Lengthening Technique for Long Gap Esophageal Atresia and Early Anastomosis

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Background/Purpose: The treatment of long gap esophageal atresia remains a major surgical challenge. Whereas many approaches have been used for this problem, none are ideal. The authors used a technique originally described by Dr John E. Foker and accomplished early repair in 3 infants with long gap atresia.

Methods: Three infants with esophageal atresia underwent thoracotomy shortly after birth and had a long gap preventing primary anastomosis. External traction sutures were placed on each esophageal pouch and exteriorized through the thoracic wall. The esophageal ends were approximated 1 to 2 mm daily by traction on the sutures. Anastomosis was performed when the 2 ends came together.

Results: Three infants were included (31, 34, 37 weeks gestation, weights 1.38 kg, 1.9 kg, and 2.3 kg, respectively). The esophageal gaps were 3, 5, and 4.5 cm, respectively. Definitive anastomosis was performed at 14, 17, and 10 days, respectively. Two patients had anastomotic leaks that were treated conservatively. One patient had an esophageal stenosis that required dilatation.

Conclusions: This technique allowed rapid esophageal lengthening in these 3 cases and led to early repair of long gap esophageal atresia, avoiding the need for a prolonged hospitalization or eventual replacement as well as long-term swallowing difficulties.

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INDEX WORDS: Esophageal atresia, long gap, lengthening technique.

LONG GAP ESOPHAGEAL atresia remains an important challenge for pediatric surgeons. Many techniques have been described for the treatment of this problem, but none has proven ideal. Less than optimal results after esophageal replacement have led to a widely held belief that elongation of the native esophagus will provide a better functional outcome. Current elongation techniques may require a significant time delay until final repair, be associated with significant morbidity, and finally may fail to achieve the desired goal. Even when these techniques are successful, they often are followed by a long and difficult training period during which infants are unable to swallow.

In 3 patients who presented with long gap esophageal atresias we used an esophageal lengthening technique originally described by Dr John E. Foker. This technique consists of the placement of traction sutures into the ends of the proximal and distal esophageal pouches after full mobilization and bringing these sutures together through the thoracic wall under slight tension (Figs 1 and 2). Postoperatively, these sutures are pulled 1 to 2 mm daily. Once the 2 ends of the esophagus are in proximity, esophageal anastomosis is performed.

The details of each case are of sufficient importance to warrant individual presentation.

CASE REPORTS

Case 1
A baby boy born at 37 weeks weighing 2.340 g had esophageal atresia without distal fistula diagnosed on day one of life.
he presented with a significant stenosis that required dilatation. He currently is one year old and doing well.

Case 2

A 1,380-g boy was delivered vaginally at 31 weeks’ gestation after premature rupture of membranes. He was found to have esophageal atresia and distal tracheoesophageal fistula and on day one underwent thoracotomy. After fistula ligation and esophageal mobilization, the atretic gap was 3 cm, and primary anastomosis was impossible. Traction sutures of 4-0 silk with teflon pledgets were placed with metallic clips placed on the sutures near each esophageal end. A gastrostomy also was performed. Traction of 1 to 2 mm daily began on day 2 and progressed until day 10 when the sutures in the distal pouch came out. Traction continued daily on the proximal pouch until the clips on the esophageal ends were in proximity on x-ray done on day 14. A small pneumothorax on day 4 resolved spontaneously. On day 14, a second thoracotomy was performed, and esophageal anastomosis was achieved with minimal tension. Contrast esophagogram on postoperative day 7 showed no leak but a small diverticulum at the anastomosis. Significant gastroesophageal reflux developed that eventually required fundoplication on day 63. Four months later he is doing well tolerating full oral feedings and gaining weight.

Case 3

A boy born at 34 weeks weighing 1,955 g was transferred to our institution on day 4 of life with respiratory difficulty. Esophageal atresia with distal fistula was diagnosed, and thoracotomy was performed. After fistula ligation and esophageal mobilization, the atretic gap was 5 cm. Traction sutures of pledgeted 3-0 Dexon were placed with metallic clips on the suture ends. Postoperatively, traction of 1 mm daily was started on day 2. On day 9 a right chylothorax developed, which required tube drainage. On day 17 the proximal pouch sutures became loose and were withdrawn completely. A second thoracotomy was performed, and moderate inflammation was encountered with persistence of a significant gap between the ends. However, after extensive mobilization, an esophageal anastomosis was achieved under moderate tension. Postoperatively, an anastomotic leak without mediastinitis developed that was well controlled with...
over the past 40 years.8,12-20 Elongate the esophagus enough to bridge the atretic gap. Suturing with this strategy has led to techniques that try to achieve.9,22 Results with this strategy has led to techniques that try to elongate the esophagus enough to bridge the atretic gap. Such techniques have been described in various forms over the past 40 years.8,12-20

In a variety of tissues, including the esophagus, growth can be stimulated through tension and directional forces.19,21 This concept was the basis of the technique applied initially by Dr Foker on 4 patients with long gaps (5.5 to 6.8 cm) and in whom primary repair was achieved.9,22

Although this technique necessitates a second thoracotomy, the time required between the 2 is rather minimal when compared with other approaches. Long hospitalization and complications like aspiration also will be minimized by doing early anastomosis. In addition, swallowing difficulties for many months if not years to come probably will be avoided as well. As with any other new technique, more adjustment is needed to achieve the best results with the least complications.

Although the use of pledgeted sutures should tend to eliminate shear at the tissue-suture junction, both patients whose sutures were pledgeted had sutures cut through one of the esophageal pouches. Whereas the presence of the pledgets are not suspected to have caused the sutures to cut through, the optimal size, quantity, material, and placement technique for the traction sutures has yet to be determined. In case 3, moderate inflammation was found at the end of the esophageal pouch. Perhaps a less reactive suture or pledget material may minimize inflammation and further minimize complications.

The original technique described placing the sutures extraluminally to avoid salivary leak and mediastinis.9 We suspect our sutures were placed transluminally. Whether this accounts for the pneumothoraces seen in 2 patients is uncertain. We believe also that placing the traction sutures transversely may decrease the risk of tearing through the esophageal pouches. Placing 2 clips on one side and one clip on the other side will make radiologic identification easier.

The first stage of this 2-stage operation will possibly be amenable to a thoracoscopic approach in the future. Despite our limited experience with this technique, we feel it provides a superior alternative to many existing approaches for long gap atresia.

REFERENCES