Endocarditis [created by Paul Young 02/10/07]

iv drug use

- Intravenous drug users represent a risk group of fairly young people (median age 30–40 years).
- The tricuspid valve is infected in more than 50% of cases, followed by the aortic valve in 25% and the mitral valve in 20%, with mixed right-sided and left-sided infective endocarditis in a few instances.
- 60–80% of patients have no known preexisting valve lesions.
- The pathogens usually originate from the skin, explaining the predominance of Staph aureus. Pseudomonas aeruginosa and fungi are also encountered and produce severe forms of infective endocarditis.
- In HIV-1-positive intravenous drug users, both the risk of and mortality from infective endocarditis rise inversely to the CD4 count; risk is unaffected in patients with CD4 counts of more than 500 cells per microL, but increases four-fold in those with CD4 counts of less than 200 cells per microL
- HIV-1-positive patients sometimes present with infective endocarditis caused by unusual organisms, including bartonella, salmonella, and listeria.

therapy

	Dose and route	Duration (weeks)	Comments
Penicillin-susceptible viridans streptococci and *Strep bovis*			
Procain benzylpenicillin	6×2–3 million U daily IV	4	Preferred in patients older than age 65 years or with impaired renal function
Ceftriaxone*	1×2 g daily IV or IM	4	
Procain benzylpenicillin with gentamicin	6×2–8 million U daily IV 3×1 mg/kg daily IV or IM	2 2	Gentamicin once daily might be adequate
Ceftriaxone* with netilmicin	1×2 g daily IV or IM 1×4 mg/kg daily IV	2 2	
Vancomycin	2×15 mg/kg daily IV	4	Recommended for patients allergic to β lactam
Intermediate penicillin-resistant (MIC 0·1–1 mg/L) viridans streptococci and *Strep bovis*			
Procain benzylpenicillin with gentamicin	6×3 million U daily IV 3×1 mg/kg daily IV or IM	4 2	Gentamicin once daily might be adequate
Vancomycin	2×15 mg/kg daily IV	4	Recommended against highly resistant strains or for patients allergic to β lactam
***Enterococcus* spp†**			
Procain benzylpenicillin with gentamicin	6×3–5 million U/daily IV 3×1 mg/kg daily IV or IM	4–6 4–6	6-weeks' therapy recommended for patients with >3 months symptoms
Ampicillin with gentamicin	6×2 g/daily IV 3×1 mg/kg daily IV or IM	4–6 4–6	Gentamicin once daily might be adequate
Vancomycin with gentamicin	2×15 mg/kg daily IV 3×1 mg/kg daily IV or IM	4–6 4–6	Monitor drug serum concentrations and renal function
Microorganisms of the HACEK group‡			
Ceftriaxone*	1×2 g daily IV or IM	4	
Ampicillin with gentamicin	6×2 g daily IV 3×1 mg/kg daily IV or IM	4 4	Gentamicin once daily might be adequate

IV=intravenous. IM=intramuscular. *Preferred for outpatient treatment. †Treatment of endocarditis due to vancomycin-resistant enterococci depends on careful assessment of susceptibility to alternative antibiotics, including new streptogramin combination quinupristin/dalfopristin. ‡Includes *Haemophilus* spp, *A actinomycetemcomitans*, *C hominis*, *E corrodens*, and *K kingea*. Adapted from references 79–81 with permission from Mosby.

	Dose and route	Duration (weeks)	Comments
Native valves			
Meticillin-susceptible staphylococci			
Flucloxacillin, or oxacillin, or nafcillin	6×2 g daily IV	4–6	Benefit of gentamicin addition not known
with gentamicin (optional)	3×1 mg/kg daily IV or IM	3–5 days	
Cefazolin (or other first generation cephalosporins)	3×2 g daily IV	4–6	Alternative for patients allergic to penicillins (not in case of immediate-type penicillin hypersensitivity)
with gentamicin (optional)	3×1 mg/kg daily IV or IM	3–5 days	
Vancomycin	2×15 mg/kg daily IV	4–6	Recommended for patients allergic to β lactam
Meticillin-resistant staphylococci			
Vancomycin	2×15 mg/kg daily IV	4–6	Recommended for patients allergic to β lactam
Prosthetic valves			
Meticillin-susceptible staphylococci*			
Flucloxacillin, or oxacillin, or nafcillin	6×2 g daily IV	≥6	Rifampin increases hepatic metabolism of numerous drugs, including warfarin
with rifampicin	3×300 mg daily orally	≥6	
and gentamicin	3×1 mg/kg daily IV or IM	2	
Vancomycin	2×15 mg/kg daily IV	≥6	Recommended for patients allergic to β lactam
with rifampicin	3×300 mg daily orally	≥6	
and gentamicin	3×1mg/kg daily IV or IM	2	
Meticillin-resistant staphylococci			
Vancomycin	2×15 mg/kg daily IV	≥6	
with rifampicin	3×300 mg daily orally	≥6	
and gentamicin	3×1 mg/kg daily IV or IM	2	

IV=intravenous. IM=intramuscular. *Rifampicin plays a special part in prosthetic device infection, because it helps kill bacteria attached to foreign material. Rifampicin should never be used alone, because it selects for resistance at a high frequency (about 10^{-6}). Adapted from references 79–81 with permission from Mosby.

rare cause of endocarditis that are culture negative

- Brucella
- C. burnetti
- Bartonella
- Chlamydia
- Mycoplasma
- Legionella
- Whipples

risk factors

- Risk of native-valve disease is classically associated with congenital heart disease and chronic rheumatic heart disease.
- mitral valve prolapse is a more controversial issue; patients with valve regurgitation have an increased risk of infective endocarditis.
- Degenerative valve lesions are a primary cause of senile aortic stenosis or mitral regurgitation, which are risk factors for infective endocarditis.
- 1–5% of individuals with infective endocarditis have prosthetic-valve endocarditis. Whether mechanical valves or bioprostheses are more prone to infection remains unresolved.
- IV drug use
- Nosocomial endocarditis
- Haemodialysis

prosthetic valve endocarditis

- PVE is classified as either early or late infection, depending on whether the infection arises within 60 days of surgery or later.
- The condition peaks during the first 2 months after valve implantation and is often due to Staphylococcus epidermidis or Staph aureus.
- Progressive endothelialisation of the prosthetic material over 2–6 months reduces the susceptibility of the valve to infection.
- Late PVE is often due to other organisms:
eg, streptococci and gram-negative bacteria of the HACEK group, Haemophilus spp, Actinobacillus actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens, and Kingella kingae

nosocomial endocarditis

- Nosocomial endocarditis is a growing category
- Less than 50% of patients had cardiac predisposing factors.
- Predominant pathogens were staphylococci and enterococci, and were frequently associated with catheters or medicosurgical procedures.
- The authors of one study estimated that up to 13% of nosocomial Staph aureus bacteraemia were responsible for subsequent infective endocarditis. Moreover, possible right-sided nosocomial endocarditis was reported in 5% of bone-marrow transplant recipients who had central venous catheters.
- Nosocomial endocarditis is important because its case fatality rate is greater than 50%.
- Another iatrogenic risk for infective endocarditis is haemodialysis. The disease is two to three times more frequent in haemodialysis patients than in peritoneal dialysis patients or in the general population. More than 50% of cases are due to Staph aureus.