COMPLICATIONS OF HERNIA REPAIR

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Ambroise Paré (1510-90)

Paré was respected as a “hernia specialist,” and was known to have elevated the surgeon’s profession from an ill-reputed handicraft to a respected art. An entire chapter on hernias appears in Paré’s The Apologie and Treatise.

Astley Paston Cooper (1768-1841)

Although removal of the testis was sanctioned in operations for hernias of the indirect type but not for other forms, Paré severely condemned the itinerant herniotomists who produced castration.
Recognized as one of the fathers of modern hernia surgery, wrote the definitive text at the time. “No disease of the human body, belonging to the province of the surgeon, requires in its treatment a greater combination of accurate anatomical knowledge, with surgical skill, than hernia in all its varieties.”

Cooper described the ligament of Cooper (pectineal), the cremasteric fascia, and the fascia transversalis, and described lethal complications of advanced hernia, as well as complications of surgical treatment. He often stated: “trauma and failure of surgery were strong deterrents for both patient and surgeon.”

Astley Paston Cooper (1768-1841)

Post Renaissance Era - significantly described inguinal anatomy and developed theory regarding technique to minimize complications, in particular recurrence.

Complications of Hernia Surgery

- May occur in up to 50% of cases, depending on
  - Condition & stage of hernia and hernia contents (bowel)
  - Surgical technique
  - Previous hernia surgery (recurrence)
  - Smoking
  - Increased BMI
  - Advanced age
- Approximately one-half of complications will require surgical reintervention
- Accurate diagnosis often requires additional information from imaging

Complications of Hernia Surgery

Types

- Acute
  - Bleeding
  - Injury to adjacent structures (bladder, intestine, blood vessel, spermatic cord)
  - Nerve injury / entrapment – neuroma, myofascial type pain, reflex sympathetic dystrophy
  - Seroma / Hematoma
  - Infection / Abscess
  - Mesh related issues
  - Conversion
- Chronic
  - Recurrence (primary 2-3%; recurrent 5-10%; incisional may exceed 30%)
  - Pain
### Complications of Hernia Surgery

#### Recurrence

**Most common complication**
- Usually occurs 2–3 years after surgery
- Prevalence varies by type of initial repair
  - Up to 10% after open surgery with mesh placement (up to 30% without mesh)
  - Up to 7.5% after laparoscopic surgery
- More common in direct hernias
  - Bilateral direct hernias
  - Direct hernias combined with indirect hernia
- Delayed recurrence – after 5 years
  - Less related to type of repair than tissue dysfunction and age, and poor fascial quality

**Recurrence – why?**

- Closure under excessive tension
- Chronically high intraabdominal pressure
  - OBESITY
  - Obstructive uropathy
  - Chronic coughing
  - Chronic straining at stool / anorectal disease
  - Ascites, pregnancy, ...
- Initial repair inadequate
  - Failure to identify / exclude all fascial defects
  - Failure to identify and use adequate fascial support
- Infection of initial repair wound
- Inadequate / poor collagen formation in the wound / tissue dysfunction
  - Age
  - Protein and vitamin malnutrition / immunodeficiency
  - Concomitant therapeutic administration of corticosteroids or antimetabolites

### Complications of Hernia Surgery

#### Recurrence

**Incidence varies with surgeon expertise & experience**
- Hernia Specialist
- True General Surgeon (vs. subspecialist doing an occasional procedure)
- Laparoscopic Surgeon
- Learning curve dilemma
  - Lap: 30–250 cases
  - Most experienced <5% recurrence
  - Least experienced 20% recurrence
  - Open: 5 cases for <5% recurrence

- Expect highest recurrence with combination: laparoscopic hernia repair and inexperience
Complications of Hernia Surgery

**Recurrence**

- Clinical evaluation may be limited
  - OBESITY
  - Existence of nonabsorbable mesh and accompanying fibrosis
  - Abdominal distention / obstruction / intraabdominal pathology
  - Spontaneous contraction / retraction of the abdominal wall
  - Imaging often useful to define anatomy of recurrence

**Nerve injury / neuralgia – chronic pain**

- Chronic residual neuralgia can result from surgical injury to sensory nerves in the groin
  - Ileoinguinal nerve most frequently
  - A well known cause of residual neuralgia is neuroma
    - results from hypertrophic growth of a portion of nerve fibers outside the neurilemma of partially or completely divided nerve
  - TREATMENT:
    - Neurolysis of the involved nerve;
    - Excision of neuroma / proximal transection
    - Injection w/ steroids to area

