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Original Article

Laparoscopic gastrectomy for locally advanced gastric carcinoma: long-term survival outcomes and prognostic factors

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Abstract: The purpose of this study was to evaluate the long-term outcomes of laparoscopic gastrectomy for patients with locally advanced gastric carcinoma. Of the 113 patients with locally advanced gastric carcinoma, 89 patients underwent laparoscopic total gastrectomy, while 24 patients underwent laparoscopic distal gastrectomy. There were no intraoperative or postoperataive 30-day death occurred. The 3-, and 5-year overall survival rates were 64% and 57% respectively. Univariate analysis revealed that pathological T status, pathological N status, tumor size and cancer cell differentiation status were statistically significant factors affecting overall survival. Earlier pathological T status and earlier pathological N status were significantly predictive for longer overall survival by multivariate analysis. In summary, laparoscopic gastrectomy can be considered as an alternative to traditional incision in patients with locally advanced gastric carcinoma. A prospective randomized controlled study on a larger scale is required to reach definitive conclusions regarding the efficacy of laparoscopic gastrectomy relative to other techniques.

Keywords: Gastric carcinoma, laparoscopic gastrectomy, minimally invasive surgery, prognosis

Introduction

Gastrectomy to treat early stage gastric carcinoma (cT1) using laparoscopy was first described in 1994 by Japanese general surgeon [1]. Compared with open gastrectomy, the benefits of laparoscopic gastrectomy for early stage gastric carcinoma stem primarily from its less traumatic approach and include reduced postoperative pain and impairment in abdominal muscle, lower cytokine production, and improved immune surveillance [2-10]. Various literatures have reported laparoscopic gastrectomy for early stage gastric carcinoma to be a safe procedure with acceptable long-term outcomes [11-14]. Prospective, multi-institutional studies have examined the feasibility of laparoscopic gastrectomy for early stage gastric carcinoma and demonstrated that laparoscopic gastrectomy is associated with low complication rate and faster recovery [15-17]. However, laparoscopic gastrectomy is still not practiced in locally advanced gastric carcinoma due to difficult technology and complexity of D2 lymph node dissection by laparoscopy. There are only limited reports of laparoscopic gastrectomy for locally advanced gastric carcinoma [18-21]. Our institution has accumulated significant experience with laparoscopic surgery for early stage gastric carcinoma; therefore, we have expanded the indications for using laparoscopic surgery in patients with locally advanced gastric carcinoma. The purpose of this study was to evaluate the long-term survival outcomes of laparoscopic gastrectomy in 113 patients with locally advanced gastric carcinoma. This study also aimed to determine the significant prognostic factors predicting clinical outcome based on the seventh edition of tumor-node-metastasis (TNM) classification for gastric carcinoma proposed by Union for International Cancer Control (UICC), Japanese Gastric Cancer Association (JGCA) and American Joint Committee on Cancer (AJCC) [22-25].

Patients and methods

This study complied with the Declaration of Helsinki. This retrospective research was approved by our local ethics committees. The need

Table 1. Patient characteristics (*n*=113)

Characteristics	*n* (%)
Age, years (range)	60 (40-77)
Sex	
Male	68 (%)
Female	45 (%)
ASA score	
I	91 (%)
II	19 (%)
III	3 (%)
Comorbidity	
None	91 (%)
Present	22 (%)
Liver cirrhosis	3 (%)
Hypertension	8 (%)
Type 2 diabetes mellitus	5 (%)
Stable angina	1 (%)
Chronic arrhythmia	3 (%)
Chronic heart failure	2 (%)
Clinical TNM stage (7th AJCC-UICC)	
IB	48 (%)
IIA	36 (%)
IIB	29 (%)

Table 2. Surgical and pathological data

Data	*n* (%)
Type of resection	
Laparoscopic total gastrectomy	89 (%)
Laparoscopic distal gastrectomy	24 (%)
Operative time (min)	190 (range 160-270)
Blood loss (ml)	150 (range 120-300)
Postoperative stay (days)	9 (range 7-35)
Retrieved lymph nodes	18 (range 17-26)
Pathological TNM stage (7th AJCC-UICC)	
IB	29 (%)
IIA	28 (%)
IIB	26 (%)
IIIA	11 (%)
IIIB	12 (%)
IIIC	7 (%)
Surgical margin (R0/R1/R2)	113/0/0
Histological type	
Differentiated	58 (%)
Undifferentiated	55 (%)

for informed consent from patients was waived because of its retrospective nature.

