hospital

**Study Period:** from 2023-2025.

**Inclusion Criteria:**

- Patients who had extensive midfacial fractures (Le Fort II/Le Fort III) & mandibular fractures with major occlusion disturbance.
- Patients with Naso-orbital ethmoid along with midface fractures with CSF rhinorrhea
- Associated anatomical obstruction, distortion of oral, nasal passages.

**Exclusion Criteria:**

- Multi-trauma patients presenting with severe neurological damage,
- major thoracic trauma; and
- patients who need repeated operations.

**Technique:**

Preoperative submental intubation in craniofacial injuries was first proposed by a Spanish faciomaxillary surgeon, Francisco Hernandez Altamir in 1986.<sup>[6]</sup> The conventional sub-mental intubation technique essentially involves

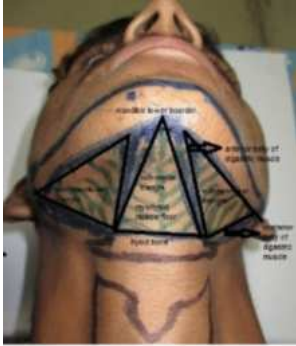
1) Creation of an Oro-cutaneous tunnel

2) diverting the proximal end of the armored ETT through anterior floor of the mouth behind mandible into submental region.

**Anatomical Relevance In Creation Of Oro- Cutaneous Tunnel For**

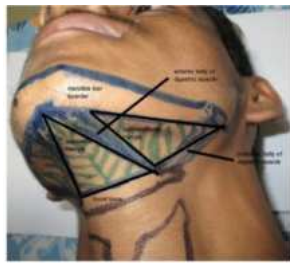
**Sub-mental Intubation:**

The sub-mental area is triangle shaped, situated just below the chin, is demarcated by the anterior bellies of digastric muscles of both sides, chin at the apex, body of the hyoid bone at the base with the mylohyoid muscles form the floor [fig:1,2] Usually superficial to mylohyoid, it contains a few anatomical structures like lymph nodes and thin vessels.



**Fig 1:** Surface Markings Of Submental And Submandibular Triangles With Boundaries

The submandibular region, just below the body and the ramus of the mandible, is bounded antero-inferiorly by the anterior belly of digastric, postero-inferiorly by the posterior belly of digastric muscles, and superiorly the inferior border of the mandible including the imaginary line projected to the mastoid process, being floored by mylohyoid and hyoglossus. Superficial to mylohyoid and hyoglossus there lie the submandibular gland, hypoglossal nerve, and a few arteries. [fig:1,2]



**Fig 2:** Side view showing submental and submandibular triangle with boundaries

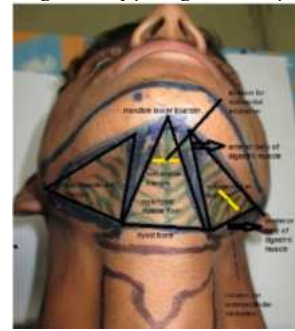
Both the routes (anterior-submandibular and posterior-submandibular, depending on the incision chosen) approach the floor of the mouth. In submandibular triangle lingual nerve, and the hypoglossal nerve course upwards and forwards to supply the tongue. In the posterior part of the sub-mandibular area the lingual and hypoglossal nerves are wide apart but also the submandibular gland exists instead of its duct. In the anterior part, those two nerves get closely approximated in convergence manner with sharing some fibers of hypoglossal and lingual nerve. [Fig 3]



**Fig 3:** Showing Important Structures In Submandibular Gland

In the anterior submandibular approach, there is immense chance of facing the two main nerves of tongue and the submandibular duct along with the sublingual gland may get damaged unintentionally. If we approach at a posterior plane at the level of third molar (posterior submandibular approach), there is less chance of such damage. Only possible hindrance could be by the submandibular gland itself, which can be easily retracted without any anatomical or functional damage. The Oro-tracheal intubation with appropriate-sized armored ETT is done in conventional way. After local infiltration of skin and soft tissue of the proposed site with 2% lignocaine with adrenaline, a skin incision is made in the right sub-mental region parallel to the inferior border of the corresponding mandible. Approximately 1.5 cm

incision is good enough for easy passage of ETT up to 7.5 mm size [fig:4]



**Fig 4:** Incisions For Submental And Submandibular Intubation

Right-sided incision is always advantageous as it permits better visualization of the intraoral part of the ETT by left-handed laryngoscopy. However, selection of the side is usually done so as to avoid the site of injury and mandibular fracture. Blunt dissection is carried out with a medium-sized curved artery forceps or Kelly clamp along the lingual surface of the mandible through subcutaneous tissue, platysma, investing layer of deep cervical fascia, mylohyoid muscle in between the two heads of digastrics muscles to sublingual mucosa. A para-median oral incision is made over the tented mucosa created by the tip of the artery forceps. Tongue is retracted on the other side for better visualization. The tunnel created is widened by separating two blades of the artery forceps. Use of two artery forceps facilitates exposure better than a single one. The tip of the pilot balloon cuff is pulled out through the sub-mental incision. Then the tip of the artery forceps is again introduced through the incision to take out the distal end of the ETT in similar fashion and the ETT is placed in the sulcus between the tongue and the mandible in the floor of the mouth. While pulling, the intraoral part of the Flexo-metallic ETT is kept steady with a Magill's forceps or the index finger of an assistant. The position of the tube is confirmed by direct laryngoscopy, chest auscultation, and capnography. The skin exit point of the ETT is marked with permanent ink. The ETT is secured to the skin using stay suture with 2-0 heavy silk. Transparent adhesive dressing is applied over the skin to avoid displacement while manipulating the mandible as well as to visualize the ink-mark. [fig:5,6,7]



