Retropharyngeal Dissection by Parker Flex-Tip Nasal Endotracheal Tube

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Possible complications of nasotracheal intubation include injury to the nasal or pharyngeal mucosa. Dissection of the retropharyngeal tissue by the endotracheal tube is one of the rarer of the more severe complications. Previous studies have indicated that the Parker Flex-Tip (PFT) tracheal tube (Parker Medical, Highlands Ranch, Colo) reduces the incidence of mucosal injury. We experienced a case involving inadvertent retropharyngeal placement of a PFT tube in a 29-year-old patient during nasotracheal intubation under general anesthesia for elective dental treatment. Despite thermosoftening the PFT tube, expanding the nasal meatus, and ensuring gentle maneuvering, the tube intruded into the left retropharyngeal mucosa. However, the injury was not severe, and the only required treatment was the administration of antibiotics and corticosteroids. Even when a PFT tube is utilized, pharyngeal dissection is possible. When resistance is felt during passing of the PFT tube through the nasopharynx, an alternative method to overcome this resistance should be utilized.

Key Words: Nasotracheal intubation; Retropharyngeal dissection; Parker Flex-Tip.

Nasotracheal intubation is frequently utilized during oral surgery under general anesthesia. However, nasotracheal intubation is associated with potential complications. Epistaxis from the nasal mucosa is the most frequent complication, and its reported incidence is 18–77% of nasotracheal intubations.¹ Other possible complications include damage to the inferior/middle nasal concha and polyps or tumors in the nasal cavity.² Nasotracheal intubation is also associated with a risk of infection, resulting in problems such as maxillary sinusitis³ or bacteremia.⁴ Dissection of the retropharyngeal tissue by a nasotracheal tube is a rare complication. In a severe case, a nasotracheal tube reportedly intruded into the intracranial cavity, causing brain injury.⁵ Retropharyngeal dissection from intubation during oral surgery has rarely been reported.^{6–8} In routine practice, nasopharyngeal advancement of the endotracheal tube is performed blindly; thus, it is very difficult to directly observe what happens to nasopharyngeal structures

during this stage of the intubation. Consequently, prevention of dissection is important.

One method by which to reduce these complications is to choose a tube that is less harmful to the nasal and pharyngeal mucosa. Previous studies have reported that the Parker Flex-Tip (PFT) tracheal tube (Parker Medical, Highlands Ranch, Colo), the tip of which is specially designed, significantly reduces epistaxis and injury to the mucosa (Figure 1).^{9,10} However, we experienced a case involving inadvertent retropharyngeal placement of a PFT tube in which special perioperative care was required. To the best of our knowledge, no previous report has described tissue dissection by a PFT tube. We herein present this case of dissection of the retropharyngeal tissue by a PFT tube in a patient with cognitive impairment requiring dental treatment under general anesthesia.

CASE REPORT

A 29-year-old Japanese woman (weight, 78.9 kg; height, 152 cm; body mass index, 34.1 kg/m²) was scheduled for dental treatment and removal of a lower third molar under general anesthesia at our institution. She had severe mental retardation and required assistance in everyday life. The patient exhibited no understanding of verbal communication. Because of cognitive impair-

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Figure 1. The tip of the Parker Flex-Tip tracheal tube.

ment, we were unable to perform a complete preoperative airway assessment. She had no problems associated with eating or apparent mouth opening, however. She was taking diazepam for epilepsy and brotizolam and zolpidem for insomnia. No other abnormalities that would have prevented general anesthesia were found during the preoperative examination.

General anesthesia was induced using 4–6% sevoflurane with a mixture of 67% nitrous oxide in oxygen. After loss of consciousness, an intravenous line was placed, and 0.15 µg/kg/min of remifentanyl, 40 mg of propofol, and 40 mg of rocuronium bromide were administered intravenously. Slight glossoptosis was present, but ventilation was still possible without oropharyngeal airway placement. Prior to intubation, we cleaned and expanded both nasal meatuses with cotton swabs soaked in 0.025% benzalkonium chloride. The endotracheal tube (inner diameter, 7.0 mm) was warmed with hot water for softening and lubricated by Caine Zero Jelly (Nagase Medical Co, Ltd, Hyogo, Japan). We attempted intubation from the right nostril but felt significant resistance during advancement of the tube through the nasal cavity. Therefore, we removed the endotracheal tube, and slight epistaxis was observed from the right nasal meatus, for which treatment was not necessary. We subsequently downsized the endotracheal tube to an inner diameter of 6.5 mm and changed the side of intubation to the other nostril. Although minor resistance was again felt, slight rotation of the tube allowed for its smooth forward advancement. Examination of the tube with a standard laryngoscope (Macintosh blade size 3) revealed a tubelike bulge on the left retropharyngeal mucosa. We considered that dissection of the retropharyngeal tissue by the tube had occurred. Thus, the PFT tube was immediately removed. Oral intubation was then performed using a Mallinckrodt oral/nasal reinforced tracheal tube (inner diameter, 6.5 mm; Covidien/Medtronic, Minneapolis, Minn) (Figure 2). We then inspected the pharynx with a fiberscope and found no severe damage to the nasopharynx. An otolaryngologist subsequently examined

