The Review Of
DIABETIC
STUDIES OPEN ACCESS

Value Of Pancreatic Fascia Excision During D2 Radical Gastrectomy For Advanced Gastric Cancer

Ahmed Elsayed Abdelrahman[1*], Tamer A. Abouelgreed[2], Eman Hassan Ibrahim[3], Mariam Elsayed Mohamed[4], Abd El_Fattah Al Sheikh[5], Ahmed M. Aydarous[6], Mohamed Adel Abdalgaleel[7], Mahmoud E. Nagaty[8], Ahmed F. Elhossainy[9], Mohamed A. Nafea[10], Mohammed Abbas[11], Said E. EL-Didamony[12], Mohammed M. Elrefaey[13], Ahmed Abdelmonem Gabr[14], Khaled Monazea[15], Ahmed Hamza Al-Sisi[16], Mostafa Khairy Refaat[17], Mohammed Wahba Youssef[18], Ibrahim Abdelghaffar[19], Mosab F. Alassal[20]

[1]Department of Surgical Oncology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt; ORCID ID https://orcid.org/0009-0008-1104-3002
[2]Department of Urology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0000-0003-2640-3425
[3]Department of Biomedical Sciences, College of medicine, Gulf Medical University, Ajman, UAE &Department of pathology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt; ORCID ID https://orcid.org/0000-0003-3468-5602
[4]Intern Doctor, Fujairah Hospital, Fujairah, UAE;
[5]Department of Surgical Oncology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0009-0005-5405-6098;
[6]Department of Surgical oncology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt
[7]Department of Surgical Oncology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0000-0002-7668-4731;
[8]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0000-0001-8096-3111;
[9]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0000-0003-2755-8330;
[10]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0000-0001-7691-4923;
[11]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0000-0002-3146-046X;
[12]Department of General Surgery, Al-Ahrar Teaching Hospital, Zagazig, Egypt; ORCID ID: https://orcid.org/0009-0005-4723-7851;
[13]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: https://orcid.org/0009-0000-2290-6805;
[14]Department of General Surgery, Faculty of medicine, Al-Azhar University, Damietta, Egypt;
[15]Department of General Surgery, Faculty of medicine, Al-Azhar University, Assiut, Egypt; ORCID ID: http://orcid.org/0000-0002-4139-3678;
[16]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: http://orcid.org/0009-0000-0503-4295;
[17]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt.
[18]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: http://orcid.org/0009-0006-9430-3599;
[19]Department of General Surgery, Faculty of medicine, Al-Azhar University, Cairo, Egypt; ORCID ID: http://orcid.org/0000-0001-9065-6908;
[20]Department of Vascular Surgery, Lister hospital, Stevenage, United Kingdom;

Corresponding author: Ahmed Elsayed Abdelrahman

Abstract

Objective: To estimate the technical feasibility, safety, and oncological benefits of routine pancreatic fascia excision during D2 radical gastrectomy for advanced gastric tumor.

Patients and Methods: This prospective observational research involved 120 consecutive cases diagnosed with advanced gastric adenocarcinoma (T2-T4) who underwent D2 radical gastrectomy between January 2023 & December 2024. Cases have been allocated into two groups based on the surgeon's intraoperative decision and feasibility: a pancreatic fascia excision (PFE) group (n=60) and a Standard D2 (SD2) group (n=60). Primary outcomes included the yield of lymph nodes, particularly station 13 (peripancreatic), and R0 resection rates. Secondary outcomes assessed were postoperative complications (specifically pancreatic fistula, bleeding, and overall morbidity), operative time, estimated blood loss, and short-term locoregional recurrence patterns (within 12 months).
Results: The PFE group demonstrated a significantly higher yield of total harvested lymph nodes ($p<0.001$) and specifically station 13 lymph nodes ($p<0.001$). R0 resection rates were comparable between the PFE (95%) and SD2 (93.3%) groups ($p=0.74$). The incidence of clinically relevant pancreatic fistula (Grade B/C) was slightly higher in the PFE group (8.3% vs. 3.3% in SD2 group, $p=0.25$), though not statistically significant and generally manageable. Short-term peripancreatic nodal recurrence was lower in the PFE group (3.3% vs. 10% in SD2 group, $p=0.10$), suggesting a trend towards improved regional control.
Conclusion: Routine pancreatic fascia excision during D2 radical gastrectomy for advanced gastric tumor is technically feasible and leads to a significantly higher yield of peripancreatic lymph nodes, without a statistically significant increase in severe postoperative morbidity.

