**GROIN HERNIA REPAIR- REVISITED**

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**1. DEFINITION AND CLASSIFICATION OF GROIN HERNIAS**

A groin hernia is defined as protrusion of intrabdominal contents through a congenital or acquired fascial defect. A recurrent groin hernia occurs when a patient, who has had a previous groin hernia repair, again has groin swelling from a recurrent fascial defect (1).

One of the difficulties in comparing hernia repair studies is the lack of standardization or differences between studies in what classification they have used (if any). But there seems to be as much controversy about hernia classifications as there is with what hernia repair operation should be used. A couple of the most commonly used classifications include Gilbert’s classification (1980) and Nyhus’ classification (1993). Both of these classifications are anatomically based (2). The Nyhus classification is as follows:

| I | Indirect, small (normal internal ring / hernia sac in canal) |
| II | Indirect, medium (enlarged internal ring / hernia sac extends through external ring, but not into scrotum) |
| III | A: Direct hernia  
    B: Indirect, large (enlarged internal ring is encroaching into location of direct hernia)  
    C. Femoral |
| IV | Recurrent  
    A: Indirect  
    B: Direct  
    C: Femoral  
    D: Combinations of A, B, and C |

A more recent classification has been developed that is based upon clinical presentation (3). The factors considered important in the presentation are how reducible the hernia is (reduces spontaneously on lying down (H1); groin only, reduces completely with gentle manual pressure (H2); inguinoscrotal, reducible with manual manipulation (H3); irreducible (H4)); and how fat the patient is (subscapular skin-fold thickness: <15 mm (F1), 15–25 mm (F2), 25–35 mm (F3), >35 mm (F4).) The scale is meant to be used to assign more experienced surgeons to operate on difficult hernias in fat patients. Interestingly, this classification was used in a recent paper published from Ghana (4).
2. HISTORY AND EVOLUTION OF TECHNIQUES 

In the mid to late 1800’s, groin hernia repair recurrence rates after 1 year were 30 - 40% and most recurred within 4 years. Mortality rates were reported between 5 - 10%. The late 1800’s brought significant change with outcome improvements in patients undergoing groin hernia repairs. Not only was aseptic surgery introduced, but the idea that a successful groin hernia repair required more than just manipulation of the hernia sac; it also required repair of the underlying fascial defect. Bassini, an Italian surgeon, is credited as the father of modern herniorrhaphy as he was the first to describe clear anatomical dissection and reconstruction of the inguinal canal.

As such, inguinal hernia repairs began as suture repairs, all being modifications of the Bassini repair. The two main principles of a suture repair include repair of the transversalis fascial defect and tightening of the internal ring. Other suture repairs are essentially modifications of the Bassini repair. The McVay repair is a modification of the Bassini repair that permits closure of the femoral ring in the event of a femoral hernia. The Shouldice repair was introduced in Canada in the 1950’s and it too is based on principles established by Bassini. This technique involves tightening the internal ring and a continuous 4 layer repair of the posterior wall of the inguinal canal to repair the transversalis fascia defect. Recurrence rates from specialized hernia centres using the Shouldice technique are reported to be <1%.

Although most popularized in the United Kingdom, the nylon darn repair is a suture repair that introduced the concept of a tension-free repair. In the beginning of the 1900’s, various surgeons used pedicled strips of the external oblique aponeurosis or fascial grafts from the thigh for their repairs. This led to the idea of a lattice or darn suture repair. The plication – darn technique was formally described by Moloney in the 1950’s. The technique was revised and further popularized by Abrahamson in the 1980’s. In his reported series of 100 patients, his recurrence rate was also <1%.

By now the notion of minimizing tension in a groin hernia repair, to reduce the risk of recurrence, was becoming more popular. This eventually led to mesh repair techniques. The difficulty was finding the appropriate material. Metal sheets were first introduced, but they were fraught with complications. PTFE (polytetrafluoroethylene) results were also disappointing. Credit for the successful introduction of mesh should be attributed to Usher. He initially used polyethylene and later substituted it with polypropylene mesh in the 1950’s. Rives (1960’) and Stoppa (1980’) made significant contributions in this area of surgery. While Newman was first to use mesh for anterior repair, Lichtenstein popularised this approach (1980’s). Gilbert introduced the Prolene Hernia Repair system based on input from Usher.

Since the 1970’s, the use of polypropylene meshes have become increasingly popular. Multiple forms of hernia meshes have been manufactured and multiple approaches have been described. The most popular open mesh repairs today include a flat patch, plug and patch, or the prolene hernia system. The reported advantages of using these mesh repairs include low recurrence rates, less postoperative pain, and quicker return to regular activities. The advent of laparoscopy has also resulted in the introduction of the TAPP and TEP mesh repairs.

