Expert Consensus Document on AORTIC ARCH Pathologies and its Treatment

An expert consensus document of the European Association for Cardio-Thoracic Surgery (EACTS) and the European Society of Vascular Surgery (ESVS)

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Cardiac Surgeons

Vascular Surgeons
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Terminology

Type A, type B and non-A-non-B aortic dissection

An arch involvement either by the most proximal tear or by retrograde extension is referred to as non-A-non-B aortic dissection.
Aortic dissection: Classification

Type A

Most proximal tear

Most distal tear

Primary entry tear

Type B

Most proximal tear

Most distal tear

Communications between lumina

STANFORD
Aortic arch replacement in various extent: When referring to aortic arch treatment, qualitative and semi-quantitative statements should be avoided.

Hemirarch means open distal anastomosis

Ishimaru zones
JVS 2010;52:1022–1033
### Classes of Recommendations

<table>
<thead>
<tr>
<th>Classes of Recommendations</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.</td>
</tr>
<tr>
<td>Class II</td>
<td>Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.</td>
</tr>
<tr>
<td><strong>Class IIA</strong></td>
<td>Weight of evidence/opinion is in favour of usefulness/efficacy.</td>
</tr>
<tr>
<td><strong>Class IIB</strong></td>
<td>Usefulness/efficacy is less well established by evidence/opinion.</td>
</tr>
<tr>
<td>Class III</td>
<td>Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.</td>
</tr>
</tbody>
</table>
## Level of Evidence

<table>
<thead>
<tr>
<th>Level of Evidence A</th>
<th>Data derived from multiple randomized clinical trials or meta-analyses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Evidence B</td>
<td>Data derived from a single randomized clinical trial or large non-randomized studies.</td>
</tr>
<tr>
<td>Level of Evidence C</td>
<td>Consensus of opinion of the experts and/or small studies, retrospective studies, registries.</td>
</tr>
</tbody>
</table>
Position Paper

Number of recommendations: 41

Level of evidence

Level A 1
Level B 10
Level C 30

Number of references 252
**THE EVOLUTION OF EVIDENCE: RCTs in Patients with Severe Aortic Stenosis**

- **Pre-TAVI**
- **2008-2012**: 1,057 (2 RCTs)
- **2012-2017**: 5,910 (6 RCTs)

- 2008: FIRST-IN-MAN TAVI
- 2012: ESC GUIDELINES
- 2017: ESC GUIDELINES
2017 ESC/EACTS Guidelines: Management of Aortic Stenosis

**Classes of recommendations**

**2012**
- I: 44%
- IIa: 44%
- IIb: 12%

**2017**
- I: 55%
- IIa: 28%
- IIb: 11%
- III: 5%

**Levels of evidence**

**2012**
- C: 88%
- B: 12%

**2017**
- B: 78%
- C: 22%
Organisation

Aortic team definition
The WC advocates that an aortic team—should be closely involved from diagnosis to treatment and finally follow-up being led by cardiac and vascular surgery in collaboration with anesthesiology, cardiology, radiology and genetics.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision making for the treatment of aortic arch pathologies by an aortic team is recommended.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>Treatment of elective aortic arch pathology is recommended to be performed in specialised centers providing open and endovascular cardiac and vascular surgery on site only.</td>
<td>I</td>
<td>C</td>
</tr>
</tbody>
</table>
**Organisation**

<table>
<thead>
<tr>
<th>Recommendation</th>
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<th>Level</th>
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</thead>
<tbody>
<tr>
<td>Continuing follow-up of patients with aortic arch pathologies before and after treatment in a dedicated outpatient clinic is recommended.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>A hybrid-room with a fixed imaging system is recommended for thoracic endovascular aortic repair involving the aortic arch.</td>
<td>I</td>
<td>C</td>
</tr>
</tbody>
</table>
Centralisation

Centralisation of care of aortic arch pathologies in large centers

- understand the natural course of the disease
- provide the entire range of treatment options under one umbrella
- treat potential complications of each individual therapy
- 24/7 availability
- rapid activation of the multidisciplinary team

Recommendation Class Level

Centralisation of care for aortic arch pathologies is recommended. I C

EJCTS 2013;43:226–30
### Recommendations on preoperative imaging

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative assessment of aortic arch pathologies with <strong>Computed Tomography</strong> Angiography is recommended as first line imaging modality.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>Assessment of patency and morphology of the <strong>circle of Willis</strong> is recommended where treatment involves the aortic arch.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>Assessment of the <strong>extracranial supraaortic vessels down to the level of the femoral artery bifurcation</strong> is recommended where treatment involves the aortic arch.</td>
<td>I</td>
<td>C</td>
</tr>
</tbody>
</table>
## Endovascular repair in the aortic arch

