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Outcomes Of Stapled Versus Hand Sewn Oesophagojejunal Anastomosis after Total Gastrectomy: A Retrospective Study

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Abstract: ***Aim:*** *Oesophagojejunostomy is the major cause of morbidity following total gastrectomy for malignancy. This study was done to compare the short term and long term outcomes between stapled versus hand sewn oesophagojejunal anastomosis after total gastrectomy for oesophagogastric junction carcinoma and proximal gastric carcinoma.*

Methods:*This is a retrospective study of 63 patients who underwent total gastrectomy for adenocarcinoma of OG junction & proximal stomach at the Institute of Surgical Gastroenterology, Centre of Excellence for Upper Gastrointestinal Surgery, Rajiv Gandhi Government General hospital, Chennai from August 2014 to July 2017. The study population was divided into two arms: Stapled oesophagojejunal anastomosis arm (48 patients) and Hand-sewn oesophagojejunal anastomosis arm (15 patients). Anastomotic techniques and postoperative complications were defined. Analysis of various parameters was done based on data obtained from prospectively maintained database and periodic patient reviews. Statistical analysis was performed using SPSS software and p value of <0.05 was considered to be statistically significant.*

Results: *The mean age of the patients was 51.7 years (range: 26 to 70 years). Majority (87%) of the patients had dysphagia at presentation. The two groups were comparable in terms of presenting symptoms, comorbidities, behavioural and dietary habits, biochemical parameters and stage of the disease. The handsewn group had longer operative times (208 min vs 170 min), more blood loss (201 ml vs 168ml), delay in NG tube removal (11.67 days vs 6.42 days), delay in initiation of oral intake (10 days vs 6 days), delay in drain removal (12.4 days vs 7.4 days) and prolonged postop hospital stay (15.6 days vs 9.52 days), which were all statistically significant. The incidence of anastomotic leak, anastomotic stricture, wound infections, transfusion requirement and mortality were not statistically significant between the two groups.*

Conclusion: *Stapled esophagojejunal anastomosis is a safe way to create an oesophagojejunal anastomosis, allowing shorter operating time, early initiation of orals and shorter hospital stay when compared with handsewn anastomosis.*

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I. Introduction

Surgery remains the mainstay of treatment for oesophagogastric junction carcinoma and proximal body gastric carcinoma, while chemotherapy and chemo-radiotherapy serve as adjuvant or neoadjuvant treatment methods[1]. Total gastrectomy with D2 lymphadenectomy offers the best prospects in terms of overall survival[2]. After surgery, complications in terms of post-operative morbidity and mortality are related to the oesophagojejunal anastomosis, which is the Achilles heel of total gastrectomy.

Oesophagojejunostomy, using a circular stapler or hand sewn sutures, is a standard technique for Roux-en-Y reconstruction after total gastrectomy. Recently, mechanical anastomosis has been considered to be a safe way to create an oesophagojejunostomy, with leakage rates equivalent [5–7]or even superior [4, 8] to those of manual hand-sewn anastomosis. Improvements in suturing techniques have allowed improvement in the results of handsewn anastomosis, thereby previously described failure rates of about 15 percent are no longer appropriate.

Trials comparing different anastomotic techniques have arrived at different conclusions. This study is to compare the short term and long term outcomes of stapled versus hand sewn esophagojejunal anastomoses after total gastrectomy for oesophagogastric junction carcinoma and proximal gastric carcinoma and thereby formulate a standard method of patient selection, type of anastomosis and perioperative care to achieve good outcome after total gastrectomy.

II. Materials And Methods

The records of all patients admitted for the management of adenocarcinoma of oesophagogastric junction and proximal stomach from 2014 to 2017 in the Institute of Surgical Gastroenterology, Centre of Excellence for Upper Gastrointestinal Surgery**,** Rajiv Gandhi Government General hospital, Chennai were obtained from prospectively maintained database.

All patients who underwent total gastrectomy followed by esophagojejunal anastomosis were included in the study. Patients who underwent total gastrectomy for stump carcinoma or recurrent carcinoma stomach, those who underwent palliative resections, proximal gastrectomy, transhiatal oesophagectomy and multivisceral resection were excluded from the study.

