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Original Research Article

Open Versus Laparoscopic Ventral Hernia Repair: A Randomized Clinical Trial

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Abstract:

Background: Ventral hernia repair is a common surgical procedure with two primary approaches: open and laparoscopic. Despite advancements in minimally invasive techniques, there remains a debate regarding the optimal method for repair. This study aims to compare the clinical outcomes of open versus laparoscopic ventral hernia repair.

Materials and Methods: A randomized clinical trial was conducted involving 150 patients diagnosed with ventral hernia. Participants were randomly assigned to either the open repair group (n=75) or the laparoscopic repair group (n=75). Key outcome measures included operative time, postoperative pain, length of hospital stay, complication rates, and recurrence rates. Follow-up assessments were conducted at 1 month, 6 months, and 1 year post-surgery.

Results: The mean operative time was significantly shorter in the laparoscopic group (60 ± 15 minutes) compared to the open group (90 ± 20 minutes, $p<0.001$). Postoperative pain scores, measured on a visual analog scale, were lower in the laparoscopic group (mean score: 3.5 ± 1.2) than in the open group (mean score: 5.0 ± 1.5, $p<0.01$). The length of hospital stay was also reduced in the laparoscopic group (3 ± 1 days) compared to the open group (5 ± 2 days, $p<0.01$). Complication rates were comparable between the two groups (open: 15%, laparoscopic: 10%, $p=0.35$). However, the recurrence rate at 1 year was slightly higher in the laparoscopic group (8%) compared to the open group (5%), though this difference was not statistically significant ($p=0.45$).

Conclusion: Laparoscopic ventral hernia repair offers advantages in terms of shorter operative time, reduced postoperative pain, and shorter hospital stays. While complication rates are similar between the two methods, there is a non-significant trend towards a higher recurrence rate with laparoscopic repair. These findings suggest that laparoscopic repair is a viable option for ventral hernia repair, but careful patient selection and long-term follow-up are essential.

Keywords: Ventral hernia, Laparoscopic repair, Open repair, Randomized clinical trial, Postoperative outcomes, Surgical techniques.

Introduction

Ventral hernia repair is a prevalent surgical procedure with significant implications for patient morbidity and healthcare costs. Historically, the open approach has been the gold standard for ventral hernia repair, providing reliable outcomes with well-documented techniques [1]. However, the advent of laparoscopic surgery has introduced minimally invasive options that promise reduced postoperative pain, shorter hospital stays, and quicker recovery times [2].

The debate between open and laparoscopic approaches remains unresolved, with proponents of each method citing various advantages. Open ventral hernia repair is favoured for its direct access to the hernia site and robustness, especially in complex or recurrent cases [3]. Conversely, laparoscopic repair is associated with less postoperative pain and faster return to normal activities, though it requires specialized skills and equipment [4].

Several studies have compared the two techniques, focusing on parameters such as operative time, postoperative pain, length of hospital stay, complication rates, and recurrence rates. For instance, a meta-analysis by Forbes et al. reported that laparoscopic repair is associated with lower postoperative pain scores and shorter hospital stays but indicated no significant difference in complication rates compared to the open approach [5]. Another randomized trial by Itani et al.

suggested that while laparoscopic repair has benefits in terms of recovery, it may be associated with a higher recurrence rate [6]. Given the mixed results from previous studies, there is a need for further high-quality randomized clinical trials to provide more definitive evidence on the optimal approach for ventral hernia repair. This study aims to fill this gap by directly comparing the clinical outcomes of open versus laparoscopic ventral hernia repair in a randomized clinical trial setting, focusing on operative time, postoperative pain, length of hospital stay, complication rates, and recurrence rates.

Materials and Methods

Study Design

This randomized clinical trial was conducted to compare the outcomes of open versus laparoscopic ventral hernia repair. The study was approved by the institutional review board, and informed consent was obtained from all participants.

Participants

A total of 150 patients diagnosed with ventral hernia were enrolled in the study. Inclusion criteria included adults aged 18-70 years with a clinically confirmed ventral hernia. Exclusion criteria were patients with recurrent hernias, those with contraindications to general anesthesia, and patients with significant comorbid conditions that could affect surgical outcomes.

Randomization

Participants were randomly assigned to either the open repair group (n=75) or the laparoscopic repair group (n=75) using a computer-generated randomization sequence. Allocation concealment was ensured using sealed opaque envelopes.

Surgical Techniques

Open Repair Group: Patients in this group underwent open ventral hernia repair under general anesthesia. The hernia sac was identified, and the defect was closed using non-absorbable sutures. A synthetic mesh was placed over the defect and secured with sutures.

Laparoscopic Repair Group: Patients in this group underwent laparoscopic ventral hernia repair under general anesthesia. Three to four trocars were placed, and the hernia sac was reduced. A synthetic mesh was inserted and fixed to the abdominal wall using tacks and sutures.

Outcome Measures

The primary outcome measures were operative time, postoperative pain, length of hospital stay, complication rates, and recurrence rates.

Operative Time: Measured from the first incision to the last suture.

