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LAPAROSCOPIC GASTRECTOMY WITH D 2 LYMPHADENECTOMY: AN INITIAL MEDICAL COLLEGE EXPERIENCE FROM AN ENDEMIC ZONE OF GASTRIC CANCERS. (2013-2019)

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ABSTRACT

Objectives: The aim of the present study was to assess the technical feasibility and oncological safety of laparoscopic gastrectomy with D2 dissection. Material and Methods: This prospective observational study was conducted at Govt. Medical College Srinagar, since June 2013 to June 2019. The Kashmiri population comprises of endemic zone for gastric cancers due to their cultural and environmental influences. The study sample of patients was explained the various available modalities of treatment with their potential benefits and risks and also about the possibility of conversion to open surgery in case of any technical difficulties. This study was approved by the ethical committee of our medical college. All the patients included in the study were pathologically proven adenocarcinoma of the stomach. Results: Most of our patients were in the age range of 50 to 70 years and 34 (72.34%) patients were Males. In most of these patients, the site of tumor was distal third 30 (63.82%), followed by diffuse involvement 06 (12.76%), and upper third 07 (14.89%) and middle third 04 (8.51%). The diagnostic laparoscopy was done in all patients. Laparoscopic partial gastrectomy with Gastrojujunostomy with D2 lymphadenectomy was performed in 26 (55.31%). Laparoscopic total Gastrectomy with Esophago-jejunostomy with D2 lymphadenectomy in 17 (36.17%), Laparoscopic gastrojejunostomy in 3(6.38%) and Laparoscopic feeding jujunostomy in 1 (2.01%) were performed.The median operative time was 150 min (range 130-180) in Partial Gastrectomy and 210 min (range 200–250) in total Gastrectomy; the median estimated blood loss was 110 ml (range 90-130) in partial Gastrectomy and 150 ml (range 100–200) in total Gastrectomy. There were no major intra operative and post operative complications. Wound infection developed in 3 (6.38 %) patients, one (2.12 %) patient developed duodenal stump leak and one (2.12%) patient was converted into open and 2 (4.2%) patients developed intra abdominal sepsis. The median number of lymph nodes retrieved was 20 (10-32). A positive proximal margin was detected in 2 patients (4.65%) .The median time to start oral fluid was 4 days (3-7) days in partial Gastrectomy and 7 days (5-9) in total Gastrectomy. The median hospital stay was 5 days (4-7 days) in partial Gastrectomy and 7 days (range 5–10 days) in total Gastrectomy.There was no mortality in our study sample. Conclusion: Laparoscopic gastrectomy is safe and feasible, and it can be performed by experienced surgeons to achieve optimal oncological short-term outcomes.

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INTRODUCTION

Gastric carcinoma is the 4th leading cause of death in the United States. The disease is more prevalent in south eastern countries like Japan, China, Korea, and Malaysia.Gastric carcinoma is one of the commonest malignancies encountered in the Kashmir province. The prevalence is more common in Kashmir (1).

The esophageal and gastric cancer comprise of 60 % of total GI cancers in the Kashmir valley. Unfortunately due to unawareness and refusal to early endoscopy, these patients report to us very late. The tumor is seen predominantly in elderly population in the age range 55-75 years. The majority of tumors affected the distal stomach presenting mostly as gastric out let obstruction and associated with H- Pylori infection.

However trend is changing towards the proximal tumors as in the west. Majority of them receive palliative surgical treatment due to their late presentation. The laparoscopic approach in the management of gastric cancer is applied with increasing frequency nowadays, as well as in other intra-abdominal malignancies, particularly in cancer of the colon. The first laparoscopic gastrectomy with Billroth II reconstruction was carried out by Goh *et al*. in 1992; Kitano *et al*. (2) performed the first laparoscopic distal gastrectomy for gastric adenocarcinoma in 1994 with a modified D1 lymph node dissection. After this preliminary result, the technique has spread in Asia with several case series confirming its safety and feasibility. The first European experience was published in 1999.Azagra *et al*. (3) reported a series of 13 gastric cancer cases operated with a laparoscopic approach in Belgium.

