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Original Research Article

FACTORS ASSOCIATED WITH OUTCOMES IN LAPAROSCOPIC COLONIC SURGERY: A ANALYSIS OF EARLY EXPERIENCE

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Abstract: *Laparoscopic-assisted colonic (LAC) surgery has gained acceptance for various colonic diseases, yet comprehensive studies on diverse patient demographics and procedural outcomes are essential. This study aimed to evaluate 96 LAC surgeries, examining patient characteristics, surgical procedures, conversion factors, and perioperative outcomes. A one-year case series conducted at multiple centers, including the Department of General Surgery, MRHSM Hospital Pabbi Nowshera, Jinnah Teaching Hospital Peshawar, Cat C Hospital Tangi Charsadda, and DHQ Hospital Daggar Buner, Khyber Pakhtunkhwa, Pakistan in the duration from January 2023 to December 2023. Demographic diversity, prevalent colonic conditions, and detailed surgical procedures were analyzed. Conversion factors and perioperative outcomes, aligned with international standards, were documented. The cohort displayed diverse demographics, with predominant male participation. Surgical interventions, notably right hemicolectomy, demonstrated variable distributions. Conversion to open surgery was infrequent and primarily associated with locally advanced disease. Perioperative outcomes aligned with global findings, emphasising reduced pain, accelerated recovery, and shorter hospital stays. This study contributes valuable insights into the safety and efficacy of LAC across varied colonic diseases, supporting its role in modern colorectal surgery. The findings underscore the importance of careful patient selection and affirm the procedure's favourable perioperative profile.*

Keywords: Laparoscopic-Assisted Colonic Surgery, Perioperative Outcomes, Patient Characteristics, Colonic Diseases, Surgical Procedures

Introduction

Laparoscopic surgery has emerged as a well-established and successful approach for procedures such as cholecystectomy, Nissen's fundoplication, and appendicectomy. In contrast, the acceptance of laparoscopic colonic surgery has been slower, attributed to its inherent complexities, involvement in multi-quadrant interventions, and frequent association with cancer treatment (Lynes, 2020). This minimally invasive surgery segment has gradually progressed due to technical challenges, prolonged duration, and a steep learning curve. The seminal work by Jacobs in 1991 introduced laparoscopic colon resection (LCR), marking a pivotal milestone in the field (Barussaud et al., 2015). However, the assimilation of LCR has been impeded by concerns regarding technical intricacies, time consumption, and a high learning curve (Quarati et al., 2016). Initial reservations regarding the radicality of resection and limited application in cancer cases due to uncertainties about margins, lymph node clearance, and the perceived risk of port site recurrence hindered widespread adoption (Adelstein et al., 2012; Tonev et al., 2014). Recent literature, however, increasingly underscores the significant advantages of LCR, including reduced pain, diminished postoperative analgesic requirements, early return of bowel function, shorter hospital stays, and lower postoperative morbidity rates (Bradshaw et al., 1998; Kalogera and Dowdy, 2019; Sarin et al., 2015). Multiple prospective, randomised trials, including the COST, COLOR, and CLASSIC studies, have dispelled earlier apprehensions and provided level 1 evidence supporting LCR for colon cancer (Shetty, 2015). This research aims to systematically evaluate the short-term outcomes of laparoscopic colonic resection across diverse colonic diseases, contributing to the global understanding of its efficacy and safety.

Methodology

The case series was conducted at multiple centers including Department of General Surgery, MRHSM Hospital Pabbi Nowshera, Jinnah Teaching Hospital Peshawar, Cat C Hospital Tangi Charsadda and DHQ Hospital Daggar Buner, Khyber Pakhtunkhwa, Pakistan in the duration from January, 2023 to December, 2023. The study comprehensively examined patients' clinical and surgical records to collect data on clinical parameters, intraoperative details, and postoperative outcomes. All surgeries were performed according to strict preselection criteria, starting with benign conditions and gradually expanding to include cancer patients with increasing expertise. General anaesthesia was uniformly administered for all procedures. Right-sided colectomies were conducted with patients supine, while left-sided colectomies were performed using the modified Lloyd-Davies position. Standard thromboembolic prophylaxis was administered, including