Passionate discussion occurs when surgeons are asked their opinion on ‘how to best fix a groin hernia’. Many times strong biases are not evidence based, but more closely related to their location of training and what methods they were taught or have most experience with.

Polemly library users wishing to follow clear diagrams of the surgical techniques mentioned should look up either Greenfield’s Surgery (add link) or Mastery of Surgery (add link). Both contain well illustrated sections detailing operative techniques, with the Mastery of Surgery text reproducing Bassini’s original drawings as well as more modern step by step illustrations.

3. SURGICAL TECHNIQUES

3.1 SUTURE REPAIR

3.1.1 BASSINI REPAIR

Bassini of Padua, Italy was the first to understand and develop an anatomical approach to the repair of inguinal hernias. The original Bassini repair involves opening the external oblique aponeurosis through the external ring. He then resected the cremasteric muscle from around the spermatic cord for good exposure of the posterior wall of the inguinal canal. He also divided the transversalis fascia from pubic tubercle to beyond the internal ring so that he could do a high ligation of an indirect hernia sac in the preperitoneal space. He then reinforced the posterior wall of the inguinal canal with a single row of interrupted nonabsorbable sutures. The superior bite of each suture included 3 structures (triple layer) and the inferior bite included 2 structures (double layer). In other words he sutured the external oblique muscle, transversus abdominis muscle and upper leaf of the transversalis fascia (triple layer) to the lower leaf of the transversalis fascia and inguinal ligament (double layer) in a single row of interrupted nonabsorbable sutures. He then reappraised the external oblique aponeurosis over the cord structures.

In his study of 206 patients he included all hernia repairs, including strangulated ones. Three patients died (1.5%). He had almost 100% 5-year follow-up, and there were only 8 recurrences (3.9%). Such statistics are impressive for his era and contributed to him being named the father of modern herniorrhaphy. Many more recent studies document the Bassini repair as having much higher recurrence rates (5 - 15%), but most use a modified Bassini repair and not his original repair (9). The modified Bassini repairs do not describe opening the transversalis fascia or removing the cremasteric muscle for better exposure. Nor do they describe including the divided transversalis fascia as part of the suture repair (triple layer from the superior leaf and double layer from the inferior leaf). They only describe ligation of the indirect hernia sac and sutureting the ‘conjoined tendon’ to the inguinal ligament. Perhaps these compromises reflect such a significant shift in the surgical procedure that we are no longer talking about a true Bassini repair. A classic Bassini repair and a ‘conjoined tendon’ repair (modified Bassini repair) may be like comparing apples to oranges.

3.1.2 SHOULDICE REPAIR

The Shouldice repair is actually a modification of the Bassini’s repair based on the very same principles of dissection. The technique involves 4 continuous suture layers and was introduced with 34-gauge stainless steel wires. (In fact, surgeons at the Shouldice Clinic in Canada will still use wires for their repairs). The principles of repair include careful dissection and hemostasis, clear exposure and freeing of the spermatic cord at the level of the internal ring and complete excision of the cremasteric muscle. Reports of recurrence rates with the Shouldice technique range from <1 - 7 %. It is also interesting to note the very low recurrence rates reported by the Shouldice clinic may in fact partly reflect their strict criterion for patient selection, as they do not operate on patients with certain co-morbidities.

To give a brief step by step description of technique, after exposure of the inguinal canal and mobilization of the cord structures, the cremasteric muscles are divided longitudinally over the spermatic cord. The upper and lower flaps of cremasteric muscle, cremasteric vessels, and genital branch of the genitofemoral nerve are excised to clearly expose the posterior wall. The medial pillar of the internal ring is lifted off the preperitoneal fat and inferior epigastric vessels. Then the transversalis fascia is opened from the medial pillar of the internal ring to the pubic tubercle. Both the upper and lower flaps of the transversalis fascia are freed from the preperitoneal fat. The first suture line starts near the pubic tubercle and sutures the free edge of the lower flap to the transversalis fascia behind the posterior aspect of the upper flap of the transversalis fascia. By suturing the lateral corner of the
lower flap up to the upper flap of the transversalis fascia, the internal ring is tightened. This suture is now continued in a lateral to medial direction by sewing the free edge of the upper flap to the base of the lower flap (reflected portion of the inguinal ligament or ileopubic tract) giving a double layer closure in a ‘vest over pants’ type manner. The posterior wall is further strengthened by another double layer (layers 3 and 4). This third layer starts laterally and involves suturing the posterior surface of the lower flap of the external oblique aponeurosis to the anterior surface of the internal oblique muscle (conjoined tendon). Upon reaching the pubic tubercle, this continuous suture (now layer 4) is sewn back laterally to bring up more of the lower flap of external oblique aponeurosis over the internal oblique muscle in a ‘pants over vest’ type manner. The 3rd and 4th suture layers are superior and parallel to the inguinal ligament and thereby create a 2nd and 3rd artificial inguinal ligament for reinforcement.

