

# Thirty years of submental intubation: a review

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**Abstract.** Submental intubation has been used as an alternative to conventional intubation in the field of oral and maxillofacial surgery since its introduction by Francisco Hernández Altemir in 1986. A review of submental intubation was performed using data from all case reports, case-series, and prospective and retrospective studies published between 1986 and 2016. The indications, variations in incision length, incision sites, types of endotracheal tube used, methods of exteriorization, and complications were recorded and analyzed. A total of 70 articles reporting 1021 patients were included. The main indication was maxillofacial trauma (86.9%,  $n = 887$ ), followed by orthognathic surgery (5.8%,  $n = 59$ ), skull base surgery (2.8%,  $n = 29$ ), and rhinoplasty and rhytidectomy (1.5%,  $n = 15$ ). The complication rate was relatively low: 91.0% of patients ( $n = 929$ ) were complication-free. The most common complication was infection, occurring in 3.5% ( $n = 36$ ) of the total number of patients, followed by scarring (1.2%,  $n = 12$ ) and formation of an orocutaneous or salivary fistula (1.1%,  $n = 11$ ). In summary, submental intubation is a good alternative airway with minimal complications.

Key words: submental route; intubation; maxillofacial surgery.

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In maxillofacial surgery, nasotracheal intubation has always been the preferred route of intubation. This remained the case following the introduction of submental intubation by Francisco Hernández Altemir in 1986, which was developed with the intention of avoiding tracheostomies in selected oral and maxillofacial cases<sup>1</sup>. The procedure originally described involved initial oral intubation with a flexometallic endotracheal tube, followed by exteriorization of the endotracheal tube through a soft tissue tunnel created via a sub-periosteal dissection through a 2-cm paramedian incision made on the skin in

the submental region and mucosa on the lingual aspect of the mandible. The flexometallic endotracheal tube was exteriorized with a haemostat starting with the deflated pilot balloon followed by the tube itself. At the end of the surgery, the tube was then reversed to its initial oral position. The skin incision was closed with sutures, but not the intraoral wound.

The aim of this literature review is to provide an insight into the indications, variations in incision length, incision sites, types of tube used, methods of exteriorization, and complications of submental intubation.

## Materials and methods

A search of the PubMed and Google Scholar databases was undertaken to identify all case reports, case-series, and prospective and retrospective studies on submental intubation. Only articles published in the English language with the full text available were included. The indications, variations in incision length, incision sites, types of endotracheal tube used, exteriorization methods, and complications were recorded and analyzed. This review included articles published over a 30-year period (1986–2016).

## Results

A total of 70 articles were identified and included in this review: 21 case reports, 16 case-series, 11 prospective studies, 21 retrospective studies, and one technical note; a complete list of the 70 articles is provided in the **Supplementary Material**. A total of 1021 patients were reported in these 70 articles.

## Indications

In the majority of cases, the submental intubation was used in maxillofacial trauma (86.9%,  $n = 887$ ). This was followed by orthognathic surgery (5.8%,  $n = 59$ ), skull base surgery (2.8%,  $n = 29$ ), and rhinoplasty and rhytidectomy (1.5%,  $n = 15$ ). Other rare indications for submental intubation included oronasal fistula, nasopalatine cyst, salivary gland tumour, alveolar bone grafting, premaxilla osteotomy, upper lip haemangioma, odontogenic fibromyxoma, ranula, ossifying fibroma, intranasal pathology, nasopharyngeal angiofibroma, antral cyst, massive obstructive maxillofacial tumour, and a patient history of nasal bleeding or cerebrospinal fluid leakage (Table 1).

## Incision length and site

The preferred length of the skin incision for submental intubation was 2 cm, which was the length suggested by Altemir when he introduced the technique. This incision length was used in 612 of the patients (59.9%). A skin incision of 1.5 cm in length was used in 325 of the patients (31.8%). A few groups of authors tried a 1-cm skin incision (7.8% of the patients).

