

Original Research Article

Laparoscopic totally extraperitoneal repair versus open Lichtenstein hernioplasty in bilateral inguinal hernia: a comparative analysis

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ABSTRACT

Background: Bilateral inguinal hernia presents distinctive operative challenges. This study compared perioperative outcomes of open bilateral Lichtenstein hernioplasty and laparoscopic totally extraperitoneal (TEP) repair at a government tertiary care institution in Eastern India.

Methods: Historical patient records of 52 men with bilateral inguinal hernia were analysed. Group A (n=26) underwent open bilateral Lichtenstein hernioplasty; group B (n=26) underwent laparoscopic TEP repair. Primary outcome: visual analogue scale (VAS) pain score at 24 hours. Secondary outcomes: operative time, hospital stay, return to normal activity, complication rate, and hernia recurrence. Continuous variables are presented as mean±standard deviation (SD) and compared by independent t-test, reported with mean difference (MD) and 95% confidence intervals (CI). Categorical variables compared by Chi-square or Fisher exact test.

Results: Groups were comparable at baseline. VAS score was significantly lower in group B (3.3 ± 0.9 versus 6.1 ± 1.2 ; MD -2.8, 95% CI -3.4 to -2.2; $p < 0.001$), exceeding the minimum clinically important difference of 1.5 points. Hospital stay was shorter (1.6 ± 0.5 versus 3.2 ± 0.7 days; MD -1.6, 95% CI -1.9 to -1.3; $p < 0.001$) and return to activity was earlier (6.8 ± 2.1 versus 13.5 ± 2.8 days; MD -6.7, 95% CI -8.1 to -5.4; $p < 0.001$) in group B. Operative time was longer in group B (80 ± 14 versus 64 ± 11 min; MD +16, 95% CI 9.2-22.8; $p < 0.05$). Complication rate (7.7% versus 23.1%; relative risk [RR] 0.33, 95% CI 0.07-1.50; $p > 0.05$) and recurrence (0% versus 3.8%; $p > 0.05$) did not differ significantly.

Conclusions: Laparoscopic TEP repair provides superior postoperative recovery over open bilateral Lichtenstein hernioplasty in terms of pain, hospital stay, and return to activity, without compromising safety or recurrence. It should be the preferred approach in appropriately selected patients at centres with trained laparoscopic surgeons.

Keywords: Bilateral inguinal hernia, Laparoscopic TEP repair, Lichtenstein hernioplasty, Postoperative pain, Minimally invasive surgery, Hernia recurrence

INTRODUCTION

Bilateral inguinal hernias constitute 15-30% of all inguinal hernia presentations and carry greater perioperative morbidity when managed by bilateral open anterior repair, which requires two separate groin incisions with bilateral inguinal canal dissection.¹ The Lichtenstein tension-free mesh hernioplasty has been the established open standard for over three decades, but its bilateral application amplifies postoperative pain, wound morbidity, and convalescence.²

Laparoscopic totally extraperitoneal (TEP) repair enables simultaneous bilateral hernia correction through three midline port sites without additional incisions, covering the entire myopectineal orifice with a single mesh. A 2024 systematic review specifically designates TEP as the preferred approach for bilateral inguinal hernia, and a 2025 meta-analysis of 27 randomised controlled trials (RCTs) confirms significantly lower postoperative pain, shorter hospitalisation, and earlier return to activity with TEP.^{3,4} The 2018 hernia surge international guidelines similarly endorse laparo-endoscopic repair for bilateral hernias in suitable candidates.⁵ A summary of key published

comparative evidence is presented in Table 1. Despite guideline endorsement, comparative data from government tertiary care institutions in India - where logistical and training constraints limit laparoscopic uptake - remain scarce.⁶ This study (January 2025 - December 2025) was undertaken to compare perioperative and short-term outcomes of laparoscopic TEP repair

versus open bilateral Lichtenstein hernioplasty in patients with bilateral inguinal hernia, within a PICO framework: population (adults, bilateral hernia), intervention (laparoscopic TEP), comparator (open bilateral Lichtenstein), outcomes (VAS pain, operative time, hospital stay, return to activity, complications, recurrence).