The patients included in the study were divided into two groups: Stapled oesophagojejunal anastomosis group and Hand sewn oesophagojejunal anastomosis group.

All the data for analysis were recorded in a standard proforma. Besides age and gender, the chief complaints, co-morbid illness, nature of diet, smoking and alcohol consumption were also noted. Findings on physical examination such as pallor, pedal edema, jaundice, abdominal mass, hepatomegaly and free fluid and rectal deposits were noted. All patients underwent upper GI endoscopy and biopsy, ultrasonogram and contrast enhanced computerized tomography of the abdomen and findings were noted. An informed consent was obtained from all patients explaining the nature of illness, the magnitude of surgery, morbidity and mortality. All patients had adequate preoperative preparation before surgery.

Surgical technique

During surgery, on opening the abdomen, resectability of the tumor was assessed prior to proceeding with resection.After complete mobilization of the stomach, first part of the duodenum was divided using TLC 60mm stapler and esophagus was divided at 5cm proximal to tumor margin. Roux limb was prepared by dividing the jejunum about 20- 30 cm from DJ flexure and brought in antecolic fashion and oesophagojejunal anastomosis was done by stapled or handsewn technique.

After completing the anastomosis, an intraoperative leak test was performed by distending the anastomosis with air through Ryle's tube to check the integrity of the anastomosis. Proximal end of the jejunum was anastomosed in side to side or end to side fashion with the jejunum 40cm from the oesophagojejunal anastomotic site by hand sewn anastomosis. Feeding jejunostomy was done by modified Witzel's technique in all patients.

Anastomotic technique

Stapled anastomosis: Purse string suture was taken with 2-0 prolene in distal oesophagus, anvil passed into it and purse string suture tied around the anvil head tightly, leaving no slack. The stapler gun was inserted through the free jejunal loop and an end-to-side stapled oesophagojejunal anastomosis was made by CDH 25 stapler. Doughnuts were examined for their completeness. The jejunal stump was closed with TRH 30 or TLC 60mm stapler or handsewn sutures.

Handsewn anastomosis: Anastomosis was done by single layer interrupted sutures in an end to side fashion with 3-0 vicryl suture.

Postoperative management

Patients were managed in intensive care unit. Trial jejunostomy feeding was started on postoperative day (POD) 2 or 3 with clear fluids and gradually increased to desired amount. If clinical suspicion of anastomotic leakage was present, initial bedside USG abdomen followed by CT Abdomen with water soluble oral contrast was done on POD 7. If no leak was noted, nasogastric tube was removed and orals were started. Abdominal drains were removed after starting oral soft diet.

Follow up

All patients were followed up for a minimum of 12 months post surgery or till the death of the patient. The follow-up protocol included outpatient visit after one week, one month and then 3 monthly intervals. Clinical examination and hemogram was done in all patients. Patient who had abdominal complaints underwent ultrasonogram and endoscopy and CT if necessary. Anastomotic strictures were dilated as per institution protocol.

Parameters analysed

Patients' age & sex distribution; presenting complaints of dysphagia, abdominal pain, vomiting, loss of appetite and weight; history of smoking and alcohol intake; dietary habits; comorbidities like diabetes and hypertension; signs like abdominal mass and pallor; biochemical parameters: hemoglobin and albumin; stage distribution of disease; operative time; blood loss; transfusion requirements; postoperative parameters:

anastomotic leak, anastomotic stricture, time to nasogastric tube removal, time to initiation of oral feeds, time of abdominal drain removal, wound infection, pneumonitis, length of hospital stay and mortality were analysed between the two groups of patients.

Definitions of postoperative complications

Anastomotic leak: Radiologically or clinically detectable collection after 5th postoperative day presenting with pain and/or pyrexia.

Anastomotic stricture: Recurrence of dysphagia due to endoscopically or radiologically detected narrowing at esophagojejunal anastomotic site.

Intra-abdominal collection: Any collection detected by ultrasonogram or CECT of more than 5 cm in size.

Wound infection: Any collection of pus or fluid at the surgical site presenting with fever, leucocytosis and local inflammatory signs in the absence of any other major complications.

