

Inguinal Hernia: The Quest for the Best Repair

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Abstract

Background: Inguinal hernia repair may be the most common procedure in general surgery. Many repairs have been described but none appears completely satisfactory. A brief look at the popular methods of repair from the traditional tissue approximation to the current mesh-based techniques is presented.

Methods: The PubMed database was searched for all English language literature. Further references were obtained through cross-referencing the bibliography cited in each work and using books from the authors' collection.

Conclusion: The history of inguinal hernia is a rich one, from the traditional tissue approximation techniques to the current mesh-based repairs which are now performed as open or laparoscopic procedures. Recurrent rates have reduced but are still a problem. Perhaps the perfect repair remains elusive because the problem may also be with patients' collagen not just the surgical procedure.

Keywords: Inguinal hernia, repair, tissue approximation, mesh

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Introduction

Hernia, derived from the Greek word *Hermos* (branch or protrusion) has been recognized for centuries and reference to its occurrence and treatment by trusses and girdles is found in early Egyptian, Chinese, and Phoenician writings with Hippocrates describing it in detail in 400BC¹.

Inguinal hernia repair may be the most common procedure performed in general surgery². In United States, it is estimated that 800 000 repairs are performed annually³. In the United Kingdom 0.14% of the population have inguinal hernias for which 70 000 operations are performed annually⁴. National inguinal hernia repair statistics for Nigeria are unavailable. Over 80 methods of repair of inguinal hernia have been described since 1887⁵. Adequate repair is dependent on a good knowledge of anatomy of the inguinal region. The decision about how to repair hernia is not based on well defined processes, but on tradition, context, and familiarity with the type of hernia.

Earlier described repairs involve manipulation and apposition of tissue around the hernia and result in tension which is blamed for the relatively high recurrent rates. The emphasis now is repair without tension; this has resulted in the widespread use of meshes. Recurrence which has been a major issue in hernia repair depends largely on the experience of the surgeon and the type of repair performed. Recurrence rates for primary repair vary from 1-5% for hernia specialists and between 5 and 20% for non specialists⁶. This article is an overview of the history of inguinal hernia repair highlighting the popular methods.

Traditional tissue approximation repairs

Marcy, a student of Joseph Lister is credited with the first documented attempt at hernia repair described in 1871. He used catgut treated with phenol in a two-suture technique to close the internal ring^{7,8}.

Edoardo Bassini, in 1884 made his hallmark description of inguinal hernia repair. His original description involved reconstruction of the posterior wall after cutting the transversalis fascia by incorporating it with internal oblique and transversus abdominis to form a 'conjoint' triple layer, which he sutured to the inguinal ligament with interrupted silk sutures. This resulted in a three layer reinforcement of the posterior inguinal wall⁹. He also established the principle of repairing the posterior wall after dealing with the sac by dissecting the cremaster muscle. Recurrence rate after 1 year was 2.7%¹⁰. Bassini is regarded as the pioneer that developed an anatomical repair with clear scientific principles and set the trend for the traditional hernia repairs. His work was adopted but soon modified in different ways¹¹, his method of reconstructing the posterior wall was abandoned and commonly the conjoint tendon was just approximated to the inguinal ligament. William Halsted modified Bassini's repair by additionally suturing the external oblique aponeurosis to the inguinal ligament to reinforce the posterior wall, with the spermatic cord placed subcutaneously¹² but later modified it by placing the cord under the external oblique¹³.

Chester McVay's modification of Bassini's method in 1942 (McVay or Cooper ligament repair) was to incise and suture the transversalis fascia to the pectineal ligament. He considered this a more anatomical repair based on human cadaver dissections, that transversus abdominis and transversalis fascia inserts into pectineal ligament not inguinal ligament. It enables repair of indirect, direct and femoral hernias¹⁴. He also popularized the use of relaxing incision to reduce tension¹⁴.

E.E. Shouldice in 1945 advanced the tissue approximation repairs that had been described previously, by dividing and overlapping the transversalis fascia in a multilayered closure using continuous monofilament suture in 4 suture lines. First suture line overlaps the fascia by suturing the underside of the medial flap to the lateral edge of divided transversalis fascia, while the second suture line approximates the edge of medial flap (transversalis fascia, internal oblique and transversus abdominis muscles to inguinal ligament. The third suture line approximates the medial flap muscles to external oblique aponeurosis and returns as the fourth, further approximating these muscles more superficially to the aponeurosis.¹⁴ The recurrent rates in hernia specialist centres have been low^{2, 14, 15, 16} but difficult to replicate elsewhere^{17, 18}.

