

The Lichtenstein Inguinal Hernia Repair: An Update: Narrative Review Article

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Abstract: Inguinal hernia repair is one of the most performed surgical procedures worldwide, and the optimal surgical technique continues to be debated. The procedure involves reinforcement of the posterior wall of the inguinal canal with a flat prosthetic mesh, avoiding tissue tension and facilitating rapid recovery. Numerous studies have demonstrated recurrence rates of less than 2% in experienced hands, contributing to its widespread adoption as the standard against which other open repairs are compared. Compared with traditional tissue repairs, the Lichtenstein technique is associated with lower recurrence rates, reduced postoperative pain related to tissue tension, and shorter operative learning curves. The Shouldice repair remains a valuable option in selected patients, particularly where mesh use is contraindicated or unavailable, but its success is highly dependent on surgical expertise. Newer mesh-based techniques have shown comparable recurrence rates; however, they have not consistently demonstrated superior outcomes over the Lichtenstein repair. Despite concerns regarding chronic postoperative groin pain and mesh-related complications, the Lichtenstein repair remains a safe, effective, and cost-efficient procedure. Current evidence supports its continued role as the gold standard open repair for inguinal hernias, while emphasizing individualized patient selection and surgeon expertise in determining the most appropriate operative approach.

Keywords: Lichtenstein, Mesh Repair, Open Hernia Repair, Tension-Free Repair, Chronic Pain, Recurrence.

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INTRODUCTION

The Lichtenstein tension -free hernia repair was introduced by Irving Lichtenstein in 1984, where a mesh was used to reinforce the posterior inguinal wall. The mesh was anchored with sutures under no tension, and in his series of 1,000 patients who had undergone this repair and were followed up to 5 years, there were no recurrences from the procedure (Lichtenstein *et al.*, 1989). Amid *et al.*, further refined the Lichtenstein repair by using a larger mesh (7.5 cm by 15 cm), suturing the upper edge of the mesh with interrupted sutures, keeping the mesh slightly relaxed or tented up, crossing the tail of the mesh behind the spermatic cord and suturing it, and identifying the ilioinguinal, iliohypogastric, and genital branches of the genitofemoral nerve. The Lichtenstein repair was performed under local anesthesia (Amid, 2004; MacQueen *et al.*, 2017; Nguyen *et al.*, 2017). The long-term outcomes of the Lichtenstein repair were assessed by Amid *et al.*, who performed 5360

hernia repairs over 12 years (1984-1996), with 4 recurrences seen in the first 4 years and only 1 recurrence seen in the subsequent 8 years (Amid, 2003).

The European Hernia Society, in their guidelines for the treatment of inguinal hernia in adult patients, has recommended the Lichtenstein hernia repair for primary unilateral symptomatic inguinal hernia in adults and primary bilateral symptomatic inguinal hernias in adults (Simons *et al.*, 2009). The Hernia Surge guidelines for the management of inguinal hernias by the Australasian Hernia Society have recommended mesh-based repairs like the Lichtenstein repair for the surgical treatment of inguinal hernias (Tran, 2018). An update of the Hernia Surge Guidelines for the management of groin hernias has recommended that the Lichtenstein repair be considered as a primary inguinal hernia repair for adults with laparoscopic inguinal hernia techniques. The Lichtenstein repair and the laparoscopic hernia

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techniques are now the recommended surgical techniques for patients with primary inguinal hernias (Stabilini *et al.*, 2023).

As Lichtenstein repairs remain the most common hernia repair performed by general surgeons, we have conducted this review article to investigate the Lichtenstein hernia repair. We will compare the Lichtenstein hernia repairs against the other mesh-based and non-mesh-based open inguinal hernia repairs, looking at the complications, chronic pain, and recurrence rates. A literature review was conducted on PubMed, Google Scholar, Semantic Scholar, and Cochrane databases to look for original research studies, observational studies, clinical trials, clinical reviews, review articles, systematic reviews, and meta-analyses from 1984 to 2026. The following keywords were used: “mesh repair”, “open hernia repair”, “tension-free repair”, “Lichtenstein”, “chronic pain” and “recurrence”. All articles were in English only, and further articles were obtained by manual cross-checking. Case reports, commentaries, and editorials were excluded. All articles with adult patients were included in this review.

