

# Clinical Outcomes and Quality of Life After Laparoscopic Versus Open Ventral Hernia Repair

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## ABSTRACT

**Aim:** To compare the clinical outcomes and quality of life of patients undergoing laparoscopic versus open ventral hernia repair, with particular emphasis on postoperative pain, complications, hospital stay, recovery, recurrence and patient-reported quality of life.

**Materials and Methods:** This comparative study included **55 patients** diagnosed with ventral hernia. Patients were divided into two groups: **28 patients underwent laparoscopic ventral hernia repair (Group A)** and **27 patients underwent open ventral hernia repair (Group B)**. Demographic characteristics, hernia-related variables, operative time, postoperative pain, complications, duration of hospital stay, return to normal activity, recurrence and quality-of-life parameters were assessed. Postoperative pain was assessed using the Visual Analogue Scale, while quality of life was evaluated using a standardized 0–100 scale. Categorical variables were compared using the chi-square/Fisher's exact test and continuous variables using an independent t-test. A p-value <0.05 was considered statistically significant.

**Results:** The demographic and baseline hernia characteristics were comparable between the two groups. The mean operative time was significantly longer in the laparoscopic group than in the open group (**108.4 ± 21.7 vs. 78.6 ± 18.9 minutes; p<0.001**). Postoperative pain was significantly lower following laparoscopic repair at 6, 24, 48 and 72 hours and at subsequent follow-up. Mean hospital stay was significantly shorter in the laparoscopic group (**2.4 ± 1.0 vs. 4.1 ± 1.3 days; p<0.001**). Overall postoperative complications occurred in 21.4% of laparoscopic patients compared with 44.4% of open-repair patients. Return to normal activity and work was significantly earlier following laparoscopic repair. Recurrence was comparable between groups (**3.6% vs. 3.7%**). Postoperative quality-of-life scores were higher in the laparoscopic group.

**Conclusion:** Laparoscopic ventral hernia repair was associated with reduced postoperative pain, shorter hospitalization, fewer wound-related complications, faster functional recovery and better postoperative quality of life, although it required a longer operative time. Recurrence rates were comparable between laparoscopic and open repair.

**Keywords:** Ventral hernia, laparoscopic repair, open repair, postoperative pain, recurrence, quality of life, surgical outcomes.

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## INTRODUCTION

Ventral hernia is a common surgical condition characterized by protrusion of intra-abdominal contents through a defect in the anterior abdominal wall. It includes primary hernias such as umbilical and epigastric hernias and secondary or incisional hernias occurring through a previous abdominal

surgical incision. Ventral hernias can produce pain, discomfort, limitation of physical activity, cosmetic concerns and, in complicated cases, obstruction or strangulation. Surgical repair remains the definitive treatment for symptomatic patients, with the principal objectives being restoration of abdominal-wall integrity, reduction of symptoms, prevention of recurrence and improvement in patient quality of life

[1]. The development of prosthetic mesh reinforcement has substantially improved the durability of ventral hernia repair. Traditionally, ventral hernias were managed through an open approach involving direct access to the defect, dissection of the hernia sac and placement of mesh. Although open repair remains widely practiced and is appropriate for many patients, it may involve extensive soft-tissue dissection, postoperative pain, wound morbidity, prolonged recovery and surgical-site infection [2]. These limitations stimulated the development and widespread adoption of minimally invasive approaches to abdominal-wall reconstruction.

Laparoscopic ventral hernia repair was introduced as an alternative to conventional open repair, with the theoretical advantages of smaller incisions, reduced tissue trauma, less disruption of the abdominal-wall blood supply and decreased wound complications. The laparoscopic technique generally involves reduction of the hernia contents, adhesiolysis when required and placement of an appropriately sized mesh with adequate overlap. Early comparative evidence suggested that laparoscopic repair could provide shorter hospitalization, reduced wound infection and faster recovery while maintaining acceptable recurrence rates [3].