Between January 2010 and September 2015, 113 patients with clinical T2-3N0-1M0 gastric carcinoma who underwent complete removal of the primary tumor together with D2 lymph node dissection formed the basis of this retrospective research. Patients who had evidence distant metastasis were excluded from this retrospective research. TNM staging was carried out according to the seventh edition TNM Classification of gastric carcinoma by the UICC, JGCA and AJCC [22-25].

The preoperative workup included upper gastrointestinal endoscopy, endoscopic ultrasonography, computed tomographic scans of brain, chest, and abdomen, ultrasonography of abdomen. Positron emission tomography-computerized tomography (PET-CT), staging laparoscopy and bone scanning were performed if clinically indicated [26-28]. All patients underwent real-time video staging by laparoscopy before radical operation.

The technical aspects of laparoscopic gastrectomy with D2 lymph node dissection for locally advanced gastric carcinoma have been described previously [21]. The lymph nodes map was proposed by latest JGCA guideline [25]. Patients were placed in the supine position with legs apart, and were under general anesthesia. Carbon dioxide pneumoperitoneum was established at 15 mmHg after a 12-mm trocar was introduced through an umbilical incision. Two 12-mm trocars were introduced in the left and right lower quadrants, and two 5-mm trocars were inserted in the left and right upper quadrants. For distal gastrectomy, the D2 lymph nodes dissected were as follows: right cardiac lymph nodes (No. 1 station), lesser curvature lymph nodes (No. 3 station), lymph nodes along the left gastroepiploic vessels (No. 4sb station), lymph nodes along the right gastroepiploic vessels (No. 4d station), suprapyloric lymph nodes (No. 5 station), infrapyloric lymph nodes (No. 6 station), left gastric

Table 3. Postoperative 30-day complications

Data	*n* (%)
Cardiacvascular complications	
Atrial fibrillation	4 (%)
Heart failure	2 (%)
Gastrointestinal complications	
Anastomotic leak	6 (%)
Intra-abdominal bleeding	2 (%)
Intra-abdominal abscess	3 (%)
Pancreatic fistula	3 (%)
Others	
Urinary system infection	3 (%)
Total	22
Major complications	3 (%)
Minor complications	19 (%)
Mortality (deaths within 30 postoperative days)	0

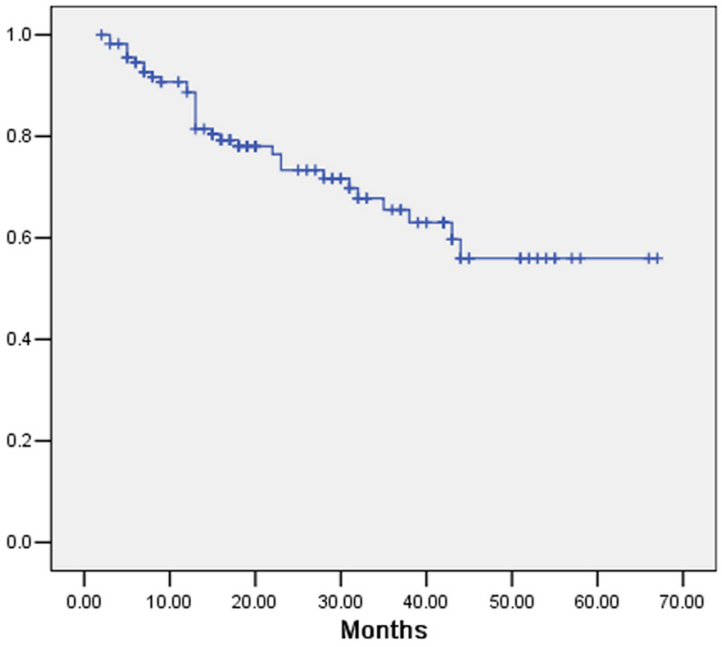

Figure 1. Cumulative Kaplan-Meier overall survival curves for patients with locally advanced gastric carcinoma.

