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Laparoscopic surgery for Left colon cancer: Clinical features and early outcomes – A single-institution retrospective series

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Received: January 10th, 2026. **Revised:** February 1st, 2026. **Accepted:** February 17th, 2026. **DOI:** 10.53901/tjs.2026.01.art02

Abstract

Introduction: Left colon cancer represents a significant proportion of colorectal malignancies and poses challenges in surgical management. Laparoscopic surgery offers potential benefits for treating left colon cancer, but the complex anatomy and risk of complications necessitate careful evaluation of outcomes. While this approach has gained popularity in Vietnam, data on factors influencing early postoperative outcomes in the Vietnamese population are limited.

Aims: This study aimed to (1) investigate clinical and laboratory characteristics, (2) evaluate early postoperative outcomes, and (3) identify associated factors in left colon cancer patients undergoing laparoscopic left colectomy at Binh Dan Hospital.

Methods: We conducted a retrospective case series analysis of 133 patients with left colon cancer who underwent laparoscopic left colectomy at Binh Dan Hospital, Vietnam, from January 2022 to December 2023. Data on demographics, clinical presentations, laboratory findings, imaging results, surgical protocols, and postoperative outcomes were collected from medical records.

Results: The mean age of patients was 60.9 ± 1.1 years, with a male-to-female ratio of $1.3:1$. The most common presenting symptoms were abdominal pain 86%, changes in bowel habits 68%, and bloody stools 55%. Sigmoid colon was the most frequent tumor location 79.7%. The average operative time was 191.47 ± 52.12 minutes. Early postoperative complications occurred in 8.3% of cases. Factors significantly associated with better outcomes included complete colonoscopy *(p=0.015)* and sigmoid colon tumor location *(p=0.050)* compared to more proximal locations. Postoperative serum albumin levels were also correlated with outcomes *(p=0.048)*.

Conclusion: Laparoscopic surgery for left colon cancer at Binh Dan Hospital demonstrated favorable early outcomes with a low complication rate. Complete preoperative colonoscopy and tumor location were identified as factors influencing early outcomes. Future research should focus on larger, multi-center studies with longer follow-up periods. Efforts to enhance public awareness about colorectal cancer screening, improve preoperative evaluations, and develop standardized perioperative care protocols are recommended to further improve patient

Keywords: Left colon cancer, laparoscopic left colectomy, clinical characteristics, paraclinical characteristics, early outcomes, Vietnam.

Introduction

Colorectal cancer ranks third globally among all cancers, with left colon cancer comprising a significant proportion of cases [1]. In Vietnam, it is the fifth most prevalent cancer, imposing a substantial burden on the healthcare system [2]. The unique anatomical characteristics of the left colon – being a fecal-containing organ with high intraluminal pressure and bacterial density – present challenges in surgical management [3].

Laparoscopic surgery has revolutionized left colon cancer treatment, offering reduced blood loss, decreased postoperative pain, shorter hospital stays, and improved cosmetic outcomes [4, 5]. However, complications including surgical site infections, ileus, and anastomotic leakage – often requiring reoperation – remain concerns that significantly impact recovery and long-term outcomes [4].

Several studies worldwide have examined the rates of postoperative complications in left colon cancer surgery and the factors that may influence patient recovery. Frasson et al. [6] identified preoperative nutritional status as an independent risk factor for anastomotic leakage and postoperative mortality in a study of 1102 patients. Similarly, Xie et al. [7] found that a high preoperative neutrophil-albumin ratio was an independent risk factor for postoperative complications and long-term prognosis in colorectal

cancer patients, based on a study of 1141 patients.

