OPEN MINIMAL ACCESS APPROACH FOR MESH REPAIR OF INGUINAL HERNIA

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INTRODUCTION

Definition: A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls.

INGUINAL HERNIAS

• Inguinal hernias are classified as
  ➢ Direct
  ➢ Indirect

• **indirect inguinal hernia** passes from the internal inguinal ring obliquely toward the external inguinal ring and ultimately into the scrotum.

• **Direct inguinal hernia** sac protrudes outward and forward and is medial to the internal inguinal ring and inferior epigastric vessels.

• This distinction is of little importance because the operative repair of both types of hernias is similar.
Hernia repair one of the most common operations performed by general surgeons
More than 600,000 hernias are repaired annually in the US.

**Incidence**

- Inguinal hernia - 75% of all hernias
- Femoral hernias - 3% of all groin hernias.

Incidence of inguinal hernias in males has a bimodal distribution with **peaks before 1 year of age** and then again **after age 40**.

- **Indirect > Direct**
- Indirect inguinal hernia is the most common hernia, regardless of gender.
  - **Male > Female**
- **Right > Left**
History Of Hernia Repair
Early attempts at the treatment of inguinal hernia

- Different types of inguinal belts were used to maintain the hernia sac inside the body cavity.
- The hernia was first manually reduced and then the hernia belt was applied, often custom made for a particular patient.
17th century- Hernia operations in this era were rare and limited to very desperate, live-or-death situations.

19th century-
The advances in anatomical knowledge of hernia lead to the introduction of two important rules for hernia surgery:

• *high ligation of hernia sac and*
• *narrowing of the internal inguinal ring*
In order to achieve a radical cure of hernia it is absolutely essential to restore those conditions in the area of the hernial orifice, which exist under normal conditions” - Edoardo Bassini.

All subsequent methods of inguinal hernia surgery until introduction of Prosthetic materials were in fact variants of Bassini concept.

It was the first technique that led to a marked reduction in both operation mortality and recurrence.
## Major Developments In Hernia Repair

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edoardo Bassini</td>
<td>1887</td>
<td>reconstructing the anatomy of the inguinal canal</td>
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<tr>
<td>Chester McVay</td>
<td>1942</td>
<td>Cooper’s ligament instead of inguinal (Poupart’s) ligament for the reconstruction</td>
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<tr>
<td>Edward Earl Shouldice</td>
<td>1953</td>
<td>incision and reconstruction of the transverse fascia</td>
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</table>
## Techniques In Tension-free Repairs

<table>
<thead>
<tr>
<th>Author</th>
<th>YEAR</th>
<th>TECHNIQUE</th>
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<tbody>
<tr>
<td>Francis Usher</td>
<td>1959</td>
<td>reinforcing Bassini technique with Mesh</td>
</tr>
<tr>
<td>Irvin Lichtenstein</td>
<td>1984</td>
<td>placing the mesh to reinforce the posterior wall of the inguinal canal</td>
</tr>
<tr>
<td>Arthur Gilbert</td>
<td>1987</td>
<td>mesh and plug repair</td>
</tr>
<tr>
<td>Ira Rutkow and Alan Robins</td>
<td>1998</td>
<td>mesh and plug repair</td>
</tr>
<tr>
<td>Arthur Gilbert</td>
<td>1999</td>
<td>Prolene Hernia System</td>
</tr>
<tr>
<td>AUTHOR</td>
<td>YEAR</td>
<td>TECHNIQUE</td>
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<tr>
<td>Rene Stoppa</td>
<td>1969</td>
<td>GPRVS (giant prosthetic reinforcement of the visceral sac)</td>
</tr>
<tr>
<td></td>
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<td>Mesh in preperitoneal space</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low midline incision</td>
</tr>
<tr>
<td>Lloyd Nyhus</td>
<td>1976</td>
<td>the incision was made above the inguinal ligament</td>
</tr>
<tr>
<td>Robert Kugel</td>
<td>1999</td>
<td>preperitoneal placement of a sutureless mesh - Kugel Hernia Patch</td>
</tr>
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Presumed Causes Inguinal Hernia

- Chronic Cough
- Chronic obstructive pulmonary disease
- Obesity
- Straining
- Constipation
- Prostatism
- Birthweight < 1500 g
- Family history of a hernia
- Valsalva's maneuvers
- Ascites
- Congenital connective tissue disorders
- Defective collagen synthesis
- Previous right lower quadrant incision
- Cigarette smoking
- Heavy Weight lifting

Microscopic examination of skin of inguinal hernia patients demonstrated significantly decreased ratios of type I to type III collagen.

