

Case Report

Tracheoesophageal Fistula: Bridging the Gap by Over-the-scope Clip Services

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ABSTRACT Tracheoesophageal fistula (TOF) can be congenital or acquired. Acquired TOF can be caused by iatrogenic or traumatic or due to malignancy with pulmonary infection or aspiration being the presenting symptom. Management of TOF is associated with high mortality and morbidity and remains an interdisciplinary challenge. In general, depending on the size and location of the tracheal aspect of the fistula, surgical therapy involves primary repair of the fistula and, if necessary, resection and reconstruction of the trachea. We present two cases of iatrogenic TOF following surgery successfully closed using over-the-scope clips. This report also compares both the Ovesco and Padlock clip devices.

KEYWORDS: Endoscopic closure devices, over-the-scope clips, tracheoesophageal fistula

INTRODUCTION

A tracheoesophageal fistula (TOF) is an abnormal communication between the trachea and the esophagus due to either a congenital or an acquired condition. Congenital TOF is due to an incomplete development of the tracheoesophageal septum occurring between the 4th and 8th week of the embryonic period.^[1] Acquired TOF is secondary to malignancy, infections, or traumatic which is either mechanical or iatrogenic.^[2] Endotracheal tube (ETT) cuff-related trauma contributes to the majority of TOFs in the nonmalignant group. The incidence of tracheal erosion as a result of an ETT in mechanically ventilated patients is 0.3%–3%.^[3] TOFs are thought to be due to erosion from the tube tip or cuff into the posterior wall of the trachea to result in a fistulous communication with the esophagus. The other etiologies of iatrogenic complication include endoscopic procedures (e.g., endobronchial brachytherapy) or lobectomy.^[4]

TOF may present with recurrent aspiration pneumonia or recurrent hypoxemic events, which may prolong the duration of mechanical ventilation. TOF may also present with acute respiratory distress, evidence of enteral feed in ETT aspirate during suctioning, positive air leak, and gastric distension.^[5]

This case report describes two cases of TOF closure using over-the-scope clips. Both TOFs are successfully

closed – one by Padlock and another by Ovesco clips. Both the patients did well and were asymptomatic for 1–6 months after the placement of clips.

CASE REPORTS

Case presentation 1

A 56-year-old male presented with a 7-year history of cough on swallowing liquids and recent onset postprandial chest pain. He had recurrent lower respiratory tract infections requiring multiple courses of oral antibiotics. He was diagnosed to have chronic bronchitis at an outside hospital. He had no vomiting or gastrointestinal (GI) bleeding. He had a history of the right posterolateral thoracotomy at the 5th intercostal space for suspected lung tumor 7 years back, and the operative details were not available. He had no addictions.

At the time of her presentation, his complete blood count and differential were normal.

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Esophagogastroduodenoscopy (EGD) was performed which revealed a pseudodiverticulum at 26 cm and a fistulous opening at 30 cm from incisors [Figure 1]. A barium esophagogram revealed a fistula between the lower esophagus and segmental bronchus of the right lower lung field [Figure 2]. The option of endoscopic closure and surgery was discussed with the patient and the relatives, and the following procedure was performed. Under conscious sedation, endoscopy was performed using forward-viewing single-channel gastroscope (GIF 180; Olympus Optical Co., Ltd., Tokyo, Japan). Padlock Clip (Aponos Medical, Kingston, NH, United States) was successfully deployed for the closure of esophageal edge of the fistula site. Repeat barium swallow confirmed closure of TOF [Figure 3]. He was asymptomatic at 9-month follow-up.

Case presentation 2

A 19-year-old male sustained road traffic accident and was operated in a referral hospital for lacerated neck wound and fracture of the mandible. Postsurgery, he

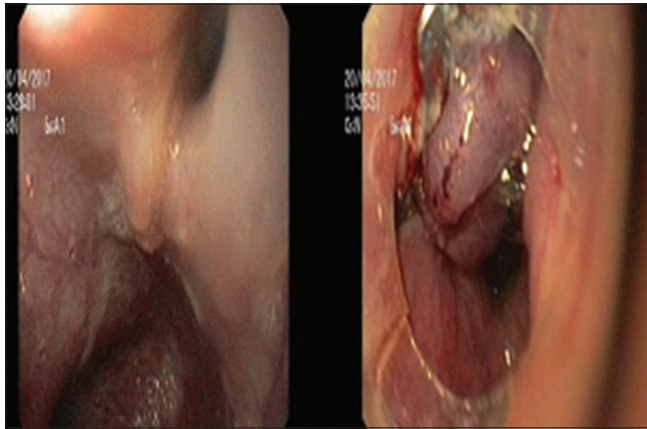


Figure 1: Tracheoesophageal fistula secondary to lobectomy and Padlock clip closure