Table 1: Summary of key published studies comparing laparoscopic and open inguinal hernia repair.

Author (year)	N	Study type	Design	Key findings
Subwongcharoen ¹⁵ (2003)	90	TEP versus Lichtenstein	Comparative	Less pain; earlier recovery with TEP
Fujita et al ¹⁶ (2004)	72	Laparoscopic versus open	Comparative	Reduced pain; quicker return to activity
Pironi et al ¹⁷ (2008)	584	TAPP versus open	Clinical study	Faster recovery despite longer operative time
Eklund et al ¹⁸ (2009)	1512	TEP versus Lichtenstein	Multicenter RCT	Better recovery in laparoscopic group; comparable recurrence
Feliu et al ¹⁹ (2011)	104	Laparoscopic versus open bilateral	Comparative	Lower pain; shorter stay with laparoscopy
Eker et al ¹⁴ (2012)	660	TEP versus Lichtenstein	RCT long-term	Lower chronic pain; similar recurrence
HerniaSurge Group ⁵ (2018)	—	Open versus laparoscopic	Int. Guidelines	Laparoscopic recommended for bilateral hernias
Usmani et al ¹¹ (2024)	Multiple	TAPP versus Lichtenstein	Systematic review/ meta-analysis	Less pain; faster recovery with laparoscopy
Yosypenko et al ²⁰ (2025)	93	TEP versus Lichtenstein	Randomised study	Lower pain; faster activity; comparable recurrence
Present study (2025)	52	TEP versus open bilateral	Comparative analysis	VAS 3.3 versus 6.1 ($p<0.001$); stay 1.6 versus 3.2 days ($p<0.001$)

RCT: Randomised controlled trial; TAPP: transabdominal preperitoneal; TEP: totally extraperitoneal; VAS: visual analogue scale

METHODS

Study design and ethical approval

Historical patient records of 52 men with bilateral inguinal hernia who underwent elective repair at the department of general surgery of a government-funded tertiary referral institution in Eastern India between January 2025 and December 2025 were retrieved and analysed. The study was conducted in accordance with the STROBE reporting guideline for observational studies. Ethics approval was granted by the institutional ethics committee. The ICMR national ethical guidelines for biomedical and health research involving human participants (2017) and the Declaration of Helsinki (2013).^{7,8} Individual informed consent was waived by the IEC as data were fully anonymised. Clinical Trials Registry India (CTRI) registration was not required for this retrospective record-based analysis.

Patient selection

Men aged ≥ 18 years; confirmed bilateral inguinal hernia; elective operative setting; and with complete retrievable clinical records were included. Patients with complicated hernia; recurrent hernia; prior lower abdominal or

laparoscopic preperitoneal surgery; ASA grade $\geq III$; and incomplete data precluding primary outcome analysis were excluded. Group A ($n=26$) underwent open bilateral lichtenstein hernioplasty; group B ($n=26$) underwent laparoscopic TEP repair.

Operative techniques

Group A included open Lichtenstein hernioplasty with bilateral oblique groin incisions under spinal or general anaesthesia. The inguinal canal was opened, the spermatic cord isolated, and the hernia sac managed by high ligation. A 15×15 cm polypropylene mesh was anchored to the inguinal ligament and conjoint tendon bilaterally with non-absorbable sutures, preserving the ilioinguinal, iliohypogastric, and genitofemoral nerves. Intraoperative photographs of this technique are shown in Figure 2. Group B included laparoscopic TEP repair. Under general anaesthesia, a 10-mm infraumbilical port provided access to the preperitoneal space developed by balloon dilator. Two 5-mm midline working ports were introduced. A single 15×15 cm polypropylene mesh was deployed to cover both myopectineal orifices. Mesh fixation was omitted in the majority of patients, consistent with guideline recommendations.⁵ Intraoperative photographs of this technique are shown in Figure 3.

