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Comparative outcomes of laparoscopic and open gastrectomy for T4b gastric cancer with transverse colon or mesentery invasion: a dual-center retrospective analysis

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Abstract

Background The safety and feasibility of laparoscopic surgery for T4b gastric cancer with transverse colon or mesocolon invasion remain insufficiently characterized. This study aimed to compare the surgical outcomes of laparoscopic and open gastrectomy in individuals with T4b gastric cancer involving these anatomical structures.

Methods A retrospective cohort study was conducted across two centers, including 53 individuals with T4b gastric cancer involving the transverse colon or mesocolon who underwent curative-intent surgery between January 2011 and December 2019. Participants were divided into two groups based on the surgical approach: laparoscopic surgery ($n=32$) and open surgery ($n=21$). Perioperative outcomes, postoperative complications, and survival outcomes were evaluated and compared.

Results Baseline characteristics were comparable between the groups. The laparoscopic approach demonstrated significantly reduced intraoperative blood loss compared to open surgery (92.5 ± 101.9 mL vs. 147.6 ± 76.6 mL, $p=0.039$). No significant differences were observed in operating time (187.8 ± 52.7 vs. 185.9 ± 52.3 min, $p=0.896$), R0 resection rates (93.8% vs. 90.5%, $p=0.659$), lymph node yield, or length of postoperative hospital stay. The incidence of postoperative complications was similar between the groups (10.3% vs. 10.5%, $p=0.986$). Additionally, mean overall survival (31.4 vs. 27.2 months, $p=0.506$) and progression-free survival (26.1 vs. 23.5 months, $p=0.573$) did not differ significantly.

Conclusions Laparoscopic gastrectomy with combined resection appears to be a feasible and safe alternative to open surgery for selected individuals with T4b gastric cancer involving the transverse colon or mesocolon. This approach achieves similar perioperative and long-term clinical outcomes compared to open surgery.

Keywords Gastric cancer, Laparoscopic surgery, Multivisceral resection, Survival outcomes, Transverse colon

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Introduction

Gastric cancer is a significant global health challenge, with over 1 million new cases diagnosed annually, making it the fifth-most diagnosed cancer worldwide. It accounts for approximately 770,000 deaths each year [1]. This high mortality rate predominantly due to delayed diagnoses, with many individuals presenting with advanced-stage condition at the time of diagnosis. Locally advanced gastric cancer (LAGC), such as T4b stage adenocarcinoma, is characterized by tumor invasion into adjacent organs and structures. Achieving R0 resection in these cases often necessitates multivisceral resection (MVR) [2]. The liver, pancreas, and transverse colon are among the organs most affected by tumor invasion [3, 4].

In recent years, laparoscopic exploration and surgical techniques have gained substantial acceptance across various surgical specialties due to their minimally invasive nature, shorter postoperative recovery periods, and comparable efficacy to open surgery in selected cases. The CLASS-01 and KLASS-02 studies have indicated that laparoscopic radical gastrectomy is an effective treatment modality for advanced gastric cancer [5, 6]. Consequently, laparoscopic approaches are increasingly being utilized for advanced gastric cancer, including cases involving tumor invasion into adjacent structures. However, few studies have specifically examined the use of laparoscopic surgery for T4b gastric cancer involving the transverse colon or mesocolon invasion. MVR in these cases is associated with a high risk of peri-operative morbidity and mortality [7, 8]. However, the feasibility and safety of performing laparoscopic surgery on individuals in this population requires further investigation.

The aim of this study is to evaluate the feasibility, safety, and long-term survival outcomes of laparoscopic surgery compared to conventional open surgery in individuals with locally advanced gastric cancer involving the transverse colon or mesocolon. The findings are intended to contribute to the optimization of surgical approaches for the management of advanced gastric cancer.

Methods

This retrospective cohort study was conducted at two medical centers: the Pancreatic and Gastric Surgery Department of Cancer Hospital of the Chinese Academy of Medical Sciences and the Gastrointestinal Surgery Department of Hebei General Hospital. Between January 2011 and December 2019, a total of 53 individuals with clinical T4b (cT4b) gastric cancer involving the transverse colon or its mesentery were identified. We defined "mesenteric invasion" as the direct invasion of gastric cancer beyond the serosal surface of the stomach into the colonic mesentery, including involvement of mesenteric vessels, nerves, and lymphatic tissue (cT4b), whereas the vessels or nerves of adjacent organs or tissues was not included. Prior to surgery, all patients and their families were provided informed consent, acknowledging and consenting to the potential use of clinical data collected during their treatment for future research. This retrospective study was approved by the institutional ethics committee of both participating hospitals (22/274–3476), and the requirement for newly informed consent was waived due to the anonymized nature of the data and the non-interventional design. The study was conducted in accordance with the Declaration of Helsinki (revised in 2013).

