

## Late Complications of Colon Interposition for Esophageal Reconstruction

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### Abstract

**Introduction:** Successful restoration of digestive continuity following esophagectomy is a challenge. Gastric graft remains the first option to reconstruct diseased esophagus. However, colon graft is preferable in some instances. Colon interposition is a complex and more demanding surgical procedure. The long-term functional results of colon interposition were satisfactory and can be subsequently affected by late complications. We reported in this retrospective study, the late complications occurred after left colon interposition performed for esophageal caustic stricture from 2000 to 2016.

**Patients and Methods:** Sixteen of 107 patients who received left colon interposition for esophageal caustic stricture developed a late complication. There were 15 women and one man with median age of 20 years. Three patients had a previous cervical leak and thoracic inlet was widened in 2 cases.

**Results:** The late post-operative morbidity rate was 14.9%. Cervical anastomotic stricture occurred in 8 patients. Dilations were successful in 6 patients and surgical revision was required in 2 patients. Symptomatic mild gastro-colic reflux occurred in 5 patients and Symptoms improvement had been obtained after medical treatment and lifestyle modification. Two patients developed graft redundancy and surgery was required after failure of life-style modification measures. It consisted of resecting the redundant colon and performing an end-to-end anastomosis.

**Conclusion:** Late complication after colon interposition can greatly affect swallowing function and quality of life. Surgery is required in some conditions to improve symptoms and life-quality. Identification of predisposing factors and improvement in technique remain the best way to reduce the risk of late complications.

**Keywords:** Esophagectomy; Dysphagia; Gastro-colic reflux; Endoscopy

### Introduction

Restoring successfully the digestive continuity following esophagectomy for benign or malignant conditions is a challenge for surgeons. Surgical procedures performed to establish gut continuity need the use and the pull up of an abdominal digestive organ to the neck or to the superior thoracic region [1,2]. Gastric graft remains the first option for esophageal reconstruction. However, colon graft is preferable in some situations or when the stomach is not available or unusable [3,4]. Colon interposition is a complex surgical procedure which is more demanding and surgeon must be familiar with this technique [5,6]. Mortality after colon interposition have been importantly improved. However morbidity is still high and dominated particularly by leak of esophagocolic anastomosis [7,8]. The long-term functional results of colon interposition procedure were satisfactory [9,10]. However functional results can be subsequently affected by late complications. We reported in this retrospective study, the late complications occurred after left colon interposition performed for esophageal caustic stricture from 2000 to 2016.

### Patients and Methods

One hundred seven patients who received a left colon interposition for esophageal caustic stricture between 2000 and 2016 were reviewed

retrospectively. Sixteen patients developed a late complication. There were 15 women and one man. The median age was 20 years (18-32 years). Emergency esophago-gastrectomy was performed in 2 patients. A roux en Y gastro-entero-anastomosis was performed in 2 patients for early gastric stenosis. The stricture was diffuse and evolved the cervical esophagus in all patients. Isoperistaltic left colon based on the left colic vessels and the marginal paracolic arcade via the sigmoid vessels was the surgical procedure performed in all patients. The substernal route was used in 15 patients and posterior mediastinum in one patient. The cervical anastomosis was performed with the pharynx in one case. Three patients had a previous cervical leak after surgery of reconstruction. The thoracic inlet was widened in 2 patients.

### Results

Sixteen patients developed a late post-operative complication making a tardive morbidity rate of 14.9% (Table 1). Cervical anastomotic stricture occurred in 8 patients (7.4%) after median delay of (3 months to 6 years) and it was revealed by a selective dysphagia for solid and semisolid meals. However, oral intake of liquid diets was maintained. Five of eight patients with anastomotic stricture had previously a leak which healed spontaneously. The patient nutritional status assessment showed a slight malnutrition. The diagnosis was confirmed by endoscopy. Successful treatment by dilations was obtained in 6 patients after a median of 6 (range: 3-12) sessions. However, surgical revision was required in 2 patients after failure of

dilatations. The surgery consisted of resecting the structured zone and performing a new end to end anastomosis.

