

**LAPAROSCOPIC GASTRECTOMY VERSUS OPEN GASTRECTOMY FOR
CARCINOMA STOMACH: A PROSPECTIVE, OBSERVATIONAL STUDY FROM A
THIRD WORLD COUNTRY****Prof. (Dr.) Iqbal Saleem Mir¹, Dr. Younis Ahmad Dar², Dr. Ranjeet Singh², Dr. Younis Bashir², Dr. Arshad Rashid^{3*}, Dr. Ishtiyah Hussain⁴ and Dr. Ayaz Rashid²**¹Professor, Department of Surgery, GMC Srinagar.²Postgraduate scholar, Department of Surgery, GMC Srinagar.³Lecturer, Department of Surgery, GMC Srinagar.⁴Registrar, Department of Surgery, GMC Srinagar.***Corresponding Author: Dr. Arshad Rashid**

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ABSTRACT

Background: Minimally invasive gastrectomy was introduced in 1993 and aimed at reducing surgical trauma and as a consequence lowering morbidity and mortality. Several systematic reviews and meta-analyses have shown an advantage in short term outcomes of laparoscopic distal and total gastrectomy compared to open procedures. Oncologic outcomes are similar on the short term. The aim of the present study was to assess the feasibility and safety of laparoscopic gastrectomy. **Methods:** Enrolled patients were informed and included at the surgical outpatient department. Performance Status of the patients was assessed. The Dutch guideline on gastric cancer was used to guide the preoperative evaluation of patients. **Results:** Laparoscopic gastrectomy was done in 17 (48.6%) patients while as open gastrectomy was done in 18 (51.4%) patients. The mean operative time in laparoscopic gastrectomy group was 262.06±23.456 minutes in comparison to 175.50±23.147 minutes in open gastrectomy group ($p < 0.01$). The mean intraoperative bleeding in open gastrectomy group was 271.11±63.929 compared to 162.06±38.893 in laparoscopic gastrectomy group ($p < 0.01$). When compared on duration of postoperative hospital stay the difference was statistically significant with mean 8.00±0.866 days hospital stay in laparoscopic group in comparison with 11.39±1.852 days in open gastrectomy group. Postoperative morbidity was seen in 4 patients in laparoscopic gastrectomy including anastomotic leak in 1 (5.8%), diarrhea in 1 (5.8%), gastric stasis and vomiting in 1 (5.8%) and respiratory infection in 1 (5.8%) patient. Postoperative morbidity was seen in 5 patients in open gastrectomy group that included gastric stasis and vomiting in 1 (5.5%), respiratory infection in 1 (5.5%) patient, surgical site infection in 2 (11.11%) patients and urinary difficulty in 1 (5.5%) patient. **Conclusion:** The study demonstrates benefits of laparoscopic surgery in terms less intraoperative blood loss, quicker postoperative recovery and reduced postoperative morbidity at the cost of longer operative time.

INTRODUCTION

Gastric cancer is the fifth most prevalent cancer and the third most common cause of cancer related death worldwide.^[1] Surgical resection with en-bloc lymphadenectomy is the cornerstone of curative treatment, however only half of the patients are eligible for surgery with curative intent. The 5-year survival rate after curative resection is 45%.^[2] Perioperative chemotherapy improves 5-year survival with approximately 10%.^[3,4]

Open gastrectomy is the preferred surgical approach worldwide.^[5] However, this procedure is associated with considerable morbidity and mortality.^[5,6,7] Minimally invasive gastrectomy was introduced in 1993 and aimed at reducing surgical trauma and as a consequence lowering morbidity and mortality.^[8] Several systematic

reviews and meta-analyses have shown an advantage in short term outcomes of laparoscopic distal and total gastrectomy compared to open procedures. Oncologic outcomes are similar on the short term.^[6,7,9,10,11]

According to ‘‘Gastric Cancer Treatment Guidelines in Japan, 2010’’, total gastrectomy is used in radical resection of proximal and middle third gastric cancer. Laparoscopic surgery is recommended as a treatment for early gastric cancer and clinical research. Patient’s preference and surgeon’s suggestion may affect the choice of operation type. And cosmetic result, cost, recovery and pain are the major factors the patients are concerned about.^[12-15]

