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Case report

Surgical management of huge tracheo-oesophageal fistula with oesophagus segment *in situ* as replacement of the posterior membranous wall of the trachea

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Abstract

Tracheo-oesophageal fistula (TEF) is an uncommon and potentially life-threatening complication of blunt chest trauma. We describe our surgical experience in a patient with huge TEF (5.6 cm in diameter) and evaluate the short-term results of surgical management by oesophageal exclusion (cervical gastro-oesophagostomy) and show that the use of oesophagus segment *in situ* as replacement of the posterior membranous wall of the trachea is feasible. Improving the nutrition status and controlling the lung infection were critical in the perioperation period.

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1. Introduction

Tracheo-oesophageal fistula (TEF) is a very uncommon and potentially life-threatening complication of blunt chest trauma [1]. After diagnosis is confirmed, surgical repair must be carried out as soon as possible [2]. Closure of the membranous trachea in one layer and closure of the oesophagus in two layers, which are membrane and muscle layer, is commonly undertaken [3]. Structural interposition between the trachea and oesophagus is advised to decrease the recurrence of TEF and can be achieved either with a muscle (intercostal, sternothyroid, sternocleidomastoid, strap) or pericardial/pleural flap to separate the lumen of trachea and oesophagus [2,4–8], as well as with fibrin glue being applied together [9]. However, for patients with a huge TEF, that is TEF greater than 5 cm, surgical repair is difficult to perform as the huge defect and necrosis of local tissues after the blunt chest trauma may be accelerated with concurrent infection and chemical erosion. The objectives of this article are to describe our surgical experience in a patient with a huge TEF and to evaluate the short-term

results of surgical management in this potentially life-threatening complication of blunt chest trauma.

2. Case report

A 6-year-old boy was referred to our department from a hospital in Shanghai, P.R. China, due to choking after taking food. Six months prior to referral, the child was severely injured in an automobile accident and during recovery he required a tracheotomy and gastrostomy for 5.5 months. He was initially evaluated and diagnosed with a traumatic TEF by oesophagoscopy and bronchoscopy in an Emergency Department, Anhui province, P.R. China. He was then referred to a children's hospital in Shanghai, P.R. China, where tracheotomy and gastrostomosis were performed to stabilise his ventilation and nutrition. After stabilising and receiving symptomatic treatment, his condition improved. He was then referred to our department for further evaluation and treatment.

On admission we noted the child to be thin and small, with a weight of 15 kg. On examination, the tracheostomy cannula was unobstructed, the inferior extremity of which reached at the level of carina; on auscultation, moist and coarse rales in the lungs were noted; the gastric stoma duct over abdomen was unobstructed, and fluid nutritional diets could successfully pass through gastric stoma duct. After bronchoscopy and three-dimensional reconstruction examination of the chest

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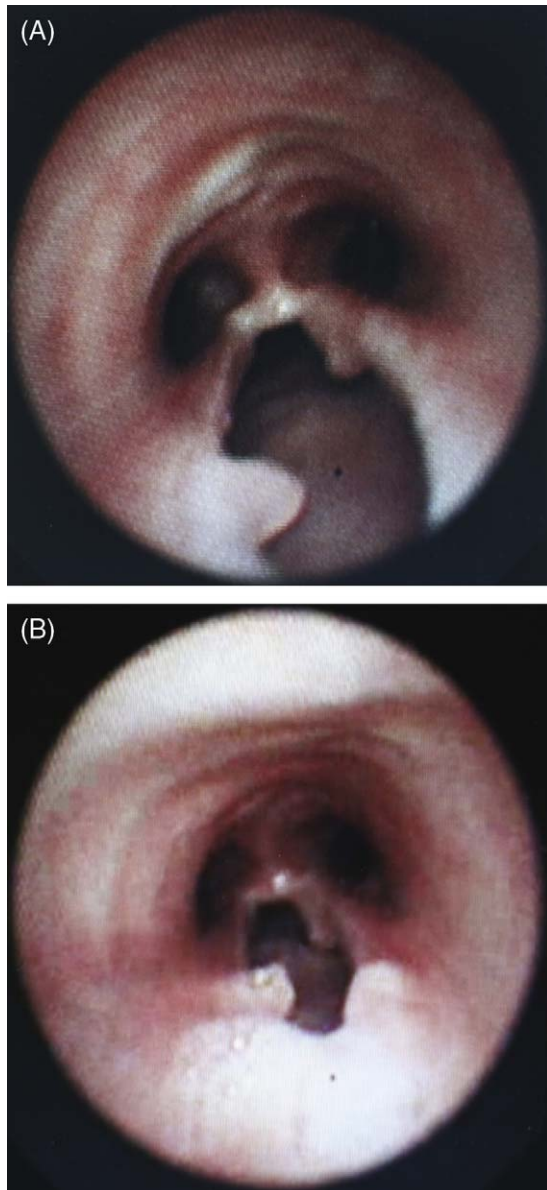


Fig. 1. (A) Bronchoscopy shows the tricho-oesophageal fistula about 5.6 cm in diameter. (B) The membranous portion of trachea with oesophagus functioned well after 8 months of operation.

computed tomography (CT) scan, a diagnosis of huge TEF was confirmed with the fused common cavity between oesophagus and trachea measuring 5.6 cm in length (Fig. 1A). The child's case was further complicated with bilateral lower lobe pneumonia associated with gastric reflux and aspiration.

Prior to definitive repair, a successful jejunostomy was performed to maximise nutrition and prevent further aspiration. Enteral nutrition was administered through a jejunal fistula. The gastric fistula was then connected through an external vacuum extractor to reduce pulmonary inflammation caused by chronic gastric reflux into lungs. The patient's condition significantly improved with supportive care and his weight began to increase. After a month of supportive care and with careful preparation, both sides of the proximal and distal TEF were closed through Endo-GIA, replacement of the membranous trachea with dislocated

oesophagus *in situ* and oesophageal–gastric anastomosis over the left neck through a meta-sternal tunnel were performed through the two incisions at neck and upper central abdomen without the need for thoracotomy on 5 September 2007.

