

Chapter 10

The Lichtenstein Inguinal Hernia Repair: A Review

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Abstract

Inguinal hernia repair is among the most frequently performed surgical procedures globally, yet the optimal surgical technique remains a subject of debate. This procedure entails the reinforcement of the posterior wall of the inguinal canal using a flat prosthetic mesh, which minimizes tissue tension and promotes rapid recovery. Numerous studies have reported recurrence rates of less than 2% when performed by experienced surgeons, thereby establishing it as the benchmark against which other open repair methods are evaluated. Compared to traditional tissue repairs, the Lichtenstein technique is associated with lower recurrence rates, reduced postoperative pain due to minimized tissue tension, and shorter operative learning curves. The Shouldice repair continues to be a valuable option for selected patients, particularly when mesh use is contraindicated or unavailable, although its success is highly contingent upon surgical expertise. While newer mesh-based techniques have demonstrated comparable recurrence rates, they have not consistently shown superior outcomes compared to the Lichtenstein repair. Despite concerns about chronic postoperative groin pain and mesh-related complications, the Lichtenstein repair remains a safe, effective, and cost-efficient procedure. Current evidence supports its continued status as the gold standard for open inguinal hernia repair, while highlighting the importance of individualized patient selection and surgeon expertise in determining the most suitable operative approach.

Keywords: Lichtenstein, Mesh repair, Open hernia repair, Tension-free repair, Chronic Pain, and Recurrence.

Introduction

The Lichtenstein tension-free hernia repair, introduced by Irving Lichtenstein in 1984, involves the use of a mesh to reinforce the posterior inguinal wall. This mesh is anchored with sutures without tension. In a series involving 1,000 patients who underwent this procedure and were followed for up to five years, no recurrences were reported (Lichtenstein et al., 1989). Amid et al. further refined the Lichtenstein repair by employing a larger mesh (7.5 cm by 15 cm), securing the upper edge of the mesh with interrupted sutures, and maintaining the mesh in a slightly relaxed or tented position. Additionally, the tail of the mesh was crossed behind the spermatic cord and sutured, while the ilioinguinal, iliohypogastric, and genital branches of the genitofemoral nerve were identified. The procedure was performed under local anesthesia (Amid, 2004; MacQueen et al., 2017; Nguyen et al., 2017). The long-term outcomes of the Lichtenstein repair were evaluated by Amid et al., who conducted 5,360 hernia repairs over a 12-year period (1984-1996). During the first four years, four recurrences were observed, with only one recurrence occurring in the subsequent eight years (Amid, 2003).

The European Hernia Society, in its guidelines for treating inguinal hernia in adult patients, recommends the Lichtenstein hernia repair for primary unilateral and bilateral symptomatic inguinal hernias in adults (Simons et al., 2009). Similarly, the Hernia Surge guidelines, endorsed by the Australasian Hernia Society, advocate for mesh-based repairs, such as the Lichtenstein repair, for the surgical management of inguinal hernias (Tran, 2018). An update to the Hernia Surge Guidelines for groin hernia management suggests considering Lichtenstein repair as a primary option for adult inguinal hernia repair, alongside laparoscopic techniques. Currently, both the Lichtenstein repair and laparoscopic hernia techniques are recommended for patients with primary inguinal hernias (Stabilini et al., 2023).

Given that Lichtenstein repairs are the most frequently performed hernia repairs by general surgeons, this review article aims to examine the Lichtenstein hernia repair method. In this chapter, we compare Lichtenstein hernia repairs with other mesh-based and non-mesh-based open inguinal hernia repairs, focusing on complications, chronic pain, and recurrence rates. A comprehensive literature review was conducted

using PubMed, Google Scholar, Semantic Scholar, and Cochrane databases to identify original research studies, observational studies, clinical trials, clinical reviews, review articles, systematic reviews, and meta-analyses from 1984 to 2026. The search employed the following keywords: "mesh repair," "open hernia repair," "tension-free repair," "Lichtenstein," "chronic pain," and "recurrence." All articles were in English, and additional articles were identified through manual cross-checking. Case reports, commentaries, and editorials were excluded, while all articles involving adult patients were included in this review.

