

REPAIR OF TRACHEAL TEAR DURING OESOPHAGECTOMY USING THE MOBILISED STOMACH

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ABSTRACT

Tracheal tears are not as uncommon as initially thought. The resultant insufficiency and hypoxia can be life-threatening. The keystone in management is early recognition and diagnosis. Immediate surgical repair is essential.

Keywords: Tracheal tear, respiratory insufficiency, surgical repair.

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INTRODUCTION

Tracheal tears are not uncommon as initially thought, especially during oesophagectomy for carcinoma of the oesophagus. Various factors play a role in the initiation and extension of these tears. The tracheal cartilage is C-shaped, with its open end posteriorly. Thus the posterior tracheal wall gains some support from the normal oesophagus. Carcinoma of the oesophagus may cause weakness of the posterior membranous tracheal wall by tumour infiltration. The posterior tracheal wall now becomes vulnerable to even trivial trauma during endotracheal tube intubation and cuff distension. A tracheal tear initiated may extend due to further overhandling during repositioning of the patient during the various stages of an oesophagectomy and reconstruction.

A sudden insufficient ventilation with resultant hypoxia will alert the anaesthetist to a possible tracheal tear. Recognition and immediate surgical repair is essential. Airway control should be obtained first either by tracheostomy or use of bronchial tubes. Repair of the tear is then done either by primary closure or use of regional vascularised pedicle flap. We describe a case of successful repair of a tracheal tear during oesophagectomy using the mobilised stomach.

CASE REPORT

A 56-year old lady presented with progressive dysphagia of four months' duration. At admission she was able to swallow only fluids. She weighed 43 kg and was 1.2m in height. A barium swallow examination revealed an irregular narrowing of the mid-oesophagus with shouldering of the proximal end and extending from the lower border of the 4th thoracic vertebrae to the upper border of 6th thoracic vertebrae. Pre-operative routine laboratory investigations were normal. Computerised axial tomography of the mediastinum showed no tracheo-bronchial invasion by tumour. On endoscopy an ulcerated tumour was seen at 25 cm from the incisors which extended up to 4 cm distally. A biopsy done proved the tumour to be a moderately differentiated squamous cell carcinoma of the oesophagus.

The patient was scheduled for a three-stage oesophagectomy. Anaesthesia was induced with thiopentone 175 mg, succinyl choline 100 mgm and vecuronium 8 mgm intravenously.

The patient was intubated using the endotracheal Carlens tube. Through a right posterolateral thoracotomy an oesophagectomy was performed. The thoracotomy was closed and patient then turned to lie supine. The anaesthetist at that time felt that the endotracheal tube was not in the correct position due to insufficient ventilation and even after few adjustments there was no improvement. The endotracheal tube was then changed to a single lumen No. 8 Portex tube. Following this procedure the right chest tube was found to be bubbling air continuously. At this juncture, we were unable to ascertain the aetiology of the persistent pneumothorax. The air entry into both lungs was thought to be satisfactory.

The next stage of synchronous exposure of the left neck for the cervical oesophagus and upper mid-line laparotomy for mobilisation of the stomach was initiated. During the neck dissection a bluish bulge suggestive of a cyst in the retrosternal region behind the trachea was seen. This was later identified as the cuff of the endotracheal tube bulging out of the torn posterior tracheal wall. The balloon was deflated and the tear was found to extend up to the carina (Fig 1) with the tip of the endotracheal tube protruding out at the lower end. It was difficult to maintain an adequate airway as nearly half the tidal volume was bubbling out of the right chest tube. Manual assistance of ventilation was performed with a finger inserted through the suprasternal region and elevating the balloon so that the tip of endotracheal tube would lie in line with the lower tracheal lumen. With the assistant supporting the endotracheal from slipping out from the tear, a tracheostomy was performed. A Portex tracheostomy tube (size 33) was inserted. Inadvertent excessive balloon insufflation at this juncture further extended the tear proximally aggravating the

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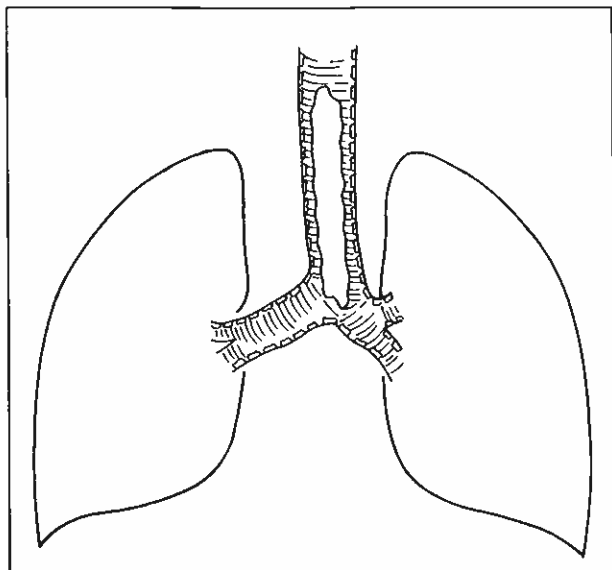
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Fig 1. - Tracheal tear extending from third tracheal ring down to carina.



