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Minimally invasive versus open surgery for gastric cancer in Turkish population

Orhan Ağcaoğlu[1], Berke Şengün[1], Serim Tarcan[2], Erman Aytaç[2], Onur Bayram[1], Serkan Zenger[3], Çiğdem Benlice[2], Volkan Özben[2], Emre Balık[1], Bilgi Baca[2], İsmail Hamzaoğlu[2], Tayfun Karahasanoğlu[2], Dursun Buğra[1]

[1] Department of General Surgery, Koç University Faculty of Medicine, Istanbul, Turkey
[2] Department of General Surgery, Acibadem Mehmet Ali Aydinlar University Faculty of Medicine, Istanbul, Turkey
[3] Medical Department of General Surgery, American Hospital, Istanbul, Turkey

ABSTRACT

Objective: In this study, it was aimed to compare short-term outcomes of minimally invasive and open surgery for gastric cancer in the Turkish population carrying both European and Asian characteristics.

Material and Methods: Short-term (30-day) outcomes of the patients undergoing minimally invasive and open gastrectomy with D2 lymphadenectomy for gastric adenocarcinoma between January 2013 and December 2017 were compared. Patient demographics, history of previous abdominal surgery, comorbidities, short-term perioperative outcomes and histopathological results were evaluated between the study groups.

Results: There were a total of 179 patients. Fifty (28%) patients underwent minimally invasive [laparoscopic (n= 19) and robotic (n= 31)] and 129 (72%) patients underwent open surgery. There were no differences between the two groups in terms of age, sex, body mass index and ASA scores. While operative time was significantly longer in the minimally invasive surgery group (p< 0.0001), length of hospital stay and operative morbidity were comparable between the groups.

Conclusion: While both laparoscopic and robotic surgery is safe and feasible in terms of short-term outcomes in selected patients, long operating time and increased cost are the major drawbacks of the robotic technique preventing its widespread use.

Keywords: Gastric cancer, laparoscopic surgery, robotic gastrectomy, D2 dissection, minimally invasive

INTRODUCTION

Radical surgery is the gold standard treatment for a majority of patients with gastric cancer (1). Minimally invasive surgery (MIS) has gained much popularity in the treatment of gastric cancer after Kitano et al. reported the first conventional laparoscopic gastrectomy in 1994 (1). Proposed advantages of minimally invasive techniques are better visualization of the anatomy, less surgical trauma on the abdominal wall and better cosmesis (2). Since its first description, MIS has evolved within a wide scope from standard laparoscopy to robotics in order to improve operative outcomes (3).

The incidence and characteristics of upper gastrointestinal disorders of the Turkish people differ from the European residents (4). The features of gastric cancer vary depending on the geographic location and characteristics of the patient population. (5) MIS for the treatment of gastric cancer have been constantly used and developed in years, especially in Eastern countries (6). There are limited studies evaluating patient characteristics and outcomes of MIS for the radical treatment of gastric cancer form the Western world. Turkey is a country in which patient population exhibits characteristics of both Eastern and Western populations due to its geographic location and genetically heterogenic Eurasian population that carries both European and Asian traits (7). In this study, it was aimed to compare short-term outcomes of MIS and open surgery for gastric cancer in the Turkish population.

MATERIAL and METHODS

After obtaining the Institutional Review Board approval (2018.221.IRB1.026), outcomes of the patients who underwent MIS (laparoscopic or robotic) and open

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Corresponding Author
Erman Aytaç
E-mail: ermanaytac@gmail.com

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gastrectomy with D2 lymphadenectomy by two surgical teams between January 2013 and December 2017 for gastric adenocarcinoma were reviewed. Patients with distant organ metastasis, presence of a previous or concurrent cancer, history of surgical or medical cancer treatment, hereditary cancer syndromes and emergent operations were excluded. Age, sex, body mass index (BMI), ASA (American Society of Anesthesiologists) score, diagnosis, tumor size, history of previous abdominal surgery, comorbidities, operative time, estimated blood loss, the number of harvested lymph nodes, additional resections, perioperative complications, length of hospital stay and interventions within the postoperative 30 days were evaluated and compared based on intent to treat whether MIS or open technique was used. Staging was performed based on the Union for International Cancer Control's TNM-7 guideline (8).

