

Surgical management of benign strictures of the oesophagus: 18 years of experience

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ABSTRACT

Introduction: Benign strictures of the oesophagus are not uncommon. The majority are due to ingestion of corrosives. Different forms of therapy have been recommended. Repeated stricture dilatation has been advocated; when this fails surgical replacement of the oesophagus may be required. There is little information regarding oesophageal dilatation in Sri Lanka.

Aim: To retrospectively analyze an 18 year series of patients with benign strictures of the oesophagus treated in a single surgical unit to determine the safety and long term effectiveness of oesophageal replacement by a variety of techniques.

Methods: 110 Patients with benign strictures of the oesophagus were treated in a single surgical unit at the Sri Jayawardenepura General Hospital, Nugegoda, Sri Lanka from 1994 to 2011. Clinical, pathological and operative data were reviewed from medical records and interviews with patients and relatives.

Results: The male: female ratio was 1.14. Caustic soda ingestion was the commonest cause. Ninety two patients had undergone dilatation prior to presentation without improvement of dysphagia, while 65 had other procedures performed. Transhiatal resection of the oesophagus was the preferred method. Gastric transposition was performed in 67 while the colon was used as the conduit in the others. Recurrence of dysphagia was seen in 8 (7.6%) while the operative mortality rate was 5.4%

Conclusion: Surgical treatment of benign strictures of the oesophagus by oesophageal replacement with the stomach or colon is a good option in patients with strictures that do not respond to dilatation and can be carried out with low mortality and morbidity. Repeated attempts at dilatation are unwarranted in such patients

Key words: Oesophagus; Benign Stricture; Surgical Techniques.

Introduction

Patients having severe dysphagia due to deranged oesophageal structure and function are compromised in their daily activities and are unable to lead a full and productive life. They cannot enjoy the pleasures of eating and drinking. The inability to swallow sufficient food through the normal pathway leads to malnutrition. Many different therapies have been recommended. Repeated dilatation to maintain

adequate lumen diameter has been recommended for chronic benign strictures [1,2,3,4]. In view of the ineffectiveness of dilatation as well as the complications caused by such procedures surgery may be required. Previous surgery may also have aggravated their ailment, leading both patient and surgeon to be reluctant about further operative intervention. However, the only option available to relieve dysphagia in such patients is oesophageal resection or by-pass and replacement with the stomach, colon or jejunum [5]. Oesophageal resection has been carried out traditionally via a thoracotomy. To reduce the complications associated with thoracotomy, especially in patients who are malnourished, trans-hiatal resection of the

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oesophagus has been recommended [6, 7, 8, 9]

Objective

The objective of this study was to analyse an 18 year historical series of patients with benign strictures of the oesophagus treated in a single surgical unit and to assess the effectiveness of surgical therapy administered to such patients.

Material and methods

In this retrospective consecutive review, all patients with benign strictures of the oesophagus requiring oesophageal substitution in an elective setting from January 1994 to December 2011 were included. Data was gathered from hospital records, information obtained by interview with the patients or relatives, and from diagnosis cards given by other hospitals, where patients had been treated previously.

Data gathered included the age, gender, duration of dysphagia and the possible aetiology of the stricture. In those who gave a history of corrosive ingestion, the type of corrosive ingested and the reason for ingestion (accidental /suicidal / forced) was identified. The methods that had been utilized for relief of dysphagia as well as the procedures employed for enteral feeding and their complications were also identified. When attempts had been made to dilate the stricture, the method used, number of times dilatation had been carried out, anaesthesia used and the complications encountered were recorded.

The site and type of stricture and the status of the stomach were determined by contrast studies and upper gastrointestinal video endoscopy. Those patients presenting with absolute dysphagia or inadequate intake had a feeding jejunostomy or gastrostomy performed as the initial procedure for alimentation and nutrition. The preparation for surgery included correction of dehydration, anaemia, treatment of respiratory tract infections and physiotherapy. The colon was prepared whenever the use of the stomach was doubtful.

Oesophageal resection by the trans-hiatal route as advocated by Orringer and Sloan [10] and Gupta [6] was attempted in all the cases. In those where resection was not possible oesophageal by-pass was carried out. A gastric tube was the preferred oesophageal substitute. When the stomach was not available the left or right colon was used. The route of transposition was

either posterior mediastinal or retrosternal. The proximal anastomosis in all such cases was in the neck, with the preferred proximal organ being the pharynx, except in those cases where the oesophagus was dilated. A feeding jejunostomy was performed in all patients.

