

## Case Report

# Unanticipated ventilation obstruction due to a defective reinforced endotracheal tube

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**Abstract:** Wire-reinforced endotracheal tubes are used to prevent obstruction. Risk factors related to reinforced endotracheal tube obstruction were believed to be repeatedly used tube and in presence of N<sub>2</sub>O. In our case, even in free of these risk factors, a delayed tube obstruction occurred with the progress of surgical duration. This delay suggests that the obstruction was caused by diffusion of warm air/oxygen into an initially small defect, especially as the duration of surgery progresses.

**Keywords:** Airway management, airway obstruction

### Introduction

Wire-reinforced endotracheal tubes (ETTs) are frequently used during maxillofacial surgery to prevent obstruction, as bending or kinking is likely to occur with regular ETTs. However, obstruction can occur even with reinforced tubes. We herein report a case of obstruction of a defective reinforced ETT during general anesthesia.

### Case report

A 49-year-old woman with no significant past medical history was scheduled for maxillary amputation (osteosarcoma) in the supine position. Anesthesia was induced with propofol (200 mg) and sufentanil (20 µg), and tracheal intubation was facilitated by neuromuscular blockade using rocuronium (40 mg). Intubation was performed with a new disposable 6.5 mm reinforced latex ETT (UnoFlex, Unomedical, Kedah, Malaysia). After intubation, mechanical ventilation was initiated with peak pressures of 13 cm H<sub>2</sub>O. Anesthesia was maintained with 1.3 MAC sevoflurane mixed with oxygen and air. No nitrous oxide was used throughout the procedure. At the conclusion of surgery (100 min after starting the procedure), ventilation was noted to be difficult. Peak inspiratory pressures increased and tidal volumes decreased. Con-

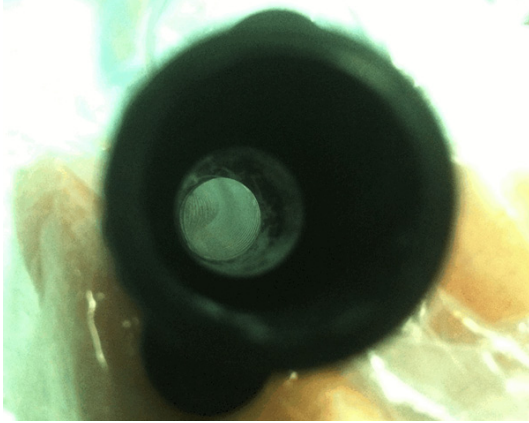
sidering the possibility of insufficient neuromuscular blockade, a 20 mg rocuronium bolus was administered. This did not improve the situation, and capnography continued to show a positive deflection during the inspiratory phase. The possibility of bronchospasm or unilateral pneumothorax was eliminated by auscultation, which revealed lung sounds that were faint but clear and equal bilaterally. The breathing circuit and ETT were visually inspected; no kinking, bending, displacement, or other abnormality was found. As ventilation became increasingly difficult, an attempt was made to pass a suction catheter through the lumen of the ETT, but this was unsuccessful. The ETT was then removed and replaced with a new 7.0 mm polyvinylchloride ETT. This immediately relieved the airway obstruction.

Subsequent inspection of the reinforced ETT revealed a thin internal meniscus (**Figure 1**). Dissection of the inner layer of latex had produced a longitudinal bubble 3 cm in length at the junction of the pilot tube and inner lumen, which almost occluded the tube. We notified the manufacturer about this.

### Discussion

During maxillofacial surgery, the operating room table is typically turned 180 away from the

## Ventilation obstruction caused by a defective tube



**Figure 1.** Dissection of the inner layer of the tube.

anesthesiologist to facilitate unrestricted access of the surgical team to the surgical field. Consequently, the artificial airway and breathing circuit must be diligently managed to prevent accidental obstruction or disconnection under the surgical drapes. If ventilation difficulty with high airway pressures occurs, the differential diagnosis includes bronchospasm, pneumothorax, and breathing circuit or airway obstruction. In our case, impaired ventilation was due to dissection of the inner layer of a reinforced ETT.

Reinforced ETT obstruction has been previously reported in reusable ETTs that were repeatedly used (1-3), as well as during  $N_2O$  anesthesia [1, 4]. In our case, the reinforced ETT was new, and  $N_2O$  was not used; nevertheless, obstruction did occur. What actually accounted for this obstruction?

Of interest, the obstruction in our case did not become apparent until 100 min after the start of surgery. Previous reports of airway obstruction due to a defective reinforced ETT have also described a substantial delay between the insertion of the ETT and clinical evidence of obstruction. For example, obstruction was noted at 90 min by Rajkumar et al in the absence of  $N_2O$  [5]. This delay suggests that the obstruction was caused by diffusion of warm air/oxygen into an initially small defect, leading to gradual enlargement of the defect until obstruction became clinically apparent. This is analogous to the process by which  $N_2O$  diffuses into and thereby enlarges a reinforced ETT defect.

In conclusion, we have described a case in which difficulty with mechanical ventilation was caused by an obstructed reinforced ETT. One must be wary of the possibility of obstruction of a reinforced ETT, especially as the duration of surgery progresses, and even with a new ETT and in the absence of  $N_2O$ .

### Disclosure of conflict of interest

None.

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