Surgical Management of Achalasia

Laparoscopic Heller Myotomy versus Per-Oral Endoscopic Myotomy

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Achalasia

- A disease of uncertain etiology affecting ~1 per 100,000 adults
  - Incidence increases with age
- Primary symptoms are dysphagia (solids and liquids) and regurgitation
- Diagnosis confirmed with motility
- High-resolution motility has shown 3 types
Normal Swallow on HRM
Normal Swallow on HRM with Impendence
Achalasia on HRM
Achalasia on HRM with Impedance
HRM Achalasia Types

Type I
- Classic achalasia
- Elevated IRP
- Absent peristalsis
- No pressurization

Type II
- Elevated IRP
- Absent peristalsis
- Pan-esophageal pressurization

Type III
- Elevated IRP
- No normal peristalsis
- Preserved fragments of distal peristalsis or spastic contractions in greater than 20% of swallows
Achalasia Treatment Concepts

- No treatment restores function to LES or esophageal body
- Goal is relief of outflow resistance with improvement in dysphagia
- All therapies move obstructed LES toward open LES (from dysphagia toward GERD)
Heller Myotomy

- Dr Ernest Heller introduced surgical treatment in 1913
- With some modifications remains the primary surgical therapy today
  - Myotomy extended 2-3 cm down onto stomach
  - Laparoscopic rather than open
  - Partial antireflux procedure added
LHM: Relief of Symptoms

Figure 1. Actuarial curve for symptom control showing probability of patients being symptom-free at 5-year follow-up. The number of patients evaluated is given in brackets. No patients were lost to follow-up; three died of unrelated causes 18, 44, and 56 months, respectively, after the Heller myotomy.

Laparoscopic Heller Myotomy Versus Endoscopic Balloon Dilatation for the Treatment of Achalasia

A Network Meta-Analysis

Markus B. Schoenberg, MD,*† Svetlana Marx, PhD,§ Jan F. Kersten, PhD,¶ Thomas Rösch, MD,||
Sebastian Belle, MD,‡ Georg Kähler, MD,† Melina C. Vassiliou, MD,‖ Stefan Lüth, MD,**
and Daniel von Renteln, MD||

Success rate when outcomes including all redilatations were evaluated

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>EBD Events</th>
<th>Total</th>
<th>LHM Events</th>
<th>Total</th>
<th>Weight</th>
<th>Odds Ratio M–H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeckxstaens 2011</td>
<td>6</td>
<td>85</td>
<td>0</td>
<td>98</td>
<td>51.4%</td>
<td>16.11 [0.89, 290.27]</td>
</tr>
<tr>
<td>Kostic 2007</td>
<td>5</td>
<td>26</td>
<td>0</td>
<td>25</td>
<td>48.6%</td>
<td>13.05 [0.68, 249.61]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>111</td>
<td>123</td>
<td>100.0%</td>
<td></td>
<td></td>
<td>14.62 [1.85, 115.33]</td>
</tr>
</tbody>
</table>

Total events 11
Heterogeneity: $\chi^2 = 0.01, df = 1 (P = 0.92); I^2 = 0$
Test for overall effect: $Z = 2.55 (P = 0.01)$

FIGURE 6. Forest plot after 12 months of direct comparison including additional redilations effect. Seventeen patients lost to follow-up or discontinued the study after 12 months in the publication by Boeckxstaens et al.
Need for Retreatment

Figure. Time to Subsequent Treatment After Initial Treatment During the Study Period

<table>
<thead>
<tr>
<th>Time, y</th>
<th>Pneumatic Dilatation</th>
<th>Surgical Myotomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>0.80</td>
<td>0.60</td>
</tr>
<tr>
<td>4</td>
<td>0.60</td>
<td>0.40</td>
</tr>
<tr>
<td>6</td>
<td>0.40</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Log-Rank P<.001

No. at Risk
- Pneumatic Dilatation: 1181, 508, 329, 193, 108, 40
- Surgical Myotomy: 280, 158, 114, 73, 42, 16

Lopushinksy SR and Urbach DR. JAMA, 2006
Location of Myotomy

LHM: Pros and Cons

- **Pros:**
  - Minimally invasive, short hospital stay and recovery
  - Reliable and reproducible results worldwide
  - Effective for all HRM types of achalasia

- **Cons:**
  - Incisions and some restrictions during healing
  - Reoperation can be difficult
Lap Myotomy with Dor
Haruhiro Inoue

- 1st human POEM procedure 2008

Peroral endoscopic myotomy (POEM) for esophageal achalasia

2010

Authors

Institution
Digestive Disease Center, Showa University Northern Yokohama Hospital
Submucosal Tunnel and Myotomy
Close Mucosotomy
POEM: Safety