Discussion

Optimizing the outcome of the Lichtenstein inguinal hernia repair

Messias et al. proposed several strategies to enhance the outcomes of Lichtenstein hernia repair. These strategies include the identification of the ilioinguinal, iliohypogastric, and genital branch of the genitofemoral nerve, as well as a thorough and meticulous dissection of the fascia. Additionally, they recommend a pragmatic neurectomy in cases of nerve injury or interference during mesh fixation. It is also advised to protect the cremaster fascia and ensure visualization of the external spermatic vein, along with an assessment of the femoral canal. Proper management of the hernial sac, selection of an appropriate mesh, and correct mesh fixation are emphasized. The use of a mesh sized 7.5 cm by 15 cm is suggested, along with the encouragement of early activity without restrictions (Kulacoglu, 2022; Messias et al., 2024).

Mesh fixation methods for the Lichtenstein inguinal hernia repair

Lin et al. conducted a meta-analysis of randomized controlled trials comparing mesh fixation using glue versus sutured fixation in the Lichtenstein repair. This study incorporated 13 studies involving 2,375 patients, revealing that glue fixation was associated with a lower incidence of chronic pain (OR 0.41, 95% CI, 0.19-0.90) and hematoma formation (OR 0.56, 95% CI, 0.34-0.95). Additionally, glue fixation was linked to a reduced operative time compared to sutured fixation (Lin et al., 2018). Similarly, De Goede et al. performed a meta-analysis on glue versus sutured mesh fixation for Lichtenstein hernia repair. This analysis included 7 studies with 1,185 patients, demonstrating that glue fixation resulted in a shorter duration of surgery (MD 2.57, 95% CI, 4.88-0.26), reduced chronic pain (RR 0.52, 95% CI, 0.31-8.87), and a quicker return to daily activities (MD 1.17, 95% CI, 2.30-0.03) (De Goede et al., 2013).

A systematic review and meta-analysis of randomized controlled trials conducted by Trisca et al. examined the effectiveness of cyanoacrylates versus sutures for mesh fixation in the Lichtenstein repair. This study included 19 trials with a total of 3,578 patients. The findings indicated that glue fixation was associated with a shorter operative time (SE = -0.47, 95% CI, 6.77-4.92) and lower immediate postoperative pain (2.37% vs. 13.3%, OR = 0.158, 95% CI, 0.064-0.386) (Trisca et al., 2024). Sanders et al. conducted a systematic review of randomized controlled trials assessing mesh fixation in open inguinal hernia repair. This study incorporated 12 trials with 1,992 patients and found that glue fixation reduced operative time, although no differences were observed in recurrence rates or length of hospital stay (Sanders & Waydia, 2014). Liu et al. performed a meta-analysis comparing fibrin glue mesh fixation to sutured mesh fixation in open hernia repair. The analysis included 9 studies with 1,623 patients, of whom 900 underwent fibrin glue fixation, and 723 underwent sutured mesh fixation. The results demonstrated that glue fixation was associated with reduced chronic pain (RR = 0.42, 95% CI, 0.22-0.79) and decreased hematoma formation (RR = 0.43, 95% CI, 0.21-0.87) (Liu et al., 2014). Ladwa et al. conducted a systematic review and meta-analysis comparing glue mesh fixation to sutured mesh fixation in open inguinal hernia repair. This study included 7 trials with 1,259 patients, with 628 undergoing sutured repair and 653 undergoing glue fixation. The analysis revealed no differences in postoperative complications, chronic pain, or length of hospital stay between the procedures; however, glue mesh fixation was associated with a reduced operative time (SMD = -0.19, 95% CI, 0.02-0.26) (Ladwa et al., 2013).