Additional analyses of similar skin revealed disaggregated collagen tracts with decreased collagen fiber density.
The presence of a PPV likely predisposes the patient to the development of an inguinal hernia. This likelihood depends on the coexistence of other risk factors.
MANAGEMENT OF CASE OF HERNIA

- **Clinical presentation**
  - Pain, discomfort
  - Groin mass

- **Groin mass**
  - Asymptomatic: Discuss conservative management with surgeon
  - Symptomatic: Change to symptomatic

- **Radiology (CT/US/MRI)**
  - No palpable mass: No evidence of hernia
  - Pain, discomfort: Palpable groin mass
  - Groin mass: Evidence of hernia

- **Conservative management**
  - No evidence of hernia: No palpable mass
  - Groin mass: Change to symptomatic

- **Surgical repair**
  - Incarcerated or strangulated:
    - Open
  - Unilateral:
    - Open vs laparoscopic
  - Bilateral:
    - Laparoscopic
  - Recurrence:
    - Approach hernia though virgin plane
The range of operative choices available for groin hernia repair is broad

Open Anterior repair
- Tissue repair
- Prosthetic repair
- Prolene hernia system
- Stoppa

Laparoscopic repair
- TAPP
- TEP
COMPLICATIONS

Complication that is becoming the benchmark for comparing hernia repairs are

- *Chronic Pain*
- *Recurrence Rate*
Common causes of hernia recurrence post repair include

1. **Patient factors**
   - malnutrition
   - immunosuppression
   - diabetes
   - steroid use
   - Smoking

2. **Technical factors**
   - mesh size,
   - prosthesis fixation
   - technical proficiency of the surgeon

3. **Tissue factors**
   - wound infection
   - tissue ischemia
   - increased tension within the surgical repair
Common Complications

- Pain
- Injury to the spermatic cord and testes
- Wound infection
- Seroma
- Hematoma
- Bladder injury
- Osteitis pubis
- Urinary retention
OPEN TISSUE-BASED REPAIRS

Anterior repair
No prosthetic material used
Place tension on the reconstructed tissue

• Bassini
• Shouldice
• McVay repair
• Iliopubic tract repair
Advantages (OPEN TISSUE-BASED REPAIRS)
useful in strangulated hernias, as here mesh prostheses are contraindicated and a tissue repair is necessary

Disadvantages:

• Place tension on the reconstructed tissue
• High recurrence rates
Bassini Repair

Interrupted sutures approximate Inguinal ligament to the lateral border of the internal oblique and transversus abdominis or conjoined tendon.
Shouldice Repair

• Four layers of suture are placed to incorporate the transversalis, iliopubic tract, femoral sheath, and inguinal ligament.

• It is tension free repair.

• Recurrence rate – 1%
Shouldice Repair

- The first layer begins at the pubic tubercle where the iliopubic tract is sutured to the lateral edge of the rectus sheath, then progressing laterally.
- The inferior flap of the transversalis fascia, which includes the iliopubic tract, is sutured continuously to the posterior aspect of the superior flap of the transversalis fascia until the internal ring is encountered. The suture is not tied here, but rather is continued back upon itself in the medial direction.
• **second layer**: At the internal ring, is the reapproximation of the **superior edge of the transversalis fascia** to the inferior fascial margin and the shelving edge of the **inguinal ligament**. The suture is then tied to the tail of the original stitch.

• **third layer**: is started at the tightened inguinal ring, joining the **internal oblique and transversus abdominis aponeuroses** to **external oblique aponeurotic fibers** just superficial to the inguinal ligament.

• **fourth layer**: At the pubic tubercle where it reverses upon itself to create a fourth suture line, which is **similar and superficial to the third layer**.
McVay repair

Interrupted nonabsorbable sutures approximate the **transversus abdominis to Cooper’s ligament**. A transition stitch is placed in the femoral sheath, occluding the femoral canal.

Useful in,

- In case of suprainguinal ligament approach to femoral hernia.
- Both inguinal and femoral canal defects dealt with.
Iliopubic Tract Repair

- Approximate the *transversus abdominis* aponeurotic arch to the *iliopubic tract* with the use of interrupted sutures.

- The repair begins at the pubic tubercle and extends laterally past the internal inguinal ring.
OPEN TENSION FREE REPAIR

The addition of a mesh prosthesis for reconstruction of the posterior wall inguinal canal, without placing tension on the floor

TYPES-
• The Lichtenstein approach
• The plug-and-patch technique
• The sandwich technique or Prolene hernia system
The Lichtenstein repair
Most Popular Method.

This repair relies on
- the mesh to first bridge the inguinal defect
- to incite a foreign body reaction with the native tissue.

