Echocardiography after stroke - where to look

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Disclosures

• No relevant financial disclosures
Cardiac Sources of Embolism: TEE superior vs TTE

- Cardiac tumor, vegetation or thrombus
- Left atrial appendage thrombus
- Aortic plaque
- Patent foramen ovale (PFO)
- Atrial septal aneurysm
27-year-old male
Expressive aphasia and loss of vision
Clinical context...

• Previous myocardial infarction 4 years prior
• DSE to LAD
• Stopped Clopidogrel because of rash
• 3 months prior to stroke
  • Recurrent myocardial infarction Rx with PCI
  • Suspected LV thrombus
  • Warfarin > Hematuria
  • Stopped Warfarin
Mass most likely…

1. Myxoma
2. Angiosarcoma
3. Melanoma
4. Thrombus
5. Infective vegetation
LV aneurysmectomy and thrombectomy
41-year-old with hemorrhagic stroke
PMH ‘cerebral vasculitis’ for 2 years

Myxoma
41-year-old with hemorrhagic stroke
PMH ‘cerebral vasculitis’ for 2 years
Myxoma
46-year-old male with posterior circulation TIA
PMH chronic atrial fibrillation

No change in mass after 1 month of therapeutic anticoagulation
Angiosarcoma
Left Ventricle Sarcoma
Other cardiac tumors

Metastatic colon cancer
Other cardiac tumors

Papillary Fibroelastoma
### Accuracy of Echo: Diagnosis of Valvular Vegetations

<table>
<thead>
<tr>
<th></th>
<th>TTE</th>
<th>TEE</th>
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</thead>
<tbody>
<tr>
<td><strong>Resolution</strong></td>
<td>3-4 mm</td>
<td>1-2 mm</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>62 - 82%</td>
<td>87 - 100%</td>
</tr>
<tr>
<td><strong>Specificity</strong></td>
<td>91 - 100%</td>
<td>91 - 100%</td>
</tr>
</tbody>
</table>

Detection of Prosthetic Valve Vegetations

- **TEE** is superior to **TTE**

  - **Sensitivity**
    - TTE: 17-44%
    - TEE: 82-100%

Note: Approximately 30% of cases of prosthetic valve endocarditis have **no** vegetations attached to the prosthesis, **only** peri-annular infection

References:

- Jacob, S et al.  Curr Opin Cardiol 17: 478, 2002
Lambl’s excrescence
Calcified nodule of Arantius
33-year-old female with transient hemianopia
PMH mitral valve tissue prosthesis

Bioprosthesis thrombosis
Post-warfarin
Duke Major Criteria
Diagnosis of Infective Endocarditis

1. Positive Blood Cultures (≥2)
   - Typical organisms (*Staph aureus, Strep viridans or bovis, HACEK, Enterococci*)
   - Persistent bacteremia (≥ 3) (*Staph epidermidis, Gram negative bacilli*)
   - Single + blood culture for Coxiella burnetii or anti-phase 1 IgG antibody titer >1:800

2. Evidence of Endocardial Involvement

- Positive Echocardiogram
  - Vegetation
  - Peri-valvular abscess
  - Prosthetic valve dehiscence
  - New valvular regurgitation

- FDG-PET/CT or SPECT/CT* *(ESC 2015)

**Duke Minor Criteria:** Diagnosis of IE

1. **Predisposing condition**
   - Prosthetic valves
   - IV drug use or valvular disease

2. **Fever:** Temperature $>38^\circ C$ (100.4$^\circ F$)

3. **Vascular phenomena**
   - Major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhages, conjunctival hemorrhages, Janeway lesions

4. **Immunologic phenomena**
   - Glomerulonephritis, Osler's nodes, Roth's spots and rheumatoid factor

5. **Other microbiologic evidence:** +blood culture not meeting major criteria

_Durack et al Am J med, 1984; Li et Clin Infect Dis 2000_
Typical Echo Features of Vegetations

- Attachment on upstream side of the valve leaflet.
- Vegetations prolapse into the upstream chamber.
- Veg motion almost independent of valve motion.
NonBacterial Thrombotic Endocarditis
Libman-Sacks Endocarditis
Atrial Fibrillation
Atrial Fibrillation: Stroke

- 5-fold increased risk of stroke
- 15% of all strokes attributable to AF
- AF related strokes have worse outcomes
- 90% of all thrombi non-rheumatic AF from LAA

LA/LAA Thrombus
Dense SEC
LAAEV $\leq$ 20 cm/s

Left atrial abnormality
7.8%/yr

Both
20.5%/yr

Complex aortic plaque
12.0%/yr

Neither 1.3%/yr

Left Atrial Appendage: Pectinate Muscles

Stöllberger C et al. Z Kardiol 2003;92:303-308
Peak Emptying Velocity 52 cm/sec
Contrast
Left atrial appendage thrombus
Spontaneous echo contrast (SEC)
Contrast helpful to determine if thrombus present
# Atherosclerotic Disease of the Aorta
## Risk of Stroke

<table>
<thead>
<tr>
<th>Ascending aorta and prox arch Plaque thickness (mm)</th>
<th>*Adjusted Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>Reference</td>
</tr>
<tr>
<td>1-1.9</td>
<td>4.4 (2.1-8.9)</td>
</tr>
<tr>
<td>2-2.9</td>
<td>5.0 (2.7-9.0)</td>
</tr>
<tr>
<td>3-3.9</td>
<td>3.4 (1.5-7.4)</td>
</tr>
<tr>
<td>≥ 4</td>
<td>9.1 (3.3-25.2)</td>
</tr>
</tbody>
</table>

*After adjustment for age, sex, HTN, smoking status, cholesterol level, DM, previous MI, and AF

Atrial septum aneurysm
Patent foramen ovale
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