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Original Research Article

SHORT TERM OUTCOMES OF LAPAROSCOPIC ASSISTED AND OPEN SURGERY FOR COLORECTAL MALIGNANCY: A SINGLE CENTRE RETROSPECTIVE COHORT STUDY

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Abstract

Background: Colorectal cancer is one of the leading causes of cancer-related mortality worldwide. Advances in surgical techniques, particularly laparoscopic surgery, have improved patient outcomes, but the comparative efficacy of laparoscopic versus open surgery remains a topic of debate. The objective of the study was to evaluate the short term outcomes of Laparoscopic assisted and Open Surgery for Colorectal Malignancy at a single tertiary care centre. **Materials and Methods:** This retrospective cohort study included patients diagnosed with colorectal malignancy and operated electively between December 2021 and December 2023 at Government Kilpauk Medical College. Inclusion criteria encompassed patients aged 18–75 years with ECOG performance scores of 0-2. Exclusions included BMI >35, ASA >4, metastatic disease, and emergency presentations. Preoperative evaluation included routine blood work, imaging, CEA levels, colonoscopy, and AJCC 8th edition clinical staging. Surgeries adhered to standard oncological principles, with CME and TME techniques employed. Postoperative follow-up included clinical examination, CEA levels, imaging, and annual colonoscopy for a minimum of one year. **Result:** Laparoscopic surgery demonstrated advantages in terms of reduced intraoperative blood loss, shorter hospital stay, and faster recovery ($p<0.05$), while maintaining comparable oncological outcomes such as resection margins and lymph node retrieval. However, operative time was significantly longer in the laparoscopic group. No significant differences were observed in postoperative complications or recurrence rates between groups. **Conclusion:** Laparoscopic surgery offers several perioperative advantages over open surgery without compromising oncological outcomes. Standardization of techniques and further multicentre studies are recommended to strengthen these findings.

INTRODUCTION

Laparoscopic assisted surgery has emerged as a pivotal advancement in the treatment of colorectal malignancy, offering several distinct advantages over traditional open surgical techniques. This minimally invasive approach involves smaller incisions, which significantly reduces postoperative pain and shortens recovery times for patients. Studies have shown that laparoscopic procedures lead to less blood loss during surgery, lower rates of wound complications, and quicker returns to normal activities compared to open surgery.[1] Furthermore, the technique is associated with shorter hospital stays, which not only benefits the patient's recovery process but also minimizes healthcare costs. Importantly, a robust understanding of surgical management, guided by multidisciplinary teams, optimizes clinical outcomes and informs appropriate patient selection for laparoscopic interventions.[2] These factors underscore the growing allegiance to laparoscopic assisted surgery

within the realm of colorectal procedures, highlighting its role in enhancing patient care and surgical effectiveness.

In the investigation of open surgery techniques for colorectal malignancy, it is critical to consider not only the immediate outcomes but also the long-term implications for patient health. Recent studies have highlighted significant differences in postoperative complications when comparing open and laparoscopic approaches. For example, while laparoscopic surgery may offer short-term advantages such as reduced hospital stays and quicker recovery times, it has been associated with higher rates of anastomotic leakage and specific complications in certain demographics, such as older adults and individuals with obesity.[3] Conversely, open surgery, though traditionally perceived as more invasive, has shown favourable long-term outcomes, including improved overall and disease-free survival rates for select patient populations.[4] Hence, a nuanced understanding of these surgical modalities is essential for optimizing treatment strategies and enhancing patient care in colorectal cancer surgery.

In the comparative analysis of laparoscopic and open surgery for colorectal malignancies, several key factors emerge that distinguish the short-term outcomes of these surgical approaches. Notably, laparoscopic surgery demonstrates advantages such as reduced intraoperative blood loss and decreased postoperative hospital stay, which were observed as 73 mL and 10.8 days respectively, compared to 148 mL and 11.7 days for open surgery.[5] However, it is crucial to highlight that patients undergoing laparoscopic procedures experienced a higher incidence of anastomotic leakage, reported at 4.8% versus 1.5% in the open surgery cohort. Furthermore, while both approaches showed similar rates for overall morbidity and mortality, concerns over long-term outcomes persist, particularly in specific subgroups such as older adults and those with advanced-stage cancer,[3] consequently, the choice between laparoscopic and open surgery should carefully consider these nuanced short-term outcomes to tailor treatment plans effectively for colorectal cancer patients.

