



# Esophageal Advanced Treatment (EAT) Center



**RUSSELL JENNINGS, MD**  
Director, EAT Center  
Pediatric Surgeon



**BRADLEY LINDEN, MD**  
Co-director, EAT Center  
Pediatric Surgeon

The Esophageal Advanced Treatment (EAT) Center at Children's Hospital Boston is **the world's only center offering the most advanced and effective surgical treatment (the Foker Technique) of esophageal atresia (EA) and the commonly associated condition tracheoesophageal fistula (TEF).**

For the one in 3,500 to 4,000 infants who are born with esophageal atresia and/or tracheoesophageal fistula, the Foker technique, devised by John Foker, MD, of the University of Minnesota, is emerging as the most effective long-term surgical solution. The Foker technique creates a nearly normal, functioning esophagus by elongating and then joining together the incomplete esophageal segments. After treatment and practice with oral feeding, children are usually able to eat everyday, solid foods like any of their peers.

Prior to his retirement in 2009, Dr. Foker worked exclusively with Russell Jennings, MD, and Bradley Linden, MD, both of Children's Department of Surgery, to ensure the continuation of his technique in Boston. Children's is the only pediatric institution in the world currently offering the Foker technique for cases of esophageal atresia as well as other esophageal conditions.

## Esophageal Atresia

Esophageal atresia (EA) refers to a congenital maldevelopment resulting in the interruption of the conduit (esophagus) that connects the throat with the stomach and which runs parallel to the windpipe (trachea). Instead of a single conduit, two tubular pouches, often very small (on the order of millimeters), extend from the back of the throat and top of the stomach respectively. Swallowed food and saliva do not have a path into the stomach; rather, they collect in the back of the throat, possibly leading to aspiration into the lungs. Oral feeding is impossible with uncorrected cases of EA.

## Tracheoesophageal Fistula

Tracheoesophageal fistula (TEF) is a congenital abnormality in which the esophagus and trachea share one or more connections (fistulas) allowing the contents of one to pass into the other. With TEF, food traveling down the esophagus, or acids refluxing up from the stomach, may pass into the lungs. The ensuing risks to the person with uncorrected TEF are severe, including complete aspiration and recurrent pneumonia.

## Esophageal Injury

Injury resulting in tissue loss or severe damage to the esophagus can result in loss of the conduit from the mouth to the stomach, either from scarring (as in lye ingestion) or from tissue loss from surgery or trauma. In effect, the end result is the same as esophageal atresia.

## Our team

A multidisciplinary staff of surgical and medical specialists at Children's collaborate with Dr. Jennings and Dr. Linden to provide the full spectrum of pre- and post-surgical care. Our team consists of physicians, nurses and other specialists from:

- Cardiology
- Endocrinology
- Gastroenterology and Nutrition
- General Surgery
- Intensive Care
- Neonatal Intensive Care
- Interventional Radiology
- Nephrology
- Otolaryngology
- Respiratory Diseases
- Urology

Evaluation and care at the EAT Center is also supported by teams within:

- Center for Advanced Intestinal Rehabilitation
- Center for Aero-Digestive Disorders
- Center for Healthy Infant Lung Development

## Scheduling

### Esophageal Advanced Treatment Center

Children's Hospital Boston  
300 Longwood Avenue, Fegan 3  
Boston, MA 02115  
617-355-3038  
[childrenshospital.org/eatc](http://childrenshospital.org/eatc)

For families residing outside of the United States, please contact Children's International Center:  
[childrenshospital.org/international](http://childrenshospital.org/international) | 01-617-355-5209  
[international.center@childrens.harvard.edu](mailto:international.center@childrens.harvard.edu)

# Esophageal Advanced Treatment (EAT) Center

## Traditional Therapies

Surgical repair involves separation of the esophagus and trachea for resolving the TEF and suturing together the two incomplete esophageal segments to create a whole, functioning esophagus. In many cases (long gap esophageal atresia), the esophageal ends, which may be only a few millimeters long, are too far apart to allow for this suturing together (called an anastomosis). For nutrition delivery to take place, surgical teams usually perform one of the following interventions.

### Gastric pull-up

Surgeons may connect the stomach directly to the throat. While this is an invasive operation, the stomach is a resilient organ that survives the repositioning and survives in its new space in the chest. However, crowding in the chest can reduce functional lung volume, making breathing more difficult. Also, because the stomach is closer to the opening of the trachea, its acids can spill more readily into the lungs, posing risks for aspiration and pneumonia.

### Colonic transposition

Surgeons may move a section of colon from its place in the abdomen to the chest to bridge the esophageal gap, in effect creating a replacement esophagus. However, the colon also puts pressure on the lungs, impacting respiration. The colon's rapid growth also necessitates multiple operations to remove loops and kinks. Each surgical intervention threatens the colon's delicate blood supply.

### Jejunum transposition

Rather than a piece of colon, surgeons may use a section of the jejunum as a replacement esophagus. Unlike the colon segment, the jejunum undergoes peristaltic action to actively push food toward the stomach. The jejunum is thin enough to be placed behind the trachea, mimicking the course of a normal esophagus. The jejunum does not dilate or kink in the manner of a transposed colon segment. However, a jejunum transposition is difficult to perform surgically and poses ulcer risks.

### Spit fistula

Surgeons may place a spit fistula to drain the upper esophageal pouch via a small stoma in the neck. Children are then able to take food orally, although nutrition for the body must be delivered with a G-tube. The fistula poses a risk to the laryngeal nerves to the vocal cords and requires regular surgical maintenance, including widening the tube as the child grows.

### G-tube

Surgeons may place a permanent tube through the abdomen and into the stomach, allowing for the direct delivery of nutrition and the venting of gas from the stomach. However, G-tubes require regular maintenance for secure placement along with a number of endoscopic procedures for adjustment as the child grows. Bowel obstructions are also common in children with G-tubes.

## The Foker Technique

Using the Foker technique, surgeons place traction sutures in the tiny esophageal ends and increase the tension on these sutures intermittently until the ends are close enough to be sewn together.

Occasionally, when the gap is not overly long, the traction sutures will stimulate enough esophageal growth relatively rapidly. When this happens, the traction sutures are placed internally. After adequate esophageal growth has been achieved, the incision is reopened and the esophageal ends are sewn together.

For the very longest gap infants, more time is needed. In these children, the traction sutures are placed internally for a period of time. Once enough esophagus has grown using internal traction, then external traction is brought through the skin to the outside of the chest wall. These children are kept on a ventilator and heavily sedated so that they do not tear the traction sutures loose. When, following the intermittent application of tension, the esophageal ends are close enough together, the child is returned to the operating room and the esophageal ends are connected.

Patients usually undergo two to three "growth" operations over a one- to three-week period. Over a span of three to six months (sometimes longer), children often learn to eat and may eventually have their feeding tubes removed.