The choice of mesh that is used in the Lichtenstein repair

Zhong et al. conducted a meta-analysis comparing lightweight mesh with heavyweight mesh in Lichtenstein inguinal hernia repair, incorporating 11 studies with a total of 2231 patients. The findings indicated that lightweight mesh was associated with a reduction in postoperative chronic pain (OR 0.64, 95% CI 0.51-0.82) and a decreased sensation of foreign bodies (OR 0.56, 95% CI 0.40-0.78). No significant differences were observed in wound infection, hematoma, or seroma formation between the two procedures (Zhong et al., 2013). Similarly, Uzzaman et al. conducted a meta-analysis of randomized controlled trials comparing lightweight and heavyweight mesh for Lichtenstein hernia repair. This analysis included 6 studies with 1936 patients and demonstrated that lightweight mesh was associated with reduced chronic pain (OR 0.67, 95% CI 0.50-0.90) and diminished foreign body sensation (OR 0.43, 95% CI 0.21-0.93). However, no differences in recurrence rates were found between the procedures (OR 1.19, 95% CI 0.54-2.64) (Uzzaman et al., 2012).

Bakker et al. conducted a systematic review and meta-analysis examining the use of lightweight mesh in Lichtenstein inguinal hernia repair. The analysis incorporated 21 studies, encompassing a total of 4576 patients, with 2257 receiving lightweight mesh and 2319 receiving heavyweight mesh. The findings indicated a significant reduction in pain associated with the lightweight mesh (14.5% compared to 19.1%, RR = 0.78, 95% CI = 0.64–0.96) and a decreased sensation of foreign body presence (12.3% compared to 20.1%, RR = 0.64, 95% CI = 0.51–0.80). Recurrence rates were comparable between the two groups (2% versus 1.6%, RR = 1.22, 95% CI = 0.76–1.96) (Bakker et al., 2020).

Chronic Pain following the Lichtenstein inguinal hernia repair

Chronic groin pain, or inguinodynia, following Lichtenstein hernia repair is characterized by pain in the groin persisting for three months or more post-surgery. Hakeem et al. investigated the factors contributing to this condition and identified that the recognition and preservation of the ilioinguinal, iliohypogastric, and genital branch of the genitofemoral nerve during the procedure, along with the appropriate fixation of the mesh, are crucial in reducing the incidence of chronic pain. Additionally, the type of mesh employed plays a role, with lightweight mesh being linked to a lower incidence of chronic pain (Hakeem & Shanmugam, 2011).

A systematic review conducted by Reinpold et al. examined the risk factors associated with chronic pain following inguinal hernia repair.

This review encompassed 113 studies and identified female gender, young age, and high postoperative pain as factors with strong evidence linking them to chronic pain (Reinpold, 2020). Additionally, Öberg et al. performed a systematic review and meta-analysis of randomized controlled trials comparing chronic pain outcomes between mesh-based and non-mesh-based inguinal hernia repairs. This analysis included 23 studies with a total of 5,444 patients, revealing chronic pain prevalence rates of 2.9% for mesh repairs and 3.5% for non-mesh repairs (Öberg et al., 2018). Furthermore, Jaiswal et al. conducted a prospective study on chronic groin pain following the Lichtenstein hernia repair, involving 454 patients with a follow-up period of up to 15 months. The incidence of chronic groin pain in this cohort was found to be 0.78% (Jaiswal, 2009).

Comparison of the Lichtenstein repair with the mesh plug and Prolene hernia system

Frey et al. conducted a randomized clinical trial to compare the Lichtenstein hernia repair with the mesh plug repair for inguinal hernia. The study involved 595 patients, with 297 undergoing the Lichtenstein repair and 298 receiving the mesh plug repair. After a 12-month follow-up, no significant differences were observed in recurrence rates or postoperative complications between the two procedures (Frey et al., 2007). Similarly, Pierides et al. conducted a prospective randomized controlled clinical trial comparing the Prolene hernia system with the Lichtenstein hernia repair. This study included 300 patients, and the findings indicated that recurrence rates and postoperative complications were comparable between the two procedures (Pierides & Vironen, 2011).