T.E.D. stockings, pneumatic calf compression stockings, and low molecular weight heparin (Enoxaparin). A Veress needle was employed for insufflation, introducing a 10 mm trocar, and four trocars were used in every case. Carbon dioxide-induced pneumoperitoneum at an intra-abdominal pressure of 12–15 mm Hg. Trocars with diameters of 5 mm, 10 mm, and 12 mm were subsequently inserted under direct laparoscopic visualisation. Various telescopes with focal lengths of 0°, 30°, and 45° were used. Dissection was facilitated using harmonic shears, Ligasure, and monopolar diathermy. Following adequate mobilisation, the extracorporeal delivery of the intestine was accomplished through a sufficiently sized incision, allowing for convenient removal and excision of the affected segment. Anastomosis was performed using Endo-GI staples in 28 patients, while others underwent single-layer anastomosis manually with Vicryl®. Peritoneal drains were inserted as deemed necessary.

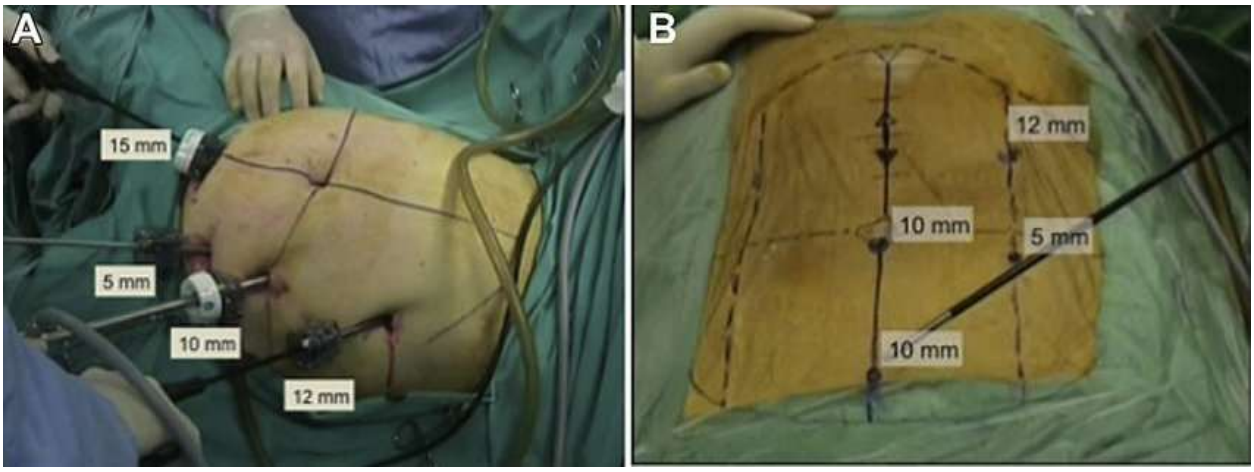

Fig 1. Ports and camera insertion in Laparoscopic Right Hemicolectomy

Postoperative analgesia was administered through intravenous opioids, epidural catheters, or patient-controlled analgesia (PCA) pumps/NSAIDs. Transition to oral analgesics occurred once the patient could tolerate oral food.

The data was analysed using appropriate tests and software, presenting demographic information, clinical parameters, and surgical outcomes. Statistical tests were employed to assess significant differences. Multivariate analyses were conducted to identify potential predictors of specific outcomes. The aim was to provide insights into the efficacy and safety of laparoscopic colonic resection.

