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Infective Endocarditis: Diagnostic and Therapeutic Issues – Should Transoesophageal Echocardiography be Performed in all Patients? – Position Con

G. L. Nicolosi

The position of a selected indication to TEE in patients with suspected IE should be probably considered as a part of a more general controversy on the appropriate use of medical technology and resources.

In fact the answer to the question when TEE should be performed could change if we are taking into account an environment where the resources are considered somewhat unlimited. In this settings the answer could be: what is easy available is needed.

In the more realistic environment of limited resources or, better to say, in the cost/benefit arena the answer should be: what is appropriate is needed.

And this makes much more sense for a clinician who likes clinical guided indications to technology and is expecting a clear cut incremental value from the decision to perform a second step examination.

The position of a selected indication to TEE in patients with suspected IE should be then strongly supported. The indication to TEE should be based on clinical guidance and TEE should be always preceded by a high technical standard TTE examination. *J Clin Basic Cardiol 2001; 4: 161–164.*

Key words: infective endocarditis, transthoracic echocardiography, transoesophageal echocardiography

It is very important to remember that protagonists and antagonists of a debate are generally requested to present their position in a lively (and perhaps somewhat exaggerated) way, in order to provide opposing (and sometimes complementary) views on problems related to daily clinical practice.

This can help to understand the difficulty of my position “contra” in the present debate, since the position “pro” on the indication to perform transoesophageal echocardiography (TEE) in all patients with suspected infective endocarditis (IE) seems very convincing and could be easily accepted.

It could be then easy to conclude that I am trying to debate from an unsustainable position, perhaps with some psychological propensity to autolesionism or to a masochist tendency.

I will try, however, to do my best to elucidate some considerations which, I think, can be helpful in the decision making of the routine daily practice with the “so called” suspected IE.

This situation is, in fact, too often faced too simply, sometimes with immediate decisions to perform a transoesophageal echocardiographic study without adequate thought, like a sub-tentorial reflex.

Heterogeneity of Indications for Transoesophageal Echocardiography in Different Institutions

First of all it must be taken into account that, from the literature, it does not appear so clear if the “so called” suspected IE is considered the same in different institutions. What is clear, on the contrary, is the fact that there is a wide variation in the indications for performing TEE in different institutions, since the proportion of TEE performed can vary from 1.4 % to a value as high as 23.6 % of the total number of transthoracic echocardiograms [1].

This survey, reporting the experience of 15 European centres, can be considered somewhat dated, since it was published in 1991, but looking around at different laboratories at the present time the situation does not appear very different. This suggests different policy in the way different institutions are facing routine daily practice in the indication to perform transoesophageal echocardiography.

Factors which affect the use of TEE in a given institution can include the case mix and the selection of patients, the quality and dedication in performing transthoracic echocardiography (TTE), and the use of specific diagnostic or referral protocols [2].

The Problem of False Positive TEE Studies

The fact that everything is not so clear, and that the present debate is not yet concluded, is also supported by the ACC/AHA guidelines for the clinical application of echocardiography [3].

They state that in infective endocarditis in native valves “TEE is more sensitive in detecting vegetations than TTE, but because of false-positive studies associated with rheumatic or myxomatous valves, Lambl’s excrescences, etc. echocardiography does not supplant clinical and microbiological diagnosis. ... In general, TEE is not indicated as the initial examination in the diagnosis of native valve infective endocarditis. TEE is indicated where TTE does not adequately visualize the valve or answer haemodynamic questions.” [3]

Furthermore, even in infective endocarditis of prosthetic valves, some indications for echocardiography have been classified in class III (ie, evidence that the procedure is not useful nor effective and in some cases may be harmful) if used for transient fever without bacteraemia or new murmur; and in class IIb (ie, usefulness less well established by evidence or opinion) if used as a routine reevaluation in uncomplicated endocarditis during antibiotic therapy [3].

The problem of false positive or not diagnostic echocardiographic studies has not been clearly assessed throughout the studies, even though it has been alluded to by the fact that echocardiographic findings are included in the Duke criteria [4], even though it has been also stated that echocardiography does not supplant clinical and microbiological diagnosis [3].

As an example Figure 1 is an apical transthoracic 5 chamber view from a 59 year old male with fever, non-Hodgkin lymphoma and an echogenic mass, mobile in real time, at the base of the posterior leaflet of the mitral valve. This could be classified as a positive echocardiogram and a major Duke cri-

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teria for the diagnosis of IE. The subsequent clinical follow up showed that the fever was related to the non-Hodgkin disease and the mass was stable over time and classified as a fibroma of the mitral valve.

