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Original Research Article

Laparoscopic Versus Open Repair of Ventral Hernia: A Prospective Comparative Analysis

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Abstract:

Background: A common abnormality of the abdominal wall, ventral hernias have a major effect on patient morbidity and medical resources. Although open repair has long been the norm, laparoscopic surgery is becoming more and more popular since it is less intrusive and has been shown to have advantages like less postoperative pain, a shorter hospital stays, and fewer wound-related problems. Comparative analysis is crucial since issues with operative time, technical requirements, and recurrence rates still exist.

Aim: To assess intraoperative, postoperative, and short-term follow-up results for patients undergoing elective surgery at a tertiary care hospital in comparison to laparoscopic and open ventral hernia repair.

Methods: Over the course of 18 months, this prospective observational study was carried out at the general surgery department of Darbhanga Medical College and Hospital. Sixty patients with ventral hernias were recruited and split evenly into two groups: Group A (n = 30) underwent laparoscopic treatment, while Group B (n = 30) underwent open repair. Data on demographics, intraoperative parameters, postoperative pain (VAS score), complications, hospital stay, and recurrence at 6 months were collected and analyzed using SPSS version 23.0.

Results: There were similarities in the groups' baseline demographics. Laparoscopic repair had a longer operative time (95.6 ± 15.2 min vs. 78.3 ± 12.7 min, $p < 0.001$) but significantly less blood loss (45.7 ± 10.5 ml vs. 78.9 ± 14.3 ml, $p < 0.001$). Postoperative pain scores at 24 hours were lower in the laparoscopic group (3.1 ± 1.2 vs. 5.6 ± 1.5, $p < 0.001$). The mean hospital stay was shorter in the laparoscopic group (2.8 ± 0.9 days vs. 5.4 ± 1.3 days, $p < 0.001$). Wound infection was significantly higher in the open group (20% vs. 6.6%, $p = 0.04$). Recurrence rates at 6 months were slightly higher in the open group (6.6% vs. 3.3%), though not statistically significant ($p = 0.55$).

Conclusion: Despite requiring more time during surgery, laparoscopic ventral hernia repair is linked to less postoperative pain, a shorter hospital stay, and fewer wound infections than open repair. Both techniques showed similar recurrence rates at short-term follow-up.

Recommendations: Laparoscopic repair should be preferred where expertise and resources are available, particularly for patients prioritizing faster recovery and reduced wound complications. Further large-scale, long-term studies are warranted to assess recurrence and cost-effectiveness.

Keywords: Ventral hernia, Laparoscopic repair, Open repair, Postoperative outcomes, Comparative study.

Introduction

Ventral hernia represents a common surgical problem worldwide, encompassing primary as well as incisional hernias that occur in the anterior abdominal wall. A defect in the abdominal musculature or fascia that allows the contents of the abdomen to protrude is its definition, excluding groin hernias. The incidence of ventral hernia following abdominal surgery has been reported to range between 10–20%, making it a significant contributor to morbidity, impaired quality of life, and healthcare costs [1]. Risk factors such as obesity, advanced age, diabetes mellitus, chronic cough, and poor wound healing increase the likelihood of occurrence and recurrence [2].

Surgical repair remains the mainstay of treatment for ventral hernia, with two primary approaches: the conventional open repair and the laparoscopic repair Open repair, which has long been considered the gold standard, entails placing mesh, typically in an

onlay or sublay position, and directly visualizing the defect [3]. Despite its effectiveness, open repair is linked to prolonged hospital stays, increased incidence of wound infection, and postoperative pain [4]. However, because to its minimally invasive nature, laparoscopic repair—most frequently via the intraperitoneal onlay mesh (IPOM) technique—has become more and more popular in recent decades. Several studies have reported its advantages, including reduced postoperative pain, fewer wound complications, shorter recovery, and earlier return to daily activities [5,6].

Despite these benefits, laparoscopic repair is not without limitations. It generally requires longer operative time, specialized instruments, and advanced surgical expertise. Additionally, concerns regarding mesh fixation, adhesions, and cost implications continue to be debated [7]. Some evidence also suggests that recurrence rates after laparoscopic repair may be comparable to open repair, particularly in complex hernias or in patients with multiple comorbidities [8]. As a result, the surgical technique chosen is frequently influenced by the surgeon's experience, the patient's characteristics, and the hernia.