Data were retrieved from prospectively maintained institutional databases. The da Vinci Xi® Surgical System (Intuitive Surgical Inc., Sunnyvale, CA, USA) was used to perform all robotic procedures. Depending on the location of the tumor, a distal subtotal or a total gastrectomy with D2 lymph node dissection was performed based on the surgeons' discretion.

Anastomotic leak was defined as a break in the integrity of the anastomosis documented by a combination of clinical, endoscopic, radiologic, and operative findings. Bowel obstruction/ileus was defined as the presence of at least three of the following five symptoms: nausea, abdominal pain, vomiting, abdominal distension, absence of flatus and/or stool within the last 24 hours, findings indicating obstruction upon plain radiographic or contrast studies, or a diagnosis of intestinal obstruction as confirmed by surgery. Conversion to open surgery was defined as the completion of any part of the procedure with open technique, excluding the delivery of the specimen. Operative time was defined as the time from the first skin incision to final closure of the abdominal wall. Overall morbidity rate was calculated by considering the number of patients who had at least one postoperative complication. Similar discharge criteria including tolerating meals without nausea or vomiting, afebrile for more than a day, adequate pain control with oral medication, and independent ambulation was applied to two study groups.

Operative Technique

For both laparoscopic and robotic procedures, after induction of general anesthesia, patient is placed in a supine position on a split table with each leg abducted at an angle of 30 degrees. Surgeon is positioned between the patient's legs; first assistant is on the right side and the second assistant on the left side of the patient. Blind technique with Veress needle is used to establish pneumoperitoneum of 12-15 mmHg unless there is a history of prior abdominal operation. The Hasson technique is used if blind entrance in to the abdominal cavity is contraindicated. A 10-mm camera port (an 8 mm port for robotic technique) is inserted in the supraumbilical region. A standard 5-port technique is used for the whole laparoscopic procedure (Figure 1A, 1B).

