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Original Research Article

Comparative study of outcome and complications of surgical management of benign gastric outlet obstruction

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ABSTRACT

Background: Gastric outlet obstruction (GOO) implies complete or incomplete obstruction of the distal stomach, pylorus, or proximal duodenum. There are many causes of benign GOO like acid ingestion, pyloric stenosis, peptic ulcer etc. The main aims of this study were to compare the perioperative morbidity and short and long term complications of different procedures for benign gastric outlet obstruction.
Methods: This non-randomised retrospective study was undertaken in the department of General Surgery, SMIMER Hospital, Surat, Gujarat, India from August 2016 to July 2019. Thirty patients had been operated during this period and included in the study. Records of all 30 patients were retrieved and analysed. All these patients underwent pre-operatively upper GI scopy with biopsy and CECT abdomen.
Results: Nausea and Vomiting was most common symptoms at time of presentation in our study. Incidence of wound infection in open Gastrojejunostomy group was very high i.e. 25% and hospital stay was also very high in open Gastrojejunostomy group. Post-operative PPI dependence was more common in Gastro-jejunostomy group in all follow up and there was no any requirement of PPI in Heineke-Mikukicz and Finney's pyloroplasty group.
Conclusions: On comparison of different surgical modalities for management of benign GOO, all surgeries performed laparoscopically were safe and carried comparatively less morbidities (perioperative, short term and long term) in comparison to open methods. Among all three laparoscopic procedures, outcome of laparoscopic pyloroplasty, both H-M pyloroplasty and Finney's pyloroplasty were better than laparoscopic gastro-jejunostomy.

Keywords: Gastrojejunostomy, GOO, Finney's pyloroplasty, Hienke-Mikulicz pyloroplasty

INTRODUCTION

Gastric outlet obstruction (GOO) implies complete or incomplete obstruction of the distal stomach, pylorus, or proximal duodenum.[1] This may occur as an obstructing mass lesion, external compression or as a result of obstruction from acute edema, chronic scarring, and fibrosis or a combination of both.[1,2]

GOO is not a single entity and it is the clinical and pathophysiological consequence of any disease process that produces a mechanical impediment to gastric emptying.[3] GOO may be caused by a heterogeneous group of diseases that include both benign and malignant conditions.[1,4] In adults, mechanical obstruction due to ulcers, tumors, big polyps is common causes of gastric outlet obstruction.[5]

Until introduction of effective ulcer therapy, duodenal ulcer was the most common cause of GOO and malignancy was attributed to only 0% of the cases. However, now in the era of H_2 blockers and proton pump inhibitors, incidence of duodenal ulcer has been decreasing as symptomatic ulcer begin to respond to

medical treatment, although this has not reflected to changes of complication like bleeding and perforation.[6,7]

At the same time, the incidence of antral carcinoma of stomach producing GOO has comparatively increased, which is mainly due to increased early diagnosis of the condition with the help of flexible fibre optic endoscope.

This study has been taken up to review the changes in the presentation of GOO in view of changing trends in the management because of new investigatory modalities. The lack of uniformity in criteria in accepting a case of GOO lead to differences in incidences and clinical features in different centers, still, any one of the followings can be used to diagnose gastric outlet obstruction: Projectile vomiting of undigested food consumed previous day, Palpable hypertrophied stomach, Visible gastric peristalsis (VGP), A gastric residue of more than 500 ml in an adult, An aspirate of more than 40 ml on saline load test, Demonstration at operation of grossly narrowed gastric outlet etc.

Aims and objective

The main aim of this study was to compare the perioperative morbidity and short and long term complications of different procedures for benign gastric outlet obstruction. Primary outcome measures were post-operative wound site infection, drain duration, RT duration, length of hospital stay and post op complications and PPI dependence.

METHODS

It was a retrospective randomized controlled trial study (CONSORT). This study was undertaken in the department of General Surgery, SMIMER Hospital, Surat, Gujarat, India from August 2016 to July 2019. Thirty patients had been operated during this period and included in the study. Records of all 30 patients were retrieved and analysed. All these patients underwent pre-operatively upper GI scopy with biopsy and CECT abdomen. GI scopy with biopsy was done under local anaesthesia for ruling out malignancy and CECT abdomen was done for knowing length of pyloric stricture which decided our plan of surgery.

Inclusion criteria

Patients of age >12 years and all patients of benign gastric outlet obstruction.

Exclusion criteria

All patients of malignant gastric outlet obstruction.