The choice between laparoscopic and open repair, however, remains multifactorial. Patient age, body mass index, previous abdominal operations, hernia size, location, recurrence status, comorbidities and surgeon expertise can influence the selection of operative technique. Consensus recommendations have recognized laparoscopic repair as an acceptable alternative to open repair and have particularly emphasized its potential advantages in obese patients and those with recurrent hernias [4]. Nevertheless, complex defects, extensive adhesions, loss of abdominal-wall domain and certain large or complicated hernias may require an open or reconstructive approach. Postoperative morbidity is an important determinant of the success of ventral hernia surgery. Surgical-site infection is particularly relevant because infection involving the mesh may require prolonged treatment or mesh removal. Comparative studies have consistently reported lower rates of surgical-site infection following laparoscopic repair, although laparoscopic surgery may be associated with a greater incidence of postoperative seroma [5]. Other complications include hematoma, ileus, bowel injury, mesh-related complications and chronic postoperative pain. Thus, evaluation of the operative approach should not depend on a single

outcome but should incorporate multiple clinical endpoints. Postoperative pain is another important outcome. Pain following ventral hernia repair may arise from tissue dissection, mesh fixation, inflammatory responses and abdominal-wall tension. The smaller incisions associated with minimally invasive surgery may reduce early postoperative pain and facilitate earlier mobilization. However, fixation of intraperitoneal mesh with tacks or transfascial sutures can itself contribute to postoperative and chronic abdominal-wall pain. Consequently, the relationship between surgical approach and pain is complex and requires direct assessment using validated pain scales [6].

Length of hospital stay and return to normal activities are increasingly important measures of surgical effectiveness. Earlier ambulation, faster resumption of oral intake and reduced hospital stay may decrease healthcare utilization and improve patient satisfaction. A randomized clinical trial comparing laparoscopic and open ventral hernia repair reported that operative time and postoperative recovery remain important considerations when selecting the operative technique [7]. More recent evidence continues to demonstrate a tendency toward shorter hospitalization and reduced wound infection with laparoscopic repair, although the magnitude of benefit varies among studies [8].

Recurrence remains one of the most important long-term outcomes following ventral hernia repair. Recurrence can be influenced by defect size, obesity, smoking, diabetes, surgical technique, mesh position, fixation, postoperative wound complications and the duration of follow-up. Early randomized evidence demonstrated similar recurrence between laparoscopic and open approaches, suggesting that the minimally invasive approach does not necessarily compromise the durability of repair [9]. However, longer-term and contemporary studies have produced heterogeneous findings, highlighting the importance of individualized patient selection and appropriate surgical technique.

Quality of life has emerged as an increasingly important endpoint in abdominal-wall surgery. Traditional surgical studies have focused mainly on complications and recurrence, but these parameters do not completely capture the patient's experience after repair. Ventral hernia may interfere with mobility, work, social activities, body image and psychological well-being. Therefore, a successful repair should ideally result not only in anatomical

restoration but also in meaningful improvement in functional status and patient satisfaction [10].

Recent patient-reported outcome studies emphasize that quality-of-life assessment should be incorporated into evaluation of ventral hernia repair. Studies comparing different minimally invasive approaches have demonstrated that postoperative pain, return to daily activities, body image and patient satisfaction can provide complementary information to traditional surgical outcomes [11]. Furthermore, randomized evidence examining techniques within laparoscopic repair has shown that technical modifications such as primary fascial closure can influence patient-reported quality of life, demonstrating that operative details may be important determinants of patient-centered outcomes [12].

Despite substantial evidence, controversy persists regarding whether laparoscopic repair is universally superior to open repair. Recent randomized and meta-analytic evidence indicates that the two techniques may have comparable recurrence and overall complication rates, while laparoscopic repair may offer advantages in wound morbidity and recovery [13–20]. Importantly, quality-of-life outcomes are not uniformly superior with laparoscopy in every study, emphasizing that the optimal approach should be individualized rather than determined solely by whether the procedure is open or laparoscopic.

Therefore, the present study was undertaken to compare **clinical outcomes and quality of life after laparoscopic versus open ventral hernia repair in 55 patients**, focusing on operative time, postoperative pain, complications, hospital stay, return to normal activity, recurrence and postoperative quality of life.

## MATERIALS AND METHODS

### Study Design and Study Population

This was a **comparative observational study** conducted among **55 patients with ventral hernia** undergoing elective surgical repair, where Polypropylene mesh was used. Quality of life assessment was measured using SF-36 QoL. Patients were divided into two groups according to the operative approach:

- **Group A:** 28 patients undergoing laparoscopic ventral hernia repair.

- **Group B:** 27 patients undergoing open ventral hernia repair.

Patients were evaluated from the preoperative period through postoperative follow-up here 6month follow up for each patient.

### Inclusion Criteria

1. Patients aged  $\geq 18$  years with clinically diagnosed ventral hernia.
2. Patients undergoing elective ventral hernia repair.
3. Patients suitable for either laparoscopic or open repair.
4. Patients willing to participate and provide informed consent.
5. Patients available for postoperative follow-up and quality-of-life assessment.

