Achalasia: Inject, Dilate, or Surgery?

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Northwestern University
Chief, Division of Gastroenterology and Hepatology
Northwestern Medicine
Northwestern Memorial Hospital

EGJ Outflow Obstruction
- Incompletely expressed achalasia
- Mechanical obstruction

Ineffective Motility (IEM)
- >50% ineffective swallows
- Fragmented peristalsis
  - >50% fragmented swallows and not meeting criteria for IEM (mean DCI >450 mmHg-s-cm)

Distal esophageal spasm (DES)
- ≥20% premature contractions (DL<4.5 s)
- Jackhammer esophagus
  - ≥20% of swallows with DCI >8,000 mmHg-cm-s and normal DL

Absent Contractility
- No scorable contraction by DCI and DL criteria (should consider achalasia with borderline IRP and/or bolus pressurization)

Ineffective Motility (IEM)
- ≥50% ineffective swallows
- Fragmented peristalsis
  - >50% fragmented swallows and not meeting criteria for IEM (mean DCI >450 mmHg-s-cm)

Rapid contraction and Hypertensive peristalsis are not considered distinct clinical-pathological entities in CC v3.0
Disorders of EGJ Outflow Obstruction
- Incompletely expressed achalasia
- Mechanical obstruction

Major Disorders of Peristalsis
- Entities not seen in normal controls

Pressure Topography of Esophageal Motility

IRP ≥ upper limit of normal AND 100% failed peristalsis or spasm
- Yes

IRP ≥ upper limit of normal AND sufficient evidence of peristalsis such that criteria for type III achalasia are not met
- Yes

IRP is normal AND 100% failed peristalsis
- Yes

Achalasia
- Type I: 100% failed peristalsis [no PEP]
- Type II: 100% failed peristalsis [+ PEP]
- Type III: >20% premature contractions

EGJ Outflow Obstruction
- Incompletely expressed achalasia
- Mechanical obstruction

Absent Contractility
- No scorable contraction by DCI and DL criteria (should consider achalasia with borderline IRP and/or bolus pressurization)

Does the Chicago Classification provide insight into Natural History?

Early Type II or III EGJOO
Chronic Type II/III--I
Late Type I/ Absent Contractility
Esophageal Physiology: Neuromuscular Control

Concept of Inhibitory and Excitatory Balance

A: EGJ Outflow Obstruction

B: Type II Achalasia

C: Type I Achalasia

D: Type III achalasia

Symptoms of dysphagia ± chest pain and bland regurgitation

Upper Endoscopy

Obstructive process: ring, stricture, etc.

Normal

High Resolution Manometry

*esophagram may be helpful when manometry is technically difficult to perform

EPT Diagnosis

EGJ Outflow Obstruction

- EGJ or EUS/CT to rule out obstructive process
- Potentially achalasia phenotype with preserved peristalsis

Absent Peristalsis

- If clinical scenario c/w achalasia, a timed barium esophagram should be performed
- Potentially advanced GERD or scleroderma
- Potentially achalasia phenotype with hypotensive LES

Achalasia I

- Severe dilatation is associated with poor treatment response
- Consider myotomy as initial therapy

Achalasia II

- Best treatment response
- Esophagram can be normal without barium retention or esophageal dilatation
- Frequently misdiagnosed with conventional manometry

Achalasia III

- Worst treatment response
- May benefit from treatment directed at spasm
- Often diagnosed as DES on esophagram

DES

- Extremely rare
- Difficult to treat
- Many cases are misdiagnosed Type III achalasia

Utilizing HRM/EPT in the Management of Achalasia
Response Rates of Achalasia Treatments

