Endocarditis and Its Complications: The Role of Echocardiography

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Disclosures

✓ No relevant financial disclosures
Endocarditis

 ✓ > 50,000 cases/yr in US (47,000 Medicare hospitalizations/year)
 ✓ Left sided - Majority of cases
 ✓ Highest mortality and complication rate

 ✓ Review
   – Guidelines for prophylaxis
   – Diagnosis and indications for TEE
   – Identification of complications
   – Prognostic (echocardiographic) features
   – Indications for surgery

ICE-PCS

 ✓ 41,000+ hospitalized cases of IE
 ✓ 30% 1 month mortality
 ✓ 33% of patients had CHF
 ✓ In-hospital mortality (without CHF) 13%

Keifer T et al. JAMA 2011
Prevention

Antibiotic prophylaxis recommended:
- Prosthetic heart valves or prosthetic material valve repair
- History of endocarditis
- Heart transplant with abnormal valve function
- Certain congenital heart defects
  - Cyanotic heart disease, not fully repaired
  - Within 6 months of repair of defect
  - Repairs with residual defects and/or leaks

Infective Endocarditis Prophylaxis

NOT recommended for:
- Transesophageal echocardiography
- EGD
- Colonoscopy
- Cystoscopy without ongoing infection

Regardless of valvular/endocarditis risk
Diagnosis

✓ At least 2 sets of blood cultures
✓ Modified Duke Criteria for suspected IE
✓ Transthoracic recommended in those with suspected IE
  – Assess for vegetations
  – Assess hemodynamic severity of valve lesions
  – Assess cardiac function
  – Re-evaluation for clinical change/symptoms

Nishimura et al. Valvular Heart Disease Guidelines, JACC 2014

Modified Duke Criteria

✓ Definite infective endocarditis
  – Clinical Criteria
    • 2 Major criteria, or
    • 1 Major criterion and 3 minor criteria, or
    • 5 Minor criteria
  
  – Major criteria
    • Blood culture positive
    • Typical microorganism for IE (multiple variations)
    • Endocarditis by imaging study

Circulation 2005;111:e394-434
Echocardiography Criteria

✓ Evidence of endocarditis
  – Oscillating intracardiac mass on valve or supporting structures, in the path of regurgitant jets, or on implanted material in the absence of an alternative anatomic explanation, or
  – Abscess, or
  – New partial dehiscence of prosthetic valve, or
  – New valvular regurgitation

Circulation 2005;111:e394-434
Echocardiography

**Transthoracic**
- Resolution ~ 3-4 mm
- Sensitivity: 62-82%
- Specificity: 91-100%
- Readily available, usual initial test of choice

**Transesophageal**
- Resolution ~ 1-2 mm
- Sensitivity: 87-100%
- Specificity: 91-100%
- Greater (3-4x) sensitivity for prosthetic valves


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**Case**

58 yo Female, chronic IV drug abuse presents with fever and malaise. +Blood cultures (MSSA). Acute HF
Underwent a robotic mitral valve repair with resection of the posterior leaflet scallop.

Leaflet Aspect

✓ Infective endocarditis
  – More commonly seen on the **upstream aspect**
    • Ventricular surface of AV with AI
    • Atrial surface of MV with MR
  – Usually at a site of endothelial damage

✓ Downstream Aspect
  – Usually a degenerative finding
  – Papillary fibroelastoma
  – Chordal structure (MV)
  – Less likely associated with significant regurgitation
Downstream Aspect

47 Male presenting with DVT and PE
Case

49 yo Male with a progressive mandibular infection and + blood cultures (Strep pneumo)

Underwent a Ross procedure (pulmonary autograft) with aortic root reconstruction
Complications of IE

- Leaflet perforation
- **Aortic root abscess**
- Annular perforation
- **Fistula formation**
- Embolism
- **Purulent pericarditis**
- Hardware infection
- Erosion

Early Surgery

- Valve dysfunction/ADHF
- Resistant organisms: Staph Aureus, Fungus
- Heart block or abscess formation
- Large mobile vegetation
- Persistent positive blood cultures
- Prosthetic valve endocarditis
- Fungal endocarditis
- Recurrent embolization
Case

18 yo Female present with an acute L MCA stroke and lower extremity thromboembolism. Negative blood cultures. New dx SLE

Treated with SC Lovenox. Returned for followup TEE. Moderate aortic insufficiency (improved).

