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Tracheal ring herniation following percutaneous dilatational tracheostomy and its resection under endoscopic control

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Abstract

A 76-year-old patient had an elective percutaneous dilatational tracheostomy (PDT) under endoscopic control in the intensive care unit. Twelve days later when her general condition improved, two attempts at decannulation failed due to upper airway obstruction above the tracheostomy site.

Bronchoscopy showed herniation of the anterior tracheal wall above the tracheostomy tube occluding 80 per cent of the lumen. The herniated anterior segment was elevated and partially resected under endoscopic guidance. The patient made a full recovery and was decannulated on the first post-operative day. Pitfalls and possible complications of PDT are discussed.

Key words: Tracheostomy; Post-operative complications; Tracheal stenosis

Introduction

A secure airway is required for mechanically ventilated patients and patients unable to maintain their airway. Endotracheal intubation is indicated for providing a secure airway for up to 72 hours but has an increasing risk of complications for longer periods. Surgical or percutaneous tracheostomy reduces the risk of subglottic stenosis and laryngeal damage, facilitates tracheobronchial toilet and provides more patient comfort (Bradley, 1997).

Over the past 15 years the bedside procedure of percutaneous dilatational tracheostomy (PDT) has gained widespread acceptance as a safe and cost-effective alternative to formal surgical tracheostomy (Hazard *et al.*, 1991). As this new technique is more widely used there have been several reports in the medical literature about the pitfalls and possible complications of the technique (Ciagla and Graniero, 1992; McFarlane *et al.*, 1994; Winkler *et al.*, 1994; Marx *et al.*, 1996; Van Heurn *et al.*, 1996; Law *et al.*, 1997).

We report a symptomatic case of anterior tracheal ring herniation after PDT with full recovery after partial resection and elevation of the herniated segment at subsequent surgical exploration.

Case report

A 76-year-old female patient was found collapsed at home and admitted to hospital as an emergency. A computed tomography (CT) scan showed a dissecting abdominal aortic aneurysm with retroperitoneal haematoma. At laparotomy the aneurysm was repaired with a Dacron graft. Post-operatively the patient was ventilated on the intensive care unit (ICU).

As the patient could not be weaned off the ventilator, PDT was performed under endoscopic control and a cuffed Portex™ tracheostomy tube (size 8) inserted. A week later the patient was self-ventilating on a T-piece and was decannulated on the 12th post-tracheostomy day. However, she became exhausted and hypoxic within three hours of decannulation and the tracheostomy tube was reinserted. A repeat attempt at decannulation on the 20th post-tracheostomy day resulted in almost immediate respiratory distress and reinsertion of the tracheostomy tube.

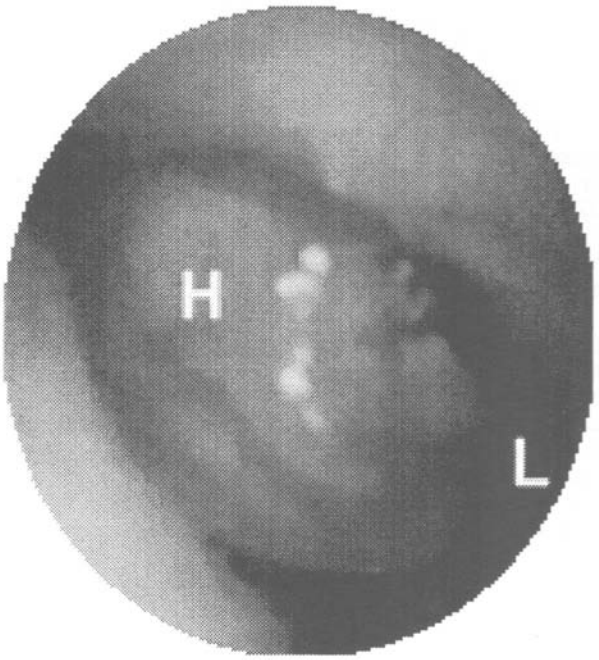

Fig. 1
Endoscopic view of the herniated anterior trachea wall.