The laparoscopic approach in gastric cancer includes both the diagnostic laparoscopy and laparoscopic resection.The technical innovations in laparoscopic instrument and the advances in the surgicaltechniques have allowed for a widespread acceptance of a laparoscopic surgery in gastriccancer management. The Advantages of the laparoscopic gastrectomy over the conventionalopen surgery include a reduced postoperative pain, an enhanced recovery, a shorterhospital stay, and a better cosmesis (4,5).Surgical resection is the sole curative treatment, in connection with regional lymphadenectomy as a recommended part of radical gastrectomy (6,7). Systematic lymph node dissection is crucial in gastric cancer surgery to achieve oncological clearance and a cure.The aggressive surgery approaches including an extensive lymph node dissection; combined with a resection of adjacent organs, if indicated. Additionally the improved peri-operative management on the patients has improved the survival (8).Laparoscopy has already proven its superiority over open surgery for colorectal cancer with shorter hospital stay (9) and similar long-term oncological outcomes (10).Recent advances in techniques for performing the lymph node dissection and the development of new instrumentations, such as stapling devices and ultrasonic devices, have made it possible to perform almost all the procedures in gastrectomy with lymphadenectomy laparoscopically which stand comparable to the open conventional surgery. Function-preserving surgery,such as pylorus preserving surgery, proximal gastrectomy, and segmental gastrectomy have been also successfully performed by laparoscopy.

Aims and objectives: The aim of the present study was to assess the technical feasibility and oncologicalsafety of laparoscopic gastrectomy with D2 dissection

MATERIAL AND METHODS

We took up a study with the gastric cancers at Govt. Medical College Srinagar to assess the technical safety and feasibility of laparoscopic management of gastric tumors. 47 patients were enrolled in the study since June 2013 to June 2019. The procedure of laparoscopic gastrectomy was explained to the study sample of patients with its potential benefits and risks with the explanation about the possibility of conversion to open technique in view of technical difficulties and in the interest of patient safety and well being. This study was approved by the ethical committee of our medical college. The patients included in the study were pathologically proven adenocarcinoma of the stomach. The study group of patients was having gastric tumours discovered during pre-operative upper gastrointestinal endoscopy and abdominal computed tomography. Patients with metastatic disease, those who underwent previous upper abdominal surgeries and those who are unfit for anesthesia are excluded from the study. A preoperative work-up that included upper gastrointestinal endoscopy, computed tomography of abdomen, pelvis and chest. Endoscopic ultrasound (EUS) was not routinely performed. The patients were optimized to the best outcome of surgery with blood transfusions, fresh frozen plasmas and correction of electrolyte imbalances if any. A routine preparation of stomach was done in every case with Ryle's tube, saline irrigation, prophylactic preoperative antibiotics and correction of any metabolic imbalances due to their co-morbid conditions if any. A well formatted form for the consent of the patient was routinely signed by all patients taken up in the study. The primary outcome was to evaluate the technical safety and oncological feasibility oflaparoscopic gastrectomy with D2 lymph node dissection.The secondary outcomes were to assess the operativetime, blood loss, and length of hospital stay, time until oralfluid intake, post operative anastomotic leak and morbidity, and mortality.The oncologic outcomes included the total number ofdissected lymph nodes, histopathologic data, and proximaland distal resection margins. The following data was collected prospectively: age, sex, histo-pathological diagnosis and peri-operative outcome were recorded in our study. Statistical analysis was performed using SPSS, statistical version 23.

Surgical procedure: The patient was kept fasting overnight. Ryle's tube was put and stomach washes and bowel preparation were given 24 to 48 hours before surgery. Operative area was shaved and prepared. All patients received a prophylactic dose of injection ceftriaxone 1 g one hour before and two doses after the surgery