In Vietnam, the adoption of laparoscopic surgery for colorectal cancer has been growing, with several studies demonstrating its feasibility and safety. Tran Van Minh Tuan et al. [8] reported on the outcomes of laparoscopic complete mesocolic excision for left colon cancer at Binh Dan Hospital. Luu Quang Dung et al. [9] reported favorable outcomes for laparoscopic surgery for left-sided colon adenocarcinoma at Hanoi Medical University Hospital. Additionally, Dang Quoc Ai and Tran Ngoc Dung [10] evaluated laparoscopic colectomy outcomes for left colon cancer at E Hospital, further supporting the efficacy of this approach in the Vietnamese setting.

However, these studies have primarily focused on surgical techniques and immediate outcomes, with limited exploration of the factors influencing postoperative recovery. While global research has investigated complications following left colon cancer surgery and factors influencing patient recovery, data specific to the Vietnamese population remain limited [3, 11]. The unique healthcare context in Vietnam, including differences in disease presentation, patient characteristics, and healthcare resources, necessitates specific investigation.

At Binh Dan Hospital, laparoscopic surgery is gradually replacing open surgery in the treatment of stage I, II, and III left colon cancer. This transition raises important questions about the safety, efficacy, and factors influencing outcomes of laparoscopic surgery for left colon cancer in this specific healthcare setting. The present study aims to address these knowledge gaps by investigating the clinical and paraclinical characteristics of left colon cancer patients treated with laparoscopic surgery at Binh Dan Hospital, evaluating early postoperative outcomes, and identifying factors associated with these outcomes.

Given Vietnam's increasing colorectal cancer incidence and ongoing transition to minimally invasive techniques, comprehensive data on laparoscopic left colon cancer surgery in this population are urgently needed. Findings from this study could improve understanding of left colon cancer demographics in Vietnam, inform clinical decision-making, and guide development of tailored perioperative care protocols. To address these needs, this study aimed to: (1) investigate the clinical and laboratory characteristics of left colon cancer patients treated by laparoscopic left colectomy at Binh Dan Hospital, (2) evaluate early postoperative outcomes, and (3) identify factors associated with these outcomes. We hypothesized that patient characteristics, tumor location, and preoperative factors would significantly influence early postoperative outcomes. By analyzing these aspects, we seek to address the current limitations in our understanding of left colon cancer treatment outcomes in Vietnam and ultimately contribute to improving patient care in this specific healthcare context.

Methods

Research Method

Retrospective case series.

We conducted a study of patients who underwent laparoscopic left colectomy for colon cancer at Binh Dan Hospital, Ho Chi Minh City, Vietnam, from January 2022 to December 2023. The study was approved by the Institutional Review Board of Binh Dan Hospital.

Study Population

Inclusion criteria: (1) age $\geq$ 18 years, (2) histologically confirmed left colon adenocarcinoma; (3) stage I-III disease with indication for curative treatment; (4) treatment with laparoscopic surgery.

Exclusion criteria: (1) stage IV disease and/or recurrent cancer; (2) emergency surgery; (3) conversion to open surgery; (4) incomplete medical records.

Data Collection

Data were collected from patients' medical records and included demographic information, clinical presentations, comorbidities, laboratory findings, imaging results, operative details, and postoperative outcomes. Specific variables collected included:

1) Demographics: age, gender, body mass index (BMI)
2) Clinical features: presenting symptoms, duration of symptoms, physical examination findings
3) Comorbidities: number and type of comorbid conditions
4) Laboratory data: complete blood count, liver and renal function tests, serum albumin, carcinoembryonic antigen (CEA)
5) Imaging findings: colonoscopy results, computed tomography (CT) findings
6) Operative details: type of laparoscopic procedure, operative time, blood loss, conversion to open surgery
7) Pathological findings: tumor location, size, stage, histological type, and differentiation
8) Postoperative outcomes: time to flatus, time to oral intake, length of hospital stay, postoperative complications

Surgical Technique

All patients underwent laparoscopic left colectomy performed by experienced colorectal surgeons. The surgical technique included the following key steps:

1) Patient positioning in modified lithotomy position
2) Pneumoperitoneum establishment and trocar placement
3) Exploration of the abdominal cavity
4) Mobilization of the left colon
5) Ligation of inferior mesenteric vessels
6) Dissection and removal of lymph nodes
7) Division of the bowel proximal and distal to the tumor
8) Extracorporeal or intracorporeal anastomosis
9) Retrieval of the specimen through a small incision

Postoperative Care

Postoperative care followed a standardized protocol, including early mobilization, pain management, and gradual resumption of oral intake. Patients were closely monitored for signs of complications, and laboratory tests were performed as clinically indicated.

