

Early-stage outcomes of bursectomy in surgery of gastric cancer and radical gastric resection

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Abstract

Aim: Bursectomy, mainly defined as a complete dissection of the peritoneal lining covering the anterior plane of the transverse mesocolon and the pancreas with an omentectomy during gastrectomy, has been performed for the serosa-positive gastric cancers. Recently, some researchers have interrogated whether bursectomy for gastric cancer is essential from a surgical point of view, thus, we aimed to investigate the short-term surgical and early-stage clinicopathological outcomes of bursectomy in the treatment of advanced gastric cancer patients by a single center study and retrospective controlled trial.

Material and Methods: From January 2016 to December 2017, retrospective findings of selected 100 gastric cancer patients in advanced tumor stages and underwent D2 radical gastrectomy were grouped and analyzed in terms of bursectomy performed or not in Bakirkoy Dr. Sadi Konuk Training and Research Hospital.

Results: In conclusion, 50 patients were in bursectomy (B) group and 50 patients in non-bursectomy (NB) group. Clinical features (age, gender, and gastrectomy pattern and tumor location) of both groups showed no statistically significant difference. Postoperative mortality rate were also similar of both groups (4%). All other post-operative complications were not significantly distinctive for two groups.

Conclusions: Bursectomy may increase the surgical duration of D2 gastrectomy and but not early-stage outcomes and post-operative complications. Experienced surgeons can perform the procedure safely. However, long-term, large sample sized, and high-quality randomized controlled trials are needed for the survival benefits of bursectomy.

Keywords: Gastrectomy; Gastric Cancer; Bursectomy; Complication; Prognosis.

INTRODUCTION

Gastric cancer is one of the most common cause of cancer-related deaths based on the potential malignancy (1-3). For curative purposes in gastric carcinoma, surgery is considered to be an optimal treatment; however, the clinical significance of bursectomy in addition to gastrectomy in curable gastric cancers is disputable. Bursectomy is defined as the complete dissection of the peritoneal lining covering the pancreas and the anterior plane of the transverse mesocolon by an omentectomy. The aim of this procedure is to remove metastases from the omental bursa and lymph nodes (LNs) around the pancreas completely (4,5). The procedure help to prevent peritoneal recurrences by eliminating micrometastatic masses in the lesser sac of peritoneal cavity and by a complete resection of the subpyloric LNs.

Up to date, there have been many controversial issues

on the clinical use of bursectomy with gastrectomy to cure an advanced gastric cancer because the survival benefit is undetermined (6). Some randomized controlled trials found that bursectomy may ameliorate the survival outcomes in advanced gastric patients (7), while some researchers have found that the incidence of postoperative complications was comparable between patients with or without bursectomy, and gastrectomy with bursectomy is advantageous in short-term overall survival results in comparison to the non-bursectomy gastrectomy, especially for the patients underwent total gastrectomy. However, other retrospective studies indicated that there were no survival benefits of bursectomy in contrast with the non-bursectomy for most of the gastric cancer patients and the bursectomy was not recommended as a routine procedure in gastric cancer surgery (8-10).

Due to the relatively high rate of gastric cancer in

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Turkey, we analyzed the short-term surgical and early-stage clinicopathological outcomes with postoperative complications of bursectomy for the treatment of advanced gastric cancer patients underwent D2 radical subtotal and total gastrectomy with or without bursectomy in our center. We conducted a single center study and retrospective trial to present a possible inferiority of the bursectomy in surgery of gastric cancer and radical gastric resection.

MATERIAL and METHODS

Patients

From January 2016 to December 2017, 100 gastric cancer patients from the Department of General Surgery, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, were enrolled in this trial according to the following criteria: (1) verified gastric adenocarcinoma and signet ring cell carcinoma; (2) N0-3, pT1-4 and M0 stages due to relevant classification (11); (3) distal and total gastrectomy; (4) D2 lymphadenectomy due to the referred guidelines (12); (5) curative resection without residual tumors (R0 resection). The Ethics Committee of Bakirkoy Dr. Sadi Konuk Training and Research Hospital approved this retrospective study (No: 2018-140). The exclusion criteria was the presence of distant metastases or positive cytology. 4 patients with positive cytology were excluded. A routine follow-up was performed in every outpatient visit. Mail and telephone interviews were used as supplementary methods. The follow-up information was recorded until January 2018. The median follow-up duration for the patients (more than 30 days) was analyzed in the study.