Figure 3: Barium swallow image of successful clip closure of tracheoesophageal fistula

had cough on swallowing liquids, was diagnosed to have aspiration pneumonia, and was discharged on oral antibiotics. He underwent EGD and a fistulous opening was noted at 21 cm from incisors with upper esophageal sphincter at 17 cm. Barium esophagogram confirmed the diagnosis of TOF in the upper esophagus. After discussing treatment options of surgery and endoscopic closure by clips, the following procedure was performed. A trial suctioning was done using an empty variceal band ligator cap, and later using 9 mm × 11 mm Ovesco clip (Ovesco Endoscopy, Tubingen, Germany), the fistula was successfully closed, and he is asymptomatic at 1-month follow up [Figures 4 and 5].

DISCUSSION

TOF can be either congenital or acquired. Congenital TOF can present in adults, but three criteria have to be met: No surrounding inflammation or malignancy, absence of adherent lymph nodes, and presence of normal mucosa.^[6]

The most common etiology of nonmalignant acquired TOF is a complication of intubation with cuff-related tracheal injury. Thin barium can confirm and type the TOF. Braimbridge and Keith classified TOF as (i) Type I, esophageal diverticulum with a large ostium and a fistula at its tip; (ii) Type II, a short tract running directly from the esophagus to the bronchus or the trachea; (iii) Type III, a fistulous tract connecting the esophagus to a cyst in the lobe, which, in turn, communicates with

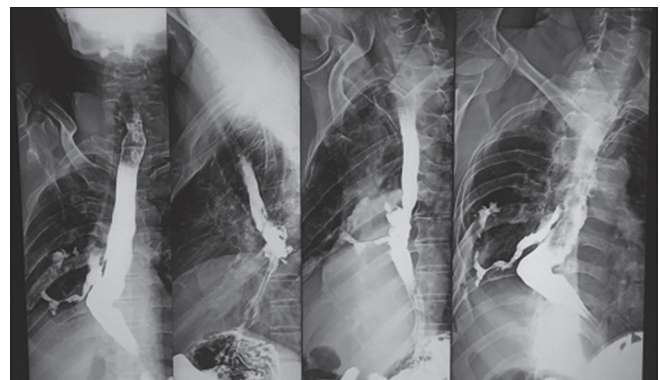


Figure 2: Bronchoesophageal fistula Type III

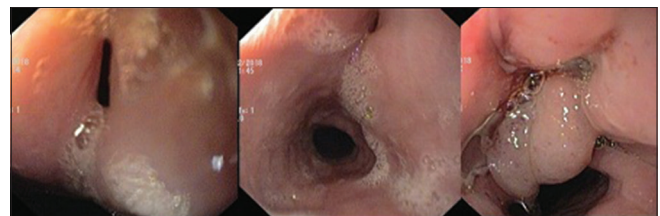


Figure 4: Tracheoesophageal fistula at postcricoid region and Ovesco clip closure

Table 1: Tracheoesophageal Fistula - Bridging the gap by over the scope clip services