**Fig 5:** Submental Intubation



**Fig 6:** Intraop photo of pan facial fracture, surgical field free from ETT



**Fig 7:** Panfacial fracture; surgical field free from ETT in submental intubation

Tracheal extubation is done in the operation theatre or in the postoperative recovery room through the sub-mental route, when the standard criteria of extubation are fulfilled and patient is awake and maintaining airway reflexes. In situation when there is need for long-term airway maintenance or ventilatory support, the sub-mento tracheal intubation is converted back to Oro-tracheal intubation by pulling the proximal end of the ETT and pilot balloon through the incision. After local infiltration of the wound with 2% lignocaine and adrenaline, the platysma is closed with an absorbable suture and skin closed with monofilament suture. The skin suture applied should be not too tight to allow drainage of tissue fluid. The mucosal wound is sutured. During the postoperative period, good hydration status is maintained which is of paramount importance regarding wound healing. Skin stitches are removed after 5-7 days. As some of the complications of the sub-mental intubation may appear late, the patients are followed up till discharge. The patients were followed up on regular basis at 1 week, 1 month and 6 months. Assessment was based on postoperative morbidity in terms of function and aesthetics.

#### Advantages Of The Sub-mento-tracheal Intubation Are

- 1) allows intra-operative application of MMF in normal dental occlusion as ETT out of oral and nasal orifices
- 2) good intra-operative airway control,
- 3) kinking & obstruction of airway is negligible as only armoured tubes are used.
- 4) tubes are held firmly by sub-mental tissues & anchored & well sutured. So negligible risk of dislodgement of endo-tracheal tubes
- 4) This technique has better surgeons' acceptability.
- 5) It is an acceptable alternative to tracheostomy for the good per-operative airway access.

#### The Contraindications Of Sub-mental Intubation Are:

Patients' refusal, bleeding diathesis, laryngo-tracheal disruption, infection at the proposed site, gunshot injuries in the maxillofacial region, when long-term airway maintenance is needed.

#### RESULTS:

We have selected 10 cases of Pan-facial fractures for study with distorted airway where oral & nasal intubations are not feasible. For all 10 cases anesthesia was given through sub mental intubation.

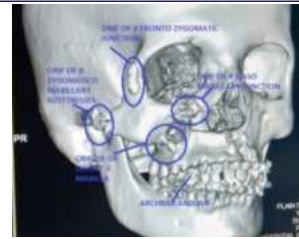
Out of 10 patients 4 patients had Major fracture of Maxilla, mandible, nasal bone. 4 patients had Major double fracture mandible along with nasal bone injury, 2 patients had fracture of maxilla, mandible, zygoma, orbits, nasal bones. All patients showed major occlusion disturbance, nasal & oral mucosal injury, facial edema, obstruction of nasal passage. All patients analyzed by 3D CT – facial bones as shown in [fig 8,9] & treatment is planned followed with post op 3D-CT or X-rays as shown in. [fig 10,11] Intra operatively we monitored for any complications like dislodgement/displacement of ETT, interruption of airway, comfort of surgeon & anesthetist.



**Fig 8:** 3 D CT Facial bones showing pan facial fracture with displacement



**Fig 9:** Post ORIF 3D CT Facial bones



**Fig 10:** Post ORIF 3D-CT Pan-facial Fracture



**Fig 11:** X-ray film showing post op ORIF

There was no difficulty in passing the tube through the floor of mouth, and the total duration of sub- mental intubation procedure ranged from 15 to 20 min. There was no significant oxygen desaturation in any subject during the procedure. No complications while doing the surgery like fluctuation of saturations, interruption of airway, aspiration, dislodgement of ETT, interference for surgical procedure.

The intubation method itself did not lead to any intraoperative complications. In all the patients, sub- mental intubation allowed simultaneous treatment of all the fractures without changing the method of intubation and without any interference from the tube during the operation. [fig 6,7] None of the subjects in the present study required postoperative ventilation. All 10 patients were extubated in the operating room itself. The decision to extubate in the operation theatre was based on the clinical condition of the patient at the time of the surgical procedure, as well as intra-operative events.

Patients were evaluated in the postoperative period at 1 week, 1 month and 6 months. Post operative follow up was smooth. No motor or sensory salivation deficit was found. Normal healing in the mucosa of the floor of the mouth was observed. No bleeding or infection in the area was noted. The scar has been well accepted by the subjects without any hypertrophy or keloid formation. None of the patients developed any post operative complications like wound infection, wound dehiscence, Oro-cutaneous fistula, keloid etc.

