Faculty Disclosure

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Dr. Mittal has listed no financial interest/arrangement that would be considered a conflict of interest.
Mesh Related Complications of Hiatus Hernia Repair

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1. HH do recur. ? True Incidence
2. Most are asymptomatic and do not require repair.
3. Use of Mesh does not eliminate recurrence.
4. Mesh causes problems.
   a. Complications
   b. Difficulty in re-operative intervention.
5. All re-operative interventions are not for recurrent HH.
Recurrence After Paraesophageal Hernia Repair in Series With Complete Radiologic Follow-up

- 551 Patients
  - Group 1 (N=335) March 1998- July 2002
    - Simple Crural Repair
    - 6% recurrence at 2 Yrs.


- 108 Patients (Group 1 = 54)
  Anatomical Recurrence Rate @ 6 Months
    (>2cm by UGI)
  12 Patients (24%) Primary Repair

Recurrence After Paraesophageal Hernia Repair in Series With Radiologic Follow-up

Table 2. Recurrence After Surgical Treatment of PEH in Series With Systematic Radiologic Control

<table>
<thead>
<tr>
<th>Source</th>
<th>No. (%) of Patients With Esophagogram</th>
<th>Recurrence, No. (%)</th>
<th>PEH Recurrence, No.</th>
<th>Sliding, No.</th>
<th>Symptoms, No. (%)</th>
<th>Mesh Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Surgery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luostarinen et al.</td>
<td>19/22 (86)</td>
<td>8 (42)</td>
<td>4</td>
<td>4</td>
<td>7 (37)</td>
<td>±Pledged</td>
</tr>
<tr>
<td>Wu et al.</td>
<td>35/38 (92)</td>
<td>8 (23)</td>
<td>2</td>
<td>5</td>
<td>12 (34)</td>
<td>NA</td>
</tr>
<tr>
<td>Hashemi et al.</td>
<td>21/27 (78)</td>
<td>9 (43)</td>
<td>NA</td>
<td>NA</td>
<td>8 (38)</td>
<td>Pledged</td>
</tr>
<tr>
<td>Wiechmann et al.</td>
<td>44/60 (73)</td>
<td>3 (7)</td>
<td>3</td>
<td>0</td>
<td>44 (100)</td>
<td>NA</td>
</tr>
<tr>
<td>Khaitan et al.</td>
<td>15/25 (60)</td>
<td>6 (40)</td>
<td>1</td>
<td>5</td>
<td>8 (50)</td>
<td>Pledged</td>
</tr>
<tr>
<td>Jobe et al.</td>
<td>34/52 (65)</td>
<td>11 (32)</td>
<td>8</td>
<td>3</td>
<td>22 (65)</td>
<td>Pledged &gt;4 cm</td>
</tr>
<tr>
<td>Mattar et al.</td>
<td>32/125 (26)</td>
<td>11 (34)</td>
<td>NA</td>
<td>NA</td>
<td>14 (44)</td>
<td>Pledged</td>
</tr>
<tr>
<td>Keidar and Szold</td>
<td>NA</td>
<td>21 (15)</td>
<td>0</td>
<td>5</td>
<td>13 (40)</td>
<td>NA</td>
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<tr>
<td>Diaz et al.</td>
<td>66/96 (69)</td>
<td>21 (32)</td>
<td>7</td>
<td>14</td>
<td>41 (62)</td>
<td>NA</td>
</tr>
<tr>
<td>Targarona et al.</td>
<td>30/37 (81)</td>
<td>6 (20)</td>
<td>1</td>
<td>5</td>
<td>15 (50)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: NA, not available; PEH, paraesophageal hernia.

7-42% recurrence rate with radiological f/u (but mainly Symptomatic patients studied.)

But is it really so high?