Relaxing incisions on rectus sheath first described by Wolfler and Berger (1892 and 1902 respectively)¹⁹ may be required in the traditional repairs to reduce tension. The commonly used ones were described by Halsted¹⁰ and Tanner²⁰

Fruchard in 1956 described the myopectineal orifice which is bounded by arching fibres of internal oblique superiorly, anterior border of iliac bone inferiorly, rectus muscle medially, and iliopsoas with iliopectineal arch laterally. It is divided into superior and inferior aspects by the inguinal ligament. This orifice allows passage of the spermatic cord superiorly and femoral vessels inferiorly and can be further divided into medial, lateral and femoral triangles which are potential sites of herniation (figure 1)^{19, 21, 22}. Rives and Stoppa developed the posterior preperitoneal approach to hernia repair based on this work⁸.

Moloney's nylon darn is a cheap and effective method of hernia repair with low recurrence rates (0.8%) in the original series^{23, 24}. It involves the placement of nylon 1 from the conjoint tendon to the inguinal ligament without tension, in an interwoven manner²⁵. High recurrence rates from the other repairs led to its development²⁵. It is not a mesh repair but simulates one and cannot be strictly regarded as a tissue approximation repair. Some

randomized control trials have shown similar results between nylon darn and mesh repairs^{25, 26} but nylon darn repairs are cheaper²⁶. This method of repair was not included in recent reviews of inguinal hernia repair^{14, 22, 27}.

Sutures

Different hernia repair techniques have employed a variety of suture types- absorbable, non absorbable, natural and synthetic, from catgut to stainless steel²⁸⁻³². Monofilaments have the advantages of strength, good tissue compatibility and are associated with less incidence of infection at the expense of poorer handling properties. Monofilament nylon has been a widely used suture³². Braided sutures have been associated with a higher incidence of infections³⁰.

Mesh repair

Early in the twentieth century due to relatively high recurrent rates from repairs by suture approximation, tissue grafts like skin dermis and fascia lata were used for repairs of large, complicated or recurrent hernias including inguinal hernias. These either lacked adequate supporting tissue or could not be closed without excess tension^{33, 34}. However complications associated with use of tissue grafts included lateral tearing of fascia and cyst formation^{33, 35, 36}.

Different prosthetic materials like tantalum gauze and fortisan fabric had been used in the repair of hernia to induce fibrosis, but were not satisfactory. Tantalum gauze for example, could fragment and be extruded cutaneously³⁷.

Although the first mesh repair was performed in 1958 by Usher et al using Marlex mesh (polypropylene)³⁸, it was Lichtenstein's tension-free repair which was described in 1986 that introduced a new dawn in inguinal hernia repair. This repair was easy to perform and local anaesthesia could be used. The inguinal canal is exposed using an anterior approach and after any indirect sac or direct hernia is tackled, the posterior wall is strengthened by sewing a piece of polypropylene mesh to the conjoint tendon and the edge of the inguinal ligament. The mesh is slit laterally to accommodate the cord. Recurrences are low (0.5%) and results have been reproducible³⁹⁻⁴².

More recent mesh based repairs include Gilbert's description of a posterior repair through an anterior approach without use of sutures. A triangular plug of polypropylene is placed into the preperitoneal space through the internal ring to cover the myopectineal orifice^{22, 43}. Further development of Gilbert's umbrella

plug has resulted in the Prolene Hernia System which consists of an onlay and underlay patch with a connector in between (figure 2). The underlay patch is supposed to protect all the triangles of the groin with the onlay part reinforcing the medial and lateral triangles while the connector allows correct positioning, prevents migration and protects the internal ring²².

Kugel technique uses a bilayer of polypropylene patch with a self-retaining outer memory recoil ring that is placed through a small muscle-splitting incision. The mesh supposedly is in the same place as a preperitoneal repair by laparoscopy. He had a recurrence rate of 0.4% from 1,468 repairs⁴⁴ but similar results have not been reproduced by others and the procedure is difficult to master²².

