

Original Research Article

Challenging conventional belief: total extraperitoneal repair with reduced operative time versus Lichtenstein in Central India

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ABSTRACT

Background: Inguinal hernia is a common surgical condition, and repair techniques significantly impact patient outcomes. This study aimed to compare total extraperitoneal (TEP) laparoscopic repair with Lichtenstein tension-free open mesh repair in terms of operative outcomes, post-operative pain, complications, and hospital stay among patients in Central India.

Methods: A comparative study was conducted at a tertiary care centre from June 2022 to August 2024. A total of 100 patients with uncomplicated inguinal hernia were enrolled and randomly assigned into two equal groups: 50 patients underwent laparoscopic TEP repair, and 50 underwent Lichtenstein repair. Patients were evaluated for operative time, blood loss, post-operative pain (using visual analogue scale), complications, hospital stay, and follow-up outcomes over a minimum period of two months.

Results: The TEP group had a shorter average operative time (78 min) compared to Lichtenstein (90 min, $p < 0.001$) and lower intraoperative blood loss (20 ml vs 35 ml, $p < 0.001$). Post-operative pain was significantly less in TEP, with 94% of patients experiencing pain for only one day versus prolonged pain in the Lichtenstein group ($p < 0.001$). Complications such as cord edema and wound infection were lower in the TEP group (0% and 2%, respectively) compared to Lichtenstein (10% and 12%, $p < 0.001$). The average hospital stay was shorter for TEP (3 days) compared to Lichtenstein (5 days, $p < 0.001$). No recurrences were observed in either group during follow-up.

Conclusions: TEP repair provides advantages of shorter operative time, reduced blood loss, less post-operative pain, fewer complications, and shorter hospital stay while maintaining comparable safety and effectiveness to Lichtenstein repair. However, it requires advanced surgical skills and specialized equipment, whereas Lichtenstein remains a safe and practical option in settings lacking laparoscopic facilities.

Keywords: Inguinal hernia, Total extraperitoneal repair, Lichtenstein repair, Laparoscopic surgery, Postoperative outcomes

INTRODUCTION

Inguinal hernias are the most common abdominal wall hernias, with about 500,000 cases reported annually.¹ The lifetime risk is approximately 27% in the men and 3% in the women.² Inguinal hernia repair constitutes over 95% of all the groin hernia surgeries and remains a significant

public health concern, particularly in developing countries. The choice of surgical technique plays a vital role in determining patient outcomes, recovery, and healthcare resource utilization.^{3,4} Since Bassini's first anatomy-based repair in 1890, various techniques have evolved, including the Lichtenstein open repair and laparoscopic methods like total extraperitoneal (TEP) and

transabdominal preperitoneal repair (TAPP). Mesh-based repairs are now preferred over traditional suture methods, though debate continues regarding the best approach. Among the most common techniques, the TEP laparoscopic and Lichtenstein tension-free repairs each have specific advantages and limitations, requiring careful selection based on patient and surgical factors.^{5,6}

The TEP laparoscopic approach is minimally invasive, offering less postoperative pain, quicker recovery, and better cosmetic outcomes, but requires advanced skills and specialized equipment. In contrast, the Lichtenstein open repair is widely accessible and easier to perform, though it may lead to longer recovery and more postoperative discomfort. The learning curve for laparoscopic hernia repair is steep, partly due to limited documented data on patient satisfaction, postoperative pain, hospital stay, complications, and recurrence.^{7,8}

The present study was undertaken to compare the results of laparoscopic hernioplasty by Total Extra-Peritoneal (TEP) technique and Lichtenstein tension Free Open Mesh Repair, in central India and determine if the relative advantages achieved could be put in practice in large scale and also identify criteria which may help stratify the patient to a particular type of repair to obtain encouraging results for that particular patient.

METHODS

After obtaining approval from the Institutional Ethical Committee and written informed consent from all participants, this comparative study was conducted in the Department of General Surgery, Government medical college Nagpur, Maharashtra at a tertiary care centre in Central India. The study was carried out over a period of two years, from June 2022 to August 2024, and included a minimum follow-up period of two months for each patient. A total of 100 patients diagnosed with inguinal hernia were enrolled in the study.