artery lymph nodes (No. 7 station), common hepatic artery lymph nodes of anterosuperior group (No. 8a station), coeliac artery lymph nodes (No. 9 station), lymph nodes along the proximal splenic artery (No. 11p station) and lymph nodes in the hepatoduodenal ligament (No. 12a station). For total gastrectomy, the D2 lymph nodes dissected were as follows: the lymph nodes dissected in distal gastrectomy, lesser curvature lymph nodes (No. 3 station), lymph nodes along the short gastric vessels (No. 4sa station), lymph nodes at the splenic hilum (No. 10 station) and lymph nodes along the distal splenic artery (No. 11d station) [21].

The length of postoperative hospital stay, all major and minor postoperative 30-day complications, and postoperative 30-day death were recorded from the medical database. Severity of postoperative 30-day complications was classified using Clavien-Dindo classification. The definition of Clavien-Dindo system was as follows: Grade 1: oral medication or bedside medical care required; Grade 2: intravenous medical therapy required; Grade 3: radiologic, endoscopic, or operative intervention required; Grade 4: chronic deficit or disability associated with the event; and Grade 5: death related to surgical complication. Major complications were classified as grades 3, 4 and 5. Minor complications were defined as 1 and 2 [29]. All slides were checked by two pathologists with proven experience in gastrointestinal tumor. The adjuvant chemotherapy was decided by internists with proven experience in gastric carcinoma and the general performance status of the patients after gastric resection [30, 31]. Adjuvant radiation therapy was not used in our series.

Follow-up data were obtained from outpatient clinic visits. Disease recurrence was defined as locoregional, peritoneal or distant metastasis proven by radiology or pathology, when available [32-34]. Follow-up of patients was ended in April 2015. The overall survival was assessed from the date of surgery until the last follow up or death of any cause. The disease-free survival was calculated from the date of surgery until

Table 4. Univariate analysis of overall survival

Characteristics	Five-year overall survival rate (%)	*P* value
Sex		0.325
Male	61	
Female	55	
Age		0.201
<65 years	63	
≥65 years	52	
Medical comorbidity		0.092
No	69	
Yes	53	
Type of resection		0.145
Total gastrectomy	54	
Distal gastrectomy	64	
Pathological T status		0.001
T_2	74	
T_3	56	
T_4	46	
pathological N status		0.002
N_0	84	
N_1	61	
N_2	31	
N_3	23	
Tumor size		0.035
<5 cm	69	
≥5 cm	48	
Cell differentiation status		0.028
Differentiated	62	
Undifferentiated	45	
Vascular invasion		0.112
No	59	
Yes	48	

the date of cancer recurrence or death from any cause.

Variables were presented as mean and standard deviations for variables following normal distribution. For variables following non-normal distribution, data were expressed as median and range. Survival was calculated by the Kaplan-Meier method, and differences in survival were determined by log-rank analysis. Possible prognostic factors associated with survival probability at a significance level of 0.10 or less were considered in a multivariable Cox's proportional hazard regression analysis. Conversions from laparoscopic to laparotomy were analyzed in the laparoscopy cohort by the "intent-to-treat" method. Analysis was performed using SPSS 14.0 (SPSS Inc., Chicago, IL, USA). All statistical tests were two-sided, with the threshold of significance set at $P<0.05$ level.

Results

Patient baseline characteristics are summarized in **Table 1**. The study cohort consisted of 68 men and 45 women with a median age of 60 years (range, 40-77 years). The type of resection and pathological diagnoses for these 113 patients are listed in **Table 2**. The medina operating time was 190 min (range, 160-270 min) and medina blood loss was 150 ml (range, 120-300 ml). The median number of dissected lymph nodes was 18 (range, 17-26). Four (3.5%) patients required conversion to open resection due to intra-operative complications such as adhesions (*n*=2) and severe bleeding (*n*=2). These cases were included in the analysis by the "intent-to-treat" analysis. The median length of postoperative hospital stay was 8 days (range, 7-35 days).

