



Recent Advances in Open Inguinal Hernia Repairs: A Narrative Review

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Open inguinal hernias are a common operation that is performed by general surgeons, and they are divided into mesh repairs and sutured based repairs. The Lichtenstein repair is the most popular mesh-based repair, and the sutured based repairs are divided into the Shouldice repair, Bassini repair and the Darning method. The open repairs are cost effective and associated with low complication. We have conducted this review article to look at the common operations that are performed. the recurrence rates and chronic pain.

Keywords: *Inguinal hernia; open hernia repairs; tension free repair; sutured hernia repairs; chronic pain.*

1. INTRODUCTION

Inguinal hernia repairs are one of the most common surgical operations that is performed by

the general surgeons. Inguinal hernia repairs have evolved from tension suture repairs to tension free mesh repair. The options that are available to the surgeon include the type of

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repair, the placement of the mesh and the method of fixation [1,2].

The open inguinal hernia repairs can be divided into the tension free mesh repair and the non-mesh sutured repairs. The Lichtenstein tension free mesh repair is the most common mesh repair, followed by the plug and patch repair and the Prolene hernia system. As for the sutured repair, the Shouldice repair is the most popular sutured repair followed by the Bassini's, McVay and the darn method [3,4].

Inguinal hernias were classified by Nyhus into four types, type one is an indirect small hernia, type 2 is an indirect medium sized hernia, type 3 is a direct hernia and type 4 are recurrent hernias. The tension free mesh repairs can also be divided into those that use the anterior approach, like the Lichtenstein, the plug and patch and the prolene hernia system. The other approach is the open posterior approach of which the Stoppa and Kugel patch are among the common procedures that are done [5].

The Lichtenstein tension free mesh repair is the most popular open hernia repair as it is associated with the lowest recurrence rates and chronic pain when compared to open sutured repairs like the Bassini's repair and the Shouldice repair [6].

Open inguinal hernia repairs are normally performed under local or spinal anesthesia, the risk of surgical site infection is low, and the more common complications are chronic pain which is due to nerve injuries and hydrocele formation. Other complication is recurrence and chronic sinus formation [7].

As open inguinal hernia repairs are still a common procedure that is performed by general surgeons, we have conducted this review article to investigate the common types of open hernia repair, the recurrence rates and chronic pain. A literature review was made on PubMed, Google Scholar, Semantic Scholar, and Cochrane databases to look for original articles, observational studies, clinical trials, clinical reviews, review articles and meta-analysis from 1990 to 2023. The following keywords were used "inguinal hernia", "open hernia repairs", "tension free repair", "sutured hernia repairs" and "chronic pain". All articles were in English language only and further articles were obtained by manual cross checking. Case reports, commentaries and editorials were excluded. All

articles including adults were included in this review. Pediatric patients and pregnant patients were excluded from this review.

2. DISCUSSION

2.1 Open Tension Free Inguinal Hernia Repair with Mesh

The Lichtenstein repair involves the ligation of the hernia sac and placement of a mesh on the posterior wall, which is anchored to the inguinal ligament, internal oblique, and aponeurosis. The procedure can be performed under local or spinal anesthesia and as a daycare procedure. The recurrence rate at the Lichtenstein hernia institute was 1% [8].

The Lichtenstein repair is simple and easy to learn and associated with low recurrence rates. This was confirmed by a randomized clinical trial by Butters et al which compared the long-term results of the Lichtenstein repair with the Shouldice repair [9].

Sakorafas et al conducted a retrospective study of the Lichtenstein hernia repair and concluded that it was a safe and effective procedure and was associated with only one patient who developed recurrence [10].

A randomized study by Danielsson et al on Lichtenstein hernia repair by trainee surgeons concluded that this procedure is safe, easy, and associated with reduced morbidity. There were no recurrences and this study highlighted that the Lichtenstein hernia repair produced the same results if they were performed by junior surgeons [11].

The advantage of the Lichtenstein repair is its reproducibility with minimal post operative complication, its cost effectiveness, its ability to be performed under local anesthesia and as a daycare procedure [12,13].