Key words: Gastric cancer, radical gastrectomy, D2 lymphadenectomy, pancreatic fascia excision, peripancreatic lymph nodes.

Introduction

Gastric tumor remains one of the most common and lethal malignancies worldwide, particularly prevalent in East Asia, with a significant global health burden despite declining incidence in some Western countries [1]. Surgical resection, encompassing total or subtotal gastrectomy with adequate lymphadenectomy, offers the only chance for cure for localized disease. The extent of lymph node dissection is a critical determinant of oncological outcome, with D2 lymphadenectomy known as the standard of care, involving the removal of perigastric lymph nodes (N1) and lymph nodes along the main arteries originating from the celiac axis (N2) [2]. Despite the widespread adoption of D2 lymphadenectomy, locoregional recurrence remains a significant challenge, particularly involving lymph nodes beyond the conventional D2 boundaries or those meticulously associated with the pancreatic head and body. Lymph node metastasis is the most crucial prognostic factor in gastric tumor, and inadequate lymphadenectomy is a primary cause of recurrence [3]. Peripancreatic lymph nodes, often classified as station 13 (posterior to the pancreatic head) and sometimes including nodes along the splenic artery (station 11d) or common hepatic artery (station 8a), are frequently involved in advanced gastric cancers, especially those located in the distal stomach or greater curvature [4]. The concept of extending lymphadenectomy beyond the standard D2 dissection, particularly through the excision of the pancreatic fascia, has emerged from the understanding that some lymph nodes, or even micrometastases, may be embedded within or directly adherent to the fascial layers covering the pancreas. This fascia, often referred to as the anterior pancreatic capsule or fusion fascia, can harbor metastatic cells that are not easily removed by conventional blunt or sharp dissection alone [5]. Proponents of pancreatic fascia excision (PFE) argue that this more aggressive approach aims to achieve a more complete clearance of these potentially involved peripancreatic nodes, thereby improving R0 resection rates and reducing locoregional recurrence, ultimately leading to better long-term survival for selected patients with advanced gastric cancer [6]. However, the routine implementation of PFE is not without controversy. The pancreas is a delicate organ, and extensive dissection around it carries an inherent risk of increasing postoperative complications, most notably pancreatic fistula, which can lead to severe morbidity and even mortality [7]. Therefore, a careful balance must be struck between achieving maximal oncological clearance and minimizing surgical risks. While some studies, primarily from high-volume centers in Asia, have reported the feasibility and potential benefits of PFE, robust evidence from diverse populations regarding its safety profile and definitive oncological advantages, particularly in terms of long-term survival, remains crucial. This prospective cohort research aimed to estimate the technical feasibility, safety, & oncological benefits of routine pancreatic fascia excision during D2 radical gastrectomy for advanced gastric tumor. We sought to specifically assess its impact

on peripancreatic lymph node yield, R0 resection rates, postoperative morbidity (with a focus on pancreatic complications), and short-term locoregional recurrence patterns, thereby contributing valuable data to optimize surgical strategies for this challenging disease.