**Infection**

- 3–5%
  - Increased frequency
    - Older patients
    - Strangulated and incarcerated hernias
    - Delay in surgery
    - Smokers
    - OBESITY
  - Usually manifests within 2 weeks after surgery
  - Risk factor for hernia recurrence
  - May be superficial or deep, and may involve mesh
    - Differentiation is important because superficial infections are more successfully managed conservatively and deep mesh-related infections may require intervention (percutaneous drainage or open +/- mesh removal)
Complications of Hernia Surgery

**Infection**

- Diagnosis
  - Clinical criteria: presence of fever or leukocytosis
  - Imaging to confirm the presence and define the location and size, guide intervention, and monitor treatment
  - Suggestive findings on imaging:
    - Gas or thick septae in a previously "simple" collection
    - Enhancing rim
    - Fat stranding in surrounding tissues
    - Increasing size, or development of a new collection following recovery from surgical repair
  - Guided aspiration may be necessary to establish dx

**Fluid Collections**

- Occur frequently in the immediate postoperative period – most resolve spontaneously without intervention within 30 days
- Problematic in up to 17% of cases
- Usually contain serous fluid (seroma) or blood (hematoma)
  - formation is related to surgical technique, lack of drain, properties of mesh
- Indication for aspiration:
  - persists (> 6 weeks) or grows
  - produces symptoms
  - suspect to be infected
- Use of image guidance if deep / intraabdominal / located under mesh
- Imaging:
  - May help identify & differentiate from hernia recurrence (and confirm resolution)
Complications of Hernia Surgery

**Mesh-related**

- Inflammatory reactions may lead to fibrosis of tissues surrounding the mesh
- Erosion of viscera / adjacent structures
- Suspect if the mesh has an asymmetric or irregular shape on exam or by imaging
- Mesh shrinkage may also occur if too small when placed
- Intraperitoneal adhesions may develop:
  - predisposing to small bowel obstruction
  - vas deferens scarring & hypospermia
- Less frequently, mesh may detach from supporting tissues and migrate within the abdominal wall or peritoneal cavity

**Testes-related**

- Ischemic atrophy - following inguinal hernia repair
- Associated ischemia with testicular atrophy
- Severe chronic testicular pain / testicle infarction
- No known successful treatment to prevent atrophy
- Incidence can be minimized by reducing surgical trauma to the cord
  - Minimize dissection of the distal sac except when unavoidable
  - Minimize frequency of re-dissection of inguinal canal & spermatic cord following prior groin surgery (or scrotum)
- Transsection or disruption of the vas deferens
- Hydrocele
- Orchitis
  - Develops insidiously, not apparent for 2-5 days after hernioplasty
  - Etiology is thrombosis and ischemia of the spermatic cord
  - Testicle and spermatic cord become swollen, hard, tender, painful and retracted.
  - Process can last 6-12 weeks

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Laparoscopic versus open repair abdominal wall hernia. Study method.

- 10 RCTs with a total number of 880 patients suffering from primary ventral or incisional hernia
- No trials were identified on umbilical or para-stomal hernia
- Recurrence rate was not different between laparoscopic and open surgery (RR 1.22; 95% CI 0.62 to 2.38; I^2 = 0%)
  - patients were followed up for less than two years in half of the trials
- Results on operative time were too heterogeneous to be pooled
- Risk of intraoperative enterotomy was slightly higher in laparoscopic hernia repair (Peto OR 2.33; 95% CI 0.53 to 10.35)
  - only 7 cases with bowel lesion (5 vs. 2)
Laparoscopic versus open repair abdominal wall hernia: Any complication.

Laparoscopic versus open repair abdominal wall hernia: Enterotomy.

Laparoscopic versus open repair abdominal wall hernia: Hernia recurrence.

Laparoscopic versus open repair abdominal wall hernia: Local seroma or hematoma.
Laparoscopic versus open repair abdominal wall hernia: Local infection.

Laparoscopic versus open repair abdominal wall hernia: Reoperation.

The most clear and consistent result was that laparoscopic surgery reduced the risk of wound infection (RR = 0.26; 95% CI 0.15 to 0.46; I² = 0%).

Based on a small number of trials, it was not possible to detect any difference in pain intensity, both in the short- and long-term evaluation.

Of note:
- Laparoscopic surgery shortened hospital stay significantly in 6 out of 9 trials.
- Data were heterogeneous.
- Laparoscopic repair led to much higher in-hospital costs.
Laparoscopic versus open repair inguinal hernia: Results.

- 41 eligible trials of lap versus open groin hernia repair
- 7161 participants (individual pt data available for 4165)
- Meta-analysis was performed using individual patient data where possible.