• First human procedure in Sept 2008
• Worldwide over 1200 procedures performed
• Single center reports and recent multi-center prospective studies published with no mortality and minimal morbidity
• USC experience:
  • 35 patients from Oct 2012-Dec 2014
  • 4 minor complications, no mortality
POEM: Efficacy
Eckardt Symptom Score

n=452

**Improvement in Eckardt Score**

**POEM vs LHM**

<table>
<thead>
<tr>
<th>Study name</th>
<th>Statistics for each study</th>
<th>Sample size</th>
<th>Std diff in means and 95% CI</th>
<th>Relative weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std diff in means</td>
<td>Lower limit</td>
<td>Upper limit</td>
<td></td>
</tr>
<tr>
<td>Vigneswaran et al.; 2014</td>
<td>-0.765</td>
<td>-2.245</td>
<td>0.715</td>
<td>9.76</td>
</tr>
<tr>
<td>Tietelbaum et al.; 2013</td>
<td>0.000</td>
<td>-0.739</td>
<td>0.739</td>
<td>39.14</td>
</tr>
<tr>
<td>Ujiki et al.; 2013</td>
<td>-0.669</td>
<td>-1.315</td>
<td>-0.022</td>
<td>51.09</td>
</tr>
<tr>
<td>Total effect (95% CI)</td>
<td>-0.416</td>
<td>-0.879</td>
<td>0.046</td>
<td></td>
</tr>
</tbody>
</table>

[Heterogeneity: $\tau^2 = 0.002; Q = 2.02; df = 2; I^2 = 0.84%; p = 0.635$]

Test of overall effect: $Z = -1.77; p = 0.078$

Type III Achalasia Pre-POEM
Development of GERD Symptoms

POEM vs LHM

<table>
<thead>
<tr>
<th>Study name</th>
<th>Odds ratio</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>POEM</th>
<th>LHM</th>
<th>Relative weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhayani et al.; 2014</td>
<td>2.465</td>
<td>0.520</td>
<td>11.679</td>
<td>4/37</td>
<td>3/64</td>
<td>33.63</td>
</tr>
<tr>
<td>Hungness et al.; 2013</td>
<td>1.250</td>
<td>0.221</td>
<td>7.077</td>
<td>2/18</td>
<td>5/55</td>
<td>27.08</td>
</tr>
<tr>
<td>Ujiki et al.; 2013</td>
<td>1.231</td>
<td>0.292</td>
<td>5.192</td>
<td>5/18</td>
<td>5/21</td>
<td>39.28</td>
</tr>
<tr>
<td>Total effect (95% CI) [Fixed]</td>
<td>1.561</td>
<td>0.633</td>
<td>3.848</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: \( \tau^2 = 0.000; Q = 0.49; df=1; I^2 = 0.00\%; p = 0.799 \)

Test of overall effect: \( Z = 0.968; p = 0.333 \)

Esophagitis after POEM: USC

The good  45%

The bad  50%

The ugly  5%
Table 1. Gastroesophageal Reflux After POEM Treatment

<table>
<thead>
<tr>
<th>Clinical symptoms, %</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall rate</td>
<td>33</td>
<td>30</td>
<td>37</td>
</tr>
<tr>
<td>Daily</td>
<td>1.5</td>
<td>6.6</td>
<td>7.8</td>
</tr>
<tr>
<td>Occasionally</td>
<td>31.3</td>
<td>23.4</td>
<td>29.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PPI use, %</th>
<th>34</th>
<th>39</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall rate</td>
<td>34</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Daily</td>
<td>11.9</td>
<td>24.6</td>
<td>19.6</td>
</tr>
<tr>
<td>Occasionally</td>
<td>22.4</td>
<td>14.8</td>
<td>9.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Endoscopic erosions, %</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall rate</td>
<td></td>
</tr>
<tr>
<td>Grade A</td>
<td>29.2</td>
</tr>
<tr>
<td>Grade B</td>
<td>12.3</td>
</tr>
<tr>
<td>Grade C</td>
<td>None</td>
</tr>
<tr>
<td>Grade D</td>
<td>None</td>
</tr>
</tbody>
</table>
POEM in Perspective

- Reflux is a problem after Heller myotomy even with partial fundoplication (Multi-center RCT)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dor ($n = 24$)</th>
<th>Toupet ($n = 19$)</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeMeester score$^a$</td>
<td>5.6 (0–131)</td>
<td>3.0 (0–107)</td>
<td>0.603</td>
</tr>
<tr>
<td>% Total time pH $\leq 4^a$</td>
<td>2.4% (0–34.5%)</td>
<td>0.6% (0–10.8%)</td>
<td>0.582</td>
</tr>
<tr>
<td>Abnormal acid reflux$^b$</td>
<td>10 (41.7%)</td>
<td>4 (21.1%)</td>
<td>0.152</td>
</tr>
</tbody>
</table>

Dilatation Versus Myotomy: GERD

- Evaluation at 12 months with pH and EGD
- Pathologic pH test 15% dilation vs 23% LHM, p=0.28
- Esophagitis in 19% dilation vs 21% LHM, p=0.84

POEM Pros and Cons

**Pros:**
- Safe, scarless with minimal pain, rapid recovery and no restrictions apart from diet
- Excellent relief of dysphagia
- Can be used for all HRM types of achalasia and for failed other procedures

**Cons:**
- No long-term data
- Early reflux more frequent but appears to be managed well with PPIs, endoscopic fundo?
Conclusions

- Both LHM and POEM are options for patients with all types of achalasia
- LHM remains “gold standard”, time will tell if POEM matches up
- GERD is an issue after all therapies for achalasia, particularly POEM
  - A hiatal hernia should be relative contraindication for POEM
- Thoracic surgeons should lead the way and offer all options for achalasia therapy