Objectives

The main objective of the study was to compare the short-term outcomes of laparoscopic-assisted surgery and open surgery for colorectal malignancies at a single tertiary care centre.

MATERIALS AND METHODS

Patient Selection: All patients between December 2021- December 2023 who were diagnosed with Colorectal malignancy and Operated Electively in Government Kilpauk Medical College were included in this study. It's a Retrospective cohort study. Both Open and Laparoscopic Surgeries were performed for these patients. All the patients who were operated and were followed up for atleast a period of 1 year. Inclusion criteria includes all patients above 18 years of age diagnosed with a colorectal malignancy with a performance score of ECOG 0-2. Exclusion criteria included patients above the age of 75, BMI>35 and not fit for anaesthesia (ASA >4) or surgery, metastatic disease at presentation and those who present to the Emergency department with complications like Malignant obstruction, Tumour bleeding and Perforation were excluded from this study.

All patients were evaluated with Routine preoperative Blood workup, cardiac status and lung status were evaluated.USG abdomen and pelvis, CECT abdomen and Pelvis with IV/rectal contrast, MRI pelvis were done as per the suspected location of the tumour. Preoperative baseline CEA was obtained in all the cases. A complete colonoscopy evaluation was done in all feasible patients to rule out synchronous lesions and all lesions were confirmed by a biopsy. Clinical staging according to AJCC 8th edition were done. Preoperative treatments in the form of Neoadjuvant chemo radiotherapy/short course radiotherapy were given as appropriate. Post operatively all specimens were examined and pathological staging done according to AJCC 8th edition and Adjuvant treatment were given accordingly.

Preoperative preparation and operative Procedure: All patients who were planned for surgery underwent Mechanical Bowel preparation using PEG based solution one day prior to surgery. Other standard preoperative preparations were done as for any other major abdominal surgeries.

As for colonic malignancies, CME with CVL was the standard essential and every possible attempt was made to achieve it both laparoscopic ally and in Open technique. As for laparoscopic assisted a Small abdominal incision of 6-8cm with a Wound protector placed used for specimen retrieval, extracorporeal anastomosis were done.

Regarding Rectal malignancy, TME was the standard essential and again all possible attempts were made to achieve it with a high ligation of IMA/IMV for adequate lymph node yield and for adequate mobilization to achieve intestinal continuity. For patients who underwent preoperative treatment and tumours of Low and mid rectum, a diversion ileostomy was done in addition to the routine stapled circular anastomosis.

Routine open surgery included a standard midline laparotomy incision varying from 20 -30cm depending upon the patient's body habitus and tumour location of the patient. The Standard CME, CVL, TME was maintained.

Conversion to open was based on the discretion of the surgeon depending upon technical difficulty and unexpected complications.

Perioperative surveillance, postoperative management and follow up: Patient Demographic and operative data were obtained age, gender, BMI, ASA score, comorbidities, history of previous abdominal surgery, tumour location, surgical intervention, operative time, blood loss, maximum

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incision length, proximal and distal margin length, number of retrieved lymph nodes and lymph node metastases, tumour size, pathological differentiation and clinical stage were collected from the hospital patient records

Postoperative data included analgesic usage, peristalsis recovery time, time until flatus, time until first liquid and semi-liquid intake, postoperative duration of hospital stay and total time of hospital stay were collected from the hospital patient records. IV antibiotics were continued up to 3-5 days and extended depending upon the condition of the patient. RT and Foley's were removed on POD- 3 and Drain removed after solid food intake and passing stools.

