ABSITE Review: Inguinal and Femoral Hernias

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Objectives

- Correctly identify anatomical landmarks intra-operatively
- Differentiate between femoral and inguinal hernias
- Understand different approaches at surgical repair
- Compare operative approaches
Questions

1. From which muscle layer is the inguinal ligament derived?
   a. Transversus abdominus
   b. External oblique
   c. Internal oblique
   d. None of the above

2. What are the borders of the femoral canal?
   a. External oblique, femoral vein, empty space
   b. External oblique, femoral vein, empty space iliopubic tract and femoral vein
   c. Iliopubic, cooper’s, femoral vein and junction of iliopubic and cooper’s ligament
   d. None of the above
Questions

3. A McVay repair
   a. May be used to repair femoral hernias
   b. Entails suturing Poupart’s to the conjoined tendon
   c. Is no longer performed
   d. Does not require a relaxing incision

4. TAPP
   a. Is contraindicated in the elderly
   b. Requires traversing the peritoneal cavity
   c. Is totally extraperitoneal
   d. Has a low learning curve
Questions

5. The base of Hasselbach’s triangle is
   a. Derived from the external oblique
   b. Cooper’s ligament
   c. There is no base
   d. The inferior epigastric
Introduction

- In the US ~1 million abdominal wall hernia repairs/year
  - 750,000 – inguinal
  - 25,000 - femoral
Introduction

- From latin word meaning rupture
- Definition: Abnormal protrusion
  - Occur at sites where the aponeurosis and fascia are not covered by striated muscle
- Male preponderance (7:1)
- Presentation:
  - Groin bulge/pain
  - Right more common than left
Introduction

- Risk Factors:
  - Age
  - Obesity
  - COPD
  - Chronic constipation
  - Straining
  - Pregnancy
  - Ascites
  - Peritoneal dialysis
Inguinal Hernia

- **Indirect**
  - Most common type
  - Weakness in the internal inguinal ring
  - Associated with patent processus vaginalis

- **Direct**
  - Weakness in the transversalis fascia
  - Due to “wear and tear”
Abdominal Wall Anatomy

- **Muscles**
  - External oblique
  - Internal oblique
  - Transversalis abdominus

- **Nerves**
  - Ilioinguinal
  - Genitofemoral

- **Blood supply**
  - Superior epigastric
  - Inferior epigastric
  - Deep circumflex
  - Posterior intercostal
  - Lumbar
Groin Anatomy

- Posterior layer of rectus sheath
- Lateral epigastric vessels
- Deep inguinal ring
- Transversalis fascia (cut away)
- Anterior superior iliac spine
- Iliopsoas muscle
- Testicular vessels and genital branch of genitofemoral
- Iliopsoas fascia (covering femoral nerve)
- External iliac vessels
- Femoral ring (dilated)
- Ductus (vas) deferens
- Obturator-pubic arterial anastomosis
- Obturator artery

- Arcuate line
- Rectus abdominis muscle
- Linea alba
- Inguinal (Hesselbach's) triangle
- Inguinal fold (conjoint tendon)
- Superior pubic ramus
- Pubic symphysis
- Lacunar (Gimbernat's) ligament
- Pectineal (Cooper's) ligament
- Iliopubic tract
Inguinal Canal

- Allows passage b/w abdomen and testes
- Transmits ilioinguinal nerve
- Parallel to inguinal ligament
- Walls:
  - Anterior - external oblique
  - Posterior – transversalis fascia
  - Inferior – inguinal ligament
  - Superior – int oblique & trans abd
Groin Anatomy

- Femoral Canal
  - Medial compartment
  - Blind pouch
  - Borders:
    - superiorly: iliopubic tract
    - inferiorly – cooper’s ligament
    - laterally – femoral vein
    - medially – junction of iliopubic tract and cooper’s ligament


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Operative Repair

- Indicated for all symptomatic hernias
- Based on surgeon’s experience
- May be:
  - Via anterior or posterior approach
  - Primary:
    - Preferred in presence of contamination
    - Best choice in female patients
    - Accomplished using: Bassini, McVay or Shouldice technique
Operative Repair

- Prosthetic Mesh Repair technique:
  - Onlay versus preperitoneal
  - Mesh bridges inguinal defect
  - Foreign body reaction incited
  - Common strategy entails:
    - Minimal tissue dissection
    - Anchoring of mesh with interrupted sutures
Operative Repair