The common strategy with Open Mesh repair method is the concept of
- minimal tissue dissection,
- anchoring the mesh with sutures, and
- Encouraging early ambulation and return to work.
A point two fingerbreadths inferior and medial to the anterior superior iliac spine is chosen as the most lateral point of the incision. It is then progressed medially for approximately 6 to 8 cm.
The Lichtenstein repair

Advantages:

• Low recurrence rate
• Easy reproducibility of technique
• Minimal tissue dissection,
• Less disability
• Early ambulation and return to employment
Ideal Mesh

- Easy to handle
- Provide adequate strength
- Be inert, biocompatible
- Resist contraction
- Resist infection
- Place no restriction on patient function
- Simple and inexpensive to manufacture
- Recent advancements have included change from a heavyweight mesh to a lightweight mesh, with larger pores that promote a host scarring response and less incidence of chronic pain or discomfort
Types of prosthetic Mesh available:

- **Polypropylene** – most commonly used available in different filament size, pore size, and weight
- **Polyester mesh**
- **Polytetrafluoroethylene (Gore-Tex)**
- **Composite mesh** (Polypropylene-Polyglycolic acid)
- **Biologic prosthetics**
  - When the risk of infection is significant biologic prosthetics may be appropriate human, porcine, or bovine sources
  - Disadvantage: increased recurrence rates

Minimizing Adhesion Formation
MESH PLACEMENT

• Mesh is placed in front of the transversalis fascia
• At least 2 cm above the border of the Hesselbach triangle.
• Medial part of the mesh should extend at least 2 cm medial to the pubic tubercle to reduce the risk of medial recurrence.
• Attaching the mesh to the shelving portion of the inguinal ligament to a point just lateral to the deep Ring
• A slit is made at the lateral end of the mesh, creating a wider tail above the cord and a narrower one below the cord. This manoeuvre positions the cord between the two tails of the mesh.
• **Monofilament non-absorbable** suture is used to secure the mesh
The plug-and-patch technique

A. Plug may be created from a flat piece of mesh, or a preformed, commercially available plug is placed in the internal ring.

B. Final view of the repair following placement of the plug and patch. A common modification is to use the flat mesh to overlap the plug, after it is placed.
PROLENE HERNIA SYSTEM

The mesh consists of two large flaps (an onlay and an underlay patch) with an intervening connector

- The underlay is positioned in the preperitoneal space
- The overlay rests along the floor of the inguinal canal.

Fig. 2. (A) Prolene hernia system anterior view. (B) Prolene hernia system posterior view. (Courtesy of Ethicon, Inc., Somerville, NJ; with permission).
STOPPA REPAIR

GPRVS (giant prosthetic reinforcement of the visceral sac)

Implanting a large polyester mesh in preperitoneal connective tissue between the peritoneum and *fascia transversalis.*

Mesh need not to be fixed with sutures due to its size and intraabdominal pressure maintaining it in situ.
Laparoscopic Technique

Based on reconstruction of the weakened posterior abdominal wall

Two methods
• Totally Extra-Peritoneal Approach (TEP)
• Transabdominal Pre-Peritoneal Approach (TAPP)

Indication:
• Bilateral Hernia
• Recurrence of Hernia
• When Patient wants early recovery
The main difference between these two techniques is the sequence of gaining access to the preperitoneal space.
Trocar placement:

Transabdominal Preperitoneal (TAPP)

Totally Extraperitoneal (TEP)

Additional trocar
Transabdominal Preperitoneal (TAPP)

The TAPP approach, first described by Arregui and colleagues in 1992

It requires laparoscopic access into the peritoneal cavity and placement of mesh in the preperitoneal space after reducing the hernia sac.

A prosthetic mesh of approximately 10 cm×15 cm is inserted and manipulated into position so that it covers the entire myopectineal orifice.
Totally Extra-Peritoneal Approach (TEP)

The first TEP inguinal hernia repair was described by McKernan and Laws in 1993.

This approach involves preperitoneal dissection and mesh placement without entering into the abdominal cavity.
Advantages
• Less pain
• low disability and early return to work

Disadvantages
• steepest learning curve 40–50 operations before a surgeon becomes experienced
• increased risk of femoral nerve injury and
• Increased risk of spermatic cord damage
• risk of developing intraperitoneal adhesions with the TAPP
• longer operative times
• technical challenges
• risk of recurrence
• increased cost..
MINIMAL ACCESS OPEN INGUINAL HERNIA REPAIR

• Mesh repair with Single Transverse mini incision over the superficial ring 1.5cm

• The position of the mesh beneath the aponeurosis of the external oblique it keeps the mesh tightly in place by acting as an external support when intra abdominal pressure rises.

• In this procedure, the external oblique aponeurosis is not incised, it is only retracted and thus the integrity is not disturbed.
ANAESTHESIA
- Spinal
- Epidural
- Local or regional

Duration of Surgery
Average: 50 min
• A transverse incision of size 1-1.5 cm given at the superficial inguinal ring.

• Spermatic cord is lifted up through incision over external ring
• At superficial ring a finger is introduced underneath the external oblique aponeurosis, and after creating the space,

• External oblique aponeurosis is retracted to expose the cord structures. The cord is identified separated and lifted up.
In cases of indirect hernias, the hernial sac is identified, dissected up to the internal ring and opened to allow examination of its contents.
• The sac is excised following high ligation.