Inclusion criteria were as follows: (1) Participants aged between 18 and 75 years; (2) Histologically confirmed gastric carcinoma; (3) Pathological T4b (pT4b) disease with invasion limited to the transverse colon and/or mesocolon; (4) Eligibility for curative-intent D2 gastrectomy; and (5) An Eastern Cooperative Oncology Group (ECOG) performance status of 0 – 2. Pathological staging was determined according to the TNM system of the 8th edition of the American Joint Committee on Cancer classification.

Exclusion criteria were as follows: (1) Prior history of neoadjuvant chemotherapy or conversion therapy; (2) Presence of peritoneal carcinomatosis; (3) Evidence of distant metastases; 3) Involvement of organs other than transverse colon and/or mesocolon requiring resection; and (4) Prior history of major abdominal surgery.

All eligible participants underwent either distal subtotal or total gastrectomy based on the location of the primary tumor, in conjunction with resection of the involved transverse colon or mesocolon. Standard radical D2 lymphadenectomy, as per the Japanese Gastric Cancer Treatment Guidelines, was performed for all participants [9]. For participants who underwent total gastrectomy, reconstruction was achieved using Roux-en-Y anastomosis, while Billroth I or Billroth II reconstruction was utilized following distal gastrectomy. Intestinal continuity was restored through end-to-side anastomosis after segmental colectomy. Postoperative complications were classified and graded according to the Clavien–Dindo classification system.

Postoperative follow-up was conducted according to a standardized protocol. During the first two years of post-surgery, participants were evaluated every three months through hematological and radiological investigations, such as computed tomography (CT), magnetic resonance imaging, chest radiography, or ultrasonography. After the second and until the fifth year, follow-up intervals were extended to every six months, with annual evaluations thereafter.

This was an exploratory retrospective cohort study without prior sample size calculation, as effect sizes and event rates in this specific T4b gastric cancer population were not well established. The study included all eligible

cases from two centers over a defined period to maximize real-world applicability. Given the small sample size, the findings should be interpreted with caution and validated in future prospective studies with appropriate statistical power.

Statistical analysis was conducted using SPSS version 23.0. Descriptive statistics for continuous variables are presented as median (Q1-Q3). Comparisons between groups were conducted using Student's t-test for continuous variables, while chi-squared test or Fisher's exact test was used for categorical variables as appropriate. The Mann-Whitney U test was used for ordinal categorical variables. Five-year overall survival and progression-free survival was analyzed using the Kaplan-Meier method, with inter-group differences evaluated by the log-rank test. Potential prognostic factors were evaluated through univariate and multivariate analysis using Cox proportional hazards regression. Multivariate analysis was conducted in an exploratory manner given the limited number of events and non-significant univariate findings. All statistical tests were two-sided, and p-values less than 0.05 were considered statistically significant.

Results

A total of 53 individuals who underwent surgery for T4b gastric cancer with transverse colon or mesentery invasion were included in the analysis. Among them, 32 participants were categorized into the laparoscopic group and 21 into the open group.

