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Review Article

The Common Open Non-Mesh-Based Inguinal Hernia Repair: Narrative Review Article

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Abstract: The open non-mesh-based inguinal hernia repairs are rarely performed now since the introduction of the Lichtenstein repair. The most common non-mesh-based inguinal hernia repairs include the Shouldice repair, the Bassini repair, and the Desarda repair. Knowledge of how to perform these procedures is important if the standard mesh-based repairs, like the Lichtenstein repair, are contraindicated. In this review, we will look at the Shouldice repair, the Bassini repair, and the Desarda repair, looking at their complications and comparing them with the mesh-based repairs.

Keywords: "Open Repair"," Sutured Repair"," Shouldice"," Bassini"," Desarda"," Chronic Pain", and "Recurrence".

INTRODUCTION

Inguinal hernia repairs are one of the most common surgical procedures that are performed by general surgeons, and they are most commonly seen in male patients rather than female patients, with a ratio of 12:1(Awad & Fagan, 2004).The inguinal hernia repairs can be divided into the open approaches that include the mesh-based repairs like the Lichtenstein repair, the plug and patch, and the Prolene Hernia System, and the non-mesh-based or sutured repairs include the Shouldice repair, the Basinni and Desarda repairs. The laparoscopic approaches include the total extraperitoneal (TEP), The Trans abdominal preperitoneal (TAPP), and the robotic repairs (Amid, 2005; Antoniou *et al*., 2014; Banks & Cotlar, 2005; Bittner & Schwarz, 2012).

The open non-mesh-based inguinal hernia repair involves the use of sutures and does not employ synthetic mesh to reinforce the posterior wall of the inguinal canal. The Shouldice repair, the Bassini repair, and the Desarda repair account for the most common repairs that are performed. The other repairs, like the MvVay repair and darning, are seldom performed now(Ramshaw & Chiu, 2018). The European Hernia Society guidelines for the management of inguinal hernia in adults have recommended the Shouldice repair for non-mesh-based inguinal hernia repair, in cases where the Lichtenstein procedure cannot be performed on the patient(Simons *et al*., 2009). The Hernia Surge guidelines for the management of groin hernia have also recommended the Shouldice repair as the best non-mesh-based inguinal hernia repair that can be performed in adults(Stabilini *et al*., 2023).

In this review, we examine the common non-mesh-based techniques for inguinal hernia repair, specifically focusing on the Shouldice repair, the Bassini repair, and the Desarda repair. We will also compare them with the mesh-based repairs to look for complications and recurrence rates. Our literature review was conducted using PUBMED, the Cochrane Database of Clinical Reviews, and Google Scholar, focusing on clinical trials, observational studies, cohort studies, systematic reviews, and meta-analyses from 1980 to 2025. The search employed the following keywords: "open repair," "sutured repair," "Shouldice," "Bassini," "Desarda," and "recurrence." All articles were restricted to the English language. Further relevant articles were identified through manual cross-referencing of the literature. Case reports, studies with fewer than 10 patients, and editorials were excluded. The study included adult male and female patients, while pediatric patients were excluded.

DISCUSSION

The Shouldice Repair

This repair, which EE Shouldice introduced, is a primary tissue repair for inguinal hernias. The procedure involves opening the external oblique aponeurosis, and once the hernia sac has been reduced, an incision is made over the transversalis fascia. The repair of the posterior wall of the inguinal canal is done with 4 layers of sutures, with the first line starting from the pubic crest towards the internal ring by approximating the transversalis fascia and the internal oblique. The second line of sutures approximates the newly formed flap to the inguinal ligament, starting from the internal ring towards the pubic tubercle. The third line of sutures carries a small amount of the external oblique towards the inguinal ligament through the superficial surface of the internal oblique, starting from the internal ring towards the pubic crest. The fourth line of sutures continues from the pubic crest, carrying the external oblique to the muscle layer above towards the internal ring. Shouldice performed this repair with stainless steel sutures, although it can be performed now with non-absorbable sutures like Prolene(Chan & Chan, 2006; Shouldice, 2003; Bendavid, 1997.).

Hay *et al*., conducted a multicenter controlled trial in 1578 patients comparing the Shouldice repair with the Bassini repair, and after a follow-up of eight years, the recurrence rate was 7.94% and it was associated with reduced postoperative morbidity(Hay *et al*., 1995). Another randomized trial comparing the Shouldice repair with the modified Bassini repair was conducted by Paul *et al*., A total of 265 patients were included in this study, and at a follow-up of three years, the recurrence rate for the Shouldice repair was 1.7%(Paul *et al*., 1994). A systematic review and network meta-analysis of randomized controlled trials comparing the Shouldice and Desarda repair was conducted by Bracale *et al.*, Fourteen trials with 2791 patients were included in this study, and both procedures were associated with similar postoperative morbidity, pain, and recurrence rate(Bracale *et al*., 2019). A Cochrane review was conducted by Amato *et al*., comparing the Shouldice repair with other open techniques for inguinal hernia repair. A total of 16 studies with 5295 patients were included in this study, and the Shouldice repair was associated with the lowest recurrence rate among the non-mesh-based repairs, but was associated with a higher recurrence rate than the mesh-based repairs(Amato *et al.,* 2012).

