Endocarditis

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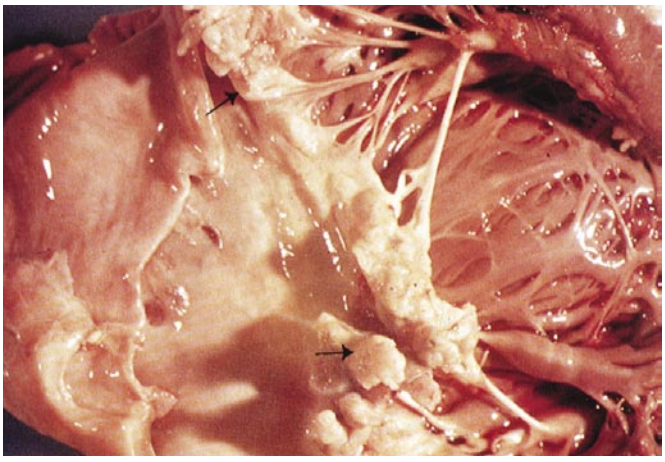
Infectious endocarditis results from microbial infection of the endothelial surface of the heart. The characteristic lesion, a vegetation (Figure 1), is a mass of platelets and fibrin within which circulating micro-organisms have adhered and enmeshed.



1 Surgical specimen of a removed mitral valve showing vegetations (arrows).

Epidemiology and microbiology

Native-value endocarditis: in developed countries, the annual incidence of infectious endocarditis remained stable at 1.7–4.2/100,000 from 1950 to 1987, but recent data suggest that the incidence may be increasing; studies from Sweden and the USA report annual incidences of 5.9/100,000 and 11.6/100,000.[1] The most likely explanation is the increased prevalence of predisposing conditions in an ageing population; 55–75% of patients with native-valve endocarditis have such conditions, including:

- rheumatic valve disease
- degenerative heart disease
- mitral valve prolapse
- congenital heart disease
- hypertrophic cardiomyopathy
- intravenous drug abuse
- a prosthetic heart valve.

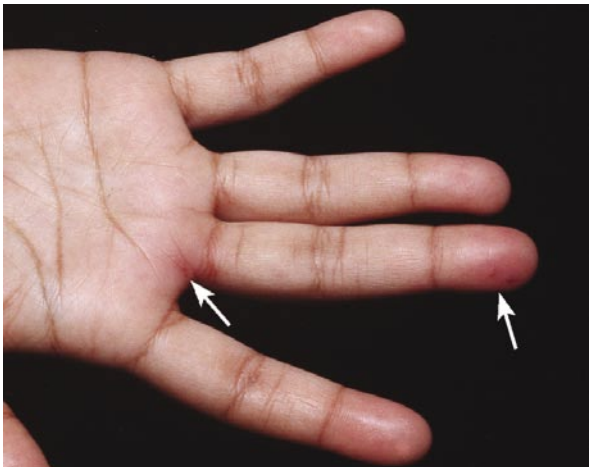
The mean age of patients with infectious endocarditis has increased in parallel with a decline in rheumatic valve disease and an increase in degenerative valvulopathy as the substrate for infection. Most cases of infectious endocarditis in the over-60s are associated with degenerative heart disease. Mitral valve prolapse with mitral regurgitation is associated with only a 4–8-fold increased risk of infectious endocarditis compared with normal valves; however, because of its prevalence, it accounts for 7–30% of cases of native-valve endocarditis.

In young adults with infectious endocarditis, 20% of cases occur in those with congenital abnormalities, who now survive into adulthood as a result of corrective surgery. Bicuspid aortic valve is the most common congenital heart lesion and is emerging as an important predisposing cause of infectious endocarditis in the fourth and fifth decades of life.

Most cases of native-valve endocarditis are caused by viridans streptococci, *Streptococcus bovis*, *Staphylococcus aureus* or enterococci. In patients with community-acquired native-valve endocarditis who are not injecting drug-users, about one-third of cases are caused by streptococci, one-third by *Staph. aureus* and one-third by other organisms, including the HACEK group (*Haemophilus* spp., *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella* spp. and *Kingella kingae*) of fastidious Gram-negative coccobacilli. When actively sought, *Bartonella* spp. have been found to cause 3% of cases, and *Coxiella burnetii* has caused a similar percentage of cases in selected areas. Both organisms are difficult to grow in blood cultures, and the diagnosis may require serological evaluation.[2]

The incidence of infectious endocarditis in injecting drug-users is 2–5%/year. Infection commonly involves the right heart valves and often occurs in previously normal valves. More than 50% of cases are caused by *Staph. aureus*.

Nosocomial native-valve endocarditis is an emerging problem. *Staph. aureus* is the most common pathogen (55%), followed by enterococci (16%) and coagulase-negative staphylococci (10%). Central venous catheters are a major risk factor. The prevalence



2 Osler nodes on the hand and the pulp of the finger (arrows) in a young woman with rheumatic heart disease and aortic valve endocarditis caused by *Staphylococcus aureus*.

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of infectious endocarditis following *Staph. aureus* catheter-related bacteraemia averages 6.1%, but was 23% in a study that systematically examined patients using transoesophageal echocardiography (TOE).[3] Patients with *Staph. aureus* catheter-related bacteraemia should undergo TOE to exclude infectious endocarditis.

Prosthetic-valve endocarditis: in 10–15% of patients with infectious endocarditis, infection develops on prosthetic valves. The cumulative prevalence of prosthetic-valve endocarditis is 3% during the first year after valve surgery and almost 6% after 5 years. The risk is greatest during the first 6 months. Methicillin-resistant coagulase-negative staphylococci are responsible for most cases seen within the first year after valve placement. After 12 months, the microbiology of prosthetic-valve endocarditis resembles that of the native-valve form, though the incidence of coagulase-negative staphylococci is greater (10%).

Marantic endocarditis (also known as thrombotic endocarditis) occurs in patients with malignancy, particularly adenocarcinoma.[4] Platelets and fibrin form vegetations on heart valves as a consequence of a hypercoagulable state. Patients present with fever and embolization of the spleen, kidneys and CNS, but blood cultures are negative.

Modified Duke clinical criteria for diagnosis of infectious endocarditis

Major criteria

Positive blood culture

- Two separate blood cultures yielding organisms that typically cause infectious endocarditis (viridans streptococci, *Streptococcus bovis*, HACEK,[1] *Staphylococcus aureus* or community-acquired enterococci without a primary focus)
- Persistently positive blood cultures (defined as positive blood cultures drawn more than 12 hours apart *or* all of three or a majority of four or more separate positive blood cultures, the first and last drawn at least 1 hour apart)
- Single positive blood culture for *Coxiella burnetii* or antiphase I IgG antibody titre › 1:800

Evidence of endocardial involvement

- Echocardiography positive for infectious endocarditis[2]
  - Oscillating intracardiac mass on a valve or supporting structure in the path of regurgitant jets or on implanted material in the absence of an alternative anatomical explanation
  - Abscess
  - New partial dehiscence of a prosthetic valve
- New valvular regurgitation (change in pre-existing murmur is not adequate)

Minor criteria

- Predisposing heart condition or intravenous drug use
- Fever (≥ 38.0°C)
- Vascular phenomenon (major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial haemorrhage, conjunctival haemorrhages or Janeway lesions)
- Immunological phenomenon (glomerulonephritis, Osler's nodes, Roth spots or rheumatoid factor)
- Microbiological evidence (positive blood culture, but less than major criterion,[3] *or* serological evidence of active infection with an organism consistent with infectious endocarditis)

[1]*Haemophilus* spp., *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens* and *Kingella kingae*
[2]TOE recommended in patients with prosthetic valves or complicated endocarditis and who have possible endocarditis
[3]Excludes a single positive culture for coagulase-negative staphylococci or organisms that do not cause infectious endocarditis

Source: Durack D T *et al. Am J Med* 1994; **96**: 200–9 and Li J S *et al. Clin Infect Dis* 2000; **30**: 633–8.

Clinical features

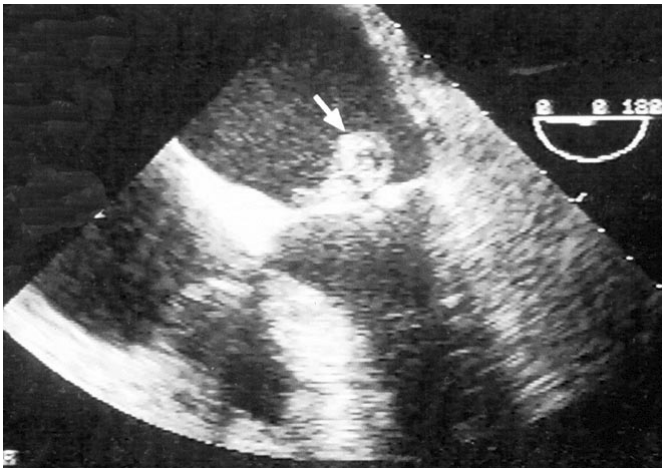
Presentation of infectious endocarditis ranges from an acute syndrome of systemic toxicity and rapid progression with intracardiac and extracardiac complications, to an indolent illness that develops over weeks with low-grade fever and minimal cardiac dysfunction.

Fever is the most common symptom (90% of patients), but may be muted or absent in the elderly, in those with chronic renal failure, and in patients who have received prior antibiotic therapy.

Other nonspecific symptoms include chills, anorexia, weight loss, myalgia, cough and back pain.

Heart murmurs are found in 85% of patients with native-valve endocarditis and most often represent the predisposing cardiac lesion. A new or changing murmur is seen in only 10–40% of patients; this may signal rapid valvular damage and impending heart failure.

Peripheral signs – the classic peripheral Oslerian manifestations of infectious endocarditis (petechiae, splinter haemorrhages, Osler's nodes – Figure 2, Janeway lesions, Roth spots) are not pathognomonic for infectious endocarditis and represent the sequelae of prolonged disease. They are now seen uncommonly, because most patients seek medical attention earlier in the course of the disease.



4 Echocardiogram of a mitral valve showing a large, round vegetation (arrow).

