

## GASTRIC PULL-UP VERSUS COLON INTERPOSITION IN TREATMENT OF CORROSIVE ESOPHAGEAL STRICTURE

By

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**Background/Purpose:** Several techniques have been used for esophageal replacement after corrosive esophageal injuries. The colon and stomach are the most commonly used conduit for esophageal substitution. This study was undertaken to compare the results of gastric pull-up versus colon interposition in treatment of children with post corrosive esophageal stricture.

**Patients and Methods:** Thirty patients (21 males and 9 females) with post-corrosive esophageal stricture were treated at Tanta University Hospital during the period from March 1993 to March 2003. Their ages ranged from 1.7 to 6 years (mean, 2.8 years). Seventeen patients (group I) were treated by transhiatal esophagectomy and gastric pull-up, while colon interposition after transhiatal esophagectomy was performed in 13 patients (group II). Patients were followed for a period of 3 months to 10 years.

**Results:** The operative time ranged from 2-2.5 hours in Group I versus 2.75-3.5 hours in Group II. The most frequent complications were pneumothorax (n=5) in Group I, and external fistula (n=4) in Group II. There were 3 deaths (6.7%), one patient in Group I, and 2 in Group II.

**Conclusion:** Both gastric pull-up as well as colon interposition are feasible and applicable in treatment of children with post corrosive esophageal stricture. However, gastric pull-up is more preferable in our unit, because the technique is more simple and easier to perform; it requires only one anastomosis, with less morbidity and mortality; and less operative time.

*Keywords:* Post-corrosive esophageal stricture, gastric pull-up, colon interposition

### INTRODUCTION

Caustic burns of the esophagus constitute one of the most difficult challenges to the esophageal surgeons. Post-corrosive esophageal stricture is a problem of considerable concern in Egypt. Patients are usually children of low socioeconomic status who accidentally drink commercial liquid potash as it looks like milk <sup>(1)</sup>.

The course of corrosive lesions of the esophagus passes into three phases: acute necrotic phase, ulcerative granulosomatous phase, and lastly cicatrization and stricture formation <sup>(2)</sup>. An extremely important factor in the acute phase is the prevention of infection in the burn in order to diminish as much as possible the subsequent stricture formation <sup>(3)</sup>.

Every effort should be done to maintain the native esophageal patency. However, surgery is indicated in

complete esophageal stenosis, marked irregularity and pocketing of esophagus, old strictures with an intense fibrosis reaction, associated esophageal fistula, failure of esophageal dilatation, previous mediastinitis, or if the patient is unwilling or unable to undergo prolonged period of dilatation <sup>(4)</sup>.

The selection of a particular form of esophageal replacement remains a controversial subject for which the surgeon's personal experience and preference are of great importance <sup>(5)</sup>. The routes of esophageal replacement could be subcutaneous, anterior mediastinum, transpleural or posterior mediastinum <sup>(6)</sup>.

### PATIENTS AND METHODS

This retrospective study included thirty children (21 males & 9 females) with post-corrosive esophageal stricture who were treated at the pediatric surgical unit,

Tanta University Hospital during the period from March 1993 to March 2003. All these patients were referred after failure of endoscopic dilatation or in presence of severe, long or multiple strictures. The ages of these patients ranged between 1.7- 6 years. All patients were evaluated as regard to the type and amount of ingested material. Physical examination, routine laboratory investigations, and radiological assessment were performed. Stamm's gastrostomy was done for 17 patients due to severe dysphagia.

The patients were divided into two groups: Group I included 17 patients, who underwent gastric pull-up and pyloroplasty. The details of the surgical technique for gastric pull up was described in the literature (7). Group II included 13 patients treated with esophagectomy and colon interposition using isoperistalsis colonic segment through transhiatal approach. The distal part of the transverse and proximal part of the descending colon pedicled on the upper branch of left colic vessels was the preferred segment as was described in the literature (1, 2). T-tube feeding jejunostomy was used to establish feeding as soon as possible after operation. All patients were evaluated clinically and radiologically for a period ranged from 3 months to 10 years.