Step 1: Port placement

The patient was placed in the lithotomy position, with arms tucked by the side of the patient. The monitor was placed on the right side of right shoulder of the patient. General anesthesia was administered and few of them were given epidural anesthesia.The operating surgeon comes in between the legs of the patient and the camera surgeon would shift from right to left side as per the convenience of dissection by the operating surgeon. The assistant holding the liver would come from the right side. The scrub nurse would come from the right side of the surgeon. The pneumo-peritoneum was created with a closed technique using a Veress needle at the base of the umbilicus. The 10 mm optical port was placed through the umbilicus for distal gastric tumours and 3 cm above and to the left of umbilicus for tumours located in the incisura and body of stomach.The two working ports were placed, one in the right upper quadrant 10/ 12 mm and other working port was placed in the left upper quadrant 10/12 mm. A 5 mm retraction port was made in the epigastric region and another accessory port was made below the right working port of the surgeon (5mm), slightly head up position was given to the patient. Diagnostic laparoscopy was done as a standard protocol in all patients to stage the tumour (liver or peritoneal metastasis, ascitis)and plan the surgical management.After evaluating the status of the tumour, the site of tumour and its fixidity to the underlying structures were confirmed. For the tumours placed distally in the antrum, pylorus and incisura, a lower partial gastrectomy was performed. Tumours in the body or higher a total laparoscopic gastrectomy was performed.

The techniques of different gastrectomies are described below in stepwise fashion.

Step 2: Division of Gastro-colic ligament and short Gastric vessels

The gastro-colic ligament was divided along the border of the transverse colon using harmonic. After dissection along the splenic flexure, a "tunnel vision" is established demonstrating the route under the short gastric vessels, with important landmarks: the posterior gastric wall at the left side, the spleen at the right side, and the retro-peritoneum with the splenic artery vein and pancreas hilum at the dorsal side.the left gastroepiploic artery is identified and ligated or clipped and cut with harmonic scissors. The short gastric vessels are divided cautiously with the use of an energy device. The dissection is continued until the angle of His and the left crus. It is very helpful to create space between the spleen and stomach by dividing the retrogastric adhesions first. The lymph nodes along the greater curvature (stations 4) are left en bloc with the specimen

Step 3: Division of Gastro-colic,Duodeno-colic ligaments and omentum

After completing the left side dissection and freeing the stomach from colon and spleen, the surgeon turns to right to complete right side dissection. The gastrocolic ligament is now cut towards the right side all along the transverse colon. As we approach the pyeloroduodenal area we start encountering the transverse mesocolon.The duodenocolic ligament is safely dissected off the transverse mesocolon taking care not to injure the vessels of transverse mesocolon. A guaze piece is off paramount help in this area as invariably there is some amount of bleeding. The dissection is carried to the first part of the duodenum and care is taken to avoid injury to head of pancrease, With a guaze piece pancrease is pushed down to expose the posterior wall of first part of duodenum, while the surgeon is dissecting towards the lower border of first part of the duodenum, left gastroepipolic vessels are ligated or clipped and cut with harmonic. The lower border of the duodenum (D1) is freed, taking care not to injure the gastroduodenal artery running posterior to D1. The lymph node station 6 is removed en block with the specimen. We make sure that omentectomy be not confused with gastrocolic ligament resection, so we try to do omentectomy separately.

Step 4: Hepatoduodenal clearance

The Hepatodudenal ligament is made naked starting the dissection from left side of the hilar plate. The fat over the left branch of the hepatic artery is lifted up and carried to the right branch of the hepatic artery across the hilar plate. The fat containing the lymph nodes between the common bile duct and portal vein posteriorly and hepatic artery from the left side is totally removed with an idea to harvest station 12 lymph node. Subsequently coming down the hepatic artery node, station 8 is found, the origin of the gastrodudenal artery and proper hepatic artery found. As we come down right gastric artery is identified the vessel is ligated and divided.

Step 5: Division of Hepato-gastric ligament

The liver is retracted upward using the eigastric port, the dissection is started at the lesser curvature of the stomach, and the lesser omentum is divided with harmonic as close to the liver as possible,After the hepato-gastric ligament is divided, and if adequate retraction is maintained, the right crus and its white line can be visualized. The dissection is continued perpendicular until the esophageal hiatus.

Step 6: Division of left gastric vein and artery

Stomach after dissection of the gastrocolic ligament is flipped anteriorly between the stomach and the liver.At this point the pedicle of the left gastric artery and the hepatic artery node (station 8) are clearly visible. In the background, the caudate lobe and vena cava are seen. Then started the dissection proximal to the station 8 node and continue towards the left gastric artery pedicle (station 7). Usually the left gastric vein is encountered first and controlled using 10 mm double endo-clips. During further dissection at this level more cranially the artery is found, and was controlled also by using 10 mm endoclips.