Pneumonitis: Any post-operative lung signs with fever and diminished air entry.

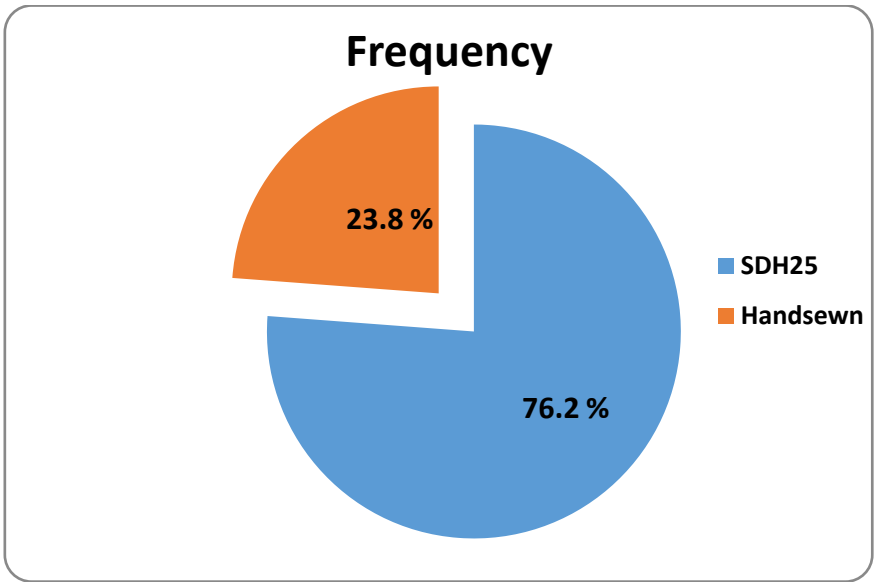
Mortality: 30 day mortality or mortality up to the time of discharge if this was longer.

Statistical analysis:

The data collected in the proforma were entered in an excel sheet of Microsoft office. The mean and standard deviation were computed for continuous variables and for categorical variables, proportions were computed. The chi square test was applied to compare the proportions between the groups. The independent t-test was used to compare the means between the groups. All analyses were two tailed and p value<0.05 was considered significant. Statistical analysis was done using SPSS software.

III. Results

63 patients who underwent total gastrectomy for carcinoma of oesophagogastric junction or proximal gastric cancer were included in this study. Among them, 48 patients (76.2%) had stapled oesophagojejunal anastomosis and 15(23.8 %) had hand sewn oesophagojejunal anastomosis.



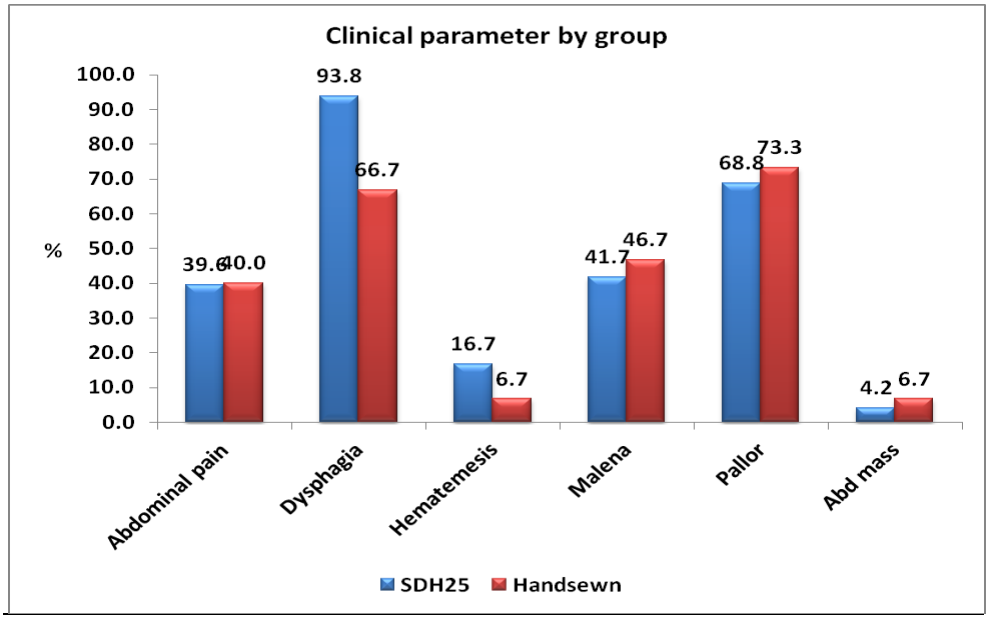
Overall, 34 patients (54%) were male and 29 (46%) were female. The mean age for patients in the stapler group was 51.1years (range: 27 to 65 years) and that for the hand sewn group was 53.3 years (range: 26 to 70 years).

