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Laparoscopic Intervention for Gastrectomy in Case of Gastric Cancer: Systematic Review

[1]Mohammed Jalawi M karkaman, [2]Awdah Abdulrahman Alkhathami,
[3]AbdulRahman Omar Hakami, [4]Abdulrahman Jalwi M. Korkoman

Abstract: **Laparoscopy-assisted gastrectomy for gastric cancer has rapidly become popular in the past decades due to its minimally invasive advantages over open gastrectomy (OG).**
This study was aimed to evaluate the laparoscopic procedure for gastrectomy in case of gastric cancer and compare between laparoscopic and open techniques, outcomes and efficiency and safety. A systematic search using the following keywords, "laparoscopy", "laparoscopic", "gastric cancer", "gastric carcinoma" and "gastrectomy", was performed through the following bibliographic databases, PubMed, Web of Science and Cochrane Library, for literature comparing Laparoscopy gastrectomy (LG), published up to 2016, and we broadened the search range by browsing the related summary, methods and references of retrieved articles. LG is a safe, feasible method for patients with gastric cancer. The results of LG were favorable in regards to much better cosmetics, less blood loss and faster recovery.

Keywords: **Laparoscopy-assisted gastrectomy (LG), "gastric cancer", "gastric carcinoma" and "gastrectomy".**

1. INTRODUCTION

Laparoscopy gastrectomy (LG) for gastric cancer was first reported in 1994 [(1)], and has undergone fast development and acquired popularity in the past couple of decades. Laparoscopic surgery has several benefits compared to open gastrectomy (OG) such as minimal invasiveness, the possibility of useful maneuvers based upon anatomic understanding through a good visual field and magnification, earlier patient healing after surgical treatment and much better postoperative lifestyle [(2,3,4,5)]. During LAG, lymph node dissection is carried out laparoscopically. A mini-laparotomy is carried out in the epigastrium, through which the anastomosis is carried out under direct vision. Absolutely laparoscopic gastrectomy (TLG) preserves the integrity of the abdominal wall, which is thought about to be incisionless, except for the trocar wounds [(6)], and is a laparoscopic technique for intracorporeal anastomosis without auxiliary cut and contact with the growth. TLG represents the evolution of LAG. There are some technical difficulties when carrying out intracorporeal anastomosis, therefore LAG is still a typical method in laparoscopic surgery [(7)]. The safety and efficacy of LAG has actually been shown in big retrospective research studies and randomized controlled trials (RCTs) [(2,3,8,9,10,11)]. In addition, a number of meta-analyses and systematic evaluations have been published on LAG [(12,13,14,15)].

Gastric cancer is the fourth leading reason for cancer-related mortality worldwide [(16)]. It is the second most typical form of cancer in first world nations [(17)] with 930,000 new cases and 700,000 deaths reported yearly [(18)]. Since the very first effective operation in 1881(19), partial or total gastrectomy remains the only curative intervention for localized gastric cancer (18,19). Post-operative survival has actually enhanced drastically. The 5-year survival rate of all resections rose from 20.7% before 1970 to 28.4% by 1990, while 5-year survival rates of alleviative resections increased from 37.6% to 55.4% during the exact same period [(20)]. Contemporary studies quote 5-year survival rates of 33-50% [(21)].

This study was aimed to evaluate the laparoscopic procedure for gastrectomy in case of gastric cancer and compare between laparoscopic and open techniques, outcomes and efficiency and safety.

2. METHODOLOGY

A systematic search using the following keywords, "laparoscopy", "laparoscopic", "gastric cancer", "gastric carcinoma" and "gastrectomy", was performed through the following bibliographic databases, PubMed, Web of Science and Cochrane Library, for literature comparing Laparoscopy gastrectomy (LG), published up to 2016, and we broadened the search range by browsing the related summary, methods and references of retrieved articles. The language of the publications was confined to English. Investigators reviewed the titles and abstracts, and assessed the full text to establish eligibility.

3. RESULTS AND DISCUSSION

We have identified one retrospective study [22] which examined early surgical results in 190 successive patients who went through overall gastrectomy for early gastric cancer in between January 2009 to April 2010. The patients were divided into those who went through laparoscopic assisted total gastrectomy (LATG), and those who underwent open overall gastrectomy (OTG). Their early surgical outcomes were evaluated to evaluate the effectiveness of LATG.