- Laparoscopic technique:
  - Based on reconstruction of weakened posterior abdominal wall
  - Steep learning curve
  - Two approaches:
    - Totally extraperitoneal
    - Transabdominal preperitoneal
    - (Intraperitoneal Onlay Mesh)
Historical Review

Edoardo Bassini (1844-1924)

- Father of modern hernia repair
  - Performed and published a novel anatomical dissection (1884)

- Repair emphasized:
  - High ligation
  - Reconstruction of the inguinal floor
  - Opening the transversalis fascia

- Preparation for deep repair in three layer repair
Bassini Repair

- Opening of inguinal floor
- Suture Poupart’s ligament:
  - lateral border of internal oblique or conjoint tendon
Shouldice Repair

- Complete dissection & reconstruction of inguinal floor
- Imbricated layered repair
- Four layers
McVay Repair

- Suturing transversus abdominus to Cooper’s ligament
- Transition stitch in femoral sheath
- Relaxing incision in external oblique
Lichtenstein Repair

- Gold standard by ACS
- Transversalis fascia is *not* opened
- Five key elements:
  - Large sheet of mesh
  - Cross tails
  - Secure to rectus, int oblique and inguinal ligament
  - Keep mesh relaxed
  - Protect nerves

PK Amid Groin hernia repair – open technique. World J Surg 29;1046-1051 2005
Gilbert “plug and mesh” Repair

- Originally described by Lichtenstein
- Modified to include indirect hernias
- Rutkow and Robbins included direct hernias

Open Preperitoneal Mesh Repair

- Approaches
  - Trans-inguinal
  - Paramedian
  - Lower midline
  - Pfannensteil
Open Preperitoneal Mesh Repair

- Associated with injuries to:
  - Bladder
  - Bowel
  - Vascular

- Recurrence rate compared to in front of TF are the same
PHS System Repair

- Combines Lichtenstein and preperitoneal repair
- 2 layers:
  - Deep
  - Superficial
Laparoscopic Hernia Repair

- Transabdominal preperitoneal (TAPP)
  - Mesh along anterior abdominal wall
  - Identify
    - Median & medial umbilical ligament
    - Lateral umbilical fold
  - Parietal peritoneum incised and reflected
  - Mesh placed b/w peritoneum and transversalis fascia
Laparoscopic Hernia Repair

- Totally extraperitoneal
  - Repair via posterior approach
  - Entirely w/in preperitoneal space
  - Mesh positioned deep to hernia defect
Femoral Hernia Repair

- Low Groin Approach
  - Lichtenstein technique
- Inguinal Approach
  - McVay repair
- Preperitoneal Approach
Complications

- Recurrence
- Postherniorrhaphy pain
- Ischemic orchitis
- Testicular atrophy

- Hemorrhage
- Osteitis pubis
- Infection
- Prosthesis-related complication
Questions of the hour…

1. Is there a superior open repair technique?
2. Is laparoscopic repair superior to open repair?
3. Chronic pain, is it avoidable?
Open vs. Open

SS Awad et al. Improved outcomes with the prolene hernia system mesh compared to the time-honored Lichtenstein onlay mesh repair for inguinal hernia repair. Am J of Surgery 2007;193:697-701
Lichtenstein vs. PHS

- Lichtenstein
  - Gold standard
  - Low learning curve

- PHS system
  - Combines benefits of anterior and posterior repair
  - Only open repair to cover myopectineal orifice

SS Awad et al. Improved outcomes with the prolene hernia system mesh compared to the time-honored Lichtenstein onlay mesh repair for inguinal hernia repair. Am J of Surgery 2007;193:697-701
Lichtenstein vs. PHS

- Retrospective study with 622 pts
  - 321 – PHS repair
  - 302 – LMR
- Follow up was 20 months
- Assessed:
  - Difference in operating time
  - Complications
  - Recurrence

SS Awad et al. Improved outcomes with the prolene hernia system mesh compared to the time-honored Lichtenstein onlay mesh repair for inguinal hernia repair. Am J of Surgery 2007;193:697-701
Lichtenstein vs. PHS

Table 2
Characteristics of the repair procedures, postoperative complications, follow-up, and recurrences rate