3.1.3 Plication - Darn Repair
The theory behind the nylon darn repair is that the latticework of suture provides a tension free repair. This procedure was originally described by Moloney. The first part of the repair involves closure of the transversalis fascia defect (plication without tension) and the second part involves the darn repair. In this repair, the transversalis fascia is not slit open. After ligation of an indirect sac or imbrication of a direct sac, the posterior wall of the inguinal canal is repaired. The repair involves using a continuous suture and starting laterally, just medial to the internal ring. The musculoaponeurotic arch is sutured to the inguinal ligament with no effort to forcibly bring the layers together (thereby avoiding tension). The second suture line extends laterally from the pubic tubercle in a continuous fashion by taking good strong aponeurotic tissue from the rectus sheath and the tendinous portion of the internal oblique as the superior portion of musculoaponeurotic arch above to the inguinal ligament below. It is important to pass through the rectus sheath medially and the tendinous portion of the internal oblique laterally to ensure that strong tissue is used. Again the tissue is not forcibly brought together, the suture lattice instead works as a darn mesh.

Abrahamson modified the technique by beginning the repair medially with an anchoring suture to the pubic fascia along with the medial part of the inguinal ligament, transversalis fascia, and transversus abdominis aponeurosis. Then using a simple continuous nylon suture, the iliopectus tract, few fibers of the inguinal ligament and lower portion of transversalis fascia are sutured to the upper portion of the transversalis fascia and lower edge of the transversus abdominis aponeurosis. In the area of the direct hernia, 1 – 3 extra bites are taken of the transversalis fascia along the edges of the tear to close it securely. For the darn portion of the repair, 3 nylon sutures are placed in a continuous fashion to form the lattice. They include the inguinal ligament inferiorly and superiorly include the rectus sheath and conjoined tendon. There is no tension placed on the sutures. The first suture is in a vertical direction, the second sutures cranially and medially, and the third sutures cranially and laterally. Similar to the Shouldice repair, this repair needs to be seen and practiced many times, before one is well familiar with the technique.

3.1.4 Femoral Hernia Repair
A femoral hernia occurs when the transversalis fascia loses its attachment to the pectineal ridge along Cooper’s ligament. This makes it possible for peritoneum and intra-abdominal contents to pass inferior to the inguinal ligament into the femoral canal because the thigh is no longer separated from the abdomen.

3.1.4.1 Femoral Approach
The femoral approach for repair involves a transverse thigh incision inferior to the inguinal ligament over the femoral canal. The sac is freed from the subcutaneous tissue to its neck and the contents are reduced if they are not strangulated. Occasionally the lacunar or inguinal ligament need to be split for exposure of the peritoneum and intra-abdominal contents to pass inferior to the inguinal ligament over the femoral vessels. These hernias are rare. Through this incision one can prevent spontaneous reduction of potentially strangulated femoral hernia sac contents and clearly visualize the femoral canal defect. The triple superior layer is then sutured to Cooper’s ligament along the pectineal ridge to close the defect. One must make a transition stitch just medial to the femoral vein whereby one continues suturing the conjoined tendon to the iliopubic tract and inguinal ligament to prevent injury to the femoral vein. This repair is often accompanied by a relaxing incision in the rectus sheath for the purpose of reducing tension on the repair. There has not been any evidence, however, that the relaxing incision reduces risk of recurrence. This open suture repair is commonly used when a bowel resection is required for strangulation, as one does not want to place any mesh into a contaminated field.

3.1.4.2 Inguinal Approach
Lotheissen was the first person to approximate the conjoined tendon to Cooper’s ligament. Chester McVay popularized this technique. A standard supra-inguinal incision is made. Dissection is similar to the Bassini technique with opening of the transversalis fascia and exposure of the preperitoneal space. This is the only way that one can prevent spontaneous reduction of potentially strangulated femoral hernia sac contents and clearly visualize the femoral canal defect. The triple superior layer is then sutured to Cooper’s ligament along the pectineal ridge to close the defect. One must make a transition stitch just medial to the femoral vein whereby one continues suturing the conjoined tendon to the iliopubic tract and inguinal ligament to prevent injury to the femoral vein. This repair is often accompanied by a relaxing incision in the rectus sheath for the purpose of reducing tension on the repair. There has not been any evidence, however, that the relaxing incision reduces risk of recurrence. This open suture repair is commonly used when a bowel resection is required for strangulation, as one does not want to place any mesh into a contaminated field.

