ORIGINAL RESEARCH

Comparison of Laparoscopic and Open Repair for Para-Umbilical Hernia: A Prospective study of Short-Term Outcomes

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ABSTRACT

Background: Para-umbilical hernia (PUH) is a common ventral hernia occurring near the umbilicus, where the abdominal wall weakens, leading to the protrusion of intra-abdominal contents. This study aimed to compare the short-term outcomes of laparoscopic and open repair of para-umbilical hernia, focusing on operative time, postoperative pain, complications, hospital stay length, and early recurrence rates.**Materials and Methods:** A prospective comparative study was conducted at a tertiary care hospital, including 110 patients diagnosed with para-umbilical hernia. Patients were randomly assigned into two groups: Group A (Laparoscopic Repair, n=55), undergoing intraperitonealonlay mesh (IPOM) repair, and Group B (Open Repair, n=55), undergoing conventional open mesh repair. The primary outcomes assessed were operative time, postoperative pain (measured using the Visual Analogue Scale), and hospital stay duration. Secondary outcomes included postoperative complications such as wound infection, seroma, hematoma, and early recurrence within three months. Statistical analysis was performed using SPSS version 25.0, with a p-value <0.05 considered statistically significant.**Results:** The mean operative time was significantly shorter in the laparoscopic group (62.4 ± 8.2 minutes) than in the open repair group (74.5 ± 9.6 minutes) ($p < 0.001$). Postoperative pain scores were consistently lower in the laparoscopic group at all time points, with a significant difference observed at 6 hours (3.2 ± 1.1 vs. 5.4 ± 1.3, $p < 0.001$). The length of hospital stay was significantly shorter in the laparoscopic group (1.8 ± 0.5 days) compared to the open repair group (3.2 ± 0.8 days) ($p < 0.001$). The incidence of postoperative complications, including wound infection (3.64% vs. 10.91%) and seroma formation (5.45% vs. 14.55%), was lower in the laparoscopic group, though not statistically significant. Early recurrence was slightly lower in the laparoscopic group (1.82% vs. 5.45%), but the difference was not significant ($p = 0.31$).**Conclusion:** Laparoscopic repair of para-umbilical hernia is associated with a significantly shorter operative time, reduced postoperative pain, and a shorter hospital stay compared to open repair. Although postoperative complications and early recurrence rates were lower in the laparoscopic group, the differences were not statistically significant. These findings suggest that laparoscopic repair may be a preferable approach for para-umbilical hernia repair, but further studies are needed to evaluate long-term outcomes.

Keywords: Laparoscopic repair, Open repair, Para-umbilical hernia, Postoperative pain, Recurrence rate.

INTRODUCTION

Para-umbilical hernia (PUH) is a common ventral hernia occurring near the umbilicus, where the abdominal wall weakens, leading to the protrusion of intra-abdominal contents. The condition is prevalent among adults, particularly in women with multiple pregnancies and individuals with obesity, chronic cough, or ascites. The progressive weakening of the lineaalba around the umbilical region leads to the development of a hernial defect, which can cause discomfort, pain, and complications such as incarceration or strangulation. Given its clinical

significance, surgical repair remains the definitive treatment for PUH.[1]

Surgical intervention for PUH can be performed using either the traditional open approach or the minimally invasive laparoscopic technique. Open repair has been the standard procedure for decades, involving a direct incision over the hernia site, defect closure with or without mesh reinforcement, and subsequent wound closure. While this approach provides direct access to the hernia, it is associated with longer recovery times, increased postoperative pain, and a higher risk of wound-related complications such as infection and seroma formation. Despite these drawbacks, open repair remains widely practiced due to its accessibility, cost-effectiveness, and surgeon familiarity.[2,3]

