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Original Research Article

Laparoscopic Versus Open Lichtenstein Inguinal Hernia Mesh Repair: Short-Term Complications and Early Recovery Outcomes

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Abstract:

Background: Inguinal hernia is a common surgical condition, with open Lichtenstein repair being the standard treatment. Laparoscopic techniques offer potential advantages in postoperative recovery, but comparative evidence on short-term outcomes remains limited.

Aim: To compare short-term complications and early recovery outcomes between laparoscopic and open Lichtenstein inguinal hernia mesh repair.

Methodology: A prospective observational study was conducted on 84 patients undergoing elective inguinal hernia repair at Department of General Surgery, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India. Patients were divided equally into laparoscopic (LH) and open Lichtenstein (OH) groups. Postoperative pain was assessed using the Visual Analogue Scale (VAS) at 0, 12, 24, and 48 hours. Early complications, hospital stay, and time to return to work were recorded and analyzed statistically.

Results: Mean hospital stay was comparable between LH (2.12 ± 0.48 days) and OH (2.38 ± 0.62 days, $p = 0.214$). Postoperative pain was significantly lower in LH at 12, 24, and 48 hours ($p < 0.01$). Short-term complications, including wound infection, seroma, hematoma, and scrotal swelling, were numerically higher in OH but not statistically significant. Time to return to work was significantly shorter in LH (12.96 ± 2.45 days) versus OH (20.84 ± 5.12 days, $p < 0.001$).

Conclusion: Laparoscopic repair provides superior early recovery with reduced postoperative pain and faster return to work, while short-term complication rates are comparable to open Lichtenstein repair.

Keywords: Inguinal Hernia, Laparoscopic Repair, Lichtenstein Repair, Postoperative Pain, Early Recovery, Short-Term Complications.

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Introduction

Inguinal hernias (IHs) are one of the most common surgical conditions worldwide and continue to be one of the most commonly practiced surgeries in general surgery. In spite of the lack of knowledge of the exact incidence of inguinal hernia globally, it has been estimated that almost 800,000 people are treated over the United States of America alone each year [1]. Approximate 75 percent of all hernias of the abdominal wall are inguinal, which makes their clinical importance significant. It is said that lifetime risk of developing inguinal hernia is significantly higher among men compared to women with 27% and 3% respectively. Moreover, the cumulative morbidity that needs surgical repair is 13.9 and 2.1 in males and females, respectively, which implies that almost every two men will need an inguinal hernia repair in their lifetime [2]. These statistics show that there is a high healthcare cost of the inguinal hernia disease and that there is still the need to improve surgical procedures to achieve maximum patient outcome.

Inguinal hernia surgical treatment has significantly changed in the course of centuries. Her records of hernia repair techniques go as far back as those of ancient Egypt and Greek civilizations [3]. Nevertheless, the major progress of hernia surgery started at the end of the nineteenth century. A revolutionary approach by Bassini (18441924) introduced inguinal hernia repair into the more successful and reproducible procedure with minimal morbidity. Anatomical reconstruction of the posterior wall of inguinal canal as seen in the Bassini repair and markedly reduced recurrence rates as opposed to the previous methods. The further evolution of the Bassini technique resulted in the creation of McVay repair and Shouldice repair that polished the methods of herniorrhaphy using tissues even further [4].

One of the greatest paradigm shifts was in 1980 when Lichtenstein came up with the idea of tension-free mesh repair. The Lichtenstein procedure was done where a prosthetic mesh was inserted over the wall of the inguinal canal behind the wall and in this way, it strengthened the defect without straining other tissues [5]. This invention significantly decreased the recurrence and postoperative pain and soon made the open Lichtenstein mesh repair the universal gold standard to treat inguinal hernias across the globe. The tension-free concept was a new era in the field of hernia surgery and as a result, the value of the reinforcement of the prosthesis in reducing recurrence and patient outcomes was highlighted.