the patient by fiberscope and found no severe bleeding in the epipharynx. The otolaryngologist removed a coagulum by suction but could not identify the exact site at which the tube had invaded the mucous membrane. The bleeding did not persist. Ultrasonographic examination revealed no findings of emphysema or hematoma in the neck. Because the dissected lesion was difficult to suture, we treated the patient with intravenous administration of an antibiotic and 100 mg of hydrocortisone sodium succinate. We also monitored her ventilation because of concern regarding the development of airway obstruction by edema or hematoma formation. We decided to cancel the planned dental treatments and conduct perioperative care in our hospital for several days.

A computed tomography scan was performed 4.5 hours after dissection by the tube to determine whether a delayed hematoma had formed (Figure 3). An edematous lesion was observed in the left oral pharynx, suggesting that this was the site at which the tube had intruded. No foreign body or airway obstruction was present.

We ensured that the patient neither ate nor drank until the next morning. We then began intravenous cefazolin sodium at 3 g/d for 3 days, at which point we began oral cefditoren pivoxil at 300 mg/d. The patient did not tolerate an oxygen mask, so the mask was disconnected and blow-by from the distal end of the oxygen tube was administered at 5 L/min for 2 hours after return to the ward. The patient's SpO₂ ranged from 95 to 97% during oxygenation. We attempted continuous measurement of the SpO₂ after discontinuation of supplemental oxygenation; however, attachment of the SpO₂ probe was not possible because of the patient's uncooperative behavior. Therefore, the nurse visited the sickroom every hour to measure the SpO₂ and observe the patient's respiration overnight. The SpO₂ remained at 96–97%, and no abnormalities were noted. Oral administration of brotizolam and zolpidem did not effectively treat her agitation, and 25 mg of intravenous hydroxyzine was therefore administered; however, her agitation persisted. The next day, she could not rest quietly in bed. She exhibited violent behavior and removed the intravenous line by herself. The antibiotic infusion was stopped and changed to oral administration. On the third day, we determined that it was impossible to continue further hospitalization because of poor cooperation. Reexamination by the otolaryngologist revealed no exacerbation in the pharynx, and we confirmed no infection or airway obstruction; therefore, we allowed her to leave the hospital. One week later, we confirmed that she had no abnormalities and required no treatment.

Figure 2. The retropharyngeal mucosa after oral intubation. The arrowhead indicates the region in which the tube intruded.

We extracted the wisdom tooth and performed other dental treatment without problems under general anesthesia 7 months later, but with oral intubation.

DISCUSSION

The PFT tube has a curved distal tip and is not sharp. It is thought that this curved tip directs the tube away from the delicate nasal mucosa; therefore, intubation with a PFT tube has reduced risk of causing epistaxis or mucous membrane damage compared with a conventional side-beveled tube.^{9,10} Furthermore, we routinely soften the tube with warm water¹¹ and expand the nasal meatus¹² before intubation to reduce mucous membrane damage. Despite these measures, however, oropharyngeal mucosal injury occurred in the present case. The retropharyngeal wall is a region in which obstruction may occur because of passing of a nasotracheal tube because the direction of the advancing tube changes at this point.¹³ We consider that the direction of the PFT tube as it advanced from the nasal meatus may have become almost perpendicular to the pharynx in our patient. Another possible reason for the dissection in this case is the existence of an overgrown Passavant ridge in the patient's retropharyngeal wall, which made it difficult to advance the tube. The dissected region was equivalent to the common site of the ridge. We rotated the tube when we felt resistance while advancing the tube. Although partial rotation of the tube is a maneuver frequently employed to overcome resistance, whether this maneuver causes dissection is controversial.⁵ Clinicians should be careful to avoid applying excessive force while passing the tube through the nasopharynx, even when using a PFT tube.

Previous studies have been performed to identify effective methods with which to improve the passage of a nasotracheal tube. Expansion of the nasal meatus is one such method.¹² Although we utilized cotton buds, a

Figure 3. Computed tomography indicates an edematous lesion (arrowheads) in a sagittal image (right panel) and an axial image (left panel).

wider device such as a nasopharyngeal airway might have been more effective. Another method is nasotracheal intubation under the guidance of a suction tube via a Seldinger technique.¹⁴ A urethral catheter can also be used as a guide for introducing the nasotracheal tube by attaching it to the tip of the tube.¹⁵ Intubation under the guidance of a fiberscope may be considered the safest method. Although a PFT tube was utilized in the present case, it might have been beneficial to use a guide when the initial resistance was felt.