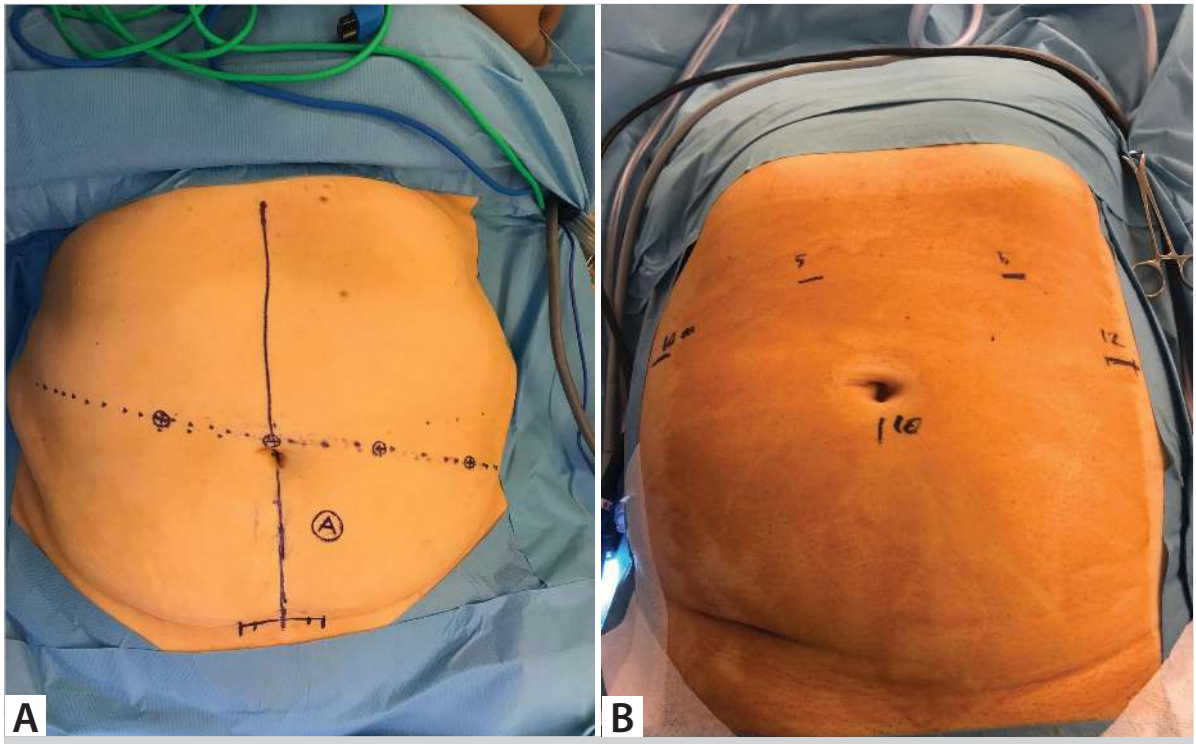

Figure 1. Intraoperative photos showing port placements used for the robotic technique **A.** and laparoscopic technique **B.**

Figure 2. Intraoperative photo showing the position of the Xi robot after docking.

In the initial phase of the procedure, the liver is retracted with a Nathanson retractor to achieve optimal view. On the left side, a 5-mm port is used for assistance and surgeon uses two 12-mm ports on each side of the camera port in laparoscopic surgery. An AirSeal® port is used as an assistant port in robotic gastrectomy (Figure 2). After port placement, patient is placed in a 20° reverse Trendelenburg position. The abdominal cavity is explored to detect the presence of any metastases. The same operative steps are followed in open, laparoscopic and robotic procedures.

First, the gastrocolic ligament is divided with an energy device toward the lower pole of the spleen exposing the omental bursa. After dividing the right gastric and gastroepiploic vessels, the pylorus is dissected to the right and the first portion of the duodenum is transected just distal to the pylorus with a staple. Dissection is then continued distally to the left side of the stomach and the short gastric and left gastroepiploic vessels are divided. The splenic lymph node station is included into the specimen and fundus is totally mobilized. The lymph nodes located at the periceliac, left gastric and porta hepatis are included in the specimen to achieve a D2 dissection.

After dissection of the first four lymphatic stations, an endo-staple is used to transect the stomach from the esophagus. After introduction of a robotic stapler in the year of mid-2015, a robotic staple is used in robotic operations for duodenal, gastric and esophageal transections. In robotic operations, specimen extraction is performed via a Pfannenstiel incision. In laparoscopic operations, 12-mm port opening on the left side, which is used by the surgeon, is enlarged to 6 cm to get the resected specimen out of the abdomen. A standardized Roux-En-Y esophago-jejunostomy or gastro-jejunostomy is performed in total and distal gastrectomy procedures, respectively by transecting the jejunum at a length of 20 to 30 cm from the Treitz's ligament for anastomosis. While an OrVil® is (Medtronic, CT, USA) inserted from the patient's mouth and placed to the distal end of esophagus for esophagojejunostomy in laparoscopic procedures, a hand-sewn intracorporeal end-to-side anastomosis is performed in robotic technique. A side-to-side stapled jejunojejunostomy is performed as the distal anastomosis of the Roux-En-Y reconstruction in both laparoscopic and robotic operations. A Jackson Pratt drain is left into the lesser sac before abdominal closure.

