Esophageal Surgery in Newborns, Infants and Children

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ABSTRACT

The most common surgery on the esophagus by pediatric surgeons the world over is performed in the newborn period in babies with congenital esophageal atresia with tracheo-esophageal fistula. Post-operative complications like recurrent fistula, anastomotic stricture and some patients with gastroesophageal reflux would also require surgical intervention. Apart from esophageal dilatation, gastrostomy and feeding jejunostomy, children with strictures secondary to caustic ingestion, reflux or previous esophageal anastomosis may require esophageal substitution. This operation may also be required in babies with pure esophageal atresia as well as those with a long gap esophageal atresia with fistula. The entire stomach, stomach tubes, colon or jejunum are often used but techniques preserving as much of the original esophagus as possible are preferable and more physiological. Surgery is also required in children with congenital esophageal stenosis and duplication cyst. [Indian J Pediatr 2008; 75 (5) : 939-943] E-mail : klnrao@hotmail.com

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Esophageal surgery is performed in all age groups in children. The most common indication, esophageal atresia (EA) is seen all over the world, especially so in our country. In fact, surgery for EA is the most common emergency surgery in neonates at our center, with about 180 cases per year. Healthy infants without pulmonary complications or other major anomalies can undergo primary repair in the first few days of life. Prompt diagnosis with appropriate clinical management and expeditious referral to a tertiary care center have led to survival rates in this group of 100% percent.\textsuperscript{1} Due to the sheer numbers, and inadequate intensive care facilities in many parts of the country, overall results are not comparable with western centers. Delayed presentations are common but a lot of progress has been made over the past few decades in units dedicated to neonatal surgery even in this group.\textsuperscript{2} Long term follow-ups are available even in babies who presented as late as on day 17 of life.\textsuperscript{3}

While congenital anomalies form the bulk of the indications for pediatric esophageal surgery, replacement of the esophagus for acquired lesions like caustic strictures are also performed, the techniques used being very similar to those in adults.

Surgery in Neonate with Esophageal Atresia

Correct preoperative management of a baby with EA forms an important part of the overall care.\textsuperscript{4} The baby should be nursed with the chest in the upright position and the oropharynx and upper pouch repeatedly suctioned. Intravenous fluids, oxygen by hood and broad-spectrum antibiotics are started. If there are features of respiratory failure, the baby is intubated. Bag-mask ventilation is not appropriate since it may cause acute gastric distention requiring emergency gastrostomy. Chest radiographs should be evaluated carefully for skeletal abnormalities, cardiovascular malformations, pneumonia, diaphragmatic hernia and a right aortic arch. Before surgery, it is important to examine the baby’s abdomen and perineum. An abdominal radiograph to detect distal gas should be done as the surgical approach would not involve a thoracotomy in babies with pure EA. This is also evaluated for skeletal abnormalities, intestinal obstruction and malrotation. A contrast upper gastrointestinal series is not recommended. An echocardiogram and renal ultrasonogram should be obtained. The baby should be shifted to an intensive care unit and operated after proper evaluation and stabilization is achieved.

The survival rate in babies with low birth weight, pneumonia or other major anomalies is lower with cardiac anomalies being the main cause of death. The Waterston classification appears to be still relevant as a prognostic indicator in our setup.\textsuperscript{5} These babies are managed with parenteral nutrition, gastrostomy to prevent reflux of gastric contents through the fistula into the trachea and upper pouch suction until they are appropriate surgical candidates.
Bronchoscopy prior to starting of the procedure is performed in many centers. A prospective study in our department showed that it helped in identifying the upper pouch fistula, distance of the lower pouch fistula from the carina thereby helping placement of endotracheal tube beyond the fistula during surgery as well as identifying tracheomalacia. Although postoperative pulmonary complications and ventilator requirements were reduced, it did not alter the mortality rate.6

