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ORIGINAL ARTICLE

Comparison of Outcomes of Laparoscopic Versus Open Resection in Colorectal Carcinoma with Obstruction

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ABSTRACT

Background: Colorectal carcinoma is among the leading malignancies worldwide, with obstruction being a common and serious presentation. Surgical resection remains the mainstay of treatment, traditionally performed through open surgery. With advances in minimally invasive techniques, laparoscopic resection has been increasingly utilized, though its role in obstructed cases remains debated.

Objectives: To compare the outcomes of laparoscopic versus open resection in patients with colorectal carcinoma presenting with obstruction.

Study Design & Setting: A comparative study was conducted at the Department of General Surgery, Sheikh Zayed Hospital Rahim Yar Khan from Jan 2023 to June 2023.

Methodology: A total of 130 patients with obstructed colorectal carcinoma were included, with 65 undergoing laparoscopic resection and 65 undergoing open resection. Perioperative parameters, postoperative complications, and recovery outcomes were recorded. Data were analyzed using SPSS version 26, with t-test and chi-square test applied. A p-value ≤ 0.05 was considered significant.

Results: The mean age was 56.0 ± 11.0 years, with a male predominance (56.9%). Duration of surgery was longer in the laparoscopic group (150.4 ± 25.2 vs. 135.6 ± 28.4 min, p = 0.004), but blood loss was significantly less (220.5 ± 80.6 vs. 310.3 ± 95.7 mL, p < 0.001). Wound infection was lower in laparoscopic cases (9.2% vs. 21.5%, p = 0.048). Return of bowel sounds, oral intake, and hospital stay were significantly earlier in laparoscopic patients (all p < 0.001). Mortality was low and comparable between groups.

Conclusion: Laparoscopic resection provided better short-term recovery outcomes than open resection while maintaining comparable safety in obstructed colorectal carcinoma.

Keywords: Anastomosis, Colorectal carcinoma, Laparoscopic resection, Obstruction, Open resection, Postoperative complications, Surgical outcomes

INTRODUCTION

Colorectal carcinoma (CRC) is one of the most prevalent malignancies worldwide and represents a major cause of cancer-related morbidity and mortality.[1] According to global estimates, it ranks as the third most commonly diagnosed cancer in men and the second in women, with an increasing incidence in both developed and developing countries. The global burden of colorectal cancer (CRC) is expected to increase by 60% to more than 2.2 million new cases and 1.1 million deaths by 2030.[2,3] Lifestyle changes, dietary patterns rich in fat and low in fiber, obesity, and aging populations have contributed to the rising burden of colorectal cancer across the globe. A significant proportion of patients with CRC present with acute complications, among which large bowel obstruction is one of the most frequent and life-threatening emergencies.[4] Nearly 15–30% of patients with colorectal carcinoma develop obstruction either as the initial presentation or during disease progression, often requiring urgent surgical intervention.[5]

Colorectal obstruction caused by carcinoma poses unique clinical challenges. Patients often present with abdominal distension, pain, constipation, vomiting, and electrolyte imbalances, which compromise their physiological reserves and increase perioperative risks.[6] Delay in treatment can lead to bowel ischemia, necrosis, or perforation, resulting in sepsis and high mortality. Therefore, timely surgical management is essential not only for relief of obstruction but also for oncologic control of the primary malignancy.[7] Traditionally, open resection has been the standard surgical approach in such cases, providing direct access to the obstructed bowel and allowing for safe removal of the tumor-bearing segment. However, the open method is often associated with significant surgical trauma, increased postoperative pain, delayed recovery, longer hospital stays, and higher complication rates, particularly in patients already compromised by obstruction.[8]

With advances in surgical technology, laparoscopic resection has emerged as an alternative approach to colorectal carcinoma, even in emergency situations involving obstruction. Laparoscopic surgery offers the advantages of minimally invasive access, reduced intraoperative blood loss, decreased postoperative pain, shorter duration of ileus, earlier return to oral intake, and faster mobilization.[9] These benefits translate into reduced hospital stays and improved patient quality of life. Importantly, it has demonstrated that laparoscopic resection, when performed by experienced surgeons, achieves oncologic outcomes comparable to open surgery in terms of resection margins, lymph node harvest, and long-term survival.[10]