A meta-analysis of randomized control trials by Zhao et al on open mesh techniques for inguinal hernia repair concluded that the Lichtenstein hernia repair was associated with similar operative time, recurrence rates and chronic pain when compared to the plug and patch and the Prolene hernia system [14].

The other open inguinal hernia repairs with mesh include the plug and patch repair where the hernia sac is reduced, and a plug mesh is

inserted in the preperitoneal space and anchored with sutures, a flat mesh is than placed over the anterior portion and sutured. This procedure is easy to perform and associated with reduced morbidity and recurrence [15].

The complications associated with the plug and patch include migration of the plug mesh that is inserted in the preperitoneal space and hematoma formation due to blunt dissection in the preperitoneal space [16].

The Prolene Hernia System is another open tension free repair that utilizes a bilayer mesh to reinforce the anterior and pre peritoneal space. The dissection of the pre-peritoneal space is done bluntly, and minimal sutures are used to anchor the mesh. This procedure was easy to do and associated with minimal complications like wound hematoma and testicular atrophy. The recurrence rates are also low from this procedure [17-20].

A rapid review comparing mesh versus non mesh repairs for groin hernias by smith et al found that mesh repair was safe, effective, and associated with reduced recurrence rates [21].

The method of mesh fixation was reviewed by Techapongsatorn et al, and they concluded that sutures, glue, and self-gripping mesh were all effective. Reduced operative time and chronic pain were factors that favor the use of glue and self-gripping mesh [22].

A meta-analysis by Liu et al comparing fibrin mesh glue versus suture mesh fixation in open inguinal hernia repair found fibrin mesh glue was associated with reduced chronic pain and comparable recurrence rates with suture mesh fixation. These were also confirmed by a systemic review and meta-analysis by Ladwa et al [23,24].

The size of the mesh used is also important for open inguinal hernia repair with the recommended size of the mesh is 9cm by 15cm to cover all potential sites of recurrence [25].

The type of mesh used was assessed by a systemic review and meta-analysis by Fang et al comparing biological mesh versus synthetic mesh in open inguinal hernia repair. They concluded that both types of mesh were associated with similar recurrence rates and chronic pain although biological mesh were

associated with seroma formation and longer operative time [26].

2.2 Open Tension Free Repair Without Mesh

This is an open inguinal hernia repair where a strip of the external oblique aponeurosis is used to strengthen the posterior wall of the inguinal canal. This technique was introduced by Desarda and in his series of 400 patients, only one patient developed recurrence and the procedure was simple and cost effective [27].

A systemic review and meta-analysis by Pereira et al comparing the Desarda technique versus the Lichtenstein repair in the treatment of inguinal hernias and they concluded that the post operative complications, recurrence rates and chronic pain was similar in both groups. This was also confirmed by a systemic review by Ge hua et al [28,29].

The Desarda technique was prospectively assessed by Bashir et al and the wound infection rates were low, recurrence rates and chronic pain were also low. This study concluded that the Desarda technique was safe and effective in the repair of inguinal hernias. A study by Gurgenzidze et al also concluded that the Desarda repair was safe and associated with a low recurrence rate [30,31].

Mitura et al prospectively assessed patients who had undergone the Desarda repair for inguinal hernia, and they were followed up for 15 years and the recurrence rate was found to be 1.5% [32].

2.3 Open Sutured Repairs for Inguinal Hernias

Shouldice repair is one of the most common sutured repairs for inguinal hernias. It can be performed under local or spinal anesthesia's and the procedure involves excision and reduction of the indirect sac and the internal oblique and transversalis fascia are incised. The repair is performed in four layers starting from the transversalis fascia from the deep ring towards the pubic tubercle and the last layer being the external oblique aponeurosis. The repair was initially performed with stainless steel sutures but now it is performed with polypropylene sutures. The recurrence rates were from 8 to 22% but wound infection rates were low [33-35].

A Cochrane review comparing the Shouldice repair versus other open techniques for inguinal hernia repair found that it was the best non mesh repair in terms of recurrence rates, but it required a longer operative time and prolonged hospital stay [36].