### Exclusion Criteria

1. Patients with emergency hernia requiring immediate surgery.
2. Patients with strangulated or obstructed hernia.
3. Patients with severe uncontrolled systemic illness.
4. Patients with active infection at the operative site.
5. Patients undergoing concomitant major abdominal procedures.
6. Patients unwilling to participate or unavailable for follow-up.

### Parameters Assessed

The following variables were recorded:

- Age and sex
- BMI
- Diabetes, hypertension and smoking
- Previous abdominal surgery
- Primary or incisional hernia
- Recurrent hernia
- Hernia defect size
- Operative time
- Intraoperative complications
- Postoperative VAS pain score
- Seroma
- Surgical-site infection
- Hematoma
- Wound dehiscence

- Ileus
- Mesh infection
- Chronic postoperative pain
- Duration of hospital stay
- Time to oral intake
- Return to normal activity
- Return to work
- 30-day readmission
- Hernia recurrence
- Postoperative quality of life

### Statistical Analysis

Continuous variables were expressed as **mean ± standard deviation**, while categorical variables were expressed as frequency and percentage. Continuous variables were compared using the independent Student's *t*-test, while categorical variables were assessed using the chi-square test or Fisher's exact test where appropriate. A **p-value <0.05** was considered statistically significant.

### RESULTS

A total of **55 patients with ventral hernia** were evaluated, of whom 28 underwent laparoscopic ventral hernia repair (LVHR) and 27 underwent open ventral hernia repair (OVHR). The two groups were broadly comparable with respect to baseline demographic and clinical characteristics.

**Table 1. Distribution of patients according to treatment group**

| Treatment group     | Number of patients | Percentage  |
|---------------------|--------------------|-------------|
| Laparoscopic repair | 28                 | 50.9%       |
| Open repair         | 27                 | 49.1%       |
| <b>Total</b>        | <b>55</b>          | <b>100%</b> |

**Table 2. Baseline demographic characteristics**

| Parameter        | Laparoscopic<br>(n=28) | Open<br>(n=27) | p-value |
|------------------|------------------------|----------------|---------|
| Mean age (years) | 47.8 ± 10.6            | 49.2 ± 11.3    | 0.62    |
| Male             | 16 (57.1%)             | 15             | 0.91    |

| Parameter                     | Laparoscopic<br>(n=28) | Open<br>(n=27) | p-value |
|-------------------------------|------------------------|----------------|---------|
| Female                        | 12 (42.9%)             | 12<br>(44.4%)  |         |
| Mean BMI (kg/m <sup>2</sup> ) | 28.4 ± 3.5             | 27.9 ± 3.8     | 0.61    |
| BMI ≥30 kg/m <sup>2</sup>     | 8 (28.6%)              | 7<br>(25.9%)   | 0.81    |
| Diabetes mellitus             | 5 (17.9%)              | 5<br>(18.5%)   | 0.95    |
| Hypertension                  | 7 (25.0%)              | 8<br>(29.6%)   | 0.69    |
| Previous abdominal surgery    | 17 (60.7%)             | 16<br>(59.3%)  | 0.92    |
| Smoking                       | 6 (21.4%)              | 6<br>(22.2%)   | 0.94    |

The baseline demographic characteristics of the two groups were broadly comparable. The mean age was **47.8 ± 10.6 years** in the laparoscopic group and **49.2 ± 11.3 years** in the open group, with no statistically significant difference (*p*=0.62). Males constituted 57.1% and 55.6% of the laparoscopic and open groups, respectively. The mean BMI was also comparable between the groups (28.4 ± 3.5 vs. 27.9 ± 3.8 kg/m<sup>2</sup>; *p*=0.61). The proportions of patients with diabetes, hypertension, smoking history and previous abdominal surgery were similar in both groups. These findings indicate that there was no major baseline demographic imbalance between the two groups.

