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Research Article

A Novel Technique for Pyloric Dilatation After Esophagectomy – Our Experience

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Abstract

Background and Introduction: Gastric stasis following esophagectomy is associated with increased incidence of complications like aspiration pneumonia and anastomotic leak. To date there is no consensus on the routine need for a pyloric drainage procedure for patients undergoing an esophagectomy with gastric conduit reconstruction. In this study, we present a novel method of pyloric drainage which offers the benefit of improved gastric drainage and reduced risk of perioperative complications.

Methods: A standard Esophagectomy is performed using either, Ivor Lewis esophagectomy, or a Minimally invasive esophagectomy with a cervical anastomosis (McKeown esophagectomy). Stomach tube is made extracorporeally by using linear stapler. Marking of the stomach tube is done. Two linear staplers are fired along the line and an incision is made on the stomach at lesser curvature medial to the marking. A sponge holder is inserted through gastrostomy along the lesser curvature and is passed across the pylorus. The sponge holder is then opened in both longitudinal and transverse planes to cause the fracture of pyloric sphincter. The sponge holder is removed and then the third stapler is fired along the marking to complete the stomach tube. The stomach tube is then pulled up through the posterior mediastinum into the neck and stapler or a hand sewn anastomosis is done between the esophagus and stomach.

Results: We analysed our technique in two hundred and thirty-eight patients with esophageal carcinoma treated by esophagectomy with gastric conduit reconstruction between 2011 and 2016. On analysis postoperative incidence of pulmonary complication is 13% and anastomotic leak rate is 5.8%. Only 2 out 0f 238 patients required postoperative endoscopic balloon dilatation for gastric stasis.

Conclusions: Our technique of pyloric dilatation is associated with no additional risk to patient and with added advantage of low incidence of pulmonary complications and anastomotic leak.

Keywords: Esophagectomy; Pulmonary Complications; Stomach

Introduction

Surgical resection plays a crucial role in the treatment of respectable esophageal cancer. The surgical procedures for esophagectomy are associated with significant morbidity and mortality of 40 - 50% and 5%, respectively [1]. Reconstruction with the gastric conduit is the preferred replacement after esophagectomy, whereas colonic interposition is usually performed when the stomach is unavailable or not feasible for gastric pull-up. Bilateral vagotomies during esophagectomy leads to delayed gastric emptying in 20 - 40% of patients. Delayed gastric emptying after esophagectomy has been associated with increased risk of aspiration pneumonia, anastomotic leak, and decreased patient satisfaction leakage due to the stasis of gastric acid secretion [2,3].

One of the unresolved questions in esophagectomy is the optimal management of the pylorus during gastric conduit formation and whether a drainage procedure improves operative outcomes, particularly those related to early morbidity. Various pyloric drain-

age procedures such as pyloroplasty or pyloromyotomy, endoscopic balloon dilatation, botulinum toxin injection have been proposed to decrease gastric outlet obstruction and lower the risk complications [4-6]. Various studies advocate that pyloric drainage procedures reduce the incidence of delayed gastric emptying (DGE), Gastric Outlet Obstruction(GOO), anastomotic dehiscence, anastomotic leak, and aspiration pneumonia. Patients undergoing a pyloric drainage procedure are at increased risk for dumping symptoms as well as biliary reflux esophagitis [7]. No study has ever been able to demonstrate a direct correlation between anastomotic leaks, and pulmonary complications with the presence or absence of a pyloric drainage procedure.

To date there is no consensus on the routine need for a pyloric drainage procedure for patients undergoing an esophagectomy with gastric conduit reconstruction. In this study, we present a novel method of pyloric drainage which is associated with low risk and offers the benefit of improved gastric drainage and reduced risk of perioperative complications.

Materials and Methods

The study was performed in tertiary medical centre. All patients with histologically confirmed malignant oesophageal cancer and undergoing elective esophagectomy and reconstruction with a gastric conduit between 2010 and 2016 were included in the study. Patients with a colon or intestinal conduit were excluded from the analysis. A total of 238 patients were included in the study. The preoperative diagnostic workup consisted of endoscopy with biopsy and histologic examination, computed tomography of the abdomen and chest and bronchoscopy if tumour in growth in the upper airway was suspected.

