AB009. Alternative conduits for esophageal reconstruction

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Abstract: Whenever esophagectomy is considered, the first choice for a conduit is the use of the stomach. It is reliable, durable and has sufficient length for replacement of the entire esophagus if necessary. However, there may be times when the stomach is not a suitable conduit and alternatives must be sought. Jejunal interposition, colon bypass both short and long segment and extraintestinal approaches are all available. The extraintestinal approach is undesirable and is used very infrequently. Jejunum and colon are acceptable, each has advantages and disadvantages and thoracic surgeons dealing with esophageal disease must be familiar with both. Common indications for the use of alternative conduits are generally in neoplastic disease for esophageal cancer when there is no other alternative available or the gastric conduit has failed and reconstitution of the GI tract is desirable. Benign disease is probably the most common indication for the use of alternative conduits. Some indications include caustic ingestion with consequent injury of the esophagus and stomach, a non-dilatable esophageal stricture secondary to reflux, acute bleeding and ulceration demanding emergency esophagectomy, multiply failed antireflux procedures with persistent symptoms that are intractable to medical management and some complications of achalasia. Advantages of jejunum are the preservation of peristalsis, no requirement for a bowel prep, and reliable link at least to the aortic arch. Disadvantages of the jejunum are potential variable arterial blood supply and the limitation of link to reach the cervical esophagus. The colon advantages are unlimited link. Disadvantages are size discrepancies, lack of peristalsis, the requirement for a bowel preparation, and a more tenuous arterial blood supply. Technique of jejunal interposition is demanding. There must be careful isolation of the vascular pedicle, the more length that is needed the more distal pedicle should be chosen. It is absolutely important to maintain vascular continuity to the very end of the jejunal interposition. Trial clamping to be certain of vascular supply is imperative. These should be done with non-crushing clamps. It is imperative to avoid tension, torsion, kinking and over-skeletonization of the vascular pedicle. The proximal anastomosis is done end to side of jejunum. The distal anastomosis is preferably done to the posterior wall of the stomach. Pitfalls are choosing a vascular pedicle too close to the first branch of the SMA leading to limited length being available, in devascularizing the proximal end of the conduit in trying to straighten the conduit to allow an end-to-end anastomosis, performing the end-to-side proximal anastomosis too far from the divided end of the jejunum leading to a blind limb and redundancy of the conduit leading to kinking. Jejunal interposition is suitable for distal esophageal reconstruction usually done through a thoracoabdominal incision and sufficient length is usually available to reach the esophagus just below the aortic arch. Colon interposition is the other alternative conduit for esophageal reconstruction when stomach is not available. The main advantage in using the colon is greater length, isoperistaltic conduit a preferable option. There are varieties of roots of transposition available depending upon the level at which reconstruction is done and there are options for a variety of pedicles using either the left colon or the right colon. An arteriogram, I believe, in my opinion is essential to identify variations in vascular supply that might make the use of long segment colons ill advised. It will also identify atherosclerotic disease of the origin of the pedicles. The preferred conduit is the left colon based on the ascending branch of the left colic artery. There must be an intact artery of Drummond allowing communication to the left branch of the middle colic artery. There must be sufficient length of the middle colic artery at its origin to allow the use of the hepatic flexure which is supplied by the right branch of the middle colic artery as often times the artery of Drummond does not extend to the hepatic flexure and relies on this communication of the middle colic artery. This use of the left colon is preferable as it gives more reliable blood supply and greater length. The right colon can be used, but is based on the ileocolic artery and communications to the right colic artery and the right branch of the middle colic artery. These communications are more tenuous and lead to an antiperistaltic conduit. In general, the left colon is more reliable and ends up with yielding a better result. Even with preoperative angiography, intraoperative transillumination and identifying the blood supply and its collaterals is important. A trial occlusion of the pedicle is essential to ensure vascular integrity. Measurement of length must be done to determine whether the hepatic flexure is required. For short segment distal esophageal reconstruction, the hepatic

flexure is rarely needed. If the entire length of the esophagus is to be replaced, the conduit is generally passed substernally and requires careful development of this anatomy, often times requires removal of the manubrium, clavicle, first and second cartilages to reduce compression on the proximal conduit and facilitate passage. Passage is demanding and should be done gently to avoid vascular injury to either the arterial or venous component. Pressure, tension and stretching should be avoided at all costs. The anastomosis for colon bypass is typically end-to-end in the proximal colon to the esophagus. The distal esophagus is often times to the stomach, can be done either posteriorly for short distal reconstructions or to the anterior aspect of the stomach if a long segment substernal replacement is chosen. Placement of the vascular pedicle is dependent upon the choice of transposition of the colon segment. The vascular pedicle in the colon must be brought through the mesentery and it must be reconstructed at the end to avoid internal herniation. Overall operative mortality for colon interposition when long segments are replaced is approximately 5%. The most common complications are pneumonia, graft ischemia, both subacute and acute either arterial or venous insufficiency. Long term complications include graft redundancy, anastomotic strictures and dysphagia. Jejunal interposition is associated with a much lower incidence of morbidity and complications leading to death. Mortality following jejunal interposition should be quite low. The series from the Massachusetts General Hospital is based on 34 patients. The most common indications for surgery in this group of patients were failed antireflux repairs, esophageal strictures and an assortment of one of a kind indication. Many of these patients had undergone prior operations further complicating their management. Morbidity following colon interposition occurred in 45% of patients. Morbidity following jejunal interposition occurred in 31% of patients. Overall hospital mortality in this group of short segment colon interpositions and jejunal interpositions was 7.3%. Only one of the fatalities was secondary to graft necrosis which occurred in jejunal interposition. Five of the 34 patients ultimately required reoperations for complications from bile reflux, constriction at the hiatus, graft redundancy, inadequate gastric pouch and a large afferent pouch which became symptomatic. Long term functional studies were done in six patients and did show some preservation of peristalsis in both groups. Late functional results were excellent in 16 patients, good in 10 patients, fair in five patients and poor in one patient and failure in two. In conclusion, short segment intestinal interposition is feasible and yields excellent good to long term results. The procedures are technically demanding and require careful attention to detail to avoid ischemic injury to the conduit and good functional results. There are advantages and disadvantages to jejunum and colon and the choice is dependent upon individual surgeon's experience.

Keywords: Colon interposition; jejunal interposition; long segment colon interposition

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