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SHORT COMMUNICATION

Using a modified nasotracheal tube to prevent nasal ala pressure sore during prolonged nasotracheal intubation

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Abstract Nasotracheal tube induced nasal ala pressure sores or necrosis during prolonged nasotracheal intubation have been reported, and it is a serious but preventable complication. Here we introduce a modified nasotracheal tube to prevent this complication. This modified nasotracheal tube is composed of two parts, an oral endotracheal tube and a proximal part of a preformed nasotracheal tube, which are linked by a connector. The use of this modified nasotracheal tube can prevent nasal ala pressure sores during prolonged nasotracheal intubation.

Keywords Nasal ala pressure sore · Nasal intubation

Nasotracheal intubation is routinely used in patients undergoing oral surgery. Various complications resulting from nasotracheal intubation may occur, such as epistaxis [1, 2], turbinectomy or retropharyngeal dissection [3]. Nasal ala pressure sores or necrosis following prolonged nasotracheal intubation have also been reported [4, 5]. The incidence of such events is not clear. It has been reported that 100% nasal ala pressure occurred after prolonged nasotracheal intubation using the preformed nasotracheal tube [6]. Several methods aimed at preventing this complication have been suggested [6, 7]. Here we describe a novel modified nasotracheal tube that effectively prevents nasotracheal intubation-induced nasal ala pressure sores or necrosis after prolonged nasotracheal intubation.

The modified nasotracheal tube consists of two endotracheal tubes (ET) of the same size, an oral endotracheal tube (the distal part) (Euromedical, Unomedical, Sdn, Bhd, Malaysia) and a preformed nasal ET tube (the proximal part) (Ruschelit, Teleflex Medical, Sdn, Bhd, Malaysia), which are linked by a connector (one end of the oral ET tube's connector) (Fig. 1). With institutional review board approval, we used this modified nasotracheal tube for patients with prolonged nasotracheal intubation general anesthesia (more than 16 h) who were scheduled to receive a wide excision of a tumor and a neck dissection with free flap coverage following the diagnosis of oral cancer. Patient preparation included ECG, arterial catheterization, pulse oximetry, and preoxygenation. Anesthesia for patients without a difficult airway was induced with fentanyl 2 μg/kg, propofol 2 mg/kg, and succinylcholine 1.5 mg/kg. After complete muscular paralysis, an oral ET tube (size 7.0 for male patients and size 6.5 for female patients) was inserted via the nasal route. For patients predicted to have difficult airways, such as a mouth opening of <2 finger breadths, awake fiber-optic intubation was performed. Following sedation with 2–3 mg midazolam i.v. and topical anesthesia of the upper airway tract with 2% lidocaine, an oral ET tube (size 7.0 for male patients and size 6.5 for female patients) was inserted via the nasal route under the guidance of the fiberscope. After nasal endotracheal intubation, the tip of the ET tube was checked and placed 3 cm above the carina with the aid of the fiberscope. The redundant part of the oral ET tube was cut, and only a 1 cm length of the oral ET tube remained outside the nostril. Next, the proximal part of a preformed

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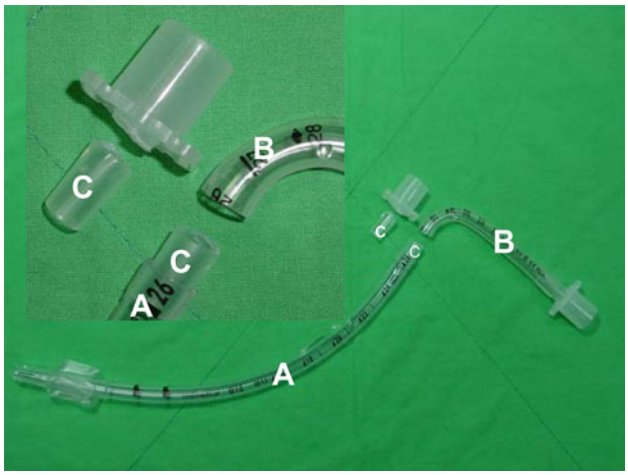

Fig. 1 The composition of the modified nasotracheal tube, which includes an oral endotracheal tube (*A*), a distal part of a preformed nasotracheal tube (*B*), and a connector (*C*), which is derived from one end of the endotracheal tube connector