There were no intra-operative deaths. There were no deaths within 30 postoperative days. There were no postoperative 30-day complications in 94 patients (%). The remaining 19 patients (%) had one or more postoperative 30-day complications, which are listed in **Table 3**.

The median follow-up time was 39 months (range, 3-67 months). The 3- and 5-year overall survival rates were 64% and 57% respectively (**Figure 1**). Univariate analysis by log-rank test indicated that pathological T status, pathological N status, tumor size and cancer cell differentiation status were statistically significant for overall survival (**Table 4**). Earlier pathological T status and earlier pathological N status were significantly predictive for longer overall survival by multivariate analysis (**Table 5**).

The 3- and 5-year disease-free survival rates were 62% and 43% respectively (**Figure 2**). Univariate analysis by log-rank test indicated that pathological T status, pathological N status and vascular invasion status were statistically significant for disease-free survival (**Table 6**). Earlier pathological T status and earlier pathological N status were significantly predic-

Table 5. Multivariate analysis of overall survival

Characteristics	HR (95% CI)	*P* value
Medical comorbidity		0.120
No	Reference group	
Yes	1.253 (0.751-1.402)	
Pathological T status		0.008
T_2	Reference group	
T_3	1.654 (0.900-1.981)	
T_4	3.214 (1.254-5.241)	
pathological N status		0.001
N_0	Reference group	
N_1	1.058 (0.654-1.325)	
N_2	2.540 (1.025-3.005)	
N_3	3.445 (2.021-4.450)	
Tumor size		0.121
<5 cm	Reference group	
≥5 cm	1.541 (0.741-1.695)	
Cell differentiation status		0.297
Differentiated	Reference group	
Undifferentiated	1.301 (0.589-1.510)	

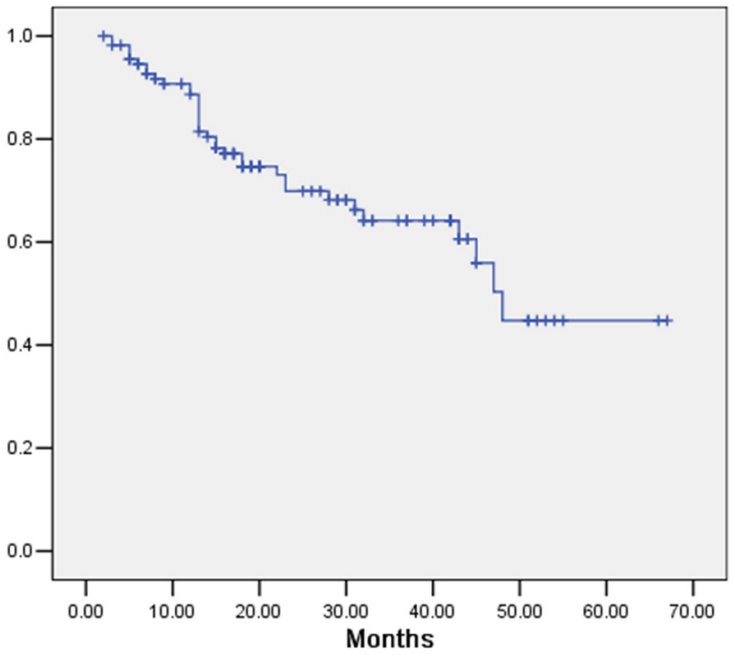

Figure 2. Cumulative Kaplan-Meier disease-free survival curves for patients with locally advanced gastric carcinoma.

tive for longer disease-free survival by multivariate analysis (**Table 7**).

