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Does body mass index affect the intraoperative and early postoperative outcomes in patients with laparoscopic distal gastrectomy for gastric cancer?

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Abstract

The effect of increased body mass index (BMI) on the short- and long-term outcomes of laparoscopic distal gastrectomy (LDG) is controversial. We aimed to evaluate the influence of BMI on intraoperative and early postoperative outcomes in patients with LDG for gastric cancer (GC). Eighty-six patients who underwent LDG for GC were included in this study retrospectively. The patients were divided into two groups as normal weighted (BMI=18.5-24.9 kg/m^2, n=29) and overweighted-obese (BMI≥25 kg/m^2, n=57). Preoperative and intraoperative data, postoperative outcomes were retrospectively analyzed and compared between the two groups. The preoperative data were similar between the groups. The rate of the history of previous abdominal surgery (19.3% to 3.4%, p=0.05) and the median preoperative carcinoembryonic antigen (CEA) levels (1.7 ng/ml to 1 ng/ml, p=0.06) were higher in the overweighted-obese group but the differences were not significant. There were no significant differences in intraoperative data and early postoperative outcomes between the groups but the rate of postoperative serious complications (12.3% to 6.9%, p=0.71), the reoperation rate (10.5% to 6.9%, p=0.71), and 90-day-mortality rate (5.3% to 0%, p=0.5) were higher in the overweighted-obese group. Although the rates of postoperative serious complications, reoperation, and mortality were higher in the overweighted-obese patients, BMI had no significant effect on intraoperative and early postoperative outcomes in patients who underwent LDG for GC. LDG for GC is a feasible and safe approach for overweighted-obese patients.

Keywords: BMI, gastric adenocarcinoma, minimally invasive gastrectomy, obesity, partial gastrectomy

Introduction

Laparoscopic distal gastrectomy (LDG) has some advantages such as less blood loss, decreased morbidity and mortality, and better cosmetic outcomes compared to open gastrectomy [1]. These advantages make LDG preferable also in obese patients [2]. Previous studies showed that increased body mass index (BMI) was associated with prolonged operative time, fewer retrieved lymph nodes, increased postoperative complications, and decreased survival in gastric cancer (GC) surgery [3].However, the effect of increased BMI on the short and long term outcomes of LDG is controversial [4]. In this study we aimed to evaluate the influence of BMI on intraoperative and early postoperative outcomes in patients with LDG for GC.

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Materials and Methods

This study was approved by local ethical committee (2020/1144). Data of eighty-seven patients who underwent LDG for GC between November 2014 and November 2020 in Inonu University were analyzed retrospectively. Eighty-six patients were included in the study. The inclusion criteria were the primary adenocarcinoma of the middle 1/3 or distal 1/3 of the stomach and BMI≥18.5 kg/m². One patient was excluded because of BMI<18.5 kg/m². The patients were divided into two groups as normal weighted (BMI=18.5-24.9 kg/m², n=29) and overweighted-obese (BMI≥25 kg/m², n=57). BMI was calculated as weight divided by height squared (kg/m²). BMI was classified into the International World Health Organization criteria [5]. 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 [6].

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 [7]. 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, tumor location (middle or distal), 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, 90-day mortality, and time to adjuvant chemotherapy were examined.

Statistics

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

Results

Table 1 shows the preoperative findings and demographic data of the patients. No significant difference was found between the groups, except for BMI. The rate of the history of previous abdominal surgery (19.3% to 3.4%, p=0.05) and the median preoperative CEA levels (1.7 ng/ml to 1 ng/ml, p=0.06) were higher in the overweighted-obese group but the differences were not significant. Intraoperative and postoperative variables are summarized in Table 2 and Table 3. There were no significant differences in intraoperative data and postoperative outcomes between the groups but the rate of postoperative serious complications (12.3% to 6.9%, p=0.71), the reoperation rate (10.5% to 6.9%, p=0.71), and 90-day-mortality rate (5.3% to 0%, p=0.54) were higher in the overweighted-obese group. Four intraoperative complications occurred (middle colic artery injury, colonic mesentery bleeding, jejunal injury, common hepatic artery injury). All of them were resolved laparoscopically during surgery. Postoperative serious complications occured in nine patients. A patient developed evisceration and gastroenterostomy leakage. The leakage was managed conservatively and the evisceration surgically. The patients with duodenal stump leakage, bleeding from the gastroenterostomy staple line, intraabdominal haemorrhage, and jejunogastrostomy leakage were reoperated. Splenectomy was performed due to haemorrhage of the splenic artery in a patient. Postoperative celiac artery thrombosis due to the thermal injury during energy-based device use was occurred in a patient. Repeated laparotomies and multiple organ resection were performed to solve the complication, but all efforts failed and the patient was died. A patient with common hepatic artery thrombosis was treated with surgical vascular reconstruction. One patient was treated with interventional procedures (intraabdominal abscess was drained percutaneously).