Figure 2 shows a systolic frame from a 4 chamber transoesophageal echocardiographic study in a patient with chronic renal failure and haemodialysis. The unexpected oscillating mass on the submitral apparatus is consistent with vegetation. On the other hand, the clinical ground was and remained absolutely negative for IE. At the subsequent follow up the mass was stable and classified as a fibrocalcific nodularity of the submitral apparatus.

These examples make very clear the point of the importance of the clinical ground on which the indication to echocardiography is made, and the consequent selection of cases

which are included or excluded from a given series. In fact it has been reported that clinicians disregard TTE demonstration of vegetations if clinical suspicion for IE is low [5]. It is also not clear whether the initial echo request, stating or not stating "rule out vegetations or IE", biases the following interpretation [5].

Relative Diagnostic Value of Transthoracic Versus Transoesophageal Echocardiography

First of all I hope that it can be accepted that TTE should always precede TEE. It is in fact very important that an easy access to TEE should not be used to excuse low technical standards of TTE.

For prosthetic valves we can easily accept that TEE may provide additional value as compared to TTE, but the role of TTE can not be understated.

Figure 3 shows in fact a transthoracic examination in a patient with a mitral mechanical prosthetic valve, where the disease was only evident on the ventricular side of the valve itself, which was masking its presence by the transoesophageal approach. This further emphasizes the complementary and not alternative role of TTE in the settings of IE.

Trying to further assess the relative diagnostic value of transthoracic versus transoesophageal echocardiography Lindner et al. reported a series of 105 patients referred for suspected endocarditis [6].

The evaluation was based on the pretest clinical probability of the disease classified as low, intermediate or high. Echo findings on TTE and TEE were also separately categorized as low, intermediate or high probability.

Concordance between TTE and TEE for either presence or absence of vegetations was 96 % [6].

TTE and TEE classified the majority (82 % and 85 % respectively) of the 67 patients with low clinical probability of IE as having a low likelihood of the disease [6].

The results of this study show that both TTE and TEE have a low diagnostic yield and should not be used in patients with low clinical probability of endocarditis, who constitute the majority of patients in whom echocardiography is requested to "rule out" the condition [6]. In those with an intermediate or high clinical probability, TTE should be the diagnostic procedure of choice. TEE should be reserved for patients who have prosthetic valves and in whom TTE is either

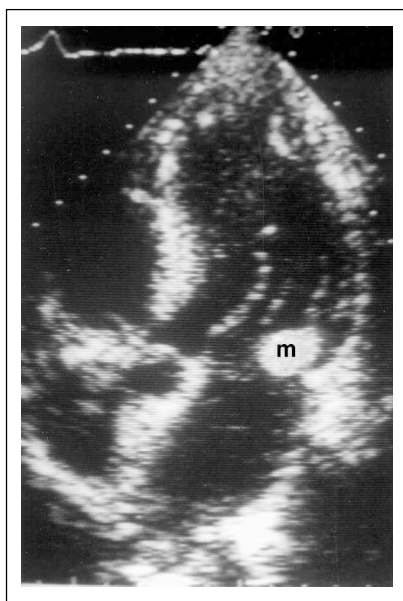


Figure 1. Apical transthoracic 5 chamber view from a 59 year old male with fever, non-Hodgkin lymphoma and an echogenic mass, mobile in real time, at the base of the posterior leaflet of the mitral valve (m). This could be classified as a positive echocardiogram and a major Duke criteria for the diagnosis of IE (see text)

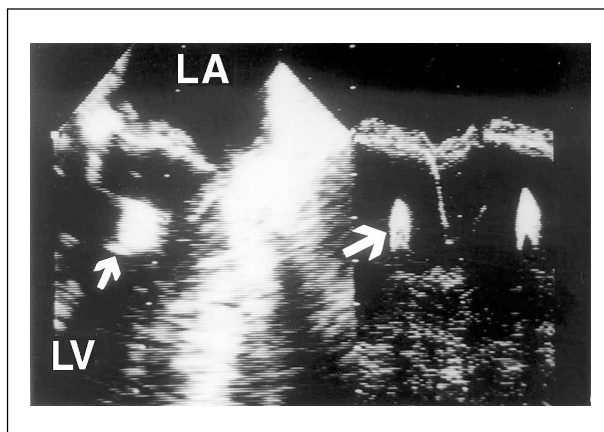


Figure 2. Systolic frame from a 4 chamber transesophageal echocardiographic study in a patient with chronic renal failure and haemodialysis. The unexpected oscillating mass on the submitral apparatus (arrows: left 2D, right M-mode derived echocardiogram) is consistent with vegetation (see text). LA = left atrium; LV = left ventricle.