Discussion

Since the use of laparoscopic gastrectomy for early gastric carcinoma was first reported in 1990s [35], this minimally invasive gastrectomy has been performed with increasing frequency. Advocates of laparoscopic gastrectomy emphasize the benefit in terms of less tissue trauma, decreased postoperative pain, reduced cytokine release, less postoperative complication rates, and shorter hospital stay. Previous series suggested that laparoscopic gastrectomy can be performed with low morbidity and mortality rates [3-8]. Randomized clinical trials evaluated the technical feasibility and safety of laparoscopic gastrectomy for early stage gastric carcinoma and demonstrated that the procedure is associated with faster recovery [15-17]. Recent meta-analysis of nonrandomized trials evaluating the safety and efficacy of laparoscopic gastrectomy for locally advanced gastric carcinoma demonstrated that laparoscopic gastrectomy may become a valid alternative to open surgery if performed in qualified centers though no randomized clinical trials reporting [1, 6, 20].

Our results are comparable to previous reports [3-8, 36, 37]. In our series, postoperative mortality and morbidity rates were 1.3% and 9.1%, respectively. We have performed 113 laparoscopic gastrectomies for locally advanced gastric carcinoma during a relatively short period at a single institution; this may have resulted in a relatively homogeneous quality of perioperative management.

Despite these favorable short-term outcomes, the adequacy of laparoscopic gastrectomy for oncologic control still needs to be proven compared with standard open gastrectomy [38-42]. Concerns about the possibility of laparoscopy-related recurrence in laparoscopic gastrectomy when compared with open gastrectomy may be related to the possibilities of cancer dissemina-

Table 6. Univariate analysis of disease-free survival

Characteristics	Five-year disease-free survival rate	*P* value
Sex		0.320
Male	54	
Female	39	
Age		0.530
<65 years	51	
≥65 years	40	
Medical comorbidity		0.090
No	54	
Yes	39	
Type of resection		0.258
Total gastrectomy	49	
Distal gastrectomy	38	
Pathological T status		0.017
T_2	63	
T_3	51	
T_4	40	
pathological N status		0.011
N_0	84	
N_1	58	
N_2	30	
N_3	18	
Tumor size		0.150
<5 cm	57	
≥5 cm	41	
Cell differentiation status		0.087
Differentiated	58	
Undifferentiated	39	
Vascular invasion		0.044
No	51	
Yes	32	

Table 7. Multivariate analysis of disease-free survival

Characteristics	Five-year disease-free survival rate	*P* value
Medical comorbidity		0.148
No	Reference group	
Yes	Reference group	
Pathological T status		0.002
T_2	Reference group	
T_3	1.369 (0.821-1.581)	
T_4	2.287 (1.854-4.251)	
pathological N status		0.008
N_0	Reference group	
N_1	1.141 (0.547-1.897)	
N_2	3.010 (2.325-4.256)	
N_3	4.025 (2.014-5.019)	
Cell differentiation status		0.128
Differentiated	Reference group	
Undifferentiated	1.201 (0.700-1.420)	
Vascular invasion		0.218
No	Reference group	
Yes	1.518 (0.870-1.987)	

tion during laparoscopy manipulation, leaving residual tumor at the resection margin, and performing an insufficient D2 lymphadenectomy. In our series, overall survival and disease-free survival for patients were comparable to other reports [1-11]. This suggests that survival outcomes after laparoscopic gastrectomy for locally advanced gastric carcinoma compare favorably with those for standard open gastrectomy.

Several studies have reported conversion rates of laparoscopic gastrectomy to open gastrectomy ranging from 0% to 15.7% [1-14]. The conversion rate is influenced by the nature of the cases selected. Of our 113 cases, 4 (3.5%) patients required conversion of the intended procedure to open gastrectomy. In this study, there were no intra-operative deaths, and the 30-day mortality rate was zero. The 30-day complication rate was 16.8%, with the most common complications classified as minor complication.

There are several limitations of this study. Because this is a retrospective and non-comparative study, our results should be interpreted with caution. Prospective randomized controlled trials are required for more conclusive results. We chose to perform laparoscopic gastrectomy in selected patients with relative early stage. This may have predisposed the study population undergoing laparoscopic gastrectomy to experience favorable outcomes compared with those undergoing open gastrectomy.