<table>
<thead>
<tr>
<th>Variable</th>
<th>LMR (n = 302)</th>
<th>PHS (n = 321)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of anesthesia (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>58.3</td>
<td>61.1</td>
</tr>
<tr>
<td>Regional</td>
<td>40.1</td>
<td>30.8</td>
</tr>
<tr>
<td>Local, with or without sedation</td>
<td>2.0</td>
<td>8.1</td>
</tr>
<tr>
<td>Operation time (min)</td>
<td>89.5 ± 1.7</td>
<td>90.6 ± 1.6</td>
</tr>
<tr>
<td>Intraoperative complications (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems related to anesthesia</td>
<td>1.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Injury to spermatic-cord structure</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Injury to vessel</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Peritoneal defect over mesh at closure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate postoperative complications (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary retention</td>
<td>3.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Hematoma or seroma</td>
<td>12.6</td>
<td>6.9*</td>
</tr>
<tr>
<td>Orchitis</td>
<td>0.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Wound infection</td>
<td>2.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Neuralgia or other pain</td>
<td>4.3</td>
<td>2.2*</td>
</tr>
<tr>
<td>Long-term complications (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematoma or seroma</td>
<td>0.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Orchitis or other testicular problems</td>
<td>0.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Infection</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Neuralgia or other pain</td>
<td>3.3</td>
<td>1.6*</td>
</tr>
<tr>
<td>Recurrence rate (%)</td>
<td>2.6</td>
<td>0.6*</td>
</tr>
</tbody>
</table>

* P < .05.
Lichtenstein vs. PHS

Conclusion:

- PHS was superior to LMR due to:
  - Lower recurrence rates
  - Decreased complications
  - Less post operative pain
  - Earlier return to normal activity

SS Awad et al. Improved outcomes with the prolene hernia system mesh compared to the time-honored Lichtenstein onlay mesh repair for inguinal hernia repair. Am J of Surgery 2007;193:697-701
Open vs. Laparoscopic

The data shows...

- **Laparoscopic approach gaining popularity**
  - Prelim recurrence rates ranged from 3-10%
  - Benefits included
    - Less Pain
    - Quicker return to activity
  - Subsided enthusiasm due to:
    - High cost
    - Steep learning curve
    - Serious complications
    - Need for general anesthesia

- **TAPP versus TEP:**
  - TEP preferred because:
    - Wide exposure
    - Avoids abdominal entry
    - Associated with decrease post-op pain
    - Faster post-operative recovery
Open versus Laparoscopic

Goal:
- Examine perioperative outcomes and complications in both TEP and open mesh repair

345 patients
- 198 – open mesh repair
- 147 – TEP repair

Follow up: three months

Compared:
- Operative time
- Complications

Open versus Laparoscopic

Results:

Table 3. Comparison of operative times

<table>
<thead>
<tr>
<th>Variable (min)</th>
<th>OPEN (n = 198)</th>
<th>TEP (n = 147)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>71.4 ± 22.3</td>
<td>69.7 ± 25.1</td>
<td>NS</td>
</tr>
<tr>
<td>Unilateral (n)</td>
<td>69.7 ± 20.1 (188)</td>
<td>63.1 ± 21.6 (83)</td>
<td>0.02</td>
</tr>
<tr>
<td>Bilateral (n)</td>
<td>102.3 ± 27 (10)</td>
<td>78.3 ± 27.0 (64)</td>
<td>0.01</td>
</tr>
<tr>
<td>Recurrent (n)</td>
<td>81.6 ± 3.2 (9)</td>
<td>74.4 ± 27 (46)</td>
<td>NS</td>
</tr>
<tr>
<td>Same-day procedure</td>
<td>78.9%</td>
<td>81.9%</td>
<td>NS</td>
</tr>
</tbody>
</table>

Open versus Laparoscopic

Open versus Laparoscopic

Open versus Laparoscopic

Results:

**Table 4. Comparison of complication rates**

<table>
<thead>
<tr>
<th></th>
<th>OPEN (n = 190)</th>
<th>TEP (n = 139)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary retention</td>
<td>1.1% (2)</td>
<td>7.9% (11)</td>
<td>0.003</td>
</tr>
<tr>
<td>Skin numbness &lt;incisional</td>
<td>35.8% (68)</td>
<td>2.8% (4)</td>
<td>0.001</td>
</tr>
<tr>
<td>Wound infection</td>
<td>0.5% (1)</td>
<td>1.4% (2)</td>
<td>NS</td>
</tr>
<tr>
<td>Fluid collection</td>
<td>3.7% (7)</td>
<td>15.8% (22)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Aspirated</td>
<td>1.6% (3)</td>
<td>5.8% (8)</td>
<td>NS</td>
</tr>
<tr>
<td>Pain &gt; 3 mo postop</td>
<td>5.3% (10)</td>
<td>1.4% (2)</td>
<td>NS</td>
</tr>
</tbody>
</table>

Open versus Laparoscopic

- **Conclusion:**
  - TEP repairs can be performed efficiently and without major complications.
  - Operative times are shorter in the hands of experienced surgeons.
  - TEP associated with lower rate of post-operative numbness and prolonged groin pain.