All operations were performed in intubation with double lumen tube. A standard Esophagectomy is performed using either, Ivor Lewis esophagectomy, or a Minimally invasive esophagectomy with a cervical anastomosis (McKeown esophagectomy). Laparoscopic mobilisation of stomach is done. A mini laparotomy incision is made, and Stomach tube is made extracorporeally by using linear stapler. Marking of the stomach tube is done from the highest point on the fundus to the lesser curvature (Figure 1). Linear staplers are used for tube preparation. Two linear staplers are fired along the line (Figure 2) and an incision is made on the stomach at lesser curvature medial to the marking (Figure 3). A sponge holder is inserted into the stomach along the lesser curvature and is passed across the pylorus (Figure 4). The sponge holder is then opened in both longitudinal and transverse planes to cause the fracture of pyloric sphincter (Figure 5). The sponge holder is removed and then the third stapler is fired along the marking. The stomach tube is passed through the posterior mediastinum into the neck and stapler or a hand sewn anastomosis is done between the esophagus and stomach.

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Postoperatively patient is shifted to ICU and Epidural anaesthesia or PCA was used postoperatively to minimize pulmonary complications. Patient is started on jejunostomy tube feed from the 1st postoperative day. chest X ray is done on 1st and 3rd Postoperative day to look for gastric tube dilatation if any. The nasogastric tube was removed on 3rd postoperative day. Gastric emptying and anastomotic integrity was evaluated by gastrograffin study done on 5th postoperative day. Patient was started on liquid diet by 5th POD and soft diet by 8th POD in case of normal gastrograffin study. Prospective data is maintained of the respiratory complications in postoperative period.

Results

A total of 238 patients underwent esophagectomy between 2009 and 2016. Of these 162 were male and 76 were female. Of 238 patients 125 received neoadjuvant therapy and 115 patients underwent primary surgery. The median age of the patients was 60 years (Table 1). In our analysis, of 238 patients who underwent esophagectomy the overall morbidity was 37.39% (89/238) and overall 30-day mortality was 2.94% (7/238). Of 238 patients 14 patients developed pulmonary pneumonia and 7 patients had respiratory failure. Anastomotic leak was noted in 14 patients (5.8%) (Table 2). None of the patients required endoscopic dilatation in postoperative period due to dilated gastric tube.

Gender	
Male	162
Female	76
Age (Median)	60
Co Morbidities	
Cardiovascular	79
Respiratory	12
Diabetes	40
None	133
Type of surgery	
VATS	161
Ivor Lewis	10
RA	10
Trans Hiatal	37
Trans thoracic (open)	20

Table 1

Respiratory	
Bronchopneumonia	14 (5.8%)
Respiratory Failure	07 (2.8%)
Pleural Effusion	10 (4.2%)
Anastomotic Leak	14 (5.8%)
Cord Paresis	22
Postop Endoscopic Balloon Dilatation	

Table 2: Perioperative complications.

Discussion

Though pyloric drainage was once routinely performed during an esophagectomy, its role has been questioned over the last decade by various studies that have published conflicting results.

In addition to the heterogeneity of perioperative outcomes, there is lack of consensus regarding the definition of DGE. The present data do not provide sufficient evidence for an ideal pyloric drainage technique.

A study by palmes., *et al.* stated that gastric-emptying disorders occurred in approximately one third patients after esophagectomy, bilateral vagotomy and gastric pull-up leading to pulmonary complications and anastomosis healing disorders [8]. Gastric conduit dilatation in the postoperative period increases the anastomotic pressure, thereby straining the suture line and contributing to anastomotic leak. Pyloric Dilatation is believed to reduce gastric stasis and stress at the anastomotic site due to stagnant or slow-moving content and contribute in reducing incidence of anastomotic leak.