Technique of gastric transposition

The stomach was mobilised following division of the greater and lesser omentum and Kocherisation of the duodenum. The blood supply to the stomach was maintained by preserving the right gastric and right gastro-epiploic vessels.

The oesophagus was mobilised transhiatally and delivered via the cervical or abdominal incisions. The mobilised stomach was brought to the neck via the posterior mediastinum except in two patients where it had to be taken retrosternally due to inadequate space in the posterior mediastinum.

Technique of colonic transposition

Colonic transposition comprised of mobilization of either the left half of the transverse colon and descending colon, or the right half of the transverse colon and ascending colon which were used as substitutes depending on the length required. A vascular pedicle consisting of the middle colic artery and the marginal artery was preserved and mobilized while the colonic substitute was transposed retrosternally into the neck. In these patients, the oesophagus was left in situ. The distal anastomosis was to the stomach, or where the stomach was diseased, to the jejunum. The continuity of the colon was restored by a colo-colic anastomosis.

All patients were managed in an intensive care unit in the immediate postoperative period. Oral feeding with liquids was commenced on the tenth postoperative day provided there were no complications with the cervical wound.

Postoperative complications including anastomotic leaks were noted. Cervical leaks were managed by open drainage and later by early endoscopic balloon dilatation. Anastomotic strictures were also managed by endoscopic balloon dilatation. Information about gain in weight, postoperative dysphagia and daily work routine was recorded from follow-up clinic records. Deaths within 30 days of surgery were taken as operative mortality.

Results

From January 1994 to December 2011, 110 patients with benign strictures of the oesophagus were treated in the authors' surgical unit at Sri Jayawardenapura General Hospital, Nugegoda, Sri Lanka. There were 46 males (42%) and 64 females (58%), Their ages ranged from 2 to 64 years, with 79 patients (73%) lying within the range of 10 to 40 years. The duration of dysphagia ranged from 1 month to 33 years.

Aetiology

Ninety nine (90%) were due to corrosive ingestion, 5 (4.6%) were post-operative in origin and 1 (0.9%) was following trauma to the neck sustained in a road traffic accident. In 5 cases (4.9%) the aetiology could not be identified.

Of the 99 patients with caustic strictures, 65 patients (66%) had ingested acetic acid, while the others had ingested a variety of caustics including sulphuric acid, nitric acid, caustic soda, harpic, clinitest tablets and various floor and tile cleaners. Ingestion was associated with a suicidal intent in 60 patients (66%), while it was accidental in 48 patients (43.6%). Two (1.8%) reported being forced to swallow caustics.

In 76 patients (69%) the oesophagus alone was affected, while in 31 patients (28.1%) the stomach also had corrosive injury. Complete necrosis and gangrene of stomach was seen in one patient and this had been treated by total gastrectomy and oesophagostomy at another hospital. In 2 patients (1.8%) the larynx, oesophagus and stomach were all involved.

In 49 patients (44.5%), the oesophageal strictures were diffuse in distribution, while 38 patients (34.5%) had multiple strictures. Only 23 patients (20.9%) were found to have a solitary stricture when assessed endoscopically and by contrast studies.

Audit of treatment

Prior to presentation to our unit, 93 patients (84.5%) had undergone dilatation. Nearly 50 patients (53.7%) had undergone dilatation up to ten times, while 2 patients (2.1%) had undergone dilatation over a hundred times. Only 5 patients had been dilated with balloon dilator using a flexible scope, while the others had been dilated with a rigid oesophagoscope under general anaesthesia and endotracheal intubation. The

nature of the oesophageal stricture had not been assessed adequately in the majority by endoscopy and contrast studies according to the data in the diagnosis cards

The other procedures performed on these patients before presentation included jejunostomy in 42 patients (38.2%) and gastrostomy in 20 patients (2.1%) In addition, 5 patients (4.5%) had undergone thoracotomy for treatment of complications following dilatation and perforation of oesophagus. Two patients were admitted with tracheostomy. Several patients had multiple procedures performed on them. One patient treated at another hospital with an oesophagectomy and gastric tube transposition required revision surgery with a colonic conduit for an anastomotic stricture while another who had a stricture after insertion of a self expandable oesophageal stent underwent oesophagectomy

Surgical treatment by gastric or colonic replacement

A one-stage oesophageal replacement with stomach or colon was performed in all patients; gastric transposition was performed in 67 patients (61%) while colonic transposition was performed in 43 (39%). A cervical gastro-pharyngeal anastomosis was performed in 61 patients (91%), while a gastro-oesophageal anastomosis was performed in 6 patients (9%). A pyloroplasty (Heineke-Mikulicz) or finger fracture of the pylorus was also carried out. For colonic transpositions, a proximal cervical colopharyngeal anastomosis was carried out in 38 patients (88%), while a colo-oesophageal anastomosis was carried out in 5 patients (12%). The distal anastomosis was to the stomach, or where the stomach was diseased, to the jejunum. The continuity of the colon was restored by colo-colic anastomoses in all patients. All anastomoses were hand sewn with 2-0 or 3-0 polyglycolic acid sutures.