They were randomly assigned into two equal groups of 50 each using a random number table method: one group underwent laparoscopic TEP hernia repair, while the other group underwent open Lichtenstein tension-free mesh repair. Alternate patient allocation was also followed to ensure equal distribution between the two groups. Inclusion criteria were patients above 18 years of age with uncomplicated inguinal hernia who were eligible for repair either by TEP or Lichtenstein tension-free mesh repair. Exclusion criteria included patients with complicated inguinal hernia, coagulopathy, severe cardiopulmonary disease, prostatomegaly, or deranged renal function.

Detailed clinical history was obtained from all patients as per the proforma. Each patient underwent thorough clinical examination, routine blood investigations, and abdominal ultrasonography prior to surgery. Depending on patient fitness and procedure, surgeries were performed under either general or spinal anesthesia. In

the postoperative period, pain was assessed using a visual analogue scale (VAS) ranging from 0 to 10. Analgesics were administered in oral or injectable form as required. Operative time was recorded from skin incision to skin closure. Intraoperative and postoperative complications such as injury to bowel, bladder, vessels, or nerves, wound infection, seroma, hematoma, and reasons for prolonged hospitalization were documented. Patients were discharged once they were fully mobilized and able to tolerate a normal diet. Follow-up evaluations were conducted in the outpatient department at 6 days, 6 weeks, and 2 months postoperatively.

Statistical analysis

All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 21. Quantitative data were expressed as mean ± standard deviation, while qualitative data were expressed as frequencies and percentages. Normality of data was tested using the Shapiro–Wilk test. Intergroup comparisons of quantitative variables such as operative time and hospital stay were carried out using the unpaired t-test, while qualitative parameters such as complications were compared using the Chi-square test. A 95% confidence interval was applied, the level of significance was set at p<0.05, and the power of the study was maintained at 80%.

RESULTS

A total of 100 inguinal hernia patients were enrolled and randomly divided into two groups of 50 each: one underwent laparoscopic TEP repair, and the other underwent open Lichtenstein tension-free mesh repair. In the Lichtenstein group, the majority of patients were between 51-60 years (52%), followed by 61-70 years (34%). In the TEP group, most patients were 51-60 years (34%) and 41-50 years (32%) as shown in Table 1.

Table 1: Distribution of the patients as per the age.

Age in years	Lichtenstein group N (%)	TEP group N (%)
31-40	02 (4.0)	08 (16.0)
41-50	03 (6.0)	16 (32.0)
51-60	26 (52.0)	17 (34.0)
61-70	17 (34)	07 (14.0)
71-80	02 (4.0)	02 (4.0)
Total	50 (100.0)	50 (100.0)

The majority of hernias in both groups were right-sided, with 39 cases (78%) in the Lichtenstein group and 38 cases (76%) in the TEP group. Left-sided hernias were less common, observed in 11 cases (22%) in the Lichtenstein group and 12 cases (24%) in the TEP group.

In the TEP group, the average operative time was 78 minutes, whereas in the Lichtenstein group, it was 90 minutes. The majority of patients in the Lichtenstein

group (78%) had an operative time of 90 minutes, while in the TEP group, half of the patients (50%) had an operative time of 60 minutes (Table 2).

Longer operative times (100-120 minutes) were seen more frequently in the Lichtenstein group compared to TEP. The difference in operative time between the two groups was found to be highly significant ($p < 0.001$).

Table 2: Comparison between operative time and surgery.

Operative time (minutes)	Lichtenstein N (%)	TEP N (%)
60	03 (6.0)	25 (50.0)
90	39 (78.0)	21 (42.0)
100	04 (8.0)	02 (4.0)
120	04 (8.0)	02 (4.0)
Total	50 (100.0)	50 (100.0)

In the TEP group, the average blood loss was 20 ml, while in the Lichtenstein group, it was 35 ml. Most patients undergoing TEP (76%) had a blood loss of 20 ml, whereas the majority in the Lichtenstein group (80%) experienced blood loss of 35 ml. Higher blood loss values (40-45 ml) were observed only in the Lichtenstein group. The association between the type of surgery and blood loss was found to be highly significant (Fisher's Exact test=86.171, $p < 0.001$), (Table 3).

Table 3: Comparison between blood loss and surgery.