Outcome Measures

The primary outcome measure was the occurrence of early postoperative complications, defined as those occurring within 30 days of surgery or before hospital discharge. Secondary outcome measures included operative time, blood loss, time to first flatus, time to oral intake, and length of hospital stay.

Early outcome evaluation criteria

Patients were classified into 2 groups: those with good outcomes (no early postoperative complications) and those with complications.

Data Collection and Statistical Analysis

Statistical analysis was performed using SPSS version 26.0. Continuous variables were compared using independent t-tests or Mann-Whitney U tests, as appropriate. Categorical variables were analyzed using chi-square or Fisher's exact tests. Multivariate logistic regression was used to identify independent predictors of postoperative complications. A p-value < 0.05 was considered statistically significant.

Results

Patient Characteristics

From January 2022 to December 2023, we recruited 133 left colon cancer patients diagnosed and treated with laparoscopic surgery at Binh Dan Hospital. Patient age ranged from 32-91 years (mean 60.9 $\pm$ 1.1), with a slight male predominance (male-to-female ratio of 1.3:1). The majority of patients (52.6%) were over 60 years old, while only 3.8% were under 40 years old.

The mean BMI was 23.1 $\pm$ 3.8 kg/m^2, with 39.8% of patients in the normal weight range, 27.1% overweight, and 24.1% obese according to Asian BMI classifications. Comorbidities were present in 65% of patients, with cardiovascular diseases being the most common (48.9%), followed by diabetes mellitus (23.3%).

No statistically significant difference in age distribution was observed between males (61.9 $\pm$ 12.9 years) and females (59.6 $\pm$ 11.8 years) (p=0.438), indicating comparable age-related risk across genders for left colon cancer.

There is a significant correlation between age and comorbidity burden ($p < 0,001$). Older patients (> 60 years) exhibited higher rates of multiple comorbidities, whereas younger patients (< 40 years) had none, indicating increased clinical complexity with advancing age in left colon cancer patients.

Clinical Presentation

The most common symptoms were abdominal pain (86%), changes in bowel habits (68%), and bloody stools (55%). The majority of patients (72.2%) presented within 3 months of symptom onset.

On physical examination, 39.1% of patients had localized abdominal tenderness, while only 0.8% had a palpable abdominal mass. Digital rectal examination revealed blood in 1.5% of cases.

Table 1: Demographic and Clinical Characteristics of Patients.

Characteristic	n	%
Age (years)		
< 40	5	3.8
40 – 60	58	43.6
> 60	70	52.6
Gender (Ratio 1.3:1)		
Male	75	56.4
Female	58	43.6
BMI (kg/m^2)		
Underweight (< 18.5)	12	9.0
Normal (18.5–22.9)	53	39.8
Overweight (23–24.9)	36	27.1
Obese (≥ 25)	32	24.1
Comorbidities		
None	47	35.3
One	45	33.8
Two	36	27.1
Three or more	5	3.8
Type of comorbidities		
Cardiovascular diseases	65	48.9
Diabetes mellitus	31	23.3
Respiratory diseases	11	8.3
Renal and urological conditions	7	5.3
Other comorbidities	21	15.8

Table 2: Age Distribution by Gender

Gender	Age (years)			p
	Min	Mean	Max	
$n = 133$	**32**	**60.9 $\pm$ 1.1**	**91**	0,438
Male	36	61.9 $\pm$ 12.9	91	
Female	32	59.6 $\pm$ 11.8	82	