Complications

Most early post-operative complications were minor in nature and included haemopneumothorax in 22 patients (20%) treated by intercostal tube drainage. Cervical anastomotic leaks occurred in 15 (13.6%) and healed with conservative measures. Major early complications included intestinal obstruction due to adhesions in 4 patients (3.6%), respiratory failure in 3 patients (2.7%), chylothorax in 2 patients (1.8%), burst abdomen in 1 patient (0.9%) and necrosis of the colon in one and haemoperitoneum in 1 patient

(0.9%). The haemoperitoneum was due to bleeding from a damaged spleen, which was treated by urgent splenectomy. The burst abdomen was treated by re-exploration of the wound and application of tension sutures on the tenth postoperative day. The chylothorax in one patient was managed conservatively while the other required thoracotomy and ligation of the thoracic duct.

Late complications included anastomotic stricture formation in 5 patients (4.5%), of which, 2 were gastro-oesophageal and 3 were colo-oesophageal. Two patients (1.8%) experienced late intestinal obstruction, while colonic fibrosis, colonic pouch formation in the neck, and gastric ulceration in the transposed stomach, was experienced by one patient each (0.9%). There were 6 deaths in total, yielding a mortality rate of 5.4%. Of these, 3 deaths were due to acute respiratory failure. These 3 patients were ventilated initially and they acquired a fulminating respiratory tract infection in the ICU leading to respiratory failure. Subsequent ventilation and vigorous antibiotic therapy failed to improve their condition and all 3 succumbed. Two deaths were due to aspiration pneumonia while ischemic necrosis of the colon leading to systemic sepsis was responsible for the other.

Of 104 survivors, 96 patients (92.3%) experienced lasting relief of dysphagia, while 8 patients (7.6%) had persistent or recurrent dysphagia, necessitating repeated balloon dilatation.

Discussion

While the commonest cause of benign oesophageal strictures in the western world is reflux oesophagitis corrosive ingestion is the commonest aetiology in Eastern European, Middle Eastern and South Asian countries [11]. Corrosive injury of the oesophagus seems to be the commonest cause of benign oesophageal stricture in Sri Lanka [1,2] as well as in India [6]. Other aetiological factors include traumatic injury to the oesophagus, systemic sclerosis and other fibrosing disorders, iatrogenic injuries, poorly executed anti reflux procedures and aggressive sclerotherapy for oesophageal varices. Our series supports these findings, as 89% of our patients suffered from strictures following corrosive ingestion.

The management of benign oesophageal strictures may be classified into conservative techniques [including stent placement] and surgical techniques. Conservative techniques include oesophageal

dilatation, which may be via rigid dilators or via flexible endoscopy with balloon dilatation. Relief of dysphagia is reported in 43% to 75% of patients [4]. Unfortunately, in those patients who do not experience lasting relief recurrent dilatation yields little benefit. In this series, we did not resort to dilatation as almost all these patients had failed to respond to one or more attempts at oesophageal dilatation over a period of time ranging from 1 month to 33 years.

Self-expandable plastic stents have been increasingly utilized for the treatment of benign strictures of the oesophagus, with success rates ranging from 17% to 95% [4]. Unfortunately, small sample sizes and widely varying definitions of clinical and technical success preclude an accurate assessment of the effectiveness of this modality of treatment.

Surgical techniques include replacement of the oesophagus with either a gastric or colonic conduit, with or without resection of the oesophagus. Replacement of the oesophagus is a challenging problem. Most patients are nutritionally compromised, while their respiratory capacity is often subnormal. Despite improvements in preoperative evaluation and anaesthetic and operative techniques, this remains a challenging operation to successfully perform.

Some surgeons recommend a bypass procedure with the oesophagus left in situ, as resection of a severely scarred oesophagus is thought to be hazardous due to adhesion formation and residual inflammation. Contrary views have been expressed by Orringer [4], who believes that the oesophagus should be resected to avoid complications developing in an occluded oesophageal pouch. These include an incidence of oesophageal carcinoma 22 to 100 times greater than normal and at an earlier age. The retained and occluded oesophagus may also develop a mucocele in up to 50% of patients after 5 years [12].