Patients categorized by pressure topography subtype

<table>
<thead>
<tr>
<th>Author</th>
<th>Subtype</th>
<th>No. patients (%)</th>
<th>Success rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandolfino</td>
<td>I</td>
<td>21 [21.2]</td>
<td>56*</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>49 [49.5]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>29 [29.3]</td>
<td>29*</td>
</tr>
<tr>
<td>Salvador (LHM)</td>
<td>I</td>
<td>96 [39]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>127 [51.6]</td>
<td>85.9</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>23 [9.4]</td>
<td>33.3</td>
</tr>
<tr>
<td>Pratap (PD)</td>
<td>I</td>
<td>24 [47.1]</td>
<td>69.3</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>24 [47.1]</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>3 [5.8]</td>
<td>33.3</td>
</tr>
<tr>
<td>Rohof (PD &amp; LHM)</td>
<td>I</td>
<td>44 [25]</td>
<td>85.7</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>114 [64.7]</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>18 [10.2]</td>
<td>86</td>
</tr>
</tbody>
</table>

LHM, laparoscopic heller myotomy; PD, pneumatic dilatation.


Response Rates of Achalasia Treatments

Patients categorized by pressure topography subtype

<table>
<thead>
<tr>
<th>Study</th>
<th>OR (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandolfino (2008)</td>
<td>0.07 (0.06, 1.17)</td>
<td>12.58</td>
</tr>
<tr>
<td>Crepin (2014)</td>
<td>0.18 (0.11, 3.15)</td>
<td>8.43</td>
</tr>
<tr>
<td>Salvador (2010)</td>
<td>0.29 (0.11, 0.78)</td>
<td>59.48</td>
</tr>
<tr>
<td>Rohof (2013)</td>
<td>0.32 (0.12, 1.06)</td>
<td>21.51</td>
</tr>
<tr>
<td>Overall (P = 0.00, P = 0.835)</td>
<td>0.26 (0.12, 0.82)</td>
<td>100.00</td>
</tr>
</tbody>
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<th>Study</th>
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<th>% Weight</th>
</tr>
</thead>
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<tr>
<td>Pandolfino (2008)</td>
<td>8.01 (1.14, 6.78)</td>
<td>13.31</td>
</tr>
<tr>
<td>Crepin (2014)</td>
<td>3.36 (0.12, 10.29)</td>
<td>10.98</td>
</tr>
<tr>
<td>Salvador (2010)</td>
<td>8.82 (0.35, 29.85)</td>
<td>53.97</td>
</tr>
<tr>
<td>Rohof (2013)</td>
<td>2.94 (0.20, 20.87)</td>
<td>34.03</td>
</tr>
<tr>
<td>Overall (P = 0.00, P = 0.844)</td>
<td>6.68 (0.72, 17.28)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

ACHALASIA: Treatment Options

- **Medication**
  - Nitrates
  - Calcium channel blockers
  - Phosphodiesterase inhibitors (sildenafil, etc.)

- **Botulinum toxin injection**

- **Pneumatic dilation**

- **Laparoscopic Heller myotomy**

- **Emerging Treatments**
  - Peroral endoscopic myotomy (POEM)

Recommendations: Treatment

- **Definitive treatment of achalasia include pneumatic dilation and Heller's myotomy which have equal long-term outcomes and the choice between the two forms of therapy should be based on practices and institutional expertise as well as patient preference**
  - (Strong recommendation, high quality evidence).

- **Younger males may benefit more from myotomy or initial dilation with the larger balloon sizes of 3.5 cm**
  - (Weak recommendation, moderate quality evidence).

- **Pharmacologic therapy for achalasia (botulinum toxin, nitrates, calcium channel blockers) should be reserved for those who cannot undergo definitive treatment with either pneumatic dilation or surgical myotomy**
  - (Strong recommendation, high quality evidence).
ACHALASIA: Treatment Options

- Medication
  - Nitrates
  - Calcium channel blockers
  - Phosphodiesterase inhibitors (sildenafil, etc.)