Clinical presentation:

The most common presenting symptoms were dysphagia (87%) followed by abdominal pain (39.7%) and vomiting (23.8%). Symptoms of bleeding from growth in the form of hemetemesis and malena were present among 14.29% and 42.86% of the patients, respectively. Majority of the patients (93.7%) had loss of appetite and weight. More than two-thirds (69.8%) of the study group had pallor at presentation. Abdominal mass was palpable in only 3 patients.

TABLE 1: GENERAL PARAMETERS

Parameter	Total patients (n=63)	Stapler Group (n=48)	Handsewn Group(n=15)
M:F	34:29	22:26	12:3
Mean age (yrs)	51.63	51.1	53.3
Dysphagia	55 (87%)	45 (93.8%)	10 (66.7%)
Vomiting	15 (23.8%)	13 (27.1%)	2 (13.3%)
Abdominal pain	25 (39.7%)	19 (39.6%)	6 (40%)
Hemetemesis	9 (14.29%)	8 (16.7%)	1 (6.7%)
Malena	27 (42.86%)	20 (41.7%)	7 (46%)
Pallor	44 (69.8%)	33 (68.6%)	11 (73.3%)
Abdominal mass	3 (4.8%)	2 (4.2%)	1 (6.7%)
Loss of appetite and weight	59 (93.7%)	46 (95.8%)	13 (86.7%)
Smoking	31 (49.2%)	21 (43.8%)	10 (66.7%)
Alcohol	32 (50.79%)	22 (45.8%)	10 (66.7%)
Non-veg diet	58 (92.06%)	45 (93.8%)	13 (86.7%)
Hb (g%)	8.9	8.89	8.98
Albumin (g/dl)	3.5	3.50	3.44
Stage			
Stage II	12 (19%)	8 (16.7%)	4 (26.7%)
Stage III	51 (81%)	40 (83.3%)	11 (73.3%)
Adjuvant chemotherapy	60 (95.2%)	47 (97.9%)	13 (86.7%)



On evaluation of comorbidities, only 5% and 3.2% of study patients had diabetes mellitus and systemic hypertension, respectively. With regards to the personal habits, 43.8%& 45.8% of stapler group patients and 66.7% & 66.7% of handsewn group patients were smokers and alcoholics, respectively. Majority (92%) were non vegetarian diet consumers.

Biochemical parameters:

The mean hemoglobin concentration was 8.9 g% (range: 4.9 to 14 g %). The need for preoperative transfusion was decided when hemoglobin was less than 8gm%.The mean serum albumin was 3.5g%(range: 2.5 to 4.2 g%). There was no statistically significant difference between the groups in terms of the above two parameters.

Evaluation and staging:

Multislice CECT chest and abdomen, UGI scopy and biopsy were done in all patients to the confirm diagnosis, assess the extent of disease and determine resectability. The patients were staged as per AJCC 7th edition (2010) TNM staging classification.The commonest stage for which total gastrectomy was done in our institution was stage III (81%), followed by stage II (19%). This clearly shows that we most commonly come

across advanced gastric cancer patients.Diagnostic laparoscopy was done in all cases to detect peritoneal and surface liver metastasis and then proceeded to total gastrectomy as per institution protocol.