- Leuketich et al (Pittsburg) 2008
  - 187 patients
  - Large PEH (> 5 cm gastric tissue)
  - Minimum 5 yr f/u
  - 82% RADIOGRAPHIC f/u
  - Median f/u 77 months
  - 15% recurrence
  - Poor symptomatic correlation.
But is it really so high?

• Yano et al (Creighton) 2008
  – 41 Patients
  – Intra-thoracic stomach
  – 1 year f/u
  – 93% (38/41) RADIOGRAPHIC (> 1 cm)
  – 3/38 (8%) recurrence
  – 2 asymptomatic 1cm recurrence.
  – 1 large recurrence after a bout of retching requiring repair (primary repair Transthoracic).
  – 20% SE with Collis gastroplasty.
Conclusion # 1 & 2

• Primary crus closure does have a failure rate.

• Recurrence after PEH > Sliding HH.

• Range variable but not more than 10-15% on long term f/u (from experienced centers).

• Most are asymptomatic and picked only on radiographic study.
1. HH do recur. ? True Incidence
2. Most are asymptomatic and do not require repair.
3. Use of Mesh does not eliminate recurrence.
4. Mesh causes problems.
   a. Complications
   b. Difficulty in re-operative intervention.
5. All re-operative interventions are not for recurrent HH.
Recurrence rate with Mesh closure

- 551 Patients
  - Group 2 (N=176) July 2002 - onwards
    - Simple Crural Repair with polypropelene mesh reinforcement
    - 1.8% recurrence at 2 Yrs.

- 108 Patients (Group 2 = 54)
  - Anatomical Recurrence Rate @ 6 Months (>2cm by UGI)
  - 4 Patients (9%) Repair with SIS group.

References:
## Recurrence rate with Mesh closure

### Table 3. Results of the Use of Mesh for PEH Repair

<table>
<thead>
<tr>
<th>Source</th>
<th>No. (%)</th>
<th>Mean Stay, d</th>
<th>Mean Follow-up, mo</th>
<th>GI Tract Symptoms</th>
<th>Recurrence</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open Surgery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Carlson et al. 1998</td>
<td>44</td>
<td>20 (45)</td>
<td>1 (2)</td>
<td>12</td>
<td>52</td>
<td>4 (10)</td>
</tr>
<tr>
<td><strong>Laparoscopy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kusterer and Gilroy, 1993</td>
<td>6</td>
<td>1 (17)</td>
<td>0</td>
<td>4</td>
<td>8-22</td>
<td>0</td>
</tr>
<tr>
<td>Edelman et al., 1995</td>
<td>5</td>
<td>2 (40)</td>
<td>1 (20)</td>
<td>4</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Fricker et al., 1998</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2.5</td>
<td>8</td>
<td>NA</td>
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<tr>
<td>Geldof et al., 1995</td>
<td>10</td>
<td>2 (20)</td>
<td>NA</td>
<td>9</td>
<td>1 (10)</td>
<td>Pellet, SE + PCR + FP</td>
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<tr>
<td>Behrens and Schürkert, 1996</td>
<td>2</td>
<td>0</td>
<td>NA</td>
<td>6</td>
<td>NA</td>
<td>Olay</td>
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<td>Huntington, 1997</td>
<td>8</td>
<td>1 (12)</td>
<td>NA</td>
<td>8</td>
<td>D</td>
<td>D</td>
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<tr>
<td>Paul et al., 1997</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>12</td>
<td>D</td>
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<tr>
<td>Frantzkis and Carlson, 1997</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>D</td>
<td>D</td>
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<td>Willems et al., 1997</td>
<td>30</td>
<td>8 (27)</td>
<td>0</td>
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<td>NA</td>
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<td>Wu et al., 1999</td>
<td>38</td>
<td>6 (16)</td>
<td>2 (5)</td>
<td>3</td>
<td>3</td>
<td>2 (5)</td>
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<tr>
<td>Kiihara and Zocchi, 1996</td>
<td>27</td>
<td>1 (4)</td>
<td>3.8</td>
<td>1-5</td>
<td>8 (30)</td>
<td>0</td>
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<td>Basso et al., 2000</td>
<td>67</td>
<td>3 (4)</td>
<td>3.5</td>
<td>22</td>
<td>6 (9)</td>
<td>0</td>
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<tr>
<td>Lambert and Huddart, 2001</td>
<td>7</td>
<td>1 (14)</td>
<td>0</td>
<td>NA</td>
<td>1 (14)</td>
<td>Olay</td>
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<tr>
<td>Meyer et al., 2002</td>
<td>10</td>
<td>1 (10)</td>
<td>0</td>
<td>24</td>
<td>0</td>
<td>0</td>
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<td>Casaccia et al., 2004</td>
<td>8</td>
<td>1 (12)</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>0</td>
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<tr>
<td>Kamizono et al., 2002</td>
<td>100</td>
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<td>0</td>
<td>NA</td>
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<td>0</td>
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<tr>
<td>Ponsky et al., 2003</td>
<td>1</td>
<td>NA</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>0</td>
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<td>Champion and Rock, 2003</td>
<td>52</td>
<td>0</td>
<td>1</td>
<td>25</td>
<td>21 (40)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Geisler et al., 2003</td>
<td>9</td>
<td>0</td>
<td>1 (11)</td>
<td>NA</td>
<td>8</td>
<td>NA</td>
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<tr>
<td>Leeder et al., 2003</td>
<td>14</td>
<td>NA</td>
<td>NA</td>
<td>2</td>
<td>46</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Keidar and Szold, 2003</td>
<td>10</td>
<td>NA</td>
<td>0</td>
<td>3</td>
<td>56</td>
<td>NA</td>
</tr>
<tr>
<td>Grandjean et al., 2003</td>
<td>24</td>
<td>1 (4)</td>
<td>NA</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Abbreviations: ACR, anterior crural repair; CR, crural repair; FP, fundoplication; NA, not available; PCR, posterior crural repair; PEH, paraesophageal hernia; PTFE, polytene; SE, sac excision.
84 yr F 2 yrs. s/p HH repair with Prolene mesh
48 yr M, 1 yrs. s/p recurrent HH repair with Gortex mesh (from chest)
Conclusion # 3

