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Modified Submental Orotracheal Intubation Using the Blue Cap on the End of the Thoracic Catheter

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The technique of submental intubation in patients with multiple facial fractures and skull base fracture was originally described by Altemir. This technique provides a secure airway and allows intermaxillary fixation while avoiding the complications of nasotracheal intubation or tracheostomy. However, when the endotracheal pilot balloon and endotracheal tube are pulled through the submental incision site using this technique, soft tissues or blood may enter the endotracheal tube and trauma may result in the surrounding tissues. To overcome these problems, we carried out a modification of submental orotracheal intubation using the blue cap on the end of the thoracic catheter in a patient with mandibular fractures and injury to the skull base and found that this modification resulted in a safer and less traumatic intubation.

Key Words: Intubation, tracheostomy, mandibular fractures, submental route, airway management

INTRODUCTION

Submental orotracheal intubation introduced by Altemir[1] is a technique of maintaining the airway when performing surgery in patients with multiple facial fractures and skull base fracture. Although this technique is not the usual way to maintain the airway, it does not interfere with the operation field, allows intermaxillary fixation during surgery,[2] makes postoperative phonation possible, and does not require posttracheostomy decannulation. This technique is therefore advantageous compared with tracheostomy, and furthermore, is relatively simple to perform and has low morbidity.[2] However, soft tissues or blood may enter the endotracheal tube and injury to the surrounding tissues can result where the tube passes, when the pilot balloon or the proximal end of the endotracheal tube is pulled extraorally from intraorally after endotracheal intubation. Thus, in order to overcome these problems, we devised and applied the method of using the blue cap on the end of the thoracic catheter in the proximal end part of the endotracheal tube when performing submental orotracheal intubation. Thus, we report the satisfactory results obtained and provide a literature review.

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CASE REPORT

A 48-year old female was admitted to the emergency department after a traffic accident. On physical examination, she was suffering painful swelling in the left mandibular angle, intra-oral bleeding and malocclusion. Laceration, epistaxis and tenderness were present in the nose. Swelling and ecchymosis were present in the left eyeball and skull base fracture was suspected. Radiographic examination confirmed mandible fracture and nasal bone fracture.

Five days after admission, reduction for mandible fracture was planned. Restoring the dental occlusion by means of intermaxillary fixation is a prerequisite to the correct anatomical reduction of mandible fracture. However, this fixation pre-

cludes oral endotracheal intubation. Nasal intubation can interfere with centralization and stabilization of nasal fractures and may lead to cranial intubation. In the past, it has been overcome by tracheostomy. The patient could not phonate during tracheostomy and tracheostomy decannulation might have been needed. We decided to perform submental orotracheal intubation because she needed intermaxillary fixation perioperatively and because injury to the skull base was suspected. Reinforced tracheal tubes were manufactured with nondetachable connectors and another tube connector was prepared before oral intubation.

Peripheral oxygen saturation and end-tidal CO_2 were monitored. After the patient was preoxygenated for 5 min using a facial mask, anesthesia was induced with 0.6 mg/kg of rocuronium, 2 mg/kg of propofol and 1.5 mg/kg of lidocaine. Orotracheal intubation was done using a 7.5 mm internal diameter reinforced tracheal tube (Kendall Inc., Mansfield, Ohio, USA). A submental skin incision was made parallel to the lower border of the mandible and 1.5 cm right from the center of the mandible. A curved hemostat was passed through the platysma and mylohyoid muscle, and up to the sublingual space. An intraoral incision was made parallel with the end of the gingiva from where the alveolar mucosa and the mucosa of the floor of the mouth met. A passage for the endotracheal tube was created. The hemostat was passed through the skin incision up to the floor of the mouth. After ventilation was stopped, the endotracheal tube connector was removed and the endotracheal pilot tube was deflated. The proximal end of the endotracheal tube and the pilot tube balloon were inserted into the blue cap of a 32 Fr sized thoracic catheter (Mallinckrodt medical Inc., Athlone, Ireland) (Fig. 1). The endotracheal tube was pushed so that the blue cap of the thoracic catheter would not fall off while the blue cap of the thoracic catheter was grabbed with the hemostat and pulled through the passage to the submental incision site (Fig. 2). Then, the pilot balloon and the proximal end of the endotracheal tube were separated from the blue cap. After the tube connector was attached to the proximal end of the endotracheal tube, the endotracheal tube was connected to the anesthetic

Fig. 1. The trachea was intubated with a reinforced tracheal tube. A curved hemostat was inserted through a skin incision in the right submental area and a passage was created through the mylohyoid muscle by blunt dissection. The tracheal tube was separated from the tube connector. The proximal end of the endotracheal tube and the pilot balloon were covered with the blue cap on the end of the thoracic catheter.

