



CASE REPORT

The unrecognised difficult extubation: a call for vigilance

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Summary

Tracheal extubation remains a critical and often overlooked period of difficult airway management. A 66-year-old man, scheduled for C5–C7 anterior fusion, with an easy view of the vocal cords, presented with a sublingual obstruction that required a reduced tracheal tube size. Despite correct tube placement, intra-operative ventilation remained difficult. At the end of surgery a pulsatile tracheal compression was fiberoptically observed above the carina. After discussion with the attending otolaryngologist, neuromuscular blockade was antagonised and the patient was able to maintain normal minute volumes while spontaneously ventilating. With the otolaryngologist present, and with the patient conscious, the trachea was successfully extubated over an airway exchange catheter. A subsequent CT scan revealed an impingement of the trachea by the innominate artery and a mildly ectatic ascending and descending aorta that, in conjunction with tracheomalacia and neuromuscular blockade, could explain the observed signs and symptoms.

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Numerous papers and current guidelines regarding difficult airway management have focused on difficult tracheal intubation. Subsequent to these guidelines, closed claims data from the past decade have shown a decrease in claims related to the period of intubation [1–3]. In comparison, little evidence or guidance exists to address difficult tracheal extubation, despite the serious risk that exists with the difficult airway during this period [4]. Also, in looking at the closed claims data regarding extubations, there has been no significant improvement over the past decade [1–3]. The numerous challenges regarding difficult extubation highlight the need for further guidelines and recommendations [1, 5]. This case focuses on the importance of a well thought through strategy for dealing with difficult extubations [6, 7].

Case report

A 66-year-old man with chronic intractable neck and bilateral arm pain, and numbness and paresthesia, presented for elective C5–C7 anterior cervical fusion. His medical history included poorly controlled hypertension,

degenerative cervical joint disease, hypercholesterolaemia and a previous lumbar discectomy. Medications included paracetamol/hydrocodone, lansoprazole, simvastatin, atenolol and valsartan. On presentation his blood pressure was 177/98 mmHg, his pulse was 72 beats min^{-1} , and he weighed 117 kg and was 191 cm tall (BMI of 31.8 $\text{kg}\cdot\text{m}^{-2}$). Airway assessment revealed a Mallampati score of 2, with a mouth opening greater than 3 cm, full dentition, a thyromental distance greater than 6 cm and a midline trachea. All other aspects of his physical examination were within normal limits.

The patient was premedicated with intravenous midazolam 2 mg and fentanyl 50 μg . Anaesthesia was induced with 160 mg propofol following which his vocal cords were easily seen (Cormack–Lehane grade 1) using a videolaryngoscope (GlideScopeTM; Verathon Inc., WA, USA). Both a 7.5-mm and 6.5-mm tracheal tube easily passed the vocal cords, but neither could be advanced into the subglottic region. Only a 6.0-mm tube could be successfully passed but ventilation remained difficult. Ventilation improved when the tracheal tube was advanced to 26 cm at the lips. Anaesthesia was maintained

with sevoflurane. Fiberoptic confirmation revealed the tube to be 1 cm above the carina. It remained difficult to maintain normal tidal volumes ($7\text{--}8\text{ ml.kg}^{-1}$) despite confirmation of correct placement of the tracheal tube. The surgery continued uneventfully and before the end the primary anaesthesia team was relieved by the on-call team.

Neuromuscular blockade was antagonised with neostigmine 5 mg and glycopyrronium 1 mg. A fiberoptic bronchoscopy was performed before extubation, revealing the tracheal tube to be 1 cm above the carina. The tracheal tube was withdrawn to 3 cm above the carina and ventilation became extremely difficult. Bronchoscopy showed significant tracheal compression consistent with a mass at the distal tip of the tracheal tube. Percentage oxygen saturation fell to the low 80s and an emergency summons was sent to the otolaryngology service. The bronchoscope was removed and the patient's lungs were manually ventilated, requiring peak inspiratory pressures greater than 50 cmH₂O.