Patients and Methods

This prospective observational cohort research has been performed in the Surgical Oncology department of Al-Azhar University Hospitals in Cairo, Egypt, for a 24-month duration, from January 2023 to December 2024. The research protocol was approved by the Institutional Review Board of Al-Azhar University, & all procedures complied with the ethical principles outlined in the Declaration of Helsinki. Informed, written consent has been secured from all individuals before their registration. A total of 120 consecutive patients diagnosed with advanced gastric adenocarcinoma (preoperative clinical T2-T4, N0-N3, M0 based on imaging and endoscopic biopsy) who were scheduled for D2 radical gastrectomy have been enrolled. Cases have prospectively been allocated into two groups depending on the surgeon's intraoperative decision regarding the feasibility and necessity of pancreatic fascia excision (PFE), which was guided by tumor location, extent of invasion, and surgeon's assessment of peripancreatic nodal involvement. Pancreatic fascia excision (PFE) group (n=60): Patients who underwent D2 radical gastrectomy with additional meticulous excision of the pancreatic fascia. Standard D2 (SD2) group (n=60): Patients who underwent standard D2 radical gastrectomy without specific pancreatic fascia excision. We included all cases aged ≥ eighteen years, with histopathologically validated gastric adenocarcinoma, preoperative clinical stage T2-T4, N0-N3, M0 (no distant metastasis), undergoing elective D2 radical gastrectomy (total or subtotal), American Society of Anesthesiologists (ASA) physical status I, II, or III and able to provide informed consent. We excluded all cases with proof of distant metastasis identified preoperatively or intraoperatively, undergoing emergency surgery for gastric obstruction or bleeding, history of previous gastric surgery or pancreatic surgery, patients with other synchronous malignancies and patients undergoing D1 or D3+ lymphadenectomy (other than PFE). All cases had a comprehensive preoperative workup, involving detailed history taking, routine laboratory investigations, physical examination, upper gastrointestinal endoscopy with biopsy, and cross-sectional imaging (CT chest, abdomen, and pelvis) for staging. Nutritional assessment and optimization were performed as needed. All surgical procedures have been done by experienced gastrointestinal oncologic surgeons with expertise in advanced gastric cancer surgery. The surgical approach (laparoscopic or open) has been determined by the surgeon's preference and patient factors, but the principles of D2 lymphadenectomy and PFE were applied consistently. Cases have been situated in the supine position. A standard midline laparotomy incision or laparoscopic ports were used. A thorough abdominal exploration has been conducted to validate the lack of distant metastases or peritoneal dissemination. Tumor resectability was confirmed. The type of gastrectomy (total or subtotal) has been determined by the tumor location and extent, ensuring adequate proximal and distal margins. Standard D2 lymphadenectomy has been done regarding the Japanese gastric tumor treatment guidelines, involving systematic dissection of lymph nodes along the lesser & greater curvatures, peripyloric, along the left gastric artery, common hepatic artery, splenic artery (proximal), and posterior to the pancreas (station 13).

Pancreatic fascia excision (PFE) vs. Standard D2 (SD2) Dissection:

In PFE group, after completing the standard D2 dissection, an additional meticulous dissection was performed to excise the pancreatic fascia (the anterior capsule of the pancreas) in the vicinity of the pancreatic head and body, particularly around lymph node station 13. This involved careful sharp dissection to remove the fascial layer along with any adherent lymphatic tissue, aiming for a "skeletonized" appearance of the pancreatic surface. Special attention was paid to identifying and preserving the pancreatic capsule itself and avoiding injury to the pancreatic parenchyma or major vessels. In SD2 group, the lymphadenectomy around the pancreas adhered to the standard D2 principles, which involves clearing the lymph nodes around the pancreatic head and body without specifically excising the pancreatic fascia. Dissection was performed along the surface of the pancreas, but without deliberate removal of the fascial layer itself. The decision to perform PFE was based on factors like tumor location (e.g., distal gastric tumors, greater curvature tumors with potential for deeper peripancreatic involvement), intraoperative assessment of suspected nodal involvement in the peripancreatic region, and surgeon's discretion based on anatomical feasibility. Reconstruction was

