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SUBMENTAL INTUBATION AN ALTERNATIVE TO TRACHEOSTOMY-A REVIEW

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SUBMENTAL INTUBATION AN ALTERNATIVE TO TRACHEOSTOMY-A REVIEW

Abstract
Submental intubation, alternative to tracheostomy and is comparatively less invasive, in cases where oral intubation could not be established as it required to establish dental relationships perioperatively this method of intubation was preferred, and it was first reported for acute airway management of maxillofacial trauma patients, where naso-endotracheal intubation was contraindicated. Submental intubation is used most commonly in trauma patients, it also includes many orthognathic and skull base surgical procedures. Submental intubation is a safe and effective technique method in securing airway, for many maxillofacial procedures.

1. Introduction

Submental intubation was first described in 1986 [1] for acute airway management of maxillofacial trauma patients, in whom naso-endotracheal intubation was contraindicated and oral intubation was not ideal due to the desire to establish dental relationships perioperatively. The technique was a nice alternative to tracheostomy.

2. Technique

Hernández Altemir's original paper described a technique for submental intubation that begins with the standard oral intubation, followed by a 2 cm submental skin incision parallel to the mandible in a paramedian location approximately one finger breadth from the mandibular border [1]. Next, a 2 cm oral incision in the lateral sulcus is made. The last step is the creation of a paramandibular, subperiosteal, sublingual pathway through the floor of the mouth to open into the oral cavity. The geniohyoid and genioglossus muscles are not crossed, and insertion of the anterior belly of the digastric muscle is spared. The deflated pneumatic cuff is then brought inferiorly through the created opening, followed by the endotracheal tube (ETT). After reversing the previous two steps at the conclusion of the operation, loose approximation of tissue with sutures is performed to allow for moderate drainage. Technical modifications of the submental intubation technique include using ventilatory tubes other than ETTs so as to provide additional options that may be implemented for specific circumstances and specific patient populations [2,3]. The first modification

described the use of a reinforced tube of a Laryngeal Mask Airway (LMA; The Laryngeal Mask Company, Henley-on-Thames, UK). In a set of three patients, use of a LMA was beneficial in avoiding the risk of damaging laryngotracheal structures, preventing any harm to the vocal cords of a voice professional, and ensuring no further harm in a patient with unstable cervical fractures and orofacial trauma. Ball et al [4] also reported the benefits of using the flexible tracheal tube supplied with the intubating LMA (ILMA; The Laryngeal Mask Company). The benefits include the easily removable universal connector and the specific shape and design of the tube tip, which aids in placement. The other modifications involve the use of a Combitube SA (Tyco- Healthcare-Kendall-Sheridan, Mansfield,MA, USA) in severe oral and maxillofacial trauma. The Combitube SA is a double lumen tube with one blind end, which functions as an esophageal obturator airway, while the other lumen serves as a standard cuffed ETT. The combined effect is the successful sealing of the oral and nasal pharyngeal cavities, specifically useful in pharyngeal bleeding. The added benefit of the proximal balloon may serve to support maxillomandibular structures, acting as a reducer and buttress for displaced bone fragments when inflated. The original technique of exteriorizing an oral tube through a surgically created tunnel requires the use of a tube fitted with a universal connector that may be removed prior to bringing the tube into the submental area. Recognizing that this tube may not always be available, two modifications using a two-tube technique were published [5,6]. After a standard oral ETT is placed, the submental incision is made and dissection of the soft tissue is created, as in the standard technique. Once the tunnel is complete, artery forceps are introduced from an intraoral position into the submental space. A second ETT is then brought back through the tunnel into the mouth. The original tube is withdrawn and the second tube is used to reintubate the patient. The authors believe that this technique avoids the risk of airway compromise if there are problems in reconnecting theuniversal connector or passing the tube from the oral to the submental position. The technique also allows for a widened operative field and ability to ascertain dental relationships perioperatively when an ETT with a removable universal connector is not available.A few technical modifications have sought to minimize the trauma produced when making the submental incision and tunnel into the oral cavity. Bartkowski et al [7] described an intraoral incision performed laterally from the frenulum of the tongue, and Nwoku et al [8] described a 2 cm intraoral incision made parallel to the gingival margin.