Fig. 2. The blue cap was grabbed with a hemostat which was used to pull the hemostat extraorally while the endotracheal tube was pushed.

circuit. Adequate tracheal position of the tube was confirmed by bilateral auscultation of the lungs. After placing the tube to the right side of the tongue and mandible, it was secured in the mouth by stay suturing with skin using #5 silk thread (Fig. 3).

Open reductions of the mandible and nasal fractures were done using a miniplate and microplate without occupying or interfering with the surgical field. No problems arose with temporary intermaxillary fixation during surgery. The maxillomandibular fixation was released at the end of surgery. The proximal end of the endotracheal

Fig. 3. The oroendotracheal tube was secured with 5-0 silk suture.

Fig. 4. After surgery the reinforced endotracheal tube was pulled back intraorally. The submental skin incision was closed with interrupted nylon sutures.

tube and pilot tube were pulled back intraorally in the reverse order after surgery, and then the submental incision area was closed using interrupted suture (Fig. 4). Extubation was done after the patient regained consciousness and adequate muscle strength in the operation room. The patient was moved to a general ward without significant hemodynamic or respiratory changes through the recovery room.

DISCUSSION

Submental orotracheal intubation was first introduced by Altemir[1] as a method of securing (the airway during surgery in patients with multiple facial fractures. Although the technique has been modified after its first introduction in 1986, it allows the securing of the airway without interfering with the surgical field, makes intermaxillary fixation possible during surgery, does not result in the complications that arise when tracheostomy or nasotracheal intubation is done, and has a low morbidity.[2] Submental orotracheal intubation is effective to maintain the airway when intermaxillary fixation is needed for confirming occlusion during reduction for multiple facial fractures,[3] when large pharyngeal flaps are present, and when reduction for panfacial fractures and rhinoplasty are performed at the same time.[4] This technique was also effective in our patient with suspected skull base injury for whom nasotracheal intubation was contraindicated and intermaxillary fixation was required during surgery. However, when this intubation method is used for a long time, injury to the submandibular gland, sublingual gland and their ducts could result. It is therefore recommended that endotracheal intubation is maintained for only up to 48 hours after surgery.[3] This technique is not recommended in patients with gunshot injury to the face, patients for whom long-term airway maintenance is required due to severe nerve damage or lung injury, patients who undergo tumor ablation,[3] and patients with severe kelloid.[4]

Potential complications of submental intubation include damage to the lingual nerve, the marginal mandibular branch of the facial nerve, the duct of the submandibular gland and the gland itself, as well as the formation of mucocutaneous fistulae. Stranc and Skoracki[5] described the development of a mucocele following submandibular endotracheal tube insertion requiring excision. Nevertheless, this method will be a useful therapeutic maneuver.

Although injury to the salivary gland ducts and bleeding could be prevented by making the dissection in the middle of the mandible,[4] endotracheal intubation could be facilitated by dissection slightly right of the middle of the mandible. Whenever possible, the right side is preferred because it allows better visualization of the intraoral position of the tube with direct laryngoscopy. At a point of the technique, Altemir1 pulled out the proximal end of the endotracheal tube from the intraoral cavity after performing endotracheal

intubation, Green and Moore[6] and Drolet, et al.[7] placed a new tube in the mandible and withdrew the original orotracheal tube after performing endotracheal intubation through the mouth. Gordon and Tolstunov[8] and Labbe, et al.[9] deflated the pilot balloon and pulled out the proximal end of the endotracheal tube after performing orotracheal intubation. However, soft tissues or blood might enter the endotracheal tube and injury to the surrounding tissues could occur when pulling the endotracheal tube from intraoral position to extraoral one. To overcome these problems, we used the blue cap of the thoracic catheter which proved to be an easy and simple method with no need of reintubation. Before the induction of anesthesia, we prepared another endotracheal tube connector. We removed the endotracheal tube connector after intraoral intubation, inserted the pilot balloon and the proximal end of the endotracheal tube into the blue cap of the thoracic catheter, and pulled the blue cap using the hemostat placed into the skin incision area. The endotracheal tube was pushed while the blue cap was pulled in order to prevent the endotracheal tube from falling off. After the pilot balloon and the proximal end of the endotracheal tube within the blue cap of the thoracic catheter were pulled out, the tube connector was reattached, and ventilation was restarted. The apnea time was less than 1 min for this procedure, and SpO_2 was maintained over 99% throughout the procedure.

In conclusion, by simultaneously pulling out the proximal end of the endotracheal tube and the pilot balloon wrapped with the blue cap of the thoracic catheter extraorally, injury to the tissues surrounding the position where the endotracheal tube and the pilot balloon passed through could be reduced and the endotracheal tube could be pulled out smoothly without influx of soft tissues or blood into the endotracheal tube. We concluded that submental orotracheal intubation could be performed more easily with fewer complications than with nasotracheal intubation or tracheostomy, through the simple modification of using the blue cap on the end of the thoracic catheter in patients with multiple facial fractures and skull base injury at the time of surgery.

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