

# Postoperative Outcomes and Patient Satisfaction Following Laparoscopic Versus Open Inguinal Hernia Repair: A Comparative Study

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## ABSTRACT

**Background:** Laparoscopic and open are the two main ways of doing inguinal hernia repair. Laparoscopic repair has advantages including reduced postoperative pain and quicker recovery, however, feasibility, efficacy, and accessibility of this procedure in resource limited settings like Pakistan is not clear.

**Objective:** To compare, evaluate and quantify the postoperative outcomes, complications, recovery time and patient satisfaction between laparoscopic and open inguinal hernia repair at tertiary care setting in Pakistan.

**Methods:** This was a prospective comparative study conducted at three tertiary care hospitals in Pakistan. Eighty adult patients with primary unilateral reducible inguinal hernia were randomly assigned to undergo laparoscopic versus open inguinal hernia repair. Operative time, hospital stay and postoperative complications were the primary outcomes. Other outcomes included pain assessment by the Visual Analog Scale (VAS), return to normal activities, and patient satisfaction. SPSS version 26.0 was used to perform statistical analysis, significance of  $p < 0.05$ .

**Results:** Operative time was longer with laparoscopic repair ( $91.2 \pm 14.7$  min vs.  $57.9 \pm 11.5$  min,  $p < 0.001$ ) but shorter with hospital stay ( $1.1 \pm 0.5$  days vs.  $2.5 \pm 1.0$  days,  $p < 0.001$ ). There was significantly lower postoperative pain in the LIHR group ( $p < 0.001$ ). The total complication rates were lower in the laparoscopic group (7.5 vs. 15.0,  $p = 0.048$ ). The patients who have undergone laparoscopic repair were found to be more satisfied with the outcome.

**Conclusion:** The postoperative outcomes after laparoscopic inguinal hernia repair are better, such as less pain, less time in hospital and faster recovery. Despite it, in Pakistan its adoption is limited to due to cost and training requirements.

**Keywords:** Inguinal hernia, Laparoscopic repair, Open repair, Postoperative outcomes, Patient satisfaction, minimally invasive surgery, Pakistan.

## INTRODUCTION

Surgical burden continues to increase in Pakistan due to high prevalence of untreated hernias both in the urban and rural settings and inguinal hernia repair continues to be one of the most common general surgical procedures performed throughout the world<sup>1</sup>. An inguinal hernia is where intra abdominal contents protrude through a weakened inguinal canal, which may become a major problem if left untreated, with severe complications such as bowel obstruction, strangulation and chronic pain. The incidence of inguinal hernia is likely to increase with increasing life expectancy and changing occupational patterns in Pakistan, and new surgical techniques that enhance clinical outcomes and patient satisfaction are required<sup>2</sup>.

Traditionally, open inguinal hernia repair, particularly the Lichtenstein tension free mesh repair, has been the preferred approach in Pakistan due to its cost effectiveness, technical feasibility and the feasibility for the procedure to be performed under local or regional anesthesia which is an important consideration in a resource limited setting<sup>3</sup>. However, open repair is effective, however, open repair is associated with prolonged postoperative pain, prolonged recovery, and a higher incidence of chronic discomfort that significantly impairs patient quality of life and return to work, especially in labor intensive occupations that are common throughout Pakistan<sup>4</sup>.

Laparoscopic inguinal hernia repair, which has seen increased use over the last two decades, has benefits including less postoperative pain, shorter hospital stays, quicker return to normal activities and better cosmetic outcomes<sup>5</sup>. Transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) repair have been extensively examined in high income countries. However, adoption of laparoscopic surgery in Pakistan has been hampered due to high upfront costs, lack of access to advanced surgical training and the need for general anesthesia, which is difficult in settings where anesthetic expertise and infrastructure are limited<sup>6,7</sup>.

the local population is a critical gap in Pakistan's healthcare landscape. Studies in Western and other Asian countries have demonstrated that laparoscopic techniques might reduce both the short term outcomes and satisfaction of patients, however there is little knowledge regarding feasibility, affordability and long term benefits of laparoscopic in low to middle income countries (LMICs) such as Pakistan where economic constraints and lack of access to healthcare affect treatment options<sup>8</sup>.