In contrast, laparoscopic repair has gained prominence over the past few decades as an alternative approach to ventral hernia repair, including PUH. The laparoscopic technique involves the placement of small ports through which a camera and specialized instruments are introduced to facilitate intra-abdominal dissection and mesh placement. This method offers several potential advantages, including reduced postoperative pain, shorter hospital stays, faster return to daily activities, and lower incidence of wound-related complications. However, laparoscopic repair also presents challenges, such as a steeper learning curve, increased operative time, higher costs, and the potential for visceral or vascular injuries due to the need for intra-abdominal dissection.[4]

The choice between laparoscopic and open repair of PUH remains a topic of debate, with surgeons selecting the approach based on patient factors, hernia characteristics, institutional resources, and individual expertise. While several studies have compared the two techniques, there remains variability in outcomes, particularly concerning postoperative pain, recurrence rates, and complications. Short-term outcomes such as operative time, postoperative pain, hospital stay, and early complications play a crucial role in determining the optimal surgical approach for PUH repair.[5,6]

Beyond short-term recovery, long-term success in PUH repair is dependent on factors such as recurrence rates and patient satisfaction. Open repair, although a straightforward procedure, is associated with a higher incidence of wound infections and longer recovery periods, potentially impacting patient compliance and quality of life. Conversely, while laparoscopic repair offers the advantage of smaller incisions and faster recovery, it requires advanced surgical skills and can be associated with specific complications such as bowel adhesions or chronic pain due to intra-abdominal mesh placement. The comparative efficacy of these techniques in real-world settings remains an area of ongoing clinical interest, necessitating further prospective evaluations.[7]

AIM AND OBJECTIVES

This prospective comparative study aims to evaluate and compare the short-term outcomes of laparoscopic versus open repair for PUH.

MATERIALS AND METHODS

Study Design

This prospective comparative study was conducted to evaluate the short-term outcomes of laparoscopic versus open repair of para-umbilical hernia.

Study Population

A total of 110 patients diagnosed with para-umbilical hernia were enrolled in the study.

Study Place

The study was conducted in the Department of General Surgery atRama Medical College Hospital & Research Centre, Hapur, Uttar Pradesh, India, ensuring a controlled and standardized clinical setting for both surgical techniques.

Study Period

The study was conducted over a period of one year, from January 2017 to December 2017,including patient recruitment, surgical intervention, and a three-month postoperative follow-up for assessing early outcomes.

Ethical Considerations

- The study was approved by the Institutional Ethics Committee prior to initiation.
- Informed consent was obtained from all participants before enrollment.
- The study adhered to the principles of the Declaration of Helsinki for ethical research involving human participants.

Inclusion Criteria

- Patients aged 18 to 70 years.
- Clinically and radiologically confirmed para-umbilical hernia.
- Elective surgical candidates for hernia repair.
- No prior history of umbilical or para-umbilical hernia repair.

Exclusion Criteria

- Patients with recurrent hernias.

- Complicated hernias (strangulated or incarcerated).
- Severe comorbid conditions precluding surgery.
- Pregnant patients.

Surgical Procedure

Patients were randomly assigned into two groups using a computer-generated randomization method to ensure an unbiased distribution.

1. Laparoscopic Repair (Group A, n=55)

- Performed under general anesthesia using a three-port technique.
- Hernia sac contents were carefully reduced.
- A polypropylene mesh was placed intraperitoneally and secured using tacks or sutures.
- Closure of the peritoneal defect was done as needed to prevent adhesions.

2. Open Repair (Group B, n=55)

- Performed under general or regional anesthesia, depending on patient suitability.
- A midline incision was made over the hernia site for direct access.
- The hernia sac was meticulously dissected and reduced.
- A polypropylene mesh was placed in a sublay or onlay position and secured with non-absorbable sutures.
- The wound was closed with absorbable or non-absorbable sutures.

Postoperative Care and Follow-up

- Standardized analgesia was provided using NSAIDs and opioids as required.
- Early mobilization within 24 hours was encouraged to minimize complications.
- Patients were discharged once pain control and mobility were achieved.
- Follow-up assessments were conducted at 1 week, 1 month, and 3 months postoperatively.

