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Review Article

The Shouldice Inguinal Hernia Repair: A Review

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Abstract: Inguinal hernia repair ranks among the most frequently performed surgical procedures globally. While mesh-based techniques, such as the Lichtenstein repair and laparoscopic methods, have become standard practice in numerous contexts, tissue-based repairs maintain significance for specific patient groups. The Shouldice repair is esteemed as the benchmark among non-mesh techniques, attributed to its low recurrence rates and favorable long-term outcomes when executed by skilled surgeons. This chapter explores the surgical principles, clinical outcomes, advantages, limitations, and contemporary relevance of the Shouldice technique. Evidence indicates that recurrence rates achieved in specialized centers are comparable to those associated with mesh-based repairs. Nevertheless, the operation's success is heavily reliant on the surgeon's expertise and patient selection. Current international guidelines continue to endorse the Shouldice repair as the preferred non-mesh option for selected primary inguinal hernias.

Keywords: Shouldice, Open Hernia, Sutured Repair, Inguinal Hernia, Chronic Pain, Recurrence.

INTRODUCTION

This pure tissue repair technique for inguinal hernia in adults, introduced by Earl Shouldice in 1942, was initially performed on army recruits. This procedure involves incising the cremasteric fascia to expose the hernia sac. Once the sac is ligated and reduced, the transversalis fascia is incised, followed by a continuous sutured repair in four layers to reinforce the posterior wall of the inguinal canal. The first layer of sutures begins at the pubic tubercle, incorporating the fascia transversalis and the upper flap of the internal oblique, transversus abdominis, and transversalis fascia, with suture bites taken continuously towards the internal ring. The second layer of sutures starts at the internal ring, reversing the first layer sutures, and continues from the newly created flap towards the curved edge of the inguinal ligament, proceeding towards the pubic tubercle where they are tied. The third and fourth layers commence at the internal ring, with bites taken from a small portion of the external oblique and the superficial surface of the internal oblique, extending to the pubic tubercle. The fourth layer continues from the pubic tubercle, incorporating the final flap of the external oblique and the remaining muscle layer towards the internal ring. The Shouldice repair is conducted under local anesthesia, and initially, stainless-steel sutures were employed for this repair (Shouldice, 2003). The Shouldice hospital reported a recurrence rate of 0.5%-1.5%, whereas other hospitals reported a recurrence rate of 5.17%. Complications associated with this procedure include pain, testicular atrophy, and dysejaculation (Bendavid *et al*., 2017; Chan & Chan, 2006; Lorenz *et al*., 2021; Bendavid, 1997).

The HerniaSurge guidelines, as issued by the Australasian Hernia Society, identify the Shouldice repair as the optimal non-mesh-based technique for inguinal hernia repair, citing its superior recurrence rates compared to other non-mesh-based methods (Tran, 2018). Similarly, the European Hernia Society's guidelines for adult inguinal hernia treatment endorse the Shouldice repair as the preferred non-mesh-based approach (Simons *et al*., 2009). Furthermore, the updated International HerniaSurge guidelines for groin hernia management advocate for the Shouldice repair, particularly for primary indirect and small direct hernias in young adults and female patients (Stabilini *et al*., 2023).

Given the recognition of the Shouldice repair as the premier non-mesh-based technique for inguinal hernia repair, this study examines its recurrence rate and associated complications, such as chronic pain. The Shouldice repair is evaluated in comparison to other open mesh-based and non-mesh-based repairs, as well as to common laparoscopic inguinal hernia repair methods. A comprehensive literature review was conducted utilizing databases such as PubMed, Google Scholar, Semantic Scholar, and Cochrane to identify original research studies, observational studies, clinical trials, clinical reviews, review articles, systematic reviews, and meta-analyses published between 1984 and 2026. The search incorporated keywords including "Shouldice," "open hernia repair," "sutured repair," "inguinal hernia," "chronic pain," and "recurrence." All articles were in English, with additional sources identified through manual cross-referencing. Excluded from this review were case reports, commentaries, and editorials, while all studies involving adult patients were included.

DISCUSSION

The Shouldice Repair

Hay *et al*., conducted a multicenter controlled trial involving 1,578 patients who had undergone open inguinal hernia repair. Of these, 820 patients received the Shouldice repair, and at an 8.5-year follow-up, the recurrence rate was 6.1% (Hay *et al*., 1995). Duce *et al*., conducted a prospective study on the outcomes of the Shouldice Repair, including 243 patients. After an 18-year follow-up, the recurrence rate was 2.88%, and the chronic pain rate was 1.8% (Martín Duce *et al.,* 2021). Karakose *et al*., performed a retrospective cohort study on Shouldice herniorrhaphy, involving 90 patients, with 42 undergoing the Shouldice repair and 48 undergoing the Lichtenstein repair. No recurrences were observed in the Shouldice group, while urinary retention occurred in 4.7% of cases postoperatively (Karakose & Eken, 2016). Porrero *et al.,* analyzed 775 patients who underwent the Shouldice repair, with the majority (83%) receiving local anesthesia. The most common postoperative complication was urinary retention, occurring in 8% of cases, and the recurrence rate after 7 years was 2% (Porrero *et al*., 2004).