Open versus Laparoscopic

- Prospective, randomized controlled trial
- Conducted b/w 1996-1997
- Follow up: 7.3 years
- 168 patients:
  - 81 – TEP
  - 87 - Lichtenstein

Hallen et al. Laparoscopic extraperitonealinguinal hernia repair versus open mesh repair: long term follow-up of a randomized controlled trial. SURGERY 2008;143:313-317
Open versus Laparoscopic

<table>
<thead>
<tr>
<th></th>
<th>TEP</th>
<th>Open mesh repair</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired inguinal sensitivity yes/no</td>
<td>9/73</td>
<td>26/81</td>
<td>.004</td>
</tr>
<tr>
<td>Groin pain yes/no</td>
<td>6/73</td>
<td>11/81</td>
<td>.82</td>
</tr>
<tr>
<td>Testicular pain yes/no</td>
<td>10/73</td>
<td>1/81</td>
<td>.003</td>
</tr>
<tr>
<td>Testicular atrophy yes/no</td>
<td>2/69</td>
<td>3/75</td>
<td>.99</td>
</tr>
<tr>
<td>Umbilical hernia yes/no</td>
<td>1/69</td>
<td>0/78</td>
<td>.99</td>
</tr>
<tr>
<td>Neuralgia yes/no</td>
<td>1/69</td>
<td>0/78</td>
<td>.99</td>
</tr>
<tr>
<td>Hydrocele yes/no</td>
<td>1/69</td>
<td>0/78</td>
<td>.99</td>
</tr>
<tr>
<td>Recurrence yes/no</td>
<td>3*/69</td>
<td>4/78</td>
<td>.87</td>
</tr>
<tr>
<td>Contralateral hernia yes/no</td>
<td>15/73</td>
<td>13/81</td>
<td>.47</td>
</tr>
</tbody>
</table>

*2 of 3 recurrences were diagnosed at the 1-year follow-up.
Open versus Laparoscopic

Conclusion:

- Long term cure of hernia in patient with lap or open hernia repair is excellent
- Individualized hernia repair yields best results and is most cost effective
- TEP is an excellent method for individuals in a working population who require short convalescence
- TEP advantageous in recurrent hernias

Hallen et al. Laparoscopic extraperitoneal inguinal hernia repair versus open mesh repair: long term follow-up of a randomized controlled trial. SURGERY 2008143:313-317
Chronic Groin Pain

- Potentially incapacitating complication
- Cause not clear: ? Nerve Entrapment
  - Ilioinguinal
  - Iliohypogastric
  - Genital branch of genitofemoral
- Routine preservation and division have been advocated
Prophylactic Ilioinguinal Neurectomy in Open Hernia Repair

- Double blinded randomized controlled trial
- 100 patients b/w 18-80yoa
  - 50: whole ilioinguinal nerve excised
  - 50: nerve preserved
- Primary outcome: incidence of chronic pain at 6 months
- Secondary outcome: incidence of groin numbness
- Follow up: 6 months

WL Mui et al “Prophylactic ilioinguinal neurctomy in open inguinal hernia repair” Annals of Surgery 244;1, 2006
Prophylactic Ilioinguinal Neurectomy in Open Hernia Repair

Results:

- No significant difference in:
  - Incidence of pain at 6 months
  - Incidence of groin numbness and sensation change
  - Quality of life

WL Mui et al “Prophylactic ilioinguinal neurctomy in open inguinal hernia repair” Annals of Surgery 244;1, 2006
Conclusion

- Lichtenstein continues to be standard although PHS and laparoscopic techniques are gaining acceptance.
- Surgeon experience is key to providing good hernia repair.
- Learning curve in laparoscopic hernia repair is steep however in hands of experienced surgeons outcome comparable to open repair.