There is no universally accepted surgical approach for the resection of the oesophagus. A right-sided approach is often used for high lesions of the oesophagus, while a left thoracotomy or thoraco-abdominal approach is preferred for lesions of the lower oesophagus. [5,11,13]. As these patients are already debilitated, their ability to withstand a thoracotomy or thoraco-abdominal procedure is considerably reduced. In addition, disruption of an intrathoracic oesophageal anastomosis often leads to mediastinitis. Both these factors contribute to the high

morbidity and mortality rates of oesophageal replacement.

Orringer popularized the application of transhiatal oesophagectomy for benign disease. This is much easier to the patient as a thoracotomy and all antecedent anesthetic and surgical complexities are avoided. [10]. Oesophagectomy for benign disease is typically more difficult than that for malignancy as there is often a history of multiple previous oesophageal operations and as periesophageal fibrosis is often more widespread and permanent.

In this series transhiatal oesophagectomy was avoided in patients who have had attempts at oesophageal substitution, previous history of dilatation with perforation when severe periesophagitis is expected. In others trial blunt dissection was attempted via cervical incision and diaphragmatic hiatus. If dissection of the oesophagus was difficult due to dense adhesions, this procedure was abandoned and by-pass carried out.

The conduits that can be used to substitute the oesophagus include the stomach, colon, and jejunum. The stomach has an excellent blood supply with a minimal chance of necrosis, requires minimal operative dissection and can be easily mobilised to reach the neck. It is also thick walled, resilient and physiological and requires only one anastomosis. In addition, the in-hospital recovery time to return to unrestricted alimentations is probably shorter when the stomach is utilized. However, certain authorities believe that use of the stomach is frequently associated with symptoms of duodenogastric reflux, rapid gastric emptying and also a higher incidence of anastomatic stricture [5]

The jejunum is rarely used for oesophageal replacement, as mobilization and obtaining a sufficiently long segment is difficult. In addition, the reservoir capacity is inferior to that of the stomach and the colon. In general, the jejunum should be considered only when the stomach and colon are not available. Dave, et al. reported the successful use of the jejunum in 81 patients with benign end-stage oesophageal disease over a period of 26 years. [14].

The concept of using a long segment of the colon to replace or bypass the oesophagus was introduced independently by Kelling and Vuillet in 1911. In his initial report of this procedure Kelling described an iso-peristaltic left colon transplant whereas Vuillet

described an anti-peristaltic graft using the transverse colon. Although Vuillet stated that his procedure is technically easier than the iso-peristaltic procedure and that the functional result was the same, subsequent studies have demonstrated that the colon is not simply an inert tube, but has active peristaltic movements.

In patients with long-standing anti-peristaltic colon interposition, peristaltic movement of a barium bolus has been observed to proceed against gravity towards the pharynx, resulting in choking and chronic aspiration [11]. Thus, an iso-peristaltic interposed colon is recommended. The left colon, placed in an iso-peristaltic fashion and based on the ascending branch of left colic artery and inferior mesenteric vein, is the segment of choice [4]. Advantages of colonic interposition include the ability to leave the oesophagus untouched and bypass it via a retrosternal route. However, this comes at the cost of performing 3 anastomoses. Gupta reported a lower incidence of neck anastomotic leaks with colonic tubes. However, he also reported that the rate of anastomotic stricture formation was similar with both gastric and colonic conduits [6].

Regardless of the choice of oesophageal substitute, the posterior mediastinal route is preferred over a retrosternal route as a passageway for transporting the organ to the neck. This route allows better drainage from the remaining cervical oesophagus into the oesophageal replacement and minimizes the amount of operative dissection. At times when the posterior mediastinum is unavailable because of scarring from previous surgery, the retrosternal route is mandatory. If the latter route is chosen the tunnel can be created safely using blunt dissection in the anterior mediastinum. The subcutaneous route is another alternative, but it is rarely used at present.

Our techniques

Pre-operatively, our policy is to optimize patients' nutritional status. This often requires a gastrostomy or a jejunostomy followed by a high protein diet. Lung capacity is optimized by means of breathing exercises and physiotherapy. Yong Han, et al. mentions the use of similar techniques in their population of patients [15].

We have adopted a general policy of avoiding a thoracotomy and intrathoracic anastomosis. In addition, we routinely favour a cervical oesophageal

anastomosis when bypassing or replacing the oesophagus. This approach has virtually eliminated sepsis resulting from anastomotic disruption as a cause of postoperative death in our patients. The oesophageal substitutes used in this series include the stomach and colon. Our current preference is to use the stomach in combination with transhiatal blunt oesophagectomy. This is in view of the technical simplicity, a sentiment shared by a majority of surgeons today [6,8,9].