In conclusion, these data suggest that in experienced

hands, laparoscopic gastrectomy can be considered as an alternative to traditional gastrectomy in patients with locally advanced gastric carcinoma. Lower pathological T status and pathological N status were significantly predictive for better overall survival and disease-free survival. A prospective randomized controlled study on a larger scale is required to reach definitive conclusions regarding the efficacy of laparoscopic gastrectomy relative to other techniques.

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Discourse of conflict of interest

None.

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References

[1] Chen XZ, Wen L, Rui YY, Liu CX, Zhao QC, Zhou ZG and Hu JK. Long-term survival outcomes of laparoscopic versus open gastrectomy for gastric cancer: a systematic review and meta-analysis. Medicine (Baltimore) 2015; 94: e454.

[2] Tang HN and Hu JH. A comparison of surgical procedures and postoperative cares for minimally invasive laparoscopic gastrectomy and open gastrectomy in gastric cancer. Int J Clin Exp Med 2015; 8: 10321-10329.

[3] Zhang B, Tu JC, Fang J, Zhou L and Liu YL. Comparison of early-term effects between totally laparoscopic distal gastrectomy with delta-shaped anastomosis and conventional laparoscopic-assisted distal gastrectomy: a retrospective study. Int J Clin Exp Med 2015; 8: 9967-9972.

[4] Liu N, Niu Z, Niu W, Peng C, Zou X, Sun S, Shinichi O, Shahbaz M, Sun Q and Jun N. Intraoperative sentinel lymph node mapping guides laparoscopic-assisted distal gastrectomy for distal gastric cancer. Int J Clin Exp Med 2015; 8: 5760-5766.

[5] Gong JQ, Cao YK, Wang YH, Zhang GH, Wang PH and Luo GD. Three-step hand-assisted laparoscopic surgery for radical distal gastrectomy: an effective surgical approach. Int J Clin Exp Med 2014; 7: 2156-2164.

[6] Huang YL, Lin HG, Yang JW, Jiang FQ, Zhang T, Yang HM, Li CL and Cui Y. Laparoscopy-assisted versus open gastrectomy with D2 lymph node dissection for advanced gastric cancer: a meta-analysis. Int J Clin Exp Med 2014; 7: 1490-1499.

[7] Lan H, Zhu N, Lan Y, Jin K and Teng L. Laparoscopic gastrectomy for gastric cancer in China: an overview. Hepatogastroenterology 2015; 62: 234-239.

[8] Yang K, Zhang WH, Chen XL, Chen XZ, Guo DJ, Zhang B, Chen ZX, Zhou ZG and Hu JK. Comparison of hand-assisted laparoscopic gastrectomy vs. laparoscopy assisted gastrectomy for gastric cancer. Hepatogastroenterology 2014; 61: 2411-2415.

[9] Mellotte G, Maher V, Devitt PG, Shin VY and Leung CP. Minimally invasive surgical oncology: State of the art. Asian Pac J Surg Oncol 2015; 1: 101-112.

[10] Yamada N, Maeda K, Sawada T, Jeong ID, Noh SH and Zhao Y. Surgical management of gastric cancer. Asian Pac J Surg Oncol 2016; 2: 121-134.

[11] Zeng YK, Yang ZL, Peng JS, Lin HS and Cai L. Laparoscopy-assisted versus open distal gastrectomy for early gastric cancer: evidence from randomized and nonrandomized clinical trials. Ann Surg 2012; 256: 39-52.

[12] Wang Y, Wang S, Huang ZQ and Chou WP. Meta-analysis of laparoscopy assisted distal gastrectomy and conventional open distal gastrectomy for EGC. Surgeon 2014; 12: 53-58.

[13] Uzel M, Sahiner Z and Filik L. Gastric cancer and gallbladder: single center experience. J BUON 2015; 20: 667-668.

[14] Lianos GD, Rausei S, Ruspi L, Galli F, Mangano A, Roukos DH, Dionigi G and Boni L. Laparoscopic gastrectomy for gastric cancer: current evidences. Int J Surg 2014; 12: 1369-1373.