Step 7: Lymphadnectomy

Subsequently, dissection was continued in order to removethe celiac node (station 9), and continues on the superior border of the splenic artery to obtain the splenic nodes (stations 11). a posterior gastric artery is present between the splenic artery and the posterior gastric wall, which can be divided by coagulation . Additionally, if tumour involving the greater curvature, therefore lymphadenectomy of station 10 is indicated, otherwise it is not necessary to do so. Subsequently dissection was continued to remove the nodes along the common hepatic artery (Station 8) and along the hepatoduodenal ligament was reached (station12), then right gastric artery was controlled as by using endoclips as it originated from the hepatic artery (station 5)).After complete separation of the greater omentum from the transverse colon, the right gastroepiploic vein was divided with harmonic and the right gastro epiploic artery was exposed and divided at its origin from the gastroduodenal artery between the 10 mm endoclips and also infrapyloric lymph nodes (station 6) are also removed. 10mm endoclips just above the pancreatic head for the dissection of the infrapyloric lymph nodes (group 6).

Step 8: Duodenal dissection and Gastric resection

The inferior and superior border of the duodenum is cleared en bloc with the inferior and superior pyloric nodes (station 5 and 6), and a retro-duodenal passage is created to allow passage of the stapler.The pylorus is identified and the duodenum is transected 1–2 cm distal to it, using 60 mm linear stapler (blue stapler) to create a secure sealing of the duodenal bulb. Before firing the stapler, the surgeon should always verify that the nasogastric or nasojejunal (feeding) tube has been removed. The stomach was then transected using sequential firings of a 60-mm linear stapler after taking an appropriate margin proximal to the tumor. The 10 mm optical port was enlarged, and the specimen was withdrawn through the wound. For the total gastrectomy procedure, all steps were performed the same as in the partial gastrectomy procedure, in addition to the mobilization of the distal esophagus and the removal of lymph node groups 2, 10, and 11d as well as all 4sa lymph nodes.The stomach is then retracted caudally, and just above the site of the future proximal transection, two stay sutures are placed, one on each side of the esophagus.

These are placed to avoid retraction of the esophageal stump into the thorax and control the stump during the anastomosis. With suturing, the camera is placed in the opposite 12-mm port at the right side of the patient switching with the needle driver to allow for sufficient space and angulation during suturing. Again linearstapler is used to divide the esophagus or the proximal stomach

Step: 9 Reconstruction

The cut end of the esophagus which is stapled by the linear stapler held by two stay sutures and fixed to the two crura is to be anastomosed to the Roux loop in a side to side fashion. We identify the ligament of treitz and walk with the bowel 25 cm from ligament of treitz, the bowel is cut by a linear stapler in to proximal digestive limb and distal Roux limb. The mesentery is cut so that loop of the jejunal bowel is selected that is freely mobile and able to reach the site of future esophageal-jejunal anastomosis. However the anastomosis between esophagus and jejunum is performed by linear stapler. The Ryles tube is pushed by the anesthetists and negotiated from the esophagus in to the jejunal loop; the cut end of jujunostomy and esophagostomy is repaired by 2-0, 20 cm V lock .40 cm down to this esophago-jejunal anastomosis. Jujuno-jejunostomy in a side to side pattern is performed by using linear stapler and otomies are closed by V- Lock.