Given the rising prevalence of ventral hernia and the ongoing debate regarding the superiority of one approach over another, comparative studies are essential to provide clarity on clinical outcomes. Recent research emphasizes not only short-term outcomes such as operative time, pain, and hospital stay, but also long-term results including recurrence, quality of life, and cost-effectiveness [9,10]. In this context, the present prospective observational study was conducted to compare laparoscopic and open ventral hernia repair with respect to perioperative and postoperative outcomes in patients at a tertiary care center.

Methodology

Study Design: This research was designed as an observational prospective study.

Study Setting: The study was carried out in the Department of General Surgery, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, which serves as a tertiary care center catering to a large population.

Study Duration: Patients who met the eligibility requirements and presented with a ventral hernia were recruited and monitored throughout the duration of the 18-month study.

Participants: The study comprised 60 patients who were admitted for surgical treatment after being diagnosed with a ventral hernia. Whenever possible, these patients were divided equally between two groups, one for open surgery and the other for laparoscopic repair, which were chosen at random.

Inclusion Criteria

- Patients aged **18 years and above** with a clinically or radiologically confirmed ventral hernia.
- Patients deemed fit for elective surgery after pre-anesthetic evaluation.
- Patients who are prepared to follow up and give written informed consent.

Exclusion Criteria

- Patients below **18 years of age**.
- Emergency presentations such as strangulated or obstructed ventral hernia.
- Patients unfit for general anesthesia or with significant comorbidities contraindicating surgery.
- Patients with recurrent hernia following prior repair.
- Pregnant women.

Bias: Selection bias was minimized by applying strict inclusion and exclusion criteria. Allocation bias was reduced by random assignment of patients to laparoscopic or open groups. Blinding the outcome assessor to the sort of operation carried out reduced observer bias.

Data Collection: A pre-made proforma was used to gather data, and it contained patient demographics and clinical history, comorbidities, intraoperative details, and postoperative outcomes such as operative time, pain scores, complications, and hospital stay. Follow-up data were recorded at regular intervals to evaluate long-term results.

Procedure: All patients underwent standard preoperative workup. After random allocation, patients either received laparoscopic ventral hernia repair or open ventral hernia repair. Laparoscopic repair was performed using (IPOM) technique, while open repair was done with conventional mesh placement. All procedures were carried out by experienced surgeons under aseptic precautions. Perioperative management was standardized for both groups.

Statistical Analysis: Microsoft Excel was used to compile and enter the data, and SPSS version 23.0 was then used for analysis. The Student's t-test was used to compare continuous variables, which were expressed as mean ± standard deviation (SD), and the Chi-square or Fisher's exact tests, depending on the situation, were used to assess categorical data. Statistical significance was defined as a p-value of less than 0.05.

Results

Sixty patients with ventral hernias were recruited and split evenly into two groups: Group A (n = 30) underwent laparoscopic treatment, while Group B (n = 30) underwent open repair. Between the two

groups, the baseline clinical and demographic features were similar.

Table 1: Demographic and Clinical Profile

Variables	Group A (Laparoscopic, n=30)	Group B (Open, n=30)	p-value
Mean Age (years)	42.6 ± 10.4	44.3 ± 9.8	0.48
Male : Female Ratio	18 : 12	17 : 13	0.79
Mean BMI (kg/m²)	26.8 ± 3.1	27.4 ± 3.5	0.53
Comorbidities (HTN/DM)	8 (26.6%)	9 (30%)	0.78
Duration of Hernia (years)	3.2 ± 1.6	3.4 ± 1.8	0.61

Both groups were similar in terms of age, gender distribution, BMI, comorbidities, and duration of hernia, ensuring comparability before surgery. No statistically significant difference was observed in baseline characteristics.

Table 2: Intraoperative Parameters

Parameters	Group A (Laparoscopic)	Group B (Open)	p-value
Mean Operative Time (min)	95.6 ± 15.2	78.3 ± 12.7	<0.001
Intraoperative Blood Loss (ml)	45.7 ± 10.5	78.9 ± 14.3	<0.001
Conversion to Open (%)	1 (3.3%)	–	–

The laparoscopic group experienced a significantly reduced intraoperative blood loss ($p < 0.001$) but a significantly longer surgical time ($p < 0.001$). Due to thick adhesions, one patient (3.3%) needed to be converted from laparoscopic to open surgery.