Mainprize *et al*., conducted an expert consensus on the Shouldice hernia repair using a Delphi methodology. The consensus identified seven key steps in the Shouldice procedure: preoperative patient preparation, application of local anesthesia, skin incision with identification of the ilioinguinal and iliohypogastric nerves, incision of the cremasteric fascia, identification and treatment of the hernia sac, reconstruction of the posterior wall in four layers using permanent monofilament sutures, and postoperative patient management (Mainprize *et al*., 2023).

Comparison of the Shouldice Repair against Other Open Inguinal Hernia Techniques

Aytaç *et al*., conducted a comparative analysis of Shouldice and Lichtenstein repairs for primary inguinal hernia. This retrospective study encompassed 241 patients, with 120 undergoing Shouldice repair and 121 undergoing Lichtenstein repair. The findings indicated that the Shouldice repair was associated with both a longer operative time and a prolonged return to active work compared to the Lichtenstein repair. Additionally, the recurrence rate was higher in the Shouldice group than in the Lichtenstein group, at 4.1% versus 0.8% (Aytaç *et al*., 2004). In a separate randomized controlled trial by Ahmadinejad *et al*., the Lichtenstein and Shouldice repairs were compared. A total of 452 patients were randomized, with 183 undergoing the Shouldice repair and 218 undergoing the Lichtenstein repair. The study found no significant differences in postoperative complications and chronic pain between the two procedures; however, the recurrence rate was higher in the Shouldice group, at 7.1% compared to 3%, after a follow-up period of three years (Ahmadinejad *et al*., 2024).

A randomized trial conducted by Paul *et al*., compared the modified Bassini repair with the Shouldice inguinal hernia repair. The study involved 265 patients, with 125 undergoing the modified Bassini repair and 119 receiving the Shouldice repair. Over a follow-up period of 3.3 years, the recurrence rate was observed to be 9.6% in the modified Bassini group and 1.7% in the Shouldice group (Paul *et al.,* 1994). In another randomized trial by Nordin *et al*., the Shouldice repair was compared with the Lichtenstein repair. This trial included 300 patients, with 148 undergoing the Shouldice repair and 149 the Lichtenstein repair. The follow-up period extended to 3 years, revealing a recurrence rate of 4.6% in the Shouldice group and 0.46% in the Lichtenstein group. The incidence of chronic pain was reported as 4.2% in the Shouldice group and 5.6% in the Lichtenstein group (Nordin *et al*., 2001). Simons *et al*., conducted a systematic review and meta-analysis of controlled trials to evaluate the role of the Shouldice repair for inguinal hernia repair. This study included six studies with a total of 2500 patients, demonstrating that the Shouldice repair was significantly more effective than other repairs (RR 0.62, 95% CI, 0.45-0.85), although potential bias was noted in the included studies (Simons, 1996). Bracale *et al*., conducted a systematic review and meta-analysis of randomized controlled trials comparing the Shouldice and Desarda repairs. This analysis incorporated 14 studies with 2791 patients, finding no significant differences in postoperative complications, recurrence rates, or chronic pain between the procedures. However, the Desarda repair was associated with a shorter operation time (MD 12.9 minutes, 95% CI 20.6-5.2) and faster recovery (6.6 days, 95% CI 11.7-1.4) (Bracale *et al.,* 2019).

Amato et al. conducted a Cochrane review comparing Shouldice repair with other open techniques in the surgical management of inguinal hernia repair. The review included 16 studies encompassing 2,566 patients, with 1,121 patients undergoing mesh repair and 1,608 patients undergoing open repair. The analysis revealed no significant differences in postoperative complications and chronic pain between the procedures. However, the recurrence rate for Shouldice repair was higher compared to mesh repair techniques (OR 3.80, 95% CI 1.99-7.26), yet lower than non-mesh techniques (OR 0.62, 95% CI 0.45-0.85). The study concluded that Shouldice repair is the most effective non-mesh open technique for managing inguinal hernias (Amato *et al*., 2012).

