FRACTURED SILVER TRACHEOSTOMY TUBE: A CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

This report raises the question of the long term durability of tracheostomy tubes and describes a patient who inhaled part of a silver tracheostomy tube after it fractured. A review of the literature is presented, which compares the clinical presentations and methods of management described in previous reports. From this review frequent sites of tracheostomy tube fracture have been identified and a method of improvement in manufacture is suggested.

Keywords: inhaled foreign body, tracheostomy tube.

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INTRODUCTION

Silver tracheostomy tubes are commonly used in patients requiring permanent tracheostomies. This paper describes an unusual complication in which the outer tube of a King's College Hospital pattern tracheostomy tube fractured and was inhaled.

CASE REPORT

A 63 year old Chinese lady underwent total thyroidectomy in 1976 for carcinoma of the thyroid gland with tracheal and recurrent laryngeal nerve involvement and retrosternal extension. Postoperatively she was managed with a permanent tube and a silver tracheostomy tube (King's College Hospital pattern). The tube was changed every six months until this one which was not changed for just over a year because the patient did not think it necessary.

She was readmitted in 1986. On the day of admission, the patient removed the inner tube for cleaning. On attempting to reinsert the inner tube, the outer tube fractured at the junction with its neck plate and was inhaled. The patient became breathless initially but improved after a few minutes of coughing and deep breathing. She then sought medical advice.

On admission she was comfortable and not in respiratory distress. She had normal chest expansion, resonant percussion note and breath sounds were equal on both sides of the chest. A CXR showed the outer tube to be lying partly in the trachea and partly in the left main bronchus (Fig. 1). Under general anaesthesia, a 7 mm diameter Storz rigid bronchoscope was inserted through tracheostomy and the tube visualised. Bronchoscope forceps were used to grasp the tube. The bronchoscope, forceps and tube were then withdrawn simultaneously, the tracheostomy tube being trailed along outside the bronchoscope. A portex tracheostomy tube was then inserted.

Inspection of the tracheostomy tube showed that it had indeed fractured at the junction between the tube and the neck plate (Fig. 2). There were no obvious features of corrosion of the tube or neck plate at this site.

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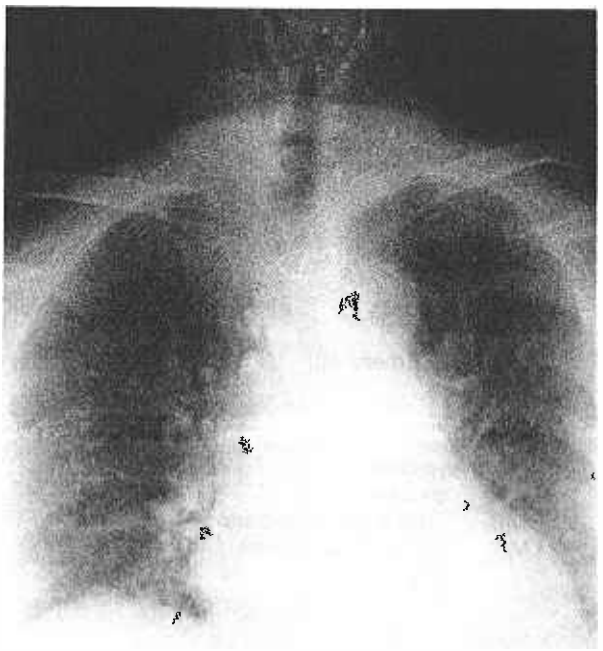

Figure 1

Chest radiograph showing the fractured tracheostomy tube in the left main bronchus

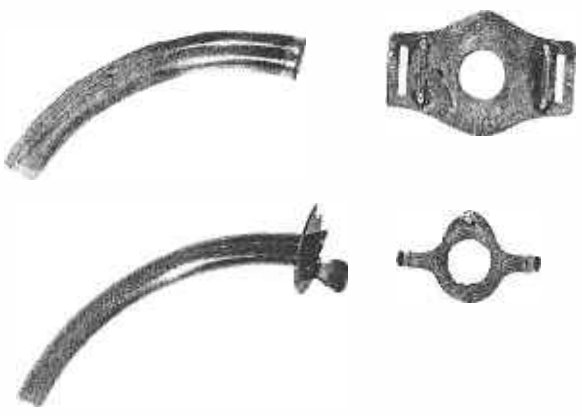

Figure 2

The fractured outer tube (above), with its inner tube and locking plate (below).