After unsatisfactoryresults with the lateral sulcus technique of Hernandez and minor modifications of others, MacInnis et al [9] implemented a midline intraoral incision. Desiring to avoid important anatomical structures and to take advantage of the dearth of vascularity in the midline, they reported that a midline approach would minimize bleeding and damage to structures such as the sublingual gland, Wharton's ducts, and lingual nerve. Their intraoral incision is a 2 cm midline incision that bisects the sagittal plane of the face and is made posterior to the openings of Wharton's ducts. Noting a risk of sublingual hematoma and edema formation, Mahood et al [10] used a 1 cm midline intraoral incision placed slightly more anteriorly. The incision is placed halfway between the reflection of mucosa from the mandible and the submandibular duct papillae. A final group of technical modifications sought to minimize damage to the ETT during the process of exteriorization and return of the tube to the intraoral position.

In 2003, Lim et al [11] noted that the standard method of exteriorization often resulted in trauma to surrounding tissues. Specifically, they noted that blood or soft tissue actually may inadvertently enter the hollow tube. Using the blue cap on the end of a thoracic catheter, a technique was developed that attempted to minimize the traumatic effects of the exteriorization process. After the ETT connector is removed and the pilot tube deflated, both are inserted into the blue cap of a 32-French (Fr) - sized thoracic catheter. With both capped, a careful process of pulling inferiorly with a hemostat through the surgically created tunnel, along with pushing from the intraoral side, minimized the traumatic exteriorization process. Nyarady et al [12] attempted to minimize the trauma of exteriorization using a sterile nylon tube. The nylon tube was first pulled through the submental tunnel with the aid of a hemostat. After disconnecting the ETT fromthe universal connector, the tube was inserted into the nylon tubing and both were brought through the submental tunnel into the extraoral position. This nylon guiding tube made the exteriorization process easier, decreasing trauma to the soft tissues. With the same goal of minimizing tissue damage, Biswas et al [13] used a percutaneous dilational tracheostomy kit in the exteriorization process.

Instead of creating the submental tunnel using blunt dissection, the tunnel wasmade using a series of dilators (21-Fr- 36-Fr). After the tunnel was created, the ETTwas exteriorized over one of the smaller dilators out to the submental area.
Another technique for submental intubation begins with oral intubation using a reinforced tube. The submental area is prepped in a sterile fashion and infiltrated with local anesthetic solution. A transverse incision, approximately 2 cm long, is made slightly posterior to the submental crease. A hemostat is then used to bluntly dissect through and through in a cranial direction into the anterior aspect of the floor of the mouth, anterior to Wharton's ducts. The orotracheal tube is briefly disconnected and brought through the floor of mouth tunnel into the submental area. The inflation tube of the cuff is also pulled through this tunnel ;correct tube positioning is confirmed by the anesthesiologist. The tube is subsequently secured to the submental skin with silk sutures to minimize risk of displacement intraoperatively. Either immediately postoperatively or in a delayed fashion, depending on the need for continued intermaxillary fixation or airway protection, the tube is transferred back to the oral position before complete extubation. Closure of the submental incision is required, while intraoral closure is not necessary. The patient is then extubated in the usual manner. A submental scar revision may be performed if an aesthetic revision is appropriate. Review of the literature showed various procedural modifications and utilization of specific ETTs with or without reinforcement.

The technique of using one ETT placed in the usual fashion and then extracted into the submental area results in fewer complications. In addition, this technique is simpler and expedient. No published modification or specific type of reinforced tubing selected has been universally demonstrated to be superior to any other. Provided there is careful creation of the submental tunnel and appropriate collaboration of the surgical and anesthesia teams, submental intubation is accomplished in an effective, safe, and expedient manner, with few complications.

3. Indications

Maxillofacial trauma is the overwhelming indication for implementation of the submental intubation technique [14–18]. It obviates the dilemma of whether to suffer the limitation of poor exposure and inability to determine dental relationships perioperatively using an orotracheal tube. The technique also eliminates the need for nasal tube placement when possibly contraindicated due to skull base or other maxillofacial fractures, and avoids tracheostomy when it is not required long-term. The submental intubation technique has become popular in many elective facial osteotomies [19], and numerous situations have arisen for its use.