Comparative studies have reported lower postoperative complication rates, faster recovery of bowel function, and equivalent oncologic outcomes with laparoscopic approaches. Additionally, advancements in laparoscopic instruments, high-definition imaging, and improved anesthetic techniques have expanded the feasibility of minimally invasive surgery in emergency colorectal settings. However, variations in outcomes continue to be reported due to differences in institutional expertise, patient demographics, and tumor characteristics.[11,12]

Given the high incidence of colorectal carcinoma and the considerable proportion of patients presenting with obstruction, the choice of surgical technique carries profound implications for short-term recovery and long-term survival. Comparing laparoscopic and open resections in obstructed cases is, therefore, critical for guiding surgical decision-making, optimizing patient outcomes, and shaping future treatment guidelines

MATERIALS AND METHODS

This comparative study was conducted in the Department of General Surgery Sheikh Zayed Hospital Rahim Yar Khan from Jan 2023 to June 2023. A total of 130 patients who presented with colorectal carcinoma complicated by intestinal obstruction and

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underwent surgical intervention were included. Patients were allocated into two groups based on the type of procedure performed: laparoscopic resection and open resection. The sample size of 130 was calculated by using a confidence level of 95%, power of 80%, and expected difference of 20% in postoperative complication rates between laparoscopic and open surgery.

All patients who were diagnosed with obstructed colorectal carcinoma on the basis of clinical examination, radiological imaging, and intraoperative confirmation were included, while those with metastatic disease not amenable to curative resection, perforation with generalized peritonitis, recurrent carcinoma, or unfit for anesthesia were excluded. Preoperative resuscitation, including intravenous fluids, nasogastric decompression, and electrolyte correction, was carried out in all patients before surgery.

In the laparoscopic group, standard minimally invasive techniques were used, including insertion of trocars, creation of pneumoperitoneum, and resection of the diseased segment with oncological principles of adequate proximal and distal margins and lymphadenectomy. In the open surgery group, midline laparotomy was performed and resection was carried out according to conventional oncological standards. Primary anastomosis or stoma formation was performed depending on intraoperative findings and patient stability. All procedures were performed by consultant surgeons experienced in both laparoscopic and open colorectal surgery.

Postoperative care was standardized for both groups. Analgesia, antibiotics, early mobilization, and progressive oral feeding were provided as per protocol. Patients were monitored for postoperative complications including wound infection, anastomotic leak, ileus, bleeding, and pulmonary complications. Duration of surgery, intraoperative blood loss, length of hospital stay, and return of bowel function were recorded. Outcomes were assessed in terms of perioperative morbidity, mortality, and short-term recovery.

Data were collected on a structured proforma. Statistical analysis was performed using SPSS software version 26. Quantitative variables such as age, operative time, intraoperative blood loss, and hospital stay were presented as mean ± standard deviation, while qualitative variables such as gender, site of carcinoma, and postoperative complications were expressed as frequencies and percentages. Comparison between the laparoscopic and open groups was carried out using the independent t-test for continuous variables and chi-square test for categorical variables. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The demographic characteristics of the study population showed that the mean age of patients was comparable between the two groups, with 55.2 ± 10.8 years in the laparoscopic group and 56.8 ± 11.2 years in the open group. Gender distribution was nearly equal, with a slight male predominance overall (56.9%). Tumor locations were also similar, with the left colon being the most common site followed by rectosigmoid and right colon, showing no significant differences between groups, as given in Table 1.

Intraoperative findings revealed that the mean duration of surgery was significantly longer in the laparoscopic group compared to the open group (150.4 ± 25.2 minutes vs. 135.6 ± 28.4 minutes, p = 0.004). Conversely, intraoperative blood loss was markedly lower in laparoscopic cases (220.5 ± 80.6 mL) than in open procedures (310.3 ± 95.7 mL, p < 0.001). The rate of primary anastomosis was slightly higher in the laparoscopic group, whereas stoma formation was more frequent in the open group, though these differences were not statistically significant. Conversion to open surgery occurred in 7.7% of laparoscopic cases, as given in Table 2.

Postoperative complications demonstrated a trend toward better outcomes in the laparoscopic group. Wound infection was significantly lower in the laparoscopic group compared to the open group (9.2% vs. 21.5%, p = 0.048). Anastomotic leaks, prolonged ileus, pulmonary complications, and reoperation rates were numerically higher in the open group, though these differences did not reach statistical significance. Thirty-day mortality was low in both groups and not statistically different, as given in Table 3.