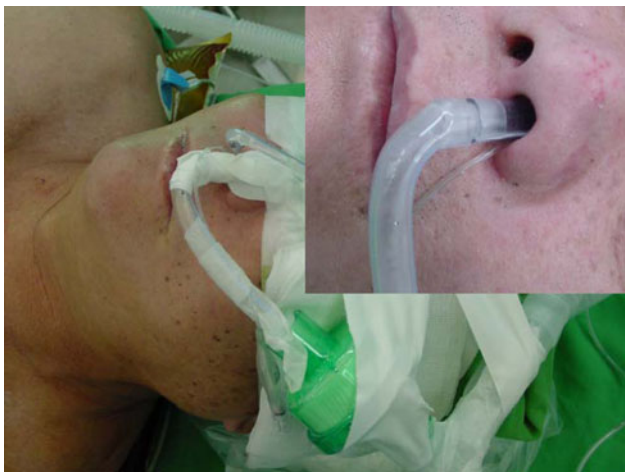

Fig. 2 A patient is shown using the modified nasotracheal tube. The direction of tube angulation is turned to the lateral side of the nose

nasotracheal tube (size 7.0 for male patients and size 6.5 for female patients), cut at the 26-cm mark for size 7 tubes and the 25-cm mark for size 6.5 tubes over the curvature region, was connected to the oral ET tube with a connector that was derived from one end of the oral ET tube's connector (Fig. 2). We used this technique (Fig. 2) in over 50 cases who received prolonged nasotracheal intubation. Only a few cases showed hyperemic changes over the nasal ala, and in all cases no necrosis was noted after the operation.

Although nasal ala pressure sores are not fatal, this post-intubation complication may result in nasal deformity, and probably causes medical legal problems. However, this complication is preventable. Zwillich and Pierson [4] reported two cases of nasal necrosis after prolonged nasotracheal intubation at an intensive care unit (ICU). They suggested that careful inspection of the tube's contact with the nose and ensuring that no tape was applied between the nose and tube could help prevent nasal necrosis. However, these suggestions are not applicable to patients under anesthesia. Huang et al. [6] reported that the combined use of Soft Liner (a soft denture lining material) and DuoDERM (a bioactive skin protector) significantly reduced the size and severity of nasal ala pressure after prolonged nasotracheal intubation. Anand et al. [7] used a polyvinyl acetyl sponge nasal pack as a cushion between the nose and nasotracheal tube, and secured the tube with the pack's silk threads. Although the pack is soft in nature, it makes direct contact with the nose. Its capacity to provide long-term pressure sore prevention is not clear.

The etiology of nasal ala pressure sore caused by a preformed nasotracheal tube is excessive drag against the nose skin. The modified nasotracheal tube we used in this report effectively prevents this complication. How does it work? First, the direction of tube angulation is turned to the lateral side of the nose (Fig. 2), so the nasal ala does not suffer direct compression by the nasotracheal tube. Second, an oral ET tube is used for tracheal intubation; due to its curvature, the direction at which the tube emerges from the nostril is toward contrary to nose tip, which may also decrease the possibility of compression by the nasotracheal tube. There are some another advantages of using this modified nasotracheal tube too. Compared with the preformed nasotracheal tube, it is easier to manipulate the fiberscope within the oral ET tube when performing fiberscope-guided tracheal intubation. In addition, the optimal depth of the ET tube in the trachea can be checked with a fiberscope before cutting the redundant part. This optimal determination of the ET tube's position cannot be achieved using the preformed nasotracheal tube due to its fixed length and shape. After the operation, if the ET tube is left in for further postoperative care at the ICU, we can remove the proximal part of the modified nasotracheal tube and link an original connector to the oral ET tube with a 2 cm withdrawal. This indicates that the tip of the ET tube is placed 5 cm above the carina, which is suggested to be the optimal ET tube depth for tracheal intubation [8]. In this way, the ICU nurse can easily take care of the ET tube in the case of suction, and it may also prevent the formation of a nasal ala pressure sore, which can be caused by the preformed nasotracheal tubes used in ICUs [4].

Because this modified nasotracheal tube consists of two ET tubes, caution should be applied in order to prevent the disconnection or the dislodgment of the two tubes during anesthesia. Actually, the connector we used in this modified nasotracheal tube was quite a good fit, and it connected firmly with each ET tube. No disconnections or dislodgments were observed in any of our cases. Continuous airway pressure monitoring is essential in order to prevent this complication.

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