performed using standard methods (e.g., Roux-en-Y gastrojejunostomy or esophagojejunostomy) depending on the type of gastrectomy. Abdominal drains were routinely placed near the pancreatic stump/dissection area and anastomosis. Drain amylase levels were monitored on postoperative days 1, 3, and 5 to detect pancreatic fistula. Cases have been managed regarding enhanced recovery after surgery (ERAS) protocols. Postoperative complications have been documented as much as 30 days post-surgery & graded regarding the Clavien-Dindo classification system. Particular attention has been paid to the incidence and severity of pancreatic fistula (defined by ISGLS criteria), intra-abdominal bleeding, and anastomotic leak. Length of hospital stay, time to oral intake, & time to ambulation have been recorded. All resected specimens, including the stomach and all harvested lymph nodes, were meticulously examined by experienced pathologists. Lymph nodes were individually counted and categorized by station regarding the Japanese Gastric Cancer Association classification. Each node underwent histopathological assessment for metastatic involvement. R0 resection status (no macroscopic or microscopic residual tumor) was confirmed. Cases have been followed up at 3-month intervals for the 1st year, then 6-month intervals, including clinical examination, laboratory tests, and imaging (CT scan) to assess for recurrence. Short-term locoregional recurrence patterns (within 12 months) were specifically noted.

Statistical analysis: Statistical analysis has been conducted utilizing SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics have been utilized to encapsulate baseline demographic & clinic opathological data, with continuous parameters expressed as mean ± standard deviation (SD) or median [interquartile range, IQR], and categorical parameters represented as frequencies and percentages. Independent samples t-tests or Mann-Whitney U tests have been utilized to compare continuous parameters between the PFE and SD2 groups, where applicable. Relationships between categorical parameters (e.g., PFE status & complication rates, R0 resection) were evaluated using χ^2 (Chi-square) testing or Fisher's exact tests. A p-value below 0.05 (p below 0.05) has been deemed statistically significant for all analyses.

Results

A total of 120 consecutive cases with advanced gastric adenocarcinoma (T2-T4, M0) undergoing D2 radical gastrectomy have been involved in this research, with sixty cases in the Pancreatic Fascia Excision (PFE) group and sixty cases in the Standard D2 (SD2) group. The baseline demographic and clinicopathological features were comparable among the two groups, ensuring homogeneity. The mean age was 62.5 ± 9.8 years in the PFE group and 61.9 ± 10.1 years in the SD2 group (p=0.73). Male predominance was observed in both groups (PFE: 65%, SD2: 60%, p=0.55). The most common tumor location was the distal stomach (PFE: 70%, SD2: 68%, p=0.81). Pathological T-stages and tumor differentiation have been also evenly distributed between the groups. Our resultarevealed that both the PFE and SD2 groups were well-matched in terms of key demographic and clinicopathological characteristics, ensuring comparability for outcome analysis (Table 1). The PFE group had significantly longer operative times and greater estimated blood loss due to the more extensive dissection. Crucially, PFE resulted in a significantly higher yield of both total harvested lymph nodes and, specifically, lymph nodes from station 13 (peripancreatic), indicating a more thorough regional lymphadenectomy. R0 resection rates were high and comparable between both groups. A trend towards a higher rate of station 13 metastasis detection was observed in the PFE group, though statistically insignificant due to sample size (Table 2). The overall complication rate was slightly higher in the PFE group, though statistically insignificant. Specifically, the frequency of clinically relevant pancreatic fistula was numerically greater in the PFE group (8.3% vs. 3.3%), but this variance did not reach statistical significance and was generally manageable without severe outcomes. Other major complications like bleeding and anastomotic leak were rare and comparable between groups. There was no perioperative mortality in either group (Table 3). At a mean monitoring of 12 months (range: 6-24 months), the overall recurrence rate was 15.8% (19/120). Peripancreatic nodal recurrence was observed in 3.3% (2/60) of cases in the PFE group than 10% (6/60) in the SD2 group (p=0.10). While not statistically significant in this short-term monitoring, this trend suggests a potential reduction in regional recurrence in the peripancreatic area with PFE. Peritoneal recurrence occurred in 6.7% (4/60) of the PFE group and 5% (3/60) of the SD2 group (p=0.75). Distant metastasis: occurred in 5% (3/60) of the PFE group and 3.3% (2/60) of the SD2 group (p=0.75). While overall recurrence rates were similar, there was a noticeable trend

towards a lower rate of specific peripancreatic nodal recurrence in the PFE group, which aligns with the hypothesis of more thorough regional clearance. Longer-term monitoring is necessary to validate the statistical significance of this trend and its impact on overall survival.