## RESULTS

This study was included 30 children with esophageal stricture due to accidental ingestion of liquid potash. Most of patients were children of poor, uneducated families. The main presenting clinical features were, dysphagia, loss of weight, pallor, anemia, dehydration and repeated chest infection. Barium swallow showed affection of a short esophageal segment in 19 patients (64.5%), long segment in 5 patients (16.1%), and two segments were affected in 6 (19.4%) (Table 1, Fig.1A, B&C).

The middle third of the esophagus was affected in 16 patients (51.6%), whereas the upper part was affected in 5 (16.1%). The period between the ingestion of corrosive and surgery varied between 2 months to 2 years (mean, 9.5 months). Esophageal replacement was indicated due to failure of esophageal dilatation in 15 patients, multiple strictures in 6 patients, and long segment stricture in 5 patients, iatrogenic endoscopic perforation in 4 patients, (Table 2). Either the stomach (Group I) or the colon (Group II) was used for esophageal replacement (Figs. 2- 4).

**Table (1): The affected esophageal segments as detected by esophagogram**

Affected segment	Number of patients (%)
Short segment	19 ( 64.5%)
Long segment	5 (16.1% )
Two segments	6 (19.4% )

The mean operative time was 2-2.5 hours for Group I, and 2.75-3.5 hours for Group II. Pneumothorax occurred in 5 patients (29.4%) in group I in comparison to 2 (15.4%) patients in group II. Wound and chest infection occurred more in group II. Whereas, regurgitation and early satiety occurs more frequently in group I (Table 3).

Cervical fistula occurred in 4 patients (30.8%) in group II versus 2 (11.8%) in group I. Cervical fistula developed in the 5th -10th postoperative day. Those patients were treated initially by conservative therapy (stopping oral intake and maintaining nutrition through T-tube feeding jejunostomy). The fistulae closed spontaneously within 2 weeks in 4 patients, while one patient (Group II) developed a mucocutaneous fistula that required surgical repair.

Two patients in group I had reflux, whereas, no case of reflux was recorded in group II. Three patients suffered primary bleeding during operation. In 2 patients the bleeding vessel was readily visible through the esophageal hiatus. Applying good retraction on the diaphragmatic crura, allowed easy control of bleeding. In the third patient, a small incision through the hiatus was necessary for better visualization and control of the hemorrhage. Thoracotomy was not required to control bleeding in any patient. Two patients developed left recurrent laryngeal nerve injury manifested as hoarseness of voice that recovered eventually after 4-6 months. Stricture of the cervical esophagocolic anastomosis occurred in 2 patients and necessitated repeated dilatation in one patient and cervical esophagoplasty in the other patient (Table 3).

Patients were followed up every month for 1-6 months and every 3-6 months after that. In each visit a record was made as regard the state of deglutition of normal diet, the amount of food intake in each meal, the number of meals, and regurgitation of swallowed material into the mouth especially during recumbency. Children were weighted every visit to record the increase in weight. Barium swallow was done one month after surgery, at the end of 6 months, at the end of first postoperative year, and whenever there is complaint to demonstrate the shape of esophageal substitute (Figs. 5 A&B). Late postoperative sequel as early satiety, dysphagia and regurgitation were more common after gastric pull-up than after colon interposition and improved gradually in most of the patients (Table 3).