There were various causes of GOOlike acid ingestion, duodenal ulcer, pyloric stenosis and abdominal Koch's in our study. Out of 30 patients operated for benign GOOunder general anesthesia, gastrojejunostomy were done in 18 patients, Finney's pyloroplasty were done in 6 patients and Heineke-Mikulicz pyloroplasty were done in 6 patients. Post-operative morbidity, average hospital stay, wound infection and mortality was observed. All patients received antibiotic (injection ceftriaxone, injection metronidazole) preoperatively and continued post-operatively.

RESULTS

In our study, total 30 patients were operated for gastric outlet obstruction. Nausea (83%) and vomiting (73%) was most common symptoms at time of presentation in our study and other symptoms were early satiety, epigastric fullness, epigastric pain, indigestion, and anorexia and weight loss.

In our study population, males were 18 and females were 12. In our series GOO was more common in males than female and most common procedure for GOO was gastrojejunostomy (60%) followed by Heineke-Mikulicz pyloroplasty (20%) and Finney pyloroplasty (20%). All of the above three procedure has been performed by open as well as laparoscopically.

In our series 50% of Heineke mikulicz and Finney pyloroplasty as well as 22.2% of gastrojejunostomy had been performed laparoscopically and rest by open technique. In our series most common procedure for GOO was open gastrojejunostomy.

In our series most common cause of GOO was acid ingestion (40%) followed by pyloric stenosis (30%), peptic ulcer disease (27%) and Abdo Koch's (3%).

Table 1: Perioperative parameters in open surgery group.

Parameters	Gastrojejunostomy (n=14)	Heineke-Mikulicz pyloroplasty (n=03)	Finney pyloroplasty (n=03)
Avg. days of RT in situ	5 days	4 days	4 days
Avg. days of drain in situ	9.66 days	6.5 days	5.5 days
Avg. Hospital stay	18.5 days	10 days	10 days
Incidence of wound infection	25%	0%	0%
Mortality	0%	0%	0%

Table 2: Perioperative parameters in laparoscopic group.

Parameters	Gastrojejunostomy (n=4)	Heineke-Mikulicz pyloroplasty (n=3)	Finney pyloroplasty (n=3)
Avg. days of RT in situ	5 days	4 days	4 days
Avg. days of drain in situ	7 days	4 days	4 days
Avg. hospital stay	10.5 days	6 days	7 days
Incidence of wound infection	0%	0%	0%
Mortality	0%	0%	0%

Table 3: Postoperative complications at 6 month, 12 month and 2 year follow up in our study.

Complication	6 month			12 month			2 year		
	GJ (n=18)	H-M (n=6)	F (n=6)	GJ (n=18)	H-M (n=6)	F (n=6)	GJ (n=18)	H-M (n=6)	F (n=6)
Nausea	12 (67%)	2 (33%)	1 (17%)	10 (55%)	1 (17%)	1 (17%)	8 (44%)	1 (17%)	1 (17%)
Epigastric fullness	10 (55%)	2 (33%)	1 (17%)	8 (44%)	1 (17%)	1 (17%)	6 (33%)	1 (17%)	1 (17%)
Intermittent vomiting	7 (39%)	Nil	Nil	3 (17%)	Nil	Nil	2 (11%)	Nil	Nil
Postprandial vomiting	5 (28%)	1 (17%)	1 (17%)	2 (11%)	1 (17%)	Nil	2 (11%)	Nil	Nil
Abdominal pain	5 (28%)	1 (17%)	1 (17%)	2 (11%)	Nil	Nil	2 (11%)	Nil	Nil
Weight loss	6 (33%)	Nil	Nil	5 (28%)	Nil	Nil	5 (28%)	Nil	Nil

In our series incidence of wound infection in open gastrojejunostomy group was very high i.e. 25% and hospital stay was also very high in open gastrojejunostomy group i.e. 18.5 days (Table 1).

In our series incidence of wound infection and mortality was 0% in laparoscopic group of all procedure. Hospital stay was more in Lap. GJ group i.e. 10.5 days (Table 2).

Table 3 shows that all the complications at 6 month were more common in gastrojejunostomy group in comparison to H-M pyloroplasty and Finney's pyloroplasty in our study.

All the complications at 12 month were more common in gastrojejunostomy group in comparison to H-M pyloroplasty and Finney's pyloroplasty in our study. Finney's pyloroplasty has least number and incidence of complications.