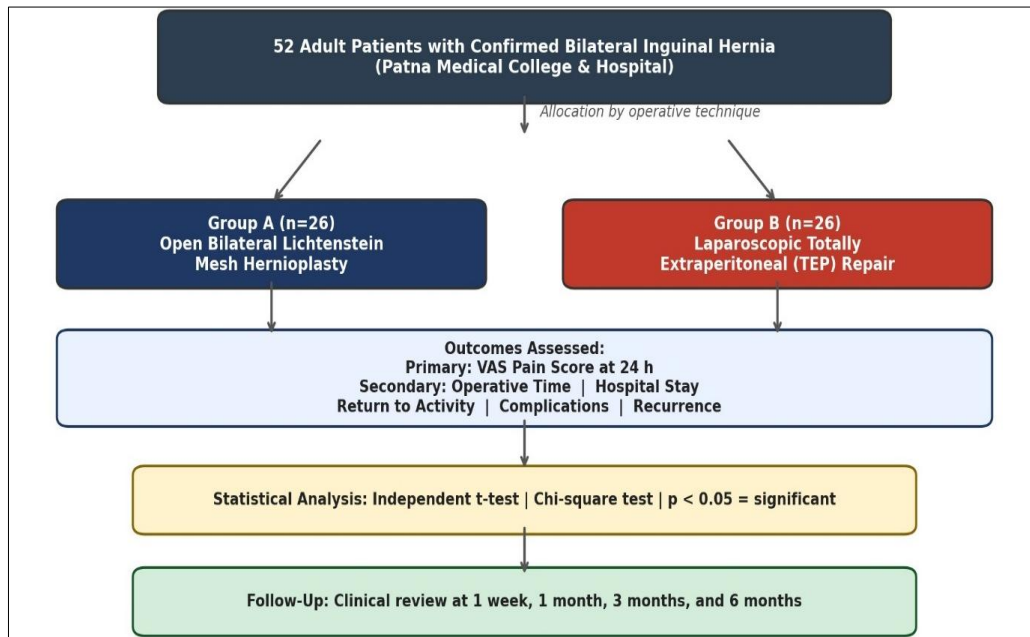


Figure 1: Study design and patient allocation flow diagram. All 52 patients completed follow-up at one week, one month, three months, and six months post-operatively.

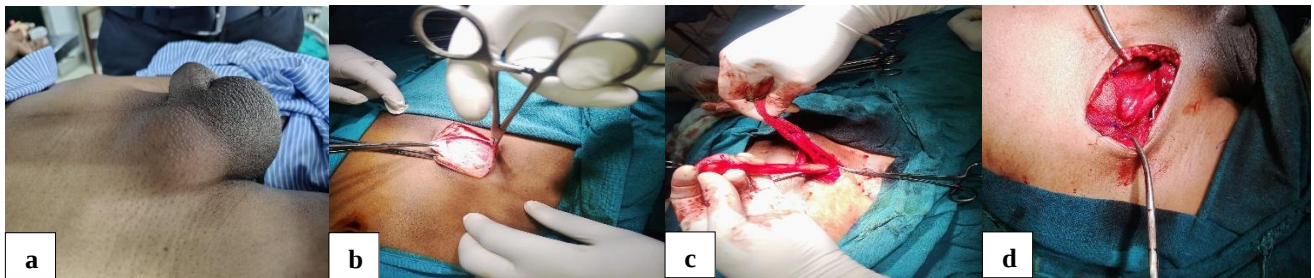


Figure 2: Intraoperative and clinical photographs - open Lichtenstein hernioplasty, (a) pre-operative: large bilateral inguinal hernia with right-sided scrotal extension, (b) intraoperative: superficial fascia retracted, inguinal floor exposed during dissection, (c) intraoperative: hernia sac mobilised and delivered prior to reduction, and (d) intraoperative: mesh visible beneath.

