

# Safety and feasibility of laparoscopic complete mesocolic excision for right-sided colon cancer: A prospective study

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## ABSTRACT

**Background:** This study aimed to evaluate the early outcomes of laparoscopic complete mesocolic excision (CME) for right colon cancer. **Methods:** A prospective study was conducted on patients with primary right colon cancer who underwent laparoscopic CME between January 2023 and January 2024 at the Gastrointestinal Surgery Department of the 108 Military Central Hospital. **Results:** A total of 47 patients underwent laparoscopic CME for right colon cancer, of whom 30 (63.83%) were male. The mean operative time was  $143.08 \pm 25.46$  minutes, with no intraoperative complications reported. The mean intraoperative blood loss was  $22.56 \pm 11.4$  ml, and no conversions to open surgery occurred. R0 resection was achieved in all cases (100%). Postoperative complications included one case of anastomotic fistula (2.22%) and one case of anastomotic bleeding (2.13%). The mean number of harvested lymph nodes was  $13.46 \pm 6.27$ , and 86.67% of patients had more than 11 lymph nodes retrieved. The mean postoperative hospital stay was  $6.87 \pm 0.92$  days. **Conclusion:** Laparoscopic complete mesocolic excision for right colon cancer can be a safe procedure with minimal complications, offers good oncological outcomes, and is feasible for broader application.

**Keywords:** complete mesocolic excision, laparoscopic surgery, right colon cancer

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## INTRODUCTION

In 2009, Hohenberger first introduced the concept of “Complete Mesocolic Excision (CME)” in the surgical treatment of colon cancer. The CME technique not only enables the en bloc resection of the tumor along with the mesocolon but also maximizes lymph node harvest. Numerous studies comparing both macroscopic and microscopic aspects have demonstrated that CME yields significantly superior specimen quality compared to conventional techniques, with favorable oncological outcomes such as prolonged overall and disease-free survival and reduced local recurrence rates. However, because the CME technique

requires precise dissection of the vascular pedicle close to its origin and the opening of the mesocolic plane along the superior mesocolic vein up to the inferior border of the pancreas with lymphadenectomy performed along the left border of the superior mesenteric artery the risk of complications remains high, which can adversely affect overall treatment outcomes [1], [2].

In Vietnam, although several studies have investigated laparoscopic surgery for right colon cancer, there are few reports on the laparoscopic CME technique for this disease [3], [4]. Therefore, we conducted this study with the objective of evaluating the feasibility, safety, and short-term outcomes

of laparoscopic complete mesocolic excision in the treatment of right colon cancer.

## MATERIALS AND METHOD

### Study design and subjects

This is an observational study. Patients with primary colon cancer who underwent laparoscopic complete mesocolic excision for right colon cancer, from January 2023 to January 2024, at the Department of Gastrointestinal Surgery, 108 Central Military Hospital.

### Inclusion criteria

Tumor invasion  $\leq$  cT4a, without distant metastasis. No complications such as bowel obstruction, tumor rupture, or abscess.

### Exclusion Criteria

Distant metastasis.

Multiple tumors in the colon or multiple colonic polyps. Contraindications to laparoscopic surgery. Emergency surgery due to tumor-related complications.

### Data analysis

Data were stored and analyzed using IBM SPSS 22.0.

## RESULTS

### General characteristics

A total of 47 patients with colon cancer met the selection criteria, comprising 30 males (63.83%) and 17 females (36.17%). The mean age was  $62.7 \pm 13.99$  years, and the mean BMI was  $21.97 \pm 2.80$ . ASA classification was distributed as follows: ASA 1: 0%, ASA 2: 95.74%, and ASA 3: 4.26%.

The majority of tumors were found in the ascending colon (40.43%) and hepatic flexure (36.17%). Most patients were diagnosed at Stage II (82.98%), while fewer cases were at Stage I (2.13%) and Stage III (14.89%). These findings highlight the distribution of tumor sites and disease stages, which may have implications for treatment planning and prognosis (Table 1).