For the open technique, patient lies in supine position. First, median upper gastric laparotomy is established from xyphoid to umbilicus. After initial exploration and evaluation of resectability, the greater omentectomy is performed. For dissection, both sonar and electrical energy-based devices were used. Later, the gastrocolic ligament is dissected, exposing the spleen in the left upper abdominal plane. If the lymph nodes at splenic hilus and preoperative evaluation suggests spread of cancer, then oncological splenectomy is performed. At the pancreas stations 7, 8 and 11, lymphadenectomy is performed in the upper border.

Table 1. Patient demographics and co-morbidities for the minimally invasive and open surgery groups

	Minimally invasive group (n= 50)	Open group (n= 129)	p
Age, years	56.1 ± 10.8	58.9 ± 12.6	0.929
Sex ratio, M/F	31(62%)/19(38%)	90(69.8%)/39(30.2%)	0.319
BMI kg/m^2	26.1 ± 4.5	25.9 ± 4.5	0.432
ASA^{Ŧ}, 1/2/3	22(44%)/25(50%)/3(6%)	49(38%)/65(50.4%)/15(11.6%)	0.493
Co-morbidity, n (%)			
Hypertension	14 (28%)	24 (18.6%)	0.167
Diabetes mellitus	6 (12%)	10 (7.8%)	0.371
Cardiac	8 (16%)	10 (7.8%)	0.099
Obesity	10 (20%)	22 (17.1%)	0.644
Pulmonary	3 (6%)	6 (4.7%)	0.711
Endocrine	3 (6%)	4 (3.1%)	0.401
Liver	1 (2%)	5 (3.9%)	0.999
Stage distribution^{Ψ}			0.128
I	20 (40%)	32 (24.8%)	
II	11 (22%)	33 (25.6%)	
III	19 (38%)	64 (49.6%)	
T classification^{Ψ}			0.412
pT1	19 (38%)	30 (23.3%)	
PT2	5 (10%)	17 (13.2%)	
pT3	10 (20%)	29 (22.5%)	
pT4	16 (32%)	42 (32.6%)	
Metastatic LN	3.5 ± 5.4	6.3 ± 9.7	0.991
N classification			0.101
pN0	25 (50%)	46 (35.7%)	
pN1	10 (20%)	22 (17.1%)	
pN2	9 (18%)	24 (18.7%)	
pN3	6 (12%)	37 (28.7%)	
Neoadjuvant radiotherapy	4 (8%)	6 (4.7%)	0.744
Neoadjuvant chemotherapy	16 (32%)	51 (39.5%)	0.874
Previous history of abdominal surgery	16 (32%)	40 (31%)	0.897

BMI : Body mass index.
Ŧ: American Society of Anesthesiologists (ASA) score.

Later, we focus on duodenum. Following lymphadenectomy at station 6, gastroepiploic vessels are transected close to origin. Then, central lymphadenectomy is performed at 5, 7, 8, 9 and 12. Left and right gastric arteries are displaced, duodenum is transected 3-5 cm distal to the pylorus. Lymphadenectomy at para-aortic station 16 is performed if proximal carcinomas were found. Tumor location determines whether the tubular resection on the esophageal side is performed with a purse string clamp. Staplers are utilized similar to minimally invasive technique described above. For reconstruction, a side-to-side stapled jejunojejunostomy is performed as the distal anastomosis of the Roux-En-Y. The operation is ended after an intraabdominal drain is placed on the subhepatic side. The aponeurosis is sutured followed by stapling of the skin.

