Laparoscopic Ventral Hernia Repair

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Assistant Professor of Surgery
• Basics
• Bridging
• Defect Closure
• Mesh fixation
• Positioning system
Each hernia is unique...
Approach to the Hernia Patient

- **Individualized** approach
- Complete History and Physical
- CT Scan
  - Recurrent hernia
  - Atypical location
  - Obesity
- Old operative notes whenever possible
- Routine laboratory studies, nutritional panel
Hernia Grading System

**Grade 1**
*Low Risk*
- Low risk of complications
- No history of wound infection

**Grade 2**
*Co-Morbid*
- Smoker
- Obese
- Diabetic
- Immunosuppressed
- COPD

**Grade 3**
*Potentially Contaminated*
- Previous wound infection
- Stoma present
- Violation of the gastrointestinal tract

**Grade 4**
*Infected*
- Infected mesh
- Septic dehiscence

Ventral Hernia Working Group. *Surgery 148:3*
Risk factors for Hernias

- **Obesity**
- Diabetes Mellitus
- **Smoking**
- COPD
- Advanced age
- Malnutrition
- Immunosuppression, steroids
- Radiation Therapy
- Connective tissue Disorders
Obesity and Abd Pressure


Intra-abdominal pressure in the morbidly obese.

Lambert DM, Marceau S, Forse RA.
Creighton University Medical Center, Department of Surgery, Omaha, NE 68131, USA.

- 45 morbidly obese (BMI 55)
  - 12mm ($\pm$ 0.8) Hg in obese
  - 0mm ($\pm$ 2) Hg in controls
Obesity Trends* Among U.S. Adults
BRFSS, 2010

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
### Definition of Obesity

**BMI = Weight kg/Height m^2**

<table>
<thead>
<tr>
<th>Category</th>
<th>BMI Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>≤ 19</td>
</tr>
<tr>
<td>Normal</td>
<td>19 - 25</td>
</tr>
<tr>
<td>Overweight</td>
<td>26 - 29</td>
</tr>
<tr>
<td>Obese Class I</td>
<td>30 - 35</td>
</tr>
<tr>
<td>Obese Class II</td>
<td>35 - 39.9</td>
</tr>
<tr>
<td>Morbid Obesity</td>
<td>&gt; 40</td>
</tr>
<tr>
<td>Super Obesity</td>
<td>&gt; 50</td>
</tr>
</tbody>
</table>

BMI 40 = approximately 100 lbs above ideal weight

66% as of 2004!!
Weight Loss is NOT easy

Sjostrom, et al. NEJM 2007
“Staged” hernia repair
Preoperative Goals: Patient Discussion

• Set realistic expectations:
  – Goals of repair
  – Timing of repair
  – Understanding magnitude of procedure
  – Complications
  – Recovery
Preoperative Goals

• Weight Loss
  – Set specific goals
  – Bariatric surgery first if necessary
• Smoking cessation (ideally ≥ 4 weeks)
• Heal chronic wounds
• Increase physical activity
• Optimize nutritional status
• Optimize cardiopulmonary status
Surgical Planning

• OPEN vs. Laparoscopic
Laparoscopic
# OPEN vs. LAP ??

