Percutaneous tracheostomy: a guide wire complication

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We report an unusual complication of percutaneous dilatational tracheostomy, in which the guide wire became lodged in the bronchial tree. The assistance of an expert bronchoscopist resulted in successful removal of a fractured J wire with no adverse sequelae for the patient. A subsequent incident has given insight into the mechanism of damage to the guide wire.

Keywords: complications, guide wire damage; equipment, guide wire; surgery, percutaneous tracheostomy

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Percutaneous tracheostomy has become the procedure of choice for patients on intensive care requiring long-term control of the airway. This is due to a combination of factors including: cost effectiveness; avoidance of transferring critically ill patients to the operating theatre; and the simplicity of the technique. In addition, the complication rate is acceptable when compared with conventional surgical tracheostomy. We describe an unusual complication while performing bedside percutaneous tracheostomies.

Case report

A 44-yr-old male developed respiratory insufficiency and deteriorated neurologically following clipping of a ruptured posterior inferior cerebellar artery aneurysm. He required artificial ventilation and the decision was made to proceed to immediate percutaneous tracheostomy, since this was his second period of assisted ventilation and ongoing neurological assessment was required.

The patient was anaesthetized using alfentanil 1.5 mg and propofol 150 mg, followed by infusions of both drugs titrated to maintain a bispectral index of 50–60. Muscle relaxation was achieved using atracurium 70 mg. A size 4 laryngeal mask was inserted before anaesthetizing the pretracheal skin with lidocaine 1%, 10 ml with epinephrine 1:200,000. A 1.5 cm skin incision was made over the first and second tracheal rings, and blunt dissection was made down to the trachea using a pair of artery forceps. Under fiberoptic bronchoscopic control, the trachea was located in a standard fashion using a needle, through which the J-tipped flexible guide wire and guiding catheter from a Portex Ultraperc single dilator kit were inserted (Portex Ltd, Kent, UK). Dilatation of the trachea was performed easily using the single dilator supplied. The 9 mm tracheostomy tube was difficult to insert so instead of redilating the lumen, a 8 mm tube was easily inserted. Although we were able to remove the white guiding catheter, the guide wire seemed to be lodged and could not be removed. The patient was easy to ventilate since we connected the tracheostomy tube to an angled catheter mount, with the guide wire going out through the suction port.

The bronchoscope was also inserted through the suction port, to investigate where the guide wire was stuck. The wire appeared intact with no obvious kinking or damage. However, the tip of the guide wire could not be seen as it passed into the bronchial tree. When traction was applied, the outer coiled distal part of the flexible wire was clearly seen to be unwinding. A chest radiograph to identify the condition and to locate the guide wire was undertaken, and the assistance of an experienced respiratory bronchoscopist was sought.

The chest radiograph (Fig. 1) showed the tip of the wire in a small loop inside the lung with no knotting evident. Using a constricting wire loop over the guide wire (Fig. 2), the wire was pulled back sufficiently to show the tip of the J-wire lying in the bronchus, with some blood obscuring the view. A pair of ‘grabbers’ was inserted down the suction port of the bronchoscope, to hold the most distal part of the wire and to prevent stretching of the outer coiled section. The whole guide wire was then successfully removed. On inspection, the external coiled section of the guide wire was intact, but the inner wire had snapped and was protruding through the coiled section at an acute angle (Fig. 3). As we had been trying to pull it out, the external coil was getting stretched and the fine inner wire seemed to be getting stuck.
in the mucosa. A repeat chest radiograph a few hours later revealed no pneumothorax. The patient went on to make a full neurological recovery and was decannulated successfully.

A subsequent straightforward percutaneous tracheostomy performed on the same intensive care unit by one of the authors (JCA), during which extra attention was paid to the wire insertion, resulted in a similar episode of the wire becoming lodged. This time, however, it was immediately noticed and bronchoscopy confirmed that, on this occasion, the wire had not gone past the carina. The fractured wire could clearly be seen before any attempts were made to withdraw it. The wire was removed using a gentle pulling force. On examination, the inner wire had obviously fractured on contact with the trachea and had gone through the outer coil, piercing the mucosa. The outer coil was not stretched as no excessive force had been required to remove it (Fig. 4).

Discussion

We describe two cases in which the inner wire of a flexible J-tipped guide wire fractured, resulting in the wires becoming lodged in the respiratory mucosa. There was no knotting in either case. The second case shed light on the mechanism of damage to the wires. Various early and late complications of percutaneous tracheostomy have been described in the literature. A Medline search found no other guide-wire-related complications. After the first case, we were uncertain as to the cause of this complication. At no point did we lose sight of the guide wire externally. We did not pay particular attention to the markings on the proximal portion of the wire, so we cannot be certain that it did not go further into the lung than intended by the manufacturer on the first occasion. Even if this did occur, with the radiographic evidence that no knotting had occurred, it would still not explain why the wire got stuck. Possible
explanations include the following. (i) The J-wire may have perforated the mucosa, hooking into the lung parenchyma, and the fracture of the inner wire may have occurred on withdrawal. (ii) The J-wire coiled back on itself, as seen on the radiograph and may have presented a very high resistance to withdrawal; the fracture of the inner wire may have occurred on withdrawal. (iii) The inner wire may have fractured. On examining the radiograph (Fig. 1B) more closely, the J-section of the wire looks as if it may have an acute angle on it. It may have kinked, causing the inner section to fracture and protrude into the mucosa. (iv) Problems could have occurred in the first case as a result of the difficulty inserting the 9 mm tracheostomy tube. Since on inspection there were no kinks higher up on the wire, it can be concluded that the skin incision was merely too small. We changed to an 8 mm tracheostomy tube to avoid having to alter the incision or redilate the passage. We do not think that this difficulty with the 9 mm tracheostomy tube caused the fracture, but it may have resulted in the wire inadvertently migrating into the right main bronchus.

After the second episode, it became obvious that the third postulated mechanism was the likeliest cause of the fracture of the inner wire. We would advocate continuing caution with the use of these guide wires, particularly in respect of the length that is inserted into the trachea. It is worthwhile intermittently pulling back on the wire to make sure it moves freely within the trachea. Unfortunately, it is not always possible to see the very distal part of the wire although, if feasible, bronchoscopic inspection may be advisable to detect such fractures early. This incident has been reported to the Medical Devices Agency and to Portex Ltd (Kent) UK.

Since submitting the manuscript for publication, it has been brought to the authors’ attention that certain batches of the equipment in question have been withdrawn by the manufacturer.

References

Fig 4 The second damaged wire in which the outer coil is not stretched, demonstrating that the inner wire had fractured.