Table 3: Comorbidities by Age Group

Comorbidities	Age (years)			p
	<40	40 – 60	>60	
None	5	28	13	< 0.001
One	0	20	25	
Two	0	9	27	
Three or more	0	1	5	

Table 4: Clinical Presentation and Physical Examination Findings

Characteristic	n	%
Chief complain		
Abdominal pain	62	46.6
Bloody stools	36	27.1
Changes in bowel habits	28	21.7
Incidental finding	6	4.5
Constipation	1	0.8
Duration of symptoms		
< 3 months	96	72.2
$6 - 12$ months	8	6.0
> 12 months	9	6.8
Physical Examination Finding		
No abnormal findings	78	58.6
Localized abdominal pain	52	39.1
Blood on digital rectal exam	2	1.5
Palpable mass	1	0.8

Paraclinical Findings

Preoperative Laboratory Findings

Preoperative laboratory tests showed that 78.2% of patients had normal white blood cell counts, while 18.8% had leukocytosis. Anemia (hemoglobin < 12 g/dL) was present in 47.4% of patients preoperatively. The mean serum albumin level was 40.1 ± 4.09 g/L, with 38.3% of patients having hypoalbuminemia (< 40 g/L).

Hemoglobin and Albumin Levels

Mean hemoglobin levels decreased slightly from 12.43 ± 1.97 g/L preoperatively to 11.98 ± 1.78 g/L postoperatively. A strong positive correlation ($r = 0.745$, $p < 0.001$) indicated that patients with higher preoperative hemoglobin levels tended to maintain higher levels postoperatively.

Serum albumin decreased markedly from 40.1 ± 4.09 g/L preoperatively to 33.37 ± 3.24 g/L postoperatively. A positive correlation ($r = 0.609, p < 0.001$) also indicated a similar trend. Notably, only 55 patients had postoperative albumin measurements.

The percentage of patients with normal hemoglobin levels decreased from 52.6% preoperatively to 38.3% postoperatively. For albumin, the percentage of patients with normal levels decreased dramatically from 61.7% preoperatively to 1.5% postoperatively. Importantly, 58.6% of patients did not have postoperative albumin tests.

Tumor Markers

Carcinoembryonic antigen (CEA) levels were elevated (> 5 ng/mL) in 36.9% of patients, with 21.1% having levels > 10 ng/mL.

Table 5: Preoperative and Postoperative Hemoglobin and Albumin Levels with Pearson Correlation Coefficients

Parameter (r)	Before Surgery	After Surgery	Correlation
Hemoglobin ($p < 0.001$)			
Mean (g/L)	12.43	11.98	**0.745**
Normal range	52.6%	38.3%	
Albumin ($p < 0.001$)			
Mean	40.1	33.37	
Normal range	61.7%	1.5%	**0.609**
Sample size	133	55	

Tumor Characteristics and Staging

Imaging Findings

Colonoscopy was performed in all patients, but complete colonoscopy (reaching the cecum) was achieved in only 15.8% of cases. The most common tumor location was the sigmoid colon (79.7%), followed by the descending colon (10.5%) and splenic flexure (9.8%). In terms of endoscopic appearance, 56% of tumors were described as exophytic/fungating, 36% as annular/constricting, and 5% as ulcerative.

Computed tomography (CT) scans confirmed the tumor locations identified by colonoscopy in most cases. CT scans also revealed regional lymph node involvement in 51.9% of patients.