(**Table1**) presents early surgical results in all patients in the consisted of research study [22]. Operation time, it took longer to carry out for LATG than OTG (LATG vs. OTG; 150.8 minutes vs. 131.2 minutes; $P < 0.001$). There was no substantial distinction for postoperative issue rate (LATG 12.7% vs. OTG 18.9%; $P = 0.291$). There were considerable distinctions for the amount of estimated blood loss (LATG 179.7 mL vs. OTG 272.7 mL; $P < 0.001$) and postoperative change in hematocrit (Hct) (LATG 36.2 vs. OTG 34.5; $P = 0.002$). The mean day to first flatus ($P < 0.001$) and start of soft diet ($P = 0.034$) were checked previously in the LATG group than in OTG group. The postoperative medical facility stay was significantly shorter in the LATG group than in the OTG group ($P = 0.045$). NRS scores were substantially lower in the LATG group than in the OTG group at POD 0 at 11:00 AM, POD 1 at 8:00 AM, POD 1 at 11:00 PM, POD 2 at 8:00 AM, POD 3 at 8:00 AM, POD 5 at 8:00 AM ($P < 0.001$, $P = 0.003$, $P = 0.005$, $P = 0.008$, $P = 0.010$, $P = 0.004$).

Table 1: Early surgical outcomes in patients who underwent OTG and LATG [22]

Variables	Overall patients		
	OTG (n = 127)	LATG (n = 63)	P-value
Operation time	131.2 ± 21.6	150.8 ± 31.2	<0.001
Postoperative complications	24 (18.9)	8 (12.7)	0.291
Estimated blood loss (mL)	272.7 ± 209.6	179.7 ± 123.8	<0.001
Preoperative Hct	40.4 ± 3.7	39.9 ± 4.1	0.437
Postoperative Hct	34.5 ± 3.5	36.2 ± 3.6	0.002
Time to first flatus (day)	3.8 ± 0.8	3.3 ± 0.7	<0.001
Time to commencement of soft diet (day)	5.6 ± 4.4	4.3 ± 1.7	0.034
No. of administration of analgesics	5.3 ± 4.9	3.6 ± 3.9	0.024
Pain score by numeric rating scale			
POD 0 day 11:00 PM	5.5 ± 2.2	3.6 ± 1.3	<0.001
POD 1 day 8:00 AM	4.1 ± 1.8	3.3 ± 1.4	0.003
POD 1 day 11:00 PM	3.3 ± 1.6	2.6 ± 1.1	0.005
POD 2 day 8:00 AM	3.0 ± 1.5	2.4 ± 1.2	0.008
POD 3 day 8:00 AM	2.8 ± 1.5	2.2 ± 1.1	0.010
POD 5 day 8:00 AM	1.9 ± 1.3	1.3 ± 1.2	0.004
Postoperative hospital stay (day)	9.6 ± 5.3	8.1 ± 3.8	0.045

OTG, open total gastrectomy; LATG, laparoscopic assisted total gastrectomy; Hct, hematocrit; POD, post-operative day

Postoperative clinical course:

We included a very important systematic review study [23] that showed through all postoperative outcomes which are summarized in (**Table 2**). Postoperative pain was examined by the number of days of analgesic usage. Patients who underwent TLG got fewer analgesics (P < 0.001). The results likewise preferred TLG for very first flatus day (P = 0.001) and first oral intake (P < 0.001), which showed a quicker recovery of bowel function. Moreover, postoperative healthcare facility stay was 3.75 d shorter for TLG patients (P < 0.001) [23].

Mortality was described in 7 research studies that were included in the viewpoint organized review [23], and there was no substantial difference in postoperative mortality in between the groups (P = 0.40). The rate of general postoperative complications was lower in the TLG group (P < 0.001). Visual inspection of the funnel plot exposed balance, indicating no major publication bias. After additional analysis, surgical issues were also lower in the TLG group (P = 0.03). Wound problems such as infection and dehiscence took place in 1.7% of TLG patients compared to 6.3% of OG patients (P < 0.001). Other surgical complications such as anastomotic leakage, intra-abdominal collections, bleeding, and anastomotic stricture were similar between the two groups (P > < 0.001). Other surgical complications such as anastomotic leak, intra-abdominal collections, bleeding, and anastomotic stricture were comparable between the two groups (P > 0.05). In addition, TLG was associated with a significant decrease in medical issues(P=0.008) with a possible contribution from pulmonary issues (TLG = 2.8%, OG = 4.8%, P = 0.003) [23]. and this research study have actually showed that Operative blood loss and the requirement for transfusions were lower in TLG cases shown in the pooled analysis. The reduced length of the cut injury and the application of energy-dividing devices, such as the Harmonic Scalpel and Ligasure, added to the decrease in blood loss. Another factor is that laparoscopy enables a magnified view of small vessels, especially during dissection of the plane between the pancreas envelope and some significant vessels such as the left gastric artery, typical hepatic artery, coeliac trunk and splenic vessels. The most constant finding in this meta-analysis was the longer operation time for TLG [23].