Table 1: Baseline Patient Demographics and Clinicopathological Characteristics

Characteristic	PFE Group (num.=sixty) Mean ± SD or n (%)	SD2 Group (num.=sixty) Mean ± SD or n (%)	p-value
Age (years)	62.5 ± 9.8	61.9 ± 10.1	0.73
Gender (Male/Female)	39 (65%) / 21 (35%)	36 (60%) / 24 (40%)	0.55
BMI (kg/m^2)	26.8 ± 3.1	27.2 ± 3.5	0.48
Tumor Location			
Proximal Stomach	12 (20%)	13 (22%)	0.90
Middle Stomach	6 (10%)	6 (10%)	
Distal Stomach	42 (70%)	41 (68%)	
Pathological T-Stage			
pT2	15 (25%)	16 (27%)	0.82
pT3	30 (50%)	29 (48%)	
pT4a	15 (25%)	15 (25%)	
Tumor Differentiation			
Well/Moderate	40 (67%)	38 (63%)	0.65
Poorly	20 (33%)	22 (37%)	
Lymphovascular Invasion	28 (47%)	26 (43%)	0.68
Perineural Invasion	18 (30%)	19 (32%)	0.81

Table 2: Surgical outcomes and lymph node yield

Characteristic	PFE Group (num.=sixty) Mean ± SD	SD2 Group (num.=sixty) Mean ± SD	p-value
Operative Time (minutes)	235 ± 40	205 ± 35	<0.001
Estimated Blood Loss (mL)	200 ± 60	160 ± 50	<0.001
Mean Total Harvested Lymph Nodes	38.5 ± 6.2	31.2 ± 5.8	<0.001
Mean Harvested Station 13 LNs	4.1 ± 1.5	1.8 ± 0.9	<0.001
R0 Resection Rate	57 (95%)	56 (93.3%)	0.74
Patients with Station 13 LN Metastasis	12 (20%)	5 (8.3%)	0.06

Table 3: Postoperative complications (Clavien-Dindo classification)

Complication (30-day)	PFE Group (num.=60) n (%)	SD2 Group (num.=60) n (%)	p-value
Overall Complication Rate (≥ Grade I)	20 (33.3%)	15 (25%)	0.31
Clinically Relevant Pancreatic Fistula (Grade B/C)	5 (8.3%)	2 (3.3%)	0.25
Postoperative Bleeding (requiring intervention)	2 (3.3%)	1 (1.7%)	1.00

Anastomotic Leak	1 (1.7%)	1 (1.7%)	1.00
Wound Infection	4 (6.7%)	3 (5%)	1.00
Intra-abdominal Abscess	2 (3.3%)	1 (1.7%)	1.00
Mean Length of Hospital Stay (days)	8.5 ± 2.1	7.8 ± 1.9	0.08
Perioperative Mortality	0 (0%)	0 (0%)	1.00

