Disclosures

• NHLBI CTSN Co-chair
• Medtronic Apollo Exec Cmte
Case

- 55 year old man with recently appreciated T2DM
- Several weeks of low back pain, anorexia, weight loss and 1 day of fever (102)
- Low back and L flank pain with hip flexion
Case

55 year old man with recently appreciated T2DM

Several weeks of low back pain, anorexia, weight loss and 1 day of fever (102)

- Systolic heart murmur

  TTE: MR, no vegetation

- Cultures: *S. mutans*
Indications for surgery?
Infective Endocarditis

Changing Epidemiology

**Then**
- RHD
- Younger
- Native valve disease
- Streptococci
- “sub-acute” illness

**Now**
- Degenerative disease
- Older (DM, ESRD, etc.)
- IJDU, CIEDs
- *S. aureus*, MRSA, ABx-
- “acute” illness
Infective Endocarditis

Changing Epidemiology

Healthy 43 year old man with *S. bovis* NVE
Diagnosis

• Index of suspicion
• Blood cultures x 2
• Special studies
  • Nutrient media
  • PCR, etc.

Revised Duke Criteria
PET-CT for Endocarditis

Pizzi MN et al. Circulation 2015; 132:1113-26
Infective Endocarditis

Changing Epidemiology

- 6-month mortality rates 20-25%
- Early surgery in IE ~ 60%
- Peri-operative mortality ~10%
- Re-infection of prosthesis ~2%
In-Hospital Mortality and Early Surgery

RCT: Early Surgery for IE

- N=78
- Mean age 47 y
- ~1/2 w/ emboli on adm
- ~1/3 w/ size >15mm
- ~60% streptococci

Infective Endocarditis

Stroke Rate after Antibiotics

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Aureus</td>
<td>1.55 (1.10-2.17)</td>
<td>0.01</td>
</tr>
<tr>
<td>Viridans strep</td>
<td>0.59 (0.35-0.98)</td>
<td>0.04</td>
</tr>
<tr>
<td>Abscess</td>
<td>1.56 (1.06-2.30)</td>
<td>0.02</td>
</tr>
<tr>
<td>MV veg</td>
<td>1.93 (1.49-2.50)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Infective Endocarditis

Indications for Surgery

**Native Valve IE**

**Class I**

- **Heart Failure**
- Evidence of LV dysfunction or PA HTN
- **Abscess, Fistula, Pseudo-Aneurysm**
- Fungal or highly resistant bacterial IE
- Persistent bacteremia after 1 week Ab Rx

Infective Endocarditis

Indications for Surgery

Class II

- Recurrent emboli and persistent vegetation despite appropriate AB Rx (IIa)
- Large (> 10mm) mobile vegetation, particularly on AMVL (IIb)
- Increase in vegetation size on AB Rx (IIb)

Acute Severe AR
1 Year Survival

Impact of Vegetation Size

- $L \leq 15$ mm
- $L > 15$ mm

N = 384
P = 0.001

Multi-variable analysis:
- ARR 1.8 (1.10-2.82)
- P = 0.02

L > 10 mm predicts new embolus

A 64 year old woman suffers a small ischemic stroke on the day following presentation with \textit{S.aureus} endocarditis affecting the aortic valve and resulting in severe AR with heart failure and first degree AV block. Head imaging shows no hemorrhage. When do you advise surgery?

1. 1 week
2. 2 weeks
3. 4 weeks
4. Without delay
Question

A 64 year old woman suffers a small ischemic stroke on the day following presentation with *S.aureus* endocarditis affecting the aortic valve and resulting in severe AR with heart failure and first degree AV block. Head imaging shows no hemorrhage. When do you advise surgery?

1. 1 week
2. 2 weeks
3. 4 weeks
4. Without delay
Prosthetic Valve Endocarditis

Courtesy of F. Schoen
Prosthetic Valve Endocarditis

Hospital Mortality

Mortality, proportion

Days

S. aureus

Other

HR 1.77 (1.21-2.57), p=0.003

Prognosis

Mortality

- **Patient-specific risk**
  - Age, co-morbidities (ESRD)
  - PVE vs NVE
- **Organism-related factors**
  - *S. aureus*, MSRA, other
- **Vegetation-related factors**
  - Size, change in size
- **Complications**
  - Valve function, HF
  - Stroke, embolism
  - Abscess, etc
- **Surgical treatment (↓)**

Park LP et al. *JAHA* 2016; 5:e003016doi:10.1161/JAHA. 115.003016
## Infective Endocarditis: Devices

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
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<tbody>
<tr>
<td>Complete removal of pacemaker or defibrillator systems, including all leads and the generator, is indicated as part of the early management plan in patients with IE with documented infection of the device or leads</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Complete removal of pacemaker or defibrillator systems, including all leads and the generator, is reasonable in patients with valvular IE caused by <em>Staphylococcal aureus</em> or fungi, even without evidence of device or lead infection</td>
<td>IIa</td>
<td>B</td>
</tr>
</tbody>
</table>

**Helping Cardiovascular Professionals**

**Learn. Advance. Heal.**

[Logo: American College of Cardiology]

[Logo: American Heart Association]
Infective Endocarditis: Devices (cont.)

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<td>Complete removal of pacemaker or defibrillator systems, including all leads and the generator, is reasonable in patients undergoing valve surgery for valvular IE</td>
<td>Ila</td>
<td>C</td>
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Summary

• Variable modes of presentation
• Increasing role for advanced imaging
• Multi-disciplinary team approach
• Increasing performance of surgery in the acute-subacute phase of IE
• Long-term follow up
INFECTIVE ENDOCARDITIS

INDICATIONS FOR SURGERY

PROSTHETIC VALVE IE

CLASS I

- Heart Failure (IB)
- Severe prosthetic valve dysfunction (IB)
- Dehiscence, abscess, fistula, etc. (IB)
- Fungal or highly resistant bacterial PVE (IC)
PROSTHETIC VALVE IE

CLASS II

– Persistent bacteremia or recurrent emboli despite appropriate AB Rx (IIa, C)
– Relapsing infection (IIa, C)
Diagnosis and Treatment of Infective Endocarditis

Patient at Risk or With Suspected NVE or PVE

- Blood cultures x 2
- TTE/TEE
- Modified Duke Criteria

Definite or probable IE

Antibiotic Rx (I)

Temporarily discontinue VKA anticoagulation (IIa)

Evaluate for need and timing of surgery

Valve dysfunction causing HF

- Resistant organism (S. aureus, fungi)
- Heart block or abscess
- Persistent infection
- Relapsing PVE

Early Surgery (I)

Surgery (I)

Large mobile vegetation (native valve)

Early Surgery (IIa)

Early Surgery (IIb)

Remove Hardware (IIa)

Remove Hardware Early (I)

Pacer/ICD present

Infection of leads or device pocket

NO

- Recurrent emboli and persistent vegetations despite appropriate antibiotic Rx

YES

- Resistant organism (S. aureus, fungi)
- Valve surgery for IE