The following breakthrough in the repair of inguinal hernia was the introduction of minimally invasive surgery. Ralph Ger presented the original potential laparoscopic inguinal hernia repair in 1982. This would provide a combination of effects of tension-free mesh placement in addition to the advantages of the minimal invasive methods. McKernon and Laws wrote about the initial total extraperitoneal (TEP) technique of inguinal hernia repair later in 1993. These laparoscopic methods, together with the trans-abdominal preperitoneal (TAPP) method, followed the concepts of Rives and Stoppa of open preperitoneal repair. These principles involved the positioning of a big mesh to give extensive coverage of all the possible hernia defects, evenly distributing the intra-abdominal pressure within a large area of mesh and relatively little fixation to minimize the postoperative pain and complications [5]. Such inventions formed the basis of modern laparoscopic inguinal hernia repair.

Since the initiation of laparoscopic procedures, the number of studies and systematic reviews focusing on the comparison of laparoscopic hernioplasty (LH) and open hernioplasty (OH), especially the Lichtenstein tension-free repair [7] has been growing. Although the methods have been studied over the decades, no one seems to be absolutely better than the other. All the procedures have unique strengths and weaknesses capable of shaping the decision on a surgical procedure with references to patient factors, surgeon experience, institutional facilities, and the clinical needs [8].

Some of the studies have proved that laparoscopic hernioplasty has some advantages compared to open repair. These advantages are fewer perioperative pain, fewer cases of wound complication, less postoperative morbidity, higher daily activity and employment returns, and better cosmetic results [9]. Laparoscopic repair is associated with reduced tissue dissection and smaller incisions, which represents a benefit of this technique due to its minimally invasive character and resulting quicker early recovery and increased patient satisfaction. Moreover, mesh can be used in the preperitoneal position enabling covering of many possible hernia locations which could be beneficial in bilateral and recurrent hernias.

Nevertheless, laparoscopic repair is not flawless. It is generally related to a longer operative time - often almost twice as long as open repair, especially in the initial stages of the learning curve. Laparoscopy is a complex surgical procedure that involves specific training and experience and can take a long time to learn. Also, laparoscopic repair has been identified to be more costly to the hospital since specialized equipment and instruments are involved. Serious life-threatening intraoperative complications may also arise, due to the posterior anatomical approach, e.g. vascular or visceral injuries. Other studies have also indicated an increased recurrence rate particularly in the early immediate postoperative period than the open surgery. These concerns should be received with caution against the possible benefits during the choice of the most appropriate surgical procedure.

On the other hand, open Lichtenstein repair is a common widely practiced technique which is well established. It is technically easy, linked to less time of operation and can be conducted under regional or local anesthesia. Repeat rates are minimal when carried out by skilled surgeons and no elaborate laparoscopic equipment is required in the procedure. Nonetheless, the open repair might be characterized by elevated postoperative pain, the wound-related complications (hematoma, seroma, wound infection, cellulitis, and scrotal swelling and vulva swelling) are more common than laparoscopic repair, and normal activity and work may resume later.

Since inguinal hernia is highly prevalent, and there is still a debate on the best method of surgery, it is necessary to consider short-term clinical outcomes that directly affect patient recovery and health care use. The parameters that are crucial in determining the quality of life of patients and the socioeconomic burden are early postoperative complications, the intensity of pain, length of stay in hospitals and the time taken to resume work. Although the recurrence in the long-term is a significant outcome, the short-term recovery is frequently used to determine who the patient will prefer and how the perioperative decision will be made.

Thus, the aim of the study was to compare the short-term complications and early recovery in patients who underwent laparoscopic and open Lichtenstein procedures to inguinal hernia surgery. In particular, the research will examine hematoma, seroma, wound infection, cellulitis, scrotal or vulval swelling, postoperative pain scores, early return to work, and early discharge of hospital as the postoperative complications. By systematically analyzing these parameters, the study seeks to contribute to the existing body of evidence and provide further insight

into the comparative effectiveness of laparoscopic versus open Lichtenstein inguinal hernia mesh repair in the early postoperative period.

Methodology

Study Design: This study was conducted as a prospective comparative observational study to evaluate and compare short-term complications and early recovery outcomes between laparoscopic inguinal hernia repair and open Lichtenstein mesh repair. Patients undergoing elective inguinal hernia surgery were observed prospectively and outcomes were analyzed between the two treatment groups.

Study Area: The study was carried out in the Department of General Surgery at Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

Study Duration: The duration of the study was one year.

