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SHORT COMMUNICATION

A new modification for safer submental orotracheal intubation

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Abstract In patients in whom a tracheal tube cannot be inserted through the nostrils due to multiple facial trauma or hypoplasty of the nose, submental orotracheal intubation (SOI) is performed to avoid tracheostomy. We report a new modification for SOI to minimize the risk of apnea. A 20-year-old man was scheduled for sagittal split ramus osteotomy. As the patient had severe hypoplasia of the nose, SOI was planned. Following orotracheal intubation with a spiral tube (first tube), a submental tunnel was surgically created. A second tube that had been confirmed, in advance, to snugly fit into the proximal end of the first tube was passed into the submental tunnel via a polypropylene cylinder and connected between the first tube and the breathing circuit. After careful withdrawal of the second tube through the submental tunnel, the first tube was directly connected to the breathing circuit after removal of the second tube. Although this technique requires additional time, apnea time is minimal even in patients in whom withdrawal of the tracheal tube through the submental tunnel takes time, because the second tube forms a link between the first tube and the breathing circuit, making it possible to ventilate the patient throughout the procedure.

Keywords Submental orotracheal intubation · Oral and maxillofacial surgery · Apnea time

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Nasotracheal intubation is often employed for oral and maxillofacial surgery, because conventional orotracheal intubation precludes temporary intermaxillary fixation, which is used to establish the patient's occlusion in the intraoperative period. However, in patients in whom the tracheal tube cannot be inserted through the nostril due to multiple facial trauma or hypoplasty of the nose, tracheostomy is the only available option. Because tracheostomy is associated with inherent complications such as hemorrhage, surgical emphysema, infection, recurrent laryngeal nerve injury, tracheal stenosis, and scar formation, it should be avoided when possible. Submental orotracheal intubation (SOI) is an alternative to tracheostomy. SOI is used in cases of major facial trauma and orthognathic surgery which require intermaxillary fixation. Although SOI is inappropriate in patients who require long-term assisted ventilation, it is a simple procedure with a low complication rate that allows operative occlusion correction [1].

In the original SOI method, after a spiral tube was inserted orally into the trachea, incisions of both the submental skin and the floor of the mouth were performed, these being connected by blunt dissection (submental tunnel). After temporarily disconnecting the spiral tube from the breathing circuit and removing the universal connector, the proximal free end of the tube was grasped by forceps and pulled through the floor of the mouth to the submental area; the tube was then reconnected to the breathing circuit [2]. With this technique, however, difficulty in withdrawing

the tube through the submental tunnel for any reason could result in a prolonged apnea time. Further, when withdrawing the tube through the submental tunnel, the proximal end of the spiral tube, which is not sterilized, might come into contact with the submental soft tissue.

In a second SOI method, after the spiral tube was inserted orally into the trachea, a submental tunnel was created. Another tracheal tube was introduced through the submental incision to the floor of the mouth and was subsequently exchanged with the previous tube [3–5]. This method seems to overcome some of the disadvantages of the original method. However, because Magill forceps or other devices are needed with this second method, contact between the forceps and the cuff of the tube may increase the risk of cuff damage. Moreover, exchange of the tube is more difficult than that with conventional orotracheal intubation because a stylet cannot be used for exchange. Thus, there is a potential risk of prolonged apnea and failure of tube exchange with this second method. We report a new modification of SOI to minimize the risk of apnea.

Written informed consent for this case report was obtained from the patient, a 20-year-old man who was scheduled for sagittal split ramus osteotomy (SSRO). As the patient had severe hypoplasia of the nose with complete obstruction of both nasal passages, SOI was planned. Following induction of anesthesia with propofol, 50 mg of rocuronium was administered and orotracheal intubation was performed using a spiral tube (internal diameter 8.0 mm; the first tube); anesthesia was maintained using a combination of intravenous propofol and remifentanil. The surgeon made a 1-cm-long incision in the submental skin, and a Kelly's forceps was bluntly introduced through the submental incision to the floor of the mouth. The sterilized polypropylene cylinder of a disposable 10-cc syringe, the tip of which had been cut in advance, was inserted through the submental incision to the floor of the mouth (Fig. 1a). A non-cuffed tracheal tube (internal diameter 6.5 mm; outer diameter 8.9 mm; the second tube), the distal end of which was confirmed, in advance, to snugly fit into the proximal end of the first tube, was passed into the cylinder (Fig. 1b). Then the first tube was disconnected from the breathing circuit, the universal connector was removed from the proximal end of the first tube, and the distal end of the second tube was inserted into the proximal end of the first tube. The breathing circuit was then connected to the second tube (Fig. 1c), allowing immediate recommencement of ventilation. Subsequently, the second tube was carefully withdrawn back out through the submental tunnel, ensuring that the distal end of the first tube was not dislodged from its position in the trachea, until both the first tube and its pilot balloon appeared in the submental region. The first tube was then directly connected to the breathing circuit after removal of the second tube and the cylinder of the syringe and reapplication of the universal connector of the first tube (Fig. 1d). The tube was secured to the skin with a suture.

