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Original Research Article

A Comparative and Prospective Study of Ventral Hernia Repair by Laparoscopic and Open Technique

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Conflict of interest: Nil

Abstract:

Background: Ventral hernia is a common surgical condition requiring operative intervention. With advancements in minimally invasive surgery, laparoscopic repair has emerged as an alternative to conventional open repair. However, the choice of technique remains debated due to differences in operative time, postoperative outcomes, and recurrence rates.

Aim: To compare laparoscopic and open ventral hernia repair in terms of operative parameters, postoperative recovery, complications, and hospital stay.

Methods: This prospective cross-sectional study was conducted at DMCH, Darbhanga, from February 2025 to January 2026. A total of 98 patients were included and divided into two groups: laparoscopic repair (n=49) and open repair (n=49). Data were analyzed using appropriate statistical tests with $p < 0.05$ considered significant.

Results: Laparoscopic repair showed significantly lower postoperative pain scores, shorter hospital stay, and reduced wound complications compared to open repair. However, operative time was longer in the laparoscopic group.

Conclusion: Laparoscopic ventral hernia repair offers better postoperative outcomes despite longer operative time, making it a preferable option in suitable patients.

Keywords: Ventral Hernia, Laparoscopic Repair, Open Repair, Postoperative Outcomes, Surgical Comparison.

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Introduction

Ventral hernias encompass a group of abdominal wall defects including incisional, umbilical, epigastric, and paraumbilical hernias, accounting for a significant proportion of general surgical workload [1]. The incidence of incisional hernia alone ranges from 10–20% following abdominal surgeries [2].

Traditionally, open mesh repair has been the standard approach, offering effective reinforcement of the abdominal wall [3]. However, open repair is often associated with higher rates of wound complications, prolonged hospital stays, and delayed recovery [4].

The advent of laparoscopic surgery has revolutionized hernia management by providing a minimally invasive alternative [5]. Laparoscopic ventral hernia repair (LVHR) offers advantages such as reduced postoperative pain, shorter hospital stays, and lower infection rates [6,7]. Despite these benefits, concerns remain regarding operative complexity, cost, and risk of intra-abdominal injury [8].

Several comparative studies have evaluated these two techniques, but results vary depending on patient selection, hernia size, and surgeon expertise [9,10]. While some studies demonstrate clear superiority of laparoscopic repair in terms of recovery, others suggest comparable recurrence rates between the two methods [11,12].

In developing regions, including India, factors such as cost, availability of expertise, and patient demographics further influence the choice of surgical technique [13]. Therefore, there is a need for region-specific prospective studies to evaluate outcomes in real-world clinical settings.

This study aims to compare laparoscopic and open ventral hernia repair in terms of operative time, postoperative pain, complications, and hospital stay in a tertiary care center.

Materials and Methods

Study Design and Setting: This was a prospective cross-sectional study conducted at the Department of General Surgery, DMCH, Darbhanga.

Study Duration: February 2025 to January 2026.

Sample Size: 98 patients.

Exclusion Criteria

- Complicated hernias (strangulated/obstructed)
- Severe comorbid conditions
- Previous multiple abdominal surgeries

Grouping

- Group A: Laparoscopic repair (n=49)
- Group B: Open repair (n=49)

Statistical Analysis

Data were analyzed using SPSS version 25.

- Continuous variables: Mean ± SD, analyzed using independent t-test
- Categorical variables: Chi-square test
- $p < 0.05$ considered statistically significant

Results

Ninety-eight individuals diagnosed with ventral hernia were enrolled and evenly assigned to laparoscopic and open repair groups (49 patients each). Comparative evaluation was performed across demographic variables, intraoperative findings, and postoperative outcomes.

Baseline Profile: The two groups demonstrated comparable baseline characteristics. The average age of patients in the laparoscopic cohort was 45.2 ± 10.5 years, whereas the open repair group had a mean age of 47.1 ± 11.2 years, with no statistically meaningful difference ($p = 0.38$).