Duration of Surgery

The mean duration of surgery was 170.83 minutes (range: 140 to 200 minutes; standard deviation of 14.85) for stapled esophagojejunal anastomosis; whereas it was 208 minutes (range: 190 to 220 minutes; standard deviation of 8.61) for hand sewn oesophagojejunal anastomosis. It was statistically significant between the groups (p value = 0.000)

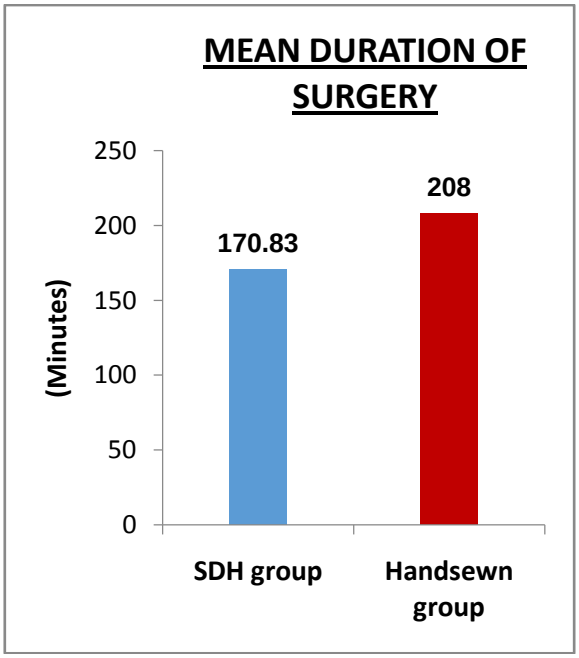
Blood Loss and transfusion requirement

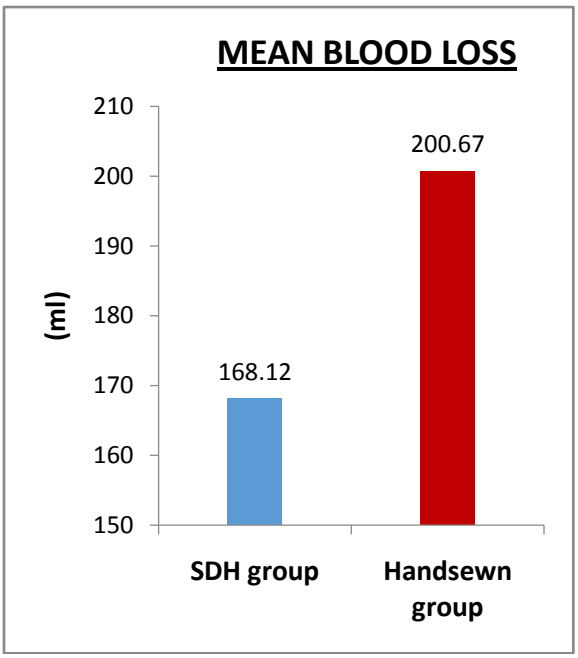
Preoperative transfusion was done in 54.2% of stapled esophagojejunal anastomoses patients and 66.7% of hand sewn esophagojejunal anastomosis patients which was not statistically significant (p value = 0.552).

The mean blood loss was 168 ml (standard deviation: 38.24) for stapled esophagojejunal anastomoses and 201 ml (standard deviation: 29.14) for hand sewn esophagojejunal anastomosis which was statistically significant with p value = 0.002.

TABLE 2: SURGERY RELATED PARAMETERS

Parameter	Stapler Group (n=48)	Handsewn Group (n=15)	p value
Mean Duration of surgery (min)	170.83	208	**0.000**
Mean blood loss (ml)	168.12	200.67	**0.002**
Preop transfusion requirement	26 (54.2%)	10 (66.7%)	0.552
Wound infection	6 (12.5%)	5 (33.3%)	0.113
Pneumonia	2 (4.2%)	2 (13.3%)	0.238
Positive resection margin	1 (2.1%)	1 (6.7%)	0.422
Mean time to RT removal (days)	6.42	11.67	**0.002**
Mean time to initiation of orals (days)	6.09	10.01	**0.000**
Mean time to DT removal (days)	7.4	12.4	**0.001**
Mean length of hospital stay (days)	9.52	15.6	**0.000**
Anastomotic leak	1 (2.1%)	2 (13.3%)	0.138
Anastomotic stricture	1 (2.1%)	1 (6.7%)	0.422
Recurrence	1 (2.1%)	1 (6.7%)	0.422
Mortality	1 (2.1%)	2 (13.3%)	0.138