Outcome Measures

The study evaluated primary and secondary outcomes:

Primary Outcomes

- Operative time (measured in minutes).
- Postoperative pain (measured using the Visual Analogue Scale [VAS]).
- Length of hospital stay (measured in days).

Secondary Outcomes

- Postoperative complications (e.g., wound infection, seroma, hematoma, mesh-related complications).
- Early recurrence rates, defined as hernia recurrence within three months postoperatively.

STATISTICAL ANALYSIS

- Data analysis was performed using SPSS version 16.0.
- Continuous variables (operative time, pain scores, length of stay) were presented as mean ± standard deviation (SD) and compared using the independent t-test.
- Categorical variables (complication rates, recurrence rates) were analyzed using the Chi-square test or Fisher's exact test, as appropriate.
- A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Characteristics

Variable	Laparoscopic Repair (n=55)	Open Repair (n=55)	p-value
Age (years)	45.6 ± 12.3	46.2 ± 11.8	0.78
Male (%)	30 (54.55%)	32 (58.18%)	0.68
Female (%)	25 (45.45%)	23 (41.82%)	0.68
BMI (kg/m²)	27.5 ± 3.2	28.0 ± 3.5	0.54
Diabetes Mellitus (%)	10 (18.18%)	9 (16.36%)	0.81
Hypertension (%)	12 (21.82%)	11 (20.00%)	0.75

Table 1 show that the baseline characteristics of the patients in both the laparoscopic and open repair groups were similar, as indicated by non-significant p-values. The mean age of patients undergoing laparoscopic repair was 45.6 ± 12.3 years, while for open repair, it was 46.2 ± 11.8 years (p = 0.78). The gender distribution was also comparable, with males accounting for 54.55% in the laparoscopic group and 58.18% in the open repair group (p = 0.68). Similarly, the mean BMI was nearly identical between groups, with 27.5 ± 3.2 kg/m² in the laparoscopic group and 28.0 ± 3.5 kg/m² in the open group (p = 0.54). The presence of comorbidities, including

diabetes mellitus (18.18% vs. 16.36%, p = 0.81) and hypertension (21.82% vs. 20.00%, p = 0.75), did not show statistically significant differences between the two groups. These findings confirm that both groups were well-matched, allowing for a fair comparison of surgical outcomes.

Table 2: Operative and Hospital Stay Data

Variable	Laparoscopic Repair (n=55)	Open Repair (n=55)	p-value
Operative Time (minutes)	62.4 ± 8.2	74.5 ± 9.6	<0.001
Hospital Stay (days)	1.8 ± 0.5	3.2 ± 0.8	<0.001

Table 2 show that the operative time was significantly shorter in the laparoscopic repair group, with a mean duration of 62.4 ± 8.2 minutes compared to 74.5 ± 9.6 minutes in the open repair group (p < 0.001). This suggests that laparoscopic repair is a more time-efficient procedure. Additionally, patients undergoing laparoscopic repair had a significantly shorter hospital stay, averaging 1.8 ± 0.5 days, whereas open repair patients had an average hospital stay of 3.2 ± 0.8 days (p < 0.001). The shorter hospital stay in the laparoscopic group highlights its advantage in facilitating early discharge and reducing hospital resource utilization.

Table 3: Postoperative Pain Scores (VAS Scale)

Time Point	Laparoscopic Repair (n=55)	Open Repair (n=55)	p-value
6 Hours	3.2 ± 1.1	5.4 ± 1.3	<0.001
24 Hours	2.1 ± 0.9	3.8 ± 1.2	<0.001
48 Hours	1.5 ± 0.7	2.9 ± 0.8	<0.001
1 Week	0.8 ± 0.5	1.5 ± 0.7	0.002