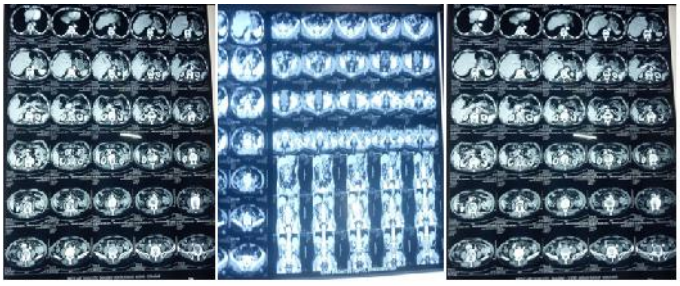

Figure 1. Pre-operative CT scan showing Growth at Antrum, Pylorus And body

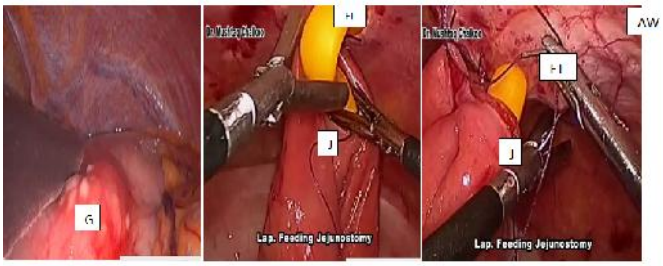

Figure 2. Diagnostic Laparoscopic and Feeding Jejunostomy, (G); Growth, (FT); Feeding Tube, (J); Jejunum,(AW): Abdominal Wall

RESULTS

The studyof 'Laparoscopic gastrectomy with D 2 Lymphadenectomy'An intial Medical college experience from an endemic zone of Gastric Cancer was carried out at tertiary care hospital in the Post-Graduate Department of General and minimal access surgery, Government Medical College Srinagar from June 2013 to June 2019. 47 patients were included in the study. The age of the patients ranged from 35 to 75 years with a mean age 58.5 years. The study reflects that majority of patients were Males 34 (72.34%) and females 13 (27.65%) Table1.Majority of patients presented with pain in epigastrium (74.46%) and loss of appetite (51.06%), Nausea and vomiting (36.17%), dyspepsia (34.04%), weight loss (31.91%) and bloody stools (19.14%). Most of patients presented with combination symptoms. The co. morbid conditions associated with our patients wereHypertension 13 (27.65%), Diabetes 07 (14.89 %), COPD 04 (8.51%) and hypothyroidism 06 (12.76%).

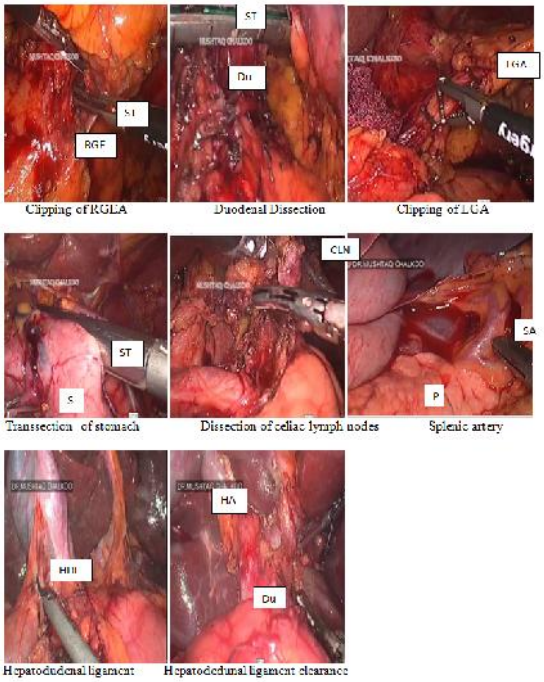

Figure 3. Partial Gastrectomy with D2 Lymphadenectomy; (RGE); Right gastroepiploic artery,(ST); Stapler.(DU); Duodenum, (LGA): Left Gastric artery, (CLN): Celiac Lymph Node, (P); Pancrease,(SA); Splenic artery,(HDL): Hepatodeudenal Ligament, (HA); Hepatic Artery

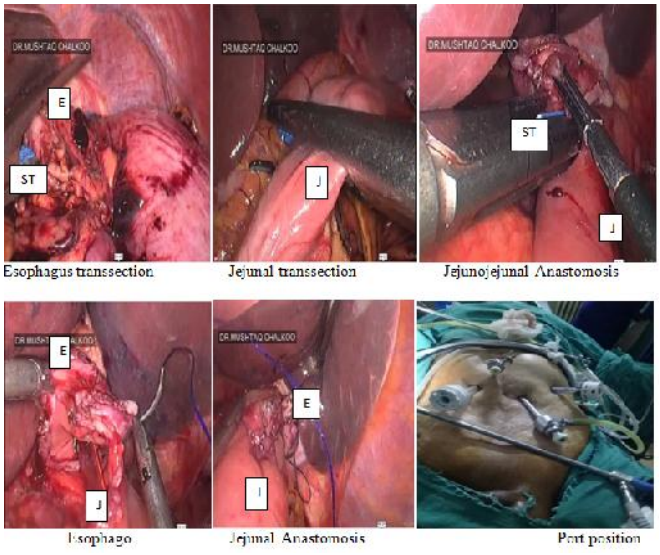

Figure 4. Total Gastrectomy with D2 lymphadenectomy; (E); Esophagus, (ST); Stapler,(J); Jejenum