Statistical Analysis

Categorical variables were expressed as frequency (%) and continuous variables as mean ± standard deviation (SD) unless otherwise stated. Categorical variables were compared with Fisher's exact test or Chi-square test. Continuous variables were compared with independent t test or Mann-Whitney U test considering the normality. SPSS 18 (IBM Corp. Armonk, NY) was

Table 2. Surgical outcomes and postoperative complications for the minimally invasive and open surgery groups

	Minimally Invasive group (n= 50)	Open group (n= 129)	p
Operative time, min	339.6 ± 113.7	195.6 ± 76.2	**<0.001**
Blood loss, ml	164.5 ± 128.2	124.5 ± 64.4	0.198
Harvested LN	31.5 ± 11.1	34.6 ± 12.0	0.946
Largest tumor diameter, mm	38.1 ± 24	43.3 ± 24.2	0.850
Additional resections (e.g. spleen, pancreas)	4 (8%)	28 (21.7%)	**0.031**
Intraoperative complications, n (%)	4 (8%)	8 (6.2%)	0.675
Overall morbidity, n (%)	17 (34%)	42 (32.6%)	0.769
Anastomotic leakage, n (%)	3 (6%)	3 (2.3%)	0.350
Anastomotic stenosis, n (%)	1 (2%)	1 (0.8%)	0.481
Intraperitoneal abscess, n (%)	2 (4%)	4 (3.1%)	0.672
Intraperitoneal hematoma, n (%)	4 (8%)	2 (1.6%)	0.052
Pancreas fistula, n (%)	0 (0%)	1 (0.8%)	0.999
Pneumothorax, n (%)	2 (4%)	0 (0%)	0.999
Pleural effusion, n (%)	1 (2%)	4 (3.1%)	0.999
Pulmonary emboli, n (%)	1 (2%)	1 (0.8%)	0.486
Wound site infection, n (%)	0 (0%)	5 (3.9%)	0.323
Subcutaneous seroma, n (%)	0 (0%)	2 (1.6%)	0.999
Subcutaneous hematoma, n (%)	1 (2%)	3 (2.3%)	0.999
Atelectasis, n (%)	2 (4%)	12 (9.3%)	0.355
Pneumonia, n (%)	0 (0%)	2 (1.6%)	0.999
Urinary tract infections, n (%)	0 (0%)	2 (1.6%)	0.999
Hospital stay, days	9.5 ± 5	9.3 ± 6.6	0.835
Mortality within postop. 30-days, n (%)	0 (0%)	0 (0%)	

LN: Lymph nodes.

used for statistical analyses. Statistical significance was accepted when p< 0.05.

RESULTS

Patient Demographics and Comorbidities

One hundred and seventy-nine patients were included in the study. Fifty patients (27.9%) underwent MIS (laparoscopic, n=19 and robotic, n= 31) and 129 patients (72.1%) underwent open surgery. Age, sex, BMI, ASA scores, disease stage, history of previous abdominal surgery, use of neoadjuvant treatment and medical comorbidities were comparable between the two groups (Table 1).

Surgical Outcomes and Postoperative Complications

Total gastrectomy was performed in 130 (72.6%) patients [MIS, 34 (68%) vs open, 96 (74.4%); p= 0.387], and subtotal gastrectomy was performed in 49 (27.4%) patients [MIS, 16 (32%) vs open, 33 (25.6%); p= 0.746]. While operative time was longer in the MIS group (339.6 ± 113.7 versus 195.6 ± 76.2, p< 0.001), estimated blood loss was similar between the groups (164.5 ± 128.2 vs. 124.5 ± 64.4 ml, p= 0.198). The number of patients requiring additional resections was higher in the open group [n= 4 (8%) vs. n= 28 (21.7%), p= 0.031]. Histopathologic outcomes were similar between the groups (Table 2).

Conversion to open surgery was required in 7 (14%) patients in the MIS group (Robotic= 3, laparoscopic= 4). Causes of conversion were insufficient exploration (n= 3), intra-abdominal adhesions (n= 1), uncontrolled bleeding (n= 1) and technical difficulties (n= 2). No differences were observed with respect to intra- and postoperative complications between the groups. Intraoperative complications were vascular injury (n= 5), splenic injury (n= 5), ischemia of gastroenterostomy anastomosis (n= 1), and pancreas injury (n= 1). There were no re-operations in both groups. Hospital stay was similar between the two study groups (9.5 ± 5 versus 9.3 ± 6.6 days; p= 0.835) (Table 2).