Anastomotic leak

Oesophagojejunal anastomotic leak was seen in 1 patient (2.1%) in stapler group and 2 patients (13.3%) in handsewn group which was not statistically significant with P value of 0.138. All the three patients with anastomotic leak were initially managed by ICD tube insertion. Following ICD insertion, one patient in handsewn group was managed by SEMS and one patient in stapler group was managed by relaparotomy.

Wound infection and Pneumonia

12.5% & 4.2% of stapler group patients and 33.3% & 13.3% of handsewn group patients had wound infections and pneumonia, respectively but there was no statistically significant difference between the groups.

RT Removal

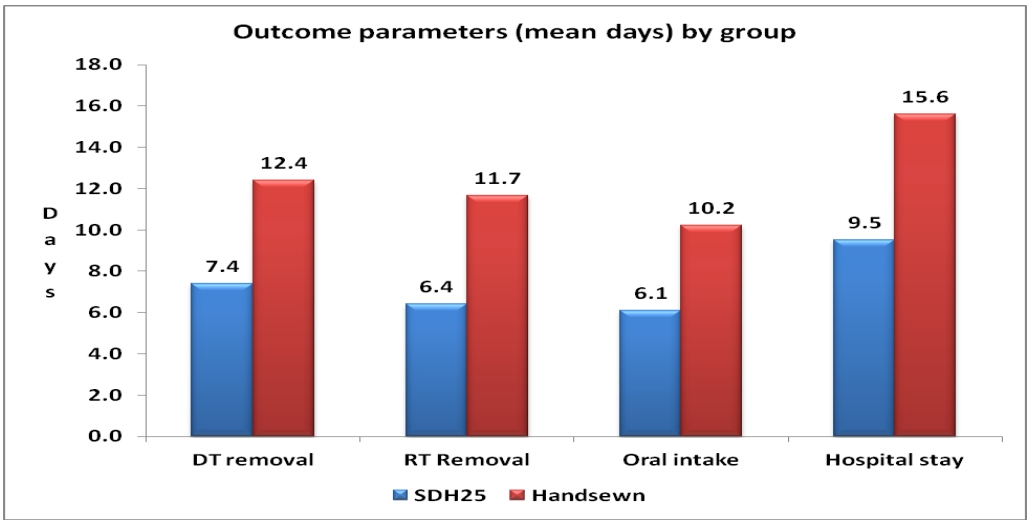
Meantime to RT removal was 6.42 days in stapler group and 11.67 days in hand sewn group which was statistically significant (p value=0.002).

DT removal

Mean time to DT removal was 7.40 days in stapler group and 12.40 days in handsewn group which was statistically significant with p value = 0.001.

Oral intake

Mean time to initiation of oral intake was 6.09 days in stapler group and 10.01 days in hand sewn group which was statistically significant (p value=0.000)



Length of hospital Stay

Comparing both groups, the mean hospital stay was 9.52 days in stapler group and 15.6 days in hand sewn group which was statistically significant with p value=0.000.

Anastomotic stricture

One patient (2.1%) in stapler group and one patient (6.7%) in handsewn group had anastomotic stricture which was managed by endoscopic dilatation.There was no statistical significance between the groups.

Margin status

One patient each in stapler group and handsewn group had proximal margin positive for tumour which was not statistically significant.

Adjuvant Chemotherapy Status

All patients in both the groups had adjuvant chemotherapy except one who died in stapler group and two who died in handsewn group.

Anastomotic recurrence

One patient (2.1%) in stapler group and one patient (6.7%) in handsewn group had tumour recurrence at anastomotic site which was not statistically significant with p value=0.422. They were managed by palliative chemoradiotherapy.

Mortality

Comparing the groups, One patient (2.1%) in stapler group and two patients (13.3%) in handsewn group diedwhich was not statistically significant with p value = 0.138. The overall mortality rate was 4.8%.