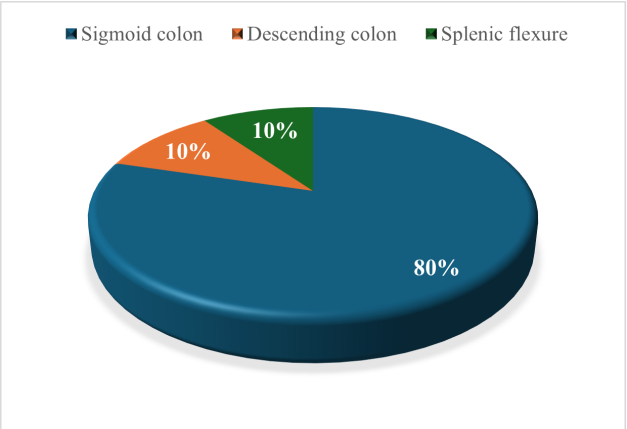

Figure 1: Distribution of Left Colon Cancer Tumor Locations.

Notably, 60.2% of tumors occupied > 75% of luminal circumference, indicating predominantly late-stage presentation. Most cases (69.9%) had no associated lesions. Among those with associated lesions, polyps were the most common (17.3%).

Table 6: Tumor Characteristics Based on Colonoscopy and CT Findings.

Tumor Characteristics	n	%
Complete colonoscopy achieved	21	15.8
Tumor location on colonoscopy		
Sigmoid colon	106	79.7
Descending colon	14	10.5
Splenic flexure	13	9.8
Tumor size on colonoscopy		
$< 1/2$	16	12.0
$1/2 - 3/4$	37	27.8
$> 3/4$	80	60.2
Invasive (T)		
T1	3	2.3
T2	7	5.3
T3	21	15.8
T4	102	76.7
Node metastasis	64	51.9

Pathological Findings

Histopathological examination revealed that 84.2% of tumors were conventional adenocarcinomas, while 15.0% were mucinous adenocarcinomas. Most tumors (78.9%) were moderately differentiated.

Regarding the degree of primary tumor invasion, most cases were detected at a late stage, with 76.7% at T4 and 15.8% at T3. Only 7.6% of cases were at stages T1 and T2 combined. Lymph node metastasis showed a relatively even distribution: 51.9% of patients had lymph node metastasis, while 48.1% did not.

When classified according to AJCC staging, stages II and III were predominant, with the highest rates being stage IIB (29.3%) and IIIB (28.6%). Notably, stage I accounted for only 6.8%, while late stages such as IIIB and IIIC combined accounted for up to 47.4%.

The study found no statistically significant correlation between tumor location and the time from symptom onset to hospital admission. This reaffirms that colon cancer is a latent, silent disease with diverse progression, requiring increased awareness for screening and prevention.

These findings emphasize the importance of optimizing these parameters before surgery and monitoring them postoperatively to improve treatment outcomes. The high proportion of advanced-stage tumors underscores the need for earlier detection and more effective screening programs in Vietnam.

Surgical Procedures and Intraoperative Outcomes

The most common laparoscopic procedure was sigmoid colectomy (52.6%), followed by left hemicolectomy (16.5%) and anterior resection (15.8%). A significant correlation was found between tumor location and surgical method ($p < 0.001$). Tumors in the sigmoid colon were typically treated with sigmoid colectomy or anterior resection, while splenic flexure tumors usually underwent high left colectomy or extended resection.

There were no intraoperative complications or conversions to open surgery reported.

The mean operative time was 191.47 $\pm$ 52.12 minutes (range: 90-390 minutes), and the average estimated blood loss was 47.18 $\pm$ 42.62 mL (range: 5-300 mL).

Postoperative Outcomes and Complications

There were no intraoperative complications or conversions to open surgery reported. Mean time to first flatus was 3.65 ± 1.3 days, oral intake 3.62 ± 1.22 days, and hospital stay 8.33 ± 1.90 days (range 5-23). Early postoperative complications occurred in 11 patients (8.3%), with surgical site infection being the most common (3.0%), followed by early postoperative ileus (2.3%) and anastomotic leakage (0.8%). There were no postoperative deaths.