Surgical repair is performed under general anesthesia with endotracheal intubation through a right posterolateral thoracotomy. Frequent desaturation can occur during surgery especially while retracting the lung. An experienced anesthetist is therefore essential as these babies should be manually ventilated with low inspiration pressures and small tidal volumes. The azygos vein is usually the first structure to be identified after thoracotomy. As it lies over the tracheoesophageal fistula, it is routinely ligated and divided. In a recent study, it has been suggested that by preserving the azygos vein, early postoperative edema of the esophageal anastomosis can be prevented resulting in a significant reduction in the number of anastomotic leaks.7

Post-operatively babies are nursed in a TEF chair, so that elevation of the head end is always maintained at an angle of 30-45°.8 We routinely start feeds on the 2nd postoperative day through a trans-anastomotic nasogastric tube which has been inserted at the time of surgery.4

In long gap EA, babies often end up with an initial gastrostomy and esophagostomy. Many complications are encountered with a gastrostomy before the patient gets an esophageal replacement. Although, it is routinely advised to minimally dissect the lower pouch because of its perceived deficiency of blood supply and to preserve the vagal fibres, mobilization of the lower pouch can bridge the defect in the first attempt and is far more physiological than an esophageal replacement. In a prospective, randomized study in our department, we compared 20 neonates with long gap EA and TEF managed by ligation of fistula, distal pouch mobilization and primary repair versus ligation of fistula, esophagostomy and gastrostomy followed by delayed esophageal replacement.9 The mean duration of hospitalization as well as final survival was statistically significant in favor of the first group (p<0.05).

Complications after esophageal atresia repair and their management

Most neonates who undergo repair of EA and TEF have some degree of esophageal dysmotility which resolves with time. Strictures at the site of the anastomosis are common and may subsequently require dilatation. Serial esophagography should be performed at two months, six months and one year of age, or whenever swallowing difficulties occur. Recurrent tracheoesophageal fistula would require surgical correction and is mostly seen at the site of the primary anastomosis. Using a ventilating bronchoscope, the fistula is cannulated with a ureteric catheter which is then identified through esophagoscopy.10 Tissue damage of the poorly vascularized distal esophagus and surgical dissection performed too close to the trachea have been postulated as risk factors.

Approximately one half of patients with surgically corrected EA develop gastroesophageal reflux disease (GERD). Of these, one half responds to routine medical therapy with prokinetic agents, histamine H2 receptor blockers, or both, while the other requires surgical intervention in the form of fundoplication for correction. Long-term endoscopic follow-up may be indicated in these patients to look out for Barrett’s esophagus and its sequelae. In a prospective study in our unit over a 2 year period, 27 babies developed anastomotic leak. Creation of a feeding jejunostomy in 71% of the patients allowed us to maintain nutrition and also reduced the percentage of feeds in intercostal chest drain on an average from 25% to 8%, thus reducing chest contamination. There is a high incidence of GER in these babies and an additional gastrostomy gave better results than feeding jejunostomy alone. (Monika Bawa, MCh thesis. Efficacy of management protocol for anastomotic leak after repair of EA and TEF, PGIMER. 2007).

Esophageal stricture

A contrast esophagogram is essential to know the anatomy of the esophagus, presence of multiple strictures as well as capacity and drainage of the stomach. In patients with associated GER, this should be first managed surgically before any definitive procedure on the esophagus. Most respond well to further esophageal dilatation. Localized strictures would require resection and anastomosis. During dilatation, if an esophageal opening cannot be found through endoscopy, a mini-laparotomy and gastrostomy followed by retrograde dilatation should be attempted before opting for organ replacement / bypass procedures. Long strictures especially secondary to caustic ingestion often require esophageal replacement.

Esophageal Replacement

Esophageal replacement is indicated in children with pure EA, long-gap EA when anastomosis is not possible, corrosive strictures and other unusual causes. Type and location of the graft depend on etiology and surgeon preferences. Several options are now available with good results, such as use of the native esophagus or replacement with colon, stomach, or small bowel. Common problems with all esophageal substitutions include high stricture rate, leaks, GER and nutritional problems. An optimal substitute for the esophagus should