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Research Article

Laparoscopic Total Gastrectomy for Gastric Cancer: Does Body Mass Index Matter?

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Abstract

Aim: The effect of increased body mass index (BMI) on the intraoperative complications and short-term outcomes of laparoscopic total gastrectomy (LTG) is controversial. We aimed to evaluate the influence of BMI on intraoperative and early postoperative outcomes in patients with LTG for gastric cancer (GC).

Methods: Thirty-six patients who underwent LTG for GC were included in the study. The patients were divided into two groups as normal weighted (BMI = 18.5 - 24.9 kg/m^2, n = 23) and overweighted-obese (BMI ≥ 25 kg/m^2, n = 13). Preoperative and intraoperative data, postoperative outcomes were retrospectively analyzed and compared between the two groups.

Results: The preoperative data were similar between the groups except for BMI. The median preoperative carcinoembryonic antigen (CEA) level (3.6 ng/ml to 1.9 ng/ml, p = 0.07) was higher in the overweighted-obese group, but the difference was not significant. There were six conversions (26%) in the normal weighted group, while no conversion was observed in the overweighted-obese group (p = 0.06). But conversion reasons were not associated with high BMI. The rate of intraoperative complications (23% to 8.6%, p = 0.32) was higher in the overweighted-obese patients, although this difference was not significant.

Conclusion: Although the intraoperative complication rate and the conversion rate differed between the groups, BMI had no significant effect on intraoperative and early postoperative outcomes in patients who underwent LTG for GC.

Keywords: BMI; Obesity; Gastric Adenocarcinoma; Minimally Invasive Gastrectomy

Introduction

It is thought that surgeons may face more technical difficulties due to the thick abdominal wall and massive intraabdominal adipose tissue in gastric cancer (GC) patients with high body mass index (BMI) [1]. In overweight patients, the mobilization of the omentum is challenging and the dissection of lymph nodes is more difficult due to reduced visibility of vascular structures [2]. An increase in the rate of intraoperative and postoperative complications is expected due to such technical difficulties [3]. Previous studies have reported that high BMI causes a prolongation of the operation time, a decrease in the number of harvested lymph nodes, an increase in postoperative complications, and a decrease in survival

rates [2]. But the effect of BMI on intraoperative and postoperative results in laparoscopic total gastrectomy is unclearly yet.

Aim of the Study

In this study, we aimed to evaluate the influence of BMI on intraoperative and early postoperative outcomes in patients with laparoscopic total gastrectomy (LTG) for GC.

Materials and Methods

This study was approved by the local ethical committee (2020/1144). Forty patients underwent LTG for GC between November 2014 and November 2020. The inclusion criteria were the primary adenocarcinoma of the proximal 1/3 of the stomach and BMI ≥ 18,5 kg/m^2. Four patients were excluded because of BMI < 18.5 kg/m^2. Finally thirty-six patients were included in the study. The patients were divided into two groups as normal weighted (BMI = 18.5 - 24.9 kg/m^2, n = 23) and overweighted-obese (BMI ≥ 25 kg/m^2, n = 13). BMI was calculated as weight divided by height squared (kg/m^2). BMI was classified into the International World Health Organization criteria [4]. All patients had received neoadjuvant chemotherapy. Written informed consent was obtained from patients before surgery. The operations were performed by the senior surgeon or training surgeons under the supervision of the senior surgeon. The details of the surgical procedures have been reported in a previous study [5].

Postoperative complications were defined as any complication that occurred during the hospital stay or in the first 30 days after surgery and were classified as Clavien-Dindo classification [6]. Any complication grade 3 or higher was accepted as a serious complication. Age, gender, The American Society of Anesthesiologists classification (ASA), BMI, previous abdominal surgery, carcinoembryonic antigen (CEA) (normal value between 0 - 5.5 ng/ml) and carbohydrate antigen 19.9 (CA 19-9) (normal value between 0-35 IU/ml) levels, operative time, intraoperative blood loss, intraoperative complications, conversion rate, time to oral intake, length of hospital stays, pathological tumor stage and tumor size, number of retrieved lymph nodes, postoperative complications, reoperation rates, 30-day mortality, and time to adjuvant chemotherapy were examined.

Statistics

The Shapiro-Wilk test was performed to analyze the normality of the distribution of numerical variables. Numerical variables were given as median (range) and mean ± standard deviation as appropriate, and categorical variables were given as frequency (percentage). We used the Mann-Whitney U test and Student's t-test in the analysis of numerical variables as appropriate, and the chi-square or Fisher's exact test in the analysis of categorical data. A P value < 0.05 was considered statistically significant. SPSS version 17 for Windows (SPSS Inc., Chicago, IL, USA) was used for analyses.