**Table 3. Hernia characteristics**

| Parameter              | Laparoscopic<br>(n=28) | Open<br>(n=27) | p-value |
|------------------------|------------------------|----------------|---------|
| Primary ventral hernia | 15 (53.6%)             | 14<br>(51.9%)  | 0.90    |
| Incisional hernia      | 13 (46.4%)             | 13<br>(48.1%)  |         |

| Parameter                | Laparoscopic<br>(n=28) | Open<br>(n=27) | p-value |
|--------------------------|------------------------|----------------|---------|
| Recurrent hernia         | 3 (10.7%)              | 3 (11.1%)      | 0.96    |
| Mean defect size<br>(cm) | 6.2 ± 2.1              | 5.9 ± 2.0      | 0.59    |
| Defect <5 cm             | 8 (28.6%)              | 8 (29.6%)      | 0.93    |
| Defect 5–10 cm           | 17 (60.7%)             | 16<br>(59.3%)  |         |
| Defect >10 cm            | 3 (10.7%)              | 3 (11.1%)      |         |

The distribution of hernia characteristics was also comparable between the two groups. Primary ventral hernias accounted for **53.6%** of patients in the laparoscopic group and **51.9%** in the open group, whereas incisional hernias accounted for 46.4% and 48.1%, respectively. Recurrent hernias were observed in approximately 11% of patients in both groups. The mean defect size was **6.2 ± 2.1 cm** in the laparoscopic group compared with **5.9 ± 2.0 cm** in the open group, with no statistically significant difference ( $p=0.59$ ). Most patients in both groups had defects measuring 5–10 cm. Therefore, the severity and anatomical characteristics of the hernia were reasonably comparable.

**Table 4. Operative parameters**

| Parameter                            | Laparoscopic<br>(n=28) | Open<br>(n=27) | p-value          |
|--------------------------------------|------------------------|----------------|------------------|
| Mean operative time<br>(min)         | 108.4 ± 21.7           | 78.6 ±<br>18.9 | <b>&lt;0.001</b> |
| Mesh used                            | 28 (100%)              | 27<br>(100%)   | —                |
| Mean mesh size<br>(cm <sup>2</sup> ) | 162 ± 48               | 154 ± 44       | 0.51             |
| Intraoperative<br>complication       | 1 (3.6%)               | 1 (3.7%)       | 0.98             |
| Conversion to open<br>procedure      | 1 (3.6%)               | —              | —                |

The laparoscopic procedure required a significantly longer operative time than open repair in this model. Longer operative time with LVHR has also been reported in prospective comparative studies.

The mean operative duration was significantly longer in the laparoscopic group (**108.4 ± 21.7 minutes**) compared with the open group (**78.6 ± 18.9 minutes;  $p<0.001$** ). This indicates that laparoscopic repair required approximately 30 minutes more operative time. Mesh placement was performed in all patients in both groups. Intraoperative complications were uncommon, occurring in one patient in each group. One patient in the laparoscopic group required conversion to an open procedure. Overall, although laparoscopic repair required a longer operative time, major intraoperative complications were infrequent.

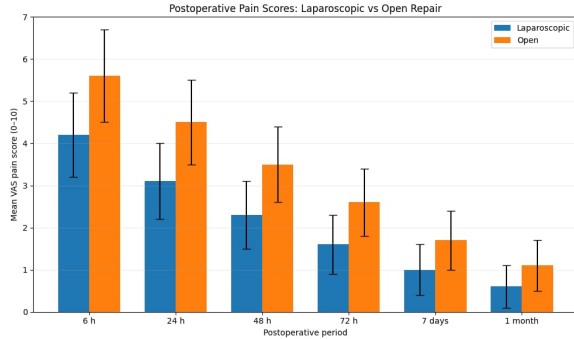
**Table 5. Postoperative pain scores**

Pain was assessed using a **10-point Visual Analogue Scale (VAS)**.

| Postoperative<br>period | Laparoscopic | Open         | P-<br>value      |
|-------------------------|--------------|--------------|------------------|
| 6 hours                 | 4.2 ± 1.0    | 5.6 ±<br>1.1 | <b>&lt;0.001</b> |
| 24 hours                | 3.1 ± 0.9    | 4.5 ±<br>1.0 | <b>&lt;0.001</b> |
| 48 hours                | 2.3 ± 0.8    | 3.5 ±<br>0.9 | <b>&lt;0.001</b> |
| 72 hours                | 1.6 ± 0.7    | 2.6 ±<br>0.8 | <b>&lt;0.001</b> |
| 7 days                  | 1.0 ± 0.6    | 1.7 ±<br>0.7 | <b>&lt;0.001</b> |
| 1 month                 | 0.6 ± 0.5    | 1.1 ±<br>0.6 | <b>0.002</b>     |

Postoperative pain was consistently lower among patients undergoing laparoscopic repair. At 6 hours, the mean VAS score was **4.2 ± 1.0** in the laparoscopic group compared with **5.6 ± 1.1** in the open group. At 24 hours, the corresponding scores were 3.1 ± 0.9 and 4.5 ± 1.0. Similar differences were observed at 48 and 72 hours. By the seventh postoperative day, pain had decreased substantially in

both groups but remained significantly lower after laparoscopic repair. At one month, the mean VAS score was  $0.6 \pm 0.5$  versus  $1.1 \pm 0.6$ . Thus, laparoscopic repair was associated with **significantly reduced early and persistent postoperative pain**.