situation. In order to provide adequate ventilation, two Portex size 5 tubes were inserted through the tracheostome into each bronchus. They were positioned for adequate ventilation with the aid of fluoroscopy; on the right side the tip of the tube was seated just above the take off of the right upper lobe bronchus (Fig 2). The tubes were then fixed and both lungs were independently ventilated. The tracheal tear had extended from the carina upwards to the third tracheal ring. The torn posterior wall was ragged and membranous and retracted towards the cartilaginous ends, thus leaving bare the whole posterior wall of trachea. The stomach which was mobilised to be used as an oesophagus substitute was pulled up through the posterior mediastinum, behind the trachea and anastomosed to the anterior end of the cervical oesophagus, on the left side of the neck.

The stomach was tucked all around the posterior aspect of the trachea and anchored with two sutures on the left. The serosal wall of the anterior surface of the stomach appeared to be an adequate substitute for the posterior membranous wall of trachea (Fig 3).

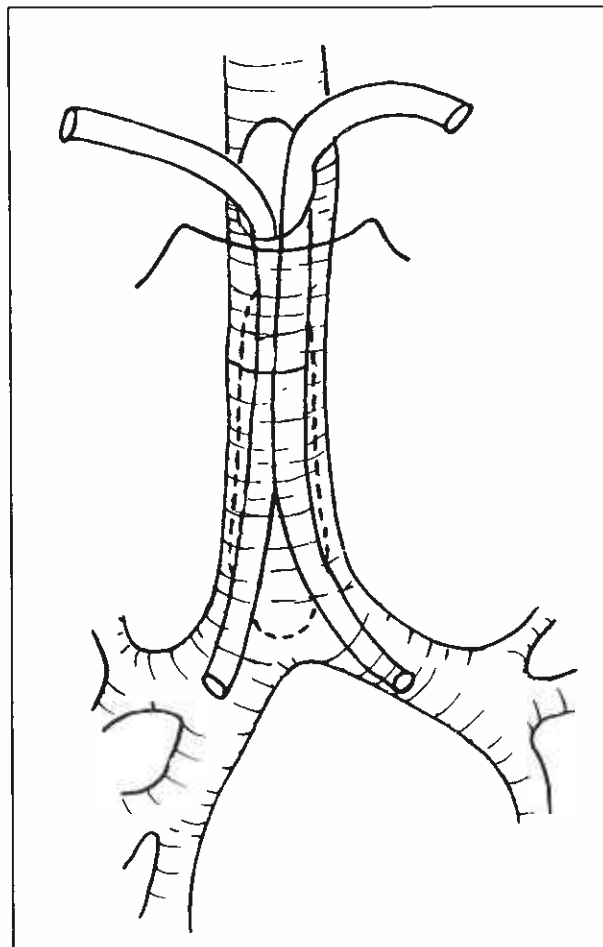
The neck wound was loosely closed over a gauze soaked with antiseptic solution. This was changed daily. The right and left endobronchial tubes were connected to separate ventilators for respiratory support.

On the 18th post-operative day, a bronchoscopic examination was performed and the posterior wall was found to be intact and the trachea noted to have a good lumen. On the 18th post-operative day, both endobronchial tubes were removed and a Portex tracheostomy tube was inserted, and the patient slowly weaned off the respirator. Barium swallow done on 25th post-operative day revealed a satisfactory conduit for the bolus with no anastomotic leak. The Portex tracheostomy tube was changed to a metal flanged one. She was able to feed well and continued breathing through the metal tracheostomy tube. On the 53rd post-operative day she was discharged from hospital.

DISCUSSION

The posterior wall of the trachea is vulnerable to injury as it is membranous and lacks cartilaginous support. The oesophagus which forms the posterior relation of the trachea lends to it a natural support. External injury causing tracheal rupture is well documented, whereas tracheal tear caused by intubation is uncommon, although recent reports have shown it to be less