In majority of patients the site of tumor was lower third 30 (64.82%), followed by upper third 07 (14.89 %) diffuse involvement 06 (12.76%), and middle third 04 (8.51%). The diagnostic laparoscopy was done in all patients. Laparoscopic partial gastrectomy with Gastrojujunostomy with D2 lymphadenectomy in 26 (55.31%).Laparoscopictotal Gastrectomy with Esophago-jejunostomy with D2 lymphadenectomy in 17 (36.17%),

Laparoscopic gastrojejunostomy 3(6.38%) andLaparoscopic feeding jujunostomy in 1 (2.01%) Table 2.

Table 1. Demographic Details of Patients

Patients characteristic	Number of patients	Percentage
Age (years)		
< 40	06	12.47
40- 60	16	35.04
>60	25	53.19
Males	34	72.34
Females	13	27.65
Symptoms		
Nausea and Vomiting	17	36.17
Dyspepsia	16	34.04
Loss of appetite	24	51.06
Pain	35	74.46
Weight loss	15	31.91
Bloody Stools	09	19.14
Co-Morbities		
Hypertension	13	27.65
Diabeties	07	14.89
Hypothyroidism	06	12.76
COPD	04	8.51
Tumor Location		
Upper third	07	14.89
Middle third	04	8.51
Lower third	30	64.82
Diffuse involvement	06	12.76

Table 2. Various procedures done

Procedure	Number of patients	Percentage
Diagnostic laparoscopy	47	100
Laparoscopic partial gastrectomy with Gastrojujunostomy with D2 lymphadenectomy	26	55.31
Laparoscopic Total Gastrectomy with Esophagojejunostomy with D2 lymphadenectomy	17	36.17
Laparoscopic Gastrojejunostomy	3	6.38
Laparoscopic Feeding Jejunostomy	1	2.01

The median operative time was 150 min (range 130-180 minutes)in Partial Gastrectomy and 210 min (range 200-250) in total Gastrectomy, the median estimated blood loss was 110 ml (range 90-130) in partial Gastrectomy and 150 ml (range 100–200) in total Gastrectomy, There were no major intra operative and post operative complications. 3 (6.38 %) patients developed wound infection, one (2.12 %) patients developed duodenal stump leak and one (2.12%) patient converted into open and 2 (4.2%) patients develops intra abdominal sepsis. The median time to start oral fluid was 4 days (3-7) days in partial Gastrectomy and 7 days (5-9) in total Gastrectomy. The median hospital stay was 5 days (4-7 days) in partial Gastrectomy and 8 days (range 6–11 days) in total Gastrectomy. There was no mortality in study sample.

Table 3. Post operative parameters

Indices	Partial Gastrectomy with D2 Lymphadnectomy	Total Gastrectomy With D2 Lymphadencetomy
Operative time (minutes)	150 (130-180)	210(200-250)
Blood Loss (ml)	110 (90-130)	150 (100-200)
Hospital stay (Days)	5 (4-7)	8 (6-11)
Start Of oral intake(Days)	4(3-7)	7(5-9)
Duodenal Stump Leak	1	0
wound infection	1	2
Intra abdominal sepsis	1	1
Converted to open	1	0
Mortality	0	0

Most of patients presented at stage II (46.51%)and stage III(39.53 %) and in stage I(13.90%) and median lymph nodes retrieved was 20 (range 10-32)).Histopathological examination showed that 25(58.13%) patients have moderately differentiated adenocarcinoma and 9 (20.90%) patients have poorly differentiated adenocarcinoma and 9 (20.90%)patients have well differentiated adenocarcinoma.A positive proximal margin was detected in 2 patients (4.65%).Growth was resectable in 43 (91.48 %) of patients and was unresectable in 04(8.51%) of patients Table 3.