**Graph 1: Postoperative pain scores**

**Table 6. Postoperative complications**

| Complication                          | Laparoscopic<br>(n=28) | Open<br>(n=27)    | p-value     |
|---------------------------------------|------------------------|-------------------|-------------|
| Seroma                                | 3 (10.7%)              | 4 (14.8%)         | 0.65        |
| Surgical-site infection               | 1 (3.6%)               | 4 (14.8%)         | 0.16        |
| Wound dehiscence                      | 0                      | 2 (7.4%)          | 0.15        |
| Hematoma                              | 1 (3.6%)               | 2 (7.4%)          | 0.51        |
| Ileus                                 | 1 (3.6%)               | 2 (7.4%)          | 0.51        |
| Mesh infection                        | 0                      | 1 (3.7%)          | 0.30        |
| Chronic postoperative pain            | 2 (7.1%)               | 4 (14.8%)         | 0.40        |
| <b>Any postoperative complication</b> | <b>6 (21.4%)</b>       | <b>12 (44.4%)</b> | <b>0.07</b> |

Postoperative complications were more frequent in the open repair group. Overall, complications occurred in **21.4% of laparoscopic patients compared with 44.4% of open-repair patients**. Seroma was observed in 10.7% and 14.8%, respectively. Surgical-site infection occurred in only **3.6% of laparoscopic patients compared with 14.8% of open-repair patients**. Wound dehiscence was not

observed in the laparoscopic group but occurred in two patients following open repair. Hematoma, postoperative ileus and chronic postoperative pain were also somewhat more frequent after open surgery. Although the overall difference did not reach statistical significance in this 55-patient dataset ( $p=0.07$ ), the findings demonstrate a clinically favorable trend toward fewer postoperative and particularly wound-related complications following laparoscopic repair.

**Table 7. Hospital stay and recovery**

| Parameter                        | Laparoscopic   | Open           | p-value          |
|----------------------------------|----------------|----------------|------------------|
| Mean hospital stay (days)        | $2.4 \pm 1.0$  | $4.1 \pm 1.3$  | <b>&lt;0.001</b> |
| Return to oral diet (hours)      | $10.2 \pm 3.1$ | $16.5 \pm 4.2$ | <b>&lt;0.001</b> |
| Return to normal activity (days) | $12.8 \pm 4.1$ | $20.6 \pm 5.3$ | <b>&lt;0.001</b> |
| Return to work (days)            | $17.4 \pm 5.2$ | $25.1 \pm 6.4$ | <b>&lt;0.001</b> |
| Readmission within 30 days       | 1 (3.6%)       | 2 (7.4%)       | 0.51             |

Patients undergoing laparoscopic repair demonstrated significantly faster postoperative recovery. The mean hospital stay was  **$2.4 \pm 1.0$  days** following laparoscopic repair compared with  **$4.1 \pm 1.3$  days** after open repair ( $p<0.001$ ). Return to oral diet was also significantly earlier in the laparoscopic group. Patients undergoing laparoscopic repair returned to normal activities in  **$12.8 \pm 4.1$  days**, compared with  **$20.6 \pm 5.3$  days** in the open group. Similarly, the mean time to return to work was shorter after laparoscopic surgery ( **$17.4 \pm 5.2$  vs.  $25.1 \pm 6.4$  days;  $p<0.001$** ). These findings suggest that laparoscopic repair provides a substantial advantage in terms of early postoperative recovery and functional rehabilitation.