Apart from nausea and epigastric fullness (17% each), there were no other complications in H-M pyloroplasty and Finney's pyloroplasty at 2 year follow up. Gastrojejunostomy group had 11% to 44% incidence of various complications even at 2 year follow up.

Post-operative PPI dependence were more commonly in gastro-jejunostomy group in all follow up and there was no any requirement of PPI in Heineke-Mikukicz and Finney pyloroplasty group beyond 12 months. PPI dependence in gastro-jejunostomy group was 100% at 6 month, 89% at 12 month and 67% at 2 years. There was only 17% incidence of PPI requirement in H-M pyloroplasty and Finney's pyloroplasty in 1st six month.

DISCUSSION

GOO is any disease that mechanically impedes normal emptying of the stomach. GOO occurs in approximately 2% of patients with chronic duodenal ulcer.[8] GOO occurs in no more than 5% of patients with peptic ulcer disease and it accounts for 5% to 8% of ulcer related complications. The peak incidence is now in a much older age.[9]

Etiology can be broadly divided into Acquired and genetic factors. Acquired includes, *H. pylori* infection, nutritional (high salt, high nitrate, low vitamin A and C, and smoked food), occupational (rubber workers, coal workers), cigarette smoking, *Epstein bar* virus infection, radiation exposure and also prior gastric surgery for benign gastric ulcer disease. Genetic includes, Type A blood, pernicious anemia, family history, hereditary non-polyposis colon cancer and Li-Fraumeni syndrome and certain precursor lesions like adenomatous gastric polyps, chronic atrophic gastritis, dysplasia, intestinal metaplasia and Menetrier's disease.[8-10]

General symptoms include- pain, vomiting, loss of appetite, constipation and loss of weight with ball-rolling movement in the abdomen. Its association with Ca stomach is seen by, offensive vomitus containing coffee ground coloured altered blood. Patient may give history of Malena and jaundice. While, that with peptic ulcer, have non-bilious painless vomiting usually in the evening and in advanced patients may occur at any time.

Hence, an attempt was made to study the most common presenting symptoms, perioperative morbidities, short term and long term complications of various surgical

modalities for management of benign gastric outlet obstruction.

Gastrojejunostomy

Open GJ

Upper midline incision was placed. Dilated stomach seen due to GOO and confirmed the diagnosis. Truncal vagotomy was done. Gastrocolic omentum was opened, through lesser sac posterior surface of the stomach is exposed. First loop of jejunum (approx. 10 cm from DJ junction) was taken for anastomosis. Both stomach and jejunum are brought together. Posterior sero-muscular continuous or interrupted 3 zero silk sutures were placed with each bites at 5 mm interval followed by opening of stomach and jejunum with cautery parallel to seromuscular stiches. Posterior layer full thickness suture with 2-0/3-0 silk continued in continuous fashion. It was continued as anterior all layer suturing using Connell suture or continuous suture. Then anterior seromuscular suture was placed as continuous or interrupted silk sutures. Mesocolon was sutured to stomach wall 1-2 cm away from the suture line (both anteriorly and posteriorly).

Laparoscopic stapled GJ

In this study, the abdomen was entered using either Veress needle insufflations or the Hasson technique. Total 4 to 5 trocars were placed in the upper abdomen as per seen figure. Right mid clavicular port was converted to 12 mm port for stapler. After placement of trocars; the greater curvature of the stomach was identified. The gastrocolic omentum was opened using an ultrasonic or Harmonic scalpel. The lesser sac was entered, and the distal stomach was identified. A loop of small bowel approximately 30 cm to 50 cm distal to the ligament of Treitz was chosen for the Gastrojejunostomy.

A laparoscopic stay suture was used to align the small bowel segment in an antecolic manner to the anterior or posterior wall of the stomach. Enterotomies were then made with cautery in both the jejunum and stomach. Green colour Cartridge (Echelon 60) was used to create the anastomosis. The common enterotomy was closed laparoscopically with 2 layers of suture.

Heineke-Mikulicz pyloroplasty

Open

Upper midline incision was used for laparotomy. Duodenum is mobilised by Kocherisation. About 5-6 cm incision was made along the lower antrum, pylorus and 1st part of the duodenum longitudinally to its entire thickness.

Whole procedure is described in Figure 1.