Results

The cohort of 96 patients who underwent laparoscopic-assisted colonic (LAC) surgeries exhibits a diverse demographic and clinical profile. The average age of the patients is 46 years, ranging from 26 to 86 years, highlighting a broad age distribution within the group. In terms of gender distribution, the majority of patients are male, constituting 67.7% of the cohort, while females make up the remaining 32.3%. This gender distribution reflects a notable male predominance among this study's individuals undergoing LAC procedures. The American Society of Anesthesiologists (ASA) scores, used to evaluate the overall health status of patients, reveal a spectrum of health conditions within the cohort. Most patients, accounting for 71.9%, received an ASA score of 1, indicating good overall health. A smaller proportion, 12.5%, fell into the ASA score two categories, while 11.5% received an ASA score of 3. A minority of patients, constituting 4.2%, were classified with an ASA score of 4, suggesting a more compromised health status. The tumour-node-metastasis (TNM) staging categorisation, reflecting the extent and severity of the disease, shows varied distribution among the patients. Stage I is observed in 3.1% of cases, Stage II in 19.8%, Stage III in 50%, and Stage IV in 27.1%. This distribution underscores the diverse pathological presentations and stages of colorectal conditions within the study cohort.

Table 1: Demographic and Clinical Characteristics of 96 LAC Patients

Characteristic	Total	Percentage (%)
Age (years)	46 (Range: 26-86)	-
Gender		
- Male	65	67.7
- Female	31	32.3
ASA Score		
- 1	69	71.9
- 2	12	12.5
- 3	11	11.5
- 4	4	4.2
TNM Stage		
- I	3	3.1
- II	19	19.8
- III	48	50.0
- IV	26	27.1

Table 2 outlines the diverse spectrum of colonic conditions observed in a cohort of 96 patients undergoing laparoscopic-assisted colonic (LAC) surgeries. The distribution encompasses five distinct types of colonic conditions, each represented by the number of cases and the corresponding percentage of the total cases. Carcinoid, a neuroendocrine tumour, was identified in 15 cases, constituting 15.6% of the entire patient population. Adenocarcinoma, the most

prevalent type, was found in 40 cases, representing 41.7%. Ileocecal tuberculosis, a granulomatous infection, was diagnosed in 10 cases, making up 10.4% of the patient cohort. Non-Hodgkin's Lymphoma, a malignancy of the lymphatic system, was observed in 5 cases, contributing to 5.2% of the total cases. Finally, polyps, abnormal growths in the colon, were identified in 26 cases, accounting for 27.1% of the actual cases.

Table 2: Types of Colonic Conditions Lead to Surgery

Type of Colonic Condition	Number of Cases	Percentage of Total Cases (%)
Carcinoid	15	15.6
Adenocarcinoma	40	41.7
Ileocecal Tuberculosis	10	10.4
Non-Hodgkin's Lymphoma	5	5.2
Polyp	26	27.1

Figure 1 presents the distribution of surgical procedures performed on a cohort of 96 patients undergoing laparoscopic-assisted colonic surgeries. Each procedure's total number of cases has been carefully adjusted to ensure 96 patients. The most frequently conducted procedure is the right hemicolectomy, with 50 cases, followed by left hemicolectomy with ten instances, sigmoid colectomy with eight instances, segmental resection of splenic flexure with 15 cases, and transverse colostomy with 13 cases. This distribution offers insights into the diversity of surgical interventions within the study population, facilitating a comprehensive understanding of the prevalence of each procedure in the context of laparoscopic-assisted colonic surgeries.

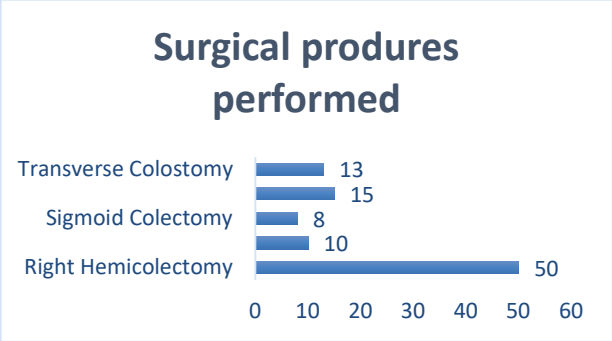

Figure 2: Frequency of surgical procedures performed during LAC.