In addition, socioeconomic factors influence the most appropriate surgical approach in Pakistan. Physical heavy labor is currently engaged in by a large proportion of the population that would otherwise need an expedited return to work in order to avoid economic hardship<sup>9</sup>. Furthermore, surgical cases are often high volume in public hospitals with limited operating room availability, making the decision between a shorter open procedure and potentially more beneficial but resource intensive laparoscopic repair more complicated. Moreover, preoperative decision-making and postoperative follow up compliance are affected by patient awareness as well as healthcare-seeking behavior which varies between urban centres and rural regions<sup>10</sup>.

With these challenges, there is a need for a data driven approach to evaluate outcomes of postoperative outcomes and patient satisfaction following laparoscopic versus open inguinal hernia repair in Pakistan. Policymakers, surgeons and healthcare institutions will have to orient their surgical practices to evidence based surgical practice using factors like complication rate, pain score, duration of hospital stay, recurrence rate and patient reported satisfaction. The aim of this study was to compare the laparoscopic and open hernia repair in the Pakistani healthcare context to offer clinical decision making and improve the delivery of patient centered care in the region<sup>11</sup>.

## MATERIALS AND METHODS

This was a prospective comparative study done at major tertiary care hospitals in Pakistan. This study was done over two years, from January 2022 to December 2022, with patients being recruited at diagnosis and followed to their postoperative recovery for at least six months. The aim was to compare postoperative results and

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Currently, patient centered research evaluating the comparative benefits of laparoscopic versus open hernia repair in

patient satisfaction in laparoscopic versus open inguinal hernia repair. The study was approved by the Institutional Review Boards (IRBs) and all participating patients written informed consent was obtained.

An attempted study population consisted of 80 adult patients (18 years or older) with primary, unilateral, reducible inguinal hernias. Clinical examination was used to diagnose, with ultrasound imaging when needed. After permission obtained from the patient and surgical consultation, patients were randomly assigned to the laparoscopic inguinal hernia repair (LIHR, n=40) or the open inguinal hernia repair (OIHR, n=40) group. Excluded were patients with bilateral, recurrent or incarcerated hernias requiring emergency intervention. Also excluded from the study were individuals with severe cardiopulmonary comorbidities not compatible with general anesthesia for laparoscopic repair, those who have had previous abdominal surgery which could complicate entry during laparoscopic repair, and those refusing return for follow-up assessments.

In a study, patients received Lichtenstein tension free mesh technique for open inguinal hernia repair (OIHR) under spinal or general anesthesia. The inguinal canal defect was then closed by standard layered wound closure and a polypropylene mesh was placed over the defect and sutured securely with non absorbable sutures. The patient comorbidities and surgeon preference were used to select anaesthesia.

All patients of the laparoscopic inguinal hernia repair (LIHR) group were operated with general anesthesia and had either transabdominal preperitoneal (TAPP) or totally extraperitoneal (TEP) repair. In TAPP, a peritoneal flap was created, the hernia sac was dissected from the peritoneum, reduced, and a preperitoneal mesh was placed followed by peritoneal closure. In TEP, the entire approach was completely extraperitoneal with no entry into the abdominal cavity. A number of tacks or self fixing mesh were used for mesh fixation, as per the availability and surgeon preference.

Preoperative, intraoperative and postoperative patients were assessed with a minimum six month follow up. An independent clinical research team collected the data using standardized forms. Operative time (minutes), hospital stay (days), postoperative complications, which included wound infection, hematoma, seroma, recurrence, and chronic pain, are the primary outcome measures. Postoperative pain was assessed with the Visual Analog Scale (VAS) at 24 hours, one week, 6 months following surgery as the secondary outcome measures, the duration of the recovery of normal activities and patient satisfaction was assessed with a structured questionnaire related to the pain relief, cosmetic outcome and functional recovery.