[15] Ghoneum M, Felo N, Nwaogu OM, Fayanju IY, Jeffe JA and Margenthaler DB. Clinical trials in surgical oncology. Asian Pac J Surg Oncol 2015; 1: 73-82.

[16] Zheng YF, Tan LK, Tan BH, Sterling H and Kane R. Principles of surgical oncology. Asian Pac J Surg Oncol 2015; 1: 17-26.

[17] Parisi A, Nguyen NT, Reim D, Zhang S, Jiang ZW, Brower ST, Azagra JS, Facy O, Alimoglu O, Jackson PG, Tsujimoto H, Kurokawa Y, Zang L, Coburn NG, Yu PW, Zhang B, Qi F, Coratti A, Annecchiarico M, Novotny A, Goergen M, Lequeu JB, Eren T, Leblebici M, Al-Refaie W, Takiguchi S, Ma J, Zhao YL, Liu T and Desiderio J. Current status of minimally invasive surgery for gastric cancer: A literature review to highlight studies limits. Int J Surg 2015; 17: 34-40.

[18] Qiu JF, Yang B, Fang L, Li YP, Shi YJ, Yu XC and Zhang MC. Safety and efficacy of laparoscopy-assisted gastrectomy for advanced gastric cancer in the elderly. Int J Clin Exp Med 2014; 7: 3562-3567.
[19] Emir S, Sözen S, Bali I, Gürdal SÖ, Turan BC, Yıldırım O and Yetişyiğit T. Outcome analysis of laporoscopic D1 and D2 dissection in patients 70 years and older with gastric cancer. Int J Clin Exp Med 2014; 7: 3501-3511.
[20] Zou ZH, Zhao LY, Mou TY, Hu YF, Yu J, Liu H, Chen H, Wu JM, An SL and Li GX. Laparoscopic vs. open D2 gastrectomy for locally advanced gastric cancer: a meta-analysis. World J Gastroenterol 2014; 20: 16750-16764.
[21] Lin JX, Huang CM, Zheng CH, Li P, Xie JW, Wang JB and Lu J. Laparoscopy-assisted gastrectomy with D2 lymph node dissection for advanced gastric cancer without serosa invasion: a matched cohort study from South China. World J Surg Oncol 2013; 11: 4.
[22] Markovic-Denic L, Cirkovic A, Zivkovic S, Stanic D and Skodric-Trifunovic V. Cancer mortality in central Serbia. J BUON 2014; 19: 273-277.
[23] Li X, Liu Y, Cao B, Liu B, Bai T, Li X, Mei L and Che X. Metastatic lymph node ratio and prognosis of gastric cancer at different pT stages. Hepatogastroenterology 2015; 62: 507-511.
[24] Yung KW, Yung TT, Chung CY, Tong GT, Liu Y, Henderson J, Welbeck D and Oseni S. Principles of cancer staging. Asian Pac J Surg Oncol 2015; 1: 1-16.
[25] Japanese Gastric Cancer Association. Japanese gastric cancer treatment guidelines 2010 (ver. 3). Gastric Cancer 2011; 14: 113-123.
[26] Canyilmaz E, Soydemir G, Serdar L, Uslu GH, Sahbaz A, Colak F, Kandaz M, Bahat Z and Yoney A. Evaluation of prognostic factors and survival results in gastric carcinoma: single center experience from Northeast Turkey. Int J Clin Exp Med 2014; 7: 2656-2666.
[27] Qu JL, Qu XJ, Li X, Zhang JD, Teng YE, Jin B, Zhao MF, Yu P, Liu J, Li DY and Liu YP. Early initiation of fluorouracil-based adjuvant chemotherapy improves survival in patients with resectable gastric cancer. J BUON 2015; 20: 800-807.
[28] Biondi A, D'Ugo D, Cananzi FC, Papa V, Borasi A, Sicoli F, Degiuli M, Doglietto G and Persiani R. Does a minimum number of 16 retrieved nodes affect survival in curatively resected gastric cancer? Eur J Surg Oncol 2015; 41: 779-786.
[29] Xiao H, Xie P, Zhou K, Qiu X, Hong Y, Liu J, Ouyang Y, Ming T, Xie H, Wang X, Zhu H, Xia M and Zuo C. Clavien-Dindo classification and risk factors of gastrectomy-related complications: an analysis of 1049 patients. Int J Clin Exp Med 2015; 8: 8262-8268.