DISCUSSION

Optimizing the Outcome of the Lichtenstein Inguinal Hernia Repair

Messias *et al.*, recommended the following to improve the outcome of the Lichtenstein hernia repair, which includes identification of the ilioinguinal, iliohypogastric, and genital branch of the genitofemoral nerve, comprehensive and meticulous dissection of the fascia, and pragmatic neurectomy in nerve injury or nerve interference during mesh fixation, protecting the cremaster fascia and visualizing the external spermatic vein, and assessment of the femoral canal, management of the hernial sac, choosing the right mesh and correct fixation of the mesh, using an appropriate sized mesh (7.5cm by 15cm), and to encourage early activity without restrictions (Kulacoglu, 2022; Messias *et al.*, 2024).

Mesh Fixation Methods for the Lichtenstein Inguinal Hernia Repair

A meta-analysis of randomized controlled trials assessing mesh fixation with glue versus sutured fixation in the Lichtenstein repair was conducted by Lin *et al.*, A total of 13 studies with 2375 patients were included in this study, and 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). Glue fixation is also associated with a reduced operative time when compared to sutured fixation (Lin *et al.*, 2018). A meta-analysis of glue versus sutured mesh fixation for the Lichtenstein hernia repair was conducted by De Goede *et al.*, A total of 7 studies with 1185 patients were included in this study, and glue fixation was associated with 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 faster return to daily activity (MD-1.17,95%CI,2.30-0.03) (De Goede *et al.*, 2013).

A systematic review and meta-analysis of randomized controlled trials on the effectiveness of cyanoacrylates versus sutures for mesh fixation in the Lichtenstein repair was conducted by Trisca *et al.*, There were 19 studies with 3578 patients in this study, and glue fixation was associated with a shorter operative time (SE-0.47,95%CI,6.77-4.92), and immediate postoperative pain was lower (2.37% vs 13.3%, OR-0.158,95%CI,0.064-0.386) (Trisca *et al.*, 2024). A systematic review of randomized controlled trials assessing mesh fixation in open inguinal hernia repair was conducted by Sanders *et al.*, A total of 12 studies with 1992 patients were included in this study, and glue fixation was associated with a reduced operative time, but there were no differences regarding recurrence rates and length of hospital stay (Sanders & Waydia, 2014). A meta-analysis comparing fibrin glue mesh fixation versus sutured mesh fixation in open hernia repair was conducted by Liu *et al.*, A total of 9 studies with 1623 patients were included, with 900 patients undergoing fibrin glue fixation and 723 undergoing sutured mesh fixation. Glue fixation was associated with reduced chronic pain (RR-0.42,95%CI,0.22-0.79), and reduced hematoma formation (RR-0.43,95%CI,0.21-0.87) (Liu *et al.*, 2014). A systematic review and meta-analysis comparing glue mesh fixation versus sutured mesh fixation in open inguinal hernia repair was conducted by Ladwa *et al.*, A total of 7 studies with 1259 patients were included in this study, with 628 patients undergoing sutured repair and 633 patients undergoing glue fixation. There were no differences regarding postoperative complications, chronic pain, and length of hospital stay between the procedures, but glue mesh fixation was associated with 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

A meta-analysis comparing lightweight mesh with heavyweight mesh in the Lichtenstein inguinal hernia repair was conducted by Zhong *et al.*, A total of 11 studies with 2231 patients were included in this study. Lightweight mesh was associated with reduced postoperative chronic pain (OR-0.64,95%CI,0.51-0.82), and reduced foreign body sensation (OR-0.56,95%CI,0.40-0.78). There were no differences in wound infection, hematoma, or seroma formation between the procedures (Zhong *et al.*, 2013). A meta-analysis of randomized controlled trials comparing lightweight and heavyweight mesh for the Lichtenstein hernia repair was conducted by Uzzaman *et al.*, There were 6 studies with 1936 patients included in this study, and lightweight mesh was associated with reduced chronic pain (OR-0.67,95%CI,0.50-0.90), reduced foreign body sensation (OR-0.43,95%CI,0.21-0.93), but there were no differences regarding recurrence between

the procedures (OR-1.19,95%CI,0.54-2.64)(Uzzaman *et al.*, 2012).

