Inner Wall Detachment of the Spiral Tube During Extubation: A Case Report

Tomo Morota,* Katsuya Endou,* Hiroshi Omizo,* Setsuo Furuta,† and Hisashi Miyajima‡

*Department of Dental Anesthesiology, Aidu Chuo Hospital, Aizuwakamatsu, Japan, †Ask Dental Clinic, Kani, Japan, and ‡Department of Dental Oral and Maxillofacial Surgery, Aidu Chuo Hospital, Aizuwakamatsu, Japan

We report a case of endotracheal tube malfunction, in which the inner surface of the tube peeled off during anesthesia. The patient, a 7-year-old boy, was under general anesthesia for the treatment of multiple dental caries. The damaged tube could have caused respiratory failure, putting the patient's life at risk. We speculate that the use of nitrous oxide was one of the contributing factors to the inner wall detachment. Several additional lessons can be learned from this incident in order to prevent tube-related trouble during an operation.

Key Words: Spiral tube; Inner wall detachment; Nitrous oxide gas; Tube-related trouble.

This paper reports endotracheal tube malfunction, in which the inner surface of the Mallinckrodt reinforced uncuffed endotracheal tube (hereafter called a spiral tube) peeled off the outer reinforced wall. The patient was a 7-year-old boy, and extensive treatment of multiple dental caries was being conducted under general anesthesia. Anesthesia was induced with nitrous oxide, oxygen, and sevoflurane. After intravenous access was established, vecuronium bromide was administered.

The patient was intubated orally with an uncuffed spiral tube (6.0 mm inner diameter) with an aluminum stylet. The spiral tube was fixed at one corner of the mouth. No endotracheal lubricants were used. Anesthesia was maintained with nitrous oxide, oxygen, and sevoflurane. Because the dental treatment areas were located on both sides of the mouth, the tube was moved to the opposite corner during the operation. No anomaly of the tube was observed at that time.

Throughout the operation, oxygen saturation was between 98 and 99% and end-tidal carbon dioxide was between 35 and 38 mm Hg without any elevation in airway pressure. However, when the anesthesia was discontinued and endotracheal suction was attempted

after the operation, an endotracheal suction catheter (10 French size, 3.33 mm outside diameter) could not be inserted. It was visually confirmed that a protruding part on the inner surface narrowed the tube lumen significantly (Figure 1). Therefore, endotracheal suction was attempted again with a finer catheter (8 fr, 2.66 mm OD), but it could not be inserted either. During these attempts, the patient recovered from anesthesia, and body movements started. Because ventilation was normal with an oxygen saturation of 98% and breath sounds were clear to auscultation, the spiral tube was extubated with positive pressure after performing only oral suction. After extubation, the patient was returned to our dental hospital and released on the next day after an uneventful postoperative course. The operation took 1 hour and 25 minutes and the patient was under anesthesia for 2 hours and 33 minutes.

We asked the manufacturer to investigate the cause of this damage. According to their report, the detachment was 14 cm long from the connector to the depth mark at 15 cm (Figure 2), running in parallel with the inflation line with 1.5 mm in between. They replied that the manufacturing process did not cause the detachment.

Even though the cause for this particular incident is unknown, it is advised that the stylet should be inserted carefully after appropriate bending and removed with care, minimizing excessive force to the spiral tube. In the present case, we speculate that the use of nitrous oxide may have been a contributing factor to the detachment of the inner surface of the tube by leading to expansion of the closed space between the separated layers of the tube.¹ Longer exposure might have caused more serious

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Address correspondence to Dr Tomo Morota, Department of Dental Anesthesiology, Aidu Chuo Hospital, Aizuwakamatsu, Fukushima, Japan; morotatomo@onchikai.jp.

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Figure 1. Inner wall detachment of spiral tube, seen from connector side.

insufflation of nitrous oxide, possibly leading to impairment of respiration. Usage of remifentanyl, which does not invade a closed cavity, in place of nitrous oxide would eliminate this problem. It is of critical importance

Figure 2. Inner wall detachment of spiral tube. *1 indicates starting point of detachment.

to have a thorough risk management process for medical equipment technology.

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REFERENCES

1. Shigematsu H, Fujita K, Suzuki S, et al. A case report of airway obstruction associated with the use of wire reinforced polyvinyl chloride (PVC) endotracheal tube [in Japanese]. *J Jpn Dent Soc Anesthesiol*. 1991;19:602–606.