Blood loss (ml)	Lichtenstein N (%)	TEP N (%)
15	0 (0)	07 (14.0)
20	0 (0)	38 (76.0)
30	01 (2.0)	02 (4.0)
35	40 (80.0)	03 (6.0)
40	04 (8.0)	00 (0.0)
45	05 (10.0)	00 (0.0)
Total	50 (100.0)	50 (100.0)

Table 4: Comparison between post-operative pain and surgery.

Post-operative pain (days)	Lichtenstein N (%)	TEP N (%)
1	14 (28.0)	47 (94.0)
2	27 (54.0)	03 (6.0)
3	06 (12.0)	00 (0.0)
4	03 (6.0)	00 (0.0)
Total	50 (100.0)	50 (100.0)

In the TEP group, most patients (94%) had post-operative pain for only one day, while in the Lichtenstein group, pain often persisted longer, with 54% reporting it on the second day and 12% on the third day. This difference was statistically significant ($p < 0.001$), (Table 4). In the

Lichtenstein group, 5 patients developed cord edema and 6 had wound infections, whereas in the TEP group, no patients had cord edema and only 1 had a wound infection. One patient in the Lichtenstein group developed a seroma.

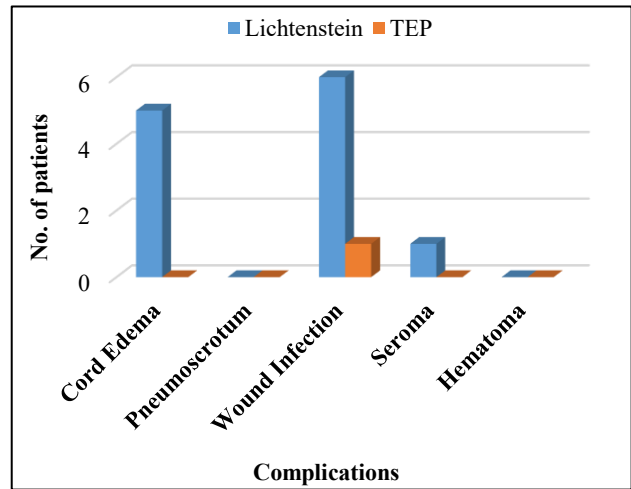


Figure 1: Comparison between complications and surgery.

No cases of pneumoscrotum or hematoma were observed in either group. The differences in cord edema and wound infection between the groups were highly significant ($p < 0.001$), (Figure 1).

The average hospital stay was shorter for the TEP group (approximately 3 days) compared to the Lichtenstein group (approximately 5 days). Most TEP patients (44; 88%) were discharged by day 3, while most Lichtenstein patients (39;78%) stayed for 5 days. The difference in hospital stay between the groups was highly significant ($p < 0.001$), (Table 5).

Table 5: Comparison between surgery and hospital stay in days.

Hospital stay (days)	Lichtenstein N (%)	TEP N (%)
3	0 (0)	44 (88.0)
4	05 (10.0)	05 (10.0)
5	39 (78.0)	01 (2.0)
6	02 (4.0)	00 (0.0)
7	03 (6.0)	00 (0.0)
8	01 (2.0)	00 (0.0)
Total	50 (100.0)	50 (100.0)

All patients attended follow-up at 6 days post-surgery. At 6 weeks, 47 patients in the Lichtenstein group and 43 in the TEP group returned for follow-up, while at 2 months, 5 and 4 patients, respectively, were followed up. There was no significant difference between the groups ($p > 0.05$), and no recurrences were observed in either group, (Figure 2).

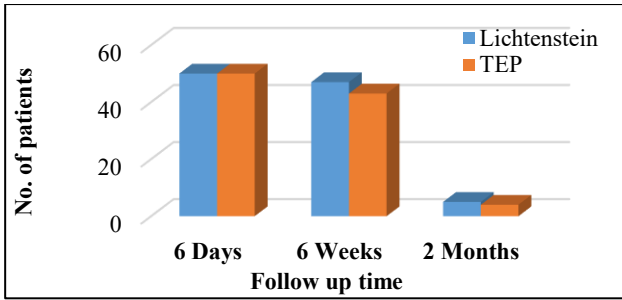


Figure 2: Distribution of subjects according to follow-up.