The plug and patch technique was described in 1993. Here a plug of polypropylene mesh is placed through the defect in the internal ring or posterior inguinal wall with or without an additional flat overlay mesh. It is a simple procedure and can be done under local anaesthesia²². It can cause patient discomfort, and complications which are rare include mesh migration⁴⁵. The technique compares favourably with Lichtenstein but is more expensive⁴⁶.

The common laparoscopic repairs that have been described include transabdominal preperitoneal repair (TAPP) and total extraperitoneal repair (TEP) and are based on the principle of placing a mesh in the preperitoneal space as described originally by Stoppa⁴⁷. TAPP is done from within the peritoneal cavity and peritoneum is incised and mesh placed. In TEP all the dissection is within the extraperitoneal space. Effective laparoscopic repair should include dissection of myopectineal orifice and exposure of the pubic bone; excision of fat from cord and preperitoneum; assessment of all possible hernia sites; reduction of direct inguinal hernia; dissection, separation and reduction of indirect sac from cord structures²². Trials done comparing open and laparoscopic hernia repair have been controversial⁴⁸⁻⁵⁰. The general trend of studies done comparing open and laparoscopic use of mesh for inguinal hernia suggests that laparoscopic repair took longer time, was associated with rare but more serious complications, was more expensive, and had a steeper learning curve. However it caused less chronic pain for patients who returned to work faster. Long term recurrent rates were similar for both, but laparoscopic groin hernias were better repaired by experts. Laparoscopic repair of bilateral groin hernias may be better especially when recurrent⁵¹.

With improved recurrence rates from mesh repair, chronic groin pain (inguinodynia) defined as post operative pain lasting more than 3 months⁵² is now a problem. Non degradable meshes can also be complicated by infection^{53, 54} especially when used in potentially contaminated surgical fields⁵⁵. This has resulted in the trial of biological materials which some studies suggest may give similar results with meshes but with less pain⁵⁶. However evaluation of use of absorbable and biosynthetic materials for inguinal hernia repair have not lived up to initial expectations⁵⁷. The ideal mesh should have no adhesion potential, excellent tissue integration, good memory; shrink minimally, easy to use and cheap. It should also not promote infection, formation of fistula or seroma⁵⁸. The search for the ideal mesh continues.

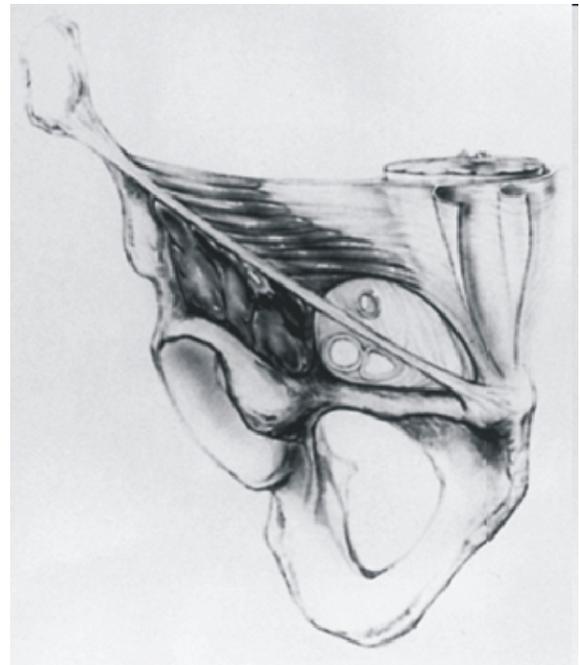


Figure 1 Myopectineal orifice¹⁹



Figure 2 Prolene Hernia System

Role of collagen

There is now increasing recognition that the aetiopathogenesis of inguinal hernia may involve changes in the components of the extracellular matrix resulting in less resistance and elasticity of the transversalis fascia⁵⁹. The presence of appropriate type of collagen in adequate amount is essential in normal function of transversalis fascia⁶⁰⁻⁶². A normal functioning transversalis fascia is necessary to prevent inguinal hernia and is important in repair⁶³. Although mesh repair reinforces and replaces the local tissue, an intrinsically abnormal connective tissue will still be vulnerable to recurrence.

Conclusion

The history of inguinal hernia repair is a rich one, and currently outcomes have improved. Bassini laid the foundation upon which others have built. Mesh use is established and laparoscopic repair is becoming popular. Recurrence rates are reducing and chronic pain is now an issue. But with the increasing recognition of the role of an abnormal extracellular matrix, perhaps the perfect repair for inguinal hernia may not be within the realms of surgery.

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