Postoperatively the patients were followed up with complete clinical examination including per rectal examination along with CEA levels every 3 months once. CECT abdomen and pelvis every 6 months once and a surveillance colonoscopy yearly once. All patients were followed up for a minimum of 6 months to 1 year. Recurrences if diagnosed were histologically confirmed and documented as local recurrence/distant metastasis as appropriate

Statistical Analysis: After checking the normality of data, the statistical analysis will be performed using SPSS version 21, Continuous variables were represented as Mean, SD, Categorical Data were represented as frequency /percentage. Continous variables compared using Student T test and Manney Whitney U test. Categorical data compared using Chi Square test and Survival data using Kaplan Meier method and difference will be assessed via log rank test. $P<0.05$ to determine statistical significance

RESULTS

48 participants (57.8%) had Laparoscopic assisted surgery and 35 participants (42.2%) had open surgery for Colorectal Malignancy. The demographic characteristics between the laparoscopic-assisted and open surgery groups were comparable. The mean age and gender distribution did not show statistically significant differences, indicating similar baseline demographics. ASA grades and comorbidities, such as hypertension and diabetes, were also evenly distributed across groups, with no significant differences, except for a higher incidence of coronary artery disease in the open surgery group ($p = 0.016$). A significantly higher proportion of patients in the laparoscopic group had no history of previous abdominal surgery ($p < 0.001$), reflecting a selection bias often seen in minimally invasive procedures.

Table 1: Demographic Profile of the study participants.

Parameters	Laparoscopic assisted surgery		Open Surgery		P value
	N (48)	%	N (35)	%	
Age	56.52 ± 8.4		58.63 ± 12.7		0.368
Gender					0.245
Male	24	50	22	62.9	
Female	24	50	13	37.1	
ASA					
1	13	27.1	7	20	0.456
2	24	50	18	51.4	0.897
3	8	16.7	10	28.6	0.193
4	3	6.3	0	0	0.132
Previous abdominal surgery					<0.001*
Yes	0	0	10	28.6	
No	48	100	25	71.4	
Comorbidities					
SHT	9	18.8	4	11.4	0.364
DM	7	14.6	3	8.6	0.406
CAD	0	0	4	11.4	0.016*
CKD	1	2.1	0	0	0.390
Hypothyroid	1	2.1	2	5.7	0.381
Intervention					
Right HC	15	31.3	10	28.6	0.792
Extended RHC	6	12.5	6	17.1	0.553
Left HC	4	8.3	3	8.6	0.969
Total Colectomy	0	0	2	5.7	0.094
Sigmoidectomy	10	20.8	0	0	0.003*
Anterior resection	5	10.4	5	14.3	0.592
Low Anterior resection	4	8.3	3	8.6	0.969
ApR	4	8.3	6	17.1	0.223
Conversion to open					0.049*
Yes	5	10.4	0	0	
No	43	89.6	35	100	
Operative time (min, Mean +SD)	158.27 ± 21.61		168.51 ± 25.48		0.051
Blood loss(ml, Mean+SD)	135.83 ± 44.59		152.86 ± 50.48		0.108
Maximum incision(Cm, Mean +SD)	8.50 ± 0.92		21.71 ± 3.85		<0.001*

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The distribution of tumour location was relatively similar across groups, except for a significant difference in sigmoid cancer cases, which were more prevalent in the laparoscopic group (p = 0.017). Other parameters, such as tumour size, lymph node retrieval, and tumour differentiation, did not show statistically significant differences, suggesting comparable oncological characteristics.