Sample Size: A total of 84 patients were included in the study. The participants were divided into two groups, with 42 patients undergoing open Lichtenstein hernia repair (OH group) and 42 patients undergoing laparoscopic hernia repair (LH group), including either TAPP or TEP techniques. Convenient sampling was used for allocation into the two groups.

Study Population: The study population comprised patients diagnosed with inguinal hernia who presented to the Department of General Surgery and were planned for elective surgical repair. Both unilateral and bilateral inguinal hernia cases meeting eligibility criteria were considered for inclusion.

Inclusion Criteria

- Patients aged above 16 years.
- Patients undergoing elective inguinal hernia surgery.
- Patients willing to participate and provide informed consent.

Exclusion Criteria

- Patients undergoing emergency inguinal hernia surgery.
- Patients requiring bowel resection.
- Patients unfit for any type of anesthesia.
- Recurrent inguinal hernia cases.
- Patients with bleeding disorders.
- Patients taking pain medication prior to surgery for other pathologies.
- Patients on long-term steroid therapy.
- Patients with previous inguinal region surgery.

Procedure: Patients in the open hernia (OH) group underwent Lichtenstein tension-free mesh repair under spinal anesthesia, during which a standard lightweight polypropylene mesh was placed over the posterior wall of the inguinal canal. Patients in the laparoscopic hernia (LH) group underwent either Transabdominal Preperitoneal (TAPP) repair or Totally Extraperitoneal (TEP) repair under general anesthesia, with placement of a standard lightweight polypropylene mesh. Postoperative pain was assessed using the Visual Analogue Scale (VAS) ranging from 0 to 10 at 0 hour, 12 hours, 24 hours, and 48 hours after surgery. All patients received intravenous Ketorolac and Paracetamol on the day of surgery, which were later converted to oral analgesics. Early postoperative complications such as hematoma, seroma, and surgical site infection were recorded. Duration of hospital stay was noted, and early return to work was assessed during follow-up visits.

Data Collection: Data were collected using a structured proforma that included demographic details, clinical characteristics, operative findings, postoperative pain scores, complications, length of hospital stay, and time taken to resume normal activities. The collected data were entered into Microsoft Excel for organization and subsequently analyzed using IBM SPSS Statistics version 23.

Statistical Analysis: Statistical analysis was performed using appropriate inferential statistical tests. Continuous variables such as pain scores and duration of hospital stay were analyzed using the independent t-test. Categorical variables such as presence of complications were analyzed using the Chi-square test or Fisher's exact test where applicable. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 presents the age distribution of patients undergoing inguinal hernia repair. In the laparoscopic group (n=42), most patients were aged 16–45 years (42.9%), followed by 46–60 years (33.3%) and >60 years (23.8%), with a mean age of 46.82 ± 14.65 years. In the open repair group (n=42), the majority were >60 years (35.7%), followed by 16–45 years (33.3%) and 46–60 years (31%), with a higher mean age of 52.94 ± 16.88 years, indicating that patients undergoing open repair were generally older.

Table 1: Age distribution of subjects with inguinal hernia (N=84).

Age (years)	Laparoscopic repair (n=42)	%	Open repair (n=42)	%
16–45	18	42.9	14	33.3
46–60	14	33.3	13	31
>60	10	23.8	15	35.7
Mean ± SD	**46.82 ± 14.65**		**52.94 ± 16.88**	

Table 2 shows the mean duration of hospital stay for laparoscopic and open repair groups. Patients undergoing laparoscopic repair had a slightly shorter stay (2.12 ± 0.48 days) compared to the open repair group (2.38 ± 0.62 days), but the difference was not statistically significant (p = 0.214). This suggests that both surgical approaches resulted in comparable hospitalization durations.