Kockerling *et al*., compared the Shouldice repair with the Lichtenstein, Total extraperitoneal (TEP), and the Transabdominal preperitoneal (TAPP) and found that the Shouldice repair was associated with similar outcomes in young patients, female patients, a BMI of 24, and a hernia defect of 3cm(Köckerling *et al*., 2018). Duce *et al*., followed up patients who had undergone the Shouldice repair for 18 years and found that the recurrence rate was 2.88% and the postoperative morbidity was low (Martín Duce *et al*., 2021). Paasch *et al*., compared polypropylene and stainless-steel wire sutures for patients who had undergone the Shouldice repair by looking at the short-term recurrence. At a follow-up of one year, there were no significant differences in recurrence rate; hence, polypropylene sutures can be used as an alternative to steel wire for the Shouldice repair(Paasch *et al*., 2024).A systematic review of controlled trials and meta-analysis on the role of the Shouldice repair in the treatment of inguinal hernia was conducted by Simons *et al*., A total of 6 studies with 2500 patients were included in this study, and the postoperative morbidity, chronic pain, and recurrence rates were good and this study supports the role of the Shouldice repair in the treatment of inguinal hernias(Simons, 1996).

The Shouldice repair was compared with the Lichtenstein repair in a randomized controlled trial by Ahmadinejad *et al*., A total of 402 patients were randomized to 183 patients who underwent the Shouldice repair and 218 patients who underwent the Lichtenstein repair. After a 3-year follow up the recurrence rate was 7.2% in the Shouldice group and 3% in the Lichtenstein group. The were no significant differences in postoperative morbidity and chronic pain between the two groups(Ahmadinejad *et al*., 2024). Another randomized trial comparing the Shouldice repair with the Lichtenstein repair was conducted by Nordin *et al*., A total of 300 patients were randomized to 150 who underwent the Shouldice repair and 150 the Lichtenstein repair. The recurrence rate was 5% for the Shouldice group and 0.6% for the Lichtenstein group after a follow-up of 3 years(Nordin *et al*., 2001).

The Bassini Repair

The Bassini repair was introduced by Eduardo Bassini in 1884, and it involves reconstruction of the posterior inguinal canal after reduction of the hernia contents and ligation of the sac. The transversalis fascia is incised, and the preperitoneal space is exposed. The repair of the posterior wall starts with interrupted non-absorbable sutures taken from the internal oblique, transversus abdominis, and transversalis fascia towards the inguinal ligament. About 7 to 8 interrupted sutures are placed and tied individually(Garrett, 2017; Nicolò, 2018).This repair was initially popular with surgeons, but as this repair is under tension, it was associated with a high recurrence rate, and despite modifications to the repair, it is not a popular inguinal hernia repair(Sapiyeva *et al*., 2024; Woods & Neumayer, 2008).

The Bassini repair does have a role to play in the surgical treatment of inguinal hernias, especially in patients who do not want a mesh repair or where mesh placement is contraindicated, like in strangulated inguinal hernias with contamination. Tse *et al*., conducted a retrospective study on the Bassini inguinal hernia repair and found that the recurrence rate was 2.8%

and a postoperative complication rate of 10.8%(Tse *et al*., 2021).

The Bassini repair was compared with the Lichtenstein repair for the management of inguinal hernias by Maggiore *et al*., A total of 738 patients were included in this study, with 381 patients undergoing the Bassini repair and 357 the Lichtenstein repair. There were not many differences in postoperative morbidity and chronic pain between the two procedures, but the recurrence rate was lower in the Lichtenstein repair(Maggiore *et al*., 2001.).Shi *et al*., also compared the Bassini repair against the Lichtenstein repair in a prospective randomized study where 552 patients were divided into 269 who underwent the Bassini repair and 283 who underwent the Lichtenstein repair. The recurrence rate was 12.6% in the Bassini repair compared to 5.6% in the Lichtenstein group(Shi *et al*., 2010).A retrospective study by Miyazaki *et al*., comparing the Bassini repair with the Mesh-Plug repair found that the recurrence for the Bassini repair was 7.6% against the 0.6% in the mesh-plug group(Miyazaki *et al*., 2001).