It is ideal to prevent injury and/or infection and to ensure safety of the airway once dissection by a tracheal tube has occurred. The posterior wall of the pharynx is composed of loose connective tissue, and it is located in close proximity to the mediastinum and spinal cord. The spread of injury or infection can lead to lethal complications. Careless performance of high-pressure ventilation might produce emphysema from the neck to the mediastinum if the tube has dissected the mucosa.⁸ A different intubation method should immediately be carried out. If active bleeding is observed, prompt attention to the site must be conducted.¹⁶ It may be necessary to determine whether airway obstruction is present because of emphysema or hematoma formation using computed tomography or ultrasonography. Additional evaluations may also be needed in the later postoperative period to check for delayed hematoma formation.^{6,7}

Our patient had cognitive impairment and could not alert us to the presence of abnormalities by verbal communication. Symptoms related to airway obstruction or infection might have been difficult to detect. Therefore, it was necessary to monitor her respiratory status frequently and check for objective signs of infection or airway obstruction during the postoperative period.

In conclusion, use of a PFT tracheal tube for nasotracheal intubation, which significantly reduces injury to the nasal mucosa, can cause pharyngeal

dissection. When obstruction occurs during advancement of a PFT tube through the nasopharynx, an alternative method to overcome the obstruction should be considered or orotracheal intubation should be carried out if the surgical procedure allows.

REFERENCES

1. Elwood T, Stillions DM, Woo DW, Bradford HM, Ramamoorthy C. Nasotracheal intubation: a randomized trial of two methods. *Anesthesiology*. 2002;96:51–53.
2. Hall CE, Shutt LE. Nasotracheal intubation for head and neck surgery. *Anaesthesia*. 2003;58:249–256.
3. Hansen M, Poulsen MR, Bendixen DK, Hartmannandersen F. Incidence of sinusitis in patients with nasotracheal intubation. *Br J Anaesth*. 1988;61:231–232.
4. Valdes C, Tomas I, Alvarez M, Limeres J, Medina J, Diz P. The incidence of bacteraemia associated with tracheal intubation. *Anaesthesia*. 2008;63:588–592.
5. Paul M, Dueck M, Kampe S, Petzke F, Ladra A. Intracranial placement of a nasotracheal tube after transnasal trans-sphenoidal surgery. *Br J Anaesth*. 2003;91:601–604.
6. Krebs MJ, Sakai T. Retropharyngeal dissection during nasotracheal intubation: a rare complication and its management. *J Clin Anesth*. 2008;20:218–221.
7. Ersoy B, Gursoy T, Celebiler O, Umuroglu T. A complication of nasotracheal intubation after mandibular subcondylar fracture. *J Craniofac Surg*. 2011;22:1527–1529.
8. Kamatani T, Kohzuka Y, Kondo S, Shirota T, Iijima T, Shintani S. Retropharyngeal dissection: a case report of cervicofacial subcutaneous emphysema and mediastinal emphysema during attempted nasotracheal intubation. *J Anesth*. 2013;27:785–786.
9. Prior S, Heaton J, Jatana KR, Rashid RG. Parker flex-tip and standard-tip endotracheal tubes: a comparison during nasotracheal intubation. *Anesth Prog*. 2010;57:18–24.
10. Sanuki T, Hirokane M, Matsuda Y, Sugioka S, Kotani J. The Parker Flex-Tip tube for nasotracheal intubation: the influence on nasal mucosal trauma. *Anaesthesia*. 2010;65:8–11.
11. Kim YC, Lee SH, Noh GJ, et al. Thermosoftening treatment of the nasotracheal tube before intubation can reduce epistaxis and nasal damage. *Anesth Analg*. 2000;91:698–701.
12. Smith JE, Reid AP. Asymptomatic intranasal abnormalities influencing the choice of nostril for nasotracheal intubation. *Br J Anaesth*. 1999;83:882–886.
13. Tintinalli JE, Claffey J. Complications of nasotracheal intubation. *Ann Emerg Med*. 1981;10:142–144.
14. Morimoto Y, Sugimura M, Hirose Y, Taki K, Niwa H. Nasotracheal intubation under curve-tipped suction catheter guidance reduces epistaxis. *Can J Anaesth*. 2006;53:295–298.
15. Wong A, Subar P, Witherell H, Ovodov KJ. Reducing nasopharyngeal trauma: the urethral catheter-assisted nasotracheal intubation technique. *Anesth Prog*. 2011;58:26–30.
16. Piepho T, Thierbach A, Werner C. Nasotracheal intubation: look before you leap. *Br J Anaesth*. 2005;94:859–860.