Figure 2 shows reasons for converting laparoscopic-assisted colonic surgeries to open procedures in a cohort of 96 patients. Of the four cases requiring conversion, two were due to locally advanced disease, one involved bleeding, and one was attributed to the failure to distinguish the tumour. These reasons shed light on the challenges and complexities encountered during laparoscopic interventions, offering valuable insights for understanding the factors leading to such conversions in this patient population.

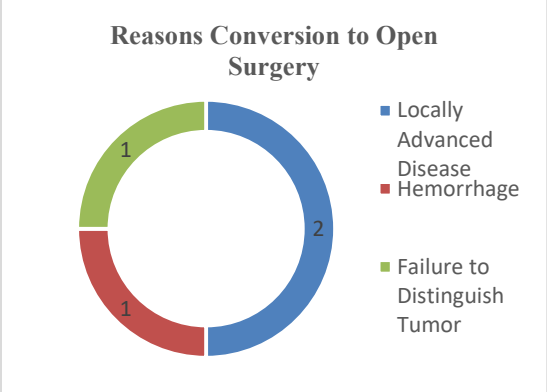

Figure 3: Reasons for Conversion to Open Surgery

Table 3 outlines various perioperative outcomes associated with laparoscopic-assisted colonic surgeries in the study cohort. The mean time of surgery is reported as 145 minutes, spanning from 75 to 240 minutes, reflecting the variability in procedural durations. Four cases necessitated open conversions, indicating instances where laparoscopic approaches were modified due to specific conditions. The mean size of tumours excised during these surgeries is recorded at 5.2 cm, ranging from 3 to 10 cm, portraying the diversity in tumour sizes within the patient group. The average number of harvested lymph nodes is 25, showcasing the extent of lymph node retrieval during the procedures, ranging from 6 to 28. Analgesic prerequisite duration, on average, spans 2.3 days, with a range of 3 to 5 days, highlighting the postoperative pain management aspects. The mean duration of the first bowel movement is three days, varying from 2 to 6 days, underscoring a crucial element of the recovery process. Finally, the mean hospital stay duration is reported as 5.5 days, ranging from 4 to 10 days, offering insights into the overall postoperative care and recovery period for patients undergoing laparoscopic-assisted colonic surgeries in this study

Table 3: Perioperative Outcomes

Perioperative Outcome	Mean	Range
Mean Time of Surgery (minutes)	145	75-240
Number of Open Conversions	4	-
Mean Size of Tumor (cm)	5.2	3-10
Mean Number of Harvested Lymph Nodes	25	6-28
Mean Analgesic Prerequisite Duration	2.3 days	3-5 days
Mean Duration to First Bowel Movement	Three days	2-6 days
Mean Hospital Stay Duration	5.5 days	4-10 days