- Botulinum toxin injection
  - Pneumatic dilation
  - Laparoscopic Heller myotomy

- Emerging Treatments
  - Peroral endoscopic myotomy (POEM)

PNEUMATIC DILATION

- Same day procedure
- Graded dilation:
  - 3.0 - 3.5 - 4.0 cm balloons
- Endoscopy
- Balloon placement by fluoroscopy
- Gradual dilation until “waist” flattens
- 8-10 psi x 15-60 seconds
- Post dilation esophagram?
- Observe x 2-3 hours
HELLER MYOTOMY

- Requires 1-2 days of hospitalization
- Needs to be performed by an experienced surgeon with esophageal training.
- Recovery is longer in terms of post-operative pain and ability to return to normal activity and advance diet.
- More expensive

Pneumatic Dilation versus Laparoscopic Heller’s Myotomy for Idiopathic Achalasia

_Pneumatic Dilation versus Laparoscopic Heller’s Myotomy for Idiopathic Achalasia_

_Guy E. Boeckxstaens, M.D., Ph.D., Vito Annese, M.D., Ph.D., Stanislas Bruley des Varannes, M.D., Ph.D., Stanislas Chaussade, M.D., Ph.D., Mario Costantini, M.D., Ph.D., Antonello Cuttitta, M.D., Ignasi Elizalde, M.D., Uberto Fumagalli, M.D., Ph.D., Marianne Gaudric, M.D., Ph.D., Wout O. Rohof, M.D., André J. Smout, M.D., Ph.D., Jan Tack, M.D., Ph.D., Aeilko H. Zwinderman, Ph.D., Giovanni Zaninotto, M.D., Ph.D., and Olivier R. Busch, M.D., Ph.D., for the European Achalasia Trial Investigators*_
Pneumatic Dilation versus Laparoscopic Heller Myotomy for Idiopathic Achalasia

Figure 2. Kaplan–Meier Curves for the Rate of Treatment Success.


Pneumatic Dilation versus Laparoscopic Heller Myotomy for Idiopathic Achalasia

Moonen et al Gut 2016
Pneumatic Dilation versus Laparoscopic Heller Myotomy for Idiopathic Achalasia

Moonen et al Gut 2016

Hydraulic dilator (EsoFLIP®)

14 paired impedance planimetry electrodes at 0.5-cm spacing
Hydraulic dilation

- Placement over a thin-tipped guidewire

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Volume (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

Positioned across EGJ via fluoroscopy (most) and FLIP-waist (all) at 30-mL fill volume

Wire removed

EGJ

8.4 mm

Filled to max volume

Held for 30-60 s

EGJ

15.6 mm

Dilation repeated

(7/10 patients)

Held for 30-60 s

Final EGJ measurement at 30 mL

Baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Hydraulic dilation</th>
<th>Pneumatic dilation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years, mean +/- SD</td>
<td>48 +/- 15</td>
<td>44 +/- 17</td>
<td>0.529</td>
</tr>
<tr>
<td>Gender: F/M</td>
<td>4/6</td>
<td>4/6</td>
<td>1.0</td>
</tr>
<tr>
<td>Achalasia subtype, n (%)</td>
<td></td>
<td></td>
<td>0.515</td>
</tr>
<tr>
<td>Type I</td>
<td>2 (20)</td>
<td>3 (30)</td>
<td></td>
</tr>
<tr>
<td>Type II</td>
<td>5 (50)</td>
<td>7 (70)</td>
<td></td>
</tr>
<tr>
<td>Type III</td>
<td>1 (10)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>FLIP Dx</td>
<td>2 (20)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Median IRP, mmHg</td>
<td>28 (23 – 31)</td>
<td>35 (29 – 54)</td>
<td>0.043</td>
</tr>
<tr>
<td>[n = 8]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basal EGJ pressure, mmHg</td>
<td>30 (16 -49)</td>
<td>29 (22 – 45)</td>
<td>0.965</td>
</tr>
<tr>
<td>EGJ-DI, mm²/mmHg</td>
<td>0.87 (0.74 – 1.2)</td>
<td>1.0 (0.66 – 1.2)</td>
<td>0.897</td>
</tr>
<tr>
<td>[n = 8]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline ES</td>
<td>6.5 (5 – 8)</td>
<td>6.5 (4 – 8)</td>
<td>0.631</td>
</tr>
</tbody>
</table>