Baseline characteristics

As shown in Table 1, baseline characteristics were comparable between the two groups in context to age (55.3 ± 10.7 vs. 59.2 ± 12.4 years, $p = 0.222$), sex distribution (M/F: 18/14 vs. 8/13, $p = 0.196$), BMI (22.3 ± 3.3 vs. 23.1 ± 2.8, $p = 0.372$), ECOG performance status ($p = 0.110$), and ASA (American Society of Anesthesiologists) classification ($p = 0.434$). Tumor characteristics including location ($p = 0.343$), size (4.9 ± 2.5 vs. 6.0 ± 3.4 cm, $p = 0.171$), histological differentiation ($p = 0.847$), and HER2 status ($p = 0.265$) were also similar between the groups. The comparison of pN stage was comparable between groups ($p = 0.124$) and the number of lymph nodes involved showed no significance between two groups (15.1 ± 8.8 vs. 10.0 ± 11.2, $p = 0.087$). As shown in Table 1, the baseline characteristics between the two groups were comparable. There were no significant differences in age (57.5 [48.0–63.8] vs. 60.0 [52.0–69.0] years, $p = 0.131$), sex distribution (M/F: 18/14 vs. 8/13, $p = 0.196$), BMI (22.7 [19.3–24.3] vs. 23.1 [21.6–24.5], $p = 0.440$), ECOG performance status ($p = 0.110$), or ASA classification ($p = 0.434$). Tumor-related characteristics including location ($p = 0.343$), size (4.8 [3.4–6.2] vs. 5.0 [4.0–7.0] cm, $p = 0.261$), histological differentiation ($p = 0.847$), HER2 status ($p = 0.265$), and MMR status were also comparable. The number of lymph nodes retrieved (35.0 [19.8–46.0] vs. 33.0 [23.0–48.0], $p = 0.750$), pN stage ($p = 0.124$), and number of lymph nodes involved (10.0 [5.0–15.0] vs. 15.0 [11.0–21.0], $p = 0.090$) were similar between groups. Tumor markers (CEA, CA19-9, and CA72-4) showed no significant differences.

Surgical outcomes

Table 2 summarizes the surgical and perioperative outcomes. Operation time was similar between the laparoscopic and open groups (182.5 [135.8–222.8] vs. 190.0 [140.0–219.0] minutes, $p = 0.956$). The laparoscopic group had significantly less intraoperative blood loss (50.0 [50.0–100.0] vs. 200.0 [50.0–200.0] mL, $p = 0.005$). R0 resection rates were comparable (30/2 vs. 19/2, $p = 0.659$).

The type of colon invasion differed significantly between groups ($p = 0.035$), with more cases of mesenteric invasion in the laparoscopic group (23 vs. 9), while the open group had more transverse colon invasions (12 vs. 9). Transverse colectomy type also showed significant differences ($p = 0.032$), with a higher frequency of total colectomy in the open group (5 vs. 1). There were no significant differences in the type of gastrectomy performed (distal/total: 24/8 vs. 13/8, $p = 0.310$) or digestive tract reconstruction method ($p = 0.429$).

Postoperative recovery and complications

Postoperative hospital stay was similar between the two groups (9.0 [7.0–11.2] vs. 10.0 [8.0–12.0] days, $p = 0.708$). The overall complication rate was low and comparable (3/32 vs. 2/21, $p = 0.986$). In the laparoscopic group, complications included gastroparesis ($n = 1$), pulmonary infection ($n = 1$), and pneumothorax ($n = 1$). In the open group, complications included anastomotic leakage ($n = 1$) and pulmonary infection ($n = 1$).

Clavien–Dindo classification of complications did not differ significantly between the groups ($p = 1.000$): one patient in each group had a complication of Grade ≤ II, and two patients in the laparoscopic group and one in the open group experienced Grade IIIa/IIIb complications. No Grade IV or higher complications were observed, and all complications were successfully managed conservatively.

Survival analysis

Univariate analysis (Table 3) indicated that factors such as tumor size, tumor location, lymph node metastasis, R0 resection status, type of gastrectomy, surgical approach, site of colon invasion, histological type, age, sex, and BMI were not significant prognostic factors for overall survival. In the multivariate analysis (Table 4), after adjusting for potential confounding factors, tumor size (HR = 0.963,

Table 1 Baseline characters

	Laparoscopic (*N* = 32)	Open (*N* = 21)	*P* value
Sex (M/F)	18/14	8/13	0.196
Age*	57.5 (48.0-63.8)	60.0 (52.0–69.0)	0.131
BMI*	22.7 (19.3–24.3)	23.1 (21.6–24.5)	0.440
ECOG			0.110
0	22	9	
1	10	11	
ASA			0.434
I	0	1	
II	31	19	
III	1	1	
Tumor location			0.343
Lower	17	13	
Middle	12	8	
Diffuse	3	0	
Tumor size*	4.8 (3.4–6.2)	5.0 (4.0–7.0)	0.261
Number of lymph nodes retrieved*	35.0 (19.8–46.0)	33.0 (23.0–48.0)	0.750
Number of lymph nodes involved*	10.0 (5.0–15.0)	15.0 (11.0–21.0)	0.090
pN stage			0.124
N0	3	1	
N1	4	2	
N2	2	0	
N3a	12	9	
N3b	11	9	
Histologic differentiation			0.847
Well or moderately	2	1	
Poorly differentiated	28	19	
Signet ring cell carcinoma	1	1	
HER2 status			0.265
Positive	14	6	
Negative	18	15	
MMR status			
pMMR	32	21	
dMMR	0	0	
CEA*	2.2 (1.6–4.1)	2.1 (0.9–3.1)	0.445
CA19-9*	12.9 (4.9–28.3)	13.1 (7.1–26.1)	0.942
CA72-4*	1.9 (1.3–6.7)	2.4 (1.3–13.7)	0.868