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEVAR in zone 0</strong> after previous debranching may be considered in patients unfit for open repair and suitable anatomy.</td>
<td>IIb</td>
<td>B</td>
</tr>
<tr>
<td><strong>TEVAR in zone 1 and 2</strong> should be considered in patients with suitable anatomy.</td>
<td>IIa</td>
<td>B</td>
</tr>
<tr>
<td>Stent-graft deployment in zone 0 is not recommended in patients with a <strong>proximal and/or distal landing zone length less than 25mm</strong> or a <strong>maximum diameter of more than 38mm</strong>.</td>
<td>III</td>
<td>B</td>
</tr>
</tbody>
</table>
# Endovascular repair in the aortic arch

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endovascular aortic arch repair in zone 0 should be considered in patients <strong>unfit for open surgery</strong> and with a <strong>suitable anatomy</strong>.</td>
<td>Ila</td>
<td>B</td>
</tr>
<tr>
<td>Zone 0-2 TEVAR is not recommended in patients with connective tissue disease if the proximal landing zone is in native aortic tissue.</td>
<td>III</td>
<td>C</td>
</tr>
<tr>
<td>In any open proximal thoracic aortic surgery, ascending/ hemiarch replacement has to be extensive and <strong>short ascending grafts should be avoided</strong> for preventing disease progression and for anticipating future endovascular modular distal extension.</td>
<td>I</td>
<td>C</td>
</tr>
</tbody>
</table>
Point of care coagulation monitoring

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>During aortic arch surgery, <strong>point-of care coagulation monitoring</strong> in conjunction with an algorithmic approach to transfusion of blood products should be considered</td>
<td>Ila</td>
<td>A</td>
</tr>
</tbody>
</table>
Ten bullet points when to choose what kind of approach

<table>
<thead>
<tr>
<th>Factors favoring one or the other approach</th>
<th>Endovascular repair</th>
<th>Open repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous CABG with patent IMA graft at risk at resternotomy</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td>Poor LV- or RV-function</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td>Poor pulmonary function</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td>Poor liver function</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td>Connective tissue disorder patients with landing zones in native tissue</td>
<td>X</td>
<td>V</td>
</tr>
<tr>
<td>Access vessels (femoral and iliac) diameter &lt; 7mm</td>
<td>X</td>
<td>V</td>
</tr>
<tr>
<td>Native ascending aorta diameter &gt; 38mm</td>
<td>X</td>
<td>V</td>
</tr>
<tr>
<td>Valvular heart disease necessitating concomitant repair</td>
<td>X</td>
<td>V</td>
</tr>
<tr>
<td>Previous mechanical aortic valve replacement</td>
<td>X</td>
<td>V</td>
</tr>
<tr>
<td>Prosthetic ascending aorta short or kinked</td>
<td>X</td>
<td>V</td>
</tr>
</tbody>
</table>

V favors  
X discourages
Standards of reporting

- The results of endovascular repair should be reported according to current SVS (Society of Vascular Surgery) guidelines that consider both technical and clinical endpoints.
- Clinical outcomes for aortic arch treatment should clearly include 30 day mortality as well as neurological outcomes (stroke and spinal cord ischemia).
- Neurological outcomes should be reported according to current recommendations.
- The completeness of follow-up information is of paramount importance and cannot be overemphasised.
- Currently, there is no robust evidence to recommend minimum case-loads for aortic arch procedures both open and endo neither for centers nor for individual physicians but a clear volume-outcome correlation like in many other cardiovascular procedures supports centralisation and specialisation.
Companion Document

Clinical cases referring to diagnosis and management of patients with thoracic aortic pathologies involving the aortic arch: A companion document of the 2018 European Association for Cardio-Thoracic Surgery (EACTS) and the European Society of Vascular Surgery (ESVS) expert consensus document addressing current options and recommendations for the treatment of thoracic aortic pathologies involving the aortic arch.

- Case-to-case clinical scenarios
- Additional examinations guiding the decision how to proceed
- Constellations favoring one or the other technique
- Treatment plans for one or other technique
Companion Document

1. Aortic arch aneurysm
2. Descending aortic aneurysm involving the distal aortic arch
3. Remaining dissection after type A aortic repair
4. Type B aortic dissection
5. Non-A-non-B aortic dissection
6. Aortic arch intramural hematoma (IMH)
7. Aortic arch penetrating atherosclerotic ulcer (PAU)
8. Graft infection involving the aortic arch