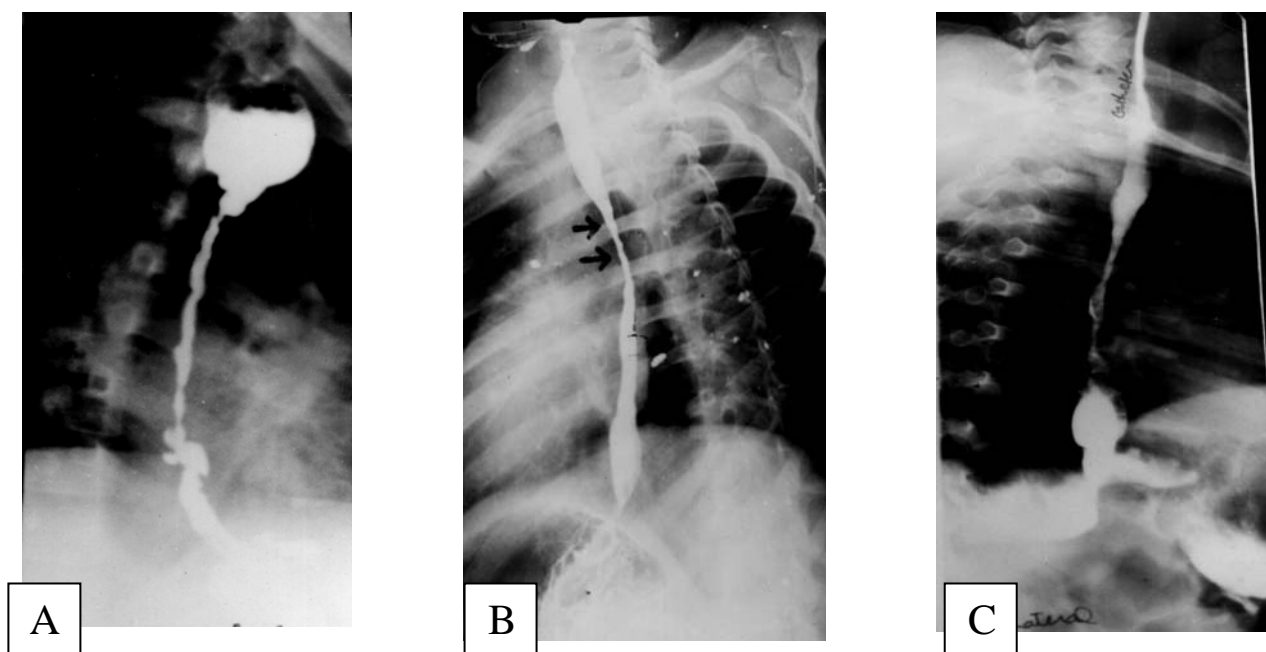
**Table (2): Indication of esophageal replacement**

<i>Indication</i>	<i>Number of Patients (%)</i>
Failure of dilatation	15 (50%)
Multiple stricture	6 (20%)
Long segment stricture	5 (16.6%)
Iatrogenic perforation	4 (13.3%)

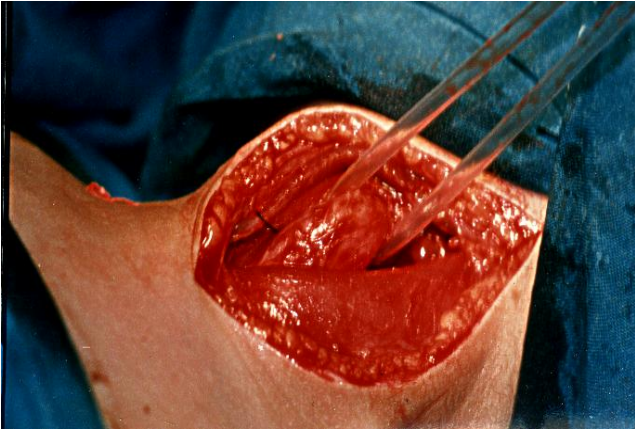
**Table (3): Early postoperative complications**

<i>Complications</i>	<i>Group I (17 patients)</i>	<i>Group II (13 patients)</i>
Pneumothorax	5 (29.4%)	2 (15.4%)
Bleeding	1 (5.9%)	2 (15.4%)
Cervical fistula	2 (11.8%)	4 (30.8%)
Wound infection	1 (5.9%)	2 (15.4%)
Chest infection	2 (11.8%)	3 (23.1%)
LRLN injury*	1 (5.9%)	1(7.7%)
Regurgitation	2 (11.8%)	
Reflux	2 (11.8%)	1(7.7%)
Stricture		2 (15.4%)
Early satiety	2 (11.8%)	
Mortality	1 (5.9%)	2 (15.4%)