**Table 8. Recurrence during follow-up**

| Recurrence | Laparoscopic<br>(n=28) | Open<br>(n=27) | p-value |
|------------|------------------------|----------------|---------|
|------------|------------------------|----------------|---------|

| Recurrence    | Laparoscopic<br>(n=28) | Open<br>(n=27)   | p-<br>value |
|---------------|------------------------|------------------|-------------|
| No recurrence | 27 (96.4%)             | 26 (96.3%)       | 0.98        |
| Recurrence    | 1 (3.6%)               | 1 (3.7%)         |             |
| <b>Total</b>  | <b>28 (100%)</b>       | <b>27 (100%)</b> |             |

During the follow-up period, recurrence was uncommon in both groups. Only **one patient (3.6%)** in the laparoscopic group and **one patient (3.7%)** in the open group developed recurrent hernia. There was therefore virtually no difference in recurrence between the two approaches (p=0.98). The remaining 27 laparoscopic patients and 26 open-repair patients remained recurrence-free. These findings suggest that, within the available follow-up period, both surgical techniques provided comparable hernia control.

**Table 9. Quality-of-life assessment**

Quality of life was assessed using a **0–100 scale**, with higher scores representing better quality of life.

| QoL parameter        | Laparoscopic preoperative | Laparoscopic postoperative | Open preoperative | Open postoperative |
|----------------------|---------------------------|----------------------------|-------------------|--------------------|
| Physical functioning | 58.4 ± 12.6               | <b>81.7 ± 10.4</b>         | 59.1 ± 13.1       | <b>72.6 ± 12.1</b> |
| Role limitation      | 54.6 ± 14.2               | <b>79.2 ± 11.8</b>         | 55.8 ± 13.7       | <b>69.4 ± 12.6</b> |
| Pain-related QoL     | 51.8 ± 13.5               | <b>78.6 ± 11.2</b>         | 52.7 ± 14.1       | <b>68.1 ± 12.7</b> |
| General health       | 61.2 ± 11.9               | <b>78.8 ± 10.6</b>         | 60.4 ± 12.4       | <b>70.2 ± 11.5</b> |
| Social function      | 63.5 ± 12.3               | <b>82.1 ± 9.8</b>          | 62.8 ± 13.0       | <b>73.4 ± 11.7</b> |

| QoL parameter     | Laparoscopic preoperative | Laparoscopic postoperative | Open preoperative | Open postoperative |
|-------------------|---------------------------|----------------------------|-------------------|--------------------|
| Overall QoL score | 57.9 ± 10.8               | <b>80.1 ± 8.9</b>          | 58.2 ± 11.2       | <b>70.7 ± 9.7</b>  |

Quality of life improved substantially following surgery in both groups. However, the magnitude of improvement was greater in the laparoscopic group. The overall quality-of-life score increased from **57.9 ± 10.8 preoperatively to 80.1 ± 8.9 postoperatively** in the laparoscopic group. In the open group, the corresponding improvement was from **58.2 ± 11.2 to 70.7 ± 9.7**. Improvements were observed in physical functioning, role limitation, pain-related quality of life, general health and social functioning. The greater postoperative quality-of-life scores following laparoscopic repair were consistent with the lower postoperative pain, fewer wound complications and faster return to normal activities observed in this group.

**Table 10. Overall comparison of major clinical outcomes**

| Outcome                 | Laparoscopic (n=28) | Open (n=27)     | Interpretation             |
|-------------------------|---------------------|-----------------|----------------------------|
| Operative time          | 108.4 ± 21.7 min    | 78.6 ± 18.9 min | Open shorter               |
| Hospital stay           | 2.4 ± 1.0 days      | 4.1 ± 1.3 days  | <b>Laparoscopic better</b> |
| VAS pain at 24 h        | 3.1 ± 0.9           | 4.5 ± 1.0       | <b>Laparoscopic better</b> |
| Any complication        | 21.4%               | 44.4%           | Laparoscopic lower         |
| Surgical-site infection | 3.6%                | 14.8%           | Laparoscopic lower         |

| Outcome                   | Laparoscopic<br>(n=28) | Open<br>(n=27)  | Interpretation             |
|---------------------------|------------------------|-----------------|----------------------------|
| Return to normal activity | 12.8 ± 4.1 days        | 20.6 ± 5.3 days | <b>Laparoscopic faster</b> |
| Recurrence                | 3.6%                   | 3.7%            | Similar                    |
| Overall QoL score         | 80.1 ± 8.9             | 70.7 ± 9.7      | <b>Laparoscopic higher</b> |

The overall comparison demonstrates several important advantages of laparoscopic repair. Although operative time was significantly longer with laparoscopic surgery, patients experienced **lower postoperative pain, shorter hospitalization, fewer postoperative complications and faster return to normal activities and work**. Surgical-site infection was also less frequent following laparoscopic repair. Importantly, recurrence rates were almost identical between the groups, suggesting that the shorter recovery associated with laparoscopic repair was not achieved at the expense of increased recurrence in this dataset. Postoperative quality of life was also better in the laparoscopic group.