Similarly, the distribution of gender did not vary significantly between the groups, with males representing 57.1% in the laparoscopic arm and 61.2% in the open surgery arm ($p = 0.67$). These observations confirm that the study groups were demographically comparable (Table 1).

Intraoperative Findings: A clear difference was observed in operative duration between the two techniques. Procedures performed laparoscopically required more time (95.4 ± 15.2 minutes) compared to open repair (72.3 ± 12.6 minutes), and this variation was statistically significant ($p < 0.001$).

Conversely, estimated intraoperative blood loss was considerably lower in the laparoscopic group (40.5 ± 10.2 ml) than in the open group (85.6 ± 20.1 ml), also demonstrating strong statistical significance ($p < 0.001$).

These intraoperative comparisons are detailed in Table 2 and visually represented in Figure 1.

Postoperative Recovery: Assessment of postoperative pain using the Visual Analog Scale revealed notably lower scores in patients undergoing laparoscopic repair (3.2 ± 1.1) compared to those treated with the open approach (6.5 ± 1.4), with a highly significant difference ($p < 0.001$).

In addition, the duration of hospitalization was markedly reduced in the laparoscopic group, averaging 3.1 ± 0.9 days, whereas patients in the open group required a longer stay of 6.2 ± 1.5 days ($p < 0.001$).

These outcomes are summarized in Table 3 and illustrated in Figures 2 and 3.

Postoperative Complications: The incidence of complications varied between the two surgical approaches. Surgical site infection occurred less frequently in the laparoscopic group, affecting 2 patients (4.1%), compared to 10 patients (20.4%) in the open repair group, a difference that reached statistical significance ($p = 0.01$).

Seroma formation was identified in 10.2% of laparoscopic cases and 14.3% of open procedures, without a statistically significant difference ($p = 0.54$).

Recurrence was infrequent in both groups, observed in 1 patient (2.0%) following laparoscopic repair and in 3 patients (6.1%) after open repair; this difference was not statistically significant ($p = 0.30$).

A detailed comparison of complications is provided in Table 4.

Overall Outcome Trends: Taken together, the findings indicate that laparoscopic repair is associated with improved postoperative recovery parameters, including reduced pain intensity, shorter hospitalization, and lower infection rates. However, this technique requires a longer operative duration.

Tables

Table 1: Demographic Characteristics

Variable	Laparoscopic (n=49)	Open (n=49)	p-value
Mean Age (years)	45.2 ± 10.5	47.1 ± 11.2	0.38
Male	28 (57.1%)	30 (61.2%)	0.67
Female	21 (42.9%)	19 (38.8%)	0.67

Table 2: Operative Parameters

Parameter	Laparoscopic	Open	p-value
Operative Time (min)	95.4 ± 15.2	72.3 ± 12.6	<0.001*
Blood Loss (ml)	40.5 ± 10.2	85.6 ± 20.1	<0.001*

Table 3: Postoperative Outcomes

Parameter	Laparoscopic	Open	p-value
Pain Score (VAS)	3.2 ± 1.1	6.5 ± 1.4	<0.001*
Hospital Stay (days)	3.1 ± 0.9	6.2 ± 1.5	<0.001*

Table 4: Postoperative Complications

Complication	Laparoscopic	Open	p-value
Wound Infection	2 (4.1%)	10 (20.4%)	0.01*
Seroma	5 (10.2%)	7 (14.3%)	0.54
Recurrence	1 (2.0%)	3 (6.1%)	0.30