- Use of Mesh for crus reinforcement decreases hiatus hernia recurrence
  - *Not eliminate it.*
  - *? 5% with use of prosthesis.*
1. HH do recur. ? True Incidence
2. Most are asymptomatic and do not require repair.
3. Use of Mesh does not eliminate recurrence.
4. Mesh causes problems.
   a. Complications
   b. Difficulty in re-operative intervention.
5. All re-operative interventions are not for recurrent HH.
Meshes cause problems

- Synthetic
- Bio-prosthesis
- Erosions/ perforations
- Adhesions/ Fibrosis
# Prosthesis Related Complications

<table>
<thead>
<tr>
<th>Source</th>
<th>No. With Complication/Total No. (%)</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open Surgery</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carlson et al., 1998</td>
<td>1/44 (2.3)</td>
<td>Esophageal erosion 29 mo after mesh placement</td>
</tr>
<tr>
<td><strong>Laparoscopy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edelman, 1995</td>
<td>1/5 (20.0)</td>
<td>Dysphagia and fibrosis after tension-free repair with mesh + FP + gastrostomy; reoperation for esophageal stenosis</td>
</tr>
<tr>
<td>Trus et al., 1997</td>
<td>1/76 (1.3)</td>
<td>Dysphagia, mesh extraction</td>
</tr>
<tr>
<td>Schauer et al., 1998</td>
<td>1/70 (1.4)</td>
<td>Late esophageal perforation (ischemia), mesh (PTFE) extraction</td>
</tr>
<tr>
<td>Kemppainen and Kiviluoto, 2000</td>
<td>NA</td>
<td>Cardiac tamponade secondary to mesh fixation with “tacker”</td>
</tr>
<tr>
<td>Peet et al., 2000</td>
<td>1/22 (4.5)</td>
<td>Dysphagia and adherences secondary to crural closure, reinforcement with Dacron strips</td>
</tr>
<tr>
<td>Baladas et al., 2000</td>
<td>1/734 (0.1)</td>
<td>Gastroesophageal fistula secondary to FP reinforced by Teflon pledgets</td>
</tr>
<tr>
<td>Arendt et al., 2000</td>
<td>NA</td>
<td>Dysphagia; transmural migration of Teflon pledgets into esophagus 9 y after FP</td>
</tr>
</tbody>
</table>
Mesh Complications after Prosthetic Reinforcement of the Hiatal Closure - A 28 Case Series