Complication	No. of patients (%)
Anastigmatic Stricture	8 (7.4)
Gastrocolic reflux	5 (4.6)
Redundancy	2 (1.8)

**Table 1:** Late post-operative complications.

Five patients (4.6%) developed a poorly symptomatic mild gastrocolic reflux and the diagnosis was confirmed by endoscopy and contrast study. Management consisted of administration of medical treatment and lifestyle modification such as elevating the head of the bed on 4 to 6 inch blocks and avoiding recumbency for 2-3 hour after meals. Symptoms improvement has been noted in all patients. The redundancy of the transposed colon was occurred in 2 patients (1.8%). Symptoms were vomiting, regurgitation and nocturnal aspiration. The diagnosis was done by swallowing barium meal and CT scan. The redundant colon part was intrabdominal and retrosternal. After failure of style modification measures and aggravation of symptoms associated with nutritional disorders, a surgical approach was considered. The redundant colon was resected and an end-to-end colocolic and colo-gastric anastomosis was performed. The cause was stricture of cologastric anastomosis in one patient and adherences of retrosternal hiatus in the other one. Symptomatic and radiologic improvement was noted in the two patients.

## Discussion

The colon interposition for esophageal reconstruction has become an effective surgical procedure to replace or by pass the diseased esophagus [10]. The long-term functional results were satisfactory after colon interposition. However, the functional results and quality of patient-life can be affected by the occurrence of late complications including cervical anastomotic stricture, gastrocolic reflux and graft redundancy [11,12]. The late morbidity rate in our series was 14.9% (16 patients). All patients underwent a substernal left colon interposition the same performed by the same surgeon and in the same conditions. However, the study results revealed that late complications were more frequent in women (n=15) explained more probably by the predominance of female gender in the global series (91 females/16 males). Cervical anastomotic stricture is a major problem of esophageal reconstruction.

It was more frequent after esophagogastric than esophagocolic anastomosis [13,14]. It affects greatly the swallowing function and quality of patient life. The incidence of cervical anastomotic stricture varied from 6 to 14% [9,10]. The stricture rate was 7.4% (n=8) in our series and it was consistent with published studies. Dysphagia is often the typical symptom related to stricture and it is the principal complaint for patients who have anastomotic stricture. The intensity of dysphagia varies and is function of severity of stricture. Dysphagia was selective for solid and semisolid meal in our patients. Endoscopy and barium-contrast study are the most performed investigations to confirm stricture diagnosis. The first treatment is dilations and it was performed in all patients (n=8). Repeated dilations alleviated completely dysphagia in 6 patients (75%) after a median of 6 (range: 3-12) sessions. However, surgery was required in 2 patients (25%) for refractory stricture.

The surgical procedure consisted of excision of structured area and performing a new end-to-end esophagocolic anastomosis. Resection of structured anastomosis and performing a new anastomosis is a radical surgical procedure with the need to mobilise cervical part of colon graft in order to avoid anastomotic tension. Strictureplasty is another option to treat anastomotic stricture. However, this method is less radical and recurrence is frequent. The anastomotic leak and graft ischemia were a predisposing factor for stricture formation and high rate of healed cervical leak resulted in anastomotic stricture [15]. Stricture after conduit ischemia was more severe and longer with less response to dilations. Therefore, reducing the risk of leak and graft ischemia leads to decreasing the risk of cervical anastomotic stricture.

Therefore, selecting an optimal colon graft in longer and blood supply, good patient nutritional status, careful surgical technique, widening the thoracic inlet are the most important paramounts to be taken in consideration to reduce the risk of leak, ischemia and stricture of cervical esophago-colic anastomosis when performing a substernal colon interposition.

The colon is the preferred graft for some surgeons to replace the diseased esophagus because of resistance of colon mucosa to gastric acid content. This colon characteristic was demonstrated by reported endoscopic studies that revealed no significant changes in colon mucosa in response to gastric acid reflux [16]. The incidence of gastrocolic reflux after colon interposition varied greatly in reported studies [17]. Gastrocolic reflux rate was 6.4% (n=5) in our series. The endoscopy examination confirmed the diagnosis by showing changes in colon mucosa. The Barium-contrast study is more useful to allow information about graft arrangement and to identify graft stricture. Medications and life-style modification measures can be efficacy to obtain symptomatic improvement in no severe gastrocolic reflux.