Dx: Libman-Sacks Endocarditis
Differential Diagnosis

- Vegetation
  - Infective vs. non-infective/marantic
- Lambl's excrescence
- Papillary fibroelastoma (PFE)
- Thrombus
- Ruptured chord
- Valvular strands
- Myxomatous

Case

74 yo Male with prior Sapien THV aortic valve presents with a cold left arm.
Urgent embolectomy.
+Blood cultures (Strep)
Unable to perform TEE due to scleroderma esophagitis. Cardiac CT and Intracardiac echocardiogram performed to better characterize valve.

Intracardiac Echocardiography

Treated with IV antibiotics and oral anticoagulation
6 Month Follow Up

Size, Mobility and Embolic Events

DiSalvo et al. JACC 2001
Location, Location, Location

Villacosta et al. JACC 2002

Endocarditis vs. Thrombosis

Subclinical leaflet thrombosis in surgical and transcatheter bioprosthetic aortic valves: an observational study

Tanun Chakravarty, Lars Samdergaard, John Friedman, Ole De Backer, Daniel Berman, Klaus F Kofoed, Hasan Jilaihawi, Takeshi Shiota, Yigal Abramovitz, Troels H Jørgensen, Tanya Rami, Sharjeel Israr, Gregory Fontana, Martina de Kneegt, Andreas Fuchs, Patrick Lyden, Alfredo Trento, Deepak I Bhatt, Martin B Leon, Raj R Makkar, on behalf of the RESOLVE and SAVORY Investigators

DAPT

Oral Anticoagulation

Chakravarty et al. Lancet 2017
Case

✓ 68 yo male
  – Bioprosthetic MVR for IE (4 months ago)
  – Severe LV dysfunction, LVEF 10-15%
  – CKD on HD, T2DM, Prior CVA

✓ Fevers, chills, SOB, rigors
✓ Staph epi multiple culture bottles
s/p Redo BP MVR

Weaned from CPB on 3 inotropes, IABP then suffered seizure and large MCA territory CVA, pupils fixed and dilated. Expired.
Prosthetic Valve Endocarditis

- Perivalvular regurgitation
- Dehiscence/rocking motion
- Bulging of the annulus
- Necessitates TEE

Prosthetic Valve Endocarditis

Piper et al. BMJ 2001

| Table 1  | Microbiology of early and late PVE. Authors’ own findings compared to a recent European literature review.

<table>
<thead>
<tr>
<th></th>
<th>Early PVE (%)</th>
<th>Late PVE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Own experience (n=34)</td>
<td>Europe (n=68)</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>29</td>
<td>43</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Streptococci</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Enterococci</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>HACEK</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Fungi</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Mixed infections</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Culture negative</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

*Viridans group n=13 (10%); β haemolytic streptococci n=3 (2%), and Streptococcus bovis n=4 (3%).
HACEK, Haemophilus, Actinobacillus, Cardiobacterium, Ethiobacteria, Kingella.
Negative TTE

- TEE if clinical suspicion high
- If TEE negative and clinical suspicion persists
  - REPEAT studies at 5-12 days
  - Vegetations or abscess may now be present
  - If still negative, look for another source
    • Pacemaker, vascular grafts, catheters, PDA

ASCeXAM Focus

- Appropriate indications for TEE in IE
- Echocardiographic features of vegetations as described in modified Duke criteria
- Complications of IE
- Indications for surgery
- Follow-up study if high suspicion and initial study negative
Thank You!