3.1.4.3 Extraperitoneal Approach
Nyhus used a transverse incision placed above the pubic symphysis to gain access to the preperitoneal space for exposure of the femoral ring. This approach may best be suited for a prevascular hernia whereby the hernia passes inferior to the inguinal ligament over the femoral vessels. These hernias are rare. Through this incision one can prevent spontaneous reduction of potentially strangulated femoral hernia sac contents and clearly visualize the femoral canal defect. The triple superior layer is then sutured to Cooper’s ligament along the pectineal ridge to close the defect. One must make a transition stitch just medial to the femoral vein whereby one continues suturing the conjoined tendon to the iliopubic tract and inguinal ligament to prevent injury to the femoral vein. This repair is often accompanied by a relaxing incision in the rectus sheath for the purpose of reducing tension on the repair. There has not been any evidence, however, that the relaxing incision reduces risk of recurrence. This open suture repair is commonly used when a bowel resection is required for strangulation, as one does not want to place any mesh into a contaminated field.

3.2 Tension Free (Mesh) Repair

3.2.1 Open Repair

3.2.1.1 Lichtenstein Repair
Although originally described by Newman, the anterior (overlay) flat mesh repair was popularised by Lichtenstein in the mid 1980’s. Its described advantage was that it requires minimal dissection and has a quicker learning curve. It is promoted as a repair that can be easily done under local anaesthesia. A standard supra-inguinal incision is made and the external oblique aponeurosis is opened. The sac is separated from the cord up to the level of the internal ring and extraperitoneal fat. A direct sac is simply inverted, but may be imbricated. An indirect sac is dissected free and inverted or if difficult to invert, the proximal part is ligated while the distal part is left open. A polypropylene mesh is placed over the posterior wall. The inferior mesh border is fixed to the inguinal ligament using a continuous suture, extending lateral to the internal ring. The mesh is fixed to Cooper’s ligament if a femoral hernia is suspected. In the lateral part of the mesh, a slit is made so that the lower part is 1/3 the width. The so formed ‘tails’ should wrap around the cord. The lower border of the upper tail and the upper portion of the lower tail are fixed with suture to the inguinal ligament just lateral to the internal ring for a ‘shutter mechanism’ effect. The reconstituted internal ring, like the suture repairs, should be snug, but not tight. The superomedial border of the mesh is fixed to the rectus sheath and the superolateral border to the aponeurotic arch and conjoined tendon. The lateral part of the mesh tail will lie deep to the external oblique aponeurosis. Routine division of the cremaster is not proposed and is left to the discretion of the surgeon. No sutures are

http://www.ptolemy.ca/members/current/Groin%20Hernia%20Repair-Revisited/
3.2.1.2 RIVES and KUGEL PATCH REPAIRS \( (5, 9) \)

In contrast to the Lichtenstein repair, the Rives repair involves placing a flat piece of mesh in the preperitoneal position (deep to the transversalis fascia). This procedure involves opening the transversalis fascia like one would in a classic Bassini or Shouldice repair. The lower portion of the mesh is folded over like a hem and sutured to Cooper’s ligament. Superiorly it is placed posterior to the transversalis fascia, transversus abdominis and internal oblique. Full thickness interrupted sutures are used to secure the mesh in place in its preperitoneal position. The mesh is then covered by suturing a triple layer superiorly (upper transversalis fascia, transversus abdominis, and internal oblique) to the double layer inferiorly (lower transversalis fascia and inguinal ligament). This repair was intended for large inguinal hernias.

The Kugel patch repair was introduced as a technique with less dissection whereby a flat mesh could still be placed posterior to the transversalis fascia (underlay). It was boasted to have a fast recovery, minimal inguinodynia because of minimal dissection and relative ease to perform the procedure under local anaesthesia. The placement of the incision is very important in the Kugel repair. An incision is placed just superior to the internal ring and just lateral to the inferior epigastric vessels by making a small transverse incision halfway between the anterior iliac spine and pubic tubercle. The external oblique aponeurosis is opened and the internal oblique muscles are bluntly opened to identify the transversalis fascia. After entering the preperitoneal space a small pocket is created just lateral to the inferior epigastric vessels. These vessels serve as the orienting structures throughout the period of dissection. The cord is dissected and an indirect hernia sac is ligated or inverted. A 8 x 12 cm patch is introduced and held in place with a single stitch. This repair can be challenging to surgeons who are just familiar with an anterior approach.

3.2.1.3 PERFIX PLUG or PLUG and PATCH REPAIR \( (5, 9) \)

The theory behind the plug mesh repair, is that the cone shaped polypropylene mesh will plug the hole and prevent recurrence. In this mesh repair, hernia sacs are mobilized and inverted and are not routinely opened. For an indirect hernia, the sac must be mobilized sufficiently to the internal ring so that the cone shaped mesh can fit into the ring. The cone must be deep to the muscle crura of the internal ring to prevent it from extruding out of the ring. It should be secured with a couple of sutures. For a direct hernia, the edges of the attenuated transversalis fascia, where the defect is located, should be raised with a clamp and a preperitoneal pocket made. This again will permit the plug to lie deep to the transversalis fascia and prevent it from being slowly forced out. Numerous sutures should be placed to secure the plug in place, particularly if the transversalis fascia is weak. Mesh migration has been reported as a complication.