Figure 3: The Lichtenstein's hernia repair.

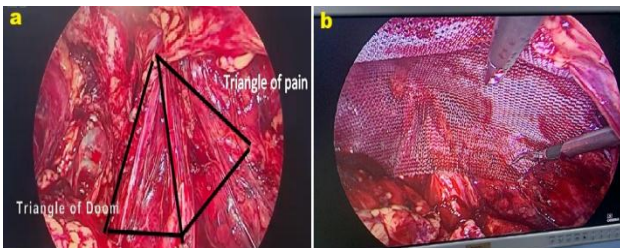


Figure 4: (a) triangle of doom and triangle of pain, (b) post mesh placement.

DISCUSSION

The present study compared laparoscopic TEP and open Lichtenstein tension-free mesh repair in 100 patients, focusing on operative time, blood loss, postoperative pain, complications, hospital stay, and follow-up outcomes. Most patients in both groups were aged 31-60 years, aligning with previous studies by Pooraneseon et al, Kockerling et al, and Colak et al, which reported similar age distributions for TEP and open repair patients.⁹⁻¹¹ Right-sided hernias were more common in both groups (60% in TEP and 61.67% in Lichtenstein), consistent with Singh et al, who reported 72% right-sided and 28% left-sided indirect inguinal hernias, with no bilateral cases.¹² This highlights the higher incidence of right-sided indirect inguinal hernias compared to left-sided ones.

The average operative time was shorter for TEP (78 minutes) than Lichtenstein repair (90 minutes), showing a

highly significant difference ($p < 0.001$). Intraoperative blood loss was also lower in the TEP group (20 ml) compared to Lichtenstein (35 ml, $p < 0.001$). While some studies such as Reghunandan et al, Sanjeev et al reported longer laparoscopic times, our findings indicate that TEP can be efficiently performed with experience, with minimal blood loss in most patients, similar to observations by Ho et al.¹³⁻¹⁵

Postoperative pain was significantly lower in the TEP group, with 94% of patients experiencing pain for only one day, compared to up to 4 days in the Lichtenstein group ($p < 0.001$), consistent with Shah et al.¹⁶ Chronic pain rates are higher after open repair (18%) versus laparoscopic repair (6%). Complications were fewer in TEP, with only one wound infection, while the Lichtenstein group had cord edema (5 patients), wound infections (6 patients), and one seroma. No pneumoscrotum or hematoma occurred in either group. These findings align with other studies (Rathod et al and Neumayer et al).^{17,18} The average hospital stay was shorter for TEP (≈ 3 days) versus Lichtenstein (≈ 5 days, $p < 0.001$). Follow-up showed no recurrences, aligning with studies reporting faster recovery and lower complication rates for laparoscopic repair.¹⁹

The present study has several limitations. This single-centre study had a small sample size and short two-month follow-up, limiting assessment of long-term outcomes like chronic pain, recurrence, and mesh complications. Patients were not randomized, and the study was not blinded, introducing potential selection and observer bias. Surgeon experience and the learning curve for TEP may have influenced results. Only uncomplicated primary hernias were included, and confounding factors such as comorbidities, BMI, and hernia size were not adjusted, limiting generalizability and interpretation.

CONCLUSION

The present study demonstrates that the TEP laparoscopic approach offers several advantages over the Lichtenstein tension-free open mesh repair. TEP was associated with significantly less post-operative pain, reduced operative blood loss, shorter hospital stays, and fewer complications such as cord edema and wound infections. Additionally, operative time was shorter with TEP. Both techniques were equally effective in terms of hernia recurrence, with no recurrences observed during the follow-up period. However, TEP requires advanced surgical skills and specialized equipment, which may limit its accessibility in some healthcare settings. Overall, while TEP provides faster recovery and fewer complications, Lichtenstein repair remains a safe and practical alternative where laparoscopic facilities are not available.