Table 2: Pooled short-term outcomes [23]

Outcomes	No. of studies	Sample size		Heterogeneity	Overall effect size	95%CI of overall effect	*P* value
		TLG	OG	(*P* value, I^2)			
Operation time (min)	14	721	811	< 0.001, 97%	WMD = 58.04	37.77-78.32	< 0.001
Blood loss (mL)	12	552	574	< 0.001, 87%	WMD = -167.57	-208.79-(-126.34)	< 0.001
Transfusion	3	268	233	0.11, 54%	RR = 0.49	0.21-1.11	0.09
Retrieved lymph nodes	13	683	789	0.04, 46%	WMD = -0.48	-2.21-1.26	0.59
Proximal margin (cm)	2	159	227	0.03, 80%	WMD = 0.00	-1.47-1.46	1.00
Distal margin (cm)	3	190	258	0.03, 70%	WMD = 0.94	-0.76-(2.64)	0.28
Analgesics given (d)	3	108	159	0.33, 11%	WMD = -1.79	-2.37-(-1.21)	< 0.001
Time to ambulation (d)	3	264	252	< 0.001, 93%	WMD = -0.91	-1.65-(-0.16)	0.02
Time to first flatus (d)	7	337	456	< 0.001, 98%	WMD = -1.97	-3.18-(-0.77)	0.001
Time to oral intake (d)	8	525	580	< 0.001, 96%	WMD = -2.39	-3.34-(-1.45)	< 0.001
Hospital stay (d)	13	683	789	< 0.001, 83%	WMD = -3.75	-4.88-(-2.63)	< 0.001
Overall complications	14	721	811	0.74, 0%	RR = 0.71	0.58-0.86	< 0.001
Surgical complications	12	635	690	0.76, 0%	RR = 0.75	0.57-0.98	0.03
Medical complications	11	615	670	0.97, 5%	RR = 0.57	0.38-0.86	0.008
Mortality	7	412	434	0.96, 0%	RR = 0.65	0.24-1.76	0.40

WMD: Weighted mean difference; RR: Risk ratio; TLG: Totally laparoscopic gastrectomy; OG: Open gastrectomy.

Six studies reported cancer recurrence from this systematic review [23]. The recurrence risk in the TLG group was 22.7% (77/339) and was 21.9% (63/288) in the OG group, however, the difference was not substantial (RR = 1.00, 95%CI: 0.74-1.34, P = 0.98). 7 studies reported postoperative survival rate, all which did not discover a substantial distinction between the two groups. Although in other consisted of research study Strong et al [24] did not report particular survival rate, they also found no substantial difference in the survival rate between the two groups after 36 months of follow-up (P > 0.05).

Postoperative outcomes and survival rate:

Two studies [25,26] reported inflammatory response index such as white blood cell (WBC) count and C-reactive protein (CRP). A substantially lower WBC count for LATG compared to OTG was found on postoperative days 1, 3, 7 [25,26] and 10 [26] and lower CRP for LATG was found on postoperative day 1 in both studies [25,26].

4 studies [27,28,29,30] offered reported no port-site metastases in the LG group. Hwang et al. [31] reported a port-site reoccurrence 10 months after LG. Zhao et al. [32] reported a case of port-site reoccurrence 13 months after LG group; a case of cut metastasis and a case of transition in the orifice of the stomach drain tube 27 and 9 months, respectively, after OG group. Moison et al. [28] reported growths repeated in remote websites in three patients in the LG and in two patients in the OG group, and a reoccurrence in the remnant stomach in the LG group. Shinohara et al. [30] reported 53 reoccurrences in the LG group: 29 (54.7%) from peritoneal recurrence, 23 (43.4%) from remote or hematogenous reoccurrence and 15 (28.3%) from locoregional or lymphatic recurrence; the matching findings in the OG group were 17 (50%), 15 (44.1%) and 11 (32.6%), respectively.

Twelve research studies reported postoperative survival rates [27,29,28,29,30,32,33,34, 35,36,37,38], all of which did not discover considerable distinctions in survival rates in between groups. Shuang et al. [39] did not report particular survival rates, they likewise found no significant difference in the survival rates between the 2 groups after 50 months of follow-up (P > 0.05). Meta-analysis of these offered information showed that the disease-free survival (DFS) rate was not considerably various in individuals who got LG compared with OG (3-year: RR = 1.11, 95% CI 0.75 to 1.65, *P* = 0.59; 5-year: RR = 1.03, 95% CI 0.93 to 1.14, *P* = 0.56). nor was the overall survival (OS) rate (1-year: RR = 1.01, 95% CI 0.96 to 1.05, *P* = 0.79; 3-year: RR = 1.08, 95% CI 0.99 to 1.17, *P* = 0.07; 5-year: RR = 1.03, 95% CI 0.96 to 1.11, *P* = 0.39).

4. CONCLUSION

The existing studies shows that LG is safe and possible, which can achieve similar lymph node dissection impacts as OG, identified by such advantages as less pain, less postoperative problems, and rapid recovery, and which is anticipated to attain the very same result in oncological treatment as OG. Many of the released research studies were retrospective, the sample sizes were reasonably small, many of the cases were early gastric cancer, the follow-up periods were not long enough, and the outcomes exhibited significant heterogeneity. LG is a safe, feasible method for patients with gastric cancer. The results of LG were favorable in regards to much better cosmetics, less blood loss and faster recovery.

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