Figures

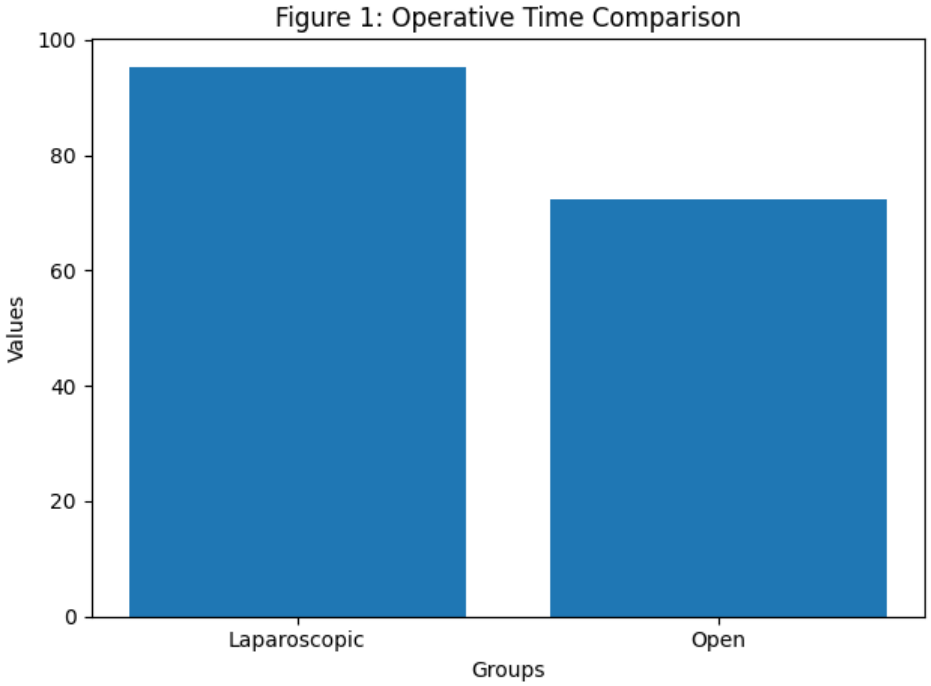

Figure 1: Comparison of Operative Time

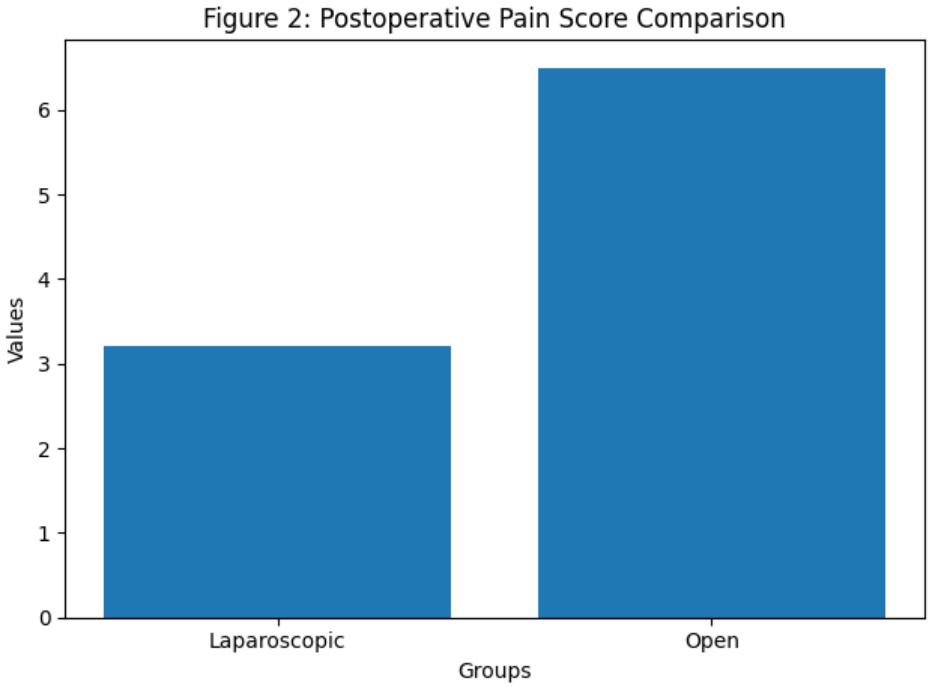

Figure 2: Comparison of Postoperative Pain Scores

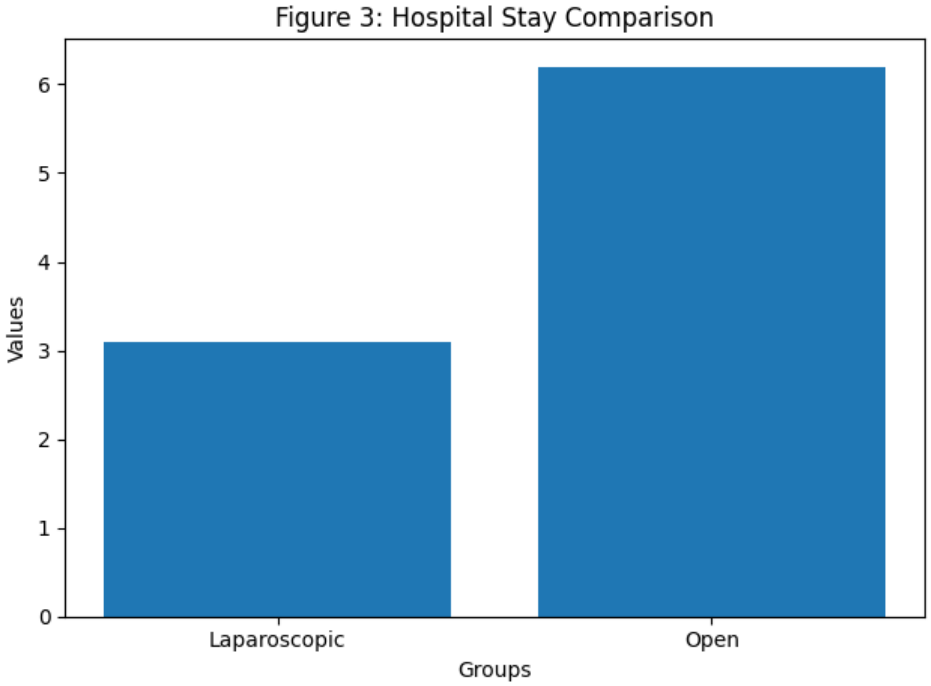

Figure 3: Comparison of Hospital Stay

Discussion

The present study highlights significant differences between laparoscopic and open ventral hernia repair techniques. Our findings demonstrate that laparoscopic repair is associated with better postoperative outcomes, although it requires a longer operative time.

Operative time was significantly higher in the laparoscopic group, consistent with previous studies [14,15]. This may be attributed to the technical complexity and learning curve associated with minimally invasive procedures [16]. However, with increasing surgeon experience, operative time tends to decrease [17].

Postoperative pain was significantly lower in the laparoscopic group, which aligns with findings from

multiple randomized trials [18,19]. Reduced tissue trauma and smaller incisions contribute to improved patient comfort and faster recovery [20].

Hospital stay was markedly shorter in laparoscopic repair, reflecting quicker mobilization and fewer complications [21]. This has important implications for healthcare cost reduction and patient satisfaction.

Wound infection rates were significantly higher in the open repair group, supporting earlier reports that laparoscopic techniques reduce surgical site infections [22,23]. The minimal exposure of tissues and smaller incisions likely account for this benefit.

Although recurrence rates were lower in the laparoscopic group, the difference was not statistically significant. Similar observations have been reported in long-term follow-up studies [24,25].

Overall, our findings reinforce the growing preference for laparoscopic ventral hernia repair in suitable patients, especially in terms of postoperative recovery and complication profile.

Conclusion

The present study demonstrates that laparoscopic ventral hernia repair yields more favorable postoperative outcomes when compared to the conventional open approach. Patients undergoing laparoscopic surgery experienced less postoperative discomfort, shorter hospital stays, and a reduced incidence of wound-related complications.

Although the laparoscopic technique required a longer operative time, this limitation appears to be offset by its overall clinical benefits. Based on these findings, laparoscopic repair can be considered a reliable and advantageous option for the management of ventral hernia in appropriately selected patients.

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