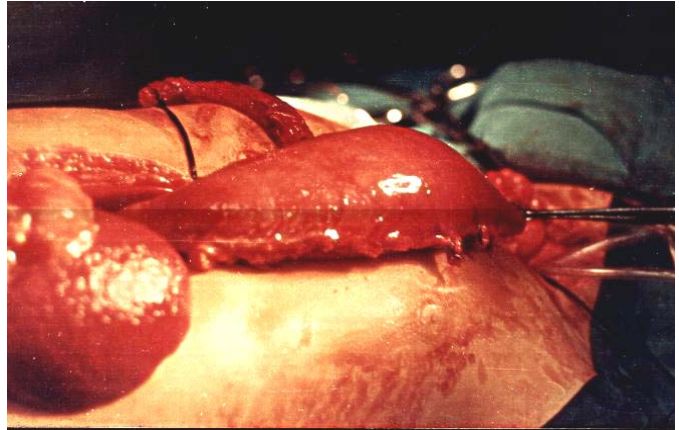
\*LRLN: Left recurrent laryngeal nerve injury



**Fig. (1): Post corrosive esophageal stricture affecting the middle and lower two-thirds of the esophagus (A), the middle third (B), and both upper and lower thirds (C)**



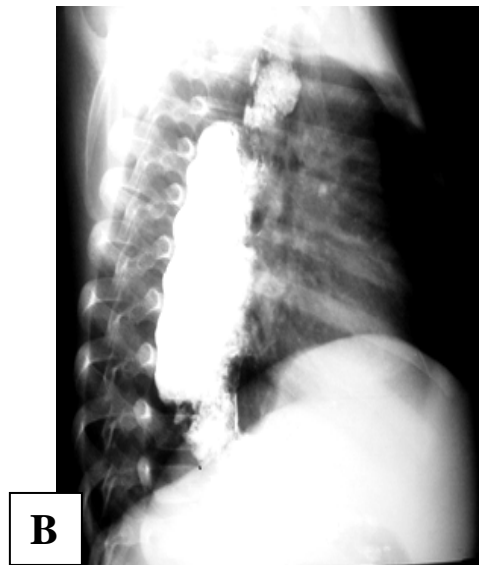
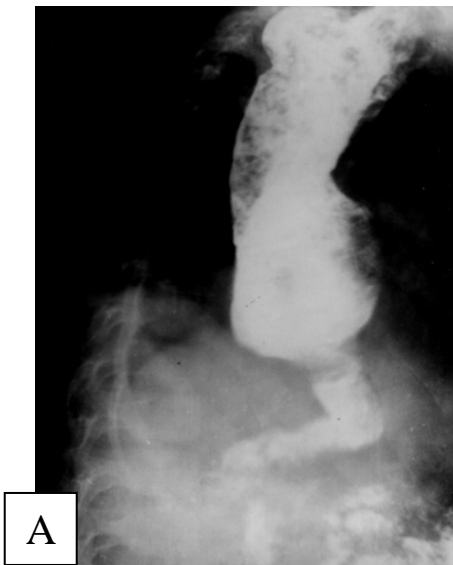
*Fig (2):. Exposure of cervical part of the esophagus*



*Fig.(3): The stomach is mobilized in front of the chest. Both the length and vascularity are excellent*



*Fig. (4):The distal part of the transverse and proximal part of the descending colon pedicled on the upper branch of left colic vessels is used for transhiatal esophageal replacement*



*Fig. (5):. Barium swallow 2 years after transhiatal esophagectomy and esophageal replacement by stomach (A), and by colon (B). Both conduit looks well without redundancy or stricture.*

## DISCUSSION

It is generally accepted that there is no ideal substitute for the esophagus, and that the best esophagus is the one's own esophagus<sup>(8)</sup>. Esophageal substitution should be indicated only when all attempts to preserve its continuity fail<sup>(9)</sup>. Several anatomic reconstructions provide a comparable equivalent outcome, but all are less perfect than the native esophagus. The ideal esophageal substitute must function as an efficient conduit from hypopharynx to the stomach and should not impair respiratory or cardiac function; It should not produce any external deformity; and must grow with the child and continue to function into adult life. The potential gastric acid reflux into the conduit must be minimal<sup>(10)</sup>.

