

## SURGICAL TECHNIQUE

# SUBMENTAL INTUBATION IN COMPLEX CRANIOMAXILLOFACIAL TRAUMA

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The submental route for endotracheal intubation is an alternative to nasal intubation or tracheostomy in the surgical management of patients with complex craniomaxillofacial injuries. The critical indication for submental intubation is the requirement for intraoperative maxillomandibular fixation (MMF) in the presence of injuries that preclude nasal intubation and in a situation where a tracheostomy is not otherwise required. MMF to re-establish dental occlusion is essential for a normal functional result in dentate patients with fractures involving alveolar segments of the jaws. However, MMF precludes orotracheal intubation. Nasotracheal intubation is often used but is contraindicated in the presence of skull base fractures and will interfere with the access to certain fracture types. A tracheostomy has a high potential complication rate and in many patients, an alternative to the oral airway is not required beyond the perioperative period. A submental intubation has been used in 11 selected cases amongst 190 consecutively treated patients with craniomaxillofacial trauma over a 3-year period. These cases have been retrospectively reviewed and there have been no significant complications. The indications and technique used are described. Submental intubation is a simple and useful technique with low morbidity in selected cases of craniomaxillofacial trauma and the author's clinical experience with this technique is described.

**Key words:** cranial trauma, endotracheal intubation, maxillofacial injury.

Abbreviations : MMF, maxillomandibular fixation; NOE, nasoorbitoethmoid.

## INTRODUCTION

Modern surgical management of fractures of the craniomaxillofacial skeleton will usually involve open reduction and accurate rigid fixation using mini- and microplate osteosynthesis. In most cases postoperative maxillomandibular fixation (MMF) is now no longer required. Previously, however, using some of the more historical and less rigid methods of fixation, postoperative MMF for several weeks was routine. For accurate functional reconstruction of facial fractures involving tooth-bearing segments of bone, a period of intraoperative MMF is essential to check for restoration of pretraumatic occlusion. Wear facets must be carefully checked against the corresponding dental elements and the teeth brought into normal intercuspation while in centric relation. This is not possible without bringing the dentition together. Intraoperative MMF generally precludes the use of an orotracheal tube except in circumstances where the posterior molars are missing or segments of the dentition have been traumatically avulsed. In these circumstances, the tube might be able to be passed between the alveolar ridges while the remaining teeth are in occlusion.

## METHOD

Submental intubation is an alternative to nasal intubation and tracheostomy. First described by Altemir in 1986,<sup>1</sup> the technique is rapid and simple with minimal morbidity. Several variations and modifications have been described.<sup>2–5</sup> Following is a description of the author's preferred technique. General anaesthesia is

induced and the patient receives orotracheal intubation in the usual manner. A transverse midline incision is premarked in the submental crease at the same point where a submental lipectomy or platysma plication incision would be placed. An incision in this location heals almost imperceptibly and is preferable to a more lateral location. Local anaesthetic with adrenaline is pre-infiltrated. A 20-mm incision will admit a size 8 tube. A strictly midline approach is used and after dissecting through subcutaneous fat, blunt dissection is performed between the anterior bellies of digastric, geniohyoid and genioglossus muscles. Intraorally a longitudinal incision is made in the midline between the submandibular ducts at the tongue base. A suitably sized flexible armoured tube is passed through the skin incision and then back out through the mouth (Fig. 1). When the anaesthetist is ready, the oral tube can be removed and the submental tube introduced. With a laryngoscope *in situ* giving maximum exposure of the larynx, the oral tube is removed completely from the oral cavity. The flexible armoured tube is then folded back into the oral cavity and intubation performed in the normal manner. This would be difficult with a preformed and relatively inflexible tube such as an oral ray tube. In an early case, an oral ray tube was used, however, the stiff preformed folds encouraged the tube to ride up the posterior oropharynx. There have been no similar problems with the use of flexible armoured tubes. Once the tube length is set, two heavy sutures are placed either side of the skin incision and around the tube. This process takes approximately 7 minutes. The patient is then fully prepped and draped giving full access to the facial bones with no airway tube within the surgical field. When the patient is ready to be extubated, the tube is removed by pulling it out through the incision and a Guedel airway placed while three to four nylon sutures are placed in the skin. There is no requirement for intraoral sutures. If necessary the submental tube could be kept *in situ* for a day or two and removed when no longer required.

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Accepted for publication 11 September 2003.



**Fig. 1.** Patient with a submental endotracheal tube *in situ*. Occlusal registration was required as the patient had a mobile mid-face due to bilateral Le Fort I and Le Fort III fractures and a four-part mandibular fracture. There were coexistent frontal, naso-orbito-ethmoid, and anterior skull base fractures with dural lacerations making nasal intubation inadvisable.

