INGUINAL HERNIAS IN 2017 - CURRENT MANAGEMENT

Ian S. Soriano, MD, FACS, FASMBS
Clinical Assistant Professor of Surgery
“No disease of the human body, belonging to the province of the surgeon, requires in its treatment, a better combination of accurate, anatomical knowledge with surgical skill than Hernia in all its varieties.”
HERNIA IS A HERNIA IS A HERNIA
INGUINAL HERNIAS

- Lifetime risk - Men 27%, Women 3%
- Failure of transversalis fascia to prevent intraabdominal contents from protruding into the myopectineal orifice of Fruchaud
- Direct (Medial), Indirect (Lateral), Femoral (Inferior)
MYOPECTINEAL ORIFICE

- Site of all inguinal hernias

- Anteroinferior abdominal wall - supported only by the transversalis fascia and tendinous insertion of transversalis abdominis muscle

- Borders
  - Superior - arch of internal oblique and transversus abdominis
  - Medial - rectus muscle and rectus sheath
  - Inferior - Cooper's Ligament
  - Lateral - Iliopsoas Muscle
  - Inguinal Ligament - divides MPO into superior and inferior halves
LAPAROSCOPIC VIEW
INGUINAL HERNIAS

- Right > Left, Men 10x > Women
- Indirect 2x > Direct
- Femoral < 5% but 35-40% present with strangulation
- Femoral F>M but in F, Inguinal 5x > Femoral
- F inguinal - almost always indirect
**What are the risk factors for the development of primary inguinal hernias in adults?**

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Risk factors not properly investigated</th>
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<tbody>
<tr>
<td><strong>High</strong></td>
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<tr>
<td>Inheritance</td>
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<td>Age</td>
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<td>Gender</td>
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<td>Collagen metabolism</td>
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<td>Prostatectomy history</td>
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<td>Obesity</td>
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<td>Very low</td>
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<table>
<thead>
<tr>
<th>Primary inguinal hernia</th>
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<tr>
<th>Raised matrix metalloproteinase</th>
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<tr>
<th>Rare connective tissue disorders (e.g. Ehler’s Danlos Syndrome)</th>
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<tbody>
<tr>
<td>High</td>
<td>Race</td>
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<tr>
<td>Moderate</td>
<td>Chronic Constipation</td>
</tr>
<tr>
<td>Low</td>
<td>Tobacco use</td>
</tr>
<tr>
<td>Very low</td>
<td>Socio-occupational factors (Heavy lifting)</td>
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Cooper's ligament

 Inferior epigastric vessels

Posterior peritoneum
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<td>Very low</td>
<td>Pregnancy</td>
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<td></td>
<td>Pulmonary disease (COPD, chronic cough)</td>
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"RISK FACTORS - PRIMARY"
What are the risk factors for the development of primary inguinal hernias in adults?

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<td>Low</td>
<td>Very low</td>
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<tr>
<td>Liver disease</td>
<td>Renal disease</td>
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<tr>
<td>Renal disease</td>
<td>Alcohol consumption</td>
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What are the acquired, demographic and perioperative risk factors for recurrence after treatment of IH in adults?

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<td></td>
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<tr>
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<tr>
<td>Low/very low (or not well studied)</td>
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- Female gender
- Direct v/s indirect
- Annual IH repair < 5 cases
- Limited surgical experience
- Poor surgical technique
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<tr>
<td>Low/very low (or not well studied)</td>
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<tr>
<td>Presence of sliding hernia</td>
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<td>Low Collagen I/III ratio</td>
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<tr>
<td>Raised MMP</td>
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<td>Obesity</td>
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<tr>
<td>Open hernia repair under L/A by general surgeons</td>
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<tr>
<td>High</td>
<td>Early postoperative hematoma formation</td>
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<tr>
<td>Moderate</td>
<td>Emergent surgery</td>
<td></td>
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<tr>
<td>Low/very low (or not well studied)</td>
<td>Low (1-7 drinks week) ethanol (protective)</td>
<td></td>
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</tbody>
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<tr>
<td>High</td>
<td>Increase age</td>
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<tr>
<td>Moderate</td>
<td>COPD</td>
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<td>Low/very low (or not well studied)</td>
<td>Prostatectomy</td>
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<td></td>
<td>SSI</td>
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<td></td>
<td>Cirrhosis</td>
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<td></td>
<td>Chronic Constipation</td>
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<td></td>
<td>Positive family history</td>
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<td></td>
<td>Smoking</td>
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What are the acquired, demographic and perioperative risk factors for recurrence after treatment of IH in adults?