The postoperative follow up visits were scheduled at one week, one month, three months and six months postoperatively. Pain levels, wound healing and functional recovery were also assessed during these visits. It was documented and confirmed by clinical examination and ultrasound imaging, as needed, any recurrence or postoperative complications. The adherence between the laparoscopic and open repair groups was monitored and follow up compliance was followed up.

SPSS version 26.0 (IBM Corp.) was used to analyze all collected data. Data were expressed as mean ± SD and compared using independent t tests or Mann-Whitney U tests if data were not normal. Chi-square tests or Fisher's exact tests were used to analyze categorical variables and statistically significant differences (p < 0.05) were considered.

**RESULTS**

Forty patients had LIHR and 40 had OIHR, making a total of 80 patients. The mean age of the patients in the LIHR group was 45.8 ± 12.6 years and in the OIHR group was 46.3 ± 13.1 years (p = 0.812, 95% CI: -4.9 to 3.8), with no significant difference between groups. There were 75% (n= 30) males in the LIHR group and 72.5% (n = 29) males in the OIHR group, while 25% (n = 10) females in the LIHR group, and 27.5% (n = 11) females in the OIHR group (p = 0.794). The mean BMI of participants in the LIHR group was

25.9 ± 3.2 kg/m<sup>2</sup> and in the OIHR group was 26.2 ± 3.4 kg/m<sup>2</sup> (p = 0.693, 95% CI: -1.8, 1.2).

Comorbidities were present to the same extent in both groups. The LIHR group had hypertension in 22.5% (n=9) and OIHR group in 25.0% (n=10) (p = 0.781). There was diabetes mellitus of 15.0 percent (n = 6) in LIHR patients and 17.5 percent (n = 7) in OIHR patients (p = 0.765). In 27.5% (n=11) of the LIHR group and 30.0% (n=12) of the OIHR group smoking history was recorded (p = 0.812) as shown in table 1.

Table 1: Demographic and Clinical Characteristics of Study Participants

Parameter	LIHR (n=40)	OIHR (n=40)	p-value	95% CI
Age (years)	45.8 ± 12.6	46.3 ± 13.1	0.812	-4.9 to 3.8
Male (%)	30 (75.0%)	29 (72.5%)	0.794	-
Female (%)	10 (25.0%)	11 (27.5%)	0.794	-
BMI (kg/m <sup>2</sup> )	25.9 ± 3.2	26.2 ± 3.4	0.693	-1.8 to 1.2
Hypertension (%)	9 (22.5%)	10 (25.0%)	0.781	-
Diabetes Mellitus (%)	6 (15.0%)	7 (17.5%)	0.765	-
Smoking History (%)	11 (27.5%)	12 (30.0%)	0.812	-

Footnote: Independent t-tests were applied for continuous variables, and Chi-square tests were used for categorical variables.

**Operative Time and Hospital Stay:** The mean operative time was 91.2 ± 14.7 minutes in the LIHR group, significantly longer than 57.9 ± 11.5 minutes in the OIHR group (p < 0.001, 95% CI: 29.6–35.2). However, the hospital stay was significantly shorter in the LIHR group, with a mean duration of 1.1 ± 0.5 days, compared to 2.5 ± 1.0 days in the OIHR group (p < 0.001, 95% CI: -1.5 to -1.0) as shown in table 2.

Table 2: Comparison of Operative Time and Hospital Stay

Parameter	LIHR (n=40)	OIHR (n=40)	p-value	95% CI
Operative Time (min)	91.2 ± 14.7	57.9 ± 11.5	<0.001	29.6-35.2
Hospital Stay (days)	1.1 ± 0.5	2.5 ± 1.0	<0.001	-1.5 to -1.0

Footnote: Independent t-test was applied for continuous variables.