The proponents of laparoscopic distal Gastrectomy (LADG) argue that the procedure is superior to open

distal Gastrectomy (ODG) because it is associated with less postoperative pain, reduced perioperative blood loss, quicker return of gastrointestinal function, faster hospital discharge, earlier return to work and unrestricted physical activity, and better cosmetic result.^[16] Opponents, however, argue that there is high risk of major intra- and postoperative complications due to complexity of the procedure and absence of tactile sensation, substantially greater costs, much longer anaesthetic and operating time, decreased numbers of lymph nodes harvesting essential for oncological adequacy, insufficient surgical resection margins, and potential for cancer reimplantation at trocar sites.^[16] Furthermore, long-term consequences are unknown.

AIMS AND OBJECTIVES

Analysis of laparoscopic and open Gastrectomy for carcinoma stomach in terms of (i) Operative time, (ii) Intraoperative bleeding, (iii) Lymph node yield, (iv) Margin status, (v) Requirement of postoperative analgesia, (vi) Time to first flatus, (vii) Hospital stay, (viii) Postoperative morbidity and mortality.

MATERIALS AND METHODS

This was a prospective, observational study. After obtaining the ethical clearance from the Institutional Ethical Committee the present observational study was conducted in the Postgraduate Department of General Surgery, Government Medical College, Srinagar over a period of one and a half year. All the patients were assessed in tumour Board of Institute.

Patient's inclusion criteria were defined as follows: Histologically proven adenocarcinoma of the stomach (i) Surgically resectable tumor, (ii) Age ≥ 18 years and < 85 years.

Patients were informed and included at the surgical outpatient department after obtaining proper informed consent in local language. Performance Status of the patients was assessed. The Dutch guideline on gastric cancer was used to guide the preoperative evaluation of patients¹³. According to this guideline, all included patients underwent gastro-esophagoscopy with biopsy and computed tomography of the thorax and abdomen to identify metastatic disease and the extension of the

disease before inclusion. Patients were evaluated as per the proforma and the data entered for statistical analysis.

Statistical Analysis: Chi-square and independent t-tests were used to compare the clinicopathologic factors and postoperative outcomes using GraphPadInStat® (version 3.06, GraphPad Software, Inc., San Diego, CA, USA). Statistical significance will be assumed for P-values < 0.05 .

RESULTS

Laparoscopic gastrectomy was done in 17 (48.6%) patients while as open gastrectomy was done in 18 (51.4%) patients. Mean age in open gastrectomies patients was 57.67 ± 11.17 years in comparison with mean age of 65.76 ± 9.67 in laparoscopic group. Operative time was less in open gastrectomy group in comparison with laparoscopic gastrectomy group 175.50 ± 23.14 minutes versus 262.06 ± 23.45 minutes. Less intraoperative bleeding was seen in laparoscopic gastrectomy group 162.06 ± 38.89 ml than 271.11 ± 63.92 ml in open gastrectomy group. Mean lymph node yield in open gastrectomy was 24.67 ± 4.89 in comparison with 22.76 ± 3.83 mean lymph node yield in laparoscopic gastrectomy. Difference in surgical resection margin (proximal and distal) was statistically insignificant. Mean hospital stay was 8.00 ± 0.86 days in laparoscopic gastrectomy group in comparison with 11.39 ± 1.85 days in open gastrectomy group. Mean time to first flatus in laparoscopic gastrectomy was 2.94 ± 0.74 days compared with 4.67 ± 0.68 days in open gastrectomy group. Requirement of postoperative intravenous analgesia was 3.53 ± 0.51 days in laparoscopic gastrectomy group in comparison with 5.28 ± 0.95 days in open gastrectomy group.

Postoperative morbidity was seen in 4 patients in laparoscopic gastrectomy including anastomotic leak, diarrhea, gastric stasis with vomiting, respiratory infection in 1 (5.8%) patient each. Postoperative morbidity was seen in 5 patients in open gastrectomy group that included gastric stasis and vomiting, respiratory infection in 1 (5.5%) patient each, surgical site infection in 2 (11.11%) patients and urinary difficulty in 1 (5.5%) patient.