Table 1: Demographic characteristics of patients (n=130)

Variable	Laparoscopic Group (n=65)	Open Group (n=65)	Total (n=130)
Age (years)	55.2 ± 10.8	56.8 ± 11.2	56.0 ± 11.0
Gender			
Male	38 (58.5%)	36 (55.4%)	74 (56.9%)
Female	27 (41.5%)	29 (44.6%)	56 (43.1%)
Tumor Location			
Right colon	18 (27.7%)	20 (30.8%)	38 (29.2%)
Left colon	27 (41.5%)	25 (38.5%)	52 (40.0%)
Rectosigmoid	20 (30.8%)	20 (30.8%)	40 (30.8%)

Table 2: Intraoperative findings and surgical details

Variable	Laparoscopic Group (n=65)	Open Group (n=65)	p-value
Duration of surgery (min)	150.4 ± 25.2	135.6 ± 28.4	0.004
Intraoperative blood loss (mL)	220.5 ± 80.6	310.3 ± 95.7	<0.001
Primary anastomosis performed	55 (84.6%)	50 (76.9%)	0.28
Stoma formation	10 (15.4%)	15 (23.1%)	0.27
Conversion to open	5 (7.7%)	—	—

Table 3: Postoperative complications

Complication	Laparoscopic Group (n=65)	Open Group (n=65)	p-value
Wound infection	6 (9.2%)	14 (21.5%)	0.048
Anastomotic leak	2 (3.1%)	4 (6.2%)	0.68
Prolonged ileus (>3 days)	5 (7.7%)	12 (18.5%)	0.07
Pulmonary complications	4 (6.2%)	8 (12.3%)	0.23
Reoperation required	1 (1.5%)	3 (4.6%)	0.62
Mortality (30-day)	1 (1.5%)	2 (3.1%)	1.00

Table 4: Postoperative recovery outcomes

Outcome	Laparoscopic Group (n=65)	Open Group (n=65)	p-value
Return of bowel sounds (days)	2.1 ± 0.8	3.4 ± 1.0	<0.001
Time to oral intake (days)	2.8 ± 1.1	4.2 ± 1.3	<0.001
Length of hospital stay (days)	7.5 ± 2.4	11.2 ± 3.6	<0.001

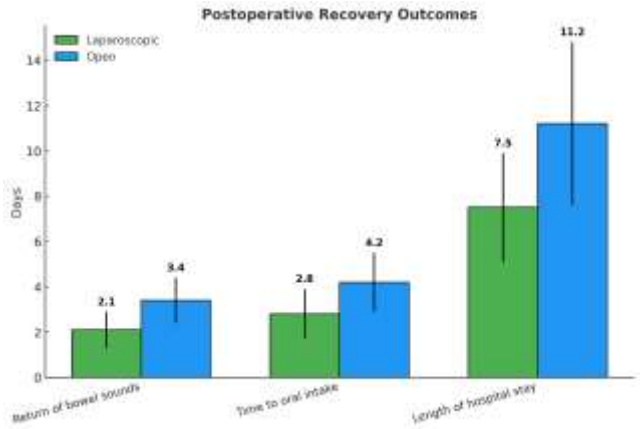

Figure 1: Comparison of postoperative recovery outcomes between laparoscopic and open groups, showing shorter recovery times with laparoscopic surgery

Recovery outcomes highlighted the advantages of laparoscopic surgery. Patients in the laparoscopic group had significantly earlier return of bowel sounds (2.1 ± 0.8 days vs. 3.4 ± 1.0 days, p < 0.001) and tolerated oral intake earlier (2.8 ± 1.1 days vs. 4.2 ± 1.3 days, p < 0.001). The mean length of hospital

stay was also considerably shorter for the laparoscopic group (7.5 ± 2.4 days) compared to the open group (11.2 ± 3.6 days), with a highly significant difference ($p < 0.001$), as given in Table 4. Patients in the laparoscopic group had faster recovery, with earlier return of bowel sounds, quicker oral intake, and shorter hospital stays compared to the open group. This highlights the superiority of laparoscopic surgery in enhancing postoperative recovery as given in figure 1.

DISCUSSION

Colorectal carcinoma is one of the most prevalent cancers worldwide and a leading cause of cancer-related deaths. A considerable proportion of patients present with obstruction, which poses serious clinical challenges. Traditionally, open resection has been the standard approach for obstructed colorectal carcinoma. However, laparoscopic surgery has emerged as a minimally invasive alternative with potential benefits in recovery and morbidity.[13] The safety and feasibility of laparoscopic resection in obstructed cases remain debated. Comparative studies are essential to evaluate outcomes of laparoscopic versus open approaches in this high-risk group.

