Judicious use of transthoracic echocardiography in the diagnosis of infective endocarditis

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Patients with a very low clinical probability of infective endocarditis do not benefit from echocardiography—but what is the definition of ''very low probability''?

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The diagnosis of infective endocarditis (IE) requires the integration of clinical, laboratory, and echocardiographic data. During the past two decades, various clinical criteria have been proposed and subsequently modified for the diagnosis of IE. In 1994 a group at Duke University proposed standardised criteria for assessing patients with suspected IE.[1] These criteria integrated factors predisposing patients to the development of IE, the blood culture isolate and persistence of bacteraemia, and echocardiographic findings with other clinical and laboratory information. The usefulness of these Duke criteria in assessing patients with potential IE has been validated in several subsequent studies.[2]

Transthoracic echocardiography (TTE) is rapid and non-invasive and has excellent specificity for vegetations. According to the population studied, TTE has been reported to have a sensitivity of 40–80% for the detection of vegetations.[3] Because of the possibility of a false negative examination (or the absence of a vegetation) or a false positive study (Lambl's excrescenses, non-infective vegetations, thrombi), echocardiography should not supplant clinical and microbiological diagnosis. TTE views may be inadequate in up to 20% of adult patients because of obesity, chronic obstructive pulmonary disease, or chest wall deformities. In patients suspected of having IE, TTE alone cannot exclude several important aspects of IE, vegetation, or inadequate views to detect small abscesses.[4]

Echocardiography is often requested in patients with fever who have a low probability of endocarditis, and is also requested in patients in whom the diagnosis is virtually certain. Echocardiography has some limitations. It is not cost effective as a means of excluding IE in patients with a low pretest probability of having the disease. With higher prior probability, a negative study result has a useful negative predictive value, but it cannot totally exclude the diagnosis of endocarditis. While most studies involving IE have focused on confirming the presence of the disease, there are few reports to date that have attempted to identify criteria that would predict the absence of vegetations on transthoracic echocardiography.[5] Lindner and colleagues have evaluated the diagnostic value of TTE in suspected IE on the basis of the pretest probability of disease by using clinical criteria that differed from the Duke criteria. In this report, if this probability is less than 4%, a negative transthoracic echocardiogram is cost effective and clinically satisfactory in ruling out IE.[6] As a general rule, TTE with Doppler flow studies should be performed in anyone suspected of having endocarditis. If the clinical suspicion of endocarditis is high and the TTE study is negative or inconclusive, a transoesophageal echocardiogram should be obtained.

ENDOCARDITIS: A CLINICAL DIAGNOSIS

Despite these advances in technology, endocarditis remains a clinical diagnosis. The diagnosis of IE is straightforward in those patients with classic oslerian manifestations: bacteraemia or fungaemia, evidence of active valvulitis, peripheral emboli, and immunologic vascular phenomena. In other patients, however, classic peripheral stigmata may be few or absent. The variability in the clinical presentation of IE requires a diagnostic strategy that will be both sensitive for disease detection and specific for its exclusion across all the forms of the disease.

In this cost conscious era the screening approach for patients with suspected endocarditis, described in *Heart* recently by Greaves and colleagues, is essential.[7] According to the probability theory, a test should not offer additional information when the pretest likelihood of disease is low. Patients with a low clinical probability of IE do not benefit from echocardiography. Despite recent American Heart Association guidelines and other authors suggesting the use of transthoracic echocardiography is not indicated in patients with a very low probability of IE, nobody has defined the ''very low probability'' group.[8]

However, Greaves and colleagues[7] propose criteria which define this very low probability group successfully. This study set out to identify clinical criteria that might permit more judicious use of TTE in patients referred for echocardiography for suspicion of IE. These criteria were: (1) vasculitic/embolic phenomena; (2) central venous access; (3) a recent history of intravenous drug use; (4) presence of a prosthetic valve; and (5) positive blood cultures. The collective absence of these five criteria indicated a zero probability of IE being demonstrated on echocardiography.

Greaves and colleagues[7] also provide information about the predictive value of TTE in suspected IE. The extent to which these data are applicable to the general population remains to be determined. Further prospective studies

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involving large numbers of patients will be required to resolve these issues and determine the most clinically useful variable for detecting the ''very low probability'' group.

RISK OF DEVELOPING IE

The risk of developing an episode of IE depends on factors related to the affected patient and to specific dental, surgical, and therapeutic procedures that cause transient bacteraemias from microorganisms commonly associated with IE. The predisposing factors (considered minor clinical criteria in the Duke model) include, in addition to intravenous drug addiction, valvar lesions of both the native valve (of congenital, rheumatic, or degenerative origin) and the prosthetic valve (biological or mechanical). The literature, on the other hand, describes numerous risk factors, such as poor dental hygiene, chronic alcoholism, and diseases which cause immunological changes such as systemic lupus erythematous, diabetes mellitus, renal insufficiency, cancer, or chronic inflammatory intestinal disease. Greaves and colleagues[7] highlight some important points about one additional predisposing factor—central venous access. These findings are in line with recent data from population based epidemiologic studies where nosocomial endocarditis is now estimated to account for around 10-15% of all episodes of endocarditis.[9] The localisation of infection to the right side of the heart may be related to the above possible risk factors, essentially pacemakers and central venous access. Although

the addition of new criteria needs rigorous prospective evaluation, probably the existence of a central venous access should be considered as a new minor criterion in future modifications of Duke's scheme.

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Factors associated with coronary artery calcification in young female patients with SLE

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Please visit the *Heart* website [www.heartjnl. com] for a link to the full text of this article.

Background: With improved survival rates of patients with systemic lupus erythematosus (SLE), damage such as accelerated atherosclerosis gains increasing importance.
Objective: To identify the prevalence of coronary artery calcifications (CAC) in asymptomatic patients.
Methods: Electron beam tomography (EBT) was performed in 75 female patients with SLE aged <50. The results were correlated with traditional and SLE related factors associated with CAC. 49 women with symptomatic coronary heart disease (CHD) and 279 women without CHD were also analysed.
Results: Overall, 21/75 (28%) patients had CAC. Low HDL cholesterol levels <1.40 mmol/l (p = 0.03, OR = 1.8, 67% v 39%) and cigarette smoking (p = 0.01, OR = 5.7, 76% v 44%) were identified as factors associated with CAC. Hypertension and high cholesterol were more common in women with CHD (p<0.01) than in those without CHD. SLE related factors were proteinuria (1331 v 465 mg/day, p = 0.02), impaired renal function (p = 0.02, OR = 2.6, 26% v 6%), and high C3 levels (p = 0.04, OR = 1.8, 65% v 38%). High C3 levels were also more common in symptomatic CHD (p = 0.02). The prevalence of Sm antibodies was lower in patients with CAC (15% v 42%, p = 0.03). In a multivariate analysis, cigarette smoking, reduced renal function, high C3, and a cumulative steroid dose above 30 g were the most important CAC associated factors in the lupus cohort.
Conclusion: A subgroup of patients with SLE with CAC without any clinical symptoms of CHD was identified by EBT. Therefore, EBT is useful for assessing asymptomatic atherosclerosis in this group.

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