IV. Discussion

After total gastrectomy, Roux-en-Y oesophagojejunal anastomosis is preferred by the majority of surgeons. The short term and long term postoperative morbidity and mortality after total gastrectomy were directly related to the oesophagojejunal anastomosis, mainly anastomotic leakage that can lead to sepsis, and anastomotic stricture. So we studied short term and long term outcomes of stapled versus hand sewn oesophagojejunal anastomosis after total gastrectomy in our super specialty department and predicted the outcome, hence formulate a standard protocol for surgery.

An interest in comparing stapled and manual suture anastomosis has existed since the introduction of the first mechanical stapler[12]. Studies by Fujimoto et al[6] tried to show the lack of a significant difference between the two techniques, but the debate continued and some found marginally better outcomes for stapled anastomosis[7.]Large studies from Japan's National Cancer Center from 1985 to 1997 showed a decrease in the rate of anastomotic leakage. Leakage rates as low as 0.5% for stapled anastomoses was reported [13] and now stapled oesophagojejunostomy is considered by most to be the best technique.

In our study, there was a prolonged operative time (mean 208 mins) in hand sewn oesophagojejunal anastomoses group when compared with stapled oesophagojejunal anastomoses group (171 mins), which was statistically significant with p value=0.000. Stapled anastomosis group had significantly less blood loss compared to handsewn group (168ml vs 200ml).

Proximal margin was positive in one case in each group which was not statistically significant andwas managed by adjuvant chemo-radiotherapy.

Among the complications, oesophagojejunal anastomotic leak developed in 1 patient (2.1%) in stapler anastomosis group and in 2 patients (13.3%) in hand sewn anastomosis group. All the three patients had ICD tube insertion initially and one patient in hand sewn group had SEMS inserted for partial disruption of oesophagojejunal anastomosis.Several randomized controlled trials have shown no difference between both subgroups in terms of leak as well as major morbidity. Stapled anastomoses help surgeons and the patients in saving the operating time and allow greater integrity of the anastomosis, resulting in reduced morbidity and shorter hospital stay. Another advantage of stapled anastomosis is that it allows higher anastomosis after radical total gastrectomy for OG junction carcinoma and proximal gastric carcinoma without need for thoracotomy, especially with tumors demonstrating intramural infiltration.

The stapled anastomosis group had earlier removal of NG tube and earlier initiation of orals by 5 days and 4 days respectively as compared to the handsewn anastomosis group which was statistically significant (p value: 0.002).

Though wound infection and pneumonia rates were higher in the handsewn anastomosis group, it did not reach statistical significance. Wound infections were managed by removal of sutures, thorough wound wash and antibiotics as per culture/sensitivity. Pneumonitis was aggressively treated by ambulation, chest physiotherapy, antibiotics and nasal oxygen.

Anastomotic stricture developed in one case in each group on follow up which was not statistically significant thereby demonstrating that the technique of anastomosis did not affect the stricture rate. The patients were subjected to endoscopic dilatation for symptomatic relief.

Anastomotic site recurrence developed in one case in each group, which was not statistically significant (p value: 0.422) thereby demonstrating that the technique of anastomosis did not have an effect on recurrence as well. Both patients were subjected to palliative chemoradiotherapy.

One patient in the stapled anastomosis group and two patients in the handsewn group expired in the follow up period which was not statistically significant (p valve: 0.138). Overall mortality rate in the study was 4.8%.

V. Conclusion

Oesophagojejunal anastomosis is the major cause of postoperative morbidity following total gastrectomy for malignancy. This study shows that stapled anastomosis group had significantly shorter operative time, earlier initiation of oral feeds and shorter duration of hospital stay when compared to handsewn anastomosis group. Though anastomotic leakage rate in stapler group was less, it was not statistically significant. This supports the use of stapled oesophagojejunal anastomosis as a safe method to create an oesophagojejunostomy as it is quick to perform, allows shorter hospital stay and does not appear to be associated with a previously noted increased incidence of benign anastomotic stricture formation when compared with handsewn anastomosis.