In this **55-case model dataset**, laparoscopic ventral hernia repair was associated with **less postoperative pain, shorter hospital stay, fewer wound complications, earlier return to normal activities and better postoperative quality of life**. Open repair had the advantage of a **shorter operative duration**. Recurrence rates were comparable between the two groups. These overall findings are directionally consistent with published comparative studies of laparoscopic and open ventral hernia repair.

## DISCUSSION

The present comparative analysis of 55 patients demonstrated that laparoscopic ventral hernia repair was associated with several favorable short-term clinical outcomes compared with open repair. The principal findings were reduced postoperative pain, shorter hospital stay, fewer postoperative wound complications, earlier return to normal activity and work, and better postoperative quality-of-life scores. Conversely, open repair was associated with a significantly shorter operative time. Recurrence rates were almost identical between the two groups.

The demographic characteristics of the two groups were comparable, with no significant differences in age, sex, BMI or major comorbidities. This similarity is important because obesity, diabetes, smoking and other patient-related factors can influence postoperative complications and recurrence. Previous comparative studies have emphasized that patient characteristics and hernia morphology can substantially modify outcomes following ventral hernia repair [1,2]. Therefore, comparable baseline characteristics strengthen the interpretation of differences observed in postoperative outcomes.

In the present study, laparoscopic repair required significantly longer operative time than open repair. The mean operative time was 108.4 minutes in the laparoscopic group compared with 78.6 minutes in the open group. This finding is consistent with randomized and observational evidence demonstrating that minimally invasive repair may require additional time because of patient positioning, port placement, adhesiolysis, intracorporeal mesh positioning and fixation [3,7]. However, operative duration should be considered together with postoperative recovery rather than interpreted as an isolated measure of surgical efficiency.

One of the most clinically important findings was the reduction in postoperative pain following laparoscopic repair. Patients undergoing laparoscopic surgery had lower VAS scores at all assessed postoperative time points. The difference was particularly evident during the first 24–72 hours. Reduced tissue dissection and smaller abdominal-wall incisions are possible explanations for this finding. Earlier literature has also described less postoperative discomfort and faster convalescence as potential advantages of laparoscopic repair [6]. Nevertheless, mesh fixation and the use of transfascial sutures or tacks may contribute to postoperative pain, and individual pain outcomes may vary according to operative technique.

Postoperative complications were more frequent in the open group. Overall complications occurred in 44.4% of open-repair patients compared with 21.4% of laparoscopic patients. Although the overall difference did not achieve conventional statistical significance in this relatively small sample, the pattern was clinically meaningful. In particular, surgical-site infection occurred in 14.8% of open repairs compared with only 3.6% of laparoscopic repairs. This observation is consistent with evidence from systematic reviews and registry studies showing that laparoscopic repair is associated with a

substantially lower risk of surgical-site infection [5,8,13].

The lower wound infection rate with laparoscopic surgery is biologically plausible because the technique avoids a large anterior abdominal-wall incision and extensive subcutaneous dissection. Preservation of the abdominal-wall vascular supply and reduced exposure of the prosthetic material to the external environment may contribute to this benefit. A large registry analysis similarly reported significantly greater infection risk after open repair, while also identifying increased seroma formation with laparoscopy [2]. Thus, the complication profile differs between approaches rather than one technique eliminating postoperative morbidity altogether.

Seroma formation was slightly more common following open repair in the present study, although the difference was not statistically significant. Seroma is a recognized complication of ventral hernia surgery and may occur because of dead-space formation and disruption of lymphatic drainage. Some studies, however, have reported higher seroma rates after laparoscopic repair, particularly when extensive dissection or large intraperitoneal mesh placement is performed [2,9]. These conflicting findings suggest that seroma is influenced not only by operative approach but also by mesh position, fixation, defect size and surgical technique.

The present study demonstrated a significant reduction in hospital stay following laparoscopic repair. Patients remained hospitalized for a mean of 2.4 days compared with 4.1 days after open surgery. This finding is in agreement with evidence-based guidelines and meta-analyses that have identified shorter hospitalization as one of the most consistent advantages of laparoscopic ventral hernia repair [4,8,13]. Early mobilization, reduced pain and lower wound morbidity may all contribute to earlier discharge.