However, surgery can become more necessary in severe form with debilitating symptoms as aspiration or when complications occurred such as graft stricture. Gastrocolic reflux after colon interposition has been a great concern for surgeons. To prevent the gastrocolic reflux, Belsey recommended [18] to perform the gastrocolic anastomosis on the posterior wall of stomach. In order to reduce the risk of gastrocolic reflux after substernal colon interposition procedure, we perform the cologastric anastomosis on the posterior side of stomach and furthermore, the colon was tucked to stomach for 3-5 cm by applying four stitches. However, when the stomach was injured (structured), the cologastric was performed on the anterior wall of stomach with a roux en y gastro-entero-anastomosis to prevent biliary gastrocolic reflux.

The lower rate and mild intensity of gastrocolic reflux in our series were more explained by the efficacy of previous described antireflux procedure associated to substernal colon interposition. As demonstrated by the recent published studies investigating gastrocolic reflux after colon interposition, performing the gastrocolic anastomosis on posterior side of stomach constitutes a veritable barrier in reducing the gastrocolic reflux risk [19-21].

Colon graft redundancy is the main late complication of colon interposition and can occur several decades after the initial reconstructive surgery [22]. The redundancy rate in our series was 1.8% and the reported incidence was ranged from 8 to 21% [10,23,24]. Redundancy leads to retention of food and liquid in the graft causing regurgitation, and nocturnal aspiration. Over the years, food retention in redundant colon aggravates the colon graft dilatation leading to debilitating symptoms and nutritional disorders. The excess in graft length is considered by authors as a cause of redundancy [10,24,25].

The colon graft is often longer than its vascular pedicle and can easily adopt a tortuous line when it is pulled up from the abdomen to the neck. Furthermore the colon is a thin-walled pliable hollow organ which responds to any obstruction by passively dilating over time. These obstructing points can be narrowed thoracic inlet, aortic arch, narrowed diaphragmatic and retrosternal hiatus, and cologastric anastomosis stricture [24,25].

Contrast swallow study provides information about anatomical arrangement of graft and the redundant area. Endoscopy and CT scan are useful to accurate the diagnosis. Re-surgery for colon graft redundancy was required in 8-22% after long-term follow up [8,23,26-28]. Surgical correction is indicated in presence of debilitating symptoms with nutritional disorders and after failure of modification life-style measures to improve symptoms. Several surgical options have been proposed to correct colon graft redundancy. Resecting redundant part with re-anastomosis and side-to-side bypass of redundant area are frequently used surgical procedures to treat colon graft redundancy [22,29,30]. Reducing colon lumen by resecting antimesenteric border with a linear stapling device may be necessary in presence of colon gross dilatation.

In order to avoid injury of graft vascular pedicle, dissection should be done close to the colon wall and dividing only vessels supplying the part to be removed [22,29,30]. In particular situation, a new esophageal reconstruction using stomach or colon can be proposed as an alternative option after failure of iterative surgeries. The food bolus travels passively by gravity through the colon graft [10,25]. In order to reduce the risk of graft redundancy, it is so primordial to make straightness of graft, resect the excess in length, eliminating any obstructing element such as widening the thoracic inlet, enlarging esophageal and retrosternal hiatus and at last performing a large gastro-colic anastomosis to facilitate graft emptying and to prevent anastomotic stricture. Identifying preoperatively the predisposing factors and performing a good surgical technique are the keys to reduce the risk of late complications during colon interposition for esophageal reconstruction.

## Conclusion

Functional results particularly swallowing function and quality of life after colon interposition for esophageal can be greatly affected by late complications. Surgery is required in some conditions to improve symptoms and life-quality. Preoperative identifying predisposing factors and improvement in technique remain the best way to reduce the risk of late complications.

## Conflict of Interest

None declared.

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