References

[1]. Hartgrink HH, Jansen EP , van Grieken NC, van de Velde CJ. Gastric cancer.Lancet.2009; 374(9688):477-90.Epub 2009 Jul 20.
[2]. Degiuli M, Sasako M, Calgaro M, Garino M, Rebecchi F, Mineccia M et al. Morbidity and mortality after D1 and D2 gastrectomy for cancer: interim analysis of the Italian Gastric Cancer Study Group (IGCSG) randomised surgical trial. Eur J SurgOncol. 2004; 30(3):303-8.
[3]. Nance FC. New techniques of gastrointestinal anastomoses with the EEA stapler. Ann Surg. 1979; 189(5):587-600.
[4]. Nomura S, Sasako M, Katai H, Sano T, Maruyama K et al. Decreasing complication rates after stapled esophagojejunostomy following a learning curve. Gastric Cancer. 2000;3(2):97-101.
[5]. Seufert RM, Schmidt-Matthiesen A, Beyer A et al. Total gastrectomy and oesophagojejunostomy—a prospective randomized trial of handsewn versus mechanically stapled anastomoses. Br J Surg 1990; 77:50-2.
[6]. Fujimoto S, Takahashi M, Endoh F, Takai M, Kobayashi K, Kiuchi S,et al. Stapled or manual suturing in esophagojejunostomy after total gastrectomy: A comparison of outcome in 379 patients. Am J Surg 1991; 162:256-9.
[7]. Ikeda Y, Minagawa S, Koyanagi N, Tateishi H, Sugimachi K. Esophagojejunostomy with manual single layer suturing after a total gastrectomy for gastric cancer. J SurgOncol. 1997; 66(2):127-9.
[8]. Viste A, Eide GE, Soreide O. Stomach cancer: a prospective study of anastomotic failure following total gastrectomy. ActaChirScand 1987; 153:303–6.
[9]. Fujiwara Y, Kusunoki M, Nakagawa K, Tanaka T, Yamamura T, Utsonomija J, et al. The relationship between stapling doughnuts: characteristics and functional results after total gastrectomy. Hepatogastroenterology 1998; 45:1177-82.
[10]. Sharma D. Choice of digestive tract reconstructive procedure following total gastrectomy: A critical reappraisal.Indian J Surg 2004; 66:270-6.
[11]. Hironori O, Hiroshi N, et al: Tailoring treatment for early gastric cancer after endoscopic resection using sentinel node navigation with infrared ray electronic endoscopy combined with indocyanine green injection. Digestive Surgery 26: 276-281, 2009.
[12]. Sannohe Y, Hiratsuka R, Doki K. Single layer suture by manual or mechanical stapling technique in esophagojejunostomy after total gastrectomy. Am J Surg. 1981; 142(3):403-6.
[13]. Hyodo M, Hosoya Y, Hirashima Y, Haruta H, Kurashina K, Saito S, et al. Minimum leakage rate (0.5%) of stapled esophagojejunostomy with sacrifice of a small part of the jejunum after total gastrectomy in 390 consecutive patients. Dig Surg. 2007; 24(3):169-72. Epub 2007 Apr 27.
[14]. Guerra JP, Silva MH, dos Santos JG. An improved technique for a stapled transabdominal esophagojejunostomy. Am J Surg 1997; 174:61–2.
[15]. Parker J, Sell H, Stahlfeld K. A new technique for esophagojejunostomy after total gastrectomy for gastric cancer. Am J Surg 2001; 182:174–6.
[16]. Bonenkamp JJ, Songun I, Hermans J, Sasako M, WelvaartK,Plukker JT et al. Randomised comparison of morbidity after D1 and D2 dissection for gastric cancer in 996 Dutch patients.Lancet. 1995; 345(8952):745-8.
[17]. Sasako M, Saka M, Fukagawa T, Katai H, Sano T. Surgical treatment of advanced gastric cancer: Japanese perspective. Dig Surg. 2007; 24(2):101-7. Epub 2007 Apr 19.
[18]. Nunobe S, Hiki N, Tanimura S, Kubota T, Kumagai K, Sano T et al. Three-step esophagojejunal anastomosis with atraumatic anvil insertion technique after laparoscopic total gastrectomy. JGastrointest Surg. 2011; 15(9):15

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