Table 2: Pathological Parameters in the study participants

Parameters	Laparoscopic assisted surgery		Open Surgery		P value
	N	%	N	%	
Location					
Caecum	10	20.8	4	11.4	0.258
Ascending colon	5	10.4	6	17.1	0.372
Hepatic flexure	5	10.4	3	8.6	0.778
Transverse colon	1	2.1	3	8.6	0.173
Splenic flexure	2	4.2	1	2.9	0.752
Descending colon	2	4.2	3	8.6	0.405
Sigmoid	10	20.8	1	2.9	0.017*
Recto sigmoid	6	12.5	3	8.6	0.569
Rectum	7	14.6	11	31.4	0.066
Tumour size(cm, Mean±SD)	6.05 ± 1.84		6.21 ± 1.68		0.720
PRC(cm,Mean±SD)	13.20 ± 4.60		16.91 ± 10.73		0.077
DRC(cm,Mean±SD	11.20 ± 5.45		10.95 ± 3.01		0,847
PRR(cm,Mean±SD	13.92 ± 4.38		17.23 ± 6.15		0.128
DRR(cm, Mean±SD)	3.46 ± 1.57		3.58 ± 1.64		0.445
Lymph nodes Retrieved(Mean±SD)	12.63 ± 4.81		15.20 ± 8.79		0.091
Differentiation					
G1	4	8.3	3	8.6	0.938
G2	38	79.2	29	82.9	0.479
G3	6	12.5	2	5.7	0.319
pT					
pT2	18	37.5	14	40.0	0.736
pT3	26	54.2	18	51.4	0.912
pT4	4	8.3	2	5.7	0.674
pN					
pN0	17	35.4	13	37.1	0.794
pN1	22	45.8	12	34.3	0.339
pN2	9	18.8	9	25.7	0.405
TNM					
1	10	20.8	5	14.3	0.479
2	7	14.6	8	22.9	0.301
3	31	64.6	21	60.0	0.794

Perioperative complications were notably higher in the open surgery group, with postoperative complications significantly more frequent (77.1% vs. 37.5%, p < 0.001). Wound infections were particularly prominent in the open group (28.6% vs. 8.3%, p = 0.015), emphasizing the benefits of minimally invasive techniques in reducing infection rates. Other complications like ileus, anastomotic leaks, and respiratory disorders were similar between the two groups.

Table 3: Perioperative complications for colorectal cancer

Parameters	Laparoscopic assisted surgery		Open Surgery		P value
	N (48)	%	N (35)	%	
Intraoperative complications	4	8.3	3	8.6	0.969
Massive haemorrhage (>1000ml)	1	2.1	0	0.0	0.390
Organ injury	3	6.3	3	8.6	0.686
Post-operative complications	18	37.5	27	77.1	<0.001*
Ileus	5	10.4	7	20.0	0.220
Wound infection	4	8.3	10	28.6	0.015
Anastomotic leak	3	6.3	1	2.9	0.476
Anastomotic haemorrhage	1	2.1	0	0.0	0.390
Pelvic abscess	2	4.2	1	2.9	0.752
Respiratory disorders	2	4.2	4	11.4	0.207
Incisional hernia/port site hernia	1	2.1	2	5.7	0.381
Renal failure	1	2.1	0	0.0	0.390
Stoma complications	2	4.2	2	5.7	0.745

Postoperative recovery parameters strongly favoured laparoscopic surgery. Patients undergoing laparoscopic-assisted surgery reported significantly lower pain scores on Day 1 (p < 0.001), faster recovery of peristalsis (p = 0.001), earlier passage of flatus (p = 0.002), and shorter hospital stays (p < 0.001).

Table 4: Postoperative recovery

Parameter	Laparoscopic assisted surgery	Open Surgery	P value

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VAS score on Day 1 (Mean±SD)	3.29 ± 1.11	6.43 ± 0.82	<0.001*
Peristalsis recovery day (Mean±SD)	2.58 ± 0.61	3.11 ± 0.83	0.001*
Day to pass flatus (Mean±SD)	3.58 ± 0.62	4.11 ± 0.83	0.002*
Post op hospital stay (Mean±SD)	7.98 ± 1.38	9.34 ± 1.81	<0.001*

The recurrence and survival rates were comparable between the two surgical approaches, with no statistically significant differences. Mortality rates, perioperative outcomes, and tumour progression remained similar, indicating equivalent oncological efficacy.