Laparoscopic

In this study, the abdomen was entered using either Veress needle insufflations or the Hasson technique. Total 4 to 5 trocars were placed in the upper abdomen as per seen in laparoscopic GJ. After placement of trocars, the pylorus of the stomach and 1st part of duodenum was identified. Incision was made by hook longitudinally from pylorus to 1st part of duodenum and closed transversally with full thickness interrupted sutures of silk 2-0.

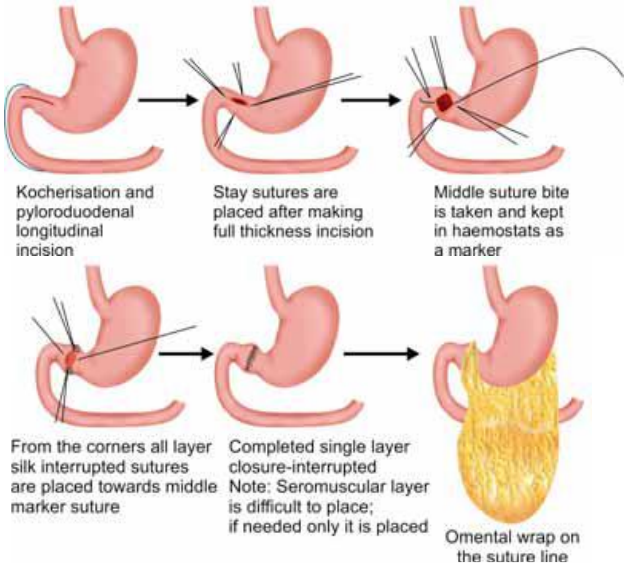

Figure 1: steps of open H-M pyloroplasty.
Source: From SRB'S surgical operations book.

The Finney pyloroplasty

Open

Upper midline incision was used. Kocherisation was done adequately. Seromuscular sutures were placed between distal part of the greater curvature of the stomach and proximal inner part of the duodenum which are tied either after placing all sutures or individually after placing sutures one by one. A 'U'-shaped incision was made from greater curvature towards proximal duodenum which was deepened to have a full thickness gastroduodenotomy. Whole procedure is described in Figure 2.

Laparoscopic

In this study, the abdomen was entered using either Veress needle insufflations or the Hasson technique. Total 4 to 5 trocars were placed in the upper abdomen as per seen in laparoscopic GJ. After placement of trocars, the pylorus of the stomach and 1st part of duodenum was identified. U shaped incision put by hook from greater curvature to duodenum extended with the harmonic shear. First seromuscular stiches were placed between adjacent duodenum and stomach with PDS 2-0

interrupted suture followed by full thickness continuous suturing with vicryl 2-0 done in continuous manner on posterior side and same suture was continuous on anterior side in as Connell suturing followed by anterior seromuscular interrupted sutures with PDS 2-0 with omentopexy. Ryle's tube is advanced beyond anastomosis after completing full thickness posterior layer.

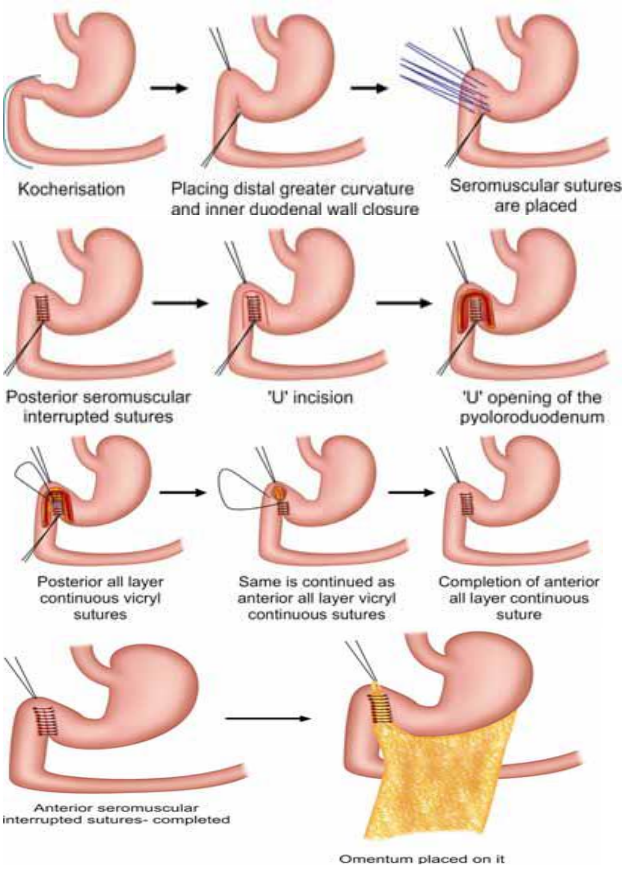

Figure 2: Steps of open Finney's pyloroplasty.
Source: From SRB'S surgical operations book.