Postoperative Pain: Assessed using a visual analog scale (VAS) ranging from 0 (no pain) to 10 (worst possible pain) at 24 hours, 48 hours, and 7 days post-surgery.

Length of Hospital Stay: Defined as the number of days from surgery to discharge.

Complication Rates: Included both intraoperative and postoperative complications, classified as minor or major.

Recurrence Rates: Evaluated at follow-up visits at 1 month, 6 months, and 1 year post-surgery.

Follow-Up

Patients were followed up at 1 month, 6 months, and 1 year post-surgery. Clinical examination and ultrasonography were performed to assess for recurrence. Pain scores and any complications were recorded during each follow-up visit.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Independent t-tests were used to compare continuous variables, and chi-square tests were used for categorical variables. A p-value of <0.05 was considered statistically significant.

Results

Operative Time

The mean operative time was significantly shorter in the laparoscopic group compared to the open group. Detailed results are shown in Table 1.

Table 1:

Group	Mean Operative Time (minutes)	Standard Deviation	p-value
Open Repair	90	20	<0.001
Laparoscopic Repair	60	15	

Postoperative Pain: Postoperative pain scores were lower in the laparoscopic group at all assessed time points. Detailed results are shown in Table 2.

Table 2:

Time Point	Open Repair (mean ± SD)	Laparoscopic Repair (mean ± SD)	p-value
24 hours	5.0 ± 1.5	3.5 ± 1.2	<0.01
48 hours	4.0 ± 1.3	2.8 ± 1.1	<0.01
7 days	2.5 ± 1.0	1.5 ± 0.8	<0.01

Length of Hospital Stay: The length of hospital stay was significantly shorter in the laparoscopic group compared to the open group. Detailed results are shown in Table 3.

Table 3:

Group	Mean Hospital Stay (days)	Standard Deviation	p-value
Open Repair	5	2	<0.01
Laparoscopic Repair	3	1	

Complication Rates: Complication rates were comparable between the two groups. Detailed results are shown in Table 4.

Table 4:

Group	Complication Rate (%)	Minor Complications (%)	Major Complications (%)	p-value
Open Repair	15	10	5	0.35
Laparoscopic Repair	10	7	3	

Recurrence Rates: The recurrence rate at 1 year was slightly higher in the laparoscopic group, though this difference was not statistically significant. Detailed results are shown in Table 5.

Table 5:

Group	Recurrence Rate at 1 Year (%)	p-value
Open Repair	5	0.45
Laparoscopic Repair	8	

Discussion

This randomized clinical trial aimed to compare the clinical outcomes of open versus laparoscopic ventral hernia repair. Our findings indicate that laparoscopic repair offers significant advantages in terms of operative time, postoperative pain, and length of hospital stay, although the recurrence rates were slightly higher, albeit not statistically significant. The shorter operative time in the laparoscopic group aligns with previous studies, which suggest that minimally invasive techniques can streamline the surgical process [1]. This reduced operative time can be attributed to the advanced visualization and precision offered by laparoscopic instruments, which allow for more efficient dissection and placement of the mesh [2].

Postoperative pain was significantly lower in the laparoscopic group at all assessed time points. This finding is consistent with other studies that report reduced pain levels due to smaller incisions and less tissue trauma associated with laparoscopic procedures [3]. The decreased pain not only improves patient comfort but also facilitates earlier mobilization and discharge, contributing to shorter hospital stays [4]. The length of hospital stay was also significantly reduced in the laparoscopic group, which corroborates with the literature indicating that minimally invasive surgeries often result in quicker recovery times and earlier discharges [5]. This reduction in hospital stay can have substantial economic benefits, decreasing healthcare costs and freeing up hospital resources. Complication rates were comparable between the two groups, which is an important consideration for surgical decision-making. While some studies have suggested higher complication rates with laparoscopic repair due to the technical demands of the procedure [6], our results indicate that with proper surgical expertise, laparoscopic repair can be performed safely with complication rates similar to those of open repair.

The recurrence rate at 1 year was slightly higher in the laparoscopic group, though this difference was not statistically significant. This finding echoes the results of Itani et al., who also reported a trend towards higher recurrence rates with laparoscopic repair [7]. This could be due to several factors, including the size of the defect and the method of mesh fixation. Future studies should investigate these variables further to optimize laparoscopic techniques and potentially reduce recurrence rates.

Despite the strengths of our study, including the randomized design and comprehensive follow-up, there are limitations to consider. The study was

conducted at a single center, which may limit the generalizability of the results. Additionally, the follow-up period of 1 year may not be sufficient to capture all recurrences, suggesting the need for longer-term studies to fully assess the durability of both repair methods.

Conclusion

In conclusion, laparoscopic ventral hernia repair offers advantages in terms of shorter operative time, reduced postoperative pain, and shorter hospital stays compared to open repair. However, the slightly higher, albeit non-significant, recurrence rate warrants caution. Surgeons should weigh these benefits against the potential risks when selecting the appropriate repair method for their patients. Further research, particularly multicenter trials with longer follow-up periods, is needed to provide more definitive guidance on the optimal approach for ventral hernia repair.

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