Management of intramural hematoma and penetrating ulcers - what is different?

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Disclosure

- Speaker name: Dittmar Böckler
- I have the following potential conflicts of interest to report:
  - Consulting
  - Employment in industry
  - Stockholder of a healthcare company
  - Owner of a healthcare company
  - Research Grant
- I do not have any potential conflict of interest
IMH & PAU - complex entities within Acute Aortic Syndrome

Ref.: Ueda et al. Insights Imaging 2012
Treatment indications for and outcome of endovascular repair of type B intramural aortic hematoma

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ABSTRACT

Objective: The aim of this study was to analyze the outcome of thoracic endovascular aortic repair (TEVAR) and medical therapy in patients with aortic intramural hematoma type B (IMHB).

Methods: Between January 2004 and January 2014, 41 IMHB patients were treated. 28 underwent TEVAR (16 male; median age, 69 years; group I) plus best medical therapy (BMT), whereas 13 had BMT alone (6 male; median age, 63 years; group II). Study endpoints were assessment of indications for TEVAR and BMT, clinical outcome, and evaluation of aortic morphology over time. Median follow-up was 32 months for group I and 40 months for group II.

Results: In group I, TEVAR was immediately performed in 7 of 28 cases because of pain and imaging results (penetrating aortic ulcer, n = 6; intramural blood pools, n = 3). In 21 of 28 cases, TEVAR was undertaken because of clinical or radiologic signs of progression at a median of 70 days (range, 2–223 days). The median number of stent grafts implanted was two (range, 1–5). The median length of covered aorta was 15 cm (range, 9.5–33.4 cm). Technical success was achieved in 25 of 28 cases. In hospital mortality was 1 of 28 in group I and 0 of 13 in group II. Survival in group I was 81.5%, 77.8%, and 67% at 1, 2, and 4 years. There was no death in group II during follow-up. Aortic reinterventions were performed in 6 of 28 group I cases, including 2 open conversions for retrograde type A dissection. Aortic diameter decreased during follow-up in 10% in group I vs 3% in group II, P = 0.059. In group I, complete remodeling was seen in 7 of 27, regression in the remaining 20. In group II, complete remodeling was seen in 3 of 12, regression was seen in 9 of 12. No patient in group II required invasive treatment.

Conclusions: BMT is justified in uncomplicated IMHB. However, IMHB becomes complicated in the majority of patients within 20 days. TEVAR in complicated IMHB is feasible but associated with a substantial aortic reintervention rate, reflecting technical challenges and fragile aortic wall conditions. (J Vasc Surg 2016;[9–11].)

Penetrating aortic ulcer

Defining risks and therapeutic strategies

Acute aortic syndrome (AAS), subsuming classic aortic dissection (AD), intramural hematoma (IMH), and penetrating aortic ulcer (PAU), has attracted considerable attention among aortic specialists over the last decade [46]. Advanced imaging modalities such as computed tomography (CT) angiography, magnetic resonance imaging (MRI), and position emission tomography (PET) have hereby provided greater insight into these aortic wall pathologies, notably PAU [25, 39]. Despite a substantial clinical overlap with AD and IMH, several questions regarding pathophysiology, surveillance, management, and treatment indications remain to be answered—especially in patients postulated [27]. Potential added complications are pseudoaneurysm formation, progression to classic AD, and propensity to rupture. Compared to aortic dissection, the risk of rupture (7% for type A AD and 3.6% for type B AD) is considerably high (up to 40%) [9, 61].

Albeit clinical differentiation of PAU from IMH and AD may be challenging as all of them present with classic ‘chest pain’, the radiologic presentation of PAU is somewhat unique. Today, PAU is best diagnosed by contrast-enhanced CT scanning [53]. Typical radiologic features of PAU are an out-pouching ulcer crater, intimal calcification, and localized intramural hemorrhage in conjunction with the scans obtained for suspected acute coronary syndrome [44].