A subgroup analysis comparing laparoscopic versus robotic surgery was performed to reveal the differences and basic

Table 3. Patient demographics, co-morbidities and perioperative outcomes for laparoscopic and robotic surgeries

	Laparoscopic (n= 19)	Robot (n= 31)	p
Age, years	57.2 ± 11.8	55.5 ± 10.5	0.822
Gender ratio, M/F	11 (57.9%)/8 (42.1%)	20 (64.5%)/11 (34.5%)	0.640
BMI kg/m^2	26.3 ± 4.6	26 ± 4.7	0.592
ASA^{Ŧ}, 1/2/3	5 (26.3%)/12 (63.2%)/2 (10.5%)	17 (54.8%)/13 (41.9%)/1 (3.2%)	0.117
Stage distribution			0.723
I	10 (52.6%)	10 (32.2%)	
II	2 (10.5%)	6 (19.4%)	
III	7 (36.8%)	15 (48.4%)	
Previous history of abdominal surgery, n (%)	8 (42.1%)	8 (25.8%)	0.297
Neoadjuvant chemotherapy	7 (36.8%)	9 (29%)	0.566
Operative time, min.	244.7 ± 60.6	404.1 ± 94.5	**<0.001**
Blood loss, ml	221.5 ± 225.5	181.3 ± 183.9	0.575
Harvested LN	30.2 ± 11.7	32.3 ± 10.9	0.529
Intraoperative complications, n (%)	3 (15.8%)	1 (3.2%)	0.112
Postoperative complications, n (%)	9 (47.4%)	8 (25.8%)	0.118
Hospital stay, days	10.1 ± 5	9.1 ± 5	0.493
Mortality within postop. 30-days, n (%)	0 (0%)	0 (0%)	

LN: Lymph Nodes, BMI: Body mass index.
Ŧ: American Society of Anesthesiologists (ASA) score.

perioperative parameters regarding these two groups. Overall, between the laparoscopic and robotic subgroups, no differences were found except for the operative time which was significantly longer in the robotic group (Table 3).

DISCUSSION

The present study revealed that minimally invasive gastrectomy with D2 lymphadenectomy seemed to provide equal perioperative and short-term oncological outcomes as open radical surgery for gastric cancer in selected cases. While our results lacked to reveal presumed benefits of MIS over open surgery, the characteristics of our patient population and structural differences between our study and prior studies provided remarkable information regarding current status of MIS for gastric cancer in Turkey. Even though they were suitable for major curative surgery, our patients had advanced disease at the time of diagnosis. Majority of our cases undergoing radical gastric surgery had T3-T4 tumors, while the main studies evaluating the value of MIS and D2 lymphadenectomy for gastric cancer treatment included less advanced disease compared to our series (9). Secondly, average BMI of our patients in this study seemed to be higher than the patients included in a vast majority of the prior studies evaluating the outcomes of laparoscopic and robotic surgery for gastric cancer (10). A Korean study has reported promising results with robotic technique in patients with high body mass compared to laparoscopic distal subtotal gastrectomy with D2 lymphadenectomy (11). This is a very good example to reveal the differences in terms of patient characteristics between the Korean and Turkish patients. Mean value of the Korean patients in the high BMI group (26.9 kg/m^2) was similar to the overall BMI (26.1 kg/m^2) of our patients. Operating patients with increased body weight and advanced staged cancer possibly complicates the course of surgery.

