Med. J. Cairo Univ., Vol. 62, No.1 March (Suppl.): 155-163, 1994

Esophagocoloplasty for Caustic Stricture of the Esophagus: Changing Concepts

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Abstract

A review of 540 patients with caustic esophageal stricture who underwent esophageal replacement over a 20 year period in our institution is presented. Their age at the time of esophagocoloplasty varied from 9 months to 18 years (mean 3.4 years). Simple colon bypass of the strictured esophagus was performed in 455 patients utilizing the retrosternal route. Transhiatal esophagectomy with colon interposition was performed in the successive 85 patients. The overall mortality rate was 4.25%. 296 patients were available for periods between 1 and 20 years for evaluation. The isoperistaltic left colon is the best substitute for strictured esophagus in our experience. Prereconstruction feeding catheter gastrostomy is of utmost importance in most of our patients. Over the years, changes in technical measures to reduce colonic graft redundancy, esophagocolic anastomotic leak and stenosis, fear of malignant potentials and complications of left strictured esophagus have been learnt and are the subjects of our review.

Introduction

IN EGYPT, caustic corrosion of the esophagus is, unfortunately, considered to be a national problem. Most sufferers are usually children who accidentally swallow caustic potash used for washing and whitening of clothes by their mothers. Rarely, attempted suicide in young adults by ingestion of potash occurs. While in a number of instances immediate death results, yet most of the victims survive to suffer the disabling sequelae of stricture formation of the pharynx, esophagus or even the

stomach whatever prompt is the therapy provided [1-2].

During the last two decades, one of our domain was the care of patients with established esophageal stricture requiring replacement. The purpose of this report is to represent the change in our concept in the principles and techniques of esophagocoloplasty by the same surgeons by repetitive performance of the operation plus intensive appraisal of the causes of complications and their subsequent correction for better long-term functional results.

Material and Methods

Form 1972 through 1992 esophagocoloplasty was performed for 540 patients with well established caustic esophageal stricture at our institution. The age at the time of definitive operation ranged from 9 months to 18 years (mean 3.4 years). There were 292 male and 248 female patients. All patients had received antegrade esophageal dilations from 1 up to 30 times (mean 5.2). Among these patients, there were 5 instances of esophageal perforations during attempted dilatation.

The prime indication for esophageal reconstruction in these patients was severe dysphagia sufficient to interfere with adequate nutrition by the oral route. This includes patients with undilatable stricture (295), patients with multiple strictures (80), frequent occlusions of the stricture with solid food (78), failure of program of repeated dilatation to achieve normal growth rate (82) and perforated esophagus (5). The site of stricture was assessed both by barium esophagogram and endoscopy. The upper esophagus was involved in 281 patients, the middle in 152, the lower esophagus in 27 and multiple sites in 80. In addition to the esophageal stricture the hypopharynx was involved in 15 patients, the larynx in 13 and the pylorus of the stomach in 17.

Preoperative Management :

Temporary tube gastrostomy (Stamm's type) was performed in 468 cases prior to esophageal reconstruction to correct nutritious deficits in these debilitated patients from long-standing dysphagia. In the remainder (72 patients) gastrostomy was done at the time of esophagocoloplasty. Pulmonary problems due to aspiration from near complete esophageal obstruction were corrected as much as possible preoperatively to reduce atelectasis and pneumonia. The 5 patients with esophageal perforation were managed primarily by proximal cervical esophagostomy and gastrostomy. Tracheostomy was done initially for 13 patients with associated laryngeal injury. Lateral pharyngeostomy was done in 3 patients at the time of gastrostomy. Preoperative pyloroplasty was needed in 17 patients with pyloric obstruction. Five days of preoperative bowel preparation was done with neomycin and sulfasaxidine. Enemata were given 2 days prior to surgery. The time interval from potash ingestion to the definitive procedure was less

than 6 months in 246; between 7-12 months in 190; between 12-24 months in 71; and more than 2 years in 30 patients respectively.