PAU typically occurs in older men (>70 years) with significant cardiovascular comorbidities, including hypertension, tobacco abuse, coronary artery disease, chronic obstructive lung disease, and renal insufficiency. Usually, their life expectancy does not exceed 10 years postdiagnosis, underlining the severity of disease in these patients [3, 44, 59, 63]. The presence of concurrent abdominal aortic aneurysms has been observed in up to 60% of patients with abdominal PAU [9, 16].

Assessment of natural history and outcome
# 1 Vessel wall anatomy / pathology

- Tunica intima
- Internal elastic lamina
- Tunica media
- External elastic lamina
- Tunica externa
# 1 Vessel wall anatomy / pathology
# 2 Spontaneous course of PAU

- No reabsorption
- 20-30% become symptomatic
- Annual growth rate unknown

Pataras et al, Clinical Radiology 2013, Nathan et al, JVS 2012
# 2 Spontaneous course of PAU

# 2  Spontaneous course of IMH

- Reabsorption  40%
- Aneurysm formation  50%
- Dissection  10% Type B
  
  88% Type A3

Nienaber CA Circulation 1995 and 2002
Cronenwett Rutherford’s Texbook of Surgery, 7th Edition
Hiratzka Fl et al, Circulation 2010; 6
# 2 Spontaneous course of IMH

7/28 (25%): TEVAR without further imaging

21/28 (75%): TEVAR because of dynamic changes in the early phase

Ref.: Bischoff MS, Böckler et al, JVS 2016
Sizing of Stentgrafts

Ref.: Mehta M et al, Endovascular Today 2009, January
# 3 Sizing of Stentgrafts

- IMH: hemorrhage in the media
- PAU: degenerative & atherosclerotic intima

Less radial force
Oversizing 0-10%

More radial force
Oversizing 10-20%
Landing zones for TEVAR in IMH

Extended disease > long tx segments > risk for paraplegia
# 4 Landing zones for TEVAR in PAU

Localized lesion > short tx segments > low risk for paraplegia
# 4 Spot-Stentgrafting to reduce Paraplegia
Editor’s Choice — Management of Descending Thoracic Aorta Diseases

Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS)


Keywords: Clinical practice guidelines, Management of Descending Thoracic Aorta Diseases, guideline, aortic disorders, classification, conclusions, recommendations

Recommendation 20

Uncomplicated* type B intramural haematoma and penetrating aortic ulcer should be treated medically, and followed by serial imaging surveillance

Class I

Level of evidence C

References 121,122

Recommendation 21

Endovascular repair should be considered for complicated* type B intramural haematoma

Class IIa

Level of evidence C

References 123–125

Recommendation 22

Endovascular repair should be considered for complicated* type B penetrating aortic ulcer

Class IIa

Level of evidence C

References 119,121,123,124

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*Uncomplicated/complicated IMH means absence or presence of recurrent pain, expansion of the IMH, peri-aortic haematoma, and intimal disruption.

*Complicated PAU means presence of recurrent pain or PAU that initially measures >20 mm in diameter or >10 mm in depth or progression of total aortic diameter.
# 5 Outcome of TEVAR in PAU

