Many sets of guidelines and expert consensus documents have been published over the last few years by the European Society of Cardiology, by the American Heart Association and by other national and international groups. This large number of publications can be confusing and often the validity of some guidelines is questionable. The guidelines one chooses to follow should have been produced on the basis of the best possible data.

Echocardiography has made a huge contribution to the improvement of diagnostic accuracy in Infective Endocarditis (IE) in recent years. Early and accurate diagnosis of endocarditis along with appropriate antimicrobial therapy and where indicated the TOE guidance of surgical therapy can reduce the mortality of endocarditis.

Infective Endocarditis is a microbial infection of intracardiac structures facing the blood. This includes large intra-thoracic vessels and intracardiac foreign bodies (valves, pacing devices, VADs, etc).

The microbiology of IE will be briefly discussed as will an outline of guidelines for antibiotic therapy.

The early lesions of endocarditis are vegetations of variable size; these are followed by later lesions of a destructive nature such as ulceration, perforation of valve leaflets, formation of fistulae, and abscess formation. TOE is a powerful tool in diagnosing and defining the extent of such lesions.

The diagnosis of IE is established by the demonstration of endocardial involvement during a systemic infection. Although echocardiography is a very useful tool it cannot be used alone to make the diagnosis of IE. Several schemes of clinical criteria (e.g. Duke Criteria, Beth Israel Criteria, see below) have been propounded to aid the diagnostic process.

Transthoracic echocardiography (TTE) should be used to screen patients with suspected native valve endocarditis and this may be adequate if negative when the images are good and when the index of suspicion is low. TTE has a good specificity for vegetations (98%), its sensitivity for vegetations is however less than 60%.

Transoesophageal Echo (TOE) has better spatial resolution than TTE and therefore a much better specificity (88-100%) and sensitivity (86-94%) for vegetations in IE. TOE should be performed...
on TTE negative cases with a high index of clinical suspicion and in all cases with suspected prosthetic valve endocarditis. TOE should also be used in TTE positive cases to define major valvular complications and if surgery is required.

A study by Fowler et al. (1997) compared TTE and TOE in patients with staphylococcal bacteraemia and recommended TOE as essential in establishing a diagnosis of IE and in detecting complications of IE.

Three echocardiographic findings are thought to be important criteria in establishing a diagnosis of IE:

1. Mobile echo dense mass attached to valvular or mural endocardium or to implanted material.
2. Demonstration of fistulae of abscess formation.

During the lecture, examples will be shown of all of the above complications.

TOE is also useful in establishing the need for surgical intervention.

<table>
<thead>
<tr>
<th>Echocardiographic Features Suggesting Potential Need for Surgical Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetation</strong></td>
</tr>
<tr>
<td>Persistent vegetation after systemic embolization:</td>
</tr>
<tr>
<td>Anterior mitral leaflet vegetation, particularly with size &gt;10 mm²</td>
</tr>
<tr>
<td>One or more embolic events during first 2 weeks of antimicrobial therapy</td>
</tr>
<tr>
<td>Two or more embolic events during or after antimicrobial therapy</td>
</tr>
<tr>
<td>Increase in vegetation size after 4 weeks of antimicrobial therapy</td>
</tr>
<tr>
<td>Valvular dysfunction</td>
</tr>
<tr>
<td>Acute aortic or mitral insufficiency with signs of ventricular failure</td>
</tr>
<tr>
<td>Heart failure unresponsive to medical therapy</td>
</tr>
<tr>
<td>Valve perforation or rupture</td>
</tr>
<tr>
<td>Perivalvular extension</td>
</tr>
<tr>
<td>Valvular dehiscence, rupture, or fistula</td>
</tr>
<tr>
<td>New heart block</td>
</tr>
<tr>
<td>Large abscess, or extension of abscess despite appropriate antimicrobial therapy</td>
</tr>
</tbody>
</table>
Duke Criteria for IE
Clinical criteria for infective endocarditis require:

- **Two major criteria, or**
- **One major and three minor criteria, or**
- **Five minor criteria**

Duke Major Criteria

**Positive blood culture for Infective Endocarditis**
Typical micro organism consistent with IE from 2 separate blood cultures, as noted below:
- Viridians streptococci, *Streptococcus bovis*, or **HACEK group**, or
- Community-acquired *Staphylococcus aureus* or enterococci, in the absence of a primary focus or

Micro organisms consistent with IE from persistently positive blood cultures defined as:
- 2 positive cultures of blood samples drawn >12 hours apart, or
- All of 3 or a majority of 4 separate cultures of blood (with first and last sample drawn 1 hour apart)

**Evidence of endocardial involvement**
Positive echocardiogram for IE defined as:
- Oscillating intracardiac mass on valve or supporting structures, in the path of regurgitant jets, or on implanted material in the absence of an alternative anatomic explanation, or
- Abscess, or
- New partial dehiscence of prosthetic valve

Or
New valvular regurgitation (worsening or changing of pre-existing murmur not sufficient)

Duke Minor Criteria
**Predisposition:** predisposing heart condition or intravenous drug use

**Fever:** temperature > 38.0° C (100.4° F)

**Vascular phenomena:** major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway lesions

**Immunologic phenomena:** glomerulonephritis, Osler's nodes, Roth spots, and rheumatoid factor

**Microbiological evidence:** positive blood culture but does not meet a major criterion as noted above¹ or serological evidence of active infection with organism consistent with IE

**Echocardiographic findings:** consistent with IE but do not meet a major criterion as noted above

¹ Excludes single positive cultures for coagulase-negative staphylococci, diphtheroids, and organisms that do not commonly cause endocarditis.

Suggested reading