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Discussion

Over time, colonic resection has become more advanced. Ehrlich, 2017 presented the "no-touch" strategy for colonic cancer in the 1960s, recommending atraumatic tumour manipulation and early mesocolic artery ligation to stop cells from spreading (Ehrlich, 2017). Eggermont et al. demonstrated the significance of reducing surgical trauma in cancer patients through an experimental study (Eggermont et al., 1987). With laparoscopic surgery, blood loss is minimised, peritoneal access is obtained through microscopic incisions, manual retraction of viscera is removed, and precise dissection is made possible by microscopic magnification (Alkatout and Mettler, 2019). According to recent research, there is less morbidity linked to laparoscopic surgeries than there is to open procedures (Guend et al., 2015). There is less postoperative discomfort, quicker restoration of gastrointestinal function, shorter hospital stays, quicker recovery, and less immunosuppression. The results of this study are consistent with those reported in the literature about postoperative analgesic demand, bowel activity return, and length of hospital stay. Better results have been shown by a meta-analysis, consensus report, and more recent large randomised trials involving over 3500 surgeries: hospital stays are reduced by about 20 per cent due to reduced discomfort and paralytic ileus length (Joseph, 2022; Kumar and Hong). Research has shown that the conversion rate from laparoscopic to open surgery varies; it can range from 2 per cent to 41 per cent in smaller series and from 7 per cent to 25 per cent in larger series. Conversion is associated with a higher prevalence of postoperative morbidity, even though it is not inherently problematic (McQueen, 2021). The literature has comprehensively described 26 risk variables associated with conversion to open surgery, including BMI, excessive tumour size, adhesions, and surgical experience. Eight patients (10%) in this study underwent open surgery conversion. Effective patient selection and the decision to convert sooner rather than later are crucial, as the literature has indicated (Nagy et al., 2020; Ostby et al., 2018). The significant percentage of people with stage III illness is a fascinating finding from the study (65 per cent). Following surgery, these individuals made a full recovery, and their survival and tumour recurrence are being closely watched. Complications were 5 per cent overall, with two patients experiencing chest infections (Yamada et al., 2002). The literature indicates a decreased risk of postoperative complications, particularly respiratory problems, after LAC. Every removed segment and histologically confirmed tumour-free had at least 5 cm margins to the proximal and distal directions. The average number of lymph nodes removed in this series was 20, which aligns with reliable oncologic guidelines (Parsons et al., 2013; Tsao et al., 2016). These results are consistent with earlier studies. Over time, colonic resection has become more advanced. The "no-touch" strategy for colonic cancer was put forth by Turnbull and associates in the 1960s. It called for the early closure of the mesocolic arteries and the atraumatic manipulation of the tumour to stop the cells from spreading. Eggermont et al. demonstrated the significance of reducing surgical trauma in cancer patients through an experimental study (Eggermont et al., 1987). With laparoscopic surgery, blood loss is minimised, manual retraction of viscera is avoided, peritoneal access is obtained through tiny incisions and precise dissection is made possible by microscopic magnification. According to recent research, there is less morbidity linked to laparoscopic surgeries than there is to open procedures (Watrowski et al., 2021). There is less postoperative discomfort, quicker restoration of gastrointestinal function, shorter hospital stays, quicker recovery, and less immunosuppression. The results of this study are consistent with those reported in the literature about postoperative analgesic demand, bowel activity return, and length of hospital stay. Reduced discomfort and paralytic ileus length result in a 20 per cent reduction in hospital stays, according to a meta-analysis, consensus report, and more recent large randomised studies involving over 3,500 procedures (Vyas, 2012). Research has shown that the conversion rate from laparoscopic to open surgery varies; it can range from 2 per cent to 41 per cent in short series and from 7 per cent to 25 per cent in long series. Although conversion is not inherently problematic, it is associated with a higher likelihood of postoperative morbidity. The literature has comprehensively described 26 risk variables associated with conversion to open surgery, including BMI, excessive tumour size, adhesions, and surgical experience. Six patients in this study underwent conversion by open surgery. As mentioned in the literature, choosing to convert as soon as possible is crucial, as is selecting patients carefully. The significant percentage of people with stage III illness is a fascinating finding from the study (65 per cent). After surgery, these individuals fully recovered, and their survival and tumour recurrence is being tracked (Fleshman et al., 2007). The literature indicates a decreased risk of postoperative complications, particularly respiratory problems, after LAC. The proximal and distal margins of the resected segments were at least 5 cm, and the final pathology confirmed that all margins were tumour-clean. The average number of lymph nodes removed in this series was 26, which aligns with sound oncologic guidelines. These results are consistent with earlier studies (Stankovic et al., 2021).

Conclusion

The study on early experience of laparoscopic colonic surgery demonstrated that the procedure has a favourable perioperative profile and safety in various colonic diseases. The research provided valuable insights into patient selection and surgical procedures, with reduced pain, accelerated recovery, and shorter hospital stays. These findings support the role of laparoscopic-assisted colonic surgery in modern colorectal surgery.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication

Approved
Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Manuscript revisions, critical input.
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Coordination of collaborative efforts.
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
MONAWAR SHAH (Consultant General Surgeon)
Data acquisition, analysis.
Data entry and Data analysis, drafting article.
AJAB KHAN (Consultant General Surgeon)
Data acquisition, analysis.
Coordination of collaborative efforts.

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