Comparative studies between open and laparoscopic ventral hernia repair

<table>
<thead>
<tr>
<th>Author</th>
<th>Year Study</th>
<th>Patient number</th>
<th>Mesh used</th>
<th>Operation time (min)</th>
<th>Percent intraoperative complications</th>
<th>LOS (days)</th>
<th>Percent postoperative complication</th>
<th>Follow-up (Mo)</th>
<th>% Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park</td>
<td>1998 Retrospective</td>
<td>56 49</td>
<td>ePTFE</td>
<td>95.4 78.5</td>
<td>N/A N/A</td>
<td>17.90 36.70</td>
<td>N/A N/A</td>
<td>24 54</td>
<td>11% 35%</td>
</tr>
<tr>
<td>Ramshaw</td>
<td>1999 Retrospective</td>
<td>79 174</td>
<td>N/A</td>
<td>58 82</td>
<td>N/A N/A</td>
<td>1.7 2.8</td>
<td>19 26.40</td>
<td>21 21</td>
<td>3% 21%</td>
</tr>
<tr>
<td>Wright</td>
<td>2002 Retrospective</td>
<td>86 90</td>
<td>N/A</td>
<td>131 102</td>
<td>2.30% 2.20%</td>
<td>1.5 2.5</td>
<td>25.60 40</td>
<td>N/A N/A</td>
<td>1% 6%</td>
</tr>
<tr>
<td>Van’t Riet</td>
<td>2002 Retrospective</td>
<td>25 76</td>
<td>PP</td>
<td>120 110</td>
<td>8% 6.50%</td>
<td>4 5</td>
<td>52 39.50</td>
<td>16 19</td>
<td>16% 18%</td>
</tr>
<tr>
<td>Mc Geevy</td>
<td>2003 Prospective</td>
<td>65 71</td>
<td>ePTFE or polyester/collagen</td>
<td>1.1 1.5</td>
<td>N/A N/A</td>
<td>7.70 21.10</td>
<td>N/A N/A</td>
<td>N/A N/A</td>
<td>N/A N/A</td>
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<tr>
<td>Lomanto</td>
<td>2006 Prospective</td>
<td>50 50</td>
<td>polyester/collagen</td>
<td>ePTFE 90.6 93.3</td>
<td>2% 2%</td>
<td>2.74 4.7</td>
<td>26 40</td>
<td>19.6 21</td>
<td>2% 10%</td>
</tr>
<tr>
<td>Bingener</td>
<td>2007 Prospective</td>
<td>127 233</td>
<td>ePTFE or PP/ ePTFE</td>
<td>N/A N/A</td>
<td>N/A N/A</td>
<td>33.10 43.30</td>
<td>N/A N/A</td>
<td>36 36</td>
<td>13% 9%</td>
</tr>
<tr>
<td>Olmi</td>
<td>2007 Prospective</td>
<td>85 85</td>
<td>polyester/collagen</td>
<td>PP 61 151</td>
<td>N/A N/A</td>
<td>2.7 9.9</td>
<td>16.50 29.40</td>
<td>24 24</td>
<td>2% 4%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>573 828</td>
<td></td>
<td>93 103</td>
<td></td>
<td>2.3 4.4</td>
<td>24.7 34.6</td>
<td>23 29</td>
<td>7% 15%</td>
</tr>
</tbody>
</table>

*Abbreviations: ePTFE, expanded polytetrafluoroethylene; Lap, laparoscopic; LOS, length of stay; PP, polypropylene.*

Surgical Planning

• Mesh or NO Mesh?
A COMPARISON OF SUTURE REPAIR WITH MESH REPAIR FOR INCISIONAL HERNIA

ROLAND W. LUIJENDIJK, M.D., PH.D., WIM C.J. HOP, PH.D., M. PETROUSJKA VAN DEN TOL, M.D., DIEDERIK C.D. DE LANGE, M.D., MARIJEL M.J. BRAAKSMA, M.D., JAN N.M. IJZERMANS, M.D., PH.D., ROELOF U. BOELHOUWER, M.D., PH.D., BAS C. DE VRIES, M.D., PH.D., MARC K.M. SALU, M.D., PH.D., JACK C.J. WERELDSMA, M.D., PH.D., CORNELIS M.A. BRUIJNINCKX, M.D., PH.D., AND JOHANNES JEEKEL, M.D., PH.D.

**Table 2. Rates of Recurrence According to Whether the Repaired Incisional Hernia Was Primary or a First Recurrence.**

<table>
<thead>
<tr>
<th>Type of Hernia</th>
<th>No. of Patients</th>
<th>No. of Recurrences</th>
<th>3-YR Cumulative Rate of Recurrence</th>
<th>Difference in Risk (95% CI)*</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td>percentage points</td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suture repair</td>
<td>80</td>
<td>30</td>
<td>43</td>
<td>19 (3 to 35)</td>
<td>0.02</td>
</tr>
<tr>
<td>Mesh repair</td>
<td>74</td>
<td>15</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First recurrence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suture repair</td>
<td>17</td>
<td>9</td>
<td>58</td>
<td>38 (-1 to 78)</td>
<td>0.10</td>
</tr>
<tr>
<td>Mesh repair</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suture repair</td>
<td>97</td>
<td>39</td>
<td>46</td>
<td>23 (8 to 38)</td>
<td>0.005†</td>
</tr>
<tr>
<td>Mesh repair</td>
<td>84</td>
<td>17</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>181</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mesh Placement