Surgical Principles;

The operation is performed by two surgical teams who begin to work independently once the colon is transected. The abdomen is opened through a supraumbilical midline incision and the cervical esophagus is approached via a left oblique neck incision. The isoperistaltic left colon pedicled on both ascending and descending branches of the upper left colic vessels was utilized as esophageal substitute in all except 25 patients who had small calibered or anomalies of the left colic vessels, hence, antiperistaltic transverse colon based on the middle colic vessels was used. The distal end of the colonic graft is anastomosed to the anterior surface of gastric antrum.

In 455 patients, simple bypass of the strictured esophagus was performed through a retrosternal tunnel. The tunnel is created by dividing the diaphragmatic attachment to the sternum strictly in the midline outside the endothoracic fascia. With careful dissection, the pleura is pushed laterally. A wide opening is made superiorly at the back of the manubrium till the fingers of the 2 surgeons meet along the tunnel easily without any restricting tissues. In no instance a part of the manubrium and sternal end of the left clavicle needed to be resected. The graft is pulled through the tunnel with great care to avoid twisting of its mesentery.

Eighty-five patients had simultaneous transhiatal esophagectomy and left colonic interposition in the same sitting [3].

Early in our series we used to do end-to-end esophagocolic anastomosis with correction of any discrepancy in the diameter between the 2 segments by uniform gathering of the colon; split the esophagus proximally for about 1-2 cm at the section margin; excision of a wedge from the esophagus or telescoping the colon about the first suture layer. This was done in 375 patients; 178 of them as 2 layers anastomosis and 197 as a single layer. We used varieties of suture material (silk, chromic-catgut, monofilament stainless-steel wire, vicryle). Later on, we changed our technique to end-to-side esophagocolic anastomosis done from inside the colonic lumen as a single single layer of fine silk sutures (3/0) (Figs. 1,2). In 15 patients with stricture of the hypopharynx, the upper anastomosis was done to the lateral wall of the hypopharynx.

Pyloromyotomy was done for the retrosternal bypass group and pyloroplasty in the interposed group to avoid gastric stasis and reflux into the colonic graft. Prior to wound closure, excess graft length is excised, the colon is gently pulled down from the abdominal incision to avoid any redundancy in the thorax and anchored ei-

ther to the peritoneum below the diaphragm or to the esophageal hiatus. Chest X-ray is done at the end of the procedure and a chest tube is inserted in the presence of pneumothorax.

Postoperative nutrition in all of our patients was maintained by gastrostomy feeds which were usually started in small amounts after 5-6 days when the ileus had disappeared. Oral feeding began about 2 weeks in absence of cervical leak, otherwise, gastrostomy feeding continued till leak seals.

Results

Early :

The 30-day in hospital mortality rate was 4.25% (23 deaths). Twenty deaths results from postoperative pulmonary complications, and in our experience, aspiration played a major role in the development of these complications. Early in our series, we had 3 instances of deaths from graft necrosis despite early recognition of this complication and graft removal.

Table 1 lists the postoperative morbidity. There were 41 instances of leak at the esophagocolic anastomosis (7.59%), all occurred within the first 2 weeks following the reconstruction. All leaks healed spontaneously with drainage, restriction of oral feeding within 2-3 weeks. Small bowel obstruction needing laparotomy happened in 19 patients. Adhesion was present in 14 patients and small bowel intussusception in 5. Pneumothorax occurred in 65 patients and managed by insertion of chest tubes. Superficial wound infection occurred in 27 patients. Thoracotomy was needed in two patients who underwent transhiatal esophagectomy to repair a tracheal tear and to control bleeding from accidental injury of one of the esophageal vessels.

Late and long-term follow up:

296 patients were available for follow up from 1 to 20 years following esophagocolic (Table 2). 21 patients (4.06%) developed stenosis at the esophagocolic anastomosis; 15 of these followed leakage. Revision of the proximal anastomosis was done for 18 patients with eventual good results and 3 responded well to dilatations.