A systematic review and meta-analysis on the use of lightweight mesh for the Lichtenstein inguinal hernia repair was conducted by Bakker *et al.*, A total of 21 studies with 4576 patients were included in this study (2257 lightweight mesh and 2319 heavyweight mesh). There was a significant reduction in pain in the lightweight mesh (14.5% vs 19.1%, RR-0.78,95%CI,0.64-0.96), and a reduced foreign body sensation in the lightweight mesh (12.3% vs 20.1%, RR-0.64,95%CI,0.51-0.80). The recurrence rates were similar between the groups (2% vs 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 the Lichtenstein hernia repair is defined as pain in the groin that occurs at or more than 3 months following the hernia repair. Hakeem *et al.*, looked at the factors that are associated with chronic groin pain following the Lichtenstein hernia repair and found that identification and preservation of the ilioinguinal, iliohypogastric, and genital branch of the genitofemoral nerve during the Lichtenstein repair and proper fixation of the mesh are important factors in decreasing the incidence of chronic pain. The type of mesh that is used is also a factor in chronic pain following the Lichtenstein repair, with lightweight mesh being associated with a reduced incidence of chronic pain(Hakeem & Shanmugam, 2011).

A systematic review on the risk factors of chronic pain after inguinal hernia repair was conducted by Reinpold *et al.*, There were 113 studies in this review, and female gender, young age, and high postoperative pain were associated with strong evidence for chronic pain(Reinpold, 2020). A systematic review and meta-analysis of randomized controlled trials on chronic pain after mesh versus non-mesh-based repair for inguinal hernias was conducted by Öberg *et al.*, A total of 23 studies with 5,444 patients were included in this study, and the prevalence of chronic pain in the mesh and non-mesh repairs was 2.9% and 3.5%, respectively(Öberg *et al.*, 2018). Jaiswal *et al.*, conducted a prospective study on chronic groin pain following the Lichtenstein hernia repair. A total of 454 patients were included in this study, and they were followed up to 15 months; the incidence of chronic groin pain was 0.78%(Jaiswal, 2009).

Comparison of the Lichtenstein Repair with the Mesh Plug and Prolene Hernia System

A randomized clinical trial comparing the Lichtenstein hernia repair versus the mesh plug repair for inguinal hernia was conducted by Frey *et al.*, A total of

595 patients were randomized to 297 patients who underwent the Lichtenstein repair and 298 patients who underwent the mesh plug repair. At a follow-up of 12 months, there were no differences regarding the recurrence rates and postoperative complications between the procedures(Frey *et al.*, 2007). A prospective randomized controlled clinical trial comparing the Prolene hernia system and the Lichtenstein hernia repair was conducted by Pierides *et al.*, A total of 300 patients were included in this study, and the recurrence rate and postoperative complications were similar between both procedures(Pierides & Vironen, 2011).

A meta-analysis of randomized controlled trials of open mesh techniques for inguinal hernia repair was conducted by Zhao *et al.*, A total of 10 studies with 2708 patients were included in this study, and there were no significant differences regarding the recurrence rates between the Lichtenstein, mesh plug, and Prolene hernia system (RR 0.17,95%CI,0.63-7.62)(Zhao *et al.*, 2009). A meta-analysis comparing the Prolene hernia system versus the Lichtenstein repair for inguinal hernia was conducted by Decker *et al.*, A total of 7 studies with 1377 patients were included in this study, and there were no differences regarding recurrence (OR-0.86,95%CI,0.32-2.28) and chronic pain (OR-1.00,95%CI,0.65-1.55). The Prolene hernia system was associated with a faster return to normal activity (WMD-0.54,95%CI,1.07-0.01)(Decker *et al.*, 2019). A meta-analysis comparing the mesh-plug repair and the Lichtenstein repair for the treatment of primary inguinal hernias was conducted by Yu *et al.*, There were 11 studies with 2929 patients, with 1475 patients undergoing mesh plug repair and 1472 undergoing the Lichtenstein repair. There were no differences regarding postoperative complications, recurrence rates, and chronic pain between the procedures, but the mesh plug repair had a longer return to normal activity (MD-1.48,95%CI,0.58,2.38)(Yu *et al.*, 2021).