Efficacy of MIS for the management of advanced gastric cancers is still controversial (12). Nevertheless, complex features of our population did not worsen the outcomes of MIS compared to open surgery. Some of the prior studies evaluating the value of MIS included patients who underwent D1 and D2 lymphadenectomy with gastrectomy as a combined group (13). This heterogeneity may deeply impact operative outcomes. A D2 lymphadenectomy with gastric resection is an extensive procedure performed to increase the number of harvested lymph node numbers. Harvesting increased number of lymph nodes has been shown to improve staging. Besides providing an accurate staging, a proper lymphadenectomy potentially reduces the risk of local recurrence and may provide better survival (14). While D2 lymphadenectomy has been the standard in Asia, associated operative morbidities and lack of survival benefits of D2 dissection in early Western trials (15) have prevented European and American surgeons from performing D2 as a standard procedure. The Italian Gastric Cancer Study Group has reported comparable morbidity after D1 and D2 lymphadenectomy

with radical gastrectomy (9). The long-term results of the Dutch Gastric Cancer Trial have revealed better survival and decreased local recurrence in patients undergoing D2 lymphadenectomy group (16). Currently, the European Society for Medical Oncology (ESMO) and other main Western guidelines recommend D2 lymphadenectomy for physically fit patients currently (17). Gastric resection with D1 lymphadenectomy is performed for palliation or for wide T1 gastric tumors in our practice. Otherwise, a gastrectomy with D2 lymphadenectomy is our standard surgical approach for the radical treatment of gastric adenocarcinoma (18).

The number of harvested lymph nodes with MIS radical gastrectomy seems acceptable (19). There are reports showing that the number of harvested lymph nodes is greater in minimally invasive procedures, while some studies comparing minimally invasive and open procedures report significantly less total number of dissected lymph nodes in MIS groups (20). Laparoscopy seems to provide comparable or poorer retrieval of lymph nodes when compared to open and robotic surgery in some series (21). Robotic surgery has been introduced to overcome limitations of laparoscopic procedures especially to improve efficacy of lymphadenectomy and intracorporeal suturing (22). While our results were statistically similar for lymphadenectomy in our open and minimally invasive gastrectomy groups, the mean numbers of harvested lymph nodes were 35, 32 and 30 for open, robotic and laparoscopic operations respectively. The surgeons are relatively less experienced on laparoscopic and robotic surgery compared to open radical gastrectomy, which has been the mainstay treatment for years. Robotic technique seems to provide some improvement in terms of the number of harvested lymph nodes, but low patient numbers possibly result statistical insignificance. On the other hand, the open technique was preferred in cases where an additional organ resection is required. This situation reveals selection bias in decision making for the type of surgery whether to perform an open or minimally invasive gastric resection. Technical difficulties, potential intraoperative and postoperative complications are the major factors preventing surgeons from robotic or laparoscopic gastrectomy. Relatively high conversion rate in our patients undergoing a laparoscopic resection compared to prior laparoscopic series seemed remarkable (6-7%) (23). Although conversion is not a parameter effecting operative quality in terms of oncological and postoperative outcomes, conversion to open surgery can be related to emerging operative experience, aggressive characteristics of the disease and relatively high BMI of our patients compared to their Asian counterparts (19,20). The number of patients with advanced gastric cancer at the time of diagnosis seems high in Turkey, which may complicate planning of treatment strategy and surgical performance (24). Longer operating time in the MIS group was in accordance with prior studies (25). The role of caseload in reducing the time spend in the operating room has been well documented previously (13). Duration of procedure is expected to be shorter in the future with increasing experience on MIS gastrectomy.

Anastomotic leak is one of the major complications of gastric surgery (26). Previously published studies report a leakage rate of 1-10% (27). Furthermore, the results of a meta-analysis published by Kostakis et al. have shown no significant difference in anastomotic leakage between MIS and open groups (23). Our operative morbidity was similar with prior reports for both MIS and open surgery (28,29). This reflects and is related to comparable duration of hospital stay following MIS and open surgery for gastric cancer in our series (30). While there are some comprehensive reports on planning treatment strategy for gastric cancer, lack of a national consensus results remarkable heterogeneities in the treatment of gastric cancer in Turkey (24). Non-randomized and retrospective nature are the major limitation of the study. Inclusion of the MIS cases which were performed within the learning curve period may have an impact on the outcomes. Increased cost is still the major drawback of the robotic technique preventing its widespreaed use expectedly. However, we can report that minimally invasive procedures including both laparoscopy and robotics are feasible and safe for the treatment of gastric cancer, yielding similar short-term results compared to open surgery.