Factors Associated with Early Outcomes

Univariate analysis revealed that complete colonoscopy (p=0.015) and sigmoid colon tumor location (p=0.050) were associated with better early outcomes. Postoperative serum albumin levels were also correlated with outcomes (p=0.048), with lower levels associated with a higher complication rate.

Multivariate logistic regression analysis identified two independent factors associated with early outcomes: complete colonoscopy (OR 0.181, 95% CI 0.049-0.063, p=0.010) and tumor location on CT (OR 2.211, 95% CI 1.053-4.641, p=0.036).

Additionally, analysis showed no statistically significant relationship when testing disease stage and T stage with treatment outcomes.

Discussion

This study provides valuable insights into the clinical characteristics and early outcomes of laparoscopic surgery for left colon cancer in a Vietnamese population. The demographic profile of our patients, with a mean age of 60.9 years and a slight male predominance, is consistent with previous reports from both Asian and Western countries [3, 12]. However, the proportion of patients under 40 years old (3.8%) in our cohort is noteworthy and aligns with recent observations of an increasing incidence of colorectal cancer in younger adults [13].

The high prevalence of comorbidities (65%) in our patient population, particularly cardiovascular diseases and diabetes, underscores the importance of comprehensive preoperative assessment and optimization. These findings are consistent with other studies reporting a high burden of comorbidities in colorectal cancer patients and highlight the need for a multidisciplinary approach to perioperative care [14, 15].

The presenting symptoms in our cohort, dominated by abdominal pain, changes in bowel habits,

and bloody stools, align with the typical clinical presentation of left colon cancer [11]. However, the relatively short duration of symptoms before hospital admission (less than 3 months in 72.2% of cases) suggests improved awareness and healthcare-seeking behavior compared to earlier studies in Vietnam [16]. This trend is encouraging but also emphasizes the need for continued public education about colorectal cancer symptoms and the importance of early medical consultation.

Our findings regarding tumor location, with the sigmoid colon being the most frequent site, corroborate existing literature on left colon cancer distribution [17]. The high proportion of advanced T-stage tumors (76.7% at T4) underscores the need for earlier detection and screening programs in Vietnam. This observation contrasts with data from countries with established screening programs, where a higher proportion of early-stage cancers are typically detected [18].

The technical aspects of laparoscopic surgery in our series, including operative time and blood loss, are comparable to or better than those reported in other studies, both in Vietnam and internationally [8–10, 19–21]. Our results are relatively consistent with the study by Tran Van Minh Tuan (2022), conducted at the same research site, which reported a mean operative time of 180 ± 40.3 minutes [8]. However, our operative time was longer compared to some other Vietnamese studies, such as Tong Van Bien (141.5 ± 38.3 minutes) [19], Dang Quoc Ai (154.79 ± 38.57 minutes) [10], and Luu Quang Dung (2023) (151 ± 38.7 minutes) [9].

When compared to international studies, our mean operative time of 191.47 minutes falls within the range reported in the literature for laparoscopic left colectomy, although it is longer than some series and shorter than others. For instance, Han et al. (2010) in South Korea reported a mean operative time of 156.2 ± 49.1 minutes for laparoscopic left hemicolectomy [20], while Abdelhady et al. (2017) in Egypt reported a mean time of 159.54 ± 23.92 minutes [21].

The slightly longer operative time in our study compared to some others may reflect the ongoing learning curve associated with laparoscopic colorectal surgery. As our surgical team gains more experience, we anticipate that operative times may decrease. However, it's important to note that our complication rates remained low despite this learning curve, suggesting that the procedure can be safely implemented with proper training and supervision. Furthermore, the variation in operative times across different studies might be attributed to factors such as case complexity, surgeon experience, and differences in surgical techniques or protocols.