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REFERENCES

1. Everhart JE. Abdominal wall hernia. Digestive diseases in the United States: epidemiology and impact. Bethesda, MD: National Institute of Diabetes and Digestive and Kidney Diseases; 1994: 471-507.
2. Jenkins JT, O'Dwyer PJ. Inguinal hernias. *BMJ.* 2008;336(7638):269-72.
3. Ein SH, Njere I, Ein A. Six thousand three hundred sixty-one pediatric inguinal hernias: a 35-year review. *J Pediatr Surg.* 2006;41(5):980-6.
4. Pooraneseon K, Chandrashekar N, Ranjan VP, Yamuna VS. A comparative study between open Lichtenstein mesh repair and laparoscopic totally extraperitoneal repair of inguinal hernia. *Int Surg J.* 2018;5:1733-7.
5. Sayanna S. Prevalence of inguinal hernia in Indian population: a retrospective study. *Med Pulse Int Med J.* 2015;2(2):75-8.
6. Pereira C, Rai R. Open Lichtenstein Hernioplasty Versus Laparoscopic Transabdominal Preperitoneal Mesh Repair: The Pain Factor. *Cureus.* 2021;13(9):e18282.
7. Putnis S, Berney C. Totally extraperitoneal repair of inguinal hernia: techniques and pitfalls of a challenging procedure. *Langenbecks Arch Surg.* 2012;397(8):1343-9.
8. Messias BA, Nicastro RG, Mocchetti ER, Waisberg J, Roll S, Junior MAFR. Lichtenstein technique for inguinal hernia repair: ten recommendations to optimize surgical outcomes. *Hernia.* 2024;28(4):1467-76.
9. Pooraneseon K, Chandrashekar N, Ranjan VP, Yamuna VS. A comparative study between open lichtenstein mesh repair and laparoscopic totally extra peritoneal repair of inguinal hernia. *Int Surg J.* 2018;5:1733-7.
10. Köckerling F. TEP for elective primary unilateral inguinal hernia repair in men: what do we know?. *Hernia.* 2019;23(3):439-59.
11. Colak T, Akca T, Kanik A, Aydin S. Randomized clinical trial comparing laparoscopic totally extraperitoneal approach with open mesh repair in inguinal hernia. *Surg Laparosc Endosc Percutan Tech.* 2003;13(3):191-5.
12. Singh RR, Gupta AK, Shah AS, Singh R, Singh A. A study about inguinal hernia mesh repairs: plug and patch versus lichtenstein mesh repair technique. *Int Surg J.* 2016;3:1967-74.
13. Reghunandan RP, Ali Usman A, Basheer S, Kuttichi L, Els Jojo J, Abdul Rasheed MF. Laparoscopic Versus Open Inguinal Hernia Repair: A Comparative Study. *Cureus.* 2023;15(11):e48619.
14. Sanjeev S, Pranav B, Garima D, Madhan PR, Chanderbhan. Comparison of operative outcome of open versus laparoscopic inguinal hernia in rural tertiary care hospital in Haryana: A randomized controlled study. *Int J Sci Res.* 2020;9(7):1-5.
15. Ho CH, Lee WJ, Chen SC, Wang W, Chiu CC, Chen JC, et al. Laparoscopic total extraperitoneal inguinal hernia repair: a review of 1,000 cases. *Surg Endosc.* 2019;33(5):1611-6.
16. Shah MY, Raut P, Wilkinson TRV, Agrawal V. Surgical outcomes of laparoscopic total extraperitoneal (TEP) inguinal hernia repair compared with Lichtenstein tension-free open mesh inguinal hernia repair: A prospective randomized study. *Medicine (Baltimore).* 2022;101(26): e29746.
17. Rathod CM, Karvande R, Jena J, Ahire MD. A comparative study between laparoscopic inguinal hernia repair and open inguinal hernia repair. *Int Surg J.* 2016;3(4):1861-7.
18. Neumayer L, Giobbie-Hurder A, Jonasson O, Fitzgibbons R, Dunlop D, Gibbs J, et al. Veterans Affairs Cooperative Studies Program 456 Investigators. Open mesh versus laparoscopic mesh repair of inguinal hernia. *N Engl J Med.* 2004;350(18):1819-27.
19. Bringman S, Ramel S, Heikkinen TJ, Englund T, Westman B, Anderberg B. Tension-free inguinal hernia repair: TEP versus mesh-plug versus Lichtenstein: a prospective randomized controlled trial. *Ann Surg.* 2003;237(1):142-7.

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