## Tab. 2 Overview of selected publications (n ≥10) on TEVAR in patients with thoracic penetrating aortic ulcer

<table>
<thead>
<tr>
<th>Author/year of publication</th>
<th>n</th>
<th>Symptoms (%)</th>
<th>Technical success (%)</th>
<th>pEndoleak I (%)</th>
<th>In-hospital mortality (%)</th>
<th>Morbidity (%)</th>
<th>Mid-term survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kos et al. 2002 [37]</td>
<td>10</td>
<td>60</td>
<td>100</td>
<td>40/30</td>
<td>0</td>
<td>10</td>
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</tr>
<tr>
<td>Eggebrecht et al. 2006 [16]</td>
<td>22</td>
<td>64</td>
<td>96</td>
<td>5/5</td>
<td>0</td>
<td>5</td>
<td>83⁸/62⁹</td>
</tr>
<tr>
<td>Brinster et al. 2006 [5]</td>
<td>21</td>
<td>76</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>N.A.</td>
</tr>
<tr>
<td>Dalanais et al. 2007 [14]</td>
<td>18</td>
<td>100</td>
<td>100</td>
<td>6/0</td>
<td>0</td>
<td>39</td>
<td>N.A.</td>
</tr>
<tr>
<td>Piffaretti et al. 2007 [49]</td>
<td>11</td>
<td>45</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>100⁵/89⁶</td>
</tr>
<tr>
<td>Gottardi et al. 2008 [25]</td>
<td>27</td>
<td>26</td>
<td>100</td>
<td>0</td>
<td>11</td>
<td>11</td>
<td>78⁵/70⁶</td>
</tr>
<tr>
<td>Geisbüsch et al. 2008 [22]</td>
<td>48</td>
<td>65</td>
<td>94</td>
<td>19/4</td>
<td>15</td>
<td>31</td>
<td>74⁸/61⁹</td>
</tr>
<tr>
<td>Patel et al. 2010 [46]</td>
<td>37</td>
<td>60</td>
<td>100</td>
<td>8/5</td>
<td>14</td>
<td>14</td>
<td>84⁶⁴/46⁵⁸</td>
</tr>
</tbody>
</table>

In hospital mortality: 7%
Thoracic Endovascular Aortic Repair of Aortic Arch Pathologies with the Conformable Thoracic Aortic Graft: Early and 2 year Results from a European Multicentre Registry

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WHAT THIS PAPER ADDS
The conformable TAG is a next generation device specifically designed for aortic arch pathologies showing high conformability with a low rate of major device related events. Endovascular therapy of aortic arch pathologies is technically demanding and associated with significant stroke risk.

Objective: To assess safety, effectiveness and clinical outcome of the conformable thoracic aortic endograft (CTAG) in the treatment of aortic arch pathologies.

Methods: Between October 2009 and December 2010, 100 consecutive patients (65 men; mean age 65 years) with aortic arch pathologies were treated with the CTAG device in five European centres. Indications were thoracic aortic aneurysm (n = 57), Type B dissection (n = 24), intramural haematoma (n = 4), penetrating aortic ulcer (n = 9), and traumatic transection (n = 6). Emergency procedures were performed in 33%. The proximal landing zone (LZ) was L2 0 in 7%, L2.1 in 14%, L2.2 in 43%, and L2.3 in 36%. Data were collected prospectively and analysed for technical and clinical success. Conformability and deployment accuracy were analysed on intra-operative angiography and post-operative computed tomography. Mean follow up was 24 ± 19 months (range, 0.3–36 months).

Results: The 30 day, 1 and 2 year survival rates were 90%, 81%, and 74% respectively. The 2 year survival was 80% in the elective and 62% in the emergency groups (p = .20). The major 30 day complication rate was 34%: primary Type Ia endoleak affected 1%, retrograde dissection in 1%, and the paraplegia and stroke rates at 30 days were 4% and 11%. Age > 70 years was an independent predictor for mortality and complications. The primary technical success rate was 92%; device deployment was successful in 100% and accurate in 99%. Conformability to the aortic arch was achieved in 95%.

Conclusion: The CTAG stent graft shows high deployment accuracy, good conformability, and clinical effectiveness in the treatment of aortic arch pathologies. However, thoracic endovascular aortic repair in the arch is associated with a relatively high stroke rate. Further studies with more patients and longer follow up are needed to evaluate the long-term results.

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Keywords: Aorta, Aneurysm, TEVAR, Stentgraft, Arch, Stroke
Survival of Patients with IMH & PAU

P 0.03

1 Coady, Cardiol Clinics 1999
# 6 Risk for complications - Stroke

Morphological risk factors of stroke during thoracic endovascular aortic repair

Drosos Kotelis & Moritz S. Bischoff & Bertram Jobst & Hendrik von Teng-Kobligk & Ulf Hinz & Philipp Geisbüs & Dittmar Böckler

Abstract

Purpose
This study aims to identify independent factors correlating to an increased risk of perioperative stroke during thoracic endovascular aortic repair (TEVAR).