Table 3 shows that the Postoperative pain scores, measured using the Visual Analogue Scale (VAS), were consistently lower in the laparoscopic group at all time points. At 6 hours postoperatively, the mean pain score was 3.2 ± 1.1 in the laparoscopic group compared to 5.4 ± 1.3 in the open repair group (p < 0.001). At 24 hours, pain levels remained lower in the laparoscopic group (2.1 ± 0.9) than in the open repair group (3.8 ± 1.2, p < 0.001). Similarly, at 48 hours, the laparoscopic group had a mean score of 1.5 ± 0.7 versus 2.9 ± 0.8 in the open repair group (p < 0.001). By 1 week postoperatively, pain scores had further decreased in both groups, but the laparoscopic group still reported significantly lower scores (0.8 ± 0.5 vs. 1.5 ± 0.7, p = 0.002). These findings suggest that laparoscopic repair is associated with reduced postoperative pain, which may contribute to faster recovery and improved patient satisfaction.

Table 4: Postoperative Complications

Complication	Laparoscopic Repair (n=55)	Open Repair (n=55)	p-value
Wound Infection (%)	2 (3.64%)	6 (10.91%)	0.14
Seroma Formation (%)	3 (5.45%)	8 (14.55%)	0.06
Hematoma (%)	1 (1.82%)	3 (5.45%)	0.31
Mesh-related Complication (%)	0 (0.00%)	2 (3.64%)	0.15

Table 4 and graph I, shows that the incidence of postoperative complications was generally lower in the laparoscopic repair group. Wound infection was reported in 3.64% of laparoscopic patients compared to 10.91% in the open repair group (p = 0.14), indicating a lower but statistically insignificant trend toward reduced infections with laparoscopic surgery. Seroma formation was observed in 5.45% of the laparoscopic group and 14.55% in the open repair group (p = 0.06), again favoring laparoscopic repair but without reaching statistical significance. Hematoma occurred in 1.82% of laparoscopic cases

versus 5.45% in the open repair group (p = 0.31). Mesh-related complications were absent in the laparoscopic group but occurred in 3.64% of open repair patients (p = 0.15). Although none of these individual complications reached statistical significance, the overall trend suggests that laparoscopic repair may be associated with a lower risk of postoperative complications.

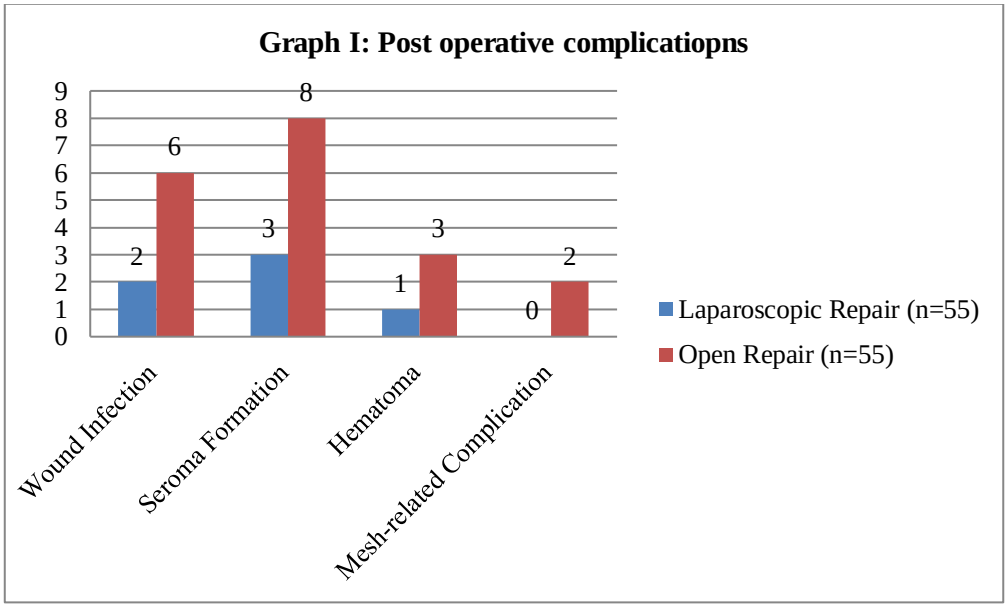

Table 5: Early Recurrence Rates (Within 3 Months)