Over time the plug repair has been augmented with a patch. The patch is a flat piece of mesh that is placed anterior to the transversalis fascia and secured in place like the Lichtenstein repair.

3.2.1.4 PROLENE HERNIA SYSTEM REPAIR (PHS) \( (5, 9) \)

This mesh was introduced in 1998 and was devised to combine the benefit of an anterior and posterior mesh repair because the mesh has both an overlay and underlay component. For the repair, an indirect sac is dissected and inverted. A pocket is made in the preperitoneal space either through a dilated internal ring or through a fascial defect in the transversalis fascia in a direct hernia. The posterior layer (underlay) of the PHS is then placed in the preperitoneal space. Since the underlay and overlay layers are connected with a stalk, there is no need to secure the underlay with sutures. The anterior portion is sutured in place like a Lichtenstein repair including the lateral slit to accommodate the spermatic cord. Despite its advertised advantage to reduce pain and recurrence rates, long term data is very limited and does not suggest any advantage to the use of this mesh.

3.2.1.5 STOPPA REPAIR \( (5, 9) \)

Stoppa described this repair in the mid 1980’s and it involves using a large polypropylene mesh for repair of large, complex, or bilateral hernias. The preperitoneal space is entered with a midline subumbilical incision or a low transverse incision. The midline fascia is divided to expose the preperitoneal space. The preperitoneal space is created with blunt dissection. Indirect hernias are opened and explored to ensure that the contents are evacuated. A large mesh measuring 24 x 18 cm is placed in the preperitoneal space. The mesh is held in place by the intrabdominal pressure and is not secured with sutures.

3.2.2 LAPAROSCOPIC REPAIR \( (10) \)

Laparoscopic hernia repairs account for a minority of hernia repairs even in high income countries. The reasons that it has not gained wide spread endorsement includes its increased OR time, increased cost, longer learning curve, need for a general anaesthetic, and higher risk of vascular or visceral injury especially in the early learning phase.

In the transabdominal preperitoneal (TAPP) approach, the operator uses two 5mm ports placed in the right and left lower quadrants and a 10mm port in the subumbilical area. Once the peritoneum is entered, a transverse incision through the peritoneum is started from the median umbilical line to the anterior superior iliac spine. The peritoneum is dissected off the transversalis fascia. The cord followed by the sac is isolated. The sac is either everted or in cases of difficult dissection is dissected with ligation of the proximal part. A polypropylene mesh is placed to effectively cover the myopectineal orifice. The mesh is fixed with laparoscopic staples medially to the Cooper’s ligament and around the periphery of the mesh. The peritoneum is secured back to the abdominal wall.

In the total extraperitoneal (TEP) approach, the peritoneum is not penetrated and it is stripped from the transversalis fascia manually or by using a balloon dissector. There is no statistically significant difference in OR time, length of hospital stay, time to return to regular activity, or recurrence rates. There is a higher risk of intra-abdominal injury with TAPP, but perhaps a shorter learning curve than with TEP. They both are associated with higher cost.

4. CRITICAL APPRAISAL OF TECHNIQUES

The management of hernia has and continues to evolve. Recurrence rates is the primary outcome upon which many studies focus. Other important outcomes include post-operative pain, infection, time to return to regular activity, and cost. The main problem with most studies is the length of follow-up. Most follow-up is short even though 50% of groin hernia recurrences do not appear for over 5 years and another 20% may not be apparent for 15-25 years. Another difficulty in sifting through the vast array of studies is that modified techniques are reported instead of original techniques. Complicate that now with the very active marketing of various meshes by surgical supply companies. Recent European guidelines on groin hernia
management (1) are useful for readers wanting a summary of the level of evidence available around various clinical questions in hernia management in the European context. Before we can recommend what might be an appropriate groin hernia repair in the African context, let us first summarize some of the questions that recent literature has tried to answer.

**How do open non-mesh repairs compare to mesh repairs in the literature?**

In a summary article analyzing open repairs of inguinal hernias, they report the following average recurrence rates for primary hernia repairs (9).