Our overall complication rate of 8.3% (11 cases) is comparable to that reported by Tong Van Bien (8.5%, 7 cases) [19] and lower than that reported by Dang Quoc Ai (19.4%, 14 cases) [10]. Specifically, our rate of surgical site infections (3.0%, 4 cases) is lower than most other studies, while our rate of anastomotic leakage (0.8%,1 case) is comparable or lower. This low rate may be attributed to meticulous surgical technique, appropriate patient selection, and optimized perioperative care protocols.

Table 7: Comparison of Operative Time with Other Studies in Vietnam and Internationally.

Study	Sample size	Operative time (min)
Our study	**133**	191.47 ± 52.12
Tran, V. M. T. (2022) [8]	72	180 ± 40.3
Luu, Q. D. (2023) [9]	63	151 ± 38.7
Dang, Q. A. (2023) [10]	72	154.79 ± 38.57
Tong, V. B. (2018) [19]	82	141.5 ± 38.3
Han, K.-S. (2010) [20]	35	156.2 ± 49.1
Abdelhady, H. (2017) [21]	11	159.54 ± 23.92

Table 8: Comparison of Postoperative Complication Rates with Other Vietnamese Studies.

Complication	Tran (2022) [8]	Dang (2023) [10]	Tong (2018) [19]	Our Study
Sample size (n)	72	72	82	**133**
Total complications	9	14	7	**11**
Surgical site infection	5	5	6	**4**
Early postoperative ileus	1	2	—	**3**
Anastomotic leakage	1	2	1	**1**

These comparisons suggest that our surgical outcomes are generally in line with or better than those reported in other Vietnamese studies. The variations in complication rates might be due to differences in patient populations, surgical expertise, or perioperative care protocols.

Furthermore, our finding of comparable laparoscopic treatment outcomes across different disease stages is particularly noteworthy. In Vietnam, where cancer screening is less emphasized, we observed a high proportion of advanced-stage disease (stage III accounting for 48.53% of cases). This contrasts with Western countries, where established screening programs typically result in higher rates of early-stage disease detection. Despite this challenge, laparoscopic surgery has become increasingly popular in Vietnam, with most tumors, regardless of size or stage, being treated primarily through this method. This differs from Western practices, where laparoscopic surgery is often reserved for early-stage tumors, while larger tumors (T3, T4 stages) are typically treated with open surgery [20, 21]. Our study found similar outcomes for laparoscopic left colon cancer surgery across all tumor stages (p=0.604), with no cases requiring conversion

to open surgery. This highlights the high level of expertise Vietnamese surgeons have developed in treating both early and advanced-stage colorectal cancer using minimally invasive approaches. Such proficiency is particularly relevant in settings where late-stage presentations are common and laparoscopic techniques are preferred across all stages, underscoring the importance of surgical skill and experience in managing advanced disease through minimally invasive methods.

Our analysis identified several factors associated with better early outcomes in laparoscopic left colon cancer surgery, including complete preoperative colonoscopy, sigmoid colon tumor location, and postoperative serum albumin levels. These findings provide valuable insights for clinical practice and highlight areas for potential improvement in patient care.

The association between complete colonoscopy and improved outcomes may be attributed to better preoperative assessment and surgical planning. In cases where complete colonoscopy is not possible due to obstructing lesions, which often indicate more advanced disease and higher T-stage tumors, alternative imaging modalities such as CT colonography or intraoperative colonoscopy may be necessary to evaluate the proximal colon. This scenario, prevalent in our study population, underscores the challenges faced in preoperative evaluation of advanced left colon cancers and emphasizes the importance of early detection and screening programs.

Sigmoid colon tumors were associated with fewer complications and better outcomes compared to more proximal left-sided tumors ($p = 0.050$). This observation may be attributed to the relative ease of mobilization and anastomosis for sigmoid tumors compared to those at the splenic flexure or descending colon, which often require more extensive dissection [22]. Additionally, the favorable anatomical characteristics of the sigmoid colon and well-established surgical techniques for this region likely contribute to these results. However, it's important to note that sigmoid colon cancer represented a significant proportion of cases in our study, which could have influenced these findings. Further investigation with larger sample sizes is necessary to confirm this association and fully understand the underlying mechanisms contributing to the potentially better outcomes for sigmoid colon tumors.