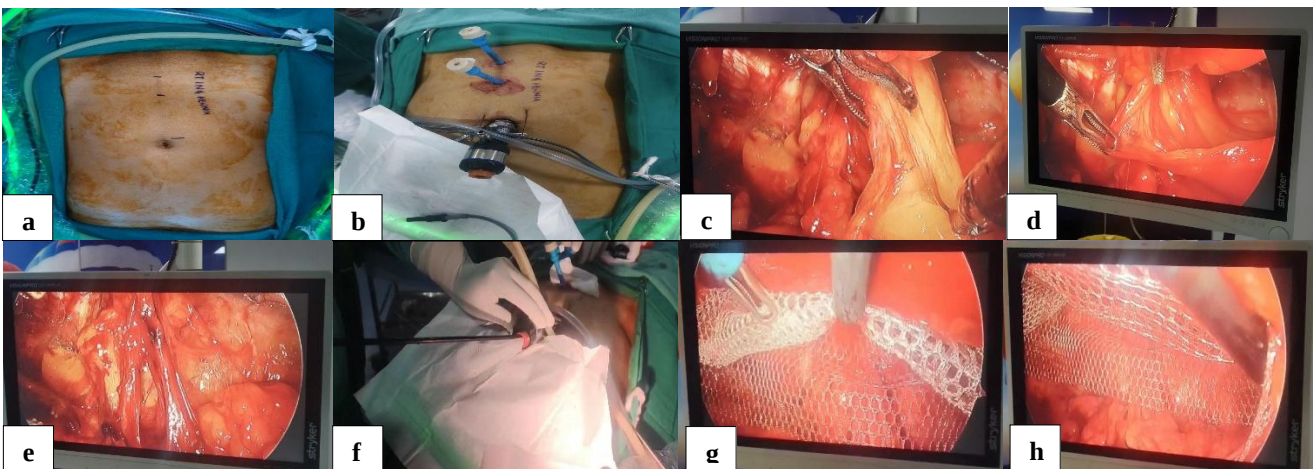


Figure 3: Intraoperative and clinical photographs - totally extraperitoneal repair, (a) preoperative: bilateral inguinal hernia, (b) port placement, (c) cord structures identified, (d) dissection of the cord structures, (e) triangle of doom identified, (f) resized 15×15 cm polypropylene mesh, (g) mesh being spread out to cover the myopectineal orifice, and (h) mesh placed in preperitoneal space between transversalis fascia and parietal peritoneum.

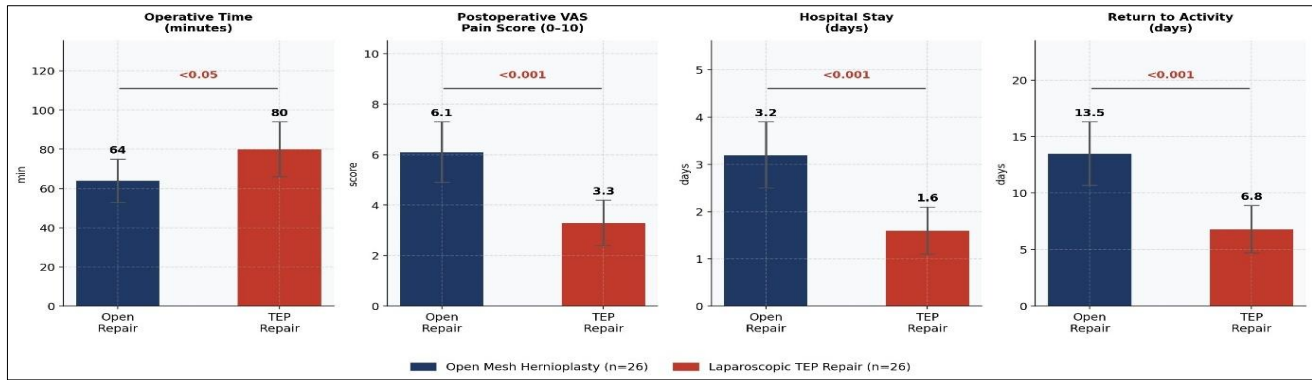


Figure 4: Grouped bar charts comparing operative time, VAS pain score at 24 hours, hospital stay, and return to activity between group A (open hernioplasty) and group B (TEP repair).

Error bars= ±1 SD

Outcome measures

The primary outcome was VAS pain score (0-10) at 24 hours, recorded by nursing staff. The minimum clinically important difference was pre-specified at 1.5 points.⁹ Secondary outcomes: operative time (minutes); hospital stay (days); return to normal activity (days); complication rate (Clavien-Dindo classification); and hernia recurrence confirmed clinically at 1 week, and 1, 3, and 6 months.

Statistical analysis

Data were analysed using statistical package for the social sciences (SPSS) version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables are expressed as mean±SD and compared by independent samples t-test, with effect sizes reported as MD and 95% CI.