Table 3: Histological Data of patients

variable	Number of Patients	Percentage
Number of retrieved lymph nodes	20 (10-32)	
Adequacy of lymph node yield	28	
> 15 (n (%))	15	
< 15 (n (%))	02	
Positive Proximal surgical margins	0	4.65
Positive distal surgical margins		00
pT- stage		
T1	8	
T2	10	
T3	18	18,60
T4	7	23.25
pN- stage		41.86
N0	6	16.27
N1	13	
N2	12	13.95
N3	12	30.23
TNM stage (AJCC)		27.90
IA	02	17.90
IB	04	
IIA	9	4.6
IIB	11	9.3
IIIA	07	20.9
IIIB	06	25.58
IIIC	04	16.27
Cancer differentiation Grades		13.9
Well differentiatedadenocarcinoma		9.3
Moderately differentiated adenocarcinoma	9	20.93
Poorly differentiated adenocarcinoma	25	58.13
	9	20.90

DISCUSSION

At Government medical college Srinagar, a postgraduate teaching institute, laparoscopy is performed in a well structured unit since 1996. Various laparoscopic advanced procedures have been performed by different laparoscopic surgeons of our department. Laparoscopic colectomies were started in the year 2006. However laparoscopic Gastric procedure was introduced as part of thesis project of our post graduates in the year 2012. Based on our clinical experience and improvements in our technique, the indications have been expanded to include those with advanced cancers. It is beyond doubt that experienced surgeons in high volume centers already apply laparoscopic approaches to complicated cases that were once contraindicated, because of safety issues and lack of strong evidence. Many studies have investigated results of laparoscopic gastrectomy,however these studies could not provide an answer to whether laparoscopic D2 gastrectomy could be performed with same quality as in open procedures (11, 12, 13–15). We took up a study on the short term outcome of laparoscopic D2 gastrectomy and observed that the technique can be safely performed as regards the short term oncological outcomes.

Laparoscopic gastrectomy is safe, feasible and gaining wide spread importance (16). Gastrectomy for gastric cancers should respect oncological principles such as number of lymph nodes retrieved and negative resection margins (17). The work from lee *et al.* (18) and xeong etal (19) should also no mean difference between number of lymph nodes between laparoscopic and open. There are few advantages of laparoscopy in advanced gastric cancer. Firstly the metastatic disease patients are spared of unnecessary laparotomy, secondly staging patients for gastric cancer disease. Majority of patients present with an advanced disease and many are found with an incurable or un-resectable disease. Preoperative evaluation methods inclusive of computed tomographicscanning are not sensitive enough to detect the small metastatic intra abdominal deposits typical of gastric adenocarcinoma. Now our study reported the outcome of laparoscopic D2 gastrectomy and confirmed that laparascopic D2 gastrectomy can be safely performed regarding short term oncological outcomes.

Gastrectomy for gastric cancer should respect oncological principles such as minimal number of lymph node retrieval and negative resection margin. The exact number of lymph nodes has also been since questioned. Retrospective study in this behalf has already concluded that improvement and survival was obtained when an optimum of 29 lymph nodes retrieval was achieved (20).According to the Japanes' research society for gastric cancer guidelines, the upper abdominal lymphnodes are grouped in to 16 stations. Which are subsequently divided into four levels (N1- N4), according to the location of primary tumour (15).The extent of lymphadenectomy is classified according to the level of lymph node dissection (D1-D2).We started our learning experience from 2012, with early gastric cancers and subsequently shifted to advanced gastric cancers. There is no doubt that laparoscopic gastrectomy is gaining global popularity due to the favorable results of less post operative pain, early recovery and return to work and less blood loss, with similar oncological outcomes as in open gastrectomies. We took up a study of 47 patients diagnosed as gastric carcinoma and subjected all them to diagnostic laparoscopy. Out of 47 patients, 4 patients were unresectable and were subjective to palliative procedures, laparoscopic feeding jujunostomy was performed in 1 patients and laparoscopic gastrojejunostomy in 3 patients.