LITERATURE REVIEW AND DISCUSSION

Aspiration of a foreign body into the tracheobronchial tree is a potentially life-threatening event. Thus it is even more alarming when the foreign body happens to be part of a tracheostomy tube, an apparatus used to preserve and maintain the patency of the airway.

There have been nine previous case reports of tracheostomy tube fracture in the literature and the main features are summarised in Table 1. In one of these reports, two separate tracheostomy tubes fractured on two different occasions(1) making a total of ten fractured tracheostomy tubes reported. Rather surprisingly there were no fatalities in these reports.

Table 1
SUMMARY OF PREVIOUS CASE REPORTS

AUTHOR	YEAR	MATERIAL	WHERE LODGED	SITE OF FRACTURE
Bassoe & Boe (9)	1960	german silver (nickel & silver)	RMB	# at distal end of cannula
Kemper (5)	1972	metal (not specified)	T&RMB	inner cannul and neck plate
Kakar (8)	1972	copper & zinc	T&LMB	outer tube and neck plate
Sood (7)	1978	PVC	T	tube and neck plate
Maru et al (1)	1978	copper alloy copper alloy	1. T 2. LMB	outer tube and neck plate outer tube and neck plate
Okafor (6)	1983	silver & zinc	T&RMB	outer tube and neck plate
Otto & Davis (2)	1985	stainless steel	T&RMB	tube and neck plate
Myatt & Willatts (3)	1984	silver (Negus)	T&RMB	outer tube and neck plate
Bowdler & Emery (4)	1985	silver (Alder-Hey)	T&RMB	outer tube and neck plate
Majid*	1988	silver (KCH)	T&LMB	outer tube and neck plate

Key to symbols:
T trachea
RMB right main bronchus
LMB left main bronchus
* this paper

Eight of the reported patients were males and one was female. Their ages ranged from 3 years(2) to 76 years(3). Nine of the tracheostomy tubes were made of metal and one was of PVC. The pattern of the tracheostomy tube was not specified in all cases but included Negus and Alder-Hey(4) patterns. The length of time the tube had been worn by the patients before fracturing varied from a few days(5) to eight years(6). The presentations ranged from acute with respiratory distress occurring shortly after tube fracture and inhalation(5), to chronic with no symptoms for several years(1). Two of the tubes were lodged in the trachea, two in the left main bronchus and six in the right main bronchus (Table 1). All tubes were removed by bronchoscopy and no patients required a thoracotomy for removal. Bronchoscopy was performed by the transtracheostomy route to remove six of the ten tubes (1,3-7) but the route was not mentioned in the remaining reports.

In eight of the ten tubes, the site the tube fractured was the junction between the tube and the neck plate (Table 1). These tubes were made of various materials: two were silver, two a copper containing alloy, one stainless steel, one silver-zinc alloy, one PVC and one unspecified metal. It is likely that in this group, the material used to bond the tube to the neck plate was either defective or underwent some change resulting in the fractures. Kakar (8) has pointed out that corrosion of a tracheostomy tube made of copper and zinc may occur. Bowdler and Emery (4) point out that in the silver Negus and Alder-hey tubes a copper and zinc material 'Silver-Flo 55' is used to hold the neck plate to the tube and that erosion may occur at this point.

In the remaining two tubes the site of tube fracture was close to the junction with the neck plate in one and at the distal end of the tube in the other. In these two tubes corrosion of the tube itself was thought to be the cause of the tube fracture. The former was made of a copper zinc alloy (8) and the later was of german silver (9).

All the above tracheostomy tubes were inserted with a view to an extended period of intubation. This raises the question of which tracheostomy tube is safe for long term use. From the literature review it would appear that by virtue of their mode of manufacture, few if any are. The weak spot appears to be the site where the tube is fixed to the neck plate. Thus both metal and plastic tracheostomy tubes can be made safer if at manufacture the tube and neck plate were moulded in one piece. The earlier tubes made of german silver and copper zinc alloys are liable to corrode and of course

these materials should no longer be used.

In summary, a silver tracheostomy tube fractured and was aspirated into the left main bronchus. Review of the literature revealed that a similar fracture occurred at the joint between the tracheostomy tube and its neck plate in eight out of ten fractured tubes. It is therefore suggested here that in order to make tracheostomy tubes safer the tube and its neck plate should be made from one piece of corrosion resistant material.

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