Radiographic follow-up of our patients revealed free passage of contrast through the colon graft into the stomach within second in most of the cases (Fig. 1,2). Redundancy of the thoracic colon transplant was found in 25 of our cases, yet marked functional obstruction of feeding problems was not encountered (Fig. 3). Asymptomatic gastrocolic reflux was noted in 15 patients in the retrosternal bypass group, only one of them developed bleeding peptic ulcer that responded to conservative measures with cimetidine and antacid therapy.

Most of our patients are able to swallow and eat a normal unrestricted diet,

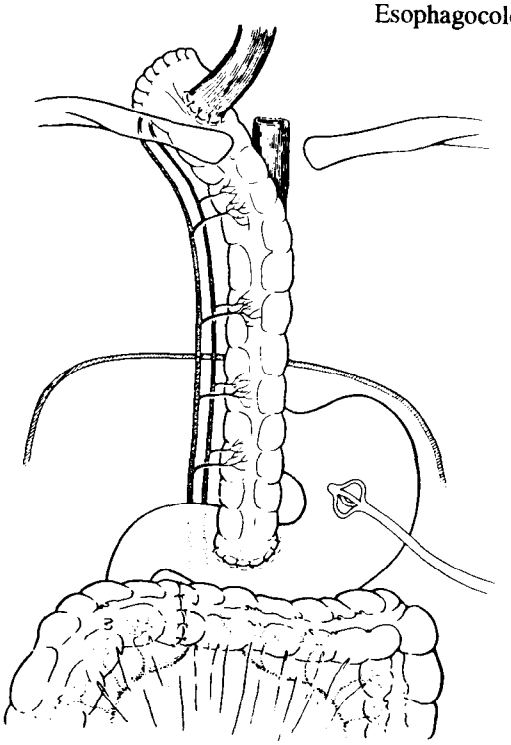

Fig. 1. Cologastric anastomosis at the anterior surface of gastric antrum & end to side esopagocolic anastomosis.

Fig. 2. Esophagogram made 2 years following retrosternal colon bypass in 5 years old girl demonstrating free flwo of Ba with no redundancy of the colonic segment.

Fig. 3. Ba study in a 6 years old boy, 1 year following transhiatal esophagectomy and colon interposition revealing straight course of the transplant.

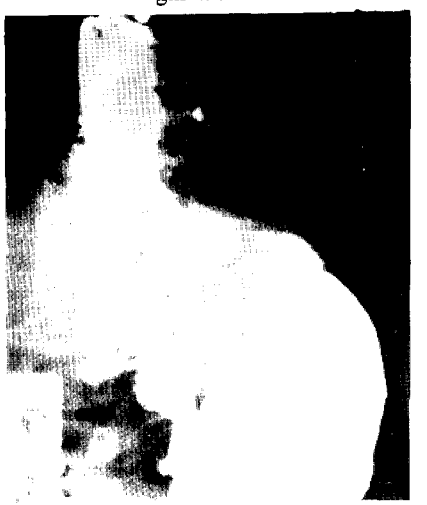

Fig. 4. Redundant colonic segment in a 7 years old boy with retrosternal colon bypass. He is eating well despite some difficulty.

Table 1: Early Postoperative Complications in 540 Patients Underwent Esophagocoloplasty.

Complication	No. of Patients (%)	
Esophagocolic anastmotic leak:		
. Retrostemal :End to End	35 / 375	(9.33%
End to Side	3 / 80	(3.75%)
. Posterior Mediastinum :		
End to Side	3 / 85	(3.53%)
Small bowel obstruction	19 / 450	(3.52%)
Pneumothorax	65 / 540	(12.40%)
Wound Infection	27 / 540	(5.0 %)
Thoractomy (Posterior Mediastinum)	2 / 85	(2.34%)

Table 2: Late Complications in 296 Patients who Underwent Esophagocoloplasty.