Surgical procedure

All the gastric cancer patients in the study underwent the laparoscopic cytological sampling and then surgical operation by well-trained surgeons in our department. For the resection patterns, total gastrectomy was applied to gastric cancer patients with tumors located in the upper/middle third and in the lower third of the stomach and with LNs metastasis. Only lower third gastric cancers had distal gastrectomy. In conformity with the guidelines of the Japanese Gastric Cancer Association (JGCA), partial and total bursectomy were performed (8). Patients with partial and total bursectomy were defined in the non-bursectomy and bursectomy group, respectively. D2 lymphadenectomy was performed due to referred guidelines (12). Roux-en-Y esophagojejunostomy reconstructions and Roux-en-Y or Billroth type II gastrojejunostomy were respectively for a distal and total gastrectomy.

Union for International Cancer Control (UICC) tumor-node metastasis (TNM) system was used for the staging of cancer (13). Postoperative mortality and morbidity were determined for 30 days or during the whole period of hospitalization.

Statistics

Statistical analysis was conducted using MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2013).

The continuous variables were defined with descriptive statistics (Mean, standard deviation, minimum, median, maximum). The independent variables with normal distribution were compared by Student-t test. Both the continuous variables without normal distribution and the ranked variables were weighed by the Mann-Whitney U test. The categorical variables were compared with the Pearson's chi-square test (or Fisher Exact test when needed). Statistical significance level was defined as 0.05.

RESULTS

Clinical Features

From January 2016 to December 2017, 100 gastric cancer patients were enrolled in the all analysis, 50 patients in bursectomy group and 50 in non-bursectomy group were determined. Most of the clinical findings were comparable between two groups, namely age, gender, gastrectomy pattern and tumor locations (Table 1).

Table 1 Clinical characteristics of the patients in non-bursectomy group and bursectomy group

Characteristics	Non-bursectomy Group N= 50 (%)	Bursectomy Group N= 50 (%)	P Value
Age (Mean±SD)	58.48 ± 11.4	60.46 ± 11.21	0.383
Gender			
Male	33 (66)	34 (68)	
Female	17 (34)	16 (32)	0.832
Gastrectomy Pattern			
Subtotal Gastrectomy	25 (50)	17 (34)	0.105
Total Gastrectomy	25 (50)	33 (66)	
Tumor Location			
Antrum	25 (50)	17 (34)	0.127
Cardia	6 (12)	13 (26)	
Corpus	19 (38)	20 (40)	

The results showed that a higher number of patients underwent total gastrectomy in bursectomy group than non-bursectomy group without a statistical significance (66% vs. 50%, $p = 0.105$). Additionally, there existed a difference in the tumor locations, as the most common region was antrum in non-bursectomy group (50%) and corpus in bursectomy group (40%) with no significant difference between groups.

In terms of type of tumors, 58% of the patients in non-bursectomy group had adenocarcinoma and the rest (42%) of the patients had a signet-ring cell carcinoma (SRCC). 64% of patients in the bursectomy group was found to have adenocarcinoma and the rest (36%) had SRCC.

The tumor depth was mostly in T3 stage in non-bursectomy patients (51.02%) while it was mostly in T4

stage in bursectomy patients (38%), without a significant difference between two groups ($p=0.502$).

Post-operative Complications

The postoperative complications of the surgery were listed in Table 2.

Table 2. Short-term postoperative complications of the patients in non-bursectomy group and bursectomy group

	Non-bursectomy Group N= 50 (%)	Bursectomy Group N= 50 (%)	P Value
Postoperative hospital stay (day) (Mean \pm SD)	7.76 \pm 2.9	7.68 \pm 3.01	0.776
Pancreatic leak	0 (0)	1 (2)	1.000
Pleural effusion	24 (48)	15 (30)	0.065
Pulmonary infection	13 (26)	6 (12)	0.074
Anastomotic leak	9 (18)	4 (8)	0.137
Intra-abdominal abscess	17 (34)	10 (20)	0.115
Surgical site infection	10 (20)	12 (24)	0.629
Postoperative ileus	0 (0)	4 (8)	0.117
Mortality	2 (4)	2 (4)	1.000

There was not any case of intraoperative mortality in the study but 2 patients died of surgery due to acute myocardial infarction and sepsis after anastomotic leak in bursectomy group, intra-abdominal hemorrhage in non-bursectomy patients. The mean postoperative hospital stay was 7.76 \pm 2.9 days in non-bursectomy group and 7.68 \pm 3.01 days in bursectomy group ($p = 0.776$). The most common postoperative complication was pleural effusion in both early periods. 7 patients needed a reoperation within 10 days of the surgery: 1 patient for hemorrhage in abdominal cavity and 3 patients for intra-abdominal abscesses in the non-bursectomy group, and 2 patients for hemorrhage in abdominal cavity and 1 patient for an intestinal obstruction in the bursectomy group. All other post-operative complications of two groups were not statistically different.