Table 14: Group Statistics.

	Type of Gastrectomy	N	Mean	SD	P Value
Age (Years)	Open Gastrectomy	18	57.67	11.178	0.029
	Laparoscopic Gastrectomy	17	65.76	9.679	
Operative Time (min)	Open Gastrectomy	18	175.50	23.147	0.000
	Laparoscopic Gastrectomy	17	262.06	23.456	
Intra operative Bleeding (ml)	Open Gastrectomy	18	271.11	63.929	0.000
	Laparoscopic Gastrectomy	17	162.06	38.893	
Lymph Node Yield	Open Gastrectomy	18	24.67	4.899	0.212
	Laparoscopic Gastrectomy	17	22.76	3.833	
Proximal Resection Margin (cm)	Open Gastrectomy	18	4.583	0.5491	0.514
	Laparoscopic Gastrectomy	17	4.206	0.7301	
Distal Resection Margin (cm)	Open Gastrectomy	18	5.778	2.1708	0.558

	Laparoscopic Gastrectomy	17	5.676	2.4682	
Hospital Stay (days)	Open Gastrectomy	18	11.39	1.852	0.000
	Laparoscopic Gastrectomy	17	8.00	.866	
Time To First Flatus (days)	Open Gastrectomy	18	4.67	.686	0.000
	Laparoscopic Gastrectomy	17	2.94	.748	
Requirement of postoperative Intravenous Analgesia (Days)	Open Gastrectomy	18	5.28	.958	0.000
	Laparoscopic Gastrectomy	17	3.53	.514	

Table 2: Type of procedure.

	Frequency	Percentage
Laparoscopic Distal Gastrectomy	6	17.1
Laparoscopic Proximal Gastrectomy	1	2.9
Laparoscopic Total Gastrectomy	10	28.6
Open Distal Gastrectomy	7	20.0
Open Proximal Gastrectomy	2	5.7
Open Total Gastrectomy	9	25.7
Total	35	100.0

DISCUSSION

The total laparoscopic gastrectomy (TLG) technique was first conceptualized by Goh P et al (1992).^[17] who reported two TLGs for the treatment of peptic ulcers. In 1996, Ballesta-Lopez first used this surgical technique for the treatment of gastric cancer and documented its feasibility and efficacy (Ballesta-Lopez C et al., 1996).^[18] Although TLG has been in use for over 20 years, its development has been limited as successful reconstruction of the digestive tract has been difficult to achieve laparoscopically.

In our study, laparoscopic gastrectomy was done in 17 (48.6%) patients while as open gastrectomy was done in 18 (51.4%) patients. Total gastrectomy was done in majority of the patients in our study including laparoscopic total gastrectomy in 10 patients and open total gastrectomy in 9 patients. Similar results were observed by Chen K et al (2014)^[19] in a randomized controlled trial involving 13 studies including 1532 patients with 721 (47.1%) total laparoscopic gastrectomy and 811 (52.9%) open gastrectomy. Consistent data was obtained in various other studies Huscher CG et al (2005)^[20] included 30 total laparoscopic gastrectomy and 29 open gastrectomy patients, Wong SK et al (2009)^[21] in their study included 18 LTG and 41 OG patients, Chouillard E et al (2010)^[22] studied 51 and 79 patients in laparoscopic total gastrectomy and open gastrectomy groups and Siani LM et al (2012)^[23] conducted a study including 50 patients including 25 patients each in LTG and OG groups, respectively.

Mean age in our study was 65.0±9.67 years in laparoscopic gastrectomy group compared to 57.67±11.17 in open gastrectomy group.

Chen K et al (2017)^[24] conducted a study on 124 patients with a mean age of 52.7±13.1 years in Laparoscopic group and 53.5±14.6 years in open groups with 81 males and 43 females. Elshoieby MH et al (2018)^[25] conducted

a study which mean age of 49 years with 7 males and 6 females.