*Values are presented as median (IQR)

95% CI: 0.854–1.087, $p = 0.544$), number of lymph node metastasis (HR = 1.021, 95% CI: 0.990–1.054, $p = 0.185$), surgical approach (HR = 0.784, 95% CI: 0.402–1.529, $p = 0.475$), and site of colon invasion (HR = 0.735, 95% CI: 0.367–1.472, $p = 0.386$) remained non-significant prognostic predictors of survival. The median five-year overall survival (OS) duration was 26.0 months (95% CI: 18.0–36.0) in the laparoscopic group and 20.0 months (95% CI: 11.0–45.0) in the open group, with no statistically significant difference between groups ($p = 0.506$) (Fig. 1). Similarly, the median five-year progression-free survival (PFS) showed no statistically significant difference between groups (21.50 months [95% CI, 14.00–24.00] vs. 12.00 months [95% CI, 7.00–43.00]; $P = 0.573$) (Fig. 2).

Discussion

Laparoscopic exploration plays a vital role in the accurate staging of gastric cancer, particularly in identifying T4b disease [10, 11]. It facilitates the identification of peritoneal metastasis or extensive abdominal/pelvic metastases, prompting consideration of conversion therapy. However, the optimal surgical approach for T4b gastric cancer with limited local invasion involving the liver, pancreas, or transverse colon remains unclear. The feasibility of transitioning directly from laparoscopic exploration to radical resection has not been conclusively established.

The transverse colon is among the most frequently invaded organs in T4b gastric cancer. Due to its anterior anatomical location and relatively straightforward resection technique, MVR is consistent with established

Table 2 Surgical outcomes

	Laparoscopic (*N* = 32)	Open (*N* = 21)	*P* value
Operation time*	182.5(135.8-222.8)	190.0(140.0-219.0)	0.956
Amount of bleeding*	50.0(50.0-100.0)	200.0(50.0-200.0)	0.005
R0 resection (Y/N)	30/2	19/2	0.659
Type of gastrectomy			0.310
Distal	24	13	
Total	8	8	
Digestive tract reconstruction			0.429
Billroth I	3	3	
Billroth II	21	10	
Roux-en-Y	8	8	
Site of colon invasion			0.035
Transverse colon	9	12	
Mesentery	23	9	
Type of transverse colectomy			0.032
Partial	8	7	
Total	1	5	
Postoperative hospital stay*	9.0(7.0-11.2)	10.0(8.0–12.0)	0.708
Postoperative complications	3	2	0.986
Postoperative hemorrhage	0	0	1.000#
Anastomotic leakage	0	1	
Gastroparesis	1	0	
Pulmonary infection	1	1	
Pneumothorax	1	0	
Clavien_Dindo classification, n (%)			
≤Grade II	1	1	
Grade IIIa/IIIb	2	1	
Grade IVa/IVb	0	0	

*Values are presented as median (IQR)

#Fisher's exact test

Table 3 Univariate prognostic analysis of survival in 52 patients with T4 gastric cancer

Varaible	Regression coefficient	Hazard Ratio(95% CI)	*P* value
Tumor size	-0.024	0.976(0.880–1.082)	0.646
Tumor location	0.173	1.188(0.732–1.929)	0.485
Number of Lymph node metastasis	0.020	1.020(0.990–1.051)	0.195
R0 resection	0.455	1.576(0.556–4.464)	0.392
Type of gastrectomy	-0.140	0.870(0.434–1.743)	0.694
Approach of gastrectomy	-0.212	0.809(0.429–1.527)	0.513
Site of colon invasion	-0.280	0.755(0.394–1.450)	0.399
Histologic type	-0.055	0.946(0.457–1.962)	0.882
Age	-0.004	0.996(0.968–1.026)	0.811
Sex (M/F)	-0.082	0.921(0.494–1.718)	0.796
BMI	0.012	1.012(0.915–1.121)	0.810

Table 4 Multivariate prognostic analysis of survival in 52 patients with T4 gastric cancer