Complication	No. of Patients
Stenosis at the Esophagocolic Anastomosis:	
. Retrostemum :End to End	17
End to Side	2
. Posterior Mediastinum :	
End to Side	2
Redundancy of colonic Graft	
.Retrosternum	20
. Posterior mediastinum :	5
Gastrocolic reflux (retrosternum)	15
Peptic ulcer of colonic Graft (Retrosternum)	1

gaining weight and have a normal life pattern without any consideration. Table 2 summarizes the late complications among patients underwent esophageal replacement.

Discussion

Over a period of 20 years, esophageal replacement was performed for 540 patients with caustic esophageal stricture. We have accumulated a large enough series and conclusions regarding esophageal substitutions and all of its ramifications.

Victims of lye stricture of the esophagus are oftenly poor operative risks due to malnutrition, dehydration, electrolyte imbalance resulting from long standing dysphagia. These patients should be prepared vigorously till their nutritional status reach as near the normal as possible [4]. In this regard, preliminary catheter gastrostomy is of great help and should be regarded as a mandatory part of the reconstructive procedure.

There is controversy concerning the removal of the strictured esophagus with substitute interposition in the mediastinum or simple bypass of the esophagus [5-6]. We used to do a retrosternal left colon bypass without esophagectomy (455 patients), so as to decrease the mortality and morbidity of this major reconstructive surgery in these high risk patients and because of anticipation of difficulty in trying to remove the scarred esophagus that usually associated with dense periesophagitis making excision difficult or hazardous. Till now, we did not encounter any complications related to the left esophagus. With more experience, now we use the transhiatal esophageal approach [7-8] for both esophagectomy and colonic interposition (85 patients), and we are highly impressed by the feasibility of dissection of the esophagus under complete vision [3]. Thoracotomy was needed in only 2 patients.

Many different organs have been used as esophageal substitutes, including skin tubes [9-10], stomach [11-13], jejunum [14], ileum [15] and colon [16-17]. Important consideration in the choice of substitute are the ease of technique, low incidence of complications, the results of its exclusion and quality of long-term functional results. The isoperistaltic left colon based on the left colic vessels is our preferred replacement in absence of vascular anomalies due to anomalies due to adequate length availability, reliabilty of its vascular pedicle and its resistance to acid peptic digestion [18]. The left colon was used in 515 of our patients. In only 25 the vascular pattern of the left colic pedicle was inadequate to perfuse the graft and antiperistaltic right colon based on the middle colic vessels was used. Early in our series, we had lost 3 colonic grafts, when based on the ascending branch of the left colic vessels. Later on, we used to base the graft on both ascending and descending branches of the left colic vessels. This

provides a better, more reliable, wide vascular base to nourish the graft. The main complications we encountered in our early series was the tendency of colonic graft to herniate into the chest causing redundancy and kinking. Yet none of these patients had swallowing difficulties to justify operative resection of a part of the colonic graft. Anchoring the graft about half of its circumference to the margins of the peritoneum or the esophageal hiatus of diaphragm diminished these complications.

A crucial step in the esophageal replacement is the technique of the esophagocolic anastomosis because of high reported incidence of leak and subsequent stenosis [19-20]. We found that changing the type of suture material, single or double layer anastomosis, methods to remedy the discrepency of the segments had not changed the incidence of proximal cervical leak. Improved results have been achieved in our series only by performing end to side esophagocolic anastomosis by single layer of interrupted fine silk suture. The incidence of proximal anastomotic leak had been dropped from 9.33% with end to end anastomosis to 3.63% with end to side one.

Gastrocolic reflux and peptic ulceration had been encountered in 15 patients with the retrosternal colon bypass group. Vagotomy and routine pyloroplasty in the transhiatal colonic interposition cases had abolished these complications by diminishing the gastric secretory activity and improving gastric emptying.

Hopefully the experience presented in this work will be of aid to others working in this field and may provide a better understanding of the care of patients requiring esophageal substitution.

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