Due to our study being retrospective and having limited number of patients, patient selection criteria were not established in the beginning, laparoscopic and robotic groups could not be analyzed separately. Therefore, further prospective studies with increased number of patients and strict patient selectin criteria, quality of life and survival outcomes will provide clearer data on the role of MIS for gastric cancer.

Ethics Committee Approval: The approval for this study was obtained from Koç University Ethics Committee (Decision No: 2018.221.IRB1.026, Date: 02.10.2018).

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ORİJİNAL ÇALIŞMA-ÖZET
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Mide kanseri tedavisinde minimal invazif cerrahi ile açık cerrahinin karşılaştırılması: Türk popülasyonu sonuçları

Orhan Ağcaoğlu[1], Berke Şengün[1], Serim Tarcan[2], Erman Aytaç[2], Onur Bayram[1], Serkan Zenger[3], Çiğdem Benlice[2], Volkan Özben[2], Emre Balık[1], Bilgi Baca[2], İsmail Hamzaoğlu[2], Tayfun Karahasanoğlu[2], Dursun Buğra[1]

[1] Koç Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, İstanbul, Türkiye

[2] Acıbadem Mehmet Ali Aydınlar Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, İstanbul, Türkiye

[3] Amerikan Hastanesi, Genel Cerrahi Tıbbi Bölümü, İstanbul, Türkiye

ÖZET

Giriş ve Amaç: Bu çalışmada mide kanseri tedavisinde minimal invaziv cerrahinin (MİC) rolü, hem MİC hem de açık teknikte öğrenme eğrisini tamamlamış cerrahlar tarafından uygulanan radikal cerrahi olgularının sonuçları karşılaştırılarak değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Ocak 2013-Aralık 2017 tarihleri arasında, iki cerrahi ekip tarafından radikal cerrahi tedavi uygulanan ardışık 199 mide adenokanseri hastası çalışmaya dahil edildi. Hastaların demografik bilgileri, geçirilmiş karın ameliyatları, komorbid faktörler, perioperatif, kısa dönem postoperatif ve histopatolojik sonuçları değerlendirildi. Postoperatif komplikasyonlar Clavien-Dindo sınıflamasına göre skoru ≥3 veya <3 olarak sınıflandırıldı.

Bulgular: Toplam 179 hastanın 53 (%28)'üne MİC (Laparoskopik 19, Robotik 31), 129 (%72)'una açık radikal cerrahi uygulandı. Gruplar arasında yaş, cins, vücut kitle indeksi ve ASA skorları açısından fark saptanmadı. Ameliyat süresi MİC grubunda açık cerrahi grubuna göre istatistiksel anlamlı olarak daha uzun bulundu (p< 0,0001). Çıkarılan toplam lenf nodu sayısı, ortalama hastanede kalış süresi ve perioperatif komplikasyonlar gibi diğer sonuçlar arasında farklılık saptanmadı.

Sonuç: Mide kanserinin radikal cerrahi tedavisinde geçirilmiş karın ameliyatlarından daha çok radikal mide cerrahisi ile birlikte uygulanacak işlemler MİC'nin tercihinde etkilidir. Ameliyat süresi daha uzun olmasına karşın, MİC tecrübeli ellerde standart açık cerrahinin güvenli sınırlarıyla uygulanabilir ve açık cerrahiye benzer onkolojik etkinlik sunar.

Anahtar Kelimeler: Mide kanseri, laparoskopik cerrahi, robotik gastrektomi, D2 disseksiyonu, minimal invaziv cerrahi

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