Early Recurrence (%)	Laparoscopic Repair (n=55)	Open Repair (n=55)	p-value
Yes	1 (1.82%)	3 (5.45%)	0.31
No	54 (98.18%)	52 (94.55%)	-

Table 5 shows that the early recurrence was slightly lower in the laparoscopic group, with only 1 patient (1.82%) experiencing recurrence compared to 3 patients (5.45%) in the open repair group (p = 0.31). Although this difference was not statistically significant, it suggests that laparoscopic repair does not increase the risk of early recurrence and may be associated with a lower recurrence rate.

Table 6: Multiple Regression Analysis Results

Variable	Coefficient (B)	Standard Error	p-value
Constant	1.27	1.67	0.446
Operative Time (minutes)	-0.02	0.02	0.296
Postoperative Pain (VAS Score)	-0.03	0.20	0.870
Length of Hospital Stay (days)	0.06	0.19	0.741

Table 6 shows that the multiple regression analysis was performed to assess the influence of operative time, postoperative pain, and length of hospital stay on early recurrence. The regression model did not find a significant association between these variables and recurrence. The coefficient for operative time was -0.02 (p = 0.296), indicating that operative time had a negligible and statistically insignificant effect on recurrence. Similarly, postoperative pain (B = -0.03, p = 0.870) and length of hospital stay (B = 0.06, p = 0.741) were not significant predictors of early recurrence. The constant term was 1.27, but it also did not reach statistical significance (p = 0.446). These findings suggest that early recurrence is likely influenced by other factors beyond operative time, postoperative pain, and hospital stay.

DISCUSSION

The present study aimed to compare the short-term outcomes of laparoscopic versus open repair of para-umbilical hernias, focusing on

operative time, postoperative pain, complications, hospital stay length, and early recurrence rates.

In our study, the mean operative time for laparoscopic repair was 62.4 ± 8.2 minutes, significantly shorter than the 74.5 ± 9.6 minutes observed for open repair ($p < 0.001$). Additionally, patients undergoing laparoscopic repair had a shorter hospital stay, averaging 1.8 ± 0.5 days compared to 3.2 ± 0.8 days for the open repair group ($p < 0.001$). These findings are consistent with those reported by Korukonda et al. (2017), who found that laparoscopic repair resulted in reduced operative times and shorter hospital stays compared to open repair.[8] Similarly, a study by Pring et al. (2008) reported that the mean length of stay was significantly longer after open repair compared to laparoscopic repair.[9]

Our results demonstrated that postoperative pain scores were consistently lower in the laparoscopic group at all measured time points. For instance, at 6 hours postoperatively, the mean pain score was 3.2 ± 1.1 in the laparoscopic group versus 5.4 ± 1.3 in the open repair group ($p < 0.001$). This trend continued at 24 hours, 48 hours, and one week postoperatively. These outcomes are in line with the meta-analysis conducted by Aslani and Brown (2010), which reported that laparoscopic repair was associated with less postoperative pain compared to open repair.[10] Similarly, Pring et al. (2008) found that patients undergoing laparoscopic repair experienced less postoperative pain than those who had open repair.[9]

The incidence of postoperative complications in our study was lower in the laparoscopic group, though the differences were not statistically significant. Wound infections occurred in 3.64% of laparoscopic patients versus 10.91% in the open repair group ($p = 0.14$). Seroma formation was observed in 5.45% of the laparoscopic group compared to 14.55% in the open group ($p = 0.06$). These findings are comparable to those of a meta-analysis by Aslani and Brown (2010), which found a higher risk of wound infection in open mesh repair compared to laparoscopic repair.[10]Additionally, Cassie et al. (2014) reported that laparoscopic repair was associated with a decreased wound infection rate compared to open repair.[11]