Table 1. Indications for submental intubation.

Indications	Number of cases
Maxillofacial fractures	887
Orthognathic surgery	59
Base of skull surgery	29
Rhinoplasty/rhytidectomy	15
Intranasal pathology	6
Massive obstructive maxillofacial tumour	6
History of cerebrospinal fluid leak	4
History of nasal bleeding	3
Oronasal fistula	1
Cancrum oris	1
Nasopalatine cyst	1
Salivary gland tumour	1
Alveolar bone grafting	1
Premaxilla osteotomy	1
Upper lip haemangioma	1
Odontogenic fibromyxoma	1
Ranula	1
Ossifying fibroma	1
Nasopharyngeal angiofibroma	1
Antral cyst	1

One article reported the use of submental intubation on four patients using a percutaneous dilatational tracheostomy kit. The majority of the articles reported a preference for the paramedian incision (61.2% of the patients) over the median skin incision (38.4% of patients).

## Type of endotracheal tube used

Flexometallic tubes were the tube of choice for submental intubation. Such tubes were used in 873 patients (85.5%). A two-tube technique was used in 11.9% of the patients. Preformed cuff tubes were used in nine patients. The type of tube used was not mentioned in 16 cases. Laryngeal mask airways (LMA) were used in 2 cases.

## Methods of exteriorization

The use of a single haemostat was most popular among the authors; this was used in 84.0% of the patients. Double haemostats were used in only 10 patients. The use of a nasal speculum as suggested by Altemir was performed in only 2.4% of the patients. Exteriorization was accomplished using dilators in five cases, and in one case a pharyngeal loop was used. In the 121 cases undergoing the two-tube technique, exteriorization was not required. The exteriorization technique was not mentioned in one of the reported cases.

## Complications

Of the 1021 cases of submental intubation, 92 presented complications either intraoperatively or postoperatively. The main complication was infection, which occurred in 36 (39.1%) of the cases with

complications. This was followed by scarring ( $n = 12$ , 13.0%) and the formation of an orocutaneous or salivary fistula ( $n = 11$ , 12.0%). Other rare intraoperative complications included tube dislodgement, tube being pushed into the bronchus, damaged pilot balloon, and tube kinked or obstructed. Other rare postoperative complications included pain, sublingual haematoma, bleeding, sialocele, and mucocele (Table 2).

## Discussion

Maxillofacial fractures were the most common indication for submental intubation. Besides concurrent base of skull fractures in some cases, which render nasal intubation unsafe, the involvement of nasal complex fractures also represents a possible contraindication to performing nasal intubation for the anaesthetist<sup>2</sup>. In most cases of maxillofacial fracture, achieving a good occlusion is important prior to fixation of the fractured bones<sup>2</sup>. In cases that do not require prolonged postoperative ventilation, submental intubation is a good alternative to tracheostomy. The tracheostomy itself is more surgically demanding and it can be complicated by a cosmetically unacceptable scar, pneumothorax, pneumonia, surgical emphysema, tracheal stenosis, and tracheomalacia<sup>3</sup>. Although submental intubation is not contraindicated in cases with a cervical injury as a result of trauma, this increases the difficulty of the technique.

The use of submental intubation in orthognathic surgery was restricted to patients with certain medical conditions and cases in which a concurrent rhinoplasty was performed during the same surgery. In the latter cases, submental intubation was performed to avoid the need to change from nasal intubation to oral intubation<sup>3</sup>.

Table 2. Complications of submental intubation.

Complications	Number of cases
No complications	929
Infection	36
Scarring	12
Salivary fistula	11
Pain	8
Dislodged tube	6
Pilot balloon damage	5
Tube pushed into bronchus	4
Tube kinked	4
Sublingual haematoma	2
Mucocele	1
Tube obstruction	1
Sialocele	1
Bleeding	1

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