Ileocolon Interposition Graft Following Surgery for Gastro-esophageal Junction Adenocarcinoma

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Received: 2 November 2012 / Accepted: 5 February 2013 / Published online: 12 March 2013
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Introduction

The stomach remains the most preferred esophageal substitute following esophagectomy for cancer [1]. However in circumstances where the stomach is not available due to involvement by the cancer, such as in our patient, or due to prior surgery, a few other options are still available. While the jejunum is suitable to reconstruct total gastrectomy and distal esophagectomy at or below the level of pulmonary hilum, its use when more of esophagus is resected is complicated by the need for micro vascular reconstructive surgery [2]. In such a scenario, the colonic conduit is the preferred substitute because of its consistent blood supply, long length and acid resistance [2]. Traditionally, the left colonic graft is more often used, but there is an increasing trend towards using right sided colonic or ileo-colonic conduits. We present a report wherein an ileo-colon interposition graft based on middle colic artery was used to reconstruct the Gastro-Intestinal tract following subtotal esophagectomy and total gastrectomy.

Electronic supplementary material The online version of this article (doi:10.1007/s13193-013-0227-x) contains supplementary material, which is available to authorized users.

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Case Report

A 45 year old lady presented with progressive dysphagia since 3 months. On evaluation there was a circumferential tumor involving the distal esophagus, Gastro-Esophageal junction and proximal stomach extending along the lesser curvature. A few enlarged nodes in the paracardia and along left gastric artery were also visible on CECT (Contrast Enhanced Computerized Tomography) (Fig. 1). Endoscopic biopsy was reported as adenocarcinoma and plan of treatment was surgery.

On laparotomy we found that tumor was adherent to the body and tail of pancreas in the region of the splenic artery and extending to involve distal esophagus 4–5 cm above the hiatus. To achieve an R0 resection, the tail of the pancreas and spleen had to be resected along with the stomach and distal esophagus. After adequate resection of the esophagus with clear margins, we would be left with three options, namely

- Intra-thoracic esophago-jejunal anastomosis.
- Colonic conduit with intra-thoracic esophago-colonic anastomosis.
- Complete trans-hiatal esophagectomy with colo-esophageal anastomosis in the neck.

As we discuss later in the manuscript, high intra-thoracic jejunum conduit is not considered very reliable. So in our patient, use of a colonic conduit was mandatory for restoring the alimentary tract continuity. The question remaining was whether to perform an intra-thoracic esophago-coloplasty or perform trans-hiatal esophagectomy and a “safe” esophago-colonic anastomosis in the neck.

Hence, total gastrectomy, subtotal trans-hiatal esophagectomy, distal pancreatectomy and splenectomy were performed. The jejunal conduit was not used to reconstruct

Fig. 1 Contrast enhanced CT section. *Black arrows* indicate absence of clear plane between the tumor and the tail of the pancreas

esophagus due to expected high thoracic anastomosis and attendant risk of complications. Distal 10–12 cm of ileum, ascending colon and transverse colon was mobilized adequately after confirming adequate vascularity. The ileocolic artery and right colic artery was ligated. The ileo-colon graft was mobilized based on middle colic artery. The ileo-colon graft was drawn into neck through the posterior mediastinum and esophageal continuity was maintained by esophago-ileal end-to-side hand sewn anastomosis (Fig. 2a, b). The alimentary tract continuity was maintained by roux-en-Y colo-jejunosomy and ileo-colonic anastomosis.

On the third postoperative day, patient developed bilateral moderate pleural effusion and this was managed by bilateral intercostal tube drainage. The oral contrast study done

on the eighth postoperative day showed no obstruction, redundancy, reflux or anastomotic leak (Fig. 2c, d). Oral feeding started on ninth postoperative day.

Gross pathology findings showed a proliferative tumor occupying the Gastro-esophageal junction and extending into the distal esophagus and proximal stomach. The tumor was 7 cm from the esophageal cut end and 8 cm from duodenal cut end. Histopathology revealed adenocarcinoma signet ring cell type involving the distal esophagus, stomach, gastro esophageal junction. Tumor was infiltrating through the muscularis propria and reaching the serosa. Sections from spleen showed congestive splenomegaly and those from the pancreas showed pancreatic tissue within normal limits. The proximal and distal margins were free of the tumor. Two lymph nodes from the mesentry showed metastatic deposits. She was staged as pT3 N₁ M₀.