The attending otolaryngologist fiberoptically verified that the tracheal tube was below the sub-glottic region of the trachea. The tip of the tracheal tube was seen to impinge onto the anterior tracheal mass. Attempts to rotate the tube were unsuccessful at moving the tube's tip off the tracheal wall. It was decided to withdraw the tracheal tube slowly while utilising fiberoptic bronchoscopy to identify the location of the compression. The anterior trachea was compressed to a diameter of 5 mm. The fiberoptic scope was able to pass this compression into normal appearing trachea that continued for 2 cm to the carina. The compression of the trachea was estimated to be at the level of the aorta and appeared pulsatile in nature. The patient's lungs became progressively more difficult to ventilate despite the end of the tracheal tube's still being below the glottic region. It was decided to investigate the effects of spontaneous ventilation. Following this, although the compression remained, the lumen improved to a patency of 2.5 cm laterally and 2.0 cm in the anterior-posterior dimension. The decision was made to withdraw the tube to the sub-glottic region of the trachea and allow the patient to emerge from anaesthesia while spontaneously breathing through the tracheal tube. With the return of spontaneous breathing the patient was comfortably able to achieve adequate tidal volumes.

For extubation it was decided to place an airway exchange catheter to provide oxygenation as well as a means to facilitate reintubation if necessary. The patient emerged from anaesthesia and the tracheal tube was removed over the airway exchange catheter once he was awake, obeying commands and breathing on his own. The airway exchange catheter remained for a further 5 min during which oxygen saturation was satisfactory.

The patient was sent for a chest CT scan in the following weeks which revealed an impingement on the trachea by the innominate artery as well as an aneurysmal dilation of the ascending aorta at 5 cm and descending aorta at 3.4 cm, that in conjunction with tracheomalacia and neuromuscular blockade, could explain the observed signs and symptoms (Fig. 1).

Discussion

We report an incident of a difficult tracheal extubation in the setting of a patient with a known difficult airway. This event highlights the often difficult and unexpected nature of airway management and the need for guidelines regarding difficult airway extubation [8, 9].

Difficult airway management occurs when the anaesthetist experiences difficulty with mask ventilation of the upper airway, tracheal intubation, or both [6, 7]. While there have been numerous attempts to predict which patients will pose problems with airway management, the difficult airway represents a complex interaction between patient factors, the clinical setting, and the skills of the practitioner [6, 7]. The fall in claims for adverse events related to the induction of anaesthesia between 1993 and 1999 compared with 1985–1992 may be attributable in part to the creation of algorithms and guidelines for the anaesthesia practitioner [1, 2]. Practice guidelines are systematically developed recommendations that assist in decision making, and while they are not

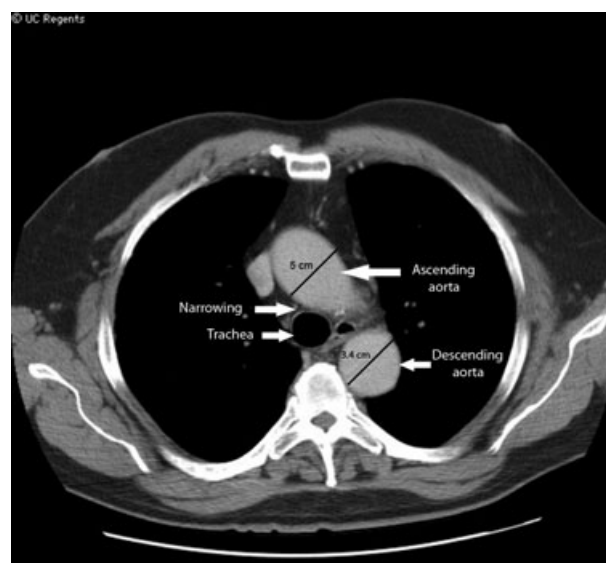


Figure 1 A narrowing of the space between the trachea and the ascending aorta, as well as an aneurysmal dilation of the ascending aorta at 5 cm and descending aorta at 3.4 cm, can be seen in this CT scan.

intended to be standards or absolute requirements, they help provide a systematic approach to difficult airway management.

The Difficult Airway Algorithm prepared by the American Society of Anesthesiologists presents the basic tenets of preparedness and forethought. A recurring theme is that the practitioner should have numerous options based on the clinical situation. Such algorithms may have had a beneficial impact on the induction period and suggest a need for additional recommendations and strategies for difficult airway management during maintenance of anaesthesia, as well as emergence and recovery.

We want to highlight the need for guidelines focusing on extubation. Current prediction models for difficult airways have no accurate means to assess the risks of a difficult extubation, despite the numerous complications that may arise at this time [4, 7]. The patient who presents with a difficult airway continues to pose problems at extubation, and is at further risk if reintubation is required [4]. While sources cite the importance of having a strategy in place before extubation, no set guidelines exist.

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