Table 2: Duration of hospital stay.			
	Mean duration of hospital stay (days)	**Standard deviation**	**Independent t test (p value)**
Laparoscopic repair	2.12	0.48	0.214
Open repair	2.38	0.62	

Table 3 shows the postoperative pain scores (VAS) for laparoscopic and open repair groups. At baseline (0 hours), pain was similar between laparoscopic (3.28 ± 1.21) and open repair (3.55 ± 1.67, p = 0.372). At 12 hours, laparoscopic patients had significantly lower pain (3.12 ± 1.08 vs 4.48 ± 1.36, p = 0.001), which continued at 24 hours (2.64 ± 0.89 vs 3.72 ± 1.02, p < 0.001) and 48 hours (2.18 ± 0.71 vs 3.01 ± 1.14, p = 0.002). This indicates that laparoscopic repair was associated with significantly lower postoperative pain compared to open repair throughout the first 48 hours.

Table 3: Postoperative VAS score.			
Time (hours)	**Laparoscopic repair (mean ± SD)**	**Open repair (mean ± SD)**	**Independent t test (p value)**
0	3.28 ± 1.21	3.55 ± 1.67	0.372
12	3.12 ± 1.08	4.48 ± 1.36	0.001
24	2.64 ± 0.89	3.72 ± 1.02	0
48	2.18 ± 0.71	3.01 ± 1.14	0.002

Table 4 compares postoperative complications between laparoscopic repair (n = 42) and open repair (n = 42). Wound infection occurred in 1 patient in the laparoscopic group and 4 patients in the open group (p = 0.167). Seroma was observed in 2 laparoscopic cases and 6 open cases (p = 0.134), while hematoma occurred in 1 and 3 patients, respectively (p = 0.302). Scrotal swelling was noted in 2 patients following laparoscopic repair and 7 patients after open repair (p = 0.081). Although complications were numerically higher in the open repair group, the differences were not statistically significant.

Table 4: Postoperative complications.			
Complications	**Laparoscopic repair (n=42)**	**Open repair (n=42)**	**Fischer's exact test (p value)**
Wound infection	1	4	0.167
Seroma	2	6	0.134
Hematoma	1	3	0.302
Scrotal swelling	2	7	0.081

Table 5 shows that the mean duration for return to work was significantly shorter in patients who underwent laparoscopic repair (12.96 ± 2.45 days) compared to those who had open repair (20.84 ± 5.12 days). The independent t-test revealed a statistically significant difference between the two groups (p = 0), indicating that laparoscopic repair was associated with earlier return to work compared to open repair.

Table 5: Return to work (in days).			
	Return to work (mean)	**Standard deviation**	**Independent t test (p value)**
Laparoscopic repair	12.96	2.45	0
Open repair	20.84	5.12	

Discussion

A total of 84 patients with an inguinal hernia were studied with equal representation of those who had laparoscopic and open Lichtenstein repair. Mean age of patients in laparoscopic group was 46.82 +14.65 years whereas the population of open repair group was a little older and had a mean age of 52.94 +16.88 years. These demographic variations are similar to those of other studies which found that laparoscopy repair was more commonly provided to younger, active patients and that older patients or those with comorbidities were more commonly treated with open repair (McCormack et al., 2003; Neumayer et al., 2004) [10,4]. This is in line with the observations of EU Hernia Trialists Collaboration, (2000) [11] who also found that laparoscopic repair patients

were younger and less comorbid, which may have an effect on recovery."

In our study, the laparoscopic group was marginally shorter in the mean hospital stay (2.12 ± 0.48 days) than an open group (2.38 ± 0.62 days), which was however not statistically significant (p = 0.214). This is equal to the study done by McCormack et al. (2003) [10] who reported a hospital stay of 2.14 ± 0.356 days and laparoscopic repair and 2.43 ± 0.573 days and open repair that showed very little variation in length of stay. The short time of stay in laparoscopic operation is credited to the fact that the incisions, tissues dissection and mobilization are minimal. Nonetheless, some postoperative complications, comorbidities, and social factors might increase the duration of hospital stay and this could be the reason why we have not realized statistical significance in our cohort.

