

BACTERIAL ENDOCARDITIS

Definition

Infection of endothelium of heart (including but not limited to the valves)

Predisposing conditions

- Abnormal valve

High risk: prior endocarditis, prosthesis, cyanotic congenital heart (unrepaired), VADs, rheumatic heart disease, AoV disease (incl. bicuspid)

Medium risk: MV disease (including MVP w/ MR or thickened leaflet), HCMP

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- Risk of bacteremia: IVDU, indwelling venous catheters, poor dentition, hemodialysis, DM, prosthetic material in heart (eg. pacemaker, ICD, graft)

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Modified Duke Criteria

Major	Minor
<ul style="list-style-type: none"> • BCx with common endocarditis pathogen (grown in 2 separate cultures) • <i>Coxiella</i> serology $\geq 1:800$ • Endocardial involvement, w/ either: echocardiogram w/ vegetation, abscess, or prosthetic dehiscence new valvular regurgitation 	<ul style="list-style-type: none"> • Predisposing condition (see above) • Fever • Vascular phenomena: septic arterial or pulmonary emboli, mycotic aneurysms, ICH, Janeway lesions • Immune phenomena: \oplus RF, GN, Osler's nodes, Roth spots • \oplus BCx not meeting major criteria
<p>Definitive (ie, highly probable): 2 major <i>or</i> 1 major + 3 minor <i>or</i> 5 minor criteria</p> <p>Possible: 1 major + 1 minor <i>or</i> 3 minor criteria</p>	

Microbiology of Endocarditis				
Etiology	Native Valve (NVE)		Prosthetic Valve (PVE)	
	Non-IVDA	IVDU	Early (≤ 60 d)	Late (> 60 d)
<i>S. viridans</i> et al.	36%	13%	<5%	20%
<i>Enterococcus</i>	11%	5%	8%	13%
<i>S. aureus</i>	28%	68%	36%	20%
<i>S. epidermidis</i>	9%	<5%	17%	20%
GNR	<5%	<5%	6%	<5%
Other	<5%	<5%	10%	10%
Fungal ^a	1%	1%	9%	3%
Culture \ominus ^b	11%	<5%	17%	12%

^a↑ risk w/ DM, indwelling lines, immunosupp. ^bCx \ominus = abiotrophic strep, HACEK (*Haemophilus para-influenzae* & *aphrophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikenella* and *Kingella*), *T. whipplei*, *Bartonella*, *Coxiella*, *Chlamydia*, *Legionella*, *Brucella* (*JAMA* 2007;297:1354; *Annals* 2007;147:829; *J Clin Microbiol* 2012;50:216)

Clinical manifestations (*Lancet* 2016;387:882)

- Persistent bacteremia: fever (80–90%), rigors, night sweats, anorexia, wt loss, fatigue
- Valvular or perivalvular infection: CHF, conduction abnormalities
- Septic emboli: stroke, PE (if right-sided), mycotic aneurysm, MI (coronary artery embolism), CNS, kidneys, spleen, joints
- Immune complex phenomena: arthritis, glomerulonephritis, ⊕ RF, ↑ ESR
- *Subacute* (less-virulent pathogens) can p/w fatigue, nonspecific sx in Pts w/o risk factors

Physical exam

- HEENT: Roth spots (retinal hemorrhage + pale center), petechiae (conjunctivae, palate)
- Cardiac: murmur (85%), new valve regurgitation (40–85%) ± thrill (fenestrated valve or ruptured chordae), muffled sounds (PV). *Frequent exams* for Δ murmurs, s/s CHF.
- Extremities
 - Janeway lesions (septic emboli → nontender, hemorrhagic macules on palms or soles)
 - Osler's nodes (immune complexes → tender nodules on pads of digits)
 - proximal* nail bed splinter hemorrhages (8–15%); petechiae (33%); clubbing; arthritis
- Δ MS or focal deficits, vertebral tenderness
- Devices: erythema, tenderness or drainage at catheter site, PM/ICD pocket tenderness

Diagnosis

- Blood cultures (*before abx*): 3 sets (aerobic & anaerobic bottles) from different sites, ideally spaced ≥ 1 h apart.
- . ECG (on admission and at regular intervals) to assess for new conduction abnormalities
- . Echocardiogram: *TTE in all*.

Obtain TEE

(i) TTE nondx

(ii) TTE \ominus but high suspicion,

(iii) high-risk (prosthetic valve, prior IE, congenital heart dis.),

(iv) suspect progressive or invasive infxn (eg, persistent bacteremia or fever, new conduction abnl, etc.)