In the original description of submental intubation, the patient was intubated orally in the normal manner and following creation of the submental passage, the tube was passed from interior to exterior while the end of the tube remains in the larynx.<sup>1</sup> The technique used here, in which a second tube is passed from exterior to interior, seems preferable as there is more control and no need to rush during the submental passage. Additionally most makes of endotracheal tube specifically prohibit removal of the universal connector, which is too large to pass through the submental incision. However, if we had a case in which the initial oral intubation was very difficult then it would be preferable to pass the oral tube back out through the submental incision rather than reintroducing a second tube. We have not had such a case yet but with the limited mouth opening associated with some patterns of facial fracture, it is probably only a matter of time.

## RESULTS

The critical indication for submental intubation is the requirement for intraoperative intermaxillary fixation in the presence of injuries that preclude nasal intubation and in a situation where a tracheostomy is not otherwise required. One hundred and ninety consecutive patients with craniomaxillofacial trauma who have been operated on by the author over a 3-year period were retro-

spectively reviewed. Eleven of these patients received submental intubation. All patients had a mobile maxillary segment together with additional injuries that precluded nasal intubation. The occlusal fractures occurred at various levels including five at the Le Fort III level. The injuries that precluded nasal intubation included seven patients with anterior cranial fossa fractures and five patients had a fractured naso-orbito-ethmoid (NOE) complex in conjunction with severely displaced nasal bones and full thickness nasal lacerations. All patients required a period of intraoperative MMF and all were extubated at the end of the procedure. No patient required a tracheostomy. The patients' ages ranged from 17 to 46 and eight were men. Patients were seen postoperatively at 2 weeks and then at various intervals up to 1 year depending on the nature of their injuries. A chart review was also performed. No significant perioperative or long-term complications have been noted. In particular there has been no postoperative haemorrhage, no infections, no salivary gland or duct injury and overall excellent scars.

## DISCUSSION

Alternatives to orotracheal intubation have traditionally been either nasal intubation or tracheostomy. Anterior and middle cranial fossa skull base fractures not infrequently coexist in the population with craniomaxillofacial fractures and are generally a contraindication to the use of a nasal tube because of the small but significant risk of intracranial penetration. This usually occurs in the region of the thin cribriform plate but more posterior areas are also vulnerable. A nasal tube could also cause further mucosal trauma and promote epistaxis. The presence of a nasal tube interferes with access to the surgical site particularly when trying to repair fractures of the nasoethmoid complex, intranasal mucosal lacerations and procedures using a coronal flap when the nasal skeleton must be fully exposed.

When a nasotracheal intubation is unsuitable in managing severe facial injuries, a tracheostomy has long been the airway of choice. This is still particularly the case when postoperative MMF is required in a patient with a head injury and in patients who require intubation for an extended period. However, a tracheostomy is no longer required in many patients once the MMF is removed intraoperatively and might not be the best option when simpler techniques are available that have a lower morbidity and complication rate. Patients who receive a tracheostomy are left with a scar in an often obvious location, which can be depressed, hypertrophic or suboptimal in other regards. The potential complications associated with a tracheostomy include loss of airway, haemorrhage, surgical emphysema, pneumomediastinum, pneumothorax and recurrent laryngeal nerve damage. Later complications include tracheal stenosis, stomal and respiratory infections, and tracheoesophageal fistula. Although these complications are usually rare, they are completely eliminated with the use of submental intubation. Loss of airway and haemorrhage are still potential risks with submental intubation as they are with tracheostomy and although the risk of haemorrhage causing loss of airway should be much less because of the relative differences in venous anatomy and any blood pooling in the oral cavity rather than directly into the trachea.

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. An example would be subcranial Le Fort III midfacial advancement, which is managed

with changes between a nasal and oral tube in some craniofacial units. If a nasal tube alone is used, care must be taken not to sever the tube during the nasal septal osteotomy or inadvertently extubate the patient during the midfacial downfracture and disimpaction.<sup>6</sup>

There are several descriptions of more lateral placement of the submental incision.<sup>3,4</sup> Again the midline approach seems preferable as there is less risk of damage to the submandibular ducts, sublingual glands and lingual nerves. The scar is in a more favourable position, and the midline is usually relatively avascular. An incision through platysma in line with the oral commissure may give the impression of a marginal mandibular nerve palsy due to platysmas contribution to lower lip depressor activity.

With modern craniomaxillofacial fixation techniques, MMF is rarely required in the postoperative period. Temporary interdental elastics are often used, however, these are easily removed if the patient is in danger of vomiting. Alternatively the elastics can be placed in the patient on the ward the following day. Submental intubation is a simple technique with specific indications and avoids the difficulties and morbidity of nasotracheal intubation

and tracheostomy. It is a useful technique in the intraoperative management of patients with complex craniomaxillofacial trauma.

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