Varaible	Regression coefficient	Hazard Ratio(95% CI)	*P* value
Tumor size	-0.037	0.963(0.854–1.087)	0.544
Number of Lymph node metastasis	0.021	1.021(0.990–1.054)	0.185
Approach of gastrectomy	-0.244	0.784(0.402–1.529)	0.475
Site of colon invasion	-0.307	0.735(0.367–1.472)	0.386

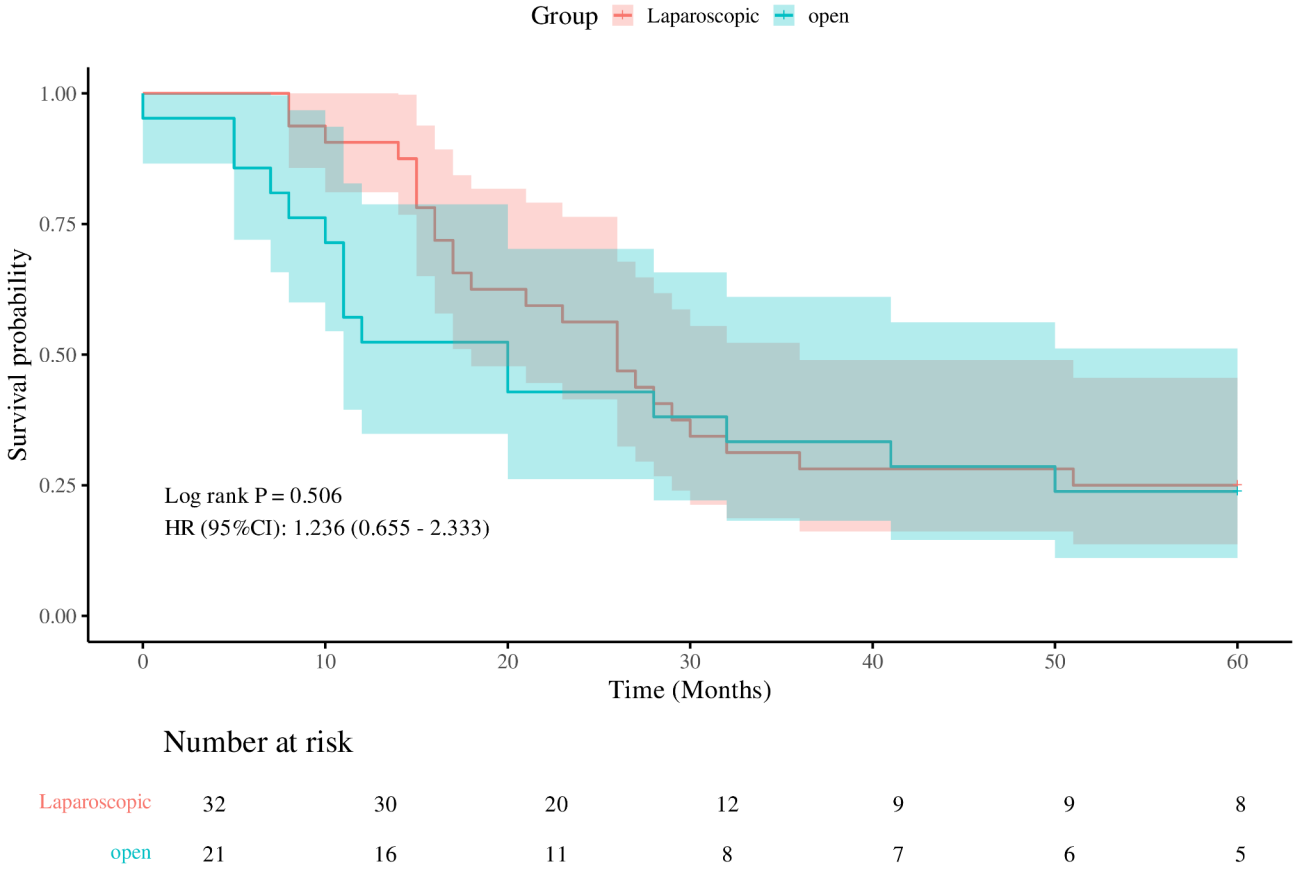

Fig. 1 Kaplan-Meier curves for OS comparing laparoscopic versus open surgery groups. The median OS was 26.0 months (95% CI: 18.0–36.0) in the laparoscopic group and 20.0 months (95% CI: 11.0–45.0) in the open group ($p = 0.506$)