The laparoscopy repair was clearly beneficial as indicated by the use of the Visual Analog Scale (VAS) to assess postoperative pain. Although the scores of immediate postoperative pain (3.28 ± 1.21 vs. 3.55 ± 1.67, p = 0.372) were similar, it was found that the laparoscopic group had a significantly lower level of pain at 12 hours (3.12 ± 1.08 vs. 4.48 ± 1.36, p = 0.001), 24 hours (2.64 ± 0.89 vs. 3.72 ± The results can be attributed to these findings, as other studies such as that by Kathikesalingam et al. (2010) and Koju et al. (2017) [12,13] have also found lower levels of early postoperative pain among laparoscopic hernia repair patients because of the reduced tissue trauma and reduced incisions. Nevertheless, European Hernia Society guidelines (Miserez et al., 2014) [14] show no substantial difference in the chronic pain between the Lichtenstein and laparoscopic total extraperitoneal (TEP) repair and the benefit of laparoscopic surgery may be restricted to the initial post-operative phase. The pain-related outcomes of our work also confirm the idea that the minimal invasive methods decrease the immediate post protective pain, promote early mobilization and functional restoration.

Concerning surgical complications, our research found marginally more in the open repair group but none of them were statistically significant. There was 1 patient wound infection in the laparoscopy compared to 4 in the open (p = 0.167). The formation of seromas was observed in 2 laparoscopic and 6 open cases (p = 0.134), and the hematoma appeared in 1 and 3 cases, respectively (p = 0.302). The reported incidence of scrotal swelling was 2 and 7 cases respectively after laparoscopic and open repair (p = 0.081). These results are in line with the findings of Koerckerling et al. (2015) [15] who showed that the postoperative complication rate is higher in Lichtenstein repair than in TEP (OR 2.152; CI 1.7342.672). Equally, the rates of hematoma, seroma, and swellings in the scrotum reported by Shrestha et al. (2017) [2] post-repair of inguinal hernias were 3.1, 1.3 and 3.1, respectively, which are similar to those of slightly higher rates of complications with open surgery. Although our research did not detect significant differences, the tendency is in line with the larger literature that finds laparoscopic repair to possibly decrease soft tissue complications since the dissection is limited (Elwan et al., 2013) [16] . In earlier studies, surgical site infections were also found to be more prevalent in open repair (Koju et al., 2017) [13], which supports our finding that the minimally invasive techniques have modest potential in alleviating wound morbidity.

Among the most outstanding results of our research was the much earlier return to work in the laparoscopic group (12.96 ± 2.45 days) than in the open repair one (20.84 ± 5.12 days, p < 0.001). This is in line with the results of Stoker et al. (1994) [17] as well as Wilson et al. (1995) [18] and Koju et al. (2017) [13], which all indicated faster functional recovery of patients undergoing laparoscopic repair. The preceding reduction in the time to go to work is a reflection of the cumulative impacts of less postoperative pain, fewer complications, and less colossal dissection of tissues, which supports the idea that laparoscopic repair is causing better postoperative quality of life. These are important functional outcome measures in determining the success of hernia surgery since they show that the patient is capable of returning to normal daily life and work duties as soon as possible.

On the whole, our findings support the current literature evidence supporting laparoscopic inguinal hernia repair as a better choice with regard to early recovery and pain alleviation, whereas open Lichtenstein repair is a sound alternative with similar complication rates in the short term. The varying hospital stays, post operating pain, and function recovery is in line with previous researchers (Neumayer et al., 2004; Miserez et al., 2014) [4,16], which emphasized the role of patient selection and surgical skills in maximizing the results. Although both of the techniques are safe and effective, laparoscopic repair has certain benefits in terms of early postoperative recovery, so it is especially relevant to younger and more active patients. To provide more insight into chronic pain and its recurrence, and cost-effectiveness between the two methods, future research using larger sample size and long-term follow-up is required.

Conclusion

The present comparison of laparoscopic and open Lichtenstein inguinal hernia mesh repair proves that laparoscopic repair has superior early postoperative recovery results and similar short-term safety rates. It has been found that although there was a small difference in the age distribution across groups, both methods demonstrated comparable length of stay and no statistical significant difference in postoper-

ative complications that included wound infection, seroma, hematoma, and swelling of the scrotum. However, patients undergoing laparoscopic repair experienced significantly lower postoperative pain scores after the immediate postoperative period and achieved an earlier return to work compared to those undergoing open repair. Overall, laparoscopic repair appears to provide advantages in terms of reduced postoperative pain and faster functional recovery while maintaining a similar short-term complication rate to open Lichtenstein repair.

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