Tracheal intubation was discontinued 2 h after the operation and the patient could breathe and expectorate on his own. He was able to take an oral diet by postoperative day 10 and he was discharged home 18 days later. Bronchoscopy performed 4 months after the operation indicated mucous membrane of oesophagus replacing membranaceous tracheae satisfactorily (Fig. 1B). The patient

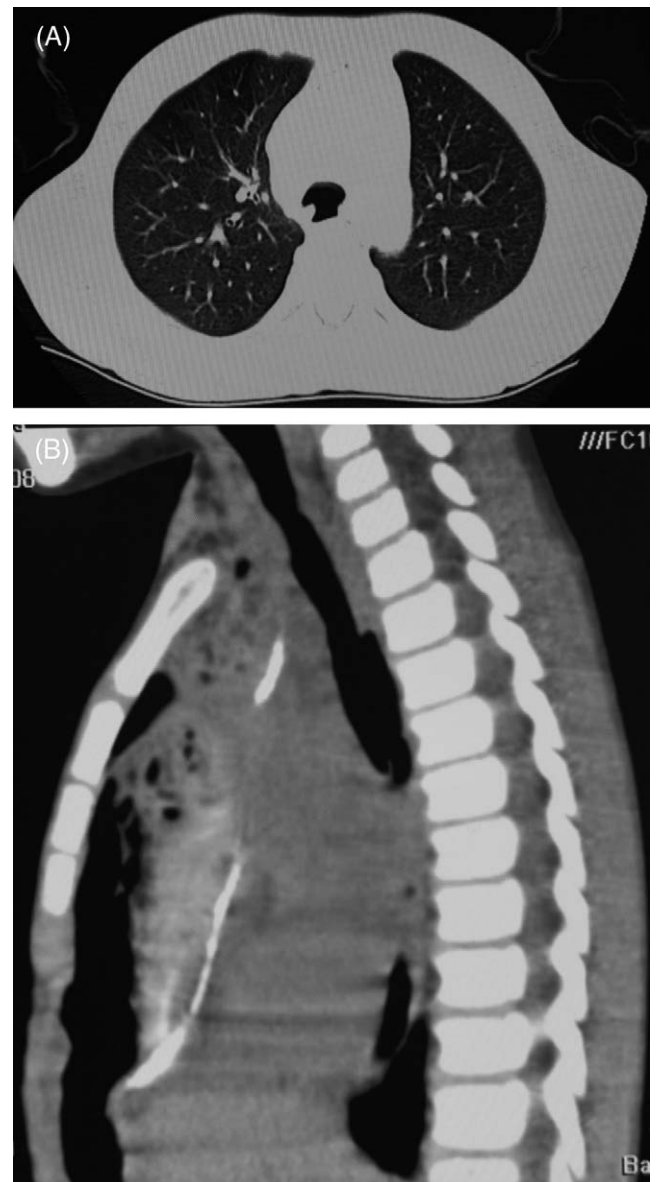


Fig. 2. Follow up CT scans after 9 months of operation. (A) CT scan shows no obvious difference of the diameter between the front and the back of the residual cavity of the trachea. Lung window shows clear lung markings, there is no reflux of the existence of pneumonia. (B) CT reconstruction shows the whole of the longitudinal section of the trachea, no obvious difference of the diameter between the front and the back of the residual cavity, no secretions at the bottom of the residual cavity.

was able to resume normal activities including returning to school. Upon follow-up after 9 months of operation, his pulmonary function tests indicated: FVC 55.00%, FEV1 60.76%, FEV1/FVC 90.52%; airway resistance guideline: total resistance of respiration was 134%, viscosity resistance under 5 Hz was 130%; and no obvious difference of the diameter between the front and the back of the residual cavity of the trachea, no secretions at the bottom of the residual cavity, lung window shows clear lung markings and there is no reflux of the existence of pneumonia (Fig. 2).

3. Discussion

We successfully treated the patient with huge TEF after blunt chest trauma by oesophageal exclusion (cervical gastro-oesophagostomy) and incorporated an oesophagus segment *in situ* as replacement of the posterior membranous wall of the trachea. To our knowledge, this is the first report of this method to treat patients with huge TEF after blunt chest trauma. The risk of operation was decreased greatly since this direct and simple procedure not only blocked the reflux to trachea, but also avoided further surgical intervention in the inflammation, oedema and necrosis area. Furthermore, the trachea and the tube stomach were separated after reconstruction since the tube stomach was located in anterior mediastinum, but trachea in postmediastinum; this would also avoid TEF recurrence. By using this surgical method to treat the huge TEF, two questions have to be considered. First, whether the oesophageal cavity that remained *in situ* affected the patient's pulmonary function in the short term and in long term. Second, whether the secretion from remained oesophageal cavity *in situ* continually cause the pulmonary

infection. In our case, self-breathing was achieved at 2 h after removing tracheal intubation. The patient began oral nutrition 9 days after the operation and was discharged home on day 18 after operation. He has resumed normal activities of daily living. The lung function and airway resistance recovered well during the follow-up 9 months later.

In summary, huge TEF is a rare and potentially fatal complication of blunt chest trauma. In our case, the surgical management of patients with huge TEF by oesophageal exclusion (cervical gastro-oesophagostomy) and use of oesophagus segment *in situ* as a replacement of the posterior membranous wall of the trachea is feasible. Improving the nutrition status and controlling the lung infection were critical in perioperation period.

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