Table 1. Preoperative findings and demographic data of the patients

	Total group (n=86)	Normal weighted group (n=29)	Overweighted-obese group (n=57)	P value
Age (year)	58.2±13.3	56.2±15	59.3±12.4	0.32
Gender (male)	55 (64%)	17 (58.6%)	38 (66.7%)	0.46
ASA				0.20
1	15 (17.4%)	8 (27.6%)	7 (12.3%)	
2	57 (66.3%)	17 (58.6%)	40 (70.2%)	
3	14 (16.3%)	4 (13.8%)	10 (17.5%)	
BMI (kg/m²)	26 (18.5-45)	22 (18.5-24.7)	27 (25-45)	p<0.001
Location				0.32
Middle 1/3	11 (12.8%)	2 (6.9%)	9 (15.8%)	
Distal 1/3	75 (87.2%)	27 (93.1%)	48 (84.2%)	
Previous abdominal surgery (yes)	12 (14%)	1 (3.4%)	11 (19.3%)	0.05
Total abdominal hysterectomy	3	-	3	
Appendectomy	3	1	2	
Laparoscopic appendectomy	1	-	1	
Cholecystectomy	1	-	1	
Laparoscopic cholecystectomy	1	-	1	
Cesarean	2	-	2	
Donor nephrectomy (right)	1	-	1	
CEA (ng/ml)	1.5 (0-66.5)	1 (0-6.5)	1.7 (0-66.5)	0.06
CA 19.9 (IU/ml)	7 (0-707)	7.2 (0.1-350.8)	7 (0-707)	0.73

ASA: The American Society of Anesthesiologists classification
BMI: Body mass index
CEA: Carcinoembryonic antigen
CA 19.9: Carbohydrate antigen 19.9

Table 2. Intraoperative variables

	Total group (n=86)	Normalweighted group (n=29)	Overweighted group (n=57)	p value
Operative time (min)	292.5 (150-520)	300 (150-500)	285 (150-520)	0.97
Blood loss (ml)	100 (0-700)	100 (10-400)	100 (0-700)	0.18
Intraoperative complication (n)	4 (4.7%)	1 (3.4%)	3 (5.3%)	1
Middle colic artery injury	1	-	1	
Colonic mezentery bleeding	1	1	-	
Jejunal injury	1	-	1	
Common hepatic artery injury	1	-	1	
Conversion (n)	5 (5.8%)	1 (3.4%)	4 (7%)	0.65

Table 3. Postoperative variables

	Total group (n=86)	Normal weighted group (n=29)	Overweighted-obese group (n=57)	P value
Time to oral intake (day)	2 (1-10)	2 (1-5)	2 (1-10)	0.23
Length of hospital stays (day)	7 (4-48)	6 (4-21)	7 (4-48)	0.26
Tumor size (cm)	5.4 (0-25)	5.5 (0-25)	5 (0-13)	0.55
Retrieved lymph nodes (n)	31.5±16	31.1±14.9	31.6±16.7	0.88
Pathological T stage				
T instu-1-2	26 (30.2%)	8 (27.6%)	18 (31.6%)	0.70
T3-4	60 (69.8%)	21 (72.4%)	39 (68.4%)	
Postoperative serious complication*	9 (10.5%)	2 (6.9%)	7 (12.3%)	
Grade 3a	1	-	1	
Grade 3b	7	2	5	0.71
Grade 4	-	-	-	
Grade 5	1	-	1	
Reoperation (n)	8 (9.3%)	2 (6.9%)	6 (10.5%)	0.71
30-day-mortality (n)	1 (1.2%)	-	1 (1.8%)	1
90-day-mortality (n)	3 (3.5%)	-	3 (5.3%)	0.54
Adjuvant chemotherapy initiation time (day)	42 (15-110)	40 (15-99)	44 (20-110)	0.87

*according to Clavien Dindo classification

Discussion

In this study, we found that LDG for GC in overweighted-obese patients can be performed with similar intraoperative and postoperative outcomes with normal weighted patients. Although the rates of serious complications, reoperations, and mortality were increased in the overweighted-obese group, these differences were not significant.

Previous studies reported increased operative time, increased intraoperative blood loss [8,9] and a high risk of intraoperative complications [10] in laparoscopic GC surgery in patients with high BMI. Fragile adipose tissue covering vascular structures and lymph nodes in overweighted-obese patients makes dissection more difficult. In addition, laparoscopic exposure is more difficult in these patients, and these can cause prolonged operative time and uncontrolled bleeding [11]. Contrary to these studies, Oki et al. [12] stated that there was no relationship between BMI and intraoperative complications in their study with 138 patients. In the study, we found no significant difference in terms of operative time and intraoperative blood loss between patients with normal weight and overweight or obesity. A meta-analysis by Lin sun et al. change as Sun et al. [9] showed no difference in the conversion rate in patients with high BMI compared to patients with normal weight, although some technical difficulties. Similarly, we found that high BMI was not associated with an increased conversion rate.

It is thought that the risk of postoperative complications and mortality is higher in obese patients due to comorbidities such as hypertension, diabetes, and cardiovascular diseases [3]. But previous studies indicated that the postoperative complications were not associated with BMI similar to our findings [4,9,13]. Also, it was previously shown that high BMI was not a risk factor for a delayed time to oral intake, prolonged length of hospital stay, increased postoperative morbidity, and mortality [8,9,14]. It can be thought that increased BMI may cause insufficient lymph node dissection due to technical difficulties caused by a large amount of adipose tissue. Shimada et al. [4]. stated that they retrieved fewer lymph nodes and a lower 5-year disease-free survival related to this in patients with BMI≥25 kg/m^2. We didn't analyze the disease-free survival but found no difference in terms of the number of retrieved lymph nodes.

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.

Conclusion

Although the rates of postoperative serious complications, reoperations, and mortality were higher in the overweighted-obese patients, BMI had no significant effect on intraoperative and early postoperative outcomes in patients who underwent LDG for GC. LDG for GC is a feasible and safe approach for overweighted patients.

Conflict of interests
The authors report no financial relationships or conflicts of interest regarding the content herein.

Financial Disclosure
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Ethical approval
This study was approved by local ethical committee (2020/1144).

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