Discussion

Esophageal reconstruction has been introduced and modified for almost a century. Various types of esophageal reconstruction have been described in literature. The aim of reconstructive esophageal surgery is not only to create an esophageal substitute, but also to achieve its function resembling a natural esophagus as closely as possible. The jejunum serves this purpose best [3], but in about 50–60 %

Fig. 2 **a** End of esophagus approximated with the side of ileum for anastomosis in the neck **b** middle colic vessels supplying the ileocolonic conduit being demonstrated **c** Gastrografin passing through the

anastomosis in the neck **d** Gastrografin emptying into the jejunum after passage through the colonic conduit

Table 1 Various types of colonic conduit and blood supply

Colonic conduit	Segment of colon	Blood supply
Left colon	Descending and transverse colon	Left colic vessels
Right colon	Ascending and transverse colon	Right colic or middle colic vessels
Ileo-colon	Terminal ileum, ascending colon and transverse colon	Right colic or Middle colic vessels

of operated patients, both arterial and venous blood flow are observed to be inefficient. Use of a free jejunal transplant with microsurgical vessel anastomosis increases the percentage of jejunum usage [4]. The colon is an excellent option for esophageal reconstruction as it has several key advantages including long length, acid resistance, excellent blood supply and potential for a wide gastric resection margin for patients with cancers of the gastro-esophageal junction [2]. The choice of graft site (ileo-colon, right colon, and left colon) mainly depends on availability, constant and reliable blood supply (Table 1).

The left colonic interposition with blood supply provided by the left colic artery was the most used in the past. During recent years, several surgeons have been increasingly using the ileocolon graft due to following reasons. First, a similar diameter of the cervical esophagus and the ileum improves the facility of anastomotic procedures relative to the colon. Second, the ileum is less bulky than the colon, which often causes cervical wound bulging. Third, the presence of competent ileo-cecal valve which can act as oesophago-gastric cardia, preventing pancreatico-biliary juice reflux [5]. Fourth, it provides good reservoir and excellent compliance. Being isoperistaltic, it prevents stasis of food inside the grafted loop and ileocecal valve has no effect on transit time [6]. So it does not delay the passage of food. Finally, the use of ileocolon grafts allows alternative grafts, including ascending-transverse colon or left-colon grafts, to be used should the first graft fail [7, 8]. We used the posterior mediastinal route to take the conduit to the neck, since we were performing primary surgery and the shortest route was available to us. However, graft necrosis and resulting mediastinitis may be potentially fatal. Some authors have used subcutaneous routes for early identification of graft necrosis and also supercharging the conduit with micro vascular techniques to improve conduit survival [9].

Popovici Z et al. reported colon interposition graft as esophageal substitute in 347 patients with pharyngoesophageal strictures and malignancy. A personal philosophy is exposed, based on increased flexibility in the choice of the type of colic interposition depending on the pattern of blood supply. The author's choice is the ileocecum with long ileal loop (65 cm), favoring preservation of the ileocecal valve, and conferring an antireflux mechanism. If this arrangement is not

feasible one should slide toward the left in a clockwise direction performing a left colon interposition [7]. Ammr attia et al. used ileocecal interposition graft for gastric replacement after total gastrectomy based on right colic or ileocolic artery. The study revealed that graft has the advantage of preventing reflux oesophagitis and providing functional replacement of stomach as reservoir of ingested food [10].

The key points of importance concerning the harvesting of the graft: (1) the root of middle colic artery should be dissected up to its origin from the superior mesenteric artery because it is the center of graft's rotation; (2) the vascular communication between the colon and ileum must be carefully verified; (3) the graft's perfusion evaluation with simple intraoperative trial clamping of the collateral vessel at the root level for unexpected variation in vascularity to avoid graft failure; (4) preventing colon graft injury during the lift to the neck..

Using colon interposition as an esophageal substitute, the assessment of quality-of-life for postoperative period is considered to be important. In this case patient had dysphagia in early postoperative days, which has improved over time. Presently patient is on 2nd month of follow up. There are no symptoms of obstruction, redundancy, excessive motility or reflux. Shinji Mine et al. reported that the symptoms of dysphagia, diarrhea, reflux, and dumping syndrome made improvements during postoperative courses in their patients. No patient required reconstruction for improvement of postoperative complaint [8]. Though fistula of the cervical anastomosis is the most common postoperative complication with an incidence ranging from 6 to about 49 % [11, 12], our patient did not have any anastomotic breakdown.

To conclude, technical knowledge of the use of colonic grafts may allow for wider resection margins in Gastro-Esophageal junction cancers and ileo-colon conduit is a useful option with distinct advantages.

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