Overlay

Inlay

Underlay

Awad ZT (2005) JACS 201(1):132
Surgical Planning

• **Key concepts:**
  – Tension-free repair
    • MUST reduce abdominal pressure
  – Mesh UNDERLAY
    • MOST effective placement strategy
  – Minimally invasive approach
    • MINIMIZES surgical dissection
    • MAXIMIZES visualization and recovery
General Recommendations

Table I. Recommendations of the VHWG for the technique of repair of incisional ventral hernias

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Strength of recommendation</th>
<th>Level of evidence</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reinforcement recommended for repair of all incisional ventral hernias</td>
<td>1</td>
<td>A/B</td>
<td>Burger et al&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Espinosa-de-los-Monteros et al&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Luijendijk et al&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>2. Centralize and reapproximate rectus muscles when feasible under physiologic</td>
<td>1</td>
<td>C</td>
<td>de Vries Reilingh et al&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>tension</td>
<td></td>
<td></td>
<td>Espinosa-de-los-Monteros et al&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kolker et al&lt;sup&gt;9&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VHWG opinion</td>
</tr>
<tr>
<td>3. Reduce bioburden prior to repair</td>
<td>1</td>
<td>B</td>
<td>Mangram et al&lt;sup&gt;32&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VHWG opinion</td>
</tr>
<tr>
<td>4. Placement of repair material: Underlay is the recommended technique for the</td>
<td>2</td>
<td>B</td>
<td>Awad et al&lt;sup&gt;31&lt;/sup&gt;</td>
</tr>
<tr>
<td>placement of appropriate repair material for open and laparoscopic repairs;</td>
<td></td>
<td></td>
<td>Espinosa-de-los-Monteros et al&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
<tr>
<td>overlay placement of repair material should only be considered when complete</td>
<td></td>
<td></td>
<td>Korenkov et al&lt;sup&gt;62&lt;/sup&gt;</td>
</tr>
<tr>
<td>fascia-to-fascia repair has been achieved</td>
<td></td>
<td></td>
<td>VHWG opinion</td>
</tr>
<tr>
<td>5. In the setting of gross, uncontrolled contamination, it is appropriate to</td>
<td>1</td>
<td>C</td>
<td>VHWG opinion</td>
</tr>
<tr>
<td>consider delayed repair</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ventral Hernia Working Group. Surgery 148:3
Operative Technique

• Access
• Adhesiolysis
  – Sharp dissection
  – Energy source only if unavoidable – accept some bleeding
  – Direct visualization
• Assess and measure defect
  – Techniques for doing this?
• Mesh/prosthetic preparation
• Mesh placement
  – Overlap
  – Tacks, sutures, how many sutures?
Access?
Figure 3  Intracorporeal (direct) measurement of a hernia defect. Spinal needles allow for more precise identification of the edges of the defect. Additional spinal needles may be used for defects larger than the length of a ruler (typically 12 cm).
Figure 7  Placement of tack is done circumferentially along the whole length of the mesh to avoid bowel incarceration. External palpation of the abdominal wall facilitates placement of the tacks and helps to avoid tacking the mesh below the inguinal ligament and above costal margins.

Operative Technique: Close Defects?

Overall
Mesh only 4.8%
Primary repair with mesh 3%

Recurrent hernia
Mesh only 10.5%
Primary repair with mesh 4.8%

# Principles for Hernia Repair

1. **Optimize patient condition**
   - Nutritional status
   - Blood sugar levels
   - Smoking cessation

2. **Prepare wound**
   - Reduce bioburden
   - Take down adhesions, fistulae

3. **Reapproximate midline to the extent possible using component separation when appropriate**

4. **Use appropriate reinforcement material**
   - Consider biologic repair material in patients at increased risk for surgical site occurrences