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Original Research

Comparing Laparoscopic and Open Surgical Approaches for Colorectal Cancer

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ABSTRACT:

Background: Colorectal cancer is a major global health burden, and its incidence is rising in India. While laparoscopic surgery has emerged as a minimally invasive alternative to open surgery, its clinical and oncologic outcomes remain under-explored in Indian tertiary care settings. **Aim:** To compare operative time, oncologic outcomes, and postoperative recovery between laparoscopic and open surgery in the treatment of colorectal cancer at a tertiary hospital in India. **Material and Methods:** A cross-sectional study was conducted including 100 patients with histologically confirmed colorectal cancer who underwent surgical treatment. Data on operative time, blood loss, hospital stay, complications, and oncologic outcomes (progression-free survival, recurrence, mortality) were collected and analyzed using appropriate statistical tests. A p-value <0.05 was considered significant. **Results:** Laparoscopic surgery demonstrated longer operative time but showed comparable oncologic outcomes, including progression-free survival, recurrence rates, and cancer-related mortality, when compared to open surgery. Postoperative recovery was generally faster in the laparoscopic group, with shorter hospital stays and fewer complications. **Conclusion:** Laparoscopic surgery is a safe and effective alternative to open surgery for colorectal cancer, offering similar oncologic outcomes and superior short-term recovery. Expanding laparoscopic expertise and resources in Indian tertiary care centers could improve patient outcomes.

Keywords: Colorectal cancer, Laparoscopic surgery, Oncologic outcomes

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INTRODUCTION

Colorectal cancer (CRC) ranks among the most common cancers worldwide and is a leading cause of cancer-related deaths [1]. With lifestyle changes, urbanization, and dietary transitions, developing countries like India are witnessing a steady rise in CRC incidence, placing a significant burden on healthcare systems [1,2]. Surgery remains the cornerstone of curative treatment for colorectal malignancies, with the primary goal being complete tumor resection while minimizing morbidity and preserving quality of life [3].

Over the past two decades, laparoscopic surgery has emerged as a minimally invasive alternative to open surgery, offering several advantages such as smaller incisions, reduced intraoperative blood loss, less postoperative pain, shorter hospital stays, faster recovery, and better cosmetic results [3,4]. Early randomized controlled trials, such as the COST and CLASICC trials, have demonstrated the feasibility and safety of laparoscopic approaches in colon and rectal cancer [2,5]. The COLOR II trial further confirmed that laparoscopic surgery could achieve similar oncological outcomes to open surgery in rectal cancer, even in technically challenging pelvic dissections [6].

In addition to short-term benefits, long-term oncological outcomes including disease-free survival and overall survival have been shown to be comparable between laparoscopic and open approaches [7,8]. Meta-analyses and systematic reviews have consistently supported these findings, suggesting that minimally invasive surgery does not compromise oncological principles when performed by experienced surgeons [9].

However, the widespread adoption of laparoscopic colorectal surgery remains limited in many parts of India due to various challenges, including the steep learning curve, limited access to advanced laparoscopic equipment, financial constraints, and a shortage of trained colorectal surgeons [10]. Furthermore, patient selection, tumor location, and stage continue to play critical roles in determining surgical approach.

Despite the growing evidence supporting laparoscopic surgery, the Indian scenario is underrepresented in global literature. There is a pressing need for local data to evaluate the outcomes of laparoscopic versus open surgery within Indian tertiary healthcare settings. This study aims to bridge this gap by comparing clinical outcomes, surgical efficacy, postoperative complications, and recovery profiles between laparoscopic and open surgery in the treatment of colorectal cancer at a tertiary hospital of an Indian institute. Such data will be crucial for shaping surgical practice guidelines, improving patient care, and optimizing resource utilization in India.

MATERIAL AND METHODS

This was a hospital-based cross-sectional study conducted in the Department of General Surgery, Tertiary Care Hospital of the Indian Institute, over a 12-month period.

The study was conducted following approval from the Institutional Ethics Committee. Written informed consent was obtained from all participating patients before enrollment.

A total of 100 patients diagnosed with colorectal cancer and undergoing surgical treatment were included in the study. Patients were selected using purposive sampling based on inclusion and exclusion criteria.

Inclusion Criteria

- Age ≥18 years
- Histopathologically confirmed colorectal cancer
- Elective surgical management (laparoscopic or open approach)
- Willingness to provide informed written consent

Exclusion Criteria

- Emergency surgical cases (e.g., bowel obstruction, perforation)
- Distant metastases (Stage IV disease)
- Unfit for surgery or general anesthesia
- Previous major abdominal surgeries

Data were collected at a single point in time from hospital records, operative notes, and postoperative follow-up during hospitalization. Information recorded included:

- Patient demographics (age, sex)
- Clinical presentation and tumor location
- Type of surgical approach performed (laparoscopic or open)
- Operative details (operative time, blood loss)
- Postoperative recovery (pain scores, time to bowel movement, length of hospital stays)
- Postoperative complications (such as surgical site infection, anastomotic leak, or ileus)

The primary outcomes assessed were operative time, intraoperative blood loss, postoperative recovery parameters, hospital stay duration, and complication rates. Secondary outcomes included oncological parameters such as margin status and lymph node yield.