Rudolf J Stadlhuber, MD
Amr El Sherif, MD
Sumeet K Mittal, MD
Robert J Fitzgibbons Jr., MD
L Michael Brunt, MD
John G Hunter, MD
Tom R DeMeester, MD
Lee L Swanstrom, MD
C Daniel Smith, MD
Charles J Filipi, MD

Creighton University Medical School, Department of Surgery
SAGES 2008, Philadelphia
28 Patients

- Polypropylene: 12 patients
- PTFE: 8 patients
- Dual Mesh: 7 patients
- Bio Mesh: 1 patient
Treatment/ Intervention

- Open Mesh Excision: 2
- Esophagostomy: 1
- Esophagectomy: 6
- Partial Gastrectomy: 2
- Total Gastrectomy: 1
- Lap. Mesh Excision: 11
- No Operation: 5

7th Esophageal conference, Omaha, NE 2009
Personal experience #1

Left thoracotomy with laparotomy with proximal esopahgo-gastrectomy with RNY esopahgo-jejunostomy.

7th Esophageal conference, Omaha, NE 2009
Personal experience #2

54 Yr. F 8 months s/p repair of recurrent HH with Sandwich PTFE and Dual mesh (chest and abdomen)

Laparotomy, Diverting esophagostomy with subsequent Takedown, EGD with Stent placement (for stenosis)
If I get this case today I would do an esophagectomy
Personal experience # 3 (Bioprosthesis)

80 Yr old female underwent repair of intra-thoracic stomach with primary crus closure, SIS reinforcement, No Fundoplication

Unrelenting dysphagia: despite multiple dilations (> 3 months)
   Distal 1/3rd stricture

Esophagectomy with GPU.
   Stomach and esophagus fused to the hiatus.

Symptom free now.
Conclusion #4a

• Mesh erode into viscera
  – *Require excision and/or prolonged hospitalization*

• Mesh cause dense fibrosis leading to problems
  – *Dysphagia- unresponsive to dilations*
Re-operative intervention with previous mesh
Re-operative intervention with previous mesh

Asked to see 75 Yr. F with profound dysphagia 10 days post-op Laparoscopic PEH repair, Nissen and SIS crus reinforcement.

Contrast study showed Slipped/ Misplaced fundoplication.

Redo procedure: stomach fused to the hiatus, along with the Splenic hilum. NO RECURRENT HH !!!

Required takedown fundoplication, partial gastrectomy, Splenectomy, partial anterior wrap.
Conclusion #4b

• Prior use of Mesh make re-operative procedure technically challenging and even dangerous.
1. HH do recur. ? True Incidence
2. Most are asymptomatic and do not require repair.
3. Use of Mesh does not eliminate recurrence.
4. Mesh causes problems.
   a. Complications
   b. Difficulty in re-operative intervention.
5. All re-operative interventions are not for recurrent HH.
Causes of failure as identified during re-operative anti-reflux surgery