Two meta-analysis by Urschel., *et al*. and Khan., *et al*. favoured pyloric drainage and concluded that it reduces the incidence of GOO and speeds up gastric emptying. All other pulmonary complications and anastomotic leak rate were comparable with or without pyloric drainage procedure in both the meta-analyses [9,10]. The criticism against these two meta-analyses was that most of the studies 18 - 20 used for the two meta-analysis utilized a whole stomach as the gastric conduit, which is now known to result in gastric stasis and DGE due to gastric denervation. Tubular gastric conduit has been postulated to have superior gravity drainage over the whole stomach [11]. The tubular conduit more readily achieves a higher intraconduit pressure over a shorter period and thus overcome the opening pressure of the denervated pyloric sphincter.

A study by Fok., *et al*. evaluated gastric-emptying function after esophagectomy with orthotopic gastric conduit pull-up by a scintigraphy and showed a significantly improved gastric emptying in the pyloroplasty group in the early postoperative follow-up period only [12]. Similarly, Bonavina., *et al*. showed a quicker gastric emptying after esophagectomy with digital disruption of the pylorus [13]. A RCT by Law., *et al*. compared pyloromyotomy and pyloroplasty after gastric pull-up, a low incidence of gastric outflow obstruction and no functional differences between both procedures in the long term [14].

In contrast to these studies, prospective RCT by Huang., *et al.* and Chattopadhyay., *et al.* showed, compared pyloroplasty and no pylorus drainage after esophagectomy and found no differences concerning gastric emptying, clinical outcome and clinical symptoms between both groups [15,16]. Surgeons against the pyloric drainage procedure argue that the long-term sequelae of pyloric drainage after esophageal substitution with gastric conduit are marked by duodenal gastric reflux, dumping, and development of intestinal metaplasia in the remnant of the cervical esophagus. These undesirable outcomes may be overcome by preservation of the pyloric sphincter complex at the time of esophagectomy.

Minimally invasive approach for esophagectomy provides a mechanical advantage to improved gravity drainage due to uniform axial alignment of the conduit with strict adherence to avoid any conduit redundancy [17].

In the present study, overall anastomotic leak rate was identified as 5.4%. In a review by Arya., *et al.* Patients not undergoing pyloric drainage had a leak rate of 11.5%, while among those who had pyloric intervention, leakage was lowest in individuals receiving Botox therapy (1.7%) and highest in those subjected to pyloric finger fracture (12.5%) [18]. In our study the overall pulmonary complication rate was 13.02% In the studies reviewed by Arya., *et al.* pulmonary complication rates when the pylorus was left intact was 25.7% and ranged from 4.2% to 17.1% where pyloric drainage was employed.

Advocates against a pyloric drainage procedure state that only a fraction of patients ever develop gastric emptying problems after an esophagectomy [19]. Most of these patients will either regain foregut function with time 2 or can be managed with prokinetic agents, Botox injections, and endoscopic dilatations, pyloric drainage procedure seems to become more and more unwarranted [20,21]. Another alternative as proposed by Swanson., *et al.* is to perform preoperative endoscopic pyloric balloon dilatation 1 - 2 weeks prior to an esophagectomy to reduce the risk of subsequent pyloric stenosis. Our technique of pyloric dilatation is not associated with any additional perioperative complication to the patient. The rate of postoperative pulmonary complications and anastomotic leak was also low in these patients.

Our study has limitations that We did not obtain radioisotope imaging to corroborate clinical suspicion of GOO in patients. Pulmonary complications can occur because of various other reasons besides the mere presence or absence of a pyloric drainage procedure including primary aspiration, recurrent laryngeal nerve injury during upper chest or neck dissection, performance of a thoracotomy versus MIE.

Conclusion

There is no conclusive evidence that the omission of pyloric drainage procedure leads to equivalent or better outcomes following esophagectomy. Prospectively designed, randomized studies are needed to justify its omission with established criteria for defining gastric emptying, biliary reflux, anastomotic leak, and pulmonary complications Our method of pyloric dilatation is associated with no additional perioperative risk to patient with added advantage of reduced incidence of postoperative complications. However, the ideal technique for pyloric dilatation remains unproven suggesting that further studies are needed to determine the intervention that will maximize the potential benefits.

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