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<tbody>
<tr>
<td>CKD</td>
<td>High</td>
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<td></td>
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<tr>
<td>Social class</td>
<td>Moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>Low/very low (or not well studied)</td>
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<tr>
<td>Work load</td>
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<tr>
<td>Pregnancy</td>
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<tr>
<td>Postoperative seroma</td>
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<tr>
<td>Race</td>
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<td>Labor</td>
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</table>
Incorrect surgical technique is likely the most important reason for recurrence after primary inguinal hernia repair.

Within this broad category of poor surgical technique include:
- lack of mesh overlap,
- improper mesh choice,
- lack of proper mesh fixation.
Clinical exam alone is recommended for confirming the diagnosis of an evident groin hernia.

Indications for imaging in groin hernias include:
- vague groin swelling and diagnostic uncertainty
- poor localization of swelling (small hernia, overlying fat)
- intermittent swelling not present on exam
- other groin complaints without swelling
For patients with obscure pain, doubtful swelling or possible recurrence

Clinical exam combined with ultrasound is recommended for patients with vague groin swelling or possible occult groin hernias

Dynamic CT or MRI (with Valsalva maneuver) can be considered for further evaluation if ultrasound is negative or non-diagnostic
For patients with chronic pain AFTER groin hernia surgery

- US-guided nerve blocks (TAP > blind iliohypogastric) is suggested as most suitable for chronic pain after inguinal hernia surgery

- US, CT or MRI are helpful in identifying non-neuropathic causes (mesh-related, tack-related, etc)
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Indirect hernia with a normal internal abdominal ring. This type is typically seen in infants, children, and small adults.</td>
</tr>
<tr>
<td>2</td>
<td>Indirect hernia in which the internal ring is enlarged without impingement on the floor of the inguinal canal. The hernia does not extend to the scrotum.</td>
</tr>
<tr>
<td>3A</td>
<td>Direct hernia. Size is not taken into account.</td>
</tr>
<tr>
<td>3B</td>
<td>Indirect hernia that has enlarged enough to encroach on the posterior inguinal wall. Indirect sliding or scrotal hernias are usually placed in this category because they are commonly associated with extension to direct space. This type also includes pantaloon hernias.</td>
</tr>
<tr>
<td>3C</td>
<td>Femoral hernia</td>
</tr>
<tr>
<td>4</td>
<td>Recurrent hernia. Modifiers A, B, C, and D are sometimes added to type 4, corresponding to indirect, direct, femoral, and mixed, respectively.</td>
</tr>
</tbody>
</table>
HERNIA CLASSIFICATION SYSTEMS

1. Nyhus and Gilbert
2. Rutkow
3. Schumpelick
4. Harkins
5. Casten
6. Halverson and McVay
7. Lichtenstein
8. Bendavid
9. Stoppa
10. Ponka
11. Alexandre
**EHS CLASSIFICATION**

<table>
<thead>
<tr>
<th>EHS groin classification system</th>
<th>Primary / Recurrent</th>
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<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Lateral (L)</td>
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<tr>
<td>Medial (M)</td>
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<tr>
<td>Femoral (F)</td>
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**EXAMPLE:** A primary, indirect, inguinal hernia with a 3-cm defect size would be PL2

**LIMITATION:** The EHS-system was not developed to classify hernia types preoperatively.

0 = no hernia detectable
1 = < 1.5 cm (one finger)
2 = < 3 cm (two fingers)
3 = > 3 cm (more than two fingers)
x = not investigated
Inguinal Hernia

Asymptomatic or Minimally Symptomatic

Symptomatic

Females

Consider watchful waiting

Elective Surgery (consider non-mesh when risk of infection)

Incarcerated/Strangulated

Emergent/Emergency Surgery
MANAGEMENT ALGORITHM

- **Primary Unilateral**
  - Mesh Repair: Lichtenstein or MIS (Lap or Robotic)
  - After Anterior Repair

- **Primary Bilateral**
  - Mesh Repair: MIS or Open Posterior
  - After Anterior Repair

- **Recurrent**
  - Mesh Repair: Lichtenstein
  - After Posterior Repair
- recurrent hernia
- presence of bilateral hernias
- patient's need for earlier return to full activity
- surgeon's experience in available technique options
- suitability of the patient for general anesthesia
- nature of the presenting hernia (small, inguinoscrotal)
- suitability of the hernia for a laparoscopic or open approach based on anatomy
# CURRENT TECHNIQUES

<table>
<thead>
<tr>
<th>Non-mesh techniques</th>
<th>Shouldice</th>
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<tbody>
<tr>
<td></td>
<td>Bassini (and many variations)</td>
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<td>Desarda</td>
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## Open mesh techniques

- Plug and patch
- PHS (bilayer)
- Variations

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## Lichtenstein Repair is the Gold Standard

- Totally extra-peritoneal (TEP)
- Trans abdominal pre-peritoneal repair (TAPP)
- Single incision laparoscopic repair (SILS)
- Robotic repair
OPEN REPAIR

Despite comparable results, the plug-and-patch and PHS are not recommended because of the:
• excessive use of foreign material,
• the need to enter both the posterior and anterior plane (no virgin approach if recurrence occurs) and
• the additional cost.