All other patients recovered well and were discharged from the hospital, involving one patient in the non-bursectomy group and two patients in the bursectomy group who had an anastomotic leak and percutaneous drainage during the postoperative follow up more than 30 days.

The bursectomy has long been a main step of radical surgery for serosa-involved gastric adenocarcinomas for some countries but also controversial to prevent the peritoneal metastasis after surgery (4). Thus, we questioned the inferiority of the bursectomy in the surgery of gastric cancer and radical gastric resection by this single center and retrospective controlled trial and found that bursectomy might be a safe technique with nonaggressive early-stage outcomes and comparable post-operative complications although it is known to rise the surgical duration of D2 gastrectomy.

The safety of operations and oncological benefits are

crucial factors to show the potential useful therapeutic features of the bursectomy procedure in the gastric cancer surgery according to the recent reports. Some researchers had claimed that the safety of bursectomy with D2 lymphadenectomy largely depends on the experience of surgeons (15). A previous randomized controlled study suggested that the bursectomy procedure might have some survival benefits among the serosa-positive (pT3–T4) patients but without significant difference. Additionally, the 3-year overall survival rate was higher in the bursectomy patients in comparison with the non-bursectomy patients (8), and the 5-years follow-up parameters of this study existed similar results (16). However, other studies had totally opposite results. A very recent phase 3, open-label, randomized controlled trial by Kurokawa et al. indicated that bursectomy had not any a survival advantage over non-bursectomy in the treatment of resectable cT3 or cT4a gastric cancer although the results of this study were early outcomes without long-term follow-up (14). The predictive probability of overall survival was significantly increased in the bursectomy compared to the non-bursectomy patients, but the final rate was only 12.7%. Moreover, 5-year overall survival was 76.7% in the non-bursectomy group and 76.9% in the bursectomy group (hazard ratio 1.05, 95% CI 0.81–1.37, one-sided $p=0.65$). So it may be interpreted from this study that the bursectomy may not be superior but also not detrimental for the gastrectomy procedure even for follow-up findings of the patients. Even though our study is a short-term retrospective one center trial, the insignificant differences in the findings of bursectomy and non-bursectomy patients support the idea of safety of the procedure.

Around the world, more than half of gastric cancer patients are diagnosed with advanced stage tumors. Therefore, comparing the findings of advanced gastric cancer patients underwent D2 gastrectomy with or without a bursectomy becomes urgent (7). In a study by Zhang et al., it is concluded that bursectomy is a complicated and technique-dependent procedure, which may prolong the surgical duration and responsible from an extensive blood loss during the operations. Another randomized controlled trial indicated that the bursectomy added 27 min to the surgical duration and 125 ml to the intraoperative blood loss compared to the non-bursectomy patients (15). A previous cohort study determined that the bursectomy procedure was related with an additional 41 min operation times and an additional 65 ml intraoperative blood loss (18). The extra time consumed during the operations was mainly due to the dissection of the anterior of meso-colon of transverse and capsule of the pancreas (15). Since our focus in this study was to compare histopathology and postoperative complications of two groups, and since there are many findings showing longer surgical duration and larger amount of intraoperative blood loss during the procedure, we did not prefer to compare these parameters. However, it does not mean the surgical bursectomy procedures are unsafe, harmful or cannot be standardized

despite a potential injury on the vessels of the transverse meso-colon.

Considering the postoperative complications in the literature, Blouhos et al. reported the postoperative morbidity rate as 19.4% for patients with bursectomy surgery (8), and Imamura et al. found the overall morbidity rate as 14.3% for both the bursectomy and non-bursectomy groups (15). Zhang et al. gave a comparable incidence of postoperative complications was comparable between two groups as 23.3% in bursectomy vs. 17.8% in non-bursectomy patients (7). Our findings also showed no statistical difference in postoperative complications between the bursectomy and non-bursectomy patients. Therefore, although the bursectomy is considered to be a time-consuming procedure, it can be performed safely in highly experienced centers or by experienced surgeons in total gastrectomy surgeries (7).

