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Infected Endocarditis

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- No relevant financial disclosures:
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- Reference to off-label/investigational use(s) of pharmaceuticals or devices:
  - None
Learning Objectives

• Upon conclusion of this activity, participants should be able to:
  • 1. Define a case of infective endocarditis
  • 2. Develop a strategy for managing infective endocarditis
Pre-Test Question

Diagnosis of infective endocarditis uses the modified Duke criteria. A diagnosis of “definite” infective endocarditis is given in all of the following scenarios except:

1. 2 Major criteria
2. 1 Major + 3 minor criteria
3. 5 minor criteria
4. 2 Major criteria + 3 minor criteria
5. 1 Major criteria
Infective Endocarditis

• Infection of the endocardial surface of the heart
• Annual incidence 3-7 per 100,000 person-years
• High morbidity and mortality
• 3rd most common life-threatening infectious syndrome after sepsis, pneumonia
Epidemiology

• Overall incidence has remained stable, the incidence of *Staphylococcus aureus* IE has increased

• Due to increased healthcare contact as a leading risk associated with infection

• Increase in mean patient age, higher proportion of prosthetic valves and other cardiac devices, and decreasing proportion of rheumatic heart disease
Diagnosis

- Straightforward in a minority of patients
  - Classic Oslerian manifestations:
    - Sustained bacteremia, active valvulitis, peripheral emboli, immunological vascular phenomena
  - Clinical variability based on host-pathogen interaction, patient risk factors, and timing
Diagnosis

• Modified Duke Criteria

• Definite IE
  • Pathological criteria: microorganisms demonstrated by culture or histological examination of a vegetation showing active endocarditis
  • Clinical criteria: 2 Major, 1 Major + 3 Minor, or 5 Minor criteria

• Possible IE
  • 1 Major + 1 Minor, or 3 Minor criteria

• Rejected
  • Alternative diagnosis explaining evidence of IE or resolution of IE syndrome with antibiotics <4 days, or no pathological evidence at surgery or autopsy with antibiotics <4 days, or does not meet criteria for possible IE as above

Infective Endocarditis

**Major Criteria**

- Predisposing heart condition, IV drug use

**Minor Criteria**

- Vascular phenomena: mycotic aneurysms, major arterial emboli, septic pulmonary infarcts, ICH, conjunctival hemorrhage, Janeway lesions
- Fever (38°C)
- Positive blood culture but does not meet a major criterion
- Immunological phenomena: glomerulonephritis, Osler nodes, Roth spots, rheumatoid factor

**Positive blood cultures:**
- Viridans group streptococci
- *Streptococcus bovis*, HACEK group
- *Staphylococcus aureus*, or community acquired enterococci

**Single positive BCx:**
- for *Coxiella burnetii*
- or anti-phase 1 IgG antibody titer ≥1:800

**Echocardiogram positive for IE:**
- Oscillating intracardiac mass on valve in the path of regurgitant jets, or on implanted material; abscess; or new partial dehiscence of prosthetic valve, or new valvular regurgitation
Echocardiography

• TTE and TEE are critical to the diagnosis and management of patients with IE

• TTE: non-invasive, readily available at most centers, and should be done initially in all cases of suspected IE

• TEE: invasive, not readily available, but much more sensitive than TTE especially in patients with prosthetic heart valves, morbid obesity, COPD, and other conditions

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Echocardiography

• TTE: low initial patient risk

• TTE then TEE as soon as possible: moderate to high clinical suspicion; difficult imaging candidate, or high initial patient risk (prosthetic heart valves, congenital heart diseases, previous IE, new murmur, heart failure, other IE stigmata)
Echocardiography

• If initial TEE is negative, but clinical suspicion remains high, then repeat TEE in 3 to 5 days is recommended
  • Vegetations may reach a detectable size in the interval
  • Abscess cavities or fistulous tracts may become evident

• Repeat TEE should be performed urgently when a patient with a positive TEE develops worrisome clinical features during antibiotic therapy
  • Progression of heart failure, change in murmur, new AV block or arrhythmia

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Management
Approach to patients with suspicion for IE

• History: risk factors, IV drug use, cardiac hx, prosthetic hardware

• Physical exam: IE stigmata, cardiac murmur

• At least 3 sets of blood cultures
  • If positive then repeat 2 sets of blood cultures every 24-48 hours until negative

• Echocardiogram: TTE vs. TEE, consideration of repeat TEE

• Multidisciplinary team: Infectious Diseases, Cardiology, Cardiovascular surgery
Antibiotic therapy

- Goal is complete eradication of microorganisms within vegetations
  - High bacterial densities within vegetations, drug penetration into the vegetation (layers of fibrin/platelets and microorganisms)
- Requires intravenous antibiotic therapy for a prolonged course typically between 4-6 weeks
- Start date of antibiotic therapy begins on the first day of negative blood cultures
- End of therapy, obtain TTE to establish new baseline