The correlation between postoperative serum albumin levels and outcomes highlights the importance of nutritional status in the perioperative period. This finding supports the implementation of enhanced recovery after surgery (ERAS) protocols, which emphasize early nutritional support [23]. Furthermore, implementation of prehabilitation programs, which combine nutritional support, exercise, and psychological preparation before surgery, could potentially improve postoperative outcomes [24]. Routine measurement of postoperative albumin levels could serve as an early warning sign for potential complications, allowing for proactive intervention.

These findings collectively emphasize the need for a comprehensive preoperative workup, meticulous surgical planning, and optimized perioperative care in laparoscopic left colon cancer surgery. By addressing these factors, we may be able to further improve outcomes and reduce complications in this patient population.

The successful implementation of laparoscopic surgery for left colon cancer in our institution, with low complication rates and favorable short-term outcomes, supports the continued adoption of minimally invasive techniques in colorectal cancer surgery in Vietnam. However, the learning curve associated with laparoscopic colorectal surgery should not be underestimated. Structured training programs, proctorship, and ongoing quality assessment are essential to ensure safe implementation and optimal outcomes as this technique becomes more widely adopted [25].

Future research directions should include prospective, multi-center studies to validate our findings and assess long-term oncological outcomes of laparoscopic surgery for left colon cancer in the Vietnamese population. Additionally, studies comparing outcomes between open and laparoscopic approaches, as well as investigations into the feasibility and outcomes of enhanced recovery protocols in this setting, would provide valuable insights to guide clinical practice.

Conclusion

Our study demonstrates that laparoscopic surgery for left colon cancer can be performed safely and effectively in a Vietnamese tertiary care center, with low complication rates and favorable short-term outcomes. The identification of factors associated with postoperative complications, including incomplete preoperative colonoscopy and non-sigmoid tumor location, provides valuable information for risk stratification and targeted interventions to improve outcomes. The high proportion of advanced-stage tumors in our cohort highlights the urgent need for improved screening and early detection strategies in Vietnam. As laparoscopic colorectal surgery continues to evolve, ongoing research and quality improvement initiatives will be crucial to optimize outcomes and ensure equitable access to high-quality surgical care for colorectal cancer patients in Vietnam.

Limitations of this study include its retrospective nature and single-center design, which may limit generalizability. Additionally, the relatively short follow-up period precludes assessment of long-term oncological outcomes.

In conclusion, this study demonstrates favorable early outcomes of laparoscopic surgery for left colon cancer at Binh Dan Hospital, with a low complication rate of 8.3%. Complete preoperative colonoscopy, tumor location, and postoperative albumin levels were identified as key factors influencing outcomes. Our findings highlight the feasibility and safety of laparoscopic approaches in a developing country setting, despite challenges of late-stage presentations. The

comparable outcomes across disease stages underscore the expertise of Vietnamese surgeons in managing both early and advanced colorectal cancer. These results provide valuable insights for improving patient care and surgical outcomes in Vietnam and similar healthcare contexts.

Future research should focus on prospective, multicenter studies to validate our findings and assess long-term oncological outcomes. Additionally, implementation of enhanced recovery after surgery (ERAS) protocols and prehabilitation programs could potentially further improve postoperative outcomes and should be investigated in the Vietnamese context.

Acknowledgments

The authors would like to thank the staff of the Department of Surgery at Binh Dan Hospital for their support in data collection and patient care. We also appreciate the assistance of the hospital's medical records department in providing access to patient data.

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Binh Dan Hospital (approval number: IRB-2022-015). Due to the retrospective nature of the study, the requirement for individual patient consent was waived by the ethics committee.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interests

The authors declare that they have no competing interests.

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