- Operation times for laparoscopic repair were longer and there was a higher risk of rare serious complications.
- Return to usual activities was faster, and there was less persisting pain and numbness.
- Hernia recurrence was less common than after open non-mesh repair but not different to open mesh methods.

Laparoscopic versus open repair inguinal hernia: Authors’ conclusions.

- Laparoscopic repair takes longer and has a more serious complication rate in respect to visceral (especially bladder) and vascular injuries, but recovery is quicker with less persisting pain and numbness.

- Reduced hernia recurrence of around 30-50% was related to the use of mesh rather than the method of mesh placement.
Smoking and BMI – independent risk factors for ANY of the post-operative complications associated with inguinal hernia repair

Table 1: Frequency of postoperative complications in male patients undergoing first-time inguinal hernia surgery

<table>
<thead>
<tr>
<th>Postoperative complications</th>
<th>N (12,697)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious</td>
<td>121</td>
<td>1.0</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>36</td>
<td>0.3</td>
</tr>
<tr>
<td>Thromboembolic</td>
<td>30</td>
<td>0.2</td>
</tr>
<tr>
<td>Bleeding</td>
<td>109</td>
<td>0.9</td>
</tr>
<tr>
<td>Reoperation</td>
<td>78</td>
<td>0.6</td>
</tr>
<tr>
<td>Systemic</td>
<td>65</td>
<td>0.5</td>
</tr>
<tr>
<td>Death</td>
<td>11</td>
<td>0.1</td>
</tr>
<tr>
<td>Any complication (total)</td>
<td>368</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Table 2: Adjusted odds ratios (ORs) and corresponding 95% confidence intervals (CI) of the rate of postoperative complications according to smoking status and BMI category, obtained from logistic regression analyses

<table>
<thead>
<tr>
<th>Any complication</th>
<th>OR (95% CI)</th>
<th>P value</th>
<th>Overall OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall smoking</td>
<td>1.02</td>
<td></td>
<td>1.02 (0.99-1.05)</td>
</tr>
<tr>
<td>Never</td>
<td>0.83</td>
<td>0.83</td>
<td>0.83 (0.78-0.88)</td>
</tr>
<tr>
<td>Low</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00 (0.96-1.05)</td>
</tr>
<tr>
<td>Medium</td>
<td>0.84</td>
<td>0.84</td>
<td>0.84 (0.79-0.90)</td>
</tr>
<tr>
<td>High</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94 (0.88-1.01)</td>
</tr>
<tr>
<td>Body mass index</td>
<td>0.97</td>
<td>0.97</td>
<td>0.97 (0.95-0.99)</td>
</tr>
</tbody>
</table>

- Smoking and BMI – independent risk factors for ANY of the post-operative complications associated with inguinal hernia repair
- Loose Weight
- Quit Smoking

Baseline characteristics according to postoperative complications and hospital stay are presented in Table 1. The entire cohort of 12,697 subjects had a mean age of 65.5 years and a mean BMI of 24.4. Current smokers constituted 20.3%, previous smokers 34.8%, and never smokers 45.9%. Ever-smokers accounted for 20.9% and never-smokers 29.1%. The overall complication rate was 3.3%. After adjusting for the other covariates in the multivariable logistic regression analysis, current smokers had a 3.4% (OR 1.34, 95% CI 1.04, 1.72) increased risk of postoperative complications compared to never smokers (Table 1). Smoking and preoperative smoking were not found to be significantly associated with an increased risk of postoperative complications.

BMI was also found to be significantly associated with an increased risk of postoperative complications (OR = 0.98, 95% CI 0.96-1.01). There was a trend to an increase in the risk of postoperative complications in association with obesity (P = 0.075). Obese patients had a 1.57% (OR 1.37, 95% CI 1.09, 1.73) increased risk of postoperative complications in comparison with the normally weighted reference group.

The length of hospital stay

The overall mean and median lengths of hospital stay were 3.0 and 2.0 days, respectively. In a multivariable model, an increased BMI was found to be significantly associated with an increased length of hospital stay (P < 0.001), as shown in Table 2. On the log scale, the mean length of hospital stay among the overweight and obese patients increased 0.05 and 0.15, respectively, compared to the normally weighted. Based on a useful interpretation of the log transformation [19], the mean length of the hospital stay increased 5% (95% CI 0.36, 7.64%) in the overweight group and 15% (95% CI 0.30, 18.0%) in the obese group. There was no statistically significant association between smoking or smoking use and the mean length of hospital stay after adjusting for the other covariates in the model.
Thank You