*Table 1. Tumor location and preoperative disease staging*

Tumor location	N (%)
Cecum	3 (6.38%)
Ascending colon	19 (40.43%)
Hepatic flexure	17 (36.17%)
Proximal one-third of transverse colon	8 (17.02%)
Preoperative disease staging	
Stage I	1 (2.13%)
Stage II	39 (82.98%)
Stage III	7 (14.89%)

### Postoperative outcomes

There was a low complication rate, with only 2 cases (4.26%) of postoperative complications, including 1 case of anastomotic bleeding (2.13%) and 1 case of postoperative bleeding (2.13%). No adverse events, anastomotic leakage, surgical site infections, or respiratory

infections were observed. The average operative time was  $143.08 \pm 25.46$  minutes, with an average of  $13.46 \pm 6.27$  lymph nodes harvested. Patients experienced their first flatus after  $2.57 \pm 0.69$  days, and the average postoperative hospital stay was  $6.87 \pm 0.92$  days. These results suggest a favorable surgical outcome with minimal complications (Table 2).

**Table 2. Postoperative outcomes**

<b>Adverse events (N; %)</b>	0; 0%
<b>Complications (N; %)</b>	2; 4.26%
<b>Anastomotic leakage (N; %)</b>	0; 0%
<b>Anastomotic bleeding (N; %)</b>	1; 2.13%
<b>Postoperative bleeding (N; %)</b>	1; 2.13%
<b>Surgical site infection (N; %)</b>	0; 0%
<b>Respiratory infection (N; %)</b>	0; 0%
<b>Operative time (min)</b>	$143.08 \pm 25.46$
<b>No. of harvested lymph nodes</b>	$13.46 \pm 6.27$
<b>Time to first flatus (days)</b>	$2.57 \pm 0.69$
<b>Postoperative hospital stay (days)</b>	$6.87 \pm 0.92$

Regarding primary tumor (pT): Majority of patients have advanced tumors, with most in pT3 (68.09%) and a smaller group in pT4 (23.4%). Regarding lymph node involvement (pN): Most patients show no regional lymph node metastasis (pN0 - 74.47%), while a smaller proportion have 1-3 lymph nodes involved (pN1 - 23.4%). In terms of disease staging: The majority of patients are in Stage II (68.09%), followed by Stage III (25.53%) and a small group in Stage I (6.38%) (Table 3).

**Table 3. Tumor characteristics and clinical staging**

<b>Category</b>	<b>Classification</b>	<b>N (%)</b>
<b>pT (Primary tumor)</b>	pT2	4 (8.51)
	pT3	32 (68.09)
	pT4	11 (23.40)
<b>pN (Lymph node involvement)</b>	pN0	35 (74.47)
	pN1	11 (23.4)
	pN2	1 (2.13)
<b>Disease staging</b>	Stage I	3 (6.38)
	Stage II	32 (68.09)
	Stage III	12 (25.53)

## DISCUSSION

This prospective study evaluated the early outcomes of laparoscopic CME in 47 patients with right colon cancer. The findings demonstrate that laparoscopic CME is a safe and feasible surgical approach, with favorable short-term outcomes and minimal postoperative complications.

The two most common tumor locations were the ascending colon (40.43%) and the hepatic flexure (36.17%). Tumors in the proximal one-third of the transverse colon accounted for 17.02%, while cecal tumors were the least common (6.38%). These findings were similar to those of An et al. (2018), who also reported a predominance of tumors in the ascending colon and hepatic flexure.

The degree of tumor invasion, assessed by computed tomography (CT), plays a critical role in determining the extent of lymphadenectomy. The study found that 62.22% of patients had cT3 tumors, while 37.78% had cT4a tumors. According to the Japanese Society for Colon Cancer (2019) guidelines, a D3 lymphadenectomy is recommended. However, with a correlation coefficient ( $\rho$ ) of 0.362, the accuracy of CT in assessing tumor invasion was limited and should only be considered suggestive.