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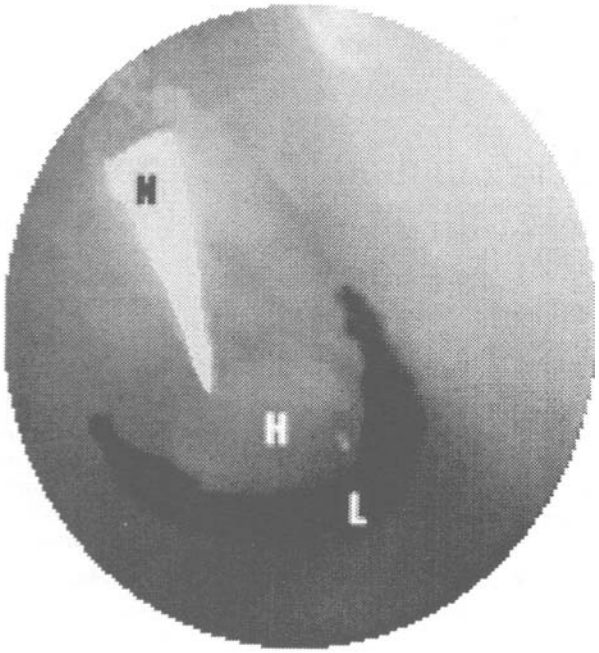

FIG. 2

A needle passed through the herniated anterior trachea wall H = herniated anterior tracheal wall, L = Tracheal lumen, N = needle.

The patient was then transferred to the ENT ward and an urgent bronchoscopy showed an 80 per cent tracheal stenosis created by protrusion of the anterior tracheal wall into the lumen above the tracheostomy tube. Dilation of this stenosis with bougies was unsuccessful.

External exploration of the tracheostomy site via collar incision with simultaneous observation by flexible bronchoscopy revealed that the anterior wall of the trachea was depressed inwards just above the tracheostomy (Figure 1). The point of maximal occlusion of the tracheal lumen seen endoscopically was confirmed externally by passing a fine needle through the trachea (Figure 2). A minimum amount of trachea was then resected allowing elevation of the remaining depressed tracheal wall.

The patient made an uneventful recovery and was successfully decannulated the following day. She was discharged home and remained well at review three months post-operatively.

Discussion

Since its first description by Ciagla *et al.* in 1985 there have been many reports on PDT and its complications in the medical literature. Although other techniques such as the Rapitrac method or guide wire dilating forceps method for percutaneous tracheostomy have been described, the dilatation method as described by Ciagla *et al.* remains the one most widely used (Powell *et al.*, 1998).

Patient selection is crucial to avoid early complications such as haemorrhage or paratracheal tube insertion. In paediatric patients or patients with a coagulopathy, goitre, aberrant jugular veins or a thick short neck PDT is contraindicated (Ciagla and Graniero, 1992).

There is also a learning curve for PDT. Trainees should avoid patients where PDT is anticipated to be difficult (Powell *et al.*, 1998).

Identification of the appropriate tracheostomy site, correct placement of the dilators and tracheostomy tube can be safely achieved with endoscopic control. This reduces the risk of injury to the posterior tracheal wall and lateral placement of the tracheostomy tube (Winkler *et al.*, 1994). In our case it is interesting to note that despite endoscopic visualization with a flexible bronchoscope the herniation of the anterior tracheal wall was not observed at the time of tracheostomy.

This is understandable in view of the fact that this complication has only once been previously reported: Frosh *et al.* (1997) presented a case with asymptomatic rupture and herniation of tracheal rings into the lumen of the trachea following PDT that was an incidental finding during bronchoscopy.

McFarlane *et al.* (1994) reported four cases of symptomatic laryngotracheal stenosis after PDT. One of these had an anterior tracheal stenosis which was resected. Unfortunately there are no details as to whether this anterior tracheal stenosis was due to a herniated tracheal ring or granulation tissue. In a prospective study of 16 ICU patients who had PDT and subsequently underwent tracheoscopy two months after decannulation Fischler *et al.* (1995) found a moderate tracheal stenosis in two cases none of which was symptomatic.

The dilation of the tracheal puncture up to 36F requires considerable pressure by the operator. As the tracheostomy tube is inserted (preferably between the first and second tracheal ring) the tracheal rings are not only forced away from the tube in a cranio-caudal direction but also pushed inwards and fractures of the rings seem to occur quite frequently (Van Heurn *et al.*, 1996). A common fault is insertion of the cannula perpendicular to the skin but oblique to the trachea which increases the risk of herniation of the tracheal rings into the lumen. This case illustrates the importance of having an experienced endoscopist present at PDT actively looking for tracheal ring herniation or rupture. When repairing a tracheal herniation it is also helpful to identify the site of maximal tracheal occlusion using an external needle seen internally via an endoscope. This will minimize the amount of trachea resected and reduces the possibility of subsequent tracheal collapse.

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