

Submental Intubation with Reinforced Tube for Intubating Laryngeal Mask Airway

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Submental endotracheal intubation is a simple and secure alternative to either nasoendotracheal intubation or a tracheostomy in the airway management of maxillofacial trauma. However, a submental endotracheal intubation is quite difficult to manage if adverse events such as a tube obstruction, accidental extubation, or a leaking cuff with the endotracheal tube in the submental route occur, which could endanger the patient. This paper describes the use of a LMA-FastrachTMETT in the submental endotracheal intubation of patients suffering from maxillofacial trauma. One of the patients was a 16-year-old male, and the other was a 19-year-old male. They were scheduled for an open reduction and internal fixation of the maxillofacial fracture including naso-orbital-ethmoidal (NOE) complex, and a zygomaticomaxillary complex fracture. A submental intubation with a LMA-FastrachTMETT was performed in both cases, and the operation proceeded without any difficulties. These cases show that the use of the LMA-FastrachTMETT can improve the safety and efficacy of submental endotracheal intubation. This is because the LMA-FastrachTMETT has a freely detachable connector, and is flexible enough to keep the patency despite the acute angle of airway.

Key Words: LMA-FastrachTMETT, maxillofacial trauma, submental intubation

INTRODUCTION

In patients suffering from maxillofacial trauma,

it is important to keep the airway secure and not to interfere with the surgical intraoral manipulation and internal fixation. Submental endotracheal intubation, which was first described by Altermir in 1986, is pertinent to the airway management of patients suffering from maxillofacial trauma.¹ This method requires use of a tracheal tube, which is flexible, kink resistant and whose connector can be quickly and easily removed and reattached. This is necessary during passage of the tube through the floor of the patient's mouth. However, standard armoured tubes are not suitable for use with submental tracheal intubation, as their connectors are not designed to be removed.² Drolet reported a case where the connector was loosely fitted after being unglued and the pneumatic cuff was damaged.³ If such adverse events occur, it will

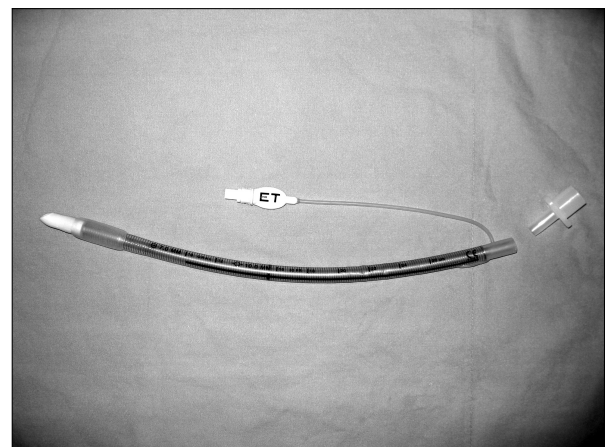


Fig. 1. Reinforced tube (LMA-FastrachTMETT) for intubating laryngeal mask airway and tube connector (detached).

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be much more difficult to manage these events. The wire-reinforced tube (LMA-Fastrach™ETT, LMA company, Henley on Thames, UK) designed for use with intubating laryngeal mask airway is flexible, kink resistant and also has the distinct advantage that its connector is purposely designed for easy removal and refitting (Fig. 1).⁴ It was suggested that the LMA-Fastrach™ETT is ideal for submental tracheal intubation. This paper describes the use of a LMA-Fastrach™ETT in the submental endotracheal intubation of patients suffering from maxillofacial trauma.

CASE REPORT

Patient 1

A 16-year-old male was scheduled for an open reduction and internal fixation of the panfacial fracture, consisting of a naso-orbital-ethmoidal (NOE) complex, a zygomaticomaxillary complex, a midpalatine, and mandible fracture. The tracheal intubation via the nasal route was deemed to be impossible. It was decided to perform submental endotracheal intubation for airway management. The patient's lungs were preoxygenated for 4 min, and anesthesia was induced with fentanyl 100 µg and thiopental sodium 250 mg. Manual ventilation of lungs was possible and 7 mg vecuronium were administered. After standard orotracheal intubation using a 100% silicone wire-reinforced tube (LMA-Fastrach™ETT, LMA company, Henley on Thames, UK) with an internal diameter of 7 mm, draping of the mouth and chin was carried out. Using an aseptic technique, a 2 cm skin incision was made in the submental, paramedian region, directly adjacent to the lower border of the mandible, approximately one third of the way from the symphysis to the angle of the mandible. A closed pair of artery forceps was introduced through the submental incision and into the floor of the mouth by blunt dissection. The forcep was kept close to the inner side of the mandible. Care was taken to avoid the submandibular duct and the lingual nerve, which were medial to the proposed tube entry site. The tissue layers encountered were subcutaneous fat, platysma, investing layer of deep cervical fascia and mylohyoid