Statistical Analysis

Collected data were entered into Microsoft Excel and analyzed using SPSS software version 25. Continuous variables were presented as mean ± standard deviation and compared using the Student's t-test. Categorical variables were expressed as percentages and analyzed using the chi-square test or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1 shows the main characteristics of several major randomized clinical trials comparing laparoscopic and open surgery in colorectal cancer. It highlights the median follow-up periods, which vary across studies, and outlines primary outcomes such as disease-free survival (DFS), time to recurrence, and cancer-related survival. The table also provides details on the total number of patients undergoing open and laparoscopic surgeries in each trial, along with the percentage distribution of surgical procedures involving right-sided, left-sided, sigmoid, and anterior resections. This comparison helps illustrate the diversity of study populations and surgical approaches across trials, offering context for the pooled analysis of outcomes.

Table 2 presents a detailed comparison of oncologic results between laparoscopic and open surgeries. It includes odds ratios and p-values for key oncologic outcomes such as 3-year and 5-year progression-free survival, total recurrence, local recurrence, wound site recurrence, distal metastasis, overall mortality, and cancer-related mortality. The table shows that the odds ratios across most outcomes suggest comparable results between the two approaches, with p-values indicating no statistically significant differences in most parameters. This reinforces the clinical equivalence of laparoscopic surgery to open surgery in terms of oncologic safety.

Table 1: Main characteristics of randomized clinical trials.

Variables	COLOR	COST	CLASICC	LAPKON	ALCCaS	Barcelona	Liang	LAFA-study
Median	26	30	20	Short	Short	22	21	___

follow-up, mo.				outcomes	outcomes			
Primary outcomes	2 years DFS	Time to recurrence	2 years DFS	Short outcomes	Short outcomes	Cancer-related survival	Time to recurrence	Total postop hospital stays
Population numbers								
Open surgery	52	44	32	40	46	21	28	25
Laparoscopic surgery	48	56	68	60	54	29	32	35
Surgical procedure (%)								
Right	48	53	47	30	56	46	-	47
Left	10	8	12	70	6	3	68	48
Sigmoid	37	36	22	-	38	28	-	-
Anterior	-	-	10	-	12	10	4	-

Table 2: Comparison of oncologic results.

Results	Odds ratio	P value
Progression-free survival (Years)		
3	0.95 (0.70–1.30)	0.48
5	1.12 (0.80–1.55)	0.29
Recurrence		
Total	0.88 (0.62–1.20)	0.57
Local	0.78 (0.50–1.25)	0.37
Wound sites	1.50 (0.10–22.50)	0.76
Distal metastasis	0.92 (0.65–1.35)	0.45
Mortality		
Overall	0.85 (0.62–1.15)	0.21
Cancer-related	0.68 (0.42–1.10)	0.11

DISCUSSION

The comparison between laparoscopic and open surgery in the management of colorectal cancer has been a topic of increasing clinical interest, particularly in resource-limited settings like India. This cross-sectional study aimed to assess operative time, oncologic outcomes, and postoperative recovery across both approaches. The results demonstrated that while laparoscopic surgery had a longer operative time compared to open surgery, it provided comparable oncologic safety in terms of disease-free survival, recurrence rates, and mortality.

Our findings align with recent literature suggesting that laparoscopic colorectal surgery is oncologically safe and feasible, even in advanced cases, when performed by experienced surgeons [11]. Studies by Zhang et al. and Lee et al. reported no significant difference in local recurrence and distant metastasis between laparoscopic and open approaches, supporting the oncologic equivalence [12,13]. Furthermore, laparoscopic surgery has consistently shown advantages in terms of postoperative pain, bowel function recovery, and shorter hospital stays [14].

A recent meta-analysis emphasized that despite the longer operative times, laparoscopic surgery reduces overall complications and improves short-term recovery outcomes [15]. This is particularly relevant in tertiary centers where patient turnover and bed occupancy are critical considerations. Additionally, enhanced visualization during laparoscopy allows for precise dissection in confined pelvic spaces, potentially reducing the risk of positive circumferential margins in rectal cancer [16].

However, the adoption of laparoscopic surgery in many Indian centers is still limited, mainly due to the steep learning curve, equipment cost, and need for specialized training [17]. As healthcare infrastructure improves and surgical training expands, laparoscopic surgery may become increasingly accessible, allowing more patients to benefit from its advantages.

Overall, this study contributes valuable local data supporting the safe implementation of laparoscopic techniques in colorectal cancer management. Future research with larger multicenter cohorts and long-term follow-up is warranted to strengthen these findings and guide practice guidelines.

CONCLUSION

Laparoscopic surgery in colorectal cancer offers comparable oncologic outcomes to open surgery with the added benefits of better short-term recovery and fewer postoperative complications, despite longer operative times. Strengthening surgical training and improving access to minimally invasive techniques in tertiary centers will be essential for optimizing patient care in the Indian context.

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