• However, in large indirect inguinal hernias, where the sac descends down to the scrotum, the distal part of the sac is left open to prevent the formation of a hydrocele, thus allowing spontaneous obliteration.

• In direct hernia, the sac is not opened
A polypropylene mesh (Proline 3 × 5 inch) is trimmed to fit the floor of the inguinal canal, and its apex is first sutured to the public tubercle using 3–0 Proline sutures.

The lower border of the mesh is sutured to the free edge of the inguinal ligament. In majority of repairs 3-4 interrupted sutures could be applied after retraction and sutures extended up just medial to the ASIS.

Interrupted Proline sutures are used to suture the two cut edges of the mesh together around the spermatic cord above the internal inguinal ring.

The infero-medial corner of the mesh is then attached well overlapping the pubic tubercle.

The mesh is spread evenly without folding, and was then anchored to the conjoined tendon by interrupted sutures (Proline 3–0) after retracting the external aponeurosis.
PERI-OPERATIVE CARE OF THE PATIENT

• Before the incision, a bolus dose of a second-generation cephalosporin is given intravenously
• Postoperative prophylactic antibiotics for 48 – 72 hours.
• The patient is mobilized about six hours after surgery
• Postoperative analgesia - paracetamol or NSAIDs or a combination of these two analgesics.
Advantages (of MINIMAL ACCESS OPEN INGUINAL HERNIA REPAIR)

- effective
- safe
- less chances of Inguinodynia (less tissue dissection and a few sutures used to fix the mesh)
- rapid return to work
- low recurrence rate
- high patient satisfaction

Other Hernia repair Approaches: 6-9% incidence chronic pain.
Minimal access repair approach: <1% incidence chronic pain.

Incidence of Recurrence and Chronic pain is not significant post minimal access approach for Hernia Repair.
# Comparison of open approaches

<table>
<thead>
<tr>
<th>Repair</th>
<th>Type</th>
<th>Recurrence rate for primary repairs</th>
<th>Postoperative pain</th>
<th>Reported advantages/disadvantages</th>
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<tbody>
<tr>
<td>Tissue repairs</td>
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</tr>
<tr>
<td>Bassini</td>
<td>Conjoined tendon to inguinal ligament</td>
<td>5%–15%</td>
<td>Many reports of pain higher than with mesh repairs</td>
<td>Need to understand groin anatomy for tissue repairs</td>
</tr>
<tr>
<td>McVay</td>
<td>Conjoined tendon to Cooper’s ligament</td>
<td>5%–15%</td>
<td></td>
<td>Repairs sufficient for inguinal and femoral hernias</td>
</tr>
<tr>
<td>Shouldice [12–15]</td>
<td>Triple layer tissue repair</td>
<td>&lt;1%–7%</td>
<td>Chronic pain reported by as many as 20% of patients at 3 years</td>
<td>All mesh repairs are tension free</td>
</tr>
<tr>
<td>Mesh repairs [16]</td>
<td></td>
<td></td>
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<tr>
<td>Lichtenstein [7,16,17]</td>
<td>Onlay patch</td>
<td>&lt;1%–5%</td>
<td></td>
<td>Easy technique to learn, long-term experience in most institutions Reported low operative times (around 35 min in some reports) Fast/mesh plug migration Fast (around 35 min in experienced hands) [21,24] Supplies laparoscopic view, mesh placed behind abdominal wall</td>
</tr>
<tr>
<td>Kugel [17,18]</td>
<td>Preperitoneal patch with spring</td>
<td>4%</td>
<td></td>
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<tr>
<td>PerFix plug [19,20]</td>
<td>Plug and patch</td>
<td>4%</td>
<td></td>
<td></td>
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<tr>
<td>Prolene Hernia System [21–26]</td>
<td>Preperitoneal and onlay</td>
<td>&lt;1%–3%</td>
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<tr>
<td>Stoppa [27]</td>
<td>Large preperitoneal mesh</td>
<td>&lt;1%</td>
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</table>
Total no of Patients- 104

Inguinal hernia mesh repair with minimal incision, over the superficial inguinal ring, without incising the external oblique aponeurosis give adequate exposure to place the mesh and repair the hernia. Follow-up did not show any recurrence or significant chronic pain.

Complications
  chronic pain in 1 patient (<1%) (less tissue dissection and a few sutures used to fix the mesh.)
  infection occurred in 1 patient
  no case of rejection or recurrence was noted during follow up.

Follow up period : 2years
The surgical treatment of inguinal hernia has made important steps forward during the last 125 years.

However, the fact that we still employ a wide variety of techniques to operate on inguinal hernia clearly shows that the road to a perfect operation is still ahead of us.
Thank You