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<th>Name of Repair</th>
<th>Type of Repair</th>
<th>Recurrence Rates</th>
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<tr>
<td>Modified Bassini</td>
<td>Conjoined tendon to inguinal ligament</td>
<td>5 - 15%</td>
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<tr>
<td>Modified McVay</td>
<td>Conjoined tendon to Cooper’s ligament</td>
<td>5 - 15%</td>
</tr>
<tr>
<td>Shouldice / Modified Shouldice</td>
<td>Three or four layer tissue repair</td>
<td>&lt;1 - 7%</td>
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<tr>
<td>Plication - Darn Repair</td>
<td>Tension-free suture repair</td>
<td>2 - 9%</td>
</tr>
<tr>
<td>Lichtenstein</td>
<td>Onlay mesh</td>
<td>&lt;1 - 5%</td>
</tr>
<tr>
<td>Kugel</td>
<td>Preperitoneal mesh</td>
<td>4%</td>
</tr>
<tr>
<td>PerFix plug</td>
<td>Plug and patch</td>
<td>4%</td>
</tr>
<tr>
<td>Prolene Hernia System</td>
<td>Preperitoneal and onlay mesh</td>
<td>&lt;1 – 3%</td>
</tr>
<tr>
<td>Stoppa</td>
<td>Large preperitoneal mesh</td>
<td>&lt;1%</td>
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In a recent meta-analysis comparing open mesh repairs to non-mesh repairs, 15 randomized or quasi-randomized trials were identified (11). The meta-analysis summarized the outcomes of 4,005 patients. There was a wide variability with respect to hernia recurrence rates, duration of follow-up, and method of follow-up. The authors could not make any meaningful conclusions regarding time to return to regular activities or postoperative pain or OR time. There was no evidence that mesh increased the risk of deep infection or chronic pain. Given the highly variable lengths of follow-up, the authors cautioned interpretation of the results, but did state that recurrence rates showed a pattern of being higher in the non-mesh group (4.4%) than in the mesh group (1.4%).

A Cochrane Database Systematic review in 2009 also evaluated open mesh repairs compared to non-mesh repairs (12). This was an expanded review of the EU Hernia Trials Collaboration and included 20 randomized or quasi-randomized trials. As one would expect, the conclusions were similar. Postoperative complications such as infections, hematomas, and seromas were similar. The authors could not make any definitive comment about chronic groin pain between the groups because more than half of the trials did not evaluate this. There was an overall quicker return to regular activity in the mesh groups, but this was not seen in all studies. There were 50 to 75% fewer recurrences associated with the mesh repairs than the open non-mesh repairs. The authors also commented that the two trials comparing Lichtenstein repair to the plug and patch repair found no differences. There was too little data to make any comments about recurrent, bilateral, or femoral hernias.

Another Cochrane Database Systematic review in 2010 specifically compared the Shouldice repair to other open hernia repairs (13). A total of 16 trials were identified summarizing the data on 2,566 hernia repairs. The authors comment that the quality of studies included, when assessed on the Jadad score, were actually ranked as low. Again the length of follow-up was highly variable; follow-up was generally short duration but ranged from one year to 13.7 years. Shouldice repairs had a higher recurrence rate than mesh repairs (odds ratio 3.8), but had lower recurrence rates than other non-mesh repairs (odds ratio 0.62). There were no differences with respect to postoperative complications or chronic groin pain.

Although many studies compare the Shouldice repair to mesh repairs, other studies compare the Moloney or modified darn repair to the Lichtenstein repair. In a prospective randomized trial involving 651 patients, the mean follow-up was 33 months (14). Analgesic use in patients with the Lichtenstein repair was lower, but there was no difference in early postoperative complications or return to regular activity. The recurrence rates were similar at 1.1 and 1.0% respectively. Given the similar results, the authors did not feel the additional cost for a mesh repair was justified. In another study from Turkey, they prospectively randomized patients to a Lichtenstein repair or a modified darn repair with approximately 50 patients in each arm (16). Their follow-up was 1 year. They had 4% recurrence rates in both groups making them a comparable procedure on relatively short term follow-up.

In a study involving 472 repairs comparing the Lichtenstein technique with the Prolene Hernia System (PHS) and Plug and Patch repairs found that the outcomes are similar (17). In yet another comparison the authors found that there was no significant difference in the rates or severity of postoperative pain between the three methods (18).

**How do open repairs compare to laparoscopic repairs in the literature?**

There has been extensive recent literature on laparoscopic repairs of inguinal hernias. A randomized trial comparing 5 year recurrence rates between TAPP repairs and Shouldice repairs found no difference (19). The study involved 1183 patients and 920 were examined for follow-up 5 years later (454 in the TAPP group and 466 in the Shouldice group). The 5 year recurrence rates were the same at 6.6% and 6.7% respectively.

In a meta-analysis of 29 randomized clinical trials comparing open and laparoscopic inguinal hernia repairs, there were 5, 588 patients included (20). The open repairs included non-mesh (Bassini, McVay, Shouldice, Moloney darn) and mesh (Lichtenstein, Stoppa) repairs. Early recurrence rates were increased in the laparoscopic groups, but this did not reach statistical significance. The laparoscopic procedure was associated with longer OR time, but a slight decrease in length of time to return to regular activities.