Categorical variables are compared by chi-square or fisher exact test, reported as RR and 95% CI with absolute risk difference (ARD). Two-tailed p<0.05 was the significance threshold. No missing data imputation was performed.

RESULTS

Baseline characteristics

Both groups were comparable at baseline (Table 1). Mean age was 44.2±11.6 years in group A and 43.8±12.1 years in group B (p=0.90). All 52 patients were men. BMI was 23.4±3.1 and 23.1±2.9 kg/m² respectively (p=0.71). Distribution of hernia type and ASA grade was similar between groups.

Primary outcome: postoperative pain

VAS pain score at 24 hours was significantly lower in group B (3.3±0.9 versus 6.1±1.2; MD -2.8, 95% CI -3.4 to -2.2; p<0.001). This difference of 2.8 points exceeds the pre-specified minimum clinically important difference of 1.5 points, confirming both statistical and clinical significance.⁹ Analgesic requirements were correspondingly lower in group B (2.4±1.1 versus 5.2±1.8 doses; MD -2.8, 95% CI -3.5 to -2.1; p<0.001).

Secondary outcomes

Group B patients were discharged significantly earlier (1.6±0.5 versus 3.2±0.7 days; MD -1.6, 95% CI -1.9 to -1.3; p<0.001) and resumed normal activity sooner (6.8±2.1 versus 13.5±2.8 days; MD -6.7, 95% CI -8.1 to -5.4; p<0.001). Operative time was significantly longer in group B (80±14 versus 64±11 min; MD +16, 95% CI 9.2-22.8; p<0.05). Full outcome data are presented in Table 2 and Figure 1.

Complications and recurrence

Overall complication rate was 23.1% (6/26) in group A and 7.7% (2/26) in group B (RR 0.33, 95% CI 0.07-1.50; ARD -15.4%; p>0.05). All complications were Clavien-Dindo grade I–II: seroma (3 versus 1), wound infection (2 versus 0), and scrotal oedema (1 versus 1). No intraoperative complications or conversions to open surgery occurred in group B. At 6-month follow-up, one recurrence (3.8%) was recorded in group A versus none in group B (p>0.05, Fisher exact).

Table 2: Baseline demographic and clinical characteristics.

Variable	Group A open (n=26)	Group B TEP (n=26)	P value
Demographics			
Age (years), mean±SD	44.2±11.6	43.8±12.1	0.90
Sex - all men, N (%)	26 (100)	26 (100)	N/A
BMI (kg/m ²), mean±SD	23.4±3.1	23.1±2.9	0.71
Symptom duration (months), mean±SD	14.3±6.8	13.9±5.4	0.81

Continued.

Variable	Group A open (n=26)	Group B TEP (n=26)	P value
Hernia type			
Direct hernia, N (%)	09 (34.6)	10 (38.5)	0.76
Indirect hernia, N (%)	17 (65.4)	16 (61.5)	0.76
Asa physical status			
Grade I, N (%)	18 (69.2)	19 (73.1)	0.74
Grade II, N (%)	08 (30.8)	07 (26.9)	0.74

BMI: Body mass index, ASA: American Society of Anesthesiologists, SD: standard deviation, N/A: not applicable, independent t-test for continuous variables; Chi-square test for categorical variables

Table 3: Operative and postoperative outcomes with effect sizes and 95% confidence intervals.

Outcome	Group A open (n=26)	Group B TEP (n=26)	P value	Effect size (95% CI)
Primary outcome				
VAS score at 24 hours, mean±SD*	6.1±1.2	3.3±0.9	<0.001	MD -2.8 (95% CI -3.4 to -2.2)
Operative parameter				
Operative time (min), mean±SD	64±11	80±14	<0.05	MD +16.0 (95% CI 9.2–22.8)
Secondary outcomes				
Analgesic doses at 24 hours, mean±SD	5.2±1.8	2.4±1.1	<0.001	MD -2.8 (95% CI -3.5 to -2.1)
Hospital stay (days), mean±SD	3.2±0.7	1.6±0.5	<0.001	MD -1.6 (95% CI -1.9 to -1.3)
Return to activity (days), mean±SD	13.5±2.8	6.8±2.1	<0.001	MD -6.7 (95% CI -8.1 to -5.4)
Complications (Clavien-Dindo grade I–II)				
Seroma, N (%)	3 (11.5)	1 (3.8)	0.29	RR 0.33 (95% CI 0.04–3.04)
Wound infection, N (%)	2 (7.7)	0 (0)	0.15	Fisher exact (zero cell)
Scrotal oedema, N (%)	1 (3.8)	1 (3.8)	1.00	RR 1.00 (95% CI 0.07–15.2)
Overall complications†, N (%)	6 (23.1)	2 (7.7)	>0.05	RR 0.33 (95% CI 0.07–1.50); ARD–15.4%
Recurrence (6-month follow-up)				
Hernia recurrence, N (%)	1 (3.8)	0 (0)	>0.05	Fisher exact (zero cell)