A meta-analysis of the Prolene hernia system versus the Lichtenstein repair in open inguinal hernia repair was conducted by Sanjay *et al.*, A total of 6 studies with 1313 patients were included in this study, and the Prolene hernia system was associated with higher perioperative complications when compared to the Lichtenstein repair (OR-0.71,95%CI,0.55-0.92). There were no differences regarding recurrence rates and chronic pain between the procedures(Sanjay *et al.*, 2012). A meta-analysis of randomized controlled trials comparing mesh plug and Lichtenstein repair for inguinal hernia repair was conducted by Li *et al.*, There was a total of 8 studies with 2912 patients, and there were no differences in postoperative complications, chronic pain, or time to return to activity between the procedures (Li *et al.*, 2012).

Table 1

Study	Study Type	N=numbers	Recurrence	Postoperative complications
Zhao <i>et al.</i> , (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 <i>et al.</i> , (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 <i>et al.</i> , (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 <i>et al.</i> , (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 <i>et al.</i> , (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

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

Comparison of the Lichtenstein Repair with the Open Non-Mesh Based Hernia Repairs

A randomized controlled trial comparing Lichtenstein and Shouldice repairs was conducted by Ahmadinejad *et al.*, There were 452 patients in this study, with 183 patients undergoing the Shouldice repair and 218 undergoing Lichtenstein repair. There were no differences regarding postoperative complications between the procedures, but the Shouldice repair was associated with a recurrence rate of 7.1% compared to 3% for the Lichtenstein repair(Ahmadinejad *et al.*, 2024). A systematic review and meta-analysis comparing chronic pain after the Shouldice versus Lichtenstein repair for inguinal hernia was conducted by Carvalho *et al.*, A total of 10 studies with 4122 patients were included in this study, and 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 comparing Lichtenstein versus the Desarda repair in the management of inguinal hernia repair was conducted by Jain *et al.*, A total of 77 patients were included in this study, with 39 patients undergoing the Desarda repair and 38 undergoing the Lichtenstein repair. There were no differences regarding postoperative complications and recurrence rates between the procedures, but the Lichtenstein repair was associated with a higher chronic pain rate(Jain *et al.*, 2021). A systematic review

comparing the Desarda versus Lichtenstein repair for inguinal hernia repairs was conducted by Ge *et al.*, There were 8 studies with 1014 patients, with 500 undergoing the Desarda and 518 undergoing the Lichtenstein repair, and there were no differences regarding postoperative complications, recurrence rates, and chronic pain between the procedures(Ge *et al.*, 2018).

A systematic review and meta-analysis comparing the Desarda repair versus Lichtenstein repair for the treatment of primary inguinal hernia was conducted by Pereira *et al.*, There were 5 studies with 536 patients, and there were differences in the recurrence rates between the procedures (RR-1.24,95%CI,0.34-5.46), and postoperative complications were higher in the Lichtenstein group (RR-0.62,95%CI,0.47-0.81)(Pereira & Varghese, 2022). A systematic review and meta-analysis of randomized controlled trials on the Desarda versus Lichtenstein repair for primary inguinal hernia was conducted by Emile *et al.*, A total of 6 studies with 2159 patients were included in this study, and there were no differences regarding the recurrence rates between the procedures (OR-0.946,95%CI,0.35-2.55), but the Lichtenstein repair was associated with higher complication rates (OR-1.86,95%CI,1.36-2.55), and higher seroma formation (OR-2.17,95%CI,1.23-2.38)(Emile & Elfeki, 2018). Another systematic review and meta-analysis comparing the Desarda repair versus the Lichtenstein repair for inguinal hernia by Mohamedahmed *et al.*, also concluded the same(Mohamedahmed *et al.*, 2020).

Table II

Study	Study Type	Comparison	Recurrence Rate	Chronic Pain
Ahmadinejad <i>et al.</i> , (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 <i>et al.</i> , (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.

Table comparing the Lichtenstein repair with the Desarda and Shouldice repair

CONCLUSION

The Lichtenstein tension-free mesh repair remains one of the most important operations in modern hernia surgery. Strong evidence supports its low recurrence rates, adaptability, and reproducibility. The Lichtenstein repair continues to represent a reliable and globally applicable procedure and is the most popular open-based inguinal hernia repair that is performed worldwide. Ongoing refinement of mesh technology, nerve-preserving techniques, and perioperative pathways will likely further improve outcomes while maintaining the central role of this operation in contemporary hernia management. The Lichtenstein repair will continue to play an important role in the surgical management of inguinal hernias.