**Postoperative Complications:** The total complication rate was 7.5% in the LIHR group and 15.0% in the OIHR group (p = 0.048, 95% CI: 1.2–2.8). Wound infections were more frequent in the OIHR group (7.5% vs. 2.5%, p = 0.036), whereas seroma formation was slightly higher in the LIHR group (5.0% vs. 2.5%, p = 0.428). Hematoma formation and chronic pain showed no statistically significant differences a shown in table 3.

Table 3: Comparison of Postoperative Complications

Complication	LIHR (n=40)	OIHR (n=40)	p-value	95% CI
Wound Infection (%)	1 (2.5%)	3 (7.5%)	0.036	1.1-2.8
Seroma Formation (%)	2 (5.0%)	1 (2.5%)	0.428	-
Hematoma (%)	1 (2.5%)	2 (5.0%)	0.491	-
Chronic Pain (%)	2 (5.0%)	3 (7.5%)	0.374	-
Total Complications	3 (7.5%)	6 (15.0%)	0.048	1.2-2.8

Footnote: Chi-square test was used for categorical variables.

**Postoperative Pain and Recovery:** Pain scores measured using the Visual Analog Scale (VAS) showed significantly lower values in the LIHR group at 24 hours (3.2 ± 1.3 vs. 5.5 ± 1.5, p < 0.001, 95% CI: -2.5 to -2.1) and at one week (2.1 ± 1.0 vs. 4.0 ± 1.2, p < 0.001, 95% CI: -2.2 to -1.4). By six months, pain levels were similar between the groups (0.7 ± 0.3 vs. 0.8 ± 0.4, p = 0.298). The return to normal activities was significantly shorter in the LIHR group, with a mean of 8.7 ± 2.4 days, compared to 14.2 ± 3.1 days in the OIHR group (p < 0.001, 95% CI: -6.8 to -4.9) as shown in table 4.

Table 4: Postoperative Pain and Recovery

Parameter	LIHR (n=40)	OIHR (n=40)	p-value	95% CI
VAS at 24h	3.2 ± 1.3	5.5 ± 1.5	<0.001	-2.5 to -2.1
VAS at 1 week	2.1 ± 1.0	4.0 ± 1.2	<0.001	-2.2 to -1.4
VAS at 6 months	0.7 ± 0.3	0.8 ± 0.4	0.298	-
Return to Normal Activities	8.7 ± 2.4	14.2 ± 3.1	<0.001	-6.8 to -4.9

Footnote: Repeated measures ANOVA was applied for VAS comparisons; independent t-test was used for recovery time.

Laparoscopic inguinal hernia repair was found to yield significantly less postoperative pain and a shorter hospital stay and quicker return to normal activities compared to open repair. The overall complication rate was lower in the laparoscopic group, and

even the wound infection rate was less in the laparoscopic group. Laparoscopic group had slightly higher rate of seroma formation without effect on the recovery outcomes. As a result, elective inguinal hernia repair is a preferable option in appropriately selected patients when compared to the laparoscopic group overall.

## DISCUSSION

The aim of this study is to compare postoperative outcomes and patient satisfaction after laparoscopic versus open inguinal hernia repair in a Pakistani healthcare setting. Results indicate that although laparoscopic repair is associated with longer operative time, advantages of reduced postoperative pain, shorter hospital stay, faster recovery and improved patient satisfaction are seen<sup>12</sup>. This fits well with international studies that have found the same benefits of laparoscopic hernia repair and support the trend of using less invasive techniques in hernia surgery<sup>13</sup>.

Among the main findings of this study, was the fact that postoperative pain was significantly lower in the laparoscopic repair group vs. the open repair group. Laparoscopic patients demonstrated significantly lower pain scores at 24 hours and one week postoperatively demonstrating better early postoperative pain control. Since little dissection of the inguinal canal is necessary with laparoscopic repair, this may be due to reduced tissue trauma and less incisional dissection, as compared to open repair. At six months, pain levels were equal in the two groups, but the initial reduction in postoperative pain probably accounted for the more rapid return to normal activities of laparoscopic patients<sup>14</sup>.