In our study, early recurrence rates were slightly lower in the laparoscopic group, with 1.82% experiencing recurrence compared to 5.45% in the open repair group ($p = 0.31$). Although this difference was not statistically significant, it suggests a potential advantage of laparoscopic repair in reducing early recurrences. This observation aligns with the findings of Korukonda et al. (2017), who reported a lower recurrence rate in the laparoscopic group, though their results also did not reach statistical significance.[8] Similarly, Pring et al. (2008) found no significant difference in recurrence rates between laparoscopic and open repair groups.[9]

Our multiple regression analysis did not identify operative time, postoperative pain, or length of hospital stay as significant predictors of early recurrence. This suggests that factors beyond these variables may influence recurrence rates. While specific comparative studies on this aspect are limited, our findings highlight the need for further research to identify determinants of recurrence following para-umbilical hernia repair.

LIMITATIONS OF THE STUDY

1. **Short Follow-Up Duration** – The study only assesses early postoperative outcomes (up to three months), which may not fully capture long-term recurrence rates and late complications.
2. **Single-Centre Study** – The study was conducted at a single tertiary care hospital, findings to other healthcare settings or populations.
3. **Limited Sample Size** – With **110 patients**, the sample size may not be large enough to detect subtle differences in rare complications or long-term recurrence rates.

CONCLUSION

This study demonstrates that laparoscopic repair of para-umbilical hernia offers several advantages over open repair, including significantly shorter operative time, reduced postoperative pain, and a shorter hospital stay. Although the incidence of postoperative complications and early recurrence rates were lower in the laparoscopic group, the differences were not statistically significant. The findings align with previous studies, reinforcing the benefits of laparoscopic repair in terms of patient recovery and overall surgical outcomes.

REFERENCES

1. Gray SH, Hawn MT, Itani KMF. Surgical progress in inguinal and ventral incisional hernia repair. *SurgClin North Am.* 2008;88(1):17–26.

2. Jin J, Rosen MJ. Laparoscopic versus open ventral hernia repair. *SurgClin North Am.* 2008;88(5):1083–100.
3. Muschaweck U. Umbilical and epigastric hernia repair. *SurgClin North Am.* 2003;83(5):1207–21.
4. White TJ, Santos MC, Thompson JS. Factors affecting wound complications in repair of ventral hernias. *Am Surg*. 1998;64(3):276–80.
5. Forbes SS, Eskicioglu C, McLeod RS, Okrainec A. Meta-analysis of randomized controlled trials comparing open and laparoscopic ventral and incisional hernia repair with mesh. *Br J Surg.* 2009;96(8):851–58.
6. Bucher P, Pugin F, Morel P. Single port laparoscopic repair of primary and incisional ventral hernia. *Hernia.* 2009;13(5):569–70.
7. Jagad RB. Laparoscopic ventral hernia repair: a new method for fixation of the mesh with sutures. *SurgLaparoscEndoscPercutan Tech.* 2008;18(3):277–79.
8. Korukonda L, Sankeerth R, Sreekanth P, Reddy B, Bhaskar R. Laparoscopic versus open repair of para-umbilical hernia: A prospective comparative study of short-term outcomes. *IntSurg J.* 2017;4(5):1670-4.
9. Pring CM, Tran V, O'Rourke N, Martin IJ. Laparoscopic versus open ventral hernia repair: A randomized controlled trial. *Aust N Z J Surg*. 2008;78(10):903-6.
10. Aslani N, Brown CJ. Does mesh offer an advantage over tissue in the open repair of umbilical hernias? A systematic review and meta-analysis. *Hernia.* 2010;14(5):455-62.
11. Cassie S, Okrainec A, Saleh F, Quereshy FA, Jackson TD. Laparoscopic versus open elective repair of primary umbilical hernias: Short-term outcomes from the American College of Surgeons National Surgical Quality Improvement Program. *SurgEndosc.* 2014;28(3):741-6.