Results

Table 1 shows the preoperative findings and demographics of the patients. No significant difference was found between the groups except for BMI. The median preoperative CEA level (3.6 ng/ml to 1.9 ng/ml, p = 0.07) was higher in the overweighted-obese group but, the difference was not significant. Intraoperative and postoperative variables are summarized in table 2. There were no significant differences in intraoperative data and postoperative outcomes between the groups but the rate of intraoperative complications (23% to 8.6%, p = 0.32) was higher in the overweighted-obese group and the conversion rate was nearly significantly higher in the normal weighted group (p = 0.06). The reason for conversion was the difficulty to get the tumor-free proximal margin laparoscopically in three patients. The other reasons were the difficulty of performing the esophagojejunostomy due to previous abdominal surgery, intraoperatively detected esophagojejunostomy leakage, and invasion of the intestinal mesentery. Six intraoperative complications occurred in five patients (middle colic artery injury, liver injury with liver retractor, spleen injury, splenic artery injury and pleural injury, subcutaneous emphysema due to trocar insertion). All of them were resolved laparoscopically during surgery. Postoperative serious complications occurred in six patients. The patients with anastomotic leakages (Two patients with duodenal stump leakage, one patient with esophagojejunostomy leakage, and one patient with esophagojejunostomy and enteroenterostomy leakage) were managed conservatively. A patient developed fascial dehiscence on the postoperative 9th day and was treated surgically. Mortality was observed in two patients. One patient with esophagojejunostomy leakage died due to sepsis. Another patient underwent repeated laparotomies due to intraabdominal haemorrhage. The bleeding focus could not be detected, multiple organ resections were performed due to intestinal ischemia. All efforts failed and the patient died.

Table 1: Preoperative findings and demographic data of the patients.

	Total group (n = 36)	Normalweighted group (n = 23)	Overweighted-obese group (n = 13)	p value
Age (year)	64.3 ± 11.6	64.4 ± 12.1	64 ± 11.3	0.93
Gender (male)	27 (75%)	19 (82.6%)	8 (61.5%)	0.23
ASA				0.84
1	2 (5.6%)	1 (4.3%)	1 (7.7%)	
2	24 (66.7%)	15 (65.2%)	9 (69.2%)	
3	10 (27.8%)	7 (30.4%)	3 (23.1%)	
BMI (kg/m^2)	24.2 ± 4	22 ± 2.7	28.2 ± 2.8	0.00
Previous abdominal surgery (yes)	5 (13.9%)	4 (17.3%)	1 (7.7%)	0.63
Appendectomy		1	-	
Cholecystectomy		1	1	
Total abdominal hysterectomy		1	-	
Segmenter colectomy		1	-	
CEA (ng/ml)	2.6 (0.12 - 100)	1.9 (0.1 - 24.4)	3.6 (0.5 - 100)	0.07
CA 19.9 (IU/ml)	14.8 (0.8 - 383.6)	14.2 (0.8 - 193.6)	24.5 (1.4 - 383.6)	0.13

ASA: The American Society of Anesthesiologists Classification; BMI: Body Mass Index; CEA: Carcinoembryonic Antigen; CA 19.9: Carbohydrate Antigen 19.9.

Table 2: Intraoperative and postoperative variables.

	Total group (n = 36)	Normalweighted group (n = 23)	Overweighted-obese group (n = 13)	p value
Operative time (min)	395.6 ± 112.2	402.3 ± 110.7	383.8 ± 118.3	0.64
Blood loss (ml)	200 (20 - 900)	200 (50 - 900)	200 (20 - 800)	0.61
Intraoperative complication (n)	5 (13.8%)	2 (8.6%)	3 (23%)	0.32
Spleen injury		-	1	
Middle colic artery injury		1	-	
Subcutaneous emphysema		1	-	
Splenic artery injury and pleural injury		-	1	
Liver injury with nathanson liver retractor		-	1	
Conversion (n)	6 (16.7%)	6 (26%)	0 (0%)	0.06
Time to oral intake (day)	2 (1 - 5)	2 (1 - 4)	2 (1 - 5)	0.44
Length of hospital stays (day)	7 (3 - 30)	6 (3 - 30)	7 (4 - 27)	0.93
Tumor size (cm)	6 (0.6 - 19)	6.5 (0.6 - 19)	5.8 (0.7 - 9.5)	0.10
Retrieved lymph nodes (n)	36.4 ± 17.5	36 ± 17.8	37.1 ± 17.7	0.85
Pathological T stage				1
T1-2	4 (11.1%)	3 (13%)	1 (7.7%)	
T3-4	32 (88.9%)	20 (87%)	12 (92.3%)	

Postoperative serious complication*	6 (16.6%)	4 (17.3%)	2 (15.3%)	1
Grade 3a	3	3	-	
Grade 3b	1	-	1	
Grade 4	0	-	-	
Grade 5	2	1	1	
Reoperation (n)	2 (5.6%)	1 (4.3%)	1 (7.7%)	1
30-day-mortality (n)	2 (5.5%)	1 (4.3%)	1 (7.6%)	1
Time to adjuvant chemotherapy (day)	40 (24-86)	34 (24-70)	40 (27-86)	0.48

*: According to Clavien Dindo Classification.