Intraoperative bleeding of 101-200ml was seen in 14 patients in laparoscopic gastrectomy group and 3 patients in open gastrectomy group followed by 201-300ml in 3 patients and 11 patients in laparoscopic and open gastrectomy groups, respectively. 3 patients in open gastrectomy group were seen with 301-400 ml intraoperative bleeding while as 1 patient had ≥400ml intraoperative bleeding in open gastrectomy group. Similar results were obtained by Kitano S et al (2002),^[26] Lee JH et al (2005),^[27] Hayashi H et al (2005)^[28] and Huscher CG et al. (2005).^[20]

The mean intraoperative bleeding in laparoscopic distal gastrectomy was 117 ml, 336 ml, 327 ml and 229 ml in their studies in comparison with 258 ml, 294ml, 489 ml and 391 ml in open distal gastrectomy.

In laparoscopic gastrectomy group, in 10 patients surgery lasted for 251-300 minutes, in 6 patients surgery lasted for 201-250 minutes while as 301-350 minutes were needed to operate one patient. In comparison, surgery of 12 patients of open gastrectomy group lasted for 151-200 minutes while as 3 patients each needed ≤150 minutes and 201-250 minutes, respectively. It indicates that open gastrectomy takes less time in comparison with laparoscopic gastrectomy. Kitano S et al (2002)^[26] conducted a study on 14 patients in which 227 minutes were required for surgery in laparoscopic gastrectomy in comparison with 171 minutes for open surgery. Hayashi H et al (2005)^[28] conducted a study on 14 patients in which 378 minutes were required for surgery in laparoscopic gastrectomy in comparison with 235 minutes for open surgery. Huscher CG et al. (2005)^[20] conducted a study on 30 patients in which 196 minutes were required for surgery in laparoscopic gastrectomy in comparison with 168 minutes for 29 open surgery patients. Laparoscopic gastrectomy was associated with longer operative times (WMD 48.3 minutes; P < 0.001)

in a study done by Viñuela EF et al (2012).^[11] Similar results were obtained by Haverkamp Let al (2013)^[6] with longer duration of surgery in laparoscopic gastrectomy compared to open gastrectomy. Wei Y et al (2018)^[29] confirmed that laparoscopic gastrectomy takes longer time than open gastrectomy.

Time to first flatus in days was earlier in laparoscopic gastrectomy group in comparison with open gastrectomy group. Time to first flatus was 2 days for 5 patients, 3 days for 8 patients, 4 days for 4 patients in laparoscopic gastrectomy group. In comparison, time to first flatus was 4-5 days in 16 patients while 2 patients needed 6 days for first time flatus. Feng LM et al (2013)^[30] conducted a clinical analysis of 25 gastric cancer cases undergoing totally laparoscopic distal gastrectomy and found that mean time to the first flatus was (2.8±1.2 days). These results were also confirmed by Pan H et al (2017)^[31] who observed that mean time to bowel function recovery was 2.1±0.4 days.

Postoperatively, 8 patients in laparoscopic gastrectomy group required analgesia for only 3 days. At day 4, 9 patients in laparoscopic gastrectomy group and 4 patients in open gastrectomy group needed intravenous analgesia. None of the patients in laparoscopic gastrectomy group needed postoperative analgesia after day 4 while as in open gastrectomy group, 7 patients needed postoperative analgesia at day 5, 5 patients needed postoperative analgesia at day 6 and 2 patients needed postoperative analgesia at day 7.

Usui S et al (2005)^[32] conducted a case-control study comparing between laparoscopy-assisted total gastrectomy group and open total gastrectomy group. Laparoscopic assisted total gastrectomy was performed in 20 patients. These cases were compared with 19 cases of open total gastrectomy, regarding operating time, blood loss, leukocyte count, C-reactive protein, time to the first passage of gas, time to initiate oral intake, and postoperative hospital stay. The time to first flatus, time to initiate oral intake, and postoperative hospital stay was significantly shorter ($P < 0.05$) in the laparoscopic surgery group than in the open surgery group.