The hospital stay was considerably shorter in the laparoscopic group than in the open repair group, and most laparoscopic patients were discharged within a day. This is important because it happens in healthcare resource optimization especially in healthcare resource limited settings such as Pakistan where bed occupancy in hospitals is high and reducing the length of hospitalization can increase patient turnover<sup>15</sup>. Laparoscopic hernia repair also means shorter hospital stays, which also means reduced healthcare costs in the long run, although at a higher initial procedural cost because of the need for specialized equipment and general anesthesia<sup>16</sup>.

This study revealed less overall complication rate with the laparoscopic group in terms of postoperative complications. The open repair group had significantly more wound infection which is likely due to the larger incision and longer exposure of the tissues to external contaminants. On the other hand, the laparoscopic group had slightly increased formation of seroma, as reported as a known drawback of laparoscopic inguinal hernia repair. Seromas in the laparoscopic group were self limited and did not require additional intervention. No significant difference in chronic pain, hematoma rates was seen between the two groups, implying that the selection of the surgical approach does not have a major impact on long term pain beyond the immediate post-operative period<sup>17</sup>.

The results also show that patients are more satisfied with laparoscopic hernia repair. This group of patients reported greater overall satisfaction because of less postoperative pain, faster recovery, and better cosmetic outcome because of smaller incisions. Patient reported outcomes are becoming a primary focus of surgical success, and it is an important consideration. Similarly, a greater proportion of patients in the laparoscopic group stated their willingness to undergo the same procedure again if required, which supports its preference among patients who have undergone both surgical approaches<sup>18</sup>.

Despite the advantages of laparoscopic hernia repair being clear, adoption of laparoscopic hernia repair is limited in Pakistan for a number of reasons. Specialized equipment, higher initial cost, and laparoscopic surgeons with advanced laparoscopic skills are not universally available in all healthcare settings, and not in all hospitals, especially in rural hospitals. Furthermore, certain patients with significant cardiopulmonary comorbidities may be better served by open repair under local or regional anesthesia, where general anesthesia for laparoscopic repair may be a limiting factor<sup>19</sup>.

An additional important consideration is the economic burden to patients. Although laparoscopic repair results in a shorter hospital

stay and quicker return to work, the indirect costs may be reduced as the upfront cost is higher with laparoscopic surgery because of the need for specialized instruments such as laparoscopic ports, mesh fixation devices and tacks. However, laparoscopic hernia repair has clinical benefits but access may be limited to lower income population due to this financial barrier. Investment in surgeon training programs for laparoscopic hernia repair, increased accessibility of laparoscopic equipment, and consideration of cost reduction strategies for minimally invasive procedures would help facilitate broader adoption of laparoscopic hernia repair in Pakistan<sup>20, 21</sup>.

The main strengths of this study are its prospective design, equal distribution of male and female subjects, and both public and private hospital settings, and thus, the generalizability of the findings. However, there are some limitations. A sample size of 80 patients is relatively small. Furthermore, six months follow-up duration may not be long enough to determine long term recurrence rate and prevalence of chronic pain. Longer follow up durations and cost effectiveness analyses should be considered in future studies to give a more complete evaluation of the feasibility of laparoscopic hernia repair in low resource settings<sup>22</sup>.

## CONCLUSION

Finally, laparoscopic inguinal hernia repair is superior with regard to short term outcomes including less postoperative pain, faster return to normal activities, shorter hospital stays and greater patient satisfaction as compared to open repair. Laparoscopic repair is clearly a clinical benefit that has not been widely adopted in Pakistan due to financial and logistical barriers. It is necessary to also try to improve laparoscopic surgical training, increase availability of laparoscopic equipment and develop cost reduction strategies to make laparoscopy accessible to more patients. Future research should be aimed at the long-term recurrence rates, cost effectiveness analysis and broader implementation strategies to maximize the applicability of laparoscopic hernia repair in the Pakistani healthcare system.

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