Values are median (range) unless otherwise specified
Symptomatic outcomes

Results: Clinical outcomes

Hydraulic dilation

Pneumatic dilation

Positive outcome 77% (7/9)

Positive outcome 88% 8/9

Type I
Type II
Type III
FLIP - Dx

Re-intervention
Median

Per Oral Endoscopic Myotomy (POEM)

Fukuoka univ.
International Experience with POEM

First case in August 2010
- 165 cases over the last five years

<table>
<thead>
<tr>
<th>First 120 Cases</th>
<th>Pre-op</th>
<th>1-year post-op</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eckardt score</td>
<td>7</td>
<td>1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Clinical success (Eckardt &lt;4)</td>
<td>-</td>
<td>92%</td>
<td>-</td>
</tr>
<tr>
<td>4-sec IRP (mmHg)</td>
<td>30.2</td>
<td>11.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>5min column height on TBE (cm)</td>
<td>13</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Symptomatic GER</td>
<td>-</td>
<td>11%</td>
<td>-</td>
</tr>
<tr>
<td>Esophagitis &gt; Grade A</td>
<td>-</td>
<td>17%</td>
<td>-</td>
</tr>
</tbody>
</table>
Response Rates of POEM versus LHM

Comparator Trial in Type III

Procedural characteristics and outcomes

<table>
<thead>
<tr>
<th></th>
<th>POEMn=49</th>
<th>LHMn=26</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median length of myotomy (cm)</td>
<td>16 (7–26)</td>
<td>8 (6–10)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Median procedure time (min)</td>
<td>102 (43–345)</td>
<td>264 (189–531)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Adverse events, n (%) Mild Moderate Total</td>
<td>2 (4) 1 (2) 3 (6)</td>
<td>1 (4) 6 (23) 7 (27)</td>
<td>1&lt;0.01&lt;0.01</td>
</tr>
<tr>
<td>Mean length of stay, days (SD)</td>
<td>3.3 (1.9)</td>
<td>3.2 (2.3)</td>
<td>0.68</td>
</tr>
<tr>
<td>PPI therapy, n (%)</td>
<td>19 (38.8)</td>
<td>12 (46.1)</td>
<td>0.7</td>
</tr>
<tr>
<td>Eckardt stage II or III, n (%)</td>
<td>1 (2.0)</td>
<td>5 (19.2)</td>
<td>0.01</td>
</tr>
<tr>
<td>Need for subsequent therapy, n (%)</td>
<td>0</td>
<td>2 (7.7)</td>
<td>0.11</td>
</tr>
<tr>
<td>Clinical response, n (%)</td>
<td>48 (98)</td>
<td>21 (80.8)</td>
<td>0.01</td>
</tr>
<tr>
<td>Duration of follow-up, months (SD)</td>
<td>8.6 (1.7)</td>
<td>21.5 (3.9)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Per Oral Endoscopic Myotomy (POEM)
Tailored: failed Heller Myotomy
Clinical Pearls: Achalasia in the 21st century

- Achalasia can be more accurately defined and subtyped into clinically relevant phenotypes that may alter management.
  - Counsel patients on prognosis
  - Consider further imaging
- Pneumatic Dilation and Surgical Myotomy are equivalent if one considers requirement of multiple PDs equivalent to HM.
- New techniques are evolving that can tailor therapy based on subtype.
  - Consider POEM for type III achalasia
- Medical therapy should be reserved for patients who are not surgical candidates or as adjunct therapies in those patients who have undergone definitive therapy.
- No therapy is perfect and patients may require re-intervention and should be followed closely.