Conflict of Interest: There is no conflict of interest.

REFERENCES

- Ahmadinejad, I., Jalali, A., Ahmadinejad, M., Soltanian, A., Ahamdinejad, Y., Shirzadi, A., & Chaghamirzayi, P. (2024). Inguinal hernia: Lichtenstein VS Shouldice technique repair: A randomized controlled trial. *Surgery Open Science*, 17, 70–74. <https://doi.org/10.1016/j.sopen.2024.01.001>
- Amid, P. K. (2003). The Lichtenstein repair in 2002: An overview of causes of recurrence after Lichtenstein tension-free hernioplasty. In *Hernia* (Vol. 7, Number 1, pp. 13–16). Springer Paris. <https://doi.org/10.1007/s10029-002-0088-7>
- Amid, P. K. (2004). Lichtenstein tension-free hernioplasty: Its inception, evolution, and principles. *Hernia*, 8(1), 1–7. <https://doi.org/10.1007/s10029-003-0160-y>
- Bakker, W. J., Aufenacker, T. J., Boschman, J. S., & Burgmans, J. P. J. (2020). Lightweight mesh is recommended in open inguinal (Lichtenstein) hernia repair: A systematic review and meta-analysis. *Surgery (United States)*, 167(3), 581–589. <https://doi.org/10.1016/j.surg.2019.08.021>
- De Goede, B., Klitsie, P. J., Van Kempen, B. J. H., Timmermans, L., Jeekel, J., Kazemier, G., & Lange, J. F. (2013). Meta-analysis of glue versus sutured mesh fixation for Lichtenstein inguinal hernia repair. *British Journal of Surgery*, 100(6), 735–742. <https://doi.org/10.1002/bjs.9072>
- Decker, E., Currie, A., & Baig, M. K. (2019). Prolene hernia system versus Lichtenstein repair for inguinal hernia: a meta-analysis. In *Hernia* (Vol. 23, Number 3, pp. 541–546). Springer-Verlag France. <https://doi.org/10.1007/s10029-019-01897-w>
- Emile, S. H., & Elfeki, H. (2018). Desarda's technique versus Lichtenstein technique for the treatment of primary inguinal hernia: a systematic review and meta-analysis of randomized controlled trials. In *Hernia* (Vol. 22, Number 3, pp. 385–395). Springer-Verlag France. <https://doi.org/10.1007/s10029-017-1666-z>
- Frey, D. M., Wildisen, A., Hamel, C. T., Zuber, M., Oertli, D., & Metzger, J. (2007). Randomized clinical trial of Lichtenstein's operation versus mesh plug for inguinal hernia repair. *British Journal of Surgery*, 94(1), 36–41. <https://doi.org/10.1002/bjs.5580>
- Ge, H., Liang, C., Xu, Y., Ren, S., & Wu, J. (2018). Desarda versus Lichtenstein technique for the treatment of primary inguinal hernia: A systematic review. In *International Journal of Surgery* (Vol. 50, pp. 22–27). Elsevier Ltd. <https://doi.org/10.1016/j.ijssu.2017.11.055>