In our study, laparoscopic resection was associated with significantly reduced intraoperative blood loss (220.5 ± 80.6 mL vs. 310.3 ± 95.7 mL, $p < 0.001$) and improved postoperative recovery, including earlier return of bowel sounds (2.1 ± 0.8 vs. 3.4 ± 1.0 days, $p < 0.001$), earlier oral intake (2.8 ± 1.1 vs. 4.2 ± 1.3 days, $p < 0.001$), and shorter hospital stay (7.5 ± 2.4 vs. 11.2 ± 3.6 days, $p < 0.001$). These findings are consistent with the results of Khan et al. (2022), who also reported longer operative time for laparoscopy but shorter ICU stay, earlier feeding, and reduced hospital stay compared to open surgery.[17] Similarly, Wang et al. (2017) demonstrated that laparoscopic complete mesocolic excision (LCME) resulted in significantly shorter hospital stay, reduced incision length, less blood loss, and lower wound infection rates compared to open resection, supporting the short-term benefits observed in our study.[18]

The complication profile in our series revealed lower wound infection in laparoscopic cases (9.2% vs. 21.5%, $p = 0.048$), aligning with Athar et al. (2022), who documented infection rates of 30.4% versus 55.1% ($p = 0.003$) for laparoscopic and open resections, respectively.[20] Similarly, Ustuner et al. (2022) observed differences in surgical complications, reporting a significantly higher reoperation rate in the open group (12.2%, $p = 0.040$), although their analysis also highlighted oncological differences, such as more metastatic lymph nodes in the open group ($p = 0.004$) and higher frequency of Stage 3C disease (25.7%). While our study did not assess detailed staging distribution, our findings of reduced complications with laparoscopic surgery support the trend of improved short-term outcomes.[14]

Regarding patient demographics, our groups were comparable in terms of age and gender distribution, which is in line with Kumari et al. (2023), who reported no significant differences between laparoscopic and open surgery groups with respect to age, gender, BMI, ASA score, and tumor location.[15] However, they observed higher frequency of T4 tumors (50% vs. 13.3%, $p = 0.031$) and complications such as perforation and obstruction in the open group, while bleeding or anemia was more frequent in laparoscopic patients (33.3% vs. 7.5%, $p = 0.032$). In contrast, our study showed significantly reduced wound infections and earlier recovery but no significant difference in anastomotic leak or pulmonary complications.

Oncological adequacy in terms of resection margins and lymph node yield has been a key concern with minimally invasive surgery. Haq et al. (2022) demonstrated no statistically significant differences between open and laparoscopic groups in proximal, distal, and circumferential margin involvement, or number of lymph nodes harvested. Our results similarly showed comparable oncological safety between both approaches.[16] Khan et al. (2022) reported median lymph node counts of 21.56 (laparoscopic) and 22.8 (open), showing no significant difference, which aligns with our findings of equivalent oncological outcomes between groups.[17] Wang et al. (2017) also reported no differences in lymph node harvest (16.2 ± 3.1 vs. 15.1 ± 3.5, $p > 0.05$) between laparoscopic and open resections.[18]

Long-term survival outcomes were not assessed in our study. However, Shah et al. (2021) demonstrated significantly better five-year disease-free survival (DFS) in AJCC stage III patients undergoing laparoscopic resection (80.9% vs. 54.8%, $p = 0.021$), with a trend toward improved DFS in stage II patients (96.7% vs. 84.1%, $p = 0.111$).[19] This suggests that the short-term benefits we observed with laparoscopic surgery may translate into improved long-term outcomes, a point that requires further follow-up in our patient cohort.

This study included a relatively large sample of 130 patients, providing adequate power for comparison. Standardized perioperative care protocols minimized confounding variables. Outcomes were measured objectively using clinical and surgical parameters. However, the study was conducted at a single center, which may limit generalizability. Long-term oncological outcomes such as disease-free and overall survival were not assessed. Surgeon expertise and case selection may also have influenced outcomes.

CONCLUSION

Laparoscopic resection was associated with favorable short-term recovery outcomes compared to open surgery in obstructed colorectal carcinoma. Both techniques were comparable in terms of perioperative safety. Laparoscopic surgery may be considered a viable alternative in appropriately selected patients.

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