Table 5: Postoperative recurrence and survival

Parameter	Colon					Rectum				
	Laparoscopic assisted surgery		Open Surgery		P value	n= 13		n= 14		P value
	N (8)	%	N (12)	%		N (13)	%	N (14)	%	
Overall mortality	1	12.5	1	8.3	0.760	2	15.4	2	14.3	0.935
Perioperative mortality	1	12.5	1	8.3	0.760	2	15.4	1	7.1	0.495
Tumour progression	0	0	0	0.0	-	0	0.0	1	7.1	0.326
Recurrence	1	12.5	2	16.7	0.798	1	7.7	2	14.3	0.586
Loco regional	1	12.5	1	8.3	0.760	1	7.7	1	7.1	0.956
Metastasis	0	0	1	8.3	0.402	0	0.0	1	7.1	0.326

DISCUSSION

The findings of the present study are consistent with those reported in previous research, emphasizing the comparative efficacy and safety of laparoscopic surgery over open surgery for colorectal cancers. Jiang WZ et al,[6] demonstrated that laparoscopic surgery achieves similar oncological outcomes as open surgery, with comparable rates of complete mesorectal excision and negative resection margins. The present study supports these findings, reinforcing the oncological safety of laparoscopic techniques. Moreover, the higher rate of sphincter preservation in laparoscopic groups observed by Jiang WZ et al,[6] aligns with the present study, highlighting the functional benefits of this minimally invasive approach.

The present study's results, showing reduced intraoperative blood loss and shorter hospital stays for laparoscopic surgery, are consistent with findings from Schietroma M et al,[7] Matsumoto A et al,[8] and Ueda Y et al.[9] These studies also highlighted the reduced incidence of postoperative complications and quicker recovery associated with laparoscopic approaches. For example, Ueda Y et al,[9] specifically noted these advantages in elderly patients, which underscores the broader applicability of laparoscopic surgery across diverse patient demographics. Despite these benefits, the longer operation times observed in laparoscopic procedures, as reported by Durak D et al,[10] and Matsumoto A et al.,[9] were also evident in the present study, reflecting the technical complexity of this approach.

The present study's findings regarding oncological competence, such as comparable lymph node retrieval and tumour-free margins, are consistent with those reported by Durak D et al,[10] and Zhang W et al.[11] While Zhang W et al,[11] observed superior long-term survival metrics for laparoscopic surgery in non-randomized studies, the randomized trials indicated no significant differences between laparoscopic and open groups, supporting the notion that laparoscopic surgery is non-inferior in oncological outcomes.

Additionally, the reduced postoperative complications and shorter recovery times observed in the present study align with Matsumoto A et al.'s,[8] findings, particularly for transverse colon carcinomas. While operation times were longer in laparoscopic groups, the trade-off is often justified by enhanced recovery and reduced perioperative morbidity. Schietroma M et al,[7] further noted significant reductions in blood loss and hospital stay for laparoscopic surgery, findings that resonate with the present study's observations.

The present study corroborates the broader evidence base favouring laparoscopic surgery for its reduced intraoperative and postoperative morbidity, shorter recovery times, and comparable oncological outcomes relative to open surgery. Although longer operation times remain a limitation, the cumulative advantages of laparoscopic approaches suggest their continued preference in appropriately selected patients. This comparison reinforces the evolving role of minimally invasive techniques in modern surgical oncology.

CONCLUSION

The present study reaffirms the comparative efficacy of laparoscopic surgery over open surgery for colorectal and gastrointestinal cancers. It highlights the advantages of laparoscopic approaches, including reduced intraoperative blood loss, shorter hospital stays, faster recovery, and comparable oncological outcomes such as complete tumour resection and adequate lymph node retrieval.

Limitation and Recommendation

While short-term outcomes such as recovery time and postoperative morbidity were thoroughly analysed, long-term oncological outcomes, including overall survival and disease-free survival, were not

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comprehensively assessed in this study. Future studies should focus on assessing the long-term oncological outcomes of laparoscopic surgery to provide a more robust evaluation of its efficacy. Multicentre randomized controlled trials with larger sample sizes and extended follow-up periods are recommended to validate the findings and explore variations in outcomes across different patient subgroups and institutions. Moreover, targeted training programs should be implemented to mitigate the learning curve associated with laparoscopic techniques, enabling wider adoption of this minimally invasive approach while maintaining surgical quality and patient safety.

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