Update On The Natural History Of Penetrating Aortic Ulcers (PAUs) And Intramural Hematomas (IMHs) With And Without TEVAR Treatment:
Medical Treatment Has A High Failure Rate: So When And How Should They Be Treated

Jean M. Panneton, MD, FRCSC, FACS
Professor of Surgery,
Chief & Program Director
Division of Vascular Surgery
Eastern Virginia Medical School
Co-Director, Sentara Aortic Center
Norfolk, VA

Failure of BMT for IMH
PANNETJM@EVMS.EDU

PAU: Natural History
PAU growth rate is proportional to the total aortic diameter and significant expansion is only when initial TAD is > 42mm

IMH: Controversies
• Reluctance or resistance to perform TEVAR in acute type B IMH
• Can TEVAR be done safely?
• Is TEVAR effective at positive aortic remodeling?

Medical therapy is the recommended treatment for majority of patients with type B IMH:
• How successful is best medical therapy (BMT) in reality?

“PAU growth rate and risk of rupture are low. Endovascular repair of symptomatic, ruptured, and large PAUs is safe and effective with excellent long-term results. For asymptomatic PAUs, serial CT surveillance is associated with a low rate of rupture or complications”


Failure of BMT for IMH

High medical therapy failure rate increasingly reported:

<table>
<thead>
<tr>
<th>Medical therapy failure rate</th>
<th>Bischoff et al.</th>
<th>Schoenhoff et al.</th>
<th>Ye et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>68.3%</td>
<td>60.0%</td>
<td>67.7%</td>
</tr>
</tbody>
</table>


IMH: Outcomes of Medical Therapy

IMH: EVMS Experience

1. Determine outcomes of patients treated with best medical therapy for acute Type B IMH
2. Identify risk factors for medical therapy failure defined as freedom from Aortic Related adverse Event and Mortality ( AREM )
IMH
Initial Management Protocol: BMT

Admission to Vascular ICU
Aggressive blood pressure and impulse control
Goal of Systolic < 120 mmHg
Combination of Esmolol & Cardene
Pain control with opiates
Repeat CTA if intractable pain
Cath & Renal Duplex Studies

Goal of Systolic < 120 mmHg
Combination of Esmolol & Cardene
Pain control with opiates
Repeat CTA if intractable pain
Cath & Renal Duplex Studies

IMH: EVMS Experience

48/67 (71.6%)
Failure Rate:
Early (<14 days)
34/67 (50.7%)
Late (>14 days)
14/67 (20.9%)

IMH: Predicting Medical Therapy Failure

Cox Multivariate: Risk Factors for BMT Failure

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMH thickness</td>
<td>1.082</td>
<td>1.003-1.168</td>
<td>0.041</td>
</tr>
<tr>
<td>IMH extension in abdominal aorta</td>
<td>0.880</td>
<td>0.474-1.632</td>
<td>0.684</td>
</tr>
<tr>
<td>Antiplatelet therapy on admission</td>
<td>1.010</td>
<td>0.854-3.036</td>
<td>0.141</td>
</tr>
<tr>
<td>IMH</td>
<td>1.304</td>
<td>0.974-1.746</td>
<td>0.074</td>
</tr>
<tr>
<td>APCE†</td>
<td>1.362</td>
<td>0.624-2.979</td>
<td>0.719</td>
</tr>
<tr>
<td>Number of days on continuous Anticoagulant therapy</td>
<td>0.785</td>
<td>0.925-1.621</td>
<td>0.785</td>
</tr>
</tbody>
</table>
Cut off IMH thickness: 8.0 mm
Sensitivity: 90.6%
Specificity: 71.4%

IMH ≥ 8.0 mm
86.3% failure rate

Odds ratio for AREM if IMH ≥ 8.0 mm
18.86 [95%CI: 4.72 – 75.29], p<0.001

Presenting IMH Thickness as a Predictive Factor

IMH: Predicting Medical Therapy Failure

Failure of BMT for IMH

IMH Summary

Medical Therapy for acute Type B IMH is associated with a high failure rate.
IMH thickness on presentation is the strongest predictor for BMT failure.
The majority of patients with IMH will benefit from TEVAR and will have improved survival free from ARM

IMH: EVMS Experience: Outcomes of Medical Therapy

AORTIC-RELATED ADVERSE EVENTS / MORTALITY

<table>
<thead>
<tr>
<th>EMERGENT TEVAR 5/25 (20%)</th>
<th>MEDICAL THERAPY 48/67 (71.9%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redo-TEVAR (3)</td>
<td>TEVAR (44)</td>
</tr>
<tr>
<td>Aortic rupture at 4 months (1)</td>
<td>EVAR (2)</td>
</tr>
<tr>
<td>Retrograde dissection requiring repair (1)</td>
<td>Retrograde dissection/death (1)</td>
</tr>
<tr>
<td>Indicated TEVAR, patient not comply (1)</td>
<td></td>
</tr>
</tbody>
</table>

IMH: EVMS Experience: Early Failure of BMT

Operative principles: IVUS

Use IVUS to determine the thickness of the IMH for the distal landing zone
Mean interval: 231.7 days (range 24-1449 days)

**Outcome**

- N = 41 patients with IMHB
- N = 28 TEVAR
- N = 7 immediate TEVAR 62%
- N = 21 delayed TEVAR 38%

"IMH becomes complicated in the majority of patients within 20 days."

Outcomes:
- post TEVAR progression: 25%
- 30-day reintervention rate: 21.4%
- RTAD: 7.1% (2/28)

"TEVAR in complicated IMHB is feasible but associated with a substantial aortic reintervention rate, reflecting technical challenges and fragile aortic wall conditions."

"IMHB becomes complicated in the majority of patients within 20 days."

**Univariate Analysis of Risk Factors for BMT Failure**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Failed BMT</th>
<th>Successful BMT</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenting IMH thickness</td>
<td>11.1±4.2 mm</td>
<td>7.6±2.3 mm</td>
<td>0.001</td>
</tr>
<tr>
<td>Antiplatelet therapy on admission</td>
<td>37.5%</td>
<td>21.1%</td>
<td>0.150</td>
</tr>
<tr>
<td>IMH extension into abdominal aorta</td>
<td>54.2%</td>
<td>36.8%</td>
<td>0.149</td>
</tr>
<tr>
<td>ΔIMH‡</td>
<td>2.0±2.9 mm</td>
<td>-0.6±3.5 mm</td>
<td>0.031</td>
</tr>
</tbody>
</table>

No difference in MAX DTA diameter, comorbidities, demographics

**Disclosures**

There will be no discussion of Randomized Controlled Trials