Thus diagnostic laparoscopy stages the tumor and avoids laparotomy in 8.5% patients.According to Burke *et al.*)21) Laparoscopy avoided laparotomy in 23.1% patients, Molloy *et al.*(22) in 42.2% patients.26 (55.31%) patients undergone Laparoscopic partial gastrectomy with Gastrojejunostomy with D2 lymphadenectomy,17 (36.17%) patients Laparoscopic Total Gastrectomy with Esophagojejunostomy with D2 lymphadenectomy. The operative time is longer in laparoscopic gastrectomy than in conventional open gastrectomy. According to the literature, the operative time ranges between 196 min and 370 min for laparoscopic gastrectomy compared with a range from 168 min to 264 min for open gastrectomy (23,24). The median operative time was 150 min (range 130-180) in Partial Gastrectomy and 210 min (range 200–250) in total Gastrectomy. The operative time was shorter than that of the study conducted by Lee and colleagues in Korea, which reported a mean operative time of 227min (25). The operative time in first few cases was more and decreased with subsequent cases after more experience was gained, and second reason is that these cases were done by a single team, who were experienced in advanced laparoscopic surgeries. There was also minimal blood loss in laparoscopic gastrectomies, the average estimated blood loss was 110 ml (range 90-130) in partial Gastrectomy and 150 ml (range 100–200) in total Gastrectomy, the average blood loss was less as compared to the studies conducted in Korea ,China, and Japan. The mean blood loss was 153 ml in the KLASS-02 trial and was 105 ml and 115 ml in the CLASS-01 and JCOG0912 trials, respectively (26, 27, 28).

The average hospital stay in our study was 7 days (5-10 days).Which was similar to study conducted by Shi Y and Lee HJ (29, 30). Patients in the current study had a shorter hospital stay than those in the CLASS-01 trial, which reported a mean Hospital stay of 10.8 days (28).The median time to start oral fluid was 4 days (3-7) days in partial Gastrectomy and 7 days (5-9) in total Gastrectomy and the median hospital stay in our study was 5 days (4-7 days) in partial Gastrectomy and 7 days (range 5–10 days) in total Gastrectomy. There were no major intra operative and post operative complications. 3 (6.38 %) patients developed wound infection, 1 (2.12%), patient developed duodenal stump leak in partial gastrectomy and 1(2.12 %) patient was converted into open because of technical difficulties and 2 (4.2%) patients developed intra abdominal sepsis which were managed by conservative treatment Table 3.

Most of patients presented at stage II (46.51%) and stage III (39.53 %) and in stage I (13.9%).The average lymph nodes retrieved in our study was 20 (10-32) which was similar to the study conducted by Brenkman *et al.*(31). Also, dissection of 18 lymph nodes is considered adequate for tumor clearance and staging.Histopathological examination showed that 25(58.13%) patients have moderately differentiated adenocarcinoma and 9 (20.90%) patients have poorly differentiated adenocarcinoma and 9 (20.90%) patients have well differentiated adenocarcinoma.

The margins of resection were found to be free of tumor in 41(95.3%) patients and positive proximal margins in 2 (4.6%) patients. Growth was resectable in 43 (91.48 %) of patients and was unresectable in 04 (8.51%) of patients (Table 3). In all patients, where growth was un-resectable, palliative laparoscopic Gastrojejunostomy in 3 patients and Laparoscopic feeding jejunostomy in 1 patient was performed. These patients showed faster recovery as compared to open gastrojejunostomy and were tolerating oral diet reasonably well. All the patients were followed up for 1, 3 and 6 weeks after discharge and were advised to follow up at 6 months and 1 year. All these patients received Adjuvant chemotherapy.Furthermore, none of our patients developed nodal recurrence or recurrence at the anastomotic site during follow-up. The complications that were seen in our study were wound sepsis in 3 patients, intra abdominal sepsis in 2 patients and conversion in one patient due to intra-operative bleeding.

Conclusion:

Laparoscopic gastrectomy is safe and feasible, and itcan be performed by experienced surgeons to achieveoptimal oncological short-term outcomes. Laparoscopic gastrectomy has less blood loss and short hospital stay, early return to work as compared to convention open gastrectomy and also laparoscopic gastrectomy laparoscopic gastrectomy have almost same oncological outcome as compared to open gastrectomy.

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