- Hakeem, A., & Shanmugam, V. (2011). Inguinodynia following Lichtenstein tension-free hernia repair: A review. *World Journal of Gastroenterology*, 17(14), 1791–1796. <https://doi.org/10.3748/wjg.v17.i14.1791>
- Jain, S. K., Bhatia, S., Hameed, T., Khan, R., & Dua, A. (2021). A randomised controlled trial of Lichtenstein repair with Desarda repair in the management of inguinal hernias. *Annals of Medicine and Surgery*, 67. <https://doi.org/10.1016/j.amsu.2021.102486>
- Jaiswal, L. C., Chaudhry, B. R., & Agrawal, M. A. (2009). Chronic groin pain following Lichtenstein mesh hernioplasty for inguinal hernia. Is it a myth?. *The Indian journal of surgery*, 71(2), 84–88. <https://doi.org/10.1007/s12262-009-0022-7>
- Kulacoglu, H. (2022). Some more time with an old friend: Small details for better outcomes with Lichtenstein repair for inguinal hernias. *International Journal of Abdominal Wall and Hernia Surgery*, 5(4), 221–228. https://doi.org/10.4103/ijawhs.ijawhs_40_22
- Ladwa, N., Sajid, M. S., Sains, P., & Baig, M. K. (2013). Suture mesh fixation versus glue mesh fixation in open inguinal hernia repair: A systematic review and meta-analysis. In *International Journal of Surgery* (Vol. 11, Number 2, pp. 128–135). <https://doi.org/10.1016/j.ijsu.2012.12.013>
- Li, J., Ji, Z., & Li, Y. (2012). Comparison of mesh-plug and Lichtenstein for inguinal hernia repair: A meta-analysis of randomized controlled trials. *Hernia*, 16(5), 541–548. <https://doi.org/10.1007/s10029-012-0974-6>
- Lichtenstein, I. L., Shulman, A. G., Amid, P. K., & Montllor, M. M. (1989). The tension-free hernioplasty. *American journal of surgery*, 157(2), 188–193. [https://doi.org/10.1016/0002-9610\(89\)90526-6](https://doi.org/10.1016/0002-9610(89)90526-6)
- Lin, H., Zhuang, Z., Ma, T., Sun, X., Huang, X., & Li, Y. (2018). A meta-analysis of randomized control trials assessing mesh fixation with glue versus suture in Lichtenstein inguinal hernia repair. *Medicine (United States)*, 97(14). <https://doi.org/10.1097/MD.00000000000010227>
- Liu, H., Zheng, X., Gu, Y., & Guo, S. (2014). A meta-analysis examining the use of fibrin glue mesh fixation versus suture mesh fixation in open inguinal hernia repair. In *Digestive Surgery* (Vol. 31, Number 6, pp. 444–451). S. Karger AG. <https://doi.org/10.1159/000370249>
- MacQueen, I. T., Chen, D. C., & Amid, P. K. (2017). Lichtenstein Tension-Free Hernioplasty. In *Textbook of Hernia* (pp. 69–77). Springer Science+Business Media. https://doi.org/10.1007/978-3-319-43045-4_10
- Messias, B. A., Nicastro, R. G., Mocchetti, E. R., Waisberg, J., Roll, S., & Junior, M. A. F. R. (2024). Lichtenstein technique for inguinal hernia repair: ten recommendations to optimize surgical outcomes. *Hernia*. <https://doi.org/10.1007/s10029-024-03094-w>
- Mohamedahmed, A. Y. Y., Ahmad, H., Abdelmabod, A. A. N., & Sillah, A. K. (2020). Non-mesh Desarda Technique Versus Standard Mesh-Based Lichtenstein Technique for Inguinal Hernia Repair: A Systematic Review and Meta-analysis. In *World Journal of Surgery* (Vol. 44, Number 10, pp. 3312–3321). Springer. <https://doi.org/10.1007/s00268-020-05587-y>
- Nguyen, D. K., Amid, P. K., & Chen, D. C. (2017). *Lichtenstein Tension-free Hernioplasty* (pp. 1–17). https://doi.org/10.1007/978-88-470-3947-6_1
- Öberg, S., Andresen, K., Klausen, T. W., & Rosenberg, J. (2018). Chronic pain after mesh versus nonmesh repair of inguinal hernias: A systematic review and a network meta-analysis of randomized controlled trials. *Surgery (United States)*, 163(5), 1151–1159. <https://doi.org/10.1016/j.surg.2017.12.017>
- Pereira, C., & Varghese, B. (2022). Desarda Non-mesh Technique Versus Lichtenstein Technique for the Treatment of Primary Inguinal Hernias: A Systematic Review and Meta-Analysis. *Cureus*. <https://doi.org/10.7759/cureus.31630>
- Pierides, G., & Vironen, J. (2011). A prospective randomized clinical trial comparing the prolene hernia system® and the Lichtenstein patch technique for inguinal hernia repair in long term: 2- And 5-year results. *American Journal of Surgery*, 202(2), 188–193. <https://doi.org/10.1016/j.amjsurg.2010.06.027>
- Reinpold, W. (2020). Risk factors of chronic pain after inguinal hernia repair: A systematic review. In *Innovative Surgical Sciences* (Vol. 2, Number 2, pp. 61–68). De Gruyter. <https://doi.org/10.1515/iss-2017-0017>
- Sanders, D. L., & Waydia, S. (2014). A systematic review of randomized controlled trials assessing mesh fixation in open inguinal hernia repair. *Hernia*, 18(2), 165–176. <https://doi.org/10.1007/s10029-013-1093-8>
- Sanjay, P., Watt, D. G., Ogston, S. A., Alijani, A., & Windsor, J. A. (2012). Meta-analysis of Prolene Hernia System mesh versus Lichtenstein mesh in open inguinal hernia repair. In *Surgeon* (Vol. 10, Number 5, pp. 283–289). <https://doi.org/10.1016/j.surge.2012.06.001>
- Silva Carvalho, L. B., Muricy, E. F., Habib, M. M., Barros, L. S., & de Lima, M. L. A. (2026). Chronic pain after Shouldice versus Lichtenstein inguinal hernia repair: a systematic review and meta-analysis. In *Hernia* (Vol. 30, Number 1). Springer-Verlag Italia s.r.l. <https://doi.org/10.1007/s10029-026-03702-x>
- Simons, M. P., Aufenacker, T., Bay-Nielsen, M., Bouillot, J. L., Campanelli, G., Conze, J., de Lange, D., Fortelny, R., Heikkinen, T., Kingsnorth, A., Kukleta, J., Morales-Conde, S., Nordin, P., Schumpelick, V., Smedberg, S., Smietanski, M.,