- Addition of PET/CT or MRI helpful to assess for periannular complications in PVE
- Brain/spine imaging necessary in those who develop severe HA, neurologic deficits, meningeal signs. Consider in any patient with left-sided endocarditis (*Circ* 2015;132:1435).
- Cx \ominus endocarditis: may be due to abx prior to BCx. PCR, bacterial 16S ribosomal RNA, serol. may be helpful. Detailed hx: animal exposure, travel, unpast. dairy, etc. ID eval.

TREATMENT

Treatment (<i>Circ</i> 2015;132:1435)	
Organism	Specific Considerations
Empiric	NVE or PVE >12 mo post-op: Vanc + CTX PVE <12 mo post op: Vanc + CTX + gent
<i>Strep</i>	<i>S. bovis</i> a/w colon cancer. Penicillin, Amp, CTX
<i>Staph</i>	<ul style="list-style-type: none"> • MRSA: vanc or dapto; MSSA: nafcillin or cefazolin • Obtain ID consult • Vanc inferior to beta lactam for long-term MSSA Rx • For PCN allergy w/ MSSA, undergo desensitization • Do not use cefazolin for CNS involvement b/c poor penetration • Rif (+ AG × 2 wk to prevent resistance) should be added in PVE • <i>S. lugdunensis</i> is <i>virulent</i> and should be treated like <i>S. aureus</i>
<i>Enterococcus</i>	Ampicillin + [CTX or gent]; VRE needs linezolid or dapto
GNRs	HACEK: CTX. <i>Pseudomonas</i> : 2 anti-Pseudomonal agents [eg, B-lactam + (AG or quinolone)]; consult ID.
Fungi	Liposomal ampho or micafungin. Risk factors: TPN, lines, pacemaker/ICD, prosthesis, IVDU. <i>Ophtho consult for candidemia.</i>
Early surgical consult for any prosthetic valve infection regardless of organism	

- De-escalate abx to organism-directed therapy once sensitivities return
- Repeat BCx q24–48h until Pt defervesces and BCx \ominus
- Anticoag. controversial; d/c for ≥ 2 wk if PVE and CNS embolic event. Can continue antiplatelet Rx if no CNS event in all comers, but no proven benefit to adding.
- Monitor for complications of endocarditis (CHF, conduction block, new emboli, etc., which can occur even on abx) and of abx Rx (interstitial nephritis, ARF, neutropenia, etc.)
- Duration of Rx: usually 4–6 wk
 - After ≥ 10 d IV abx, if doing well, and depending on organism, Pt, & abx choices, may consider Δ 'ing to PO in consultation with ID (*NEJM* 2019;380:415)
 - Uncomplicated right-sided NVE or PCN-S strep spp \rightarrow 2 wk may be comparable

Indications for surgery

1. Severe valvular dysfunction → refractory CHF
2. Uncontrolled infxn (typically urgent surgery w/in days): periannular abscess (10–40% NVE, 60–100% PVE), heart block, fistula, worsening conduction, PVE w/ dehiscence
3. Organism: consider surgery for *S. aureus*, fungal or multiRx-resistant organisms
4. Prosthetic valve: dysfunction or dehiscence
5. Systemic embolism
6. Cerebral emboli

Prognosis

- NVE: non-IVDU *S. aureus* → 30–45% mortality; IVDU *S. aureus* (often right-sided) → 10–15% mortality; SBE → 10–15% mortality
- PVE → 23% mortality

Endocarditis Prophylaxis (<i>Circ</i> 2007;116:1736)	
Cardiac conditions*	Prosthetic valve; previous NVE; congenital heart disease (CHD) including unrepaired or incompletely repaired cyanotic CHD (palliative shunts or conduits), 1 st 6 mo after completely repaired CHD using prosthetic material; cardiac transplant recipients w/ valvulopathy (Prophylaxis no longer rec. in acquired valvular dysfxn, bicuspid AoV, MVP with leaflet thickening or regurgitation, HCMP)
Procedures*	Dental: manipulation of gingival tissue or periapical region of teeth or perf oral mucosa (eg, extraction, periodontal, implant, root canal, cleaning) Respiratory: incision or biopsy of respiratory mucosa (no prophylaxis for GI or GU procedures)
Regimens	Oral: amoxicillin 2 g 30–60 min before Unable to take PO: amp 2 g IM/IV or cefazolin or Cftx 1 g IM/IV PCN-allergic: clinda 600 mg PO/IM/IV

*Pts should meet both indications (high-risk condition & high-risk procedure) to qualify for Ppx