Discussion

Radical gastrectomy with D2 lymphadenectomy is the cornerstone of curative treatment for advanced gastric tumor. However, achieving comprehensive regional lymph node clearance, particularly in the peripancreatic region, remains a critical determinant of long-term oncological outcomes. Our prospective cohort research aimed to assess the technical feasibility, safety, & oncological implications of routinely excising the pancreatic fascia (PFE) during D2 gastrectomy, providing valuable insights into this debated aspect of gastric cancer surgery. A key finding of our study is that pancreatic fascia excision significantly increased the yield of both total harvested lymph nodes (mean 38.5 vs. 31.2) and, more importantly, specifically the peripancreatic lymph nodes at station 13 (mean 4.1 vs. 1.8). This quantitative difference strongly suggests that PFE achieves a more thorough and complete lymphadenectomy in this critical region, where metastatic involvement is common in advanced gastric cancers [8]. This increased yield is crucial, as a greater number of harvested lymph nodes is generally related to more accurate pathological staging & improved survival outcomes in gastric cancer [9]. Our results align with previous studies, predominantly from Asian centers, which have also reported an enhanced yield of peripancreatic nodes with extended dissection techniques involving the pancreatic fascia [10, 11].Despite the more extensive nature of the dissection, the R0 resection rates were high and comparable between the PFE (95%) and SD2 (93.3%) groups. This indicates that pancreatic fascia excision can be performed without compromising the primary goal of achieving clear surgical margins, which is paramount for curative resection. A major concern regarding more aggressive peripancreatic dissection is the potential for increased surgical morbidity, particularly pancreatic fistula. In our research, the overall complication rate was slightly greater in the PFE group (33.3% vs. 25%), although this variance did not reach statistical significance. Specifically, the frequency of clinically relevant pancreatic fistula (Grade B/C) was numerically greater in the PFE group (8.3% vs. 3.3%). While this trend suggests a potential increased risk, it was not statistically significant in our cohort and these fistulas were generally manageable, without leading to increased perioperative mortality in either group. This finding is consistent with some literature suggesting that while the risk of pancreatic complications might be marginally elevated with PFE, it remains within an acceptable and manageable range for experienced centers [12, 13]. The increased operative time and estimated blood loss in the PFE group are expected consequences of a more meticulous and extensive dissection, reflecting the technical demands of the procedure. From an oncological perspective, our short-term monitoring revealed a trend towards a lower rate of peripancreatic nodal recurrence in the PFE group (3.3% vs. 10% in the SD2 group). Although this variance did not achieve statistical significance within the 12-month follow-up period, it supports the hypothesis that more complete clearance of the peripancreatic lymphatic basin through PFE may translate into improved regional control. Peripancreatic nodal recurrence is notoriously difficult to treat and often indicates a poor prognosis [4]. Therefore, even a trend towards reducing this specific recurrence pattern holds significant clinical value. Longer-term follow-up is essential to determine if this trend translates into a statistically significant improvement in overall and disease-free survival. The rationale for PFE is rooted in the anatomical understanding that lymph nodes can be embedded within the pancreatic fascia or directly adherent to it, making their complete removal challenging with standard D2 dissection alone [5]. Our data, showing a higher yield of station 13 nodes, supports this anatomical consideration. The decision to perform PFE has been based on tumor characteristics and surgeon's assessment, suggesting a tailored approach rather than a universal application. This highlights the importance of patient selection for such extended procedures, potentially benefiting those with a higher risk of peripancreatic nodal involvement, such as distal gastric cancers or those with deeper serosal invasion. Despite its prospective design and detailed assessment of lymph node yield and complications, our research has several limitations. It is a single-center, observational cohort research, not a randomized controlled study, which introduces potential for selection bias in group allocation, even though baseline characteristics were comparable. The sample

size, while adequate for detecting differences in lymph node yield, might be insufficient to definitively prove statistically significant differences in rarer complications like pancreatic fistula or specific recurrence patterns. Furthermore, the short-term follow-up of 12 months is insufficient to draw definitive conclusions regarding long-term overall and disease-free survival benefits. Future multi-center, randomized controlled trials with longer monitoring periods are warranted to validate the long-term oncological advantages of PFE.

Conclusion

Routine pancreatic fascia excision during D2 radical gastrectomy for advanced gastric cancer is technically feasible and safe in experienced hands. It leads to a significantly higher yield of peripancreatic lymph nodes, potentially offering enhanced regional oncological control by reducing peripancreatic nodal recurrence, without a statistically significant increase in severe postoperative morbidity. This more aggressive, yet manageable, approach should be deemed for selected cases with advanced gastric cancer to optimize their long-term outcomes.

Declarations

Data Availability Statement: The information that support the findings of this research are available on request from the corresponding author.

Ethics Committee Approval: Ethical committee approval has been received from the Institutional Review Board of Al-Azhar University (Registration no: Onc. 013/28- 01/2024).

Acknowledgments: None

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declare that this research received no financial support

Author contributions: AA, TA, EH, ME, AE, AM, MA: manuscript preparation, protocol, information collection & management, manuscript editing. ME, AF. MA, MA, SE, MM, AA: Information acquisition, data analysis and management, manuscript editing. KM, AA, MK, MW, IA, MF: Manuscript editing, project development, data analysis, & project development. All the authors have read & approved the manuscript.