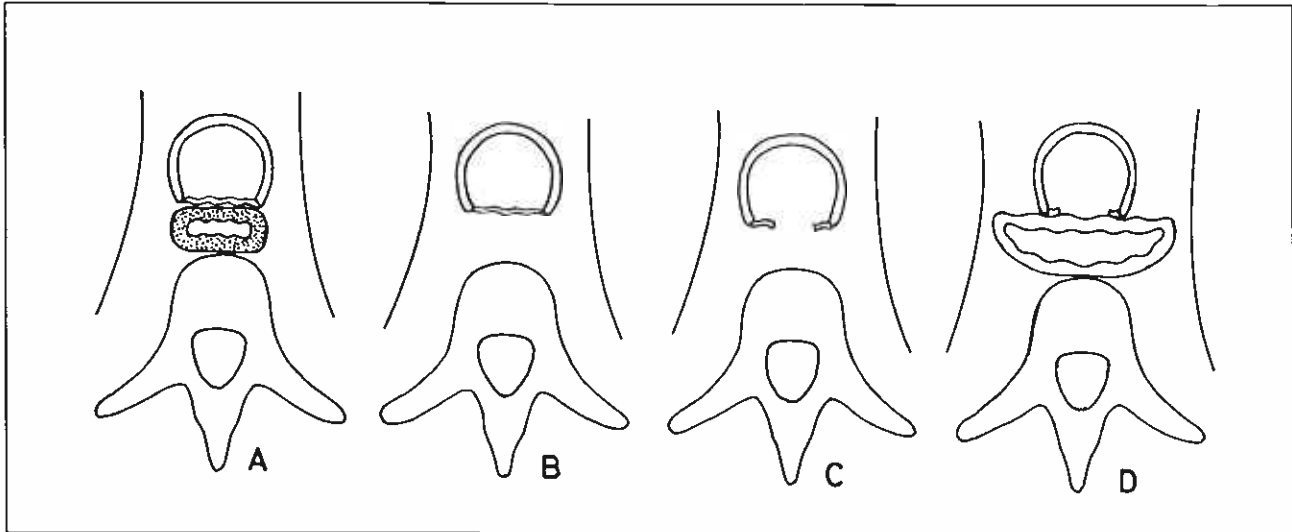
Fig 2. - Shows the 2 Portex endotracheal tubes in position.



rare than previously suspected⁽¹⁻³⁾. Various factors have been implicated in such cases. Over distension of the cuff, tip of the stylet protruding from the tracheal tube during intubation, distortion of the tracheal anatomy, adhesions to metastatic lymph nodes, weakening of the membranous trachea from surgical dissection or tumour infiltration are the various reasons implicated for tracheal tears^(3,5). The trachea is especially vulnerable to tears during oesophagectomy for carcinoma of oesophagus. Besides the reasons mentioned above, this extensive procedure involves various stages wherein the patient is re-positioned and the endotracheal tube liable to be handled. The trachea, which now lacks its posterior support is at risk of injury by the distended cuff and a tear results. The cuff then herniates through the rent to extend the tear. If unrecognised this leads to potentially dangerous complications⁽⁴⁾.

Early recognition and management is essential. The anaesthetist may experience sudden insufficient ventilation during surgery. The signs and symptoms can be misleading; however, subcutaneous emphysema, persistent or tension pneumothorax should draw attention to the possibility of a tracheal tear. During surgery this is easily recognised when the cuff is seen in the neck protruding through the posterior wall of the trachea. The management of the tracheal tear is surgical. Early control of the airway is essential, by a tracheostomy and use of bronchial tubes to maintain controlled ventilation beyond the tear. In the majority of the cases reported due to intubation injuries, the tear has been noted to be within 2-5 cm of the carina⁽³⁾. In managing airway injuries of this region, double lumen tubes should be avoided, because of the risk of extending

Fig 3. - A: Normal anatomy. B: Trachea lacking the support of oesophagus. C: Tracheal tear in membranous wall. D: Mobilised stomach providing support for tear.



the injury. A long endotracheal tube may be positioned for single lung ventilation until the tear is repaired or as in our case, two endobronchial tubes passed into each lung for ventilation. Primary repair with interrupted non-absorbable, mono-filament sutures is recommended for linear tears where repair will not compromise the lumen. The suture lines are reinforced with sternomastoid or cervical strap muscle flap. For distal tears of the trachea latissimus dorsi, intercostal muscle, pleural or pericardial flaps have been used for repair⁽⁷⁻⁹⁾. Attempts at reconstruction of trachea with grafts fascia, perichondrium, tibial periosteum, oral mucosa, dermis, skin and urinary bladder have been made with varying degrees of success^(3,7,9).

In our patient with such an extensive tear involving the whole of the posterior tracheal wall from the level of the third tracheal ring to the carina, we decided to use the already mobilised stomach as the vascularised flap. The blood supply was maintained by the vascular arcade on the lesser and greater curve fed by the right gastric and right gastroepiploic vessels. The stomach was brought up into the neck through the diaphragmatic hiatus, lying in the posterior mediastinum. The serosal surface on the anterior wall of the stomach was placed behind the trachea to act as its posterior wall. Two sutures were used to anchor the stomach to the trachea on the left side. The patient recovered uneventfully. Bronchoscopic examination revealed a healthy posterior tracheal wall with no evidence of tracheal stenosis.

CONCLUSION

Tracheo-bronchial injury resulting from intubation is a rare complication. When this occurs during an oesophagectomy, it can result in sudden insufficient ventilation. The membranous posterior wall of the trachea, devoid of its normal support

from the oesophagus, becomes vulnerable to even trivial trauma from the endotracheal tube; due to over-distension of the cuff, intraluminal stylet, excessive manipulation of the tube, tracheal abnormalities, weakness of the posterior wall of trachea from tumour infiltration and rough handling at intubation. We herewith report a patient who sustained an extensive tracheal tear which was successfully repaired using the mobilised stomach to cover the defect.

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