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Treatment

- Antibiotic therapy selection and duration are based on:
  - Microorganism
  - Resistance patterns
  - Presence of native valve or prosthetic valve/material

- Antibiotic route: Intravenous

- PICC for outpatient therapy can be placed after negative blood cultures

- Lab monitoring on weekly basis while on ABX
Treatment

• Obtain Infectious Diseases expert consultation in selecting the optimal antibiotic regimen
Native valve, VGS and *S. gallolyticus* (*bovis*)

- IV Penicillin G x 4 weeks duration
- IV Ceftriaxone x 4 weeks
- Either above regimen PLUS Gentamicin x 2 weeks
- Penicillin/Ceftriaxone allergic
  - IV Vancomycin x 4 weeks (goal trough concentration of 10-15 mcg/mL)

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Prosthetic valve, VGS and *S. gallolyticus* (bovis)

- IV Penicillin G x 6 weeks duration
- IV Ceftriaxone x 6 weeks
- Either above regimen PLUS Gentamicin x 6 weeks
- Penicillin/Ceftriaxone allergic
  - IV Vancomycin x 6 weeks (goal trough concentration of 10-15 mcg/mL)

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Native valve, *Staphylococci*

- Oxacillin-susceptible strains
  - IV Nafcillin or Oxacillin x 6 weeks
  - IV Cefazolin x 6 weeks

- Oxacillin-resistant strains
  - IV Vancomycin x 6 weeks
  - IV Daptomycin x 6 weeks

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Prosthetic valve, *Staphylococci*

- Oxacillin-susceptible
  - IV Nafcillin or oxacillin x 6 weeks
  - Plus Rifampin PO x 6 weeks
  - Plus IV Gentamicin x 2 weeks

- Oxacillin-resistant
  - IV Vancomycin x 6 weeks
  - Plus PO Rifampin x 6 weeks
  - Plus IV Gentamicin x 2 weeks

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Culture-Negative Endocarditis

• Continuous bacteremia and high frequency of positive blood cultures are hallmarks of IE

• Failure to culture microorganisms complicates diagnosis and timely, effective treatment

• Inadequate microbiological technique, fastidious bacteria or fungi, noncultivatable agents, or antibiotics prior to blood cultures
Culture-Negative Endocarditis

- Bartonella, Chlamydia, Coxiella burnetii, Legionella, Brucella, Tropheryma whipplei, Candida, and Aspergillus species
- PCR and serologies available
- *Evaluation of epidemiological factors, history of prior infections, clinical course, severity, and extracardiac sites of infection of the current infection should be performed

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Fungal Endocarditis

- Candida and Aspergillus species most common

- Risk factors—IV drug use, cardiac implantable electronic devices, prosthetic valves, central venous catheters, and immunocompromised state

- Combination of valve surgery and IV Amphotericin B x 6 weeks, following by lifelong suppression with an oral azole

- Poor outcomes without valve surgery

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Surgery

• Decisions on surgical intervention are complex and depend on clinical and prognostic factors
  • Organism, vegetation size, perivalvular infection, embolism, heart failure, age, comorbidities, and available surgical expertise.

• Optimal timing of surgery is unknown

• Indication and timing of surgery—team of cardiovascular surgery, cardiology, and infectious diseases specialists

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
Surgical evaluation

• Vegetation
  • Persistent vegetation after systemic embolization
  • Anterior mitral leaflet vegetation, ≥10 mm
  • ≥1 embolic events during first 2 weeks of ABX
  • Increase in vegetation size despite ABX

• Valvular dysfunction
  • Acute aortic or mitral insufficiency with signs of ventricular failure
  • Heart failure not responsive to medical therapy

• Valve perforation or rupture
  • Perivalvular extension; valvular dehiscence; new heart block, or large abscess
Stroke/Hemorrhage/Prior Emboli

- Stroke is an independent risk factor for post-op mortality in IE patients
- Neurological deterioration can occur from hemorrhagic transformation with anticoagulation during cardiopulmonary bypass
- Valve surgery can be considered in IE patients with stroke or subclinical cerebral emboli without delay if intracranial hemorrhage has been excluded by imaging
- Delay valve surgery >4 weeks if major ischemic stroke or intracranial hemorrhage

Baddour et al. Infective endocarditis in adults: Diagnosis, Antimicrobial Therapy, Management of Complications. 2015
At completion of therapy

- Echocardiography to establish new baseline
- Drug rehabilitation referral for IV drug users
- Antibiotic prophylaxis for invasive dental procedures
- Thorough dental evaluation and treatment
- Removal of PICC at completion of antibiotic therapy
Short-term follow up

- 3 sets of blood cultures for any febrile illness
- Physical examination for evidence of heart failure
- Evaluation for toxicity resulting from current/previous antibiotic therapy
Long-term follow up

- 3 sets of blood cultures for any febrile illness
- Evaluation of valvular and ventricular function with echocardiography
- Frequent dental professional office visits and oral hygiene

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Post-Test Question

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Questions & Discussion
References