Another summary analysis was published by the Cochrane Database Systematic Reviews that included 41 randomized or quasi-randomized trials that summarized the results in more than 7,000 patients (21). The laparoscopic techniques had longer operative times and had a higher association with more serious injuries (i.e. visceral or vascular). When compared to open groin hernia repairs, there was an overall reduced recurrence rate of 30 – 50%. This reduction was similar to open mesh repairs suggesting that the use of mesh reduced recurrence rates and not the laparoscopic procedure itself. Another Cochrane Database Systematic Review compared TAPP with TEP repairs. There were no differences with respect to OR time, postoperative complications, time to return to regular activity and recurrence rates (22).

A major weakness in most studies, including randomized controlled trials, is the short duration of follow-up. Even though meta-analyses and Cochrane reviews of randomized controlled trials indicate non-mesh repairs to be inferior to mesh repairs, the only true method to evaluate recurrence rates is long-term follow-up. Unfortunately long-term follow-up is difficult.
A few studies have compared groups with long-term follow-up, but results between studies are not consistent. One randomized clinical trial comparing non-mesh to mesh repairs in 300 patients has a median follow-up of 10 years (23). Fifty percent of recurrences developed after 3 years. They found a 1% recurrence rate in mesh repairs and a 17% recurrence rate in non-mesh repairs. They felt that recurrence rates, particularly in the suture repair groups, are underestimated as recurrence continues to develop over time. Another database with more than 10 years of follow-up compared 1,473 inguinal hernia repairs that had a suture repair, open mesh repair, or TEP repair (24). Unlike the previous study, they found that recurrence rates were similar between the groups, although the pattern of recurrence was different. Earlier recurrence was seen in mesh repairs and late recurrences were more common with suture repair.

Are the numbers of repairs required for recurrent hernias decreasing due to the use of mesh?

This is an interesting question; perhaps it is too early to definitively answer this question since the use of mesh is still relatively new. National audit data indicates that the number of repairs for recurrent hernias has not decreased suggesting that the impact of mesh repairs has not been as great as one might have hoped (24, 25). The suggested theory is that patient’s tissues become increasingly weak and stretched over time resulting in the muscle defect reforming in patients who have undergone suture repairs. In patients who have undergone mesh repairs, it is likely that the mesh contracts or slowly migrates resulting in recurrence of the defect.

What publications have recently been written on the situation in Africa regarding inguinal hernia repairs?

Surgical issues have often fallen off the radar with respect to public health policy in Africa. A recent article based on work done in Ghana suggests that inguinal hernias are ten times more prevalent there than in high income countries (26). The hernias are also considerably larger. Another paper from Ghana was a retrospective review of hernia repairs and found that 65% were done emergently for incarceration (27). Out of 120 consecutive incarcerated hernias, more than 75% of the patients were below the age of 50 and 82% were groin hernias. About 25% of these patients required a bowel resection and the mortality rate for strangulated groin hernias was 6% with mortality rates being highest in patients who had symptoms for more than 72 hours. Although this was a small series, it aptly highlights the different reality in Africa compared to high countries where all the large studies of groin hernia originate.

The modified Bassini repair is described as being the most common technique used by African surgeons due to its relative ease to learn. Recurrence rates are not well reported (26).

One study from Cameroon compared the Bassini repair to the Lichtenstein repair (28). The study does not describe any randomization. There were more patients with Type 3, 4, and 5 groin hernias (Gilbert’s classification) in the Bassini group (57%) than in the Lichtenstein group (32%). Femoral and strangulated hernias were not included. There were 381 patients in the Bassini group and 357 in the Lichtenstein group. The Bassini repair involved division of the transversalis fascia and removal of the cremaster muscle in all direct inguinal hernias. The type of anaesthetic was also not randomized, but most were done under spinal or local anaesthesia. Follow-up was short (at 1 and 6 months). Both groups had fairly high early recurrence rates as they were 5.5% and 5.0% in the Bassini and Lichtenstein groups respectively. What the study does demonstrate, however, is that the use of mesh did not improve early recurrence rates in their environment.

A more ‘economically feasible’ mesh is being used in lower income countries. One of the earliest and largest studies identifying the effective and safe use of locally produced nylon mosquito net mesh for hernia repairs was reported from India involving 359 patients (29). Over a 5 year follow-up period they identified one recurrence, no mesh rejections, and minor incision infections in 4.7%. Nylon mosquito net mesh has also been studied experimentally in Uganda and it was found to have equal wound healing, but less inflammatory response and less strength (30). In a study from Ghana, 95 patients underwent 106 inguinal hernia repairs and 76% were done under local anaesthesia (4). A 10 x 15 cm polyester (polyethylene terephthalate) mosquito net mesh was used. This material was selected because it has commercially been used in medicine as Mersilene or Dacron and some recent composite meshes used in laparoscopic inguinal and ventral hernia repairs are made from polyester. Each mesh was cut from a non-insecticide-impregnated mosquito net and autoclaved. The cost of the mesh was estimated to be $1.46 USD compared to the commercial mesh of a similar size at $100 USD. At 6 month follow-up, there were no recurrences or mesh rejections.

