Gastric Tube Esophagoplasty

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History

The esophagus was a surgical no-man’s land until Czerny first successfully resected its cervical portion in 1877. Since that time many and varied conduits (Kelling 1911; Merendino and Dillard 1955; Sweet 1945) have been used to replace the esophagus destroyed by stricture or malignancy. Typically, advances in the surgical care of children have lagged behind advances for adults. Infants with long-gap esophageal atresia are no exception. The rare survivors of this anomaly underwent multiple procedures to fashion skin-lined tubes of skin placed beneath the skin of the anterior thorax (Gross 1953). Although these children were able to swallow food they were forced to massage it down to the stomach and they were required to live with their hideous appearance. In 1955, Dale and Sherman described the use of a portion of the colon placed substernally in a child with esophageal atresia, and the modern era of esophageal substitution for children began. The colon is still the most widely used substitute for the esophagus (Campbell et al. 1982; Gross and Firestone 1967; Neville and Nahem 1983; Waterston 1964). However, the numerous associated problems led to a search for a better substitute. Following the pioneering work of Gavriliu (see for example Gavriliu 1975 and Heimlich (1966), Burrington and Stephens (1968) and later Anderson and Randolph (1973) and Cohen et al. (1974) popularized the use of the reversed gastric tube for esophagoplasty in the child. In the author’s institution, a total of 42 patients have required esophageal replacement since 1965. Nineteen of these patients underwent colon transposition and 24 received reversed gastric tube. Fourteen of the latter patients underwent esophagoplasty because of long-gap esophageal atresia, and of these ten were available for follow-up for up to 14 years.

Indications

There are four classic indications for esophageal substitution. The first is esophageal atresia with or without tracheoesophageal atresia with a long gap between the upper and the lower pouch. As experience is gained with secondary anastomosis following a period of 6–8 weeks of growth, during which the disparate esophageal

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pouches may approach each other (Woolley 1980), cervical esophagostomy and later esophageal replacement is becoming less common. The technique of circular myotomy (Livaditis et al. 1972; Ricketts et al. 1981) has been used successfully to increase the length of the upper pouch. In spite of considerable progress in these techniques, they cannot be universally applied, and replacement will still occasionally be required.

Intractable strictures secondary to ingestion of caustic alkali or acids are an all too frequent occurrence in the United States, where caustic materials are attractively packaged and available in a plethora of brands. A method of stenting the esophagus has been described (Hill et al. 1976) to avoid the necessity for esophageal replacement. However, for injury over more than a few centimeters it is doubtful if full re-epithelialization can occur, and replacement is still required if dilatation is unsuccessful.

An older indication for esophageal replacement was the presence of esophageal varices secondary to portal hypertension. New techniques of portosystemic shunts (Altman 1976; Clatworthy and Boles 1959) and endosclerosis (Lilly et al. 1982) have eliminated the need for removal and replacement of the esophagus.

A rare indication for esophageal replacement remains (Skinner and DeMeester 1976); strictures secondary to gastroesophageal reflux rarely occur since chalasia is now almost universally recognized and treated early. However, the occasional case of a neglected stricture will require esophageal replacement.

Timing of Surgery

With the increasing skills of anesthesiologists and nursing personnel and the refinement of surgical techniques, almost any procedure can be performed in the neonate. However, the small stomach of the neonate with pure esophageal atresia precludes the creation of a gastric tube in this early age group. Gastrostoma feedings can support the nutritional needs of the infant and enlarge the stomach. As long as sham feedings are given by mouth, the infant should have little difficulty in learning to feed. There is therefore no urgency to perform the procedure in early infancy. We elect a weight of around 10 kg as the “ideal” weight at which to perform the major surgery.

Is the Gastric Tube the “Ideal” Substitute?

The “ideal” substitute must have the following characteristics:

1. The operative procedure should be relatively simple technically and adaptable to the child’s anatomy.
2. The esophageal substitute should act as an efficient conduit from mouth to stomach.
3. Ventilation must not be impaired in the small child, so the substitute itself must be tubular and must remain so long-term.