Endocarditis

Overview

Diagnosis requires 2 major, 1 major with 3 minor, or 5 minor criteria from the modified Duke Criteria listed below:

MAJOR CLINICAL CRITERIA:

1. Persistently positive blood cultures with typical IE organisms. Bacteremia is continuous and high grade. Two blood cultures are positive > 90% of the time. Repeat the blood cultures every 48 hours until sterile. Prevalence of endocarditis among patients with S. aureus bacteremia is approximately (13-25%); TTE is now recommended in all patients with S. aureus bacteremia.
2. Evidence of valvular vegetation, or abscess, or dehiscence on TEE/TTE.
3. New regurgitant murmur.
4. Serologic dx (Coxiella IgG titer >1:800 or positive Bartonella or C.psittaci titers) or single positive culture of Coxiella burnetii (Q fever).

MINOR CLINICAL CRITERIA:

1. Predisposing condition (see below).
2. Fever (temperature >38.0 C).
3. Vascular events (septic emboli, pulmonary emboli, mycotic aneurysm, CNS or conjunctival, and Janeway lesions).
4. Immunologic events (Osler’s nodes, glomerulonephritis, Roth spots, + Rheum Factor).
5. Microbiologic data not meeting major criteria.

Etiology / Risk Factors

Predisposing conditions include prosthetic valves, previous IE, IDU, structural heart disease (e.g., valvular abnormalities including MV prolapse), hemodialysis and indwelling catheters.

Evaluation

- **Clinical manifestations** are inconsistent, so suspect the condition in those with risk factors. Fever may be absent in up to 10% of patients. 70% have heart murmurs (50% new murmur, 20% worsening of old murmur). Only ~10% of patients have classic

peripheral stigmata of endocarditis (Janeway lesions, Osler nodes, splinter hemorrhages).

- **Physical Exam**
- Cardiac: exam can be dynamic so reassess for new or changing regurgitant murmurs.
- Skin: the most common rash is petechiae; can be on the conjunctiva, palate, or buccal mucosal surfaces. Splinter hemorrhages are non-blanching, often at distal nail bed. Osler nodes are small tender nodules on fingers and/or toes. Janeway lesions are small, macular, painless hemorrhages on palms or soles.
- Eyes: Roth spots are pale, oval retinal lesions surrounded by hemorrhage.
- Full neurologic exam to document baseline and to evaluate for focal findings.
- Other: evaluate for arthritis, vertebral tenderness, and tender splenomegaly.
- **Microbiology** for native versus prosthetic valves differs slightly, although Staph aureus is the most common organism in both.
- **Early vs Late prosthetic valve infections**: early infections are typically acquired from surgical-related bacteremia within days to weeks. Because the valve and sutures are not yet endothelialized, bacteria easily adhere to these surfaces. They are more likely to cause valve dehiscence or abscess.
- Early organisms (<2 mo): Staph > CoNS (Staph epidermidis).
- Late organisms: CoNS and Staph aureus are roughly equivalent.
- Infections in valves > 12 mo after surgery are similar to those of native valves, with the exception of bioprosthetic valves, which may breakdown over time and become more susceptible to infection.
- **Echo**: in native valve endocarditis, the sensitivity of TTE is ~60% and TEE is ~90%. Specificity is ~99% for both. Guidelines recommend TEE first but practically, we usually begin with TTE and consider TEE if negative if there remains a high pre-test probability. Consider TEE in patients with:
- High concern for native-valve endocarditis and a negative TTE.
- Prosthetic valves (TTE is 15-30% sensitive), cardiac device (e.g. pacemaker, AICD) or prior IE.
- Limited thoracic windows (obesity, COPD, mechanical ventilation).
- Concern for perivalvular complications (e.g. myocardial abscess).
- **Culture negative endocarditis**: defined as negative cultures after 7 days. One of the most common causes is antibiotic administration before cultures. The most common infectious causes in America are Bartonella spp and Coxiella burnetii (Q fever). Other pathogens: Chlamydia, Legionella, Brucella. Note, the HACEK organisms are no longer a common cause of culture negative endocarditis as they can be cultured by most microbiology labs.

Management

- All patients need prolonged courses of antibiotics and may need surgery.
- ID should be consulted for all cases of documented endocarditis.
- Empiric therapy for native valve IE in most patients is vancomycin (targeted to a goal trough of 15-20) plus ceftriaxone 2gm IV q24h, started after cultures have been drawn. Subsequently tailor antibiotics to culture results.

- Oral antibiotic step-down therapy: Not yet standard of care but POET (https://www.nejm.org/doi/full/10.1056/NEJMoa1808312) study found that oral step down therapy was noninferior in their population to full-course IV therapy. Caveats included only Streptococcus, MSSA, CoNS, or Enterococcus faecalis organisms and few PWID.
- **Surgical indications** in native valves include:
- Valve dysfunction (i.e. aortic or mitral) causing heart failure.
- Perivalvular extension with development of abscess, fistula, and/or heart block.
- Fungi or orther highly resistant organisms that are difficult to treat with antibiotics alone.
- Persistent bacteremia despite maximal treatment, indicating a lack of source control.
- Recurrent embolization with persistent vegetations despite appropriate treatment.
- Large vegetations (>1cm) with severe valvular regurgitation (Kang et al, NEJM 2012).
- **Complications**: suspect with persistent fever for > 48 hours despite treatment or persistent bacteremia despite appropriate treatment.
- Cardiac: remember to obtain baseline ECG to assess for heart block or conduction delay (e.g. PR prolongation) due to perivalvular abscess (more common in aortic valve disease). Other complications include cardiac ischemia (embolism to coronary ostia). Heart failure is now the most common cause of death in endocarditis.
- Embolic: systemic embolization is usually due to left-sided endocarditis or via PFO. Can occur in up to 30% of patients with Staph aureus endocarditis. Risk factors include S. aureus, S. bovis, mitral valve disease, veg > 10mm and increased veg mobility on echo. While a history of aspirin use may be protective, starting anti-platelet treatment after diagnosis may cause increased bleeding (e.g. hemorrhagic conversion of septic emboli) and is not recommended.
- Persistent fever: while on antibiotics for endocarditis: consider metastatic infection including abscess (splenic, perivalvular, renal, and psoas), septic pulmonary emboli, pleural effusion, CNS infection, vertebral osteomyelitis, septic arthritis (esp. sacroiliac, pubic, manubriosternal joints), drug fever, and catheter-associated phlebitis.

Key Points

- Predisposing factors include prosthetic valves, previous IE, IDU and catheters.
- Monitor for EKG changes, evidence of heart failure and systemic emboli.
- The microbiology for native versus prosthetic valves differs slightly, although Staph aureus is the most common organism in both.
- Consider surgery in cases of heart failure, severe AI/MR, fungi or highly resistant organisms, perivalvular disease, >10mm mobile vegetation, or failed medical therapy.

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