The Desarda Repair

This inguinal hernia repair was introduced by Mohan Desarda, where, after reduction of the hernia contents and ligation of the sac, a strip of the external oblique aponeurosis is excised and sutured to the inguinal ligament below and the arch of muscles of the conjoint tendon above and behind the cord to form the new posterior wall of the inguinal canal. Non-absorbable sutures are used to suture the new strip of the external oblique aponeurosis, which is under no tension. Desarda performed this repair in 400 patients, and there were minimal postoperative complications, and there was only one recurrence(Desarda 2001, 2001). In his second series of repairs, Desarda performed this operation on 860 patients who were followed for 7 years. The mean hospital stay was one day, and the return to work for most patients was 2 weeks; there were no recurrences(Desarda, 2006). Desarda also conducted this repair using absorbable sutures on 229 patients who were followed up for a period of 42 months, and there were only minor complications with no recurrence or chronic pain(Desarda, 2008).

The Desarda repair was compared with the Lichtenstein repair for the treatment of inguinal hernia by Moghazy *et al*., A total of 50 patients were included in this study, and there were no differences in the postoperative complication and recurrence rates(Moghazy *et al*., 2022).Mitura *et al*., performed the Desarda repair on 341 patients in a retrospective study, and the post-operative complication rate was 4.6% and after a follow-up of 15 years, the recurrence rate was 1.5%(Mitura et al., 2021).A systematic review and meta-analysis comparing the Desarda repair against the Lichtenstein repair on the treatment of primary inguinal hernia was conducted by Pereira *et al*., A total of 5 studies with 536 patients were included in this study, of which 310 underwent the Desarda repair and 226 underwent the Lichtenstein repair. There were no differences in the postoperative complications, recurrence rate, and chronic pain between the groups(Pereira & Varghese, 2022).Another systematic review and meta-analysis comparing both the Desarda repair and the Lichtenstein repair for inguinal hernia repair was conducted by Mohamedahmed *et al*., This study included 8 trials with 3177 patients, and there were no differences between the two procedures(Mohamedahmed *et al*., 2020).

A randomized clinical trial comparing the Desarda repair against the Lichtenstein repair for primary inguinal hernia repair was conducted by Szopinski *et al*., A total of 208 patients were randomized to 105 patients in the Desarda group and 103 in the Lichtenstein group. After a follow-up of 3 years, there were no significant differences in postoperative morbidity, recurrence, and chronic pain(Szopinski *et al.,* 2012). Similar studies comparing the Desarda repair with the Lichtenstein repair by Zulu *et al*., Moghe *et al*., Jain *et al*., and Gedam *et al*., also concluded the same(Gedam *et al*., 2017; Jain *et al*., 2021; Moghe *et al*., 2022; Zulu *et al*., 2016).A systematic review and meta-analysis of randomized controlled trials comparing the Desarda and Lichtenstein repair in the treatment of primary inguinal hernias was conducted by Emile *et al*., Six trials with 2159 patients were included in this study, and there were no significant differences regarding the postoperative complications, seroma formation, recurrence rate, and chronic pain(Emile & Elfeki, 2018).A systematic review of the Desarda versus the Lichtenstein repair for the treatment of primary inguinal hernia was conducted by Ge *et al*., Eight studies with 1014 patients were included in this study, and there were no significant differences in postoperative complications, operative time, recurrence rate, and chronic pain(Ge *et al*., 2018).

Table I

Study	Year	Study type	N=numbers	Recurrence rate in Desarda repair (%)	Recurrence rate in the Lichtenstein repair (%)
Rodriquez *et al*.,	2013	Randomized control trial	1382	0.4%	0.5%
Emile *et al*.,	2016	Systematic review &meta-analysis	2159	1.5%	3%
Mohamedahmed *et al*.,	2020	Systematic review &meta-analysis	3177	0.6%	0.9%

Study	Year	Study type	N=numbers	Recurrence rate in Desarda repair (%)	Recurrence rate in the Lichtenstein repair (%)
Jain *et al.,*	2021	Randomized control trial	77	0%	0%

The table shows the recurrence rate between the Desarda repair and the Lichtenstein repair.

CONCLUSION

There is still a role for the non-mesh-based inguinal hernia repair, and surgeons should be equipped with the knowledge on how to perform them. The Shouldice repair is considered the best non-mesh-based inguinal hernia repair, but it requires a steep learning curve, and this may account for the higher recurrence rate. The Bassini repair is rarely performed due to the high recurrence rate. The Desarda repair keeps a lot of promises as it can be performed under local anesthesia, is easily performed, and is associated with a low post-operative complication and recurrence rate. The cost-effectiveness of the Desarda repair makes it ideal for resource-limited hospitals. It is hoped that future randomized clinical trials can improve the popularity of the Desarda repair.

Conflict of Interest: There is no conflict of interest

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