Left colon interposition is a technically demanding operation. Few surgeons gain significant experience with this operation, and technical difficulties can result in a higher incidence of late morbidity. These difficulties include progressive redundancy of the interposed colon, problems of gastrocolonic reflux and anastomotic stricture. We too experienced some of these complications, and thus only use the colon when the stomach is scarred or not available for mobilization. The route of transposition was retrosternal when the colon was used and posterior mediastinal when the stomach was the substitute. The presternal route was not used.

Orringer and Yong Han [10, 15] state that minimizing gastric trauma, ensuring a good vascular supply (“pink in the abdomen and pink in the neck”) and avoiding traction on the anastomosis reduces the incidence of anastomotic leakage – which is in keeping with our experience. In addition, Orringer further states that performance of pyloromyotomy ensures adequate gastric emptying following vagotomy [10].

Post-operatively, our patients are initially commenced on water, followed progressively by clear fluids, a liquid diet, a semi-solid diet, and eventually a solid diet. Our experience shows that this regime is both safe and effective. Gupta disagrees with this regime, preferring to start liquids only after patients are able to tolerate soft solid foods. His contention is that following long periods of absolute dysphagia, loss of sensation occurs in the hypopharynx and supraglottic larynx, resulting in dys-coordinated swallowing. He believes that the use of a soft solid diet helps prevent aspiration and acts as a dilator of the anastomotic site. [6].

Recurrence of dysphagia was noted in 5.5% of our patients, owing to stricture recurrence. This presents a perplexing problem and even though re-operation may provide relief, a stricture may occur again. Our policy with such patients is to review them at regular

intervals, with dilation via both rigid and balloon dilators as necessary. This is similar to the policy adopted by Orringer [10].

The overall mortality rates for oesophageal replacement in benign disease vary from 2% to 30%. The mortality rate for oesophageal replacement with the jejunum has been reported to be 10-15% [14,15] while that of colonic substitution is between 4.8- 30% [11,12,15,18,19]. Our overall mortality rate was 5.4%.

Conclusion

Corrosive injury is the commonest cause of benign strictures of the oesophagus in Sri Lanka. Acetic acid is the most common causative agent. This is a preventable disease, which predominantly affects younger individuals.

While dilatation may be attempted as an initial modality of treatment of benign esophageal strictures, surgery should be considered early in those patients in whom it fails. Delay results in both nutritional and pulmonary compromise, with an antecedent increase in morbidity and mortality. Good patient selection is mandatory. Only patients with a single stricture are likely to respond well to dilatation. A “road map” of the scarred oesophagus and stomach obtained by contrast studies is useful prior to dilatation. Flexible fiberoptic video endoscopy with pneumatic balloon dilatation is the preferred method of dilatation. After dilatation of the stricture the scope should be passed into the stomach through the oesophagus. If this is not possible the indication is that the stricture has not been dilated adequately or there are more strictures down the line. In such cases dilation is a failure and should be abandoned and surgery resorted to. Repeated dilatation should be avoided.

Patients who do not respond to dilatation should be referred for surgery. Surgery is best performed by a team of experts with a special interest in managing such patients in a hospital with all the required facilities.

Our experience shows that transhiatal oesophagectomy without thoracotomy is a safe and effective method of removing the diseased oesophagus and a by-pass should be considered when resection is deemed to be difficult due to scarring. Both gastric and colonic transposition have an acceptable mortality and morbidity. However, gastric

transposition is technically simpler and involves only a single anastomosis. Performing the proximal anastomosis in the neck is both technically simpler and also prevents mediastinitis in event of an anastomotic leak. Anastomosis of the stomach or colon to the pharynx helps to avoid an anastomotic stricture. Anastomotic leaks in the neck heal spontaneously, but early endoscopy and dilatation is recommended to prevent stricture.

Oesophageal resection / bypass and reconstruction has an acceptable morbidity and mortality and leads to relief of dysphagia with restoration of a near normal lifestyle. Prolonged attempts at medical management is unwarranted. The overall outcome of surgery is satisfactory. Patients can reenter society and live a normal and fulfilled life. Reconstruction restores the pleasures of eating and is viewed favourably by the patient.



Figure 1. Solitary stricture of mid-oesophagus with dilated proximal part



Figure 3. Long stricture of distal end of oesophagus



Figure 2. Solitary stricture at pharyngo-oesophageal junction

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