muscle until the tip of the artery forceps tented the mucosa of the floor of the mouth. The oral mucosa was then incised allowing easy delivery of the tip of the artery forceps into the oral cavity. The patient was ventilated for 5 min using 3% sevoflurane in 100% oxygen and the tracheal tube briefly disconnected from the breathing circuit. The connector of the LMA-Fastrach™ETT was detached. The pilot balloon (deflated) was first grabbed by the artery forceps and pulled through the passage in the floor of the mouth. Next, the tip of the artery forceps was then quickly reinserted through the submental incision to grasp the proximal end of the tube, which was pulled in a similar way. During the submental intubation procedure, the tube was firmly secured intraorally to prevent accidental extubation. After the tube was positioned, the connector was restored, the cuff re-inflated and the tube reconnected to the breathing circuit. Bilateral auscultation and proper capnography were performed to confirm that the tube was in the correct place. Intraorally, the tube lay on the floor of the mouth in the right sulcus between the tongue and the mandible. There was no difficulty in passing the tube through the floor of mouth and the total duration of the submental intubation procedure was less than 7 min. Disconnection time from the ventilator was approximate 2 min. An immediate access to the oral airway or tracheostomy equipment was prepared for secure airway in case of adverse events such as tube obstruction, accidental extubation, or leaking cuff with the tube in the submental route at all times. The submental intubation was performed without any problems such as deoxygenation and the tube was fixed by suturing onto the submental area (Fig. 2). The operation proceeded without any problems and the patient was transferred to the ICU. On postoperative day (POD) 2, the submental intubation was converted into an orotracheal intubation by the endotracheal tube pulled back intraorally in the reverse order (first the endotracheal tube, then the pilot balloon). Weaning from mechanical ventilation and extubation was done in a classical manner on the following day. The patient was transferred to the general ward POD 6 and discharged 14 days after surgery without any complications.

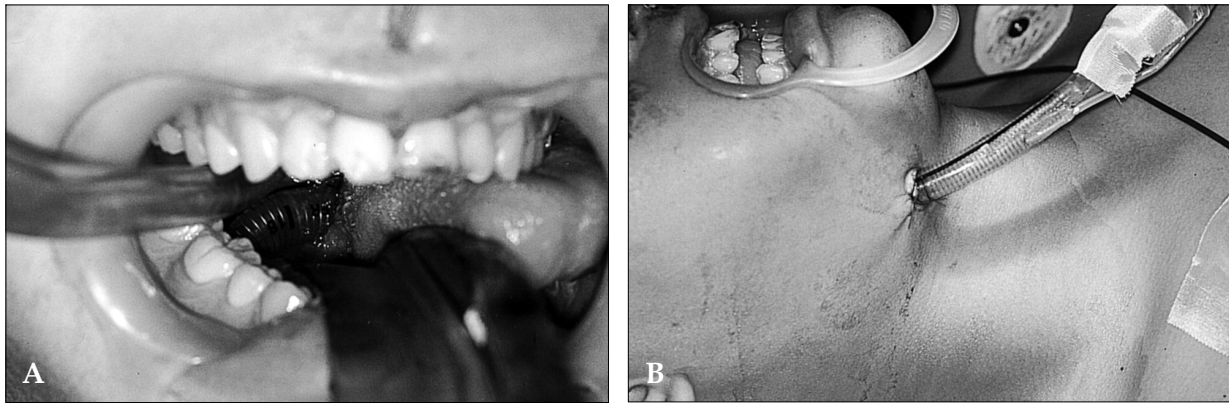


Fig. 2. Intraoperative photograph. (A) Intra-oral view of placing the LMA-Fastrach™ETT. (B) Extra-oral view of LMA-Fastrach™ETT fixed through submental incision.