<table>
<thead>
<tr>
<th>Study</th>
<th>Journal</th>
<th>N</th>
<th>Hiatus Hernia</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byrne et al</td>
<td>BJS, 2005</td>
<td>118</td>
<td>48</td>
<td>41%</td>
</tr>
<tr>
<td>Ohnmacht et al</td>
<td>An of Thor S, 2006</td>
<td>126</td>
<td>59</td>
<td>48%</td>
</tr>
<tr>
<td>Awad et al</td>
<td>Surg. Endo. 2001</td>
<td>36</td>
<td>12</td>
<td>33%</td>
</tr>
<tr>
<td>Hinder et al</td>
<td>Arch. Of Surg 2009</td>
<td>47</td>
<td>31</td>
<td>67%</td>
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<tr>
<td>Rosemurgy et al</td>
<td>Am Surg, 2004</td>
<td>64</td>
<td>39</td>
<td>61%</td>
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<tr>
<td>Swanstrom et al</td>
<td>Arch. of Surg, 2007</td>
<td>176</td>
<td>73</td>
<td>42%</td>
</tr>
<tr>
<td>Smith, Hunter et al</td>
<td>Ann of Surg, 2005</td>
<td>289</td>
<td>70</td>
<td>51%</td>
</tr>
<tr>
<td>Mittal et al</td>
<td>Not published</td>
<td>102</td>
<td>70</td>
<td>69%</td>
</tr>
</tbody>
</table>
Even for acute re-operative intervention

**Early Reoperation Following Laparoscopic Antireflux Surgery**

Patrick Yau, MD, David I. Watson, MD, Peter G. Devitt, MS, Phillip A. Game, MBBS, Glyn G. Jamieson, MS, Adelaide, South Australia, Australia

<table>
<thead>
<tr>
<th>Indications for Early Reoperation</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute hiatus hernia</td>
<td>8</td>
</tr>
<tr>
<td>“Tight” Nissen fundoplication</td>
<td>8</td>
</tr>
<tr>
<td>“Tight” diaphragmatic hiatus</td>
<td>9</td>
</tr>
<tr>
<td>Recurrent reflux</td>
<td>1</td>
</tr>
<tr>
<td>Postoperative haemorrhage</td>
<td>3</td>
</tr>
<tr>
<td>Coeliac and superior mesenteric artery thrombosis</td>
<td>1</td>
</tr>
</tbody>
</table>

759 patients
30 early re-operations
27% for acute herniation
Conclusion # 5

- Roughly 50-60% of failures requiring re-operative anti-reflux surgery can be attributed to recurrent hiatus hernia.

- In most series only 4-6% of own patients require re-operative intervention.
  - Hunter/Smith, Filipi, Mittal, Swanstrom, Madan/ Pelligrini

- 2-3% of patients having surgery at experienced centers would require re-operative intervention attributable to cruz failure.
Summary

- Primary anti-reflux surgery does fail and operative re-intervention is needed.
  - Most recurrent HH small and do not require operative re-intervention
  - 50% of failures not because of crus failure.
  - Short esophagus: probably underestimated.
- Mesh decreases rate of crus failure.
  - But will not decrease other causes of failure.
  - Recurrence is not ZERO.
Summary

• **Synthetic Mesh can erode into the viscera.**
  - *Incidence not known.*
  - *Re-operative intervention with erosions usually needed and not pretty.*
  - *Non-erosion cases: re-operative intervention difficult not impossible with PTFE mesh.*

• **Biological Mesh**
  - *If erode should be able to manage conservatively.*
  - *Hiatus Stenosis is known but underappreciated.*
  - *Re-operative intervention is difficult: with possible need for resection: fusion of stomach to the hiatus.*
Lessons learned

• **Primary crus closure: even for large defects**
  – *Preserve diaphragmatic fascia.*
  – *Address the short esophagus.*

• **Use mesh very very selectively**
  – *Only if crus tears: fascia not preserved*
  – *? For recurrent large HH if primary surgery was done well*
  – *? Steroids*

• **Use absorbable mesh ?**
  – *Make sure you do a good wrap!!*
  – *Hope you do not have to go back*