In a study of 100 children with intractable caustic stricture, Bassiouny et al<sup>(11)</sup> concluded that isoperistaltic left colon, based on both ascending and descending branches of the left colic vessels with simultaneous esophagectomy utilizing the transhiatal approach is the best substitute for a scarred esophagus in those patients<sup>(11)</sup>. On the other hand, esophageal replacement with isoperistaltic stomach in the posterior mediastinum has been considered a safe and useful procedure in the management of corrosive esophageal stricture in children<sup>(12)</sup>.

In the current study, the results of gastric pull-up and colon interposition operations were comparable. However, gastric pull-up operation has the advantage of being simpler, easy to perform, takes less time, and has fewer complications than colon interposition. These results are consistent with those of Spitz 1992, who reported that gastric pull-up is a more satisfactory alternative to colonic interposition as it is a technically more straightforward procedure<sup>(7)</sup>.

Thomas and Dedeo (1977) reported that gastric pull-up is more preferable than colon interposition, because of the privilege of having a single anastomosis with no thoracic or abdominal anastomosis, excellent blood supply and good healing power of the anastomosis, which has a larger anastomotic stoma with minimal peptic ulcer complication<sup>(14)</sup>. The gastric pull-up has a lower morbidity with a fewer cervical anastomotic leaks (12.9% versus 48% in cases of colon interposition) and stricture (9.3% versus 30%)<sup>(15)</sup>.

In the current study, cervical fistula occurred in 30.8% of cases after colon interposition and in 11.8% after gastric pull up. This is similar to those results reported by Freeman 1982<sup>(16)</sup> and Stone et al 1986<sup>(17)</sup> In most of the cases cervical fistula healed spontaneously. Ragab et al 1976 reported that the incidence of cervical leakage was 66.6%. They suggested that the fistula could be due to local causes in the wall of the esophagus because of corrosive or inadequate vascularity

particularly venous stasis. All of their fistulae healed spontaneously after using the gastrostomy tube for feeding, and they have recommended that this is the advantage of having gastrostomy as part of colon transplant operation<sup>(18)</sup>. Erdogan et al<sup>(19)</sup> reported 11 cervical leaks in 18 patients underwent esophageal replacement using the colon. They also reported 4 redundancies, 3 gastrocolic reflux and cervical anastomotic stenosis. Comparable findings were reported by Bassiouny and Bahnassy<sup>(20)</sup>. No significant redundancy or gastrocolic reflux has been noticed in our patients during the follow up period.

Efficient nutritional support is an integral part in the overall management of children with post corrosive esophageal stricture at pre and postoperative course. Gerndit and Orringer<sup>(21)</sup> used Robinson catheter for tube jejunostomy in 523 patients and recorded complications related to their jejunostomy in 11 patients (2.1%). Small bowel obstruction due to torsion at jejunostomy site in 5 patients, intraperitoneal leak of jejunal content in 2 patients, tube dislodgement in one patient, intraabdominal abscess in one patient and cutaneous stitch abscess at the jejunostomy tube site in 2 patients. To avoid these complications T-tube jejunostomy was used in our patients. T-tube has the advantage of being easy for application with fewer incidences of spontaneous extraction.

Based on the current study we still prefer gastric pull-up operation in our unit due to the relative technical ease, adequate length can almost invariably be attained, excellent healing power of the anastomosis, wide anastomotic stoma at the neck, only one single anastomosis is required, and the robust blood supply and rich plexus of submucosal arteriole ensure against the complications from ischemic necrosis. We also recommend T-tube jejunostomy for feeding the children postoperatively as it is safe, wider, easier for application, and less liable for spontaneous extraction.

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