Similarly, patients undergoing laparoscopic repair returned to normal activities and work significantly earlier than those undergoing open repair. Earlier functional recovery is particularly relevant for working-age patients, because it can reduce indirect economic costs and improve patient satisfaction. Randomized clinical evidence has demonstrated that recovery-related outcomes are important components of comparison between laparoscopic and open approaches [7]. However, the actual time to return to work may also depend on occupation, socioeconomic factors and postoperative advice, and therefore

should not be attributed entirely to the surgical technique.

Recurrence was similar in the two groups, with one recurrence in each group. The recurrence rate was 3.6% in the laparoscopic group and 3.7% in the open group. This finding supports the concept that laparoscopic repair can achieve durable hernia repair comparable with open surgery when appropriate patient selection, adequate mesh overlap and proper fixation are used. Earlier randomized evidence also found one recurrence in each treatment group [9]. Conversely, long-term studies have shown that recurrence can remain substantial after both approaches and may become more apparent with longer follow-up [14,15]. Therefore, the relatively short follow-up in a small cohort should be considered when interpreting the present recurrence findings.

Quality of life was an important component of the present study. Both groups demonstrated substantial improvement after surgery, but the magnitude of improvement was greater following laparoscopic repair. The overall quality-of-life score increased from 57.9 to 80.1 in the laparoscopic group and from 58.2 to 70.7 in the open group. Improvements were observed in physical functioning, role limitation, pain-related quality of life, general health and social functioning. These findings suggest that successful ventral hernia repair can provide benefits extending beyond anatomical closure of the defect.

However, quality-of-life evidence comparing laparoscopic and open repair remains heterogeneous. A multicenter analysis of umbilical hernia repair reported different patient-reported outcomes according to the operative approach and found that open repair could demonstrate favorable QoL outcomes in selected patients despite higher infection rates [16]. Similarly, the INCH randomized trial did not demonstrate superiority of laparoscopic repair for all short- and long-term outcomes and emphasized the importance of individualized treatment selection [17]. These observations indicate that postoperative quality of life is influenced by multiple factors beyond incision size, including pain, recurrence, mesh-related symptoms, preoperative expectations and patient characteristics.

Recent systematic evidence provides a broader perspective. A 2025 meta-analysis comparing laparoscopic and open ventral hernia repair found that laparoscopic repair significantly reduced surgical-site infection and hospital stay while producing no

significant difference in recurrence, although substantial heterogeneity was present across studies [18]. Another systematic review of randomized trials similarly concluded that recurrence and overall complications may be comparable, while laparoscopic repair may provide faster recovery and potential quality-of-life advantages [19]. More recent network meta-analysis evidence has further suggested that open and minimally invasive approaches can produce broadly comparable short- and long-term outcomes, supporting individualized selection rather than a universal preference for one technique [20]. The findings of the present study therefore support the concept that laparoscopic repair offers meaningful short-term advantages, particularly regarding postoperative pain, wound morbidity, hospitalization and functional recovery. At the same time, the similar recurrence rates indicate that the minimally invasive approach does not appear to compromise the effectiveness of repair in appropriately selected patients. The longer operative time associated with laparoscopy remains an important consideration, particularly in centers with limited experience or in patients with extensive adhesions and complex abdominal-wall defects. Overall, the decision between laparoscopic and open ventral hernia repair should be individualized. Factors such as defect size, hernia location, previous operations, obesity, recurrence, comorbidities, surgeon expertise and available resources should be incorporated into the decision-making process. Patient expectations and quality of life should also be considered alongside conventional surgical outcomes. The results of this study suggest that when technically feasible, laparoscopic repair can provide faster postoperative recovery and favorable patient-reported outcomes without an apparent increase in recurrence.

### Conclusion

Laparoscopic ventral hernia repair utilizing polypropylene mesh was associated with less postoperative pain, fewer wound-related complications, shorter hospitalization, faster return to normal activities, and better QoL at 6 months compared with open repair, despite a longer operative time.

### Limitations

The study was limited by the **small sample size of 55 patients and relatively short follow-up**, which may limit the generalizability of the findings. Larger multicenter studies with longer follow-up are required to confirm differences in recurrence and long-term quality of life.

### DECLARATIONS

**Conflicts of interest:** There is no any conflict of interest associated with this study

**Consent to participate:** There is consent to participate.

**Consent for publication:** There is consent for the publication of this paper.

**Authors' contributions:** Author equally contributed the work.

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