Patient 2

A 19-yr-old male was scheduled for an open reduction and an internal fixation of a midfacial fracture, consisting of a NOE complex, a zygomaticomaxillary complex, a midpalatine, frontal bone, and a temporal bone fracture, via the bicoronal and transoral approach. It was believed that nasotracheal intubation would have interfered with centralization and stabilization of nasal fractures and orotracheal intubation would have compromised the reduction and maintenance of facial fractures. After inducing anesthesia with 250 mg thiopental sodium and 8 mg vecuronium, an orotracheal intubation was performed using the LMA-Fastrach™ETT with an internal diameter of 7 mm. The orotracheal intubation was converted into submental intubation in the same manner as the previous case. The procedure was completed within a few minutes and was associated with minimal bleeding. The airway was never compromised, ventilation was only interrupted for a few seconds, and no arterial desaturation occurred during the procedure. The operation proceeded without any problems. The patient was admitted to the ICU with submental intubation, which was maintained postoperatively. Extubation was carried out by pulling the tube through the skin and finally tying the sutures on POD 2. The patient remained 4 days in the ICU with no episodes of oxygen desaturation before being transferred to the general ward. His postoperative recovery in the ICU was unremarkable. He was discharged 14

days after operation with the submental incision and the intraoral wound healed uneventfully.

DISCUSSION

Submental endotracheal intubation is an alternative to nasoendotracheal intubation and tracheostomy in the management of patients with severe maxillofacial trauma, because submental intubation is a simple and less complicated procedure, which does not interfere with the surgical field and procedure.^{5,6} A tracheostomy carries its own morbidity and complications such as hemorrhage, surgical emphysema, tracheostomy wound infection, recurrent laryngeal nerve injury, tracheal stenosis and poor scar appearance. The mortality rate has been reported to range from 0.5 to 2.7%.⁷⁻⁹ Therefore, performing an elective tracheostomy only for the perioperative period is not trivial. Nasotracheal intubation does not interfere with the surgical field and procedure but a skull base fracture is a contraindication, because it is possible for the tracheal tube to pass into the cranial vault.^{6,10} Furthermore, nasotracheal intubation needs to be changed into an orotracheal intubation for internal fixation of fractures in the case of a maxillofacial fracture including a NOE complex.⁶

Therefore, the indications for submental intubation are maxillofacial injuries with associated nasal bone fractures or maxillofacial injuries with associated skull base fractures, and the use of

temporary intermaxillary fixation in patients where a nasotracheal intubation is not possible.¹¹

The submental endotracheal intubation is a simple and secure technique that is associated with a low morbidity, although its morbidity has not been sufficiently assessed, and it has been reported in a limited number of patients. However, if adverse events such as a tube obstruction, an accidental extubation, or a leaking cuff with the endotracheal tube in the submental route occur, it will be much more difficult to manage, which can endanger the patient.⁶

It is believed that the appropriate device for a submental intubation must have a freely detachable connector, and be sufficiently flexible or angulated to retain patency despite the acute angle of the airway, particularly at the submental route.¹² In a previously reported case, a reinforced (spiral embedded) endotracheal tube (Mallinckrodt Medical, Inc., St. Louis, Mo) was used, because it was flexible.^{2,6} However, this tube was manufactured with a nondetachable connector. This might not be a problem, if the reintubation is performed using a second reinforced tube after a submental incision, as in the case of a submental intubation that was modified and described by Green and Moore.¹³ If not, it would be difficult to remove the tube connector and the connection would be loosened dangerously after removal and reconnection. Drolet reported a case where a tracheal tube was damaged while being pulled through a submental incision, and the damaged tube was replaced with a new one using a tube exchanger.³

The connector of the tube is detachable because the LMA-Fastrach™ETT is designed so that it can pass through the airway tube of the intubating laryngeal mask airway. Accordingly, it is convenient to detach and reconnect the connector whilst performing the submental intubation. It is sufficiently flexible to retain patency despite the acute angle of the airway and the procedure of head and neck surgery. Although this tube is expensive compared to other endotracheal tubes, it is reusable. In addition, the distal tip of the LMA-Fastrach™ETT is soft and contoured to prevent it from catching on the shelf and allowing a straightforward and non-traumatic passage of the LMA-

Fastrach™ETT.¹⁴

In this respect, the LMA-Fastrach™ETT is an adequate wire-reinforced tube for submental intubation. In conclusion, these features of the LMA-Fastrach™ETT can improve the safety and efficacy of the submental endotracheal intubation.

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