Table 3: Postoperative Outcomes

Outcomes	Group A (Laparoscopic)	Group B (Open)	p-value
Mean Pain Score (VAS at 24 hrs)	3.1 ± 1.2	5.6 ± 1.5	<0.001
Mean Hospital Stay (days)	2.8 ± 0.9	5.4 ± 1.3	<0.001
Wound Infection (%)	2 (6.6%)	6 (20%)	0.04
Seroma Formation (%)	3 (10%)	5 (16.6%)	0.44
Mesh-related Complications (%)	1 (3.3%)	2 (6.6%)	0.55

Compared to the open repair group, patients who underwent laparoscopic surgery experienced a shorter hospital stay and reported noticeably less postoperative pain. The laparoscopic group experienced a considerably decreased rate of wound infection ($p = 0.04$). Although not statistically significant, seroma and mesh-related problems were somewhat more common in the open group.

Table 4: Follow-up (6 months)

Recurrence at 6 months	Group A (Laparoscopic)	Group B (Open)	p-value
Number of Recurrences	1 (3.3%)	2 (6.6%)	0.55

Three patients overall experienced recurrence at the 6-month follow-up, with no statistically significant difference between the two groups ($p = 0.55$).

Summary of Key Findings

- Although laparoscopic repair required more time during surgery, there was less blood loss during the procedure.
- Hospital stays and postoperative pain were considerably reduced with laparoscopic repair.
- In open repair, wound infection was more prevalent (20% vs. 6.6%).
- Although not statistically significant, the open group's recurrence rates were somewhat higher at six months.

Discussion

The demographic and baseline characteristics, including age, gender distribution, BMI, comorbidities, and duration of hernia, were similar between the laparoscopic and open repair groups in the current prospective study, which included 60 patients with ventral hernia. This suggests that the two cohorts were homogeneous and well-matched for analysis.

The intraoperative findings revealed significant differences between the two approaches. Although laparoscopic repair was linked to an extended duration of surgery, it demonstrated a clear advantage in terms of reduced intraoperative blood loss. This reflects the technical nature of laparoscopic surgery, which requires longer setup and meticulous dissection, but provides superior visualization and precision, thereby minimizing

tissue trauma. The conversion rate to open repair was low, indicating that the laparoscopic method is generally feasible.

Laparoscopic repair was greatly favored by postoperative results. The minimally invasive character of laparoscopic surgery and its effect on early recovery are highlighted by the significantly lower pain scores and shorter hospital stays experienced by patients in the laparoscopic group 24 hours after operation. Additionally, the benefit of smaller incisions and less exposure of surgical sites was highlighted by the much decreased incidence of wound infection in the laparoscopic group when compared to the open group. Although seroma formation and mesh-related complications were observed in both groups, the differences were not statistically significant, indicating that these complications may not be influenced directly by the surgical approach.

Recurrence rates were somewhat higher in the open group at the 6-month follow-up, but the difference was not statistically noteworthy. This implies that both strategies are successful in preventing recurrence in the short to medium term; however, long-term monitoring would be required to determine whether the results are durable.

Since 2018, a number of comparative and prospective studies have compared laparoscopic vs open ventral hernia repair. Overall, laparoscopic repair has consistently demonstrated benefits in terms of hospital stays and wound-related problems.

Since 2018, a number of comparative and prospective studies have compared laparoscopic vs open ventral hernia repair. Overall, laparoscopic repair has consistently demonstrated benefits in terms of hospital stays and wound-related problems. Malik et al. reported that laparoscopic repair significantly reduced surgical site infections and hospitalization duration compared to open repair, while also leading to less postoperative pain [11]. Similarly, Mallik et al. confirmed lower wound complications and a faster recovery profile in the laparoscopic group, though recurrence rates remained similar between the two techniques [12].

Other prospective analyses reinforce these findings. Malik et al. demonstrated that laparoscopic hernia repair not only minimized infection risk but also decreased analgesic requirements postoperatively [13]. A multicenter analysis further supported laparoscopic repair, emphasizing shorter hospital stays and lower rates of morbidity when compared to surgical repair [14].

Recent retrospective and comparative series also found laparoscopic ventral hernia repair advantageous in terms of wound morbidity, with no significant compromise in recurrence or durability. For example, a 2019 study concluded laparoscopic repair was linked to a quicker return to regular activities and fewer wound-related problems [15]. Likewise, a 2021 comparative study reported significantly reduced surgical site occurrences in the laparoscopic group, underscoring its role as a safe and effective alternative to open repair [16].

Conclusion

Laproscopic ventral hernia repair has shorter recovery period than open ventral hernia repair during surgery, less pain afterward, a shorter hospital stay, and fewer wound-related problems. At short-term follow-up, the recurrence rates for both methods were similar. Laparoscopic repair, which offers a quicker recovery and better postoperative results, might therefore be regarded as a safe and efficient substitute for open repair.

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