Omental Flap Provides Definitive Management for Pediatric Patient With Multiple Tracheoesophageal Fistula Recurrences

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Abstract

A term female infant with tracheoesophageal fistula (TEF) and esophageal atresia (EA) underwent primary operative repair that failed with 3 TEF recurrences, which all presented with feeding and respiratory issues. Recurrences were managed with reoperation and an interpositional flap of pleura and a flap of intercostal muscle on 2 separate occasions. The third recurrence was managed with complete dissection of the esophagus prior to the division of the fistula and the interposition of an omental flap between the esophageal and tracheal repair. We present the use of a viable omental flap and complete esophageal mobilization to prevent subsequent TEF recurrences and avoid the additional morbidity of reconstructive surgery.

Keywords

recurrent tracheoesophageal fistula, omental flap, tracheoesophageal fistula, anastomotic leak

After primary repair of tracheoesophageal fistula (TEF) and esophageal atresia (EA), the incidence of recurrence of the TEF is 5%-10%.¹ Recurrent TEF can be challenging to diagnose due to a nonspecific presentation. Once diagnosed, recurrent TEF must be managed with surgical intervention. We present a child that had 3 TEF recurrences which were all appropriately managed with commonly used surgical techniques.¹⁻³ Below we report on the technique we used in the last repair where an omental flap was placed between the esophageal anastomosis and tracheal suture line.

A term infant female from a pregnancy significant for polyhydramnios was born via spontaneous vaginal delivery at 2.94 kg. She was discovered to have an EA and TEF after inability to pass a nasogastric tube. Preoperative echocardiogram showed a patent ductus arteriosus and a patent foramen ovale. A TEF just superior to the carina was identified on bronchoscopy (Gross-type C), and operative repair was performed through a right thoracotomy on day 2 of life. The mediastinal structures were exposed with an extrapleural technique. The TEF and the upper esophageal pouch were separated by a distance of 2-3 vertebral bodies. The TEF was divided, and the tracheal portion was closed. Next, a primary esophagostomy with anastomosis was done. After ensuring that the

tracheal incision line was sealed, a 10-French chest tube was placed, and the thoracotomy was closed. The patient's postoperative course was complicated by an esophageal anastomotic leak on postoperative day (POD) 7, which resolved with bowel rest by POD 14. She was discharged on POD 24 tolerating full oral feeds.

At 3 months of age, the patient was choking with feeds, and an upper gastrointestinal (GI) series revealed a recurrent TEF with an esophageal stricture. This led to reoperation with a vascularized pleural flap interposed between the esophageal and tracheal repairs. The patient's postoperative course was again complicated by an esophageal leak, which resolved with observation by POD 23. The patient struggled with reflux, esophageal dysmotility, and aspiration pneumonia. At 15 months of age, the patient had an exploratory laparotomy with Nissen fundoplication, pancreatic cyst removal, G-tube placement, and a left nephrectomy due to

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chronic hydronephrosis. The patient continued to have feeding difficulties and respiratory infections. At 2.5 years of age, she was diagnosed with a second recurrent TEF. She underwent reoperation for fistula closure with a viable intercostal muscle flap separating the trachea and esophagus. During the procedure, it was noted that old suture material in the trachea was the likely cause of this recurrence. The patient's postoperative course was complicated by a persistent esophageal leak which was treated with a pleural thoracostomy tube. At 2 months post-repair, the patient resumed oral feeds with adequate growth.

At 3.5 years of age, the patient was again having feeding difficulties and respiratory infections. She was diagnosed with a third recurrent TEF and underwent a laparotomy to take down the Nissen fundoplication and harvest a viable flap of omentum. Next, via a thoracotomy, extensive adhesiolysis and dissection of the esophagus were performed to ensure there were no other fistulas. The TEF was then divided, and the omentum was brought up through the esophageal hiatus and placed between the esophagus and trachea to completely separate both structures from the thoracic inlet to the carina. On POD 11, a barium swallow was negative for a leak, and bronchoscopy showed no obstruction so the patient was started on a clear diet. She was discharged in stable condition on POD 13. Within 6 months, the patient was back to eating regular food with minimal heartburn. To date (73 months post-final repair), the patient has had no evidence of TEF recurrence, avoided esophageal reconstruction, and has only needed periodic esophageal dilation.

Recurrent TEF has a nonspecific presentation with feeding difficulties and respiratory issues such as coughing, choking, increased pulmonary secretions, and recurrent chest infections.^{1,2} A suspected recurrent TEF can be evaluated via prone esophagram with water-soluble contrast, but the diagnosis should be confirmed with bronchoscopy and/or esophagoscopy prior to initiation of a repair.^{1,2} Our patient's clinical course was plagued by GI and respiratory issues which made it hard to distinguish when these symptoms were due to a recurrent TEF. Keeping a high level of suspicion was essential to ensure she was properly evaluated and diagnosed.

Many factors played a role in our patient's TEF recurrences. Our patient's first recurrent TEF repair required esophageal resection due to concurrent stricture and a new anastomosis which has been associated with a higher likelihood of complications.² With the exception of the last repair, each procedure was complicated by an esophageal leak, which is a significant risk factor for stricture (relative risk [RR] = 25, 95% CI: 5.8-111, $P < .001$) and recurrent TEF (RR = 8.0, 95% CI: 2.1-3.1, $P = .001$).² As the esophageal contents leak out, it forms a localized abscess that penetrates into the trachea creating a fistula tract. Additionally, our patient struggled with reflux, aspiration,

and multiple respiratory infections which increased inflammation in the thorax and are known contributors to the pathology of recurrent TEF.¹ During our patient's second recurrent TEF repair, it was noted that old suture material was present in the trachea which may have led to a foreign body reaction and recurrent fistula formation. Lastly, with each successive repair, there was more scarring and adhesions to deal with, complicating the procedure and increasing the failure rate.¹

In surgical management of recurrent TEF, it is common to interpose a vascularized flap of tissue between the esophageal anastomosis and the tracheal suture line to prevent future recurrences. Well-described examples of interposed tissue include pericardium, pleura, or a strip of intercostal muscle.¹⁻³ During the first and second procedure, our patient's interpositional flaps were made of pleura and intercostal muscle, respectively. Without knowledge of the procedure described by Bonnard et al, we used an omental flap for our patient's final repair as the other more common tissue flaps had failed. We chose the omentum because of its plasticity, ability to fight infections, and ability to repair tissue. These characteristics help the omentum safeguard anastomosis across surgical disciplines⁴ and ensure that our patient had no more TEF recurrences. Lastly, during the thoracotomy, we completely dissected the esophagus prior to dividing the fistula, which has been emphasized as a necessity in redo esophageal surgery.¹

Recurrent TEF has the potential to occur more than once. Complete esophageal mobilization and an interposition omental flap may be the best solution for complex recurrent TEFs in the pediatric population. Minimally invasive technique as demonstrated by Bonnard et al proves the feasibility of using a viable omental flap without introducing the potential morbidity of a laparotomy. Presently, there is a lack of data to support the superiority of one tissue type in preventing recurrence. A randomized trial of multiple centers will be required to answer such a question.

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