Zhao et al. conducted a meta-analysis of randomized controlled trials examining open mesh techniques for inguinal hernia repair. This study incorporated 10 studies involving 2708 patients and found no significant differences in recurrence rates among the Lichtenstein, mesh plug, and Prolene hernia system techniques (RR 0.17, 95% CI, 0.63-7.62) (Zhao et al., 2009). Decker et al. performed a meta-analysis comparing the Prolene hernia system with the Lichtenstein repair for inguinal hernia. This analysis included 7 studies with 1377 patients and revealed no differences in recurrence (OR 0.86, 95% CI, 0.32-2.28) or chronic pain (OR 1.00, 95% CI, 0.65-1.55). However, the Prolene hernia system was associated with a quicker return to normal activity (WMD -0.54, 95% CI, 1.07-0.01) (Decker et al., 2019). Yu et al. conducted a meta-analysis comparing mesh-plug repair and Lichtenstein repair for primary inguinal hernias. This study included 11 studies with 2929 patients, with 1475 undergoing mesh plug repair and 1472 undergoing Lichtenstein repair. No differences were observed in postoperative complications, recurrence rates, or chronic pain between the procedures, although the mesh plug repair was associated with a longer return to normal activity (MD 1.48, 95% CI, 0.58-2.38) (Yu et al., 2021).

Table 1: Table comparing the Lichtenstein repair with the mesh plug and Prolene Hernia System

Study	Study Type	N=numbers	Recurrence	Postoperative complications
Zhao et al. (2009)	Meta-analysis of randomized controlled trials	2708	Similar recurrence rates between Lichtenstein and Prolene hernia system- Relative Risk: 0.17	No differences in postoperative complications between the Lichtenstein and Prolene hernia system
Sanjay et al. (2012)	Meta-analysis	1313	Similar recurrence rates between the Lichtenstein and Prolene Hernia System	Higher postoperative complications in the Prolene hernia system- Relative Risk: 0.71
Pierides et al. (2011)	Randomized Controlled Trials	300	Similar recurrence between the Prolene hernia system and Lichtenstein repair	Similar postoperative complications between the Prolene hernia system and Lichtenstein repair
Li et al. (2012)	Meta-analysis of randomized controlled trials	2912	Similar recurrence rates between the mesh plug and Lichtenstein repair	Similar postoperative complications between the mesh plug and the Lichtenstein repair
Yu et al. (2021)	Meta-analysis	2929	No differences in recurrence rates between the mesh plug and Lichtenstein repair	No differences in postoperative complications between the mesh plug and Lichtenstein repair

A meta-analysis conducted by Sanjay et al. compared the Prolene hernia system with the Lichtenstein repair in open inguinal hernia

repair. This study incorporated six studies involving 1,313 patients and found that the Prolene hernia system was associated with a higher incidence of perioperative complications compared to the Lichtenstein repair (OR 0.71, 95% CI, 0.55-0.92). However, no significant differences were observed in recurrence rates or chronic pain between the two procedures (Sanjay et al., 2012). Additionally, Li et al. performed a meta-analysis of randomized controlled trials comparing mesh plug and Lichtenstein repair for inguinal hernia repair. This analysis included eight studies with a total of 2,912 patients and revealed no significant differences in postoperative complications, chronic pain, or time to return to activity between the procedures (Li et al., 2012).

Comparison of the Lichtenstein repair with the open non-mesh-based hernia repairs

Ahmadinejad et al. conducted a randomized controlled trial to compare Lichtenstein and Shouldice repairs. The study included 452 patients, with 183 undergoing the Shouldice repair and 218 undergoing the Lichtenstein repair. The results indicated no differences in postoperative complications between the two procedures; however, the recurrence rate was 7.1% for the Shouldice repair compared to 3% for the Lichtenstein repair (Ahmadinejad et al., 2024). Additionally, Carvalho et al. performed a systematic review and meta-analysis to compare chronic pain following Shouldice versus Lichtenstein repair for inguinal hernia. This analysis incorporated 10 studies with a total of 4122 patients. The findings revealed that the Shouldice repair was associated with a lower risk of chronic pain (RR 0.66, 95% CI, 0.56-0.78) but a higher recurrence rate (RR 2.54, 95% CI, 1.15-5.53) (Silva Carvalho et al., 2026).