oncological surgical principles. A study by Wang et al., involving 40 individuals demonstrated favorable outcomes, suggesting that individuals with T4 gastric cancer involving transverse colon may benefit from curative resection with acceptable morbidity and mortality.[12] However, their single-arm study did not specifically evaluate the feasibility of laparoscopic approaches. This study is the first to specifically evaluate the implementation of laparoscopic techniques for localized transverse colon invasion. In our study, the median OS time was comparable between the laparoscopic and open surgery groups (26.0 months [95% CI, 18.0–36.0] vs. 20.0 months [95% CI, 11.0–45.0]; $P = 0.506$). The PFS time between the two groups were also similar. Although there was no significant difference, from the perspective of long-term oncological safety, when laparoscopic exploration reveals gastric cancer invasion into the transverse colon or its mesentery, proceeding directly with laparoscopic surgery may be considered a feasible option if surgical treatment is indicated.

The results of the present study indicate no significant differences between laparoscopic and open approaches in terms of operative time, lymph node yield, postoperative hospital stay, or complications. Prior studies have suggested that individuals who undergo MVR may experience higher complication rates compared to those undergoing only gastrectomy [12, 13]. In this study, the overall complication rate in the laparoscopic group was 10.3%, which was comparable to the 10.5% in the open group. Both groups achieved similar R0 resection rates, with an overall rate of 92.5%. The decision to perform distal or total gastrectomy was based on the primary tumor's location, with reconstruction performed using standard Billroth I, Billroth II, or Roux-en-Y anastomosis.

Similar survival benefits between groups suggest the long-term safety of the laparoscopic approach. Both univariate and multivariate analysis confirmed that the laparoscopic approach did not result in a significant decrease in either OS or PFS. The laparoscopic surgical approach is associated with benefits such as reduced intraoperative blood loss, and may be appropriate for individuals with transverse colon/mesocolon invasion. However, for individuals who require complete resection of the transverse colon, open surgery may be generally preferred. In our study, mesenteric invasion was observed in 71.9% of patients in the laparoscopic group, compared to only 42.9% in the open surgery group. Additionally, a higher proportion of total colectomies was performed in the