A systemic review and meta-analysis by Bracale et al also concluded that the Shouldice repair was the best non mesh inguinal repair that can be offered to patients who decline a mesh repair [37].

Another suture repair method is the Bassini inguinal hernia repair which involved approximation of the conjoint tendon to the inguinal ligament using non-absorbable sutures. The procedure can be performed under local or spinal anesthesia and is cost effective and associated with low risk of wound infection, the recurrence rates are still higher when compared to Shouldice repair and mesh repair. It is indicated for patients who decline mesh repair [38].

The Darning technique is another sutured repair where the conjoint tendon is approximated to the inguinal ligament with monofilament non absorbable sutures without forcibly bringing the tissues together. It can be performed under local or spinal anesthesia and its post operative infection rates and recurrence rates are comparable to mesh repair. This repair

can also be considered for patients who decline mesh repair [39,40].

2.4 Chronic Pain After Open Inguinal Hernia Repair

Chronic pain is defined as groin pain that lasts after 3 months after an inguinal hernia repair. The cause of chronic pain is unknown, with nerve entrapment, nerve injury and the type of mesh used to be linked to its cause [41,42].

A systemic review and meta-analysis by Oberg et al on chronic pain after mesh and non-mesh repair of inguinal hernias found no difference in both procedures regarding chronic pain [43].

A retrospective study by Poobalan et al on chronic pain and quality of life following open inguinal hernia repair found that chronic pain occurred in 30% of patients who underwent open inguinal hernia repair. Some of the risk factors include young patients, daycare surgery and preoperative pain [44].

Charalambous et al conducted a meta-analysis on the incidence of chronic pain and the effects of elective division of the ilioinguinal nerve during open inguinal hernia and they concluded that it does not reduce chronic pain and may increase groin numbness [45].

Table 1. The recurrence rates for the following inguinal hernia operations

Hernia repair	Recurrence rate
Lichtenstein repair	0-1.7%
Plug and Patch	0-1.6%
Shouldice repair	0.2-2.7%
Bassini repair	2.9-29%

Table 2. Studies that show the recurrence rate of the lichtenstein repair

Study	Study type	Recurrence rate	Year of study
Sakorafas et al	Retrospective study	0.2%	2001
Bisgaard et al	Retrospective study	3%	2007
Butters et al	Randomized control trials	1.3%	2007
Danielsson et al	Prospective randomized trials	0%	1999
Frey et al	Randomized clinical trials	4.2%	2007
Zulu et al	Retrospective study	0%	2016

2.5 Recurrence of Open Inguinal Hernias

The risk factors for recurrence can be classified into perioperative, patient and hernia factors. Perioperative factors include tension, surgical experience, local anesthesia, and the use of mesh. Patient factors include high basal metabolic rate, diabetes, smoking, and poor wound healing. Hernia factors include direct hernia or a sliding hernia [46,47].

The Lichtenstein repair is associated with the lowest recurrence rate when compared to the other sutured repairs. The prospective study by Bisgaard et al showed that the risk of recurrence after 5 years was nil in patients who underwent the Lichtenstein repair [48].

The rate of recurrence of the common open inguinal hernia repairs are as follows, the Lichtenstein repair-0-1.7%, Plug and patch-0-1.6%, the Shouldice repair-0.2-2.7% and the Bassini repair-2.9-29% [49].

3. CONCLUSION

Open inguinal hernia repairs are still a common operation that is performed by surgeons and the Lichtenstein repair is the most common mesh-based repair due to its low recurrence rate and excellent reproducibility. As for the sutured based inguinal hernia repair, the Shouldice repair is the best repair, but its recurrence rate varies due to the technical aspects of the operation. The Desarda technique does offer hope as it is cost effective and does not involve the use of mesh and with time it can become an alternative to the Lichtenstein repair. Even with the introduction of laparoscopic surgery for inguinal hernia repair has seen a move toward this repair, but the open inguinal hernia repairs is still a common procedure in Africa, Asia and the far east as it is cost effective and simple to perform.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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