	OTSC (Ovesco Endoscopy, Tübingen, Germany)^[8]	PADLOCK (Padlock Clip, Aponos Medical, Kingston, NH, United States)^[8]
Clip characteristics	Nitinol (shape memory) Jaw like row of teeth 3 teeth - a (rounded/atraumatic/baby bear) for hemostasis and in thin walled structures - Esophagus & colon; t (pointed/traumatic/mamma bear) for tissue capture for reduction of clip slippage - for fistula closure or perforation; gc (longer pointed/papa bear) for thick walled stomach - gastrostomy closure	Nitinol (shape memory) 11mm, Hexagonal 6 inner prongs gather and lift the tissue Gaps between the prongs - for blood flow to promote healing Tissue controllers limit the depth of penetration of tissue
Delivery system	Similar to variceal ligation	Lock It (push of thumb)
Applicator cap	3 sizes: 11mm-9.5 × 11 mm 12mm - 10.5 × 12 mm 14mm - 11.5 × 14 mm scope Length: 25 mm (shorter)	2 sizes: 9.5 × 11 mm (Clip) 11.5 × 14 mm (Proselect) Length: 39mm (longer)
Trigger cord	Thread runs retrograde through the working channel of scope and fixed to the wheel at the biopsy port [Figure 6]	Bowden cable runs parallel to scope and connected to the handle with the assistant
Release of clip	Suction - once adequate tissue is suctioned - clip released similar to variceal band deployment [Figure 7]	Adequate suction - clip released by pressing a handle
Effective tissue contact zone	9 mm	9mm
Advantages	Twin grasper - Approximates the gaping edges of the lesion Anchor - If the edges of the lesion are indurated Reloader - For deploying a second clip on already mounted OTSC system Remove system - for removing OTSC clips Small defects (10 mm) - suction with clip closure - best Large defects - Use other devices to approximate the edges Advantages are more	Six prongs in circumferential fashion for firm hold of the tissue. No grasper or anchor device Less costly
Caution	Induration/fibrosis of chronic fistulae - Better to cauterise the margins - might improve fistula closure rate	Angulated position of target site - Difficult Smaller view as smaller diameter of cap - choose for smaller defects Esophageal and lesser curve defects might be difficult to approximate Clipping hard and fibrotic lesions to achieve hemostasis is difficult Rebleed rate is high if clip detaches in <24 h Bacterial contamination of clip might prolong infection
Comparative study	Perfusion pressure resistance - 300mm Hg Reliable and consistent	Perfusion pressure resistance - 9.2mm Hg Poor in controlling hemostasis
Contraindications	Esophageal Varices	Esophageal Varices When hemostasis or closure cannot be verified on endoscopic field of view Arteries >2 mm Polyps >1.5 cm Mucosal/submucosal defect >3 cm
Technicality	Trial of suction of the anticipated closure site with the variceal banding cylinder for approximation	
Indications	Acute bleeding Full thickness wall closure Compression/approximation of tissue Endoscopic or surgical perforation/fistulae closure	Closure of ulcers/Fistulas/perforation/post polypectomy site <2 cm Mucosal/submucosal defects Arteries <2 mm
MRI	Compatible	Conditional - ok if 3 Tesla and lower magnetic field

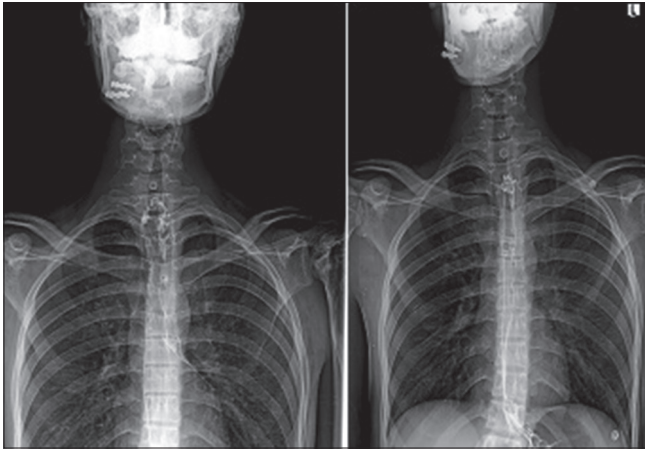


Figure 5: Barium swallow image of tracheoesophageal fistula pre- and post-clip closure



Figure 6: Tip of the scope with mounted Ovesco clip



Figure 7: Side view of the tip of the scope with mounted Ovesco clip

the bronchus; and (iv) Type IV, a fistula that runs into a sequestered segment or lobe.^[7]

In Case 1, Type III Braimbridge and Keith bronchoesophageal fistula secondary to earlier lobectomy was noted. Padlock clip was placed as the TOF was at 30 cm from incisors. In Case 2, the TOF was in the postcricoid region and was secondary to intubation, and Ovesco clip was used for closure of TOF. In both

the cases, there was no immediate postprocedural complication. Both the clips were applied successfully. Padlock clip closure of TOF was attempted in two other cases but failed in one case, there was a stricture adjacent to TOF, and the approximation of the edges was not feasible, and in another, the defect was large 3 cm with fibrotic edges. The main reason for success was complete approximation of the borders of the defect inside the cap with maximum suction in both the cases. The first case we had no option of Ovesco clip as it was not available in India at that time. For the second case, Ovesco was chosen for technicality. The article was written with a table so that it becomes easy to select between the two clips which none of the earlier articles had mentioned. The comparison between the two clips is as given in Table 1.

Size of the luminal defect and not the length of the leak or fistula outside the GI tract and time from perforation play a role with smaller defects and acute perforations being easier to close than larger and chronic ones.^[9] The classic acronym foreign bodies, radiation, infection/inflammation, epithelialization, neoplasm, distal obstruction, and steroids in the setting of fistula management is imperative to long-term success.^[9] To our knowledge, there are only few case reports of TOF successfully sealed with clips. Over-the-scope clip clips are easy to apply, and they can be used for closure of TOFs.

CONCLUSIONS

Over-the-scope clips might be considered for bridging the gap of TOF from the esophageal end. It can be an alternative to surgery in selected TOF cases such as poor surgical candidate, small defect <1 cm, benign etiology of TOF, and inpatient consenting for clip.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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