Traditionally, in combined Le Fort III/Le Fort I procedures, intraoperative conversion from an oral tube at the completion of Le Fort III osteotomy to a nasal tube at the start of the Le Fort I osteotomy is necessary to establish occlusal relationships. Submental intubation at the outset of the procedure avoids the need for oral-to-nasal tube conversion, a potentially hazardous proposition for the anesthesiologist (and patient) intraoperatively. In a similar way, our experience has shown that the technique is beneficial in orthognathic surgery with simultaneous rhinoplasty. In this case, a nasal-to-oral tube conversion is required after the maxillofacial osteotomies, prior to undertaking nasal surgery.

The submental technique is also of benefit in those patients undergoing orthognathic surgery, who have a pharyngeal flap or other anatomic anomaly precluding nasal tube placement. Certain base of skull procedures, such as the transmaxillary access with the use of Le Fort I osteotomy, is another indication for the submental technique [20]. This approach allows for improved exposure because the maxilla is retracted a greater distance than if an oral tube were present. Cancrum oris is another possible indication for the technique [21].

4. Contraindications

The submental technique is contraindicated if prolonged intubation is necessary. Any patient with a significant head injury, as in many facial injuries, should not be considered a candidate for the submental technique. In this situation, tracheostomy should be considered the treatment of choice.

5. Advantages

The primary advantage of the submental intubation technique is the ability to avoid a tracheostomy and the resulting morbidity associated with it. The major complications of a tracheostomy include, but are not limited to, infection, hemorrhage, recurrent laryngeal nerve damage, tracheal stenosis, pneumothorax, pneumomediastinum, subcutaneous emphysema, and tracheoesophageal fistula. These complications are avoided with submental intubation. In addition, the more minor risks and complications from submental intubation are less frequently present than those from tracheostomy. The time required to complete submental intubation is less than the time required for tracheostomy, and the resulting scar is more aesthetically acceptable. Minimal postoperative care and ease of reversibility also support the benefits of the submental technique over tracheostomy, when appropriate.

In those surgical cases in which submental intubation may be of benefit, there are three primary advantages that assist in the operative procedure. The ability to ensure dental occlusion throughout the procedure has already been discussed but is of great importance. Maxillofacial trauma often results in damage that alters the dental occlusal relationships. Being able to address this perioperatively is of great benefit. Any oral tube would prevent any analysis of whether preinjury occlusion has been restored. Removal of the ETT from the direct surgical field is also an important benefit. Rather than having to work around and manipulate the tube, the submental intubation technique allows for a larger and unobstructed operative field. Third, the submental approach to intubation allows for increased retraction in skull base procedures. Seeking to gain access to the skull base using a transmaxillary approach, after the osteotomy is completed, the maxilla is retracted inferiorly to open up the field of vision.

6. Potential drawbacks and complications

While only minor complications have been published in the literature, the primary disadvantage of submental intubation is the requisite submental scar. With an appropriate length of incision chosen and meticulous closure, this scar may be minimized with aesthetically acceptable results. Scar revision is always an option for cases in which the submental scar leaves a lasting, unacceptable appearance. Patients with previously documented poor scarring or tendency to form hypertrophic scars or keloids may not be appropriate candidates for the technique.

The most serious reported complication is accidental extubation. Two cases have been reported in the pediatric population [22,23]. The most frequent complication has been superficial skin infections. Damage to the ETT is another potential problem that may occur during the process of converting the oral tube position to the submental position. It can also be damaged during maxillofacial procedures, either from a drill bit to place rigid fixation or a reciprocating saw blade during osteotomies, especially those of the chin. Other infrequent minor complications reported in the literature include orocutaneous fistula formation, tube dislodgement or obstruction, transient lingual nerve paresthesia, venous bleeding, and mucocele formation. The added time required to prepare the patient for surgery is more than compensated for by increased surgical exposure, assurance of proper occlusion alignment, and the lack of postoperative morbidity and difficulties in caring for a tracheostomy.

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