Methods
A prospective maintained TEVAR database, medical records, and angiograms of 1115 men; median age was 70 years, who underwent TEVAR, were reviewed. Parameters were selected by two experienced surgeons. Risk factors in the aorta included calcified or occluded aortic arch, dissecting or pedunculated aneurysms, and type IA–III) were also analyzed. Three or more in the univariate analysis conferring an increased risk or rapid progression, or aortic arch remodeling (LSA) coverage, and number of stent grafts. Multivariate logistic regression analysis was performed to assess the independent correlations of potential risk factors.

Results
Atherosclerotic aneurysm was the most common pathology (44%). One hundred and fifty-four of our patients (51%) were treated under urgent or emergent procedures.

PAU eventually at higher risk for stroke

- 4-7% embolic stroke rate
- 1% are fatal
- Depending on PLZ and atheroma burden

Ref. 1 Kotelis et al Langenbecks Arch Surg 2009, 2 Böckler et al, EJVES 2015 publication accepted
# 6 Risk for complications – retro. AD

- Incidence is low 1.3% but mortality is high: 42%
- Associated with proximal bare stent induced injury
# 6 Risk for complications – retro. AD

Ref.: Böckler D et al., Gefäßchirurgie 2005, Vol 4:
Stent graft-induced new entry after endovascular repair for Stanford type B aortic dissection

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Background: Stent graft-induced new entry (SINE), defined as the new tear caused by the stent graft and excluding those arising from natural disease progression or iatrogenic injury from the endovascular manipulation, has been increasingly observed after thoracic endovascular aortic repair (TEVAR) for Stanford type B dissection in our center. SINE appears to be remarkably life threatening. We investigated the incidence, mortality, causes, and preventions of SINE after TEVAR for Stanford type B dissection.

Methods: Data for 22 patients with SINE were retrospectively collected and analyzed from 650 patients undergoing TEVAR for type B dissection from August 2000 to June 2008. An additional patient was referred to our center 14 months after TEVAR was performed in another hospital. The potential associations of SINE with Marfan syndrome, location of SINE and endograft placement, and the oversizing rate were analyzed by Fisher exact probability test or t test.

Results: We found 24 SINE tears in 23 patients, including SINE at the proximal end of the endograft in 15, at the distal end in 7, and at both ends in 1. Six patients died. SINE incidence and mortality reached 3.4% and 26.1%, respectively. Two SINE patients were diagnosed with Marfan syndrome, whereas there were only 6 Marfan patients among the 651 patients. The 10 proximal SINEs were evidenced at the greater curve of the arch and caused retrograde type A dissection. The eight distal SINEs occurred at the dissected flap, and five caused enlarging aneurysm whereas three remained stable. The endograft was placed across the distal aortic arch during the primary TEVAR in all 23 patients. The incidence of SINE was 33.33% among Marfan patients vs 3.26% among non-Marfan patients (P = .016). There was no significant difference in mortality between proximal and distal SINE (25% vs 28.6%, P > .99), incidence of SINE between endograft placement across the arch and at the straight portion of descending thoracic aorta (23 of 613 vs 0 of 38, P = .39), and the oversizing rate between SINE and non-SINE patients (13% ± 4.5% vs 16% ± 6.5%, P = .98).

Conclusions: SINE appears not to be rare after TEVAR for type B dissection and is associated with substantial mortality. The stress yielded by the endograft seems to play a predominant role in its occurrence. It is important to take this stress-induced injury into account during both design and placement of the endograft. (J Vasc Surg 2010;52:1450-8.)
Summary & Conclusions

- IMH & PAU are summarized with Aortic dissection in "Acute Aortic Syndrome".
- Nevertheless, there are differences regarding:
  - pathophysiology
  - imaging
  - TEVAR planing (oversizing)
- No comparative studies published comparing IMH vs. PAU.
- Management is based on Level C evidence.
- Personal experience: IMH is more challenging to manage.