Laparoscopic gastrectomy patients needed less postoperative hospitalization than open gastrectomy. <10 days postoperative hospitalization was observed in 16 patients in laparoscopic gastrectomy in comparison with 7 patients in open gastrectomy. ≥10 days hospital stay was seen in 11 patients of open gastrectomy group in comparison with only 1 patient of laparoscopic gastrectomy group. Mean duration of hospital stay in laparoscopic gastrectomy group was 8.00±0.866 days compared to 11.39±1.852 days in open gastrectomy group.

Our results are consistent with the findings of Huscher CG et al (2005),^[20] Pugliese R et al., (2007),^[33] Lee WJ et al., (2008),^[34] Song KY et al., (2008)^[35] who have

observed a mean duration of hospital stay in laparoscopic groups and open gastrectomy groups viz. 10.3 versus 14.5, 10 versus 18, 8.5 versus 12.1, 9.7 versus 10.9 days and 8.0 versus 9.0 days.

Lymph node yield of ≤20 was seen in 6 patients of laparoscopic gastrectomy group and 4 patients of open gastrectomy group. Lymph node yield was 21-25 in 8 patients in laparoscopic gastrectomy group and 7 patients of open gastrectomy group. Lymph node yield was 26-30 in 3 patients of laparoscopic gastrectomy group and 4 patients of open gastrectomy group. Lymph node yield of 31-35 was observed in 3 patients of open gastrectomy group.

Similar findings were observed by Kitano S et al (2002),^[26] Lee JH et al (2005),^[27] Hayashi H et al (2005)^[28] and Huscher CG et al. (2005)^[20] who observed lymph node yield of 20.2, 31.8, 28.0 and 30.0 in laparoscopic gastrectomy in comparison with 24.9, 38.1, 27.0 and 33.4 cm in open distal gastrectomy.

All the 17 patients in laparoscopic gastrectomy group had proximal margin of 2-5cm while as 17 (97.1%) patients in open gastrectomy group had proximal margin of 2-5cm. Distal margin of >5cm was seen in 10 (58.8%) patients of laparoscopic gastrectomy group and 10 (55.55%) patients in open gastrectomy group in comparison with distal margin of 2-5cm in 7 (41.2%) patients of laparoscopic gastrectomy and 8 (44.44%) patients of open gastrectomy.

Chen K et al. (2014)^[19] conducted a study to review the surgical outcome of totally laparoscopic gastrectomy versus open gastrectomy for gastric cancer and concluded that the number of harvest lymphnodes, surgical margins, mortality and cancer recurrence were similar between the two groups.

LTG showed longer operative time, less blood loss, fewer analgesic uses, earlier passage of flatus, quicker resumption of oral intake, earlier hospital discharge, and reduced postoperative morbidity. The number of harvested lymph nodes, proximal resection margin, hospital mortality, 5-year OS and DFS were similar. LTG had the benefits of less blood loss, less postoperative pain, quicker bowel function recovery, shorter hospital stay and lower postoperative morbidity, at the price of longer operative time (Wang W et al (2014).^[10])

Postoperative morbidity was seen in 4 patients in laparoscopic gastrectomy including anastomotic leak, diarrhea, gastric stasis with vomiting, respiratory infection in 1 (11.1%) patient each. Out of 5 patients with postoperative morbidities in open gastrectomy group including gastric stasis, vomiting 1 (11.1%), respiratory infection in 1 (11.1%), urinary difficulty in 1 (11.1%) and surgical site infection in 2 (22.2%) patients.

CONCLUSION

The present study demonstrates benefits of laparoscopic surgery in terms less intraoperative blood loss, quicker postoperative recovery, reduced postoperative morbidity with similar oncological safety. Laparoscopic total gastrectomy (LTG) is a feasible and safe surgery for gastric cancer and LTG can be performed as an alternative to OTG for selected patients by experienced surgeons in high-volume centers. However long-term oncological results cannot be evaluated at present, as adequate data are missing.

LIMITATIONS

- Relatively small sample size which was because of COVID-19 pandemic that patients were not able to reach hospital for treatment.
- Study did not report long-term oncological outcomes due to the relatively short follow-up. However, these are still interim results and patients are still on follow up with us.

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