In details of the postoperative complications, gastrointestinal surgeons are mainly concerned about a potential damage of the pancreas and in increase in the incidence of pancreatic fistula and leak formation (17). The pancreatic parenchyma may be injured during dissecting the pancreatic capsule, resulting in a higher incidence of pancreatic fistula. Previous studies have shown that subclinical pancreatic fistula occurred in up to 10% of the patients with the resection of the pancreatic capsule (18). Imamura et al. reported that there was no statistical difference in the incidence of pancreatic fistulas between the bursectomy and non-bursectomy patients (15). They deduced that the dissection of the pancreatic capsule may not result in any pancreatic fistula but may occur due to the lymphadenectomy of those lymph nodes adjacent to the pancreas parenchyma. Moreover, Blouhos et al. found that the incidence rate of pancreatic fistula was only 4.2% (18) while Zhang et al reported a ratio of 13.5% in bursectomy patients (17). Generally, the resection of the pancreatic capsule needs experienced cumulative procedures, and a well-practical surgeon in a well-qualified center can rarely cause an injury on the pancreas and, thus reduce the potential incidence of pancreatic leakage (18). In this study, only one of the patients in non-bursectomy group and 2 patients in bursectomy group experienced a pancreatic leakage, revealing a successful operation in most of the cases.

The most important objective of a total bursectomy is to prevent a potential peritoneal relapse of cancer and to improve the survival outcomes. However, our study giving early-stage outcomes did not give the evidence of survival outcomes but gave the mortality rate of bursectomy and non-bursectomy patients as 4% in each group with no significance between groups. For penetrating tumors to the serosa of stomach, some researchers hold the attitude that bursectomy cannot eliminate all disseminated free cancer cells because the bursa omentalis is not a closed space, therefore bursectomy is unlikely to improve overall survival in patients with invasive cancers up to sub serosa or serosa (8). Some previous trials showed that there was

no significant difference between the two groups in terms of their overall survival rates, and the bursectomy procedure was not recommended as a standard procedure in surgery (6,8-10,14). On the contrary, the interim analyses and the final reports by Fujita et al. showed that the bursectomy had some survival advantages in the surgery of stage pT3-4 patients in comparison with the non-bursectomy surgery and the benefits were related to the rate and type of recurrence (peritoneal seeding recurrence) and the survival rates of patients (7). Zhang et al. also reported that there was no significant difference between the two groups regarding the survival outcomes, whereas the bursectomy patients had better curves than the non-bursectomy group (17). They concluded that the bursectomy may have some benefits in respect of prolonging the patients' survival outcomes, but the statistical difference could not be found due to small sample size and limited follow-up duration. Our patient group had also a small sample size with a short-term follow-up duration so the results may not completely indicate the potential recurrence rates of the two groups, as the mortality rates of two groups were similar in this trial. Therefore, a well-designed large sample sized, randomized, controlled long-term study are expected to understand the detailed operational indications of the bursectomy during/after the surgery of advanced gastric cancer patients in Turkey.

In addition to the limitations regarding a small sample size and short-term follow-up duration in the present study, another is that the study was not a multivariate survival analysis and the results did show a survival curve. In spite of the fact that this study sets a subgroup analysis in the resection patterns and identifies the bursectomy procedure as one of the independent prognostic risk factors, there is still a potent selection bias of the retrospective study, which must be noted here again. Ruling out the fact that a few number of trials did not strongly establish the bursectomy a routine procedure, this technique-dependent operation may be considered as safe in gastric cancer patients with specific clinical features such as tumor locations or T stages or other characteristics. Therefore, well-designed randomized controlled studies with multivariate survival analysis are expected to clear the survival benefits.

CONCLUSION

Although the bursectomy causes a longer surgical duration in gastric cancer surgeries as a highly technique-dependent procedure, it can be still performed safely by experienced surgeons during D2 gastrectomy without deteriorating histopathology of LNs and increased risk of the postoperative complications. Whether the bursectomy has advantageous benefits or not-superior characteristics for gastric cancer patient, long-term surgical outcomes of bursectomy surgery are still in question.

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