A randomized controlled trial conducted by Jain et al. compared the Lichtenstein and Desarda techniques for inguinal hernia repair. The study included 77 patients, with 39 undergoing the Desarda repair and 38 the Lichtenstein repair. The findings indicated no significant differences in postoperative complications and recurrence rates between the two procedures; however, the Lichtenstein repair was associated with a higher incidence of chronic pain (Jain et al., 2021). Additionally, a systematic review by Ge et al. examined the Desarda versus Lichtenstein repair across eight studies involving 1,014 patients, with 500 undergoing the Desarda repair and 518 the Lichtenstein repair. This review found no significant differences in postoperative complications, recurrence rates, or chronic pain between the procedures (Ge et al., 2018).

Pereira et al. conducted a systematic review and meta-analysis to compare the Desarda repair with the Lichtenstein repair for treating primary inguinal hernia. This analysis included five studies encompassing 536 patients and revealed differences in recurrence rates between the two procedures (RR = 1.24, 95% CI, 0.34–5.46). Additionally, postoperative complications were more prevalent in the Lichtenstein group (RR = 0.62, 95% CI, 0.47–0.81) (Pereira & Varghese, 2022). Similarly, Emile et al. performed a systematic review and meta-analysis of randomized controlled trials comparing the Desarda and Lichtenstein repairs for primary inguinal hernia. This study incorporated six studies with a total of 2159 patients and found no significant differences in recurrence rates between the procedures (OR = 0.946, 95% CI, 0.35–2.55). However, the Lichtenstein repair was associated with higher complication rates (OR = 1.86, 95% CI, 1.36–2.55) and increased seroma formation (OR = 2.17, 95% CI, 1.23–2.38) (Emile & Elfeki, 2018). Another systematic review and meta-analysis by Mohamedahmed et al. also reached similar conclusions (Mohamedahmed et al., 2020).

Table 2: Table comparing the Lichtenstein repair with the Desarda and Shouldice repair

Study	Study Type	Comparison	Recurrence Rate	Chronic Pain
Ahmadinejad et al. (2024)	Randomized controlled Trial	Lichtenstein vs Shouldice	Lichtenstein: 3.0% vs Shouldice: 7.1% at 3-year follow-up (p=0.006), favoring Lichtenstein.	No statistically significant difference in chronic inguinal pain between groups.
Emile & Elfeki (2018)	Systematic review & Meta-analysis	Desarda vs Lichtenstein	No significant difference in recurrence between Desarda and Lichtenstein (OR 0.946, p=0.91).	Postoperative chronic pain comparable between groups overall; Desarda associated with fewer overall complications.
Pereira & Varghese (2022)	Systematic review & Meta-analysis	Desarda vs Lichtenstein	No significant difference in recurrence	Lower postoperative complication burden in the Desarda group; chronic pain outcomes favored Desarda in several included studies, but pooled recurrence remained equivalent.
Carvalho et al. (2026)	Systematic review & Meta-analysis	Desarda vs Lichtenstein	No significant difference in recurrence during follow-up	Lower postoperative pain scores in the Desarda group at 72 hours; no evidence of increased chronic pain with Desarda.

Conclusion

The Lichtenstein tension-free mesh repair remains a pivotal procedure in contemporary hernia surgery. Substantial evidence supports its low recurrence rates, adaptability, and reproducibility. This repair method continues to be a reliable and globally applicable procedure, making it the most widely performed open-based inguinal hernia repair worldwide. Ongoing advancements in mesh technology, nerve-preserving techniques, and perioperative pathways are expected to enhance outcomes while maintaining the centrality of this operation in modern hernia management. The Lichtenstein repair is anticipated to continue playing a significant role in the surgical management of inguinal hernias.

Declaration

Conflict of interest: There is no conflict of interest

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