The use of other meshes or gadgets to replace the standard flat mesh in the Lichtenstein technique is currently not recommended.
The recurrence rate and postoperative chronic pain are comparable between plug-and-patch/PHS and the Lichtenstein technique.

Self-gripping meshes do not provide any benefit in the short- and medium-term versus the Lichtenstein technique except a somewhat decreased operative time.
ANTERIOR OPEN REPAIR

1. Oblique incision from ASIS to pubic tubercle
2. Identify IH, II and GF nerves but do not dissect or divide
3. Mobilize cord structures at level of pubic tubercle
4. Preserve and dissect cremaster muscle
5. Hernia sac management
   1. Indirect hernia - anterior and medial, invert small sacs, ligate large sacs
   2. Direct Sac - dissect from cord and reduce into PP space
6. Repair inguinal floor
7. Close EO fascia (external ring) and other layers
1. Open transversalis fascia from internal ring to PT
2. dissect away preperitoneal fat from transversalis fascia
3. perform relaxing incision in anterior rectus sheath if needed from PT and extend superiorly
4. First suture – triple layer (TF, TA, IO muscle) to the reflected inguinal ligament (avoid periosteum) until internal ring is closed using interrupted non-absorbable sutures
SHOULDICE REPAIR

- Use monofilament wire/non-absorbable suture
- Layered closure instead of en masse
- 1st layer - RA to inferior leaf of TF medial to lateral to create new internal ring
  - suture reversed - superior leaf TF to IL and tied at PT
- 2nd suture - lateral at new internal ring, Conjoint Tendon to Inguinal Lig
  - suture reversed at PT - Conjoint Tendon to Ing Lig in imbricating fashion to IR
MCVAY COOPER REPAIR

- similar to Bassini except uses Cooper Ligament vs IL
- Interrupted sutures placed from PT along CL narrowing the femoral ring
- most commonly used for femoral hernia repair
- Transition stitch - includes IL to completely narrow FC and provide smooth transition to IL over femoral vessels
- Needs relaxing incision
LICHTENSTEIN REPAIR

- Gold standard for inguinal hernia surgery
- Placement of 10x15 mesh
- 2cm medial to pubic tubercle
- Inferior - shelving edge of IL
- Superior - IO and rectus
- Cord positioned between tails
- Physiologic shutter valve - lower edge of superior tail to lower edge of inferior tail and IL
- Similar results - interrupted and running suture
The dissection balloon is inserted through an intraumbilical incision into the preperitoneal space.

The dissection balloon is inflated, expanding the preperitoneal space. The expanded space is maintained with insufflation during hernial repair.
Multivariate analysis showed no significant differences between TEP and TAPP in intra-operative and post-operative complication rates, as well as reoperation rate.

The higher post-operative complication rate in TAPP, most of which were managed conservatively, could be explained by larger, more complex defects and older age.
ROBOTIC TAPP/TEP

Technique similar to laparoscopic approach

Improved visualization and dissection of MPO

Theoretical advantage of less pain from suturing instead of using tacks to secure peritoneum/mesh

In experienced hands, no difference in time and cost
10 COMMANDMENTS FOR MIS HERNIA REPAIR

• Must not deviate from the principles of posterior hernia repair (TAPP, TEP, e-TEP, rTAPP)

• Must see and dissect the entire wall including the pubis across the midline to expose all three potential hernia spaces in every patient to avoid a missed hernia, an important cause of recurrence.
10 COMMANDMENTS FOR MIS HERNIA REPAIR

• Must extend the mesh below the pubis and between the pubis and the bladder to prevent the bladder from lifting up the mesh when it fills.

• Must be able to see the Iliac Vein in order to prevent missing a femoral hernia. If the Iliac Vein is obscured by tissue extending down from the peritoneum, there is a femoral hernia.

• Must look for and dissect the tissue lateral to the vas and vessel. The lipoma must be reduced out of the internal rind in every patient. The lipoma can appear tiny, but may be the tip of the iceberg.
10 COMMANDMENTS FOR MIS HERNIA REPAIR

• Must dissect laterally and inferiorly far enough to that the re-expanding peritoneum does not lift the mesh. In TEP/e-TEPP cases, must watch the peritoneum cover the mesh. If the peritoneum lifts the mesh, must extend area of dissection.