Carvalho *et al*., conducted a systematic review and meta-analysis to compare chronic pain outcomes between the Shouldice repair and the Lichtenstein repair. This study incorporated 10 studies encompassing a total of 4122 patients. The findings indicated that the Shouldice repair was associated with a 34% reduction in the relative risk of chronic pain compared to the Lichtenstein repair (RR 0.66, 95% CI 0.56-0.78). Conversely, the Shouldice repair demonstrated a higher risk of long-term recurrence than the Lichtenstein repair (RR 2.54, 95% CI 1.15-5.63) (Silva Carvalho *et al*., 2026).

Table I

Study	Study Type	Type of hernia repairs compared	Recurrence	Chronic Pain
Carvalho *et al*., 2026	Systematic review & meta-analysis	Shouldice vs Lichtenstein	Shouldice associated with a significantly higher long-term recurrence risk than Lichtenstein (RR 2.54, 95% CI 1.15-5.63)	Shouldice associated with a 34% relative reduction in chronic postoperative pain compared with Lichtenstein (RR 0.66, 95% CI 0.56-0.78)
Amato *et al*., 2012	Cochrane Review	Shouldice vs Mesh repairs (including Lichtenstein) and other non-mesh repairs	Recurrence was higher with Shouldice than mesh repairs (OR 3.80), but lower than other non-mesh repairs such as Bassini-type repairs (OR 0.62).	No significant difference in chronic pain between Shouldice and comparator techniques
Nordin *et al*., 2001/2002	Randomized controlled Trial	Shouldice vs Lichtenstein	Recurrence: 7 recurrences in the Shouldice group versus 1 in the Lichtenstein group after 36-77 months' follow-up	Chronic groin pain was reported in 4.2% (Shouldice) and 5.6% (Lichtenstein). Difference was small.
Bracale *et al*., 2019	Meta-analysis	Shouldice vs Desarda (indirect comparison through Lichtenstein trials)	Recurrence rates were similar between Shouldice and Desarda	Chronic pain rates were similar between Shouldice and Desarda
Ahmedinejad *et al*., 2024	Randomized controlled trial	Shouldice vs Lichenstein repair	The recurrence rate was higher in the Shouldice repair (7.1% vs 3%)	There were no differences regarding chronic pain between the procedures

Table comparing the recurrence rates and chronic pain between Shouldice repair and the Desarda, Lichtenstein and Bassini repair.

Comparison of the Shouldice Repair with the Laparoscopic Inguinal Hernia Repairs

Köckerling *et al*., employed a propensity score matching system to compare the Shouldice repair with the Lichtenstein, Total Extraperitoneal, and Transabdominal Pre-Peritoneal (TAPP) repairs. This analysis included 60,514 patients. The Shouldice repair, when compared to the TAPP repair, demonstrated fewer intra-operative complications (0.5% vs. 1.3%) but more post-operative complications (2.3% vs. 1.5%). In comparison with the Total Extraperitoneal repair, the Shouldice repair was associated with reduced postoperative pain (4.6% vs. 6.1%) (Köckerling *et al*., 2018). Tschudi *et al*., conducted a randomized controlled trial to compare the TAPP repair for inguinal hernia with the Shouldice repair. This study included 100 patients, with 49 undergoing the Shouldice repair and 51 undergoing the TAPP repair. The TAPP repair was associated with fewer postoperative complications and less pain compared to the Shouldice repair. The recurrence rate was higher in the Shouldice group compared to the TAPP group (10.2% vs. 3.9%) at a 5-year follow-up (Tschudi *et al*., 2001).

Patel *et al*., conducted a prospective comparative study to evaluate the Shouldice repair against the Transabdominal Preperitoneal (TAPP) repair. The study included a total of 125 patients, with 89

patients undergoing the Shouldice repair and 89 patients undergoing the TAPP repair. The Shouldice repair demonstrated a shorter operative time compared to the TAPP repair; however, seroma formation was more prevalent in the TAPP group. At a 12-month follow-up, the recurrence rates for both procedures were found to be similar (Patel *et al*., 2025).

CONCLUSION

The Shouldice repair remains the standard non-mesh technique for inguinal hernia repair. Its success is attributed to precise anatomical reconstruction, careful patient selection, and surgical expertise. Decades of clinical practice provide evidence of excellent long-term outcomes, particularly when the procedure is conducted in specialized centers. Although mesh-based repairs predominate in contemporary practice due to their reproducibility and ease of implementation, the Shouldice repair continues to be significant for selected patients who may benefit from tissue-based reconstruction. Maintaining proficiency in this procedure ensures that surgeons retain a valuable alternative within the range of modern hernia surgery techniques.

Conflict of Interest: There is no conflict of interest.

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