Unexpected Obstruction of a Parker Flex-Tip Endotracheal Tube Caused by Outward Bending of Its Tip: A Case Report

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We report a case of Parker Flex-Tip endotracheal tube obstruction caused by its tip bending outward against the tube lumen. The Parker Flex-Tip tube tip is designed to bend inward to prevent damage to airway structures during intubation. However, when its tip is bent outward, the tube aperture is distorted, shifts against the tracheal wall, and is occluded. Moreover, the cross-sectional area of the openings on the side of the endotracheal tube, the “Murphy’s eyes” which are ellipses, decrease because the openings are pulled parallel to their long axis. Outward bending of the tip can obstruct the tube. (A&A Practice. 2020;14:e01232.)

GLOSSARY

PFT = Parker Flex-Tip endotracheal tube

The Parker Flex-Tip endotracheal tube (PFT; Parker Medical, Highlands Ranch, CO) has a soft, flexible, curved, and centered distal tip (Figure 1).¹ It is designed to prevent damage to the larynx and trachea by bending the soft tip inward toward the tube lumen when the tip touches airway structures during tracheal intubation.^{1–5} The tube lumen is obstructed if the tip bends inward across the aperture at the distal end of the PFT. This problem is overcome by double Murphy’s eyes on each side of the distal end of the PFT.¹ Because the PFT tip is designed to bend inward easily, it may be rare for the tip to bend outward against the tube lumen. However, the problems caused when the tip bends outward are unknown. We report a case of PFT obstruction caused by its tip bending outward. A written informed consent was obtained from the patient for this case report.

CASE REPORT

A 50-year-old, 158-cm, 61-kg woman was scheduled to undergo a mastectomy under general anesthesia. The patient had well-controlled asthma.

The patient was premedicated with 50mg ranitidine. On arrival in the operating room, standard noninvasive monitoring was applied. General anesthesia was induced with 100mg propofol and 2% sevoflurane, and muscle relaxation was obtained with 40mg rocuronium. After confirmation of complete muscle relaxation using a nerve stimulator, an experienced anesthesiologist performed laryngoscopy using

a Macintosh 3 blade. Because the vocal cords were not visualized but the arytenoid cartilages were seen when applying external laryngeal manipulation (Cormack and Lehane Grade 2B view), a 7-mm inner-diameter PFT was advanced blindly along the laryngeal surface of the epiglottis. The tube met with resistance when passing through the glottis but was successfully inserted into the trachea on the first attempt. After tracheal intubation, breath sounds were audible but markedly reduced and wheezing was noted. Manual ventilation with the anesthesia bag was difficult and airway pressure of more than 30 cm H₂O was required to obtain a tidal volume of 200 mL. Capnography revealed “loss of alveolar plateau” pattern, which indicated airway obstruction. We suspected bronchospasm and administered a β_2 -agonist via the PFT, but the patient did not improve. A suction catheter was then inserted into the PFT to exclude obstruction due to secretions. It was difficult to pass and aspirate secretions. Therefore, we observed the inside of the PFT and the trachea and bronchus using a fiberscope-video camera system. Fiberscopy showed that the flexible tip of the PFT was bent outward against the tube (Figure 2A) and the Murphy’s eyes were narrowed. Because the aperture at the distal end of the PFT shifted to the wall of the trachea and was in contact with the side of the trachea, the PFT was nearly obstructed (Figure 2B). The fiberscope was removed from the PFT and manual ventilation performed. The fiberscope was then reinserted into the PFT, the cuff deflated, and the tube was slightly withdrawn under fiberoptic observation. Outward bending of the tip and shifting of the tube aperture improved and the PFT was no longer obstructed (Figure 2C). Breath sounds and capnogram were normal. The operation lasted 154 minutes and was completed uneventfully. The postoperative course was uneventful except the patient complained of a moderately severe sore throat, which improved gradually.

DISCUSSION

Inward bending of the PFT is expected to occur as a design feature.¹ When the tip contacts airway structures and bends inward toward the tube lumen, the cross-sectional area of

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Figure 1. Inward and outward bending of the tip of the Parker Flex-Tip endotracheal tube and possible mechanism of obstruction of the tube caused by the outwardly bent tip.

Figure 2. Fiberoptic view of outward bending of the tip of the Parker Flex-Tip endotracheal tube (A), obstruction of the tube (B), and after slightly withdrawing the tube under fiberoptic observation (C).

both Murphy's eyes, which are ellipses, increases because the eyes are positioned at an angle to the axis of the PFT (Figure 1). Thus, endotracheal tube obstruction is avoided even when the tip is bent inward and the aperture at the distal end of the PFT closes.

The PFT tip is designed to be difficult to bend outward against the tube. However, when the tip is bent outward, the PFT aperture is pulled and shifts away from the axis of the PFT. The outwardly bent tip does not close the PFT aperture directly, but the aperture can close if it sits against the tracheal wall. When outward bending of the tip occurs, the cross-sectional area of the Murphy's eyes decreases because

the eyes are pulled parallel to the direction of their long axis (Figure 1). Thus, outward bending of the tip can cause obstruction of the PFT, as in this patient.

To prevent this complication, it is essential for the laryngoscopist to confirm passage of the PFT through the larynx during tracheal intubation. If the laryngoscopic view is poor and the tube passage cannot be seen, he or she should change to an intubation technique that permits visualization, such as videolaryngoscopy. Additionally, the laryngoscopist must not force the PFT forward when resistance is felt during intubation. It was easy to return the position of the PFT tip to normal in this patient. However, diagnosis of

outward bending of the tip was difficult. It is important to always check the PFT and the trachea using the fiberscope if any abnormality is suspected.

CONCLUSIONS

We found that when the PFT tip was bent outward against the tube, the tube aperture shifted to the wall of the trachea, and the Murphy's eyes were pulled in a direction that caused the apertures to close, which obstructed the PFT. ■■

DISCLOSURES

Name: Keisuke Yasunami, MD.

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Name: Ichiro Takenaka, MD, PhD.

Contribution: This author helped in conceptualization, methodology, formal analysis, investigation, and writing, reviewing, and editing.

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