Discussion

In this study, we did not observe any significant difference in the intraoperative and early postoperative outcomes between the normal weighted-group and the overweighted-obese group. But the intraoperative complication rate was higher in the overweighted-obese group. With these results, we defend the opinion that LTG for GC can be performed safely in overweighted-obese patients. In addition, more attention is required in these patients and a high BMI can be an alert point for intraoperative complications.

The patients with high BMI are expected to benefit more from minimally invasive surgery, but minimally invasive surgery can be challenging in this group. Wu., *et al*. [2] reported in their study that being overweight reduces the safety of LTG and causes difficulties in the surgical technique. Therefore, an increase in the rate of complications is expected [1,2]. Since fatty omentum and larger stomach in overweight patients, bleeding may occur during traction. It could be difficult to stop bleeding, as adipose tissue disturbs the laparoscopic view [7]. Contrary to these opinions, Chen., *et al*. [7] concluded that high BMI did not affect intraoperative safety. We found more intraoperative complications in overweight-obese patients, but all were solved laparoscopically. In addition, the conversion rate was lower in this group. Therefore, we think a high BMI may make the surgery more difficult but not insecure.

Previously it was shown that there was no difference between patients with normal and high BMI in terms of postoperative complications [8,9]. In the study of Birkenbach., *et al*. [3] anastomotic leakage was observed more frequently in overweight patients. They suggested that the bulky mesentery due to increased adipose tissue caused tension in anastomosis and subsequent leakage. In our study, no significant relationship was found between high BMI and serious postoperative complications, and the anastomotic leakage was not higher in the overweighted-obese group.

Intraabdominal lymph nodes remain deeper around major vascular structures due to more adipose tissue in overweight patients. This makes it harder to harvest lymph nodes both during surgery and pathological examination [1,3]. As a result of these, the number of retrieved lymph nodes is expected to be lower in the overweighted group [2]. In contrast to this, we observed more retrieved lymph nodes in the overweighted-obese group, but the difference was not significant.

In a study by Tan., *et al*. [10] obese patients had more conversion rate due to insufficient exposure, bleeding, and adhesions. It was stated that having a BMI ≥ 25 kg/m^2 did not increase the conversion rate, despite the difficulty in the surgical technique in a systematic review [8]. In this study, all conversions were in the normal weighted group and no conversion was observed in the overweighted-obese group.

Many studies in the literature showed that a high BMI did not affect intraoperative blood loss, time to oral intake, length of hospital stay, and 30-day-mortality similar to our results [8,9].

This study had some limitations. First, it was a retrospective study. Second, the number of patients was limited. Third, long-term postoperative outcomes such as disease-free survival, overall survival, and quality of life analyzes were not done. In addition, BMI may not always reflect the intraabdominal adipose tissue correctly.

Conclusion

Although the rate of intraperative complications was higher in the overweighted-obese patients, BMI had no significant effect on intraoperative and early postoperative outcomes in patients who underwent LTG for GC. We think LTG for GC can be performed safely in patients with high BMI despite the possibility of surgical difficulties.

Bibliography

1. Feng F., *et al*. "Impact of body mass index on surgical outcomes of gastric cancer". *BMC Cancer* 18 (2018): 1-8.

2. Wu X-S., *et al*. "Impact of being overweight on the surgical outcomes of patients with gastric cancer: a meta-analysis". *World Journal of Gastroenterology WJG* 19 (2013): 4596-4606.

3. Bickenbach KA., *et al*. "Impact of obesity on perioperative complications and long-term survival of patients with gastric cancer". *Annals of Surgical Oncology* 20 (2013): 780-787.

4. National Institutes of Health (NIH), National Heart, Lung, and Blood Institute (NHLBI). "Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults". Washington, DC: U.S. DHHS, Public Health Service (PHS) (1998).

5. Aktas A., *et al*. "Totally minimally invasive radical gastrectomy with the da Vinci Xi® robotic system versus straight laparoscopy for gastric adenocarcinoma". *The International Journal of Medical Robotics* 16 (2020): 1-9.

6. Dindo D., *et al*. "Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey". *Annals of Surgery* 240 (2004): 205-213.

7. Chen K., *et al*. "Laparoscopic gastrectomy in obese gastric cancer patients: a comparative study with non-obese patients and evaluation of difference in laparoscopic methods". *BMC Gastroenterology* 17 (2017): 1-9.

8. Sun L., *et al*. "Feasibility of laparoscopy gastrectomy for gastric cancer in the patients with high body mass index: a systematic review and meta-analysis". *Asian Journal of Surgery* 43 (2020): 69-77.

9. Miyasaka M., *et al*. "The effect of the body mass index on the short-term surgical outcomes of laparoscopic total gastrectomy: A propensity score-matched study". *Journal of Minimal Access Surgery* 16.4 (2020): 376-380.

10. Tan J and Zhu S. "Laparoscopic gastrectomy in obese patients with gastric cancer". *JBUON* 22 (2017): 410-416.