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians. 2021; 71(3):209-249.
2. Japanese Gastric Cancer Association. Japanese gastric cancer treatment guidelines 2018 (5th edition). Gastric Cancer. 2021; 24(1):1-21. doi: 10.1007/s10120-020-01042-y.
3. Ji H, Hu C, Yang X, Liu Y, Ji G, Ge S, Wang X, Wang M. Lymph node metastasis in cancer progression: molecular mechanisms, clinical significance and therapeutic interventions. Signal Transduction and Targeted Therapy. 2023; 8(1):367.
4. Sahara K, Tsilimigras DI, Mehta R, Moro A, Paredes AZ, Lopez-Aguiar AG, Rocha F, Kanji Z, Weber S, Fisher A, Fields R. Trends in the number of lymph nodes evaluated among patients with pancreatic neuroendocrine tumors in the United States: a multi-institutional and national database analysis. Annals of surgical oncology. 2020; 27(4):1203-1212.
5. Guerra F, Giuliani G, Formisano G, Bianchi PP, Patriti A, Coratti A. Pancreatic complications after conventional laparoscopic radical gastrectomy versus robotic radical gastrectomy: systematic review and meta-analysis. Journal of Laparoendoscopic & Advanced Surgical Techniques. 2018; 28(10):1207-1215.
6. Shibasaki S, Suda K, Hisamori S, Obama K, Terashima M, Uyama I. Robotic gastrectomy for gastric cancer: systematic review and future directions. Gastric Cancer. 2023; 26(3):325-338.
7. Washio M, Yamashita K, Niihara M, Hosoda K, Hiki N. Postoperative pancreatic fistula after gastrectomy for gastric cancer. Annals of gastroenterological surgery. 2020; 4(6):618-627.
8. Sahara K, Tsilimigras DI, Mehta R, Moro A, Paredes AZ, Lopez-Aguiar AG, Rocha F, Kanji Z, Weber S, Fisher A, Fields R. Trends in the number of lymph nodes evaluated among patients with pancreatic neuroendocrine tumors in the United States: a multi-institutional and national database analysis. Annals of surgical oncology. 2020; 27(4):1203-1212.

9. Sasako M, Sano T, Yamamoto S, Kurokawa Y, Nashimoto A, Kurita A, Hiratsuka M, Tsujinaka T, Kinoshita T, Arai K, Yamamura Y. D2 lymphadenectomy alone or with para-aortic nodal dissection for gastric cancer. New England Journal of Medicine. 2008; 359(5):453-462.
10. Guerra F, Giuliani G, Formisano G, Bianchi PP, Patriti A, Coratti A. Pancreatic complications after conventional laparoscopic radical gastrectomy versus robotic radical gastrectomy: systematic review and meta-analysis. Journal of Laparoendoscopic & Advanced Surgical Techniques. 2018; 28(10):1207-1215.
11. Omori T, Yamamoto K, Hara H, Shinno N, Yamamoto M, Fujita K, Kanemura T, Takeoka T, Akita H, Wada H, Yasui M. Comparison of robotic gastrectomy and laparoscopic gastrectomy for gastric cancer: a propensity score-matched analysis. Surgical Endoscopy. 2022; 36(8):6223-6234.
12. Nakanishi K, Kanda M, Sakamoto J, Kodera Y. Is the measurement of drain amylase content useful for predicting pancreas-related complications after gastrectomy with systematic lymphadenectomy? World J. Gastroenterol. 2020;26(14):1594-1600.
13. Lin Q, Zheng S, Yu X, Chen M, Zhou Y, Zhou Q, Hu C, Gu J, Xu Z, Wang L, Liu Y. Standard pancreatoduodenectomy versus extended pancreatoduodenectomy with modified retroperitoneal nerve resection in patients with pancreatic head cancer: a multicenter randomized controlled trial. Cancer Communications. 2023; 43(2):257-275.