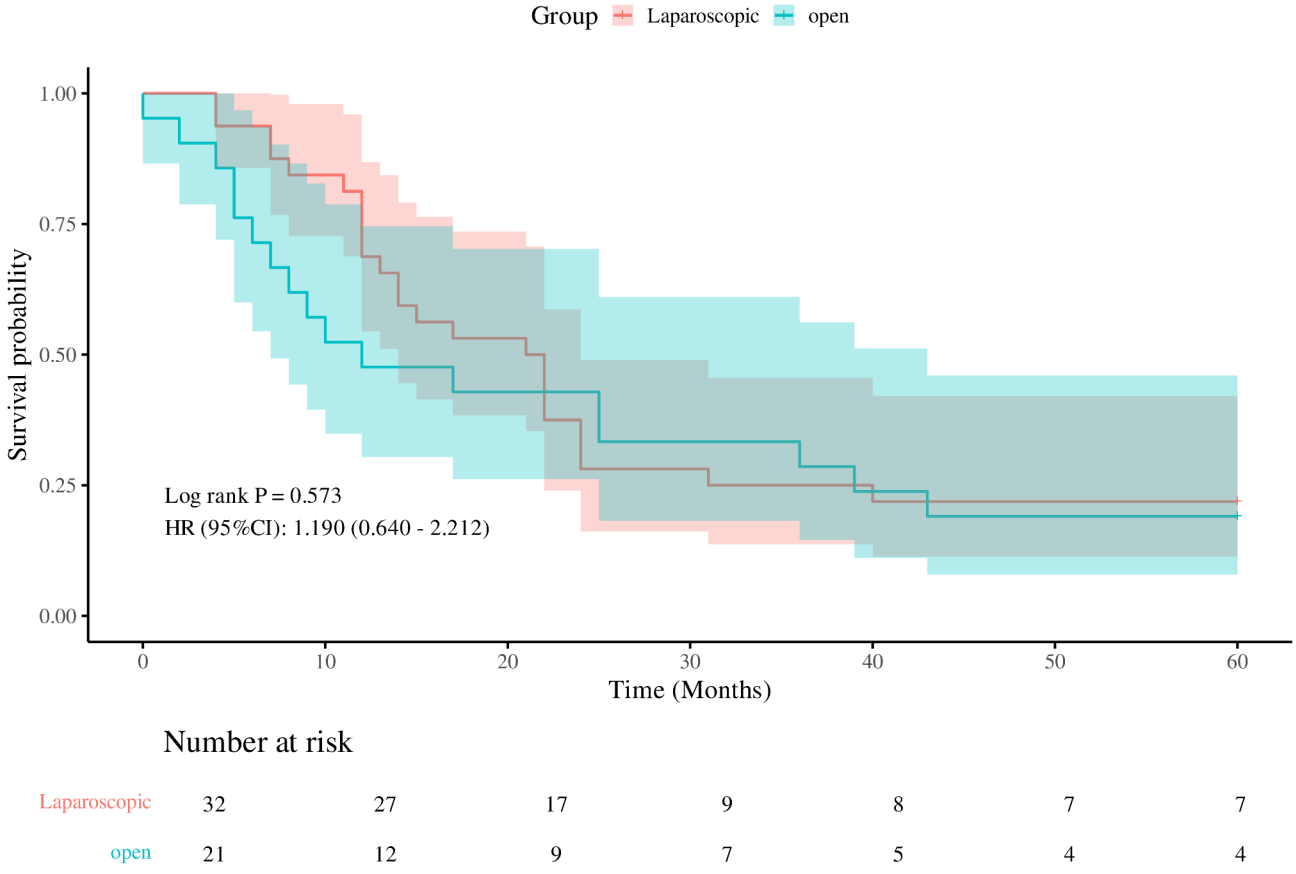

Fig. 2 Kaplan-Meier curves for PFS comparing laparoscopic versus open surgery groups. The median PFS was 21.50 months (95% CI: 14.00–24.00 in the laparoscopic group and 12.00 months (95% CI: 7.00–43.00) in the open group ($p = 0.573$)

open group. This discrepancy may be attributed to the surgeons' initial selection of surgical approach, likely influenced by concerns regarding safety, oncologic radicality, and anticipated operative duration. Therefore, laparoscopic surgery presents a promising alternative approach, especially when limited mesenteric invasion is detected, but surgical approaches should be customized to the specific challenges of each case.

The depth of tumor invasion and lymph node metastasis are recognized as unfavorable prognostic factors for OS [14]. Intraoperative differentiation between organ adhesion (pT4a) and true pathological invasion (pT4b) can be challenging without complete pathological assessment. The diagnostic accuracy of preoperative abdominal enhanced CT for T4 gastric cancer is often suboptimal, resulting in some T4b gastric cancer diagnoses being confirmed only during laparoscopic exploration [15]. For cases suspected of invasion (sT4b), achieving R0 resection should take precedence over neoadjuvant chemotherapy when surgery is considered. Resection of suspected invaded tissue is recommended, even if postoperative pathological analysis confirms inflammatory adhesion.

Studies have indicated significantly poorer survival rates associated with incomplete multivisceral resection compared to R0 resection [16, 17]. Cheng et al. reported that individuals with T4 gastric cancer demonstrated improved survival with combined resection regardless of whether tumors were adherent or truly invasive [18]. Similarly, prior research has indicated comparable short- and long-term outcomes between T4a and T4b patients who achieved R0 resection with MVR [19]. However, precise case selection is crucial, especially for individuals with T3 or lower staging, as excessive resection may increase the incidence of postoperative complications [20]. The surgical approach included mesocolon resection for isolated mesocolon involvement and partial or complete transverse colon resection when necessary to achieve R0 resection or address compromised blood supply. However, there is no consensus on whether complete resection of the transverse colon is more beneficial than partial resection. While the addition of MVR to gastrectomy is consistent with oncological principles, inappropriate extended incision may be detrimental, even for individuals with good functional status treated in established centers [19].

Lymph node metastasis is prevalent in T4b gastric cancer. In this study, the rate of lymph node metastasis among individuals with T4b gastric cancer involving transverse colon invasion was 92.5%, with 77.4% classified as N3a or N3b stage. These findings highlight the critical importance of performing a D2 or D2 + dissection. Theoretically, regional lymphatic drainage from the intestines terminates in the para-aortic lymph nodes, with No.16 lymph nodes considered the final drainage site. However, the routine necessity of No.16 lymph node dissection in T4b gastric cancer with transverse colon invasion remains inconclusive. The 6th edition of the Japanese Gastric Cancer Treatment Guidelines suggest that No.14v lymph node dissection may also be considered in tumors located in the gastric antrum, particularly when metastasis to No.6 lymph nodes is suspected.