5. MISCELLANEOUS ISSUES

Limiting wound infection

Since elective groin hernia repair is categorized as a clean procedure, it should not require prophylactic antibiotics. The more routine use of mesh, however, has led to researchers revisiting the routine prophylactic use of antibiotics for elective groin hernia repairs. In a meta-analysis of over 2,500 patients from 6 randomized trials, the surgical infection rate was 1.38% with antibiotics and 2.89% without antibiotics (31). The authors suggested that there might be slight evidence that prophylactic antibiotics should be used. In a subsequent Cochrane Database Systematic review, 13 randomized clinical trials were identified with 7 studies using mesh and 6 studies using suture repairs (32). This study included 6,825 patients. In those who had suture repairs, the rates of infection were 3.5 and 4.9 in the prophylaxis and control groups, respectively (odds ratio: 0.71/95% CI 0.51 - 1.00). In those who had a mesh repair, the rates of infection were 1.4% in the prophylactic antibiotic group and 2.9% in those who were in the control group (odds ratio: 0.49/95% CI 0.29 – 0.86). Due to the wide variance in study results, the authors could not make any strong recommendation in favour or against. They suggested that local infection rates need to be considered in making determinations whether prophylactic antibiotics should be administered or not.

Use of Mesh in strangulation

There is limited information on the use of mesh for repair of strangulated hernias. In situations of incarceration with no strangulation of bowel (and thus no need to resect bowel), general consensus is that mesh could be used. If there is only strangulation of omentum and no clear contamination, experts would also suggest that the use of mesh could be considered (33). If there is abdominal wall cellulitis, gross contamination, ascites, or if a bowel resection is required, experts would not recommend the use of mesh for repair. Much of this information is based upon expert opinion and not on scientific study.

Chronic Groin Pain

Chronic groin pain or inguinodynia is defined as persistent groin pain following inguinal hernia surgery for a period of more than 3 months after complete healing has taken place. On longterm follow-up, the incidence of this complication is reported to be 6 – 13%. Patients who complain of groin pain prior to surgery have a higher incidence of inguinodynia. A meta-analysis comparing division (ilioinguinal neurectomy) or preservation of the ilioinguinal nerve showed similar results in both groups (34). It is generally recommended that the ilioinguinal nerve be identified in open inguinal hernia repairs and care made to avoid entrapping the nerve during the repair or closure of the external oblique aponeurosis. There is currently a Cochrane Database Systematic Review underway to review intraoperative management of the ilioinguinal nerve.

6. SUMMARY

http://www.ptolemy.ca/members/current/Groin%20Hernia%20Repair-Revisited/ 2010/12/01
1. Groin hernias in Africa are more common, larger, and present with strangulation at a much higher rate than described in high income countries.

2. Good knowledge of groin anatomy and proficiency in any particular technique are crucial to the successful outcome of groin hernia surgery.

3. The major limitation in surgical studies investigating different types of groin hernia repairs and recurrence rates is long-term follow-up.

4. The Shouldice repair is acknowledged as the best tissue based repair. Unlike other tissue repairs, however, it has undergone fewer surgical modifications. It is also more technically challenging than other open repairs.

5. Given limited follow-up, mesh repair seem superior to non-mesh repairs with lower rates of recurrence. Comparison of other postoperative events are similar.

6. There is no significant difference in recurrence rates between different mesh types in open groin hernia repairs.

7. Laparoscopic groin hernia repairs are done by a minority of surgeons even in high income countries and have not been found to have superior results to open mesh repairs.

8. The safe use of alternative types of mesh, that can be made locally at much lower cost than commercial mesh, are being explored. Commercial mesh is too costly for most Africans. The use of such mesh alternatives requires a strict sterilization protocol.

9. The use of prophylactic antibiotics in groin hernia repairs should be based on the local rate of postoperative wound infection for clean surgery.

10. The general consensus at present is that mesh should not be used in situations of bowel strangulation.

11. The decision as to what groin hernia repair an individual surgeon should perform should include level of surgical expertise, familiarity with the repair technique, hernia presentation, and materials available at affordable cost.

12. Study of local experience by African surgeons with good follow-up is encouraged.

For images: Greenfield’s Surgery and Mastery of Surgery. (Both links can be found on the Ptolemy library list of surgical ebooks)

Note: If you click on either of these links; Greenfield’s Surgery and Mastery of Surgery, you will be directed to the U of T library. Please click on “No Utorid”. Delete the numbers found on the “Library Card” field and use your Ptolemy username and enter your Ptolemy password.

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7. BIBLIOGRAPHY


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