- Weber, G., & Miserez, M. (2009). European Hernia Society guidelines on the treatment of inguinal hernia in adult patients. In *Hernia* (Vol. 13, Number 4, pp. 343–403). <https://doi.org/10.1007/s10029-009-0529-7>
- Stabilini, C., van Veenendaal, N., Aasvang, E., Agresta, F., Aufenacker, T., Berrevoet, F., Burgmans, I., Chen, D., de Beaux, A., East, B., Garcia-Alamino, J., Henriksen, N., Köckerling, F., Kukleta, J., Loos, M., Lopez-Cano, M., Lorenz, R., Miserez, M., Montgomery, A., ... Simons, M. (2023). Update of the international HerniaSurge guidelines for groin hernia management. In *BJS Open* (Vol. 7, Number 5). Oxford University Press. <https://doi.org/10.1093/bjsopen/zrad080>
 - Tran, H. (2018). Endorsement of the HerniaSurge guidelines by the Australasian Hernia Society. In *Hernia* (Vol. 22, Number 1, p. 177). Springer-Verlag France. <https://doi.org/10.1007/s10029-017-1673-0>
 - Trisca, R., Oprea, V., Toma, M., Bucuri, C. E., Stancu, B., Grad, O., & Gherman, C. (2024). The Effectiveness of Cyanoacrylates versus Sutures for Mesh Fixation after Lichtenstein Repair (SCyMeLi STUDY) A Systematic Review and Meta-Analyze of Randomized Controlled Trials. *Chirurgia (Romania)*, 119(1), 87–101. <https://doi.org/10.21614/chirurgia.2024.v.119.i.1.p.87>
 - Uzzaman, M. M., Ratnasingham, K., & Ashraf, N. (2012). Meta-analysis of randomized controlled trials comparing lightweight and heavyweight mesh for Lichtenstein inguinal hernia repair. In *Hernia* (Vol. 16, Number 5, pp. 505–518). Springer-Verlag France. <https://doi.org/10.1007/s10029-012-0901-x>
 - Yu, M., Xie, W. X., Li, S., Wang, D. C., & Huang, L. Y. (2021). Meta-analysis of mesh-plug repair and Lichtenstein repair in the treatment of primary inguinal hernia. In *Updates in Surgery* (Vol. 73, Number 4, pp. 1297–1306). Springer Science and Business Media Deutschland GmbH. <https://doi.org/10.1007/s13304-021-01032-4>
 - Zhao, G., Gao, P., Ma, B., Tian, J., & Yang, K. (2009). Open mesh techniques for inguinal hernia repair: A meta-analysis of randomized controlled trials. *Annals of Surgery*, 250(1), 35–42. <https://doi.org/10.1097/SLA.0b013e3181ad63cc>
 - Zhong, C., Wu, B., Yang, Z., Deng, X., Kang, J., Guo, B., & Fan, Y. (2013). A meta-analysis comparing lightweight meshes with heavyweight meshes in Lichtenstein inguinal hernia repair. *Surgical Innovation*, 20(1), 24–31. <https://doi.org/10.1177/1553350612463444>