[30] Li B, Liu HY, Guo SH, Sun P, Gong FM and Jia BQ. The postoperative clinical outcomes and safety of early enteral nutrition in operated gastric cancer patients. J BUON 2015; 20: 468-472.
[31] Varol U, Alacacioglu A, Yildiz I, Kucukzeybek Y and Uslu R. Gastric cancer with diffuse hepatic metastases and complete radiological response to triplet chemotherapy. J BUON 2014; 19: 1128-1129.
[32] Hase K, Naomoto Y, Ninomiya M, Watanabe M, Omoto T and Wang H. Staging of gastric cancer. Asian Pac J Surg Oncol 2016; 2: 75-86.
[33] Yalcin S, Gumus M, Kilickap S, Alkis N, Ilhan M, Oksuzoglu B, Orhan B, Unsal M, Basol Tekin S, Yalcin B and Demir G. End-of-study results of Turkish gastric cancer patients from the global REGATE study. J BUON 2014; 19: 377-387.
[34] Zu H, Wang H, Li C, Kang Y and Xue Y. Clinicopathological features and prognostic analysis of gastric cancer patients in different age groups. Hepatogastroenterology 2015; 62: 225-230.
[35] Deng Y, Zhang Y and Guo TK. Laparoscopy-assisted versus open distal gastrectomy for early gastric cancer: A meta-analysis based on seven randomized controlled trials. Surg Oncol 2015; 24: 71-77.
[36] Son T, Kwon IG and Hyung WJ. Minimally invasive surgery for gastric cancer treatment: current status and future perspectives. Gut Liver 2014; 8: 229-236.
[37] Cheng Q, Pang TC, Hollands MJ, Richardson AJ, Pleass H, Johnston ES and Lam VW. Systematic review and meta-analysis of laparoscopic versus open distal gastrectomy. J Gastrointest Surg 2014; 18: 1087-1099.
[38] Imada T, Yukawa N, Nakatsuji M, Tan B, Tan JY and Fock KM. Lymph node dissection for gastric cancer. Asian Pac J Surg Oncol 2016; 2: 101-120.
[39] Eren OO, Sonmez OU, Ozkan HA and Oyan B. Revisiting post-gastrectomy anemia with a brief survey among a group of Turkish medical oncologists. J BUON 2015; 20: 808-811.
[40] Lee JH, Lim JK, Kim MG and Kwon SJ. The influence of post-operative surveillance on the prognosis after curative surgery for gastric cancer. Hepatogastroenterology 2014; 61: 2123-2132.
[41] Lee S, Park JC, Lee H, Lee YC, Shin SK, Hyung WJ, Noh H, Kim CB, Kim HK, Kang DR and Lee SK. Long-term follow-up and characteristics of cancer negative cases after endoscopic resection and gastrectomy for early gastric cancer. Hepatogastroenterology 2014; 61: 2133-2140.
[42] Angelov KG, Vasileva MB, Grozdev KS, Sokolov MB and Todorov G. Clinical and pathological

characteristics, and prognostic factors for gastric cancer survival in 155 patients in Bulgaria. Hepatogastroenterology 2014; 61: 2421-2424.

[43] Santoro R, Mancini P, Carboni F, Lepiane P, Ettorre GM and Santoro E. Subtotal gastrectomy for gastric cancer: long term outcomes of Billroth I reconstruction at a single European institute. Hepatogastroenterology 2014; 61: 2448-2454.

[44] Lee JH, Lim JK, Kim MG and Kwon SJ. The influence of post-operative surveillance on the prognosis after curative surgery for gastric cancer. Hepatogastroenterology 2014; 61: 2123-2132.

[45] De Andrade JP and Mezhir JJ. The critical role of peritoneal cytology in the staging of gastric cancer: an evidence-based review. J Surg Oncol 2014; 110: 291-297.