The multivariate Cox regression analysis in this study was conducted for exploratory purposes. Given the limited sample size and the lack of statistically significant findings in univariate analysis, the results of multivariable modeling should be interpreted with caution. The analysis was not intended to establish causality but rather to identify potential trends or associations that may warrant further investigation in larger, prospective studies. We acknowledge the risk of model overfitting and limited statistical power, which may affect the stability and generalizability of the observed associations.

From a prospective standpoint, preoperative chemotherapy merits consideration. Neoadjuvant therapy has increasingly become a standard approach for LAGC, supported by three landmark randomized trials. The MAGIC and FNCLCC trials established the role of perioperative chemotherapy, demonstrating improved R0 resection rates (by 9% and 13% respectively) and five-year survival rates (by 13.3% and 14%) compared to surgical approach alone [21, 22]. The FLOT4 trial further optimized chemotherapy regimens, achieving superior pathological complete response (pCR) rates (16% vs. 6%) and higher R0 resection rates with the FLOT regimen compared to ECF, [23]. However, the Japanese JCOG0501 trial did not demonstrate three-year survival benefits with neoadjuvant therapy [24]. The emergence of immune checkpoint inhibitors has shown promising results in LAGC treatment. The DRAGON IV study demonstrated that the combination therapy of perioperative camrelizumab (an anti-PD-1 antibody), and S-1 and oxaliplatin (SOX) significantly improved the pCR rate (18.3%) compared to SOX alone (5.0%) in individuals diagnosed with G/GEJ adenocarcinoma [25].

This retrospective study focused on individuals who did not receive preoperative therapy and were pathologically confirmed to have T4b gastric cancer, suggesting future research should investigate the combination of preoperative chemotherapy, target therapy, immune therapy, and surgery. Despite advancements, the overall pCR rate remains suboptimal, underscoring the need for pre-treatment screening tools to identify individuals with high sensitivity to neoadjuvant therapy.

This study has several limitations. First, the relatively small sample size and retrospective design may restrict the generalizability of the findings. Second, the lymph node grouping lacked sufficient granularity, preventing a more detailed analysis of lymph node groups with higher metastatic risk. Larger, randomized controlled trials are needed to further validate the benefits of curative resection in individuals with T4b gastric cancer involving transverse colon invasion.

Conclusions

This study demonstrated that laparoscopic surgery is a feasible and safe option for individuals with T4b gastric cancers involving localized transverse colon invasion. Comparable surgical outcomes, complication rates, and survival metrics between laparoscopic and open surgery groups highlight the viability of laparoscopic techniques in such cases. However, this study is a retrospective study with a small sample size, so a well-designed randomized controlled trial with a larger sample size should be conducted to further confirm this finding.

Abbreviations

AJCC	American Joint Committee on Cancer
ASA	American Society of Anesthesiologists
ECOG	Eastern Cooperative Oncology Group
LAGC	Locally advanced gastric cancer
MVR	Multivisceral resection
OS	Overall survival
PFS	Progression-free survival

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Not applicable.

Author contributions

Conception and design of the research: Yiming Lu, Zhibin Ye. Acquisition of data: Yiming Lu, Zhibin Ye, Wenhui Zhong, Xinxin Shao, Haitao Hu, Yujuan Jiang, Wangyao Li. Analysis and interpretation of the data: Yiming Lu, Haikuo Wang. Statistical analysis: Yiming Lu, Haikuo Wang, Wenhui Zhong, Xinxin Shao, Haitao Hu, Yujuan Jiang, Wangyao Li. Obtaining financing: Yantao Tian. Writing of the manuscript: Yiming Lu. Critical revision of the manuscript for intellectual content: Yiming Lu, Yantao Tian. All authors read and approved the final draft.

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Data availability

The datasets used and analyzed during the current study areavailable from the corresponding author upon reasonable request.

Declarations

Ethical approval

This study received approval from the Ethics Committee of the Cancer Hospital, Chinese Academy of Medical Sciences (22/274–3476).

Consent

Prior to surgery, all patients and their families provided informed consent, acknowledging and consenting to the potential use of clinical data collected during their treatment for future research. Therefore, when using retrospectively collected patient data, informed consent can be waived.

Competing interests

The authors declare no competing interests.

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