#### DISCUSSION:

The most important concept around which the entire oral & fascio-maxillary surgery revolves is the concept of achieving normal intra-operative dental occlusion. Oral endo-tracheal intubation does not facilitate accurate occlusion & prevent intra operative MMF application. Naso-tracheal intubation is not possible in pan- facial fractures with distorted nasal airway. Sub-mental endo-tracheal intubation is only solace in situations where nasal & oral intubations are not feasible or contraindicated in treating pan-facial fractures. In our present series, sub-mental intubation was possible in all the patients without any major complications. We got satisfactory achievement of occlusion, establishment of maxillo-mandibular fixation and complete assessment of facial symmetry, as well as easy access to endo-tracheal tube for the anesthesiologist. Moreover extubation was found to be simple and the cosmetic results were acceptable, with no long-term morbidity. [13,14,15,16] In our series, no episodes of compromised airway or arterial desaturation occurred during the procedure. Other possible potential complications such as oro-cutaneous fistula, trauma to the submandibular and sublingual glands or canals, damage to the lingual nerve, and hypertrophic scar were also not observed. [13,14,15] The present study reports good results with the use of sub-mental endo-tracheal intubation for surgical treatment of 10 patients with pan-facial fractures. In all cases, the

planned surgery was completed without interference from the artificial airway.

## CONCLUSIONS:

Our series confirms that sub-mental intubation is a useful alternative technique of airway management & provide tube free field for surgeon to do the procedure in patients with pan-facial fractures. It demands a certain surgical skill without specialized equipments; however, it is safe and quick to execute. It allows intra-operative correction of occlusion and enables surgery for associated nasal fracture in the event of concomitant skull base trauma, and avoids the dangers of classical endo-tracheal intubation. Sub-mental route of endo-tracheal intubation is a simple, safe and useful technique in managing complex maxillofacial trauma with obstructed nasal airway.

## REFERENCES

1. Adamo Arthur K. Intraoperative airway management with Pan facial Fractures, Alternative Approach. *J Craniomaxillofac Surg* 1996;2:30–35.
2. Markowitz BL, Manson PN. Pan facial Fractures: Organization of treatment. *Clin Plast Surg* 1989;16:105–14.
3. Shumrick KA, Kersten RC, Kulwin DR, Sinha PK, Smith TL. Extended access internal approaches for the management of facial trauma. *Arch Otolaryngology Head Neck Surg* 1992;118:1105–12.
4. Phero JC, Weaver JM, Peskin RM. Anesthesia for maxillofacial/mandibular trauma. In: Benumof JL, editor. *Anesthesiology clinics of North America. Anesthesia of otolaryngologic and head and neck surgery* Philadelphia: Saunders 1993. 509–23.
5. Hernández Altemir F. The submental route for endotracheal intubation: A new technique. *J Maxillofac Surg* 1986;14:64–65.
6. Schultz RC. Nasotracheal intubation in the presence of facial fractures. *Plast Reconstr Surg* 1990;86:1046.
7. Fonseca R, Walker R. *Oral and maxillofacial trauma*. 2nd ed. Philadelphia: WB Saunders; 1997: 105–35.
8. Hall DB. Nasotracheal intubation with facial fractures. *JAMA* 1989;261:1198.
9. Gluckman JL, Mangal AK. Laryngeal trauma. In: Paparella MM, Shumrick DA, Gluckman JL, Meyerhoff WL, editors. *Otolaryngology, Vol III: Head and neck*. Philadelphia PA: Saunders; 1991. p. 2231.
10. McClelland RM. Complications of tracheostomy. *Br Med J* 1965;2:567–9.
11. Glazur J. Respiration via tracheostomy – Advantages, disadvantages and complications. *Anesth Reanim* 1971;3:451.
12. Martinez- Lage JL, Eslava JM, Cebrecos AI, Marcos O. Retromolar intubation. *J Oral Maxillofac Surg* 1998;56:302–6.
13. Werter JR, Richardson G, McIlwain MR. Nasal tube Switch: Converting from nasal to an oral endotracheal tube without extubation. *J Oral Maxillofac Surg* 1994;52:994–6.
14. Caron G, Paquin R, Lessard MR, Trépanier CA, Landry PE. Submental endotracheal intubation: An alternative to tracheostomy in patients with midfacial and panfacial fractures. *J Trauma* 2000;48:235–40.
15. Gordon NC, Tolstunov L. Submental approach to Oro endotracheal intubation in patients with midfacial fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995;79:269–72.
16. Honig JF, Braun U. Latero submental tracheal intubation. An alternative method to nasal –oral intubation or tracheostomy in single step treatment of pan-facial multiple fractures or osteotomies. *Anesthetist* 1993;42:256–8.
17. MacInnis E, Baig M. A modified submental approach for oral endotracheal intubation. *Int J Oral Maxillofac Surg* 1999;28:344–6.