*Minimum clinically important difference for VAS=1.5 points; †Fisher exact test applied where expected cell count <5; MD: mean difference; RR: relative risk; ARD: absolute risk difference; CI: confidence interval; VAS: visual analogue scale (0=no pain, 10=worst pain); no intraoperative complications or conversions to open surgery in group B

DISCUSSION

The principal finding — a 2.8-point reduction in VAS pain score with laparoscopic TEP repair — exceeds the minimum clinically important difference and is consistent with the accumulated evidence spanning two decades (Table 3). The 2025 meta-analysis of 27 RCTs confirmed significantly lower pain with TEP, and the 2024 Cochrane review specifically addressing bilateral hernia designated TEP as the preferred technique.^{3,4} A 2024 network meta-analysis further confirmed reduced wound infection, seroma, and complication rates with laparoscopic repair across pooled RCT data.¹²

The 50% reduction in hospital stay (MD -1.6 days, 95% CI -1.9 to -1.3) and halving of convalescence (MD -6.7 days, 95% CI -8.1 to -5.4) are consistent with a systematic review, a 250-patient bilateral hernia comparison, and the 1,512-patient multicentre RCT by Eklund et al.^{10,11,18}

These recovery benefits carry direct resource implications, as documented in an analysis of 17,587 patients confirming cost savings with earlier laparoscopic discharge.¹³ The 2018 Hernia Surge guidelines cite these

advantages as primary drivers of the bilateral hernia recommendation.⁵

Longer operative time in group B (MD +16 min; $p<0.05$) reflects the preperitoneal dissection learning curve, consistently reported in comparative series including a 584-patient study and a 2024 bilateral hernia comparison.^{10,17} The 2023 RCT by Damous et al similarly noted longer operative time with laparoscopic bilateral repair.²¹ The Hernia Surge group estimates stabilisation after 50–100 supervised procedures.⁵

Although complication rate was numerically lower in group B (7.7% versus 23.1%; RR 0.33, 95% CI 0.07–1.50), statistical significance was not achieved, most plausibly due to insufficient power from the modest sample ($n=52$). The wide CI spanning 1.0 supports this interpretation. A long-term RCT of 660 patients demonstrated lower chronic inguinal pain with TEP; a 104-patient bilateral comparison specifically confirmed lower pain and shorter stay with laparoscopy.^{14,19} No recurrence occurred in group B (versus 3.8% in group A; $p>0.05$), consistent with the 2025 meta-analysis confirming equivalent long-term hernia control between mesh-based TEP and open Lichtenstein repair.⁴

Limitations

Limitations of this study include the retrospective record-based design with inherent selection bias, modest sample size constraining power for low-frequency outcomes, single-centre setting limiting generalisability, and 6-month follow-up period precluding evaluation of chronic inguinodynia and late recurrence. Prospective multicentre randomised studies with extended follow-up are warranted.

CONCLUSION

Laparoscopic TEP repair was associated with significantly lower postoperative pain, shorter hospital stay, and earlier return to normal activity compared with open bilateral Lichtenstein hernioplasty, without compromising operative safety or hernia recurrence at intermediate follow-up. These findings from a real-world government tertiary care institution in Eastern India support the preferential use of laparoscopic TEP repair for bilateral inguinal hernia in appropriately selected patients and underscore the need to expand laparoscopic hernia training programmes at public sector medical colleges.

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