• Must dissect between vas and vessels to prevent missing the tail of the indirect sac. Peritoneum under the mesh will lead to recurrence in the future.
10 COMMANDMENTS FOR MIS HERNIA REPAIR

• Must use a large enough mesh to widely cover all three spaces and the pubis (10x15cm)

• Must completely and safely cover the entire mesh without leaving holes or gaps. Blind tacking to close the peritoneum must be avoided

• Must pick the hernia repair that is the best fit for the patient that you can do best
ENDORSED BY

WORLD GUIDELINES
FOR GROIN HERNIA MANAGEMENT
- HERNIA SURGE GROUP
A 67-year-old man presents with a bulge in his right groin, which he recently noticed while in the shower. He is easily able to push it back completely, but it reappears intermittently. He says it is not painful and that he has not altered his activity level because of it. Physical examination confirms the presence of a right inguinal hernia.

How should his case be managed?
He requires imaging studies prior to scheduling surgery
Watchful waiting is acceptable with the knowledge that he has an 80% chance of needing surgery
Open anterior tension-free, mesh repair is recommended right away.
Laparoscopic posterior mesh repair is recommended with lower recurrence rates
He requires imaging studies prior to scheduling surgery.

Watchful waiting is acceptable with the knowledge that he has an 80% chance of needing surgery.

Open anterior tension-free, mesh repair is recommended right away.

Laparoscopic posterior mesh repair is recommended with lower recurrence rates.
A 43 year-old male with a painful left inguinal hernia presents to the surgical clinic for a pre-operative visit. During his discussion with the surgeon, he asks about differences in outcomes between open and laparoscopic inguinal hernia repairs.

Which of the following is true?
Recurrence rate is lower for laparoscopic repair
Patients had less pain after open repair
There is a small incidence of vascular injury and bowel injury in open repair
Recovery time is significantly shorter after laparoscopic repair
Laparoscopic repair is the gold standard for symptomatic inguinal hernias
Recurrence rate is lower for laparoscopic repair
Patients had less pain after open repair
There is a small incidence of vascular injury and bowel injury in open repair
Recovery time is significantly shorter after laparoscopic repair
Laparoscopic repair is the gold standard for symptomatic inguinal hernias
A 62 year-old male with a symptomatic left inguinal hernia is taken to the operating room for a totally extraperitoneal (TEP) repair. After creating the preperitoneal space and placing the trocars, the surgeon begins the dissection of the hernia sac. There is no obvious direct hernia but the surgeon is suspicious that there may be an indirect hernia.

To identify an indirect inguinal hernia sac, the surgeon should focus the dissection:
Anterior and medial to the cord
Inferior and lateral to the cord
Inferior and medial to the cord
Anterior and lateral to the cord
Anterior and medial to the cord
Inferior and lateral to the cord
Inferior and medial to the cord
Anterior and lateral to the cord
During a pre-operative counseling session with a 62 year-old male presenting with a right inguinal hernia, the surgeon notifies the patient that she will perform a tissue repair, specifically a Bassini repair. While describing the basic parts of the operation, she notes that she will create a “relaxing incision” to reduce tension on the repair.

The “relaxing incision” will be made in the: 
Transversalis Fascia
Anterior rectus sheath
Transversus abdominis muscle
Rectus muscle
ANSWER

Transversalis Fascia
Anterior rectus sheath
Transversus abdominis muscle
Rectus muscle
QUESTION 5

While performing an open left inguinal hernia repair on a 45 year-old male with a symptomatic inguinal hernia, the surgeon identifies a nerve entering the inguinal canal through the internal inguinal ring. During the course of the dissection, the nerve is inadvertently transected. During his postoperative visit, the patient reports decreased sensation along the left side of his scrotum.

The nerve that was most likely transected was the:
Ilioinguinal Nerve
Iliohypogastric nerve
Genital branch of the Genitofemoral nerve
Lateral femoral cutaneous nerve
Ilioinguinal Nerve
Iliohypogastric nerve
Genital branch of the Genitofemoral nerve
Lateral femoral cutaneous nerve
REFERENCES

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World Guidelines for Groin Hernia Management 2016 - HerniaSurge Group
TEP vs TAPP: comparison of perioperative outcome in 17,587 patients with a primary unilateral inguinal hernia - Surg Endosc 2015 (29):3750-3760
Update with level 1 studies of the EHS guidelines on the treatment of inguinal hernia in adult patients - Hernia 2014 (18): 151-163
Groin Hernia Guidelines - British Hernia Society May 2013
10 Commandments of MIS Inguinal Hernia Repair - Dr. Felix, Keynote Address, 2nd Global Symposium on Robotic and MIS Hernia Repair, Sept 2016, NYC
JOIN THE IHC REVOLUTION!!

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