CME has been shown to offer significant oncological benefits, including improved overall and disease-free survival, along with a reduced rate of local recurrence. However, the CME technique required meticulous dissection of the supplying vessels near their origins and the opening of the mesocolic plane along the superior mesocolic vein up to the inferior border of the pancreas. Lymphadenectomy was performed along the left border of the superior mesenteric artery, making the procedure technically demanding. As a result, the rate of

intraoperative adverse events remained higher compared to the “non-CME” technique [5, 6]. The study showed no cases (0%) of injury to Henle’s trunk, which was a serious adverse event due to the short length and thin wall of Henle’s trunk. It was controlled by using non-clamping, applying a Hemolock, and controlling bleeding with a Ligasure device, ensuring safety without requiring intraoperative transfusion or modification of the surgical approach. Compared to other studies, such as Kang’s (0%) [1] and Pedrazzani’s (5.1%) [2], the study’s rate of 2.22% was acceptable.

Regarding anastomotic bleeding complications following laparoscopic CME, El-Fol et al. reported rates as high as 10%, all requiring reoperation [7], while Adamina et al. reported a rate of 3.84% with no reoperations necessary [8]. Our rate of anastomotic bleeding was 2.13%, which is lower. Additionally, we observed no cases (0%) of anastomotic leakage that required reoperation or ileum drainage. Postoperatively, patients were stable and discharged on the 18th day. Other studies have reported an anastomotic leakage rate ranging from 0% to 4.44% [5], [8].

The mean operative time in our study was  $143.08 \pm 25.46$  mins, comparable to Adamina et al.’s report of 136 mins (range, 105–167 mins) [8], but shorter than El-Fol’s 180 mins [7]. Operative time did not depend on tumor size or invasion degree ( $p > 0.05$ ), but there was a significant difference based on tumor location ( $p < 0.05$ ).

A total of 586 lymph nodes were harvested from 47 patients, with a mean of  $13.46 \pm 6.27$  nodes per patient. This was higher than the numbers reported in several studies on laparoscopic right colectomy using the “non-CME” technique, such as Nguyen et al.

( $10.63 \pm 6.50$  nodes) [3] and Nguyen et al. ( $12.5 \pm 5.1$  nodes) [4].

Many authors suggested that a minimum of 12 lymph nodes should be examined in colon cancer cases, as fewer than 12 can increase the risk of false-negative results in detecting nodal metastases. Evaluating at least 12 lymph nodes ensures proper staging, accurate prognosis, and appropriate treatment selection. In the study, 39 out of 45 patients (86.67%) had more than 11 lymph nodes harvested. This result was higher compared to some “non-CME” studies, such as Nguyen’s (34.5%) [3]. When evaluating postoperative parameters such as time to first flatus and hospital stay, our study’s results were comparable to those reported by other authors.

In assessing disease staging, we observed discrepancies between preoperative and postoperative assessments. Postoperatively, stage II accounted for 68.09% of cases, whereas preoperatively, this stage was seen in 82.98%. For stage III, the postoperative proportion was 25.53%, compared to 14.89% preoperatively. Such variations between postoperative pathological findings and preoperative assessments based on abdominal CT imaging are common in other studies [6, 9]. These discrepancies can result from various factors, including CT imaging quality, the thoroughness of pathological examinations, and the level of collaboration between surgeons and pathologists in evaluating gross lesions and performing histopathological analysis. Research on CME by other authors also indicates that stage II predominates, followed by stage III. This study has several limitations. First, the sample size was relatively small, which may limit the generalizability of the findings. Second, as a single-center study, the results may not reflect outcomes in different clinical

settings or among more diverse patient populations. Third, the follow-up period was short, preventing evaluation of long-term oncological outcomes such as recurrence and overall survival. Finally, the lack of a control group (open surgery or conventional laparoscopic resection without CME) limits the ability to directly compare the effectiveness and safety of laparoscopic CME with other surgical techniques.

## CONCLUSION

Laparoscopic complete mesocolic excision for right colon cancer can be a safe and oncologically effective technique with low complication rates, showing potential for wider clinical use.

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