Several complications of submental intubation were reported previously, including damage to the pilot balloon,

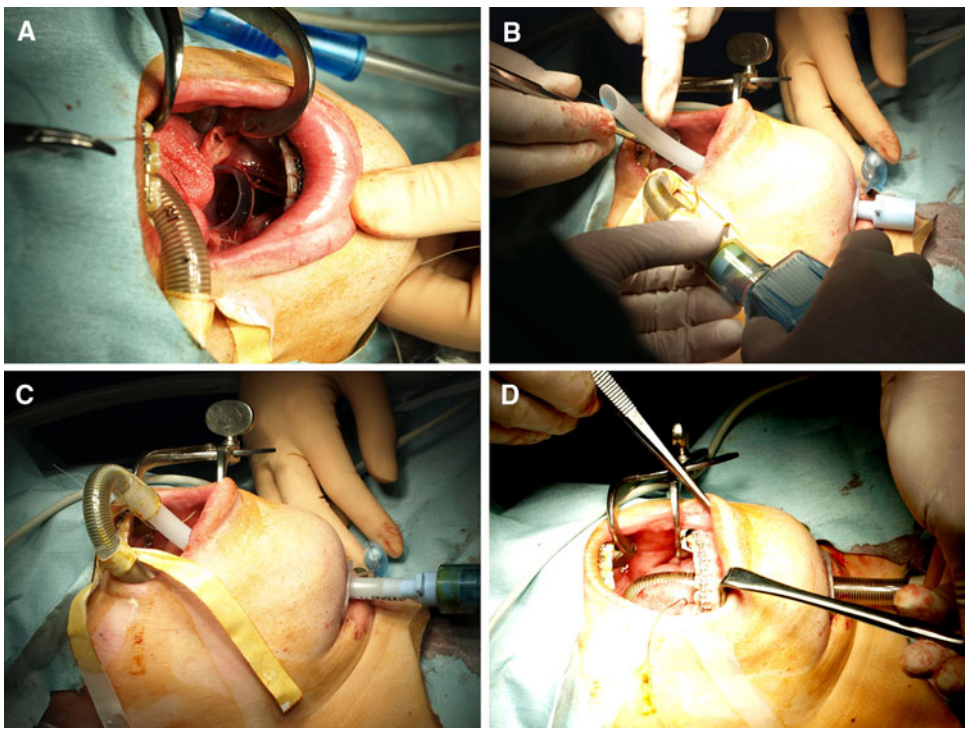

Fig. 1 **a** A sterilized polypropylene cylinder was inserted through the submental tunnel. **b** A non-cuffed tracheal tube (internal diameter 6.5 mm; outer diameter 8.9 mm) was passed into the cylinder. **c** A spiral tracheal tube (internal diameter 8.0 mm) was disconnected from the breathing circuit and the distal end of the second tube was inserted into the proximal end of the spiral tube, followed by connection of the second tube to the breathing circuit and recommencement of ventilation. **d** The first and the second tubes were carefully withdrawn toward the submental area, the second tube was removed, and the first tube was directly reconnected to the breathing circuit

infection of the submental wound, abscess formation in the floor of the mouth, and salivary fistula [6]. Careful technique and protecting the operative site from nonsterile equipment are important to decrease the risk of these complications.

Our method differs from previous methods in that we use a second tube and polypropylene cylinder, both of which can decrease the risks inherent with the other previous methods. Use of the polypropylene cylinder to facilitate withdrawal of the tube through the submental tunnel minimizes trauma to the submental soft tissue and prevents contact of the nonsterile proximal end of the spiral tube and pilot balloon with the operative site.

Previously described SOI methods are associated with the potential risk of significant apnea time when the tracheal tube is passed through the submental tunnel or when the tracheal tube is exchanged for another. The present method has a low risk of apnea even in patients in whom withdrawal of the tracheal tube through the submental tunnel is difficult and takes time, because the second tube forms a link between the first tube and the breathing circuit, such that the patient can be ventilated throughout the procedure. Moreover, because apnea during the procedure is not a concern, withdrawing the tube can be performed more carefully and gently. In the present patient, apnea time was within 3 s. To our knowledge, apnea time during submental intubation with previous methods was longer than this. Although the second tube slightly increased the dead space of the anesthetic circuit, this increase was temporary and is permissive. When performing SOI by our method, it is important to prepare the second tracheal tube and confirm in advance that it fits snugly into the proximal end of the first tube.

In conclusion, our method has the advantages of minimal apnea time, enabling careful and gentle withdrawal of the tube through the submental tunnel, while protecting the submental soft tissue from contact with the nonsterile proximal end of the first spiral tube and making exchange of the spiral tube unnecessary (no risk of difficult tube exchange). Although this technique requires additional time, it decreases the risks of SOI more than any other reported method.

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