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DIAGNOSING INFECTIVE ENDOCARDITIS

New criteria for diagnosing infective endocarditis, recently presented at the annual meeting of the Infectious Disease Society of America, may provide greater diagnostic accuracy than the currently used criteria.

Most clinicians entertain the diagnosis of infective endocarditis in the presence of fever, a new heart murmur, peripheral stigmata of endocarditis, and evidence of sustained bacteremia with a typical microorganism. Unfortunately, all of these criteria are not invariably present, leading at times to diagnostic uncertainty.

Under the new criteria, a diagnosis of infective endocarditis can be considered "definite" if a culture or histologic study of a valve or embolus can identify an organism or if there is histopathologic evidence of endocarditis. A definite diagnosis can also be established on clinical grounds if two major criteria, one major and three minor criteria, or five minor criteria are present (*Table*).

The diagnosis is considered "possible" if findings suggest infective endocarditis but a definite diagnosis can neither be established nor rejected. The diagnosis can be rejected if there is a firm alternate diagnosis, if there is resolution of the syndrome of infective endocarditis within 4 days of beginning therapy, or if there is no pathologic evidence of infective endocarditis within 4 days of starting therapy.

This system, devised by Durack and colleagues at the Duke University Medical Center, has been validated in two studies that were also presented at the recent IDSA meeting. A complete description of the criteria will be published in the next few months.

TABLE
INFECTIVE ENDOCARDITIS: DIAGNOSTIC CRITERIA

Major criteria
Bacteremia with a typical organism
Haemophilus aphrophilus
Actinobacillus actinomycetemcomitans
Cardiobacterium hominis
Eikenella corrodens
Kingella kingae
Streptococcus viridans
Community-acquired *Staphylococcus aureus* or enterococcus without another focus
Persistent bacteremia
Positive blood cultures more than 12 hours apart
Three of three or three of four positive blood cultures more than 1 hour apart
Echocardiographic evidence
Oscillating intracardiac target
Abscess
New dehiscence of a prosthesis
Minor criteria
Predisposing lesion or intravenous drug use
Temperature higher than 38°C
Vascular phenomena
Immunologic phenomena
Glomerulonephritis
Osler's nodes
Roth's spots
Rheumatic fever
Suggestive echocardiographic results without major criteria
Microbiologic evidence of an atypical organism

EPIDEMIOLOGY OF INFECTIVE ENDOCARDITIS

An estimated 8000 cases of infective endocarditis occur annually in the United States, for an incidence of 4.9 cases per 100 000 patient-years. The incidence is significantly higher in patients with valvular heart disease, congenital heart disease, previous infective endocarditis, a prosthetic valve, and mitral valve prolapse with murmur.

Between 1940 and 1970, rheumatic heart disease was the most common predisposing cardiac lesion. In the past 20 years, however, mitral valve prolapse and degenerative cardiac lesions have assumed increasing prominence.

Native valve endocarditis likely arises in situations in which turbulent blood flow leads to endo-

cardial damage and subsequent fibrin and platelet deposition, producing a thrombotic lesion. Transient bacteremia subsequently leads to seeding of these sterile lesions, resulting in infective endocarditis. Considerable work over the past two decades has suggested a role for interactions between specific organisms and endothelial receptors, accounting in part for the predilection of certain microorganisms to produce native valve endocarditis.

Early prosthetic valve endocarditis, defined as occurring within 60 days of surgery, most often arises from intraoperative contamination. Late prosthetic valve endocarditis, defined as occurring more than 60 days after surgery, most often arises from bacteremic seeding of the prosthesis, often in the setting of turbulent blood flow due to regurgitation and antecedent endocardial damage.

MICROBIOLOGY OF INFECTIVE ENDOCARDITIS

At university-based medical centers, *Streptococcus viridans* is the most common culprit in native valve infective endocarditis, followed by staphylococci. However, in some community hospitals, *Staphylococcus aureus* accounts for nearly 50% of cases.

Staphylococci account for more than 50% of cases of early prosthetic valve endocarditis. Coagulase-negative staphylococci account for 35% of cases. The microbiology of late prosthetic valve endocarditis more closely approximates that of native valve endocarditis, with *S viridans* accounting for approximately 25% of cases, enterococci for 9%, and staphylococci for nearly 40%.

CLINICAL MANIFESTATIONS

Fever may be absent in as many as 20% of patients with native valve endocarditis. Embolic phenomena are present in fewer than 50%. A heart murmur may be present in up to 85%, but a new murmur is noted in only 3% to 5% of patients. The classic cutaneous peripheral stigmata of endocarditis are present in 18% to 50% of patients, most commonly those with subacute bacterial endocarditis.

By contrast, fever is almost invariably present in patients with prosthetic valve endocarditis, although it is occasionally absent in individuals with indolent organisms. A new or changing murmur is present in approximately 60%, and 50% may demonstrate peripheral stigmata.

Anemia is common in patients with native valve infective endocarditis. A positive rheumatoid factor is present in up to 50% of individuals, usually those with subacute disease due to indolent organisms such as *S viridans*.

DIAGNOSIS

Sustained bacteremia is the hallmark of endovascular infection, in contrast to episodic bacteremia, which characterizes occult abscesses, osteomyelitis, or partially treated infective endocarditis. Antibiotic therapy within the previous 2 weeks may reduce the yield from peripheral blood cultures.

In patients with suspected endocarditis, at least three blood cultures should be obtained over 1 to 2 hours before starting antibiotic therapy. In clinically stable patients with suspected subacute disease, it is not unreasonable to obtain cultures over 24 to 48 hours in an attempt to establish a microbiologic diagnosis before starting antibiotics. In patients with acute infective endocarditis, blood cultures may be obtained over 1 to 2 hours, followed by prompt initiation of antimicrobial chemotherapy.

Echocardiography can corroborate the clinical suspicion of infective endocarditis and can visualize certain anatomic abnormalities that may mandate surgical intervention. However, neither transthoracic nor transesophageal echocardiography is 100% sensitive or specific in the diagnosis of valvular vegetations, perforations, or abscesses. Patients may have infective endocarditis despite negative transthoracic or transesophageal echocardiograms.

There is no substitute for mature clinical judgment in the diagnosis of endocarditis. The clinician should not rely on the results of imaging studies to establish the diagnosis.

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SUGGESTED READING

Bisno AL, Dismukes WE, Durack DT. Antimicrobial treatment of infective endocarditis due to viridans streptococci, enterococci, and staphylococci. JAMA 1989; **261:**1471–1477.

Dajani AS, Bisno AL, Chung KJ, et al. Prevention of bacterial endocarditis. Recommendations by the American Heart Association. JAMA 1990; **264:**2919–2922.

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