As compared with Godadevi et al study, nausea and vomiting was most common symptoms in both studies.[11] Apart from anorexia and weight loss which was 20% in our study in comparison to Godadevi et al study, where they were 84%.[11] All other symptoms (early satiety, epigastric fullness, epigastric pain and indigestion) incidence compare with other studies. Nausea-vomiting were common symptoms in all study. Vomiting is usually spontaneous and projectile type containing partially digested food particles.

In our study, acid ingestion (corrosive injury) (40%) was common cause for GOO in contrast with other two studies Godadevi et al study and Tejas et al study where peptic ulcer (46% and 41.5% respectively) was common cause for gastric outlet obstruction.[11,12] This was may be accidental.

In our study population, males were 18 and females were 12. In our series GOO was more common in males than female and most common procedure for GOO was gastrojejunostomy followed by Heineke-Mikulicz pyloroplasty and Finney pyloroplasty. The average age was being 32 years with span from 24 to 54 years. All of the above three procedure has been performed by open as well as laparoscopically. In the series of Godadevi et al, the maximum incidence was seen in the age group of 31-40 years.[11] The average age was being 47.52 years with span from 22 to 73 years. Men outnumbered women by 2:1. In the series of Fisher et al, the average age was 54 with span from 20 to 89 years and men outnumbered women by 2:1.[13]

Table 4: Comparison of open GJ's outcomes with other study.

Parameters	Present study	Godadevi et al[11]
Avg. days of RT in situ	5 days	5 days (3-10 days)
Avg. days of drain in situ	9.66 days	-
Avg. hospital stay	18.5 days	-
Incidence of wound infection	25%	4%
Mortality	0%	0%

In our study, average days of RT in situ in all open gastrojejunostomy patients was 5 days and it was same in Godadevi et al study. Wound infection developed in 25% patients in our study and treated by conservative management. Wound infection was developed in 4% patients in Godadevi et al study (Table 4).[11]

Table 5: Comparison of laparoscopic GJ's outcomes with other study.

Parameters	Present study	Zhang et al[13]
Avg. days of RT in situ	5 days	-
Avg. days of drain in situ	7 days	6 days
Avg. hospital stay	10.5 days	8 days
Incidence of wound infection	0%	2%
Mortality	0%	0%

From above Table 5, our laparoscopic GJ's outcomes were mostly same as Zhang's study. But total morbidities were less than open GJ's.[14]

However, our results were similar to results of prior studies on laparoscopic GJ that suggest that laparoscopic GJ has better outcomes than open GJ. This will allow for a direct comparison of the perioperative variable and outcome of open versus laparoscopic GJ for patients with similar underlying causes of GOO. In addition, further study should examine the efficacy and feasibility of

laparoscopic GJ in patients with different underlying disease processes.

Table 6: Comparison of laparoscopic Finney pyloroplasty's outcomes with other study.

Parameters	Present study	Moggia et al[14]
Avg. days of RT in situ	4 days	-
Avg. days of drain in situ	4 days	-
Avg. hospital stay	7 days	8 days
Incidence of wound infection	0%	0%
Mortality	0%	0%
PPI dependence (up to 6 months)	17%	100%

Our results of Laparoscopic Finney's pyloroplasty are comparable to Moggia et al study except PPI dependence which is lower in our study i.e. 17 % versus 100%.[15] This difference may be due to differences in underlying causes of benign GOO in both series. PPI dependence in our study may be depends on surgical procedures or underlying etiology and is not evaluated in our study, further evaluation required.

CONCLUSION

In management of benign gastric outlet obstruction, most common symptoms were nausea and vomiting and most common cause was corrosive acid ingestion. On Comparison of different surgical modalities for management of benign GOO, all surgeries performed laparoscopically were safe and carried comparatively less morbidities (perioperative, short term and long term) in comparison to open methods. Among all three laparoscopic procedures, outcome of laparoscopic pyloroplasty, both H-M pyloroplasty and Finney's pyloroplasty were better than laparoscopic gastro-jejunostomy. From our study it seems that H-M pyloroplasty and Finney's pyloroplasty are more physiological way to treatment of GOO surgically than gastrojejunostomy.

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