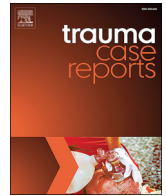


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# Trauma Case Reports

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## Case Report

# Penetrating shrapnel injury to the chest presenting as a delayed tracheoesophageal fistula (TEF). A case report

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### ARTICLE INFO

#### Keywords:

Penetrating  
Trauma  
Tracheoesophageal fistula  
Tracheobronchial  
Nonmalignant

### ABSTRACT

Tracheo-esophageal fistulae (TEF) due to trauma are rare. We report a case of a delayed TEF caused by a shrapnel from a blast.

A 25-year-old male was admitted to the hospital after sustaining a blast injury. A contrast CT scan of the chest and neck revealed the presence of metallic shrapnel in close proximity to the tracheo-esophageal groove at the level of the thoracic inlet. Bronchoscopy revealed 0.5 cm tear in the membranous trachea while esophagoscopy and contrast swallow were normal. Coughs after starting fluid intake triggered a repeat endoscopy that showed a large TEF at 22 cm from the incisors. He underwent surgical repair through a collar incision and limited sternotomy. The TEF extended for 2 cm. The esophagus was repaired in two layers, the membranous trachea was sutured primarily, and an interposition strap muscle flap was placed. A contrast swallow on postoperative day 7 revealed the presence of a small leak into the trachea that was treated conservatively.

Traumatic TEF are rare and should be suspected in patients with injuries to proximal structures. Delay in diagnosis and appropriate management can conceivably lead to death.

### Case presentation

We are presenting the medical case of a 25-year-old male who was injured in a blast. The patient was admitted to a peripheral hospital at the time of the injury. He sustained multiple shrapnel injuries with points of entry in the base of the neck and right shoulder posteriorly with no point of exit. A contrast CT of the neck and chest showed multiple shrapnel in the subcutaneous tissues in the neck as well as a shrapnel in the mediastinum that followed a trajectory starting at the base of the neck posteriorly and lodged in close proximity to the trachea and esophagus caudal to the thoracic inlet. The CT scan also showed pneumomediastinum and bilateral pleural effusions. Bronchoscopy revealed a 5 mm laceration to the membranous trachea, 8 cm proximal to the carina. An esophago-gastro-duodenoscopy (EGD) was normal. Five days later, the patient started coughing on swallowing fluid diet. Oral feeding was stopped and replaced with parenteral nutrition. The patient was then transferred to our center for further management of traumatic tracheoesophageal fistula. He was hemodynamically stable. A chest computed tomography (CT) with IV and oral contrast showed a TEF at the thoracic inlet (Fig. 1a & b). An intraoperative EGD was performed and confirmed the fistula (Fig. 2). The TEF was exposed using a collar incision combined with a partial sternotomy. The esophageal defect measured 2 cm and the tracheal injury spanned three cartilage rings. The mucosa was sutured using 4-0 continuous polydioxanone (PDS) sutures and the above muscular layer was approximated with ease using interrupted 3-0 PDS sutures. The membranous part of the trachea was sutured using 3-0 PDS without undue tension and a flap utilizing the left strap muscles was rotated and fixed between the tracheal and the esophageal suture

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<https://doi.org/10.1016/j.tcr.2018.09.002>

Accepted 18 September 2018

Available online 26 September 2018

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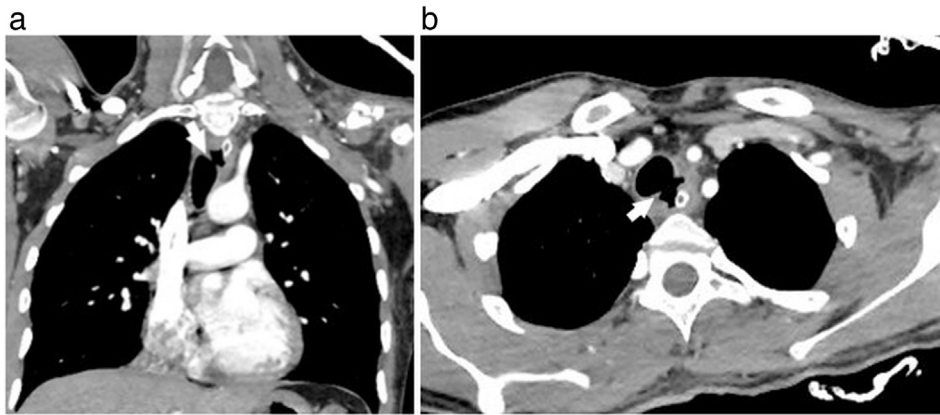


Fig. 1. CT scan showing the TE fistula (arrow) on coronal (a) and axial views (b).

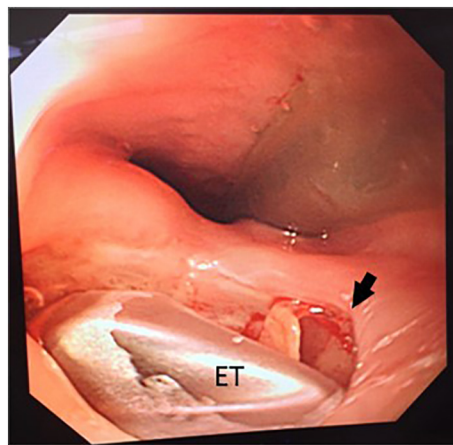


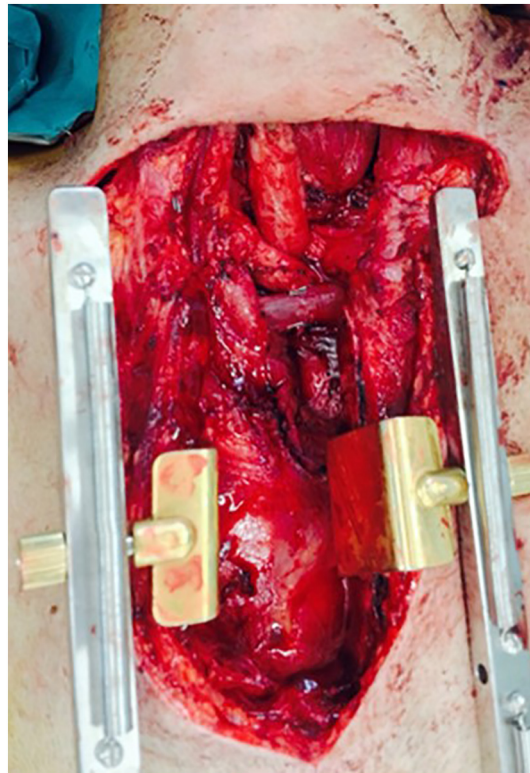
Fig. 2. Esophagoscopy image showing the cuff of the endotracheal tube (ET) confirming the presence of the TEF (arrow) at 20 cm from the incisors.

lines with 3-O PDS sutures (Fig. 3). On the first postoperative day, the patient was weaned off the ventilator and on the second, the patient passed the shrapnel through his rectum. A Barium swallow performed on the 5th postoperative day showed minor contrast leak to the trachea (Fig. 4a), consequently the patient was kept nil per os and a nasojunal (NJ) feeding tube was inserted under fluoroscopy, through which he received feeding for two weeks. After which, a follow up swallow showed complete healing of the fistula (Fig. 4b).

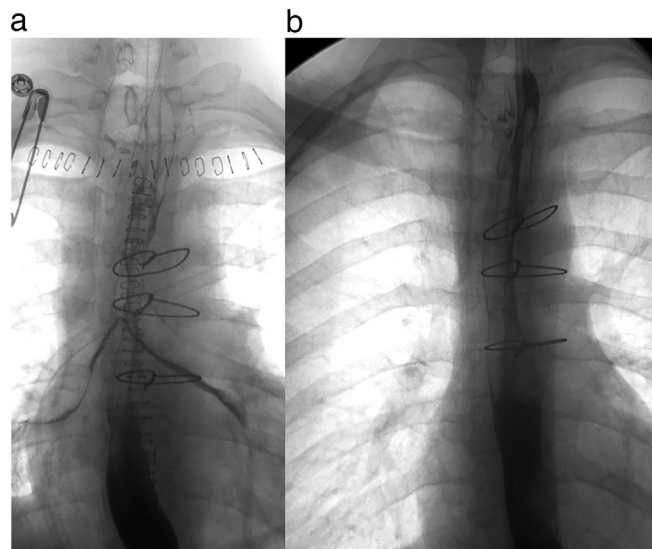
## Discussion

Tracheoesophageal fistula is a rare and abnormal communication between the trachea and the esophagus that can be life-threatening and challenging to repair [1]. Early diagnosis and management are of paramount importance to prevent major complications [1]. TEFs might not be apparent initially after the injury with subsequent Ono's sign (uncontrolled coughing after swallowing) usually raising the suspicion [2–5]. Because of that, the time of diagnosis ranges from few days up to two years after sustaining the trauma [3–6]. In this patient, the initial CT showed a shrapnel in the tracheoesophageal groove and bronchoscopy revealed a small laceration to the membranous trachea, nevertheless; esophagoscopy was normal. The probability of developing a TEF in that instance is high and an immediate exploration to remove the shrapnel and repair the injury before the development of a clinical TEF is indicated. Tracheoesophageal fistula was highly suspected when our patient developed a positive Ono's sign five days later, possibly due to insidious erosion of the shrapnel through the esophageal wall. The diagnosis of TEF can be established by contrast esophagography, esophagoscopy, or bronchoscopy [6,7]. High clinical suspicion is required in those cases as proximal TEFs may be missed if the endotracheal tube is not removed and the proximal membranous trachea is not exposed for exploration [6].

A definitive one-stage surgical repair is most commonly performed in trauma and other non-malignant cases [3,4,6]. Controlling sepsis is essential before any surgical intervention. Advancing the endotracheal tube distal to the fistula, elevating the head of bed, withholding oral feeding, decompressing the stomach by a nasogastric tube or a gastrostomy and enteral feeding through a jejunostomy tube, or a nasojunal tube are necessary steps. The specific surgical strategy is determined by the location of the fistula, length of the tract, and the degree of injury of both the trachea and esophagus. The preferred approach is through a low collar



**Fig. 3.** Lower collar incision with a limited sternotomy. Post-repair image.



**Fig. 4.** (a) Early upper GI swallow showing minor leak in the early postoperative period. (b) Leak resolved with conservative management two weeks post-operatively.

incision for high TEFs while a right thoracotomy through the fourth interspace is preferable for TEFs at or just above the carina [6]. Tracheal resection and re-anastomosis should be done if the injury to the trachea is extensive [6]. With proper mobilization about half of the trachea can be resected with primary anastomosis. Alternatively, tracheal resection is avoided in cases of small defects or no tracheal stenosis [6,7]. An interposition muscle flap, described by Feliciano et al. [8], is used to isolate the suture lines [3,7]. The vascularized interposition flap could be a muscle, pleural, or an omental flap [3,4]. We closed both esophageal and tracheal defects primarily using absorbable sutures and an interposition strap-muscle flap was fashioned between the trachea and esophageal repair.

Minor or early postoperative leak can be managed conservatively and local endoscopic intervention (cyanoacrylate glue

application) was described in one non-healing case [1,4,9]. In our case, an early post-operative leak was managed by restricted oral intake and NJ nutritional support. The leak resolved completely.

Endoscopic treatment for TEFs has been described in few cases with varying success rates [10]. In our opinion, definitive surgical repair should be done as soon as possible to control respiratory sepsis. On the other hand, repair of recurrent TEFs presents a more complex procedure when needed [7].

## Conclusion

Although their incidence is rare, TEF should be suspected when sudden respiratory symptoms occur in patients with tracheoesophageal injuries. Control of tracheobronchial contamination should be done as soon as the diagnosis is established. Definitive one-stage repair is most commonly done in trauma cases with good outcomes. Delay in, or missed, diagnosis may lead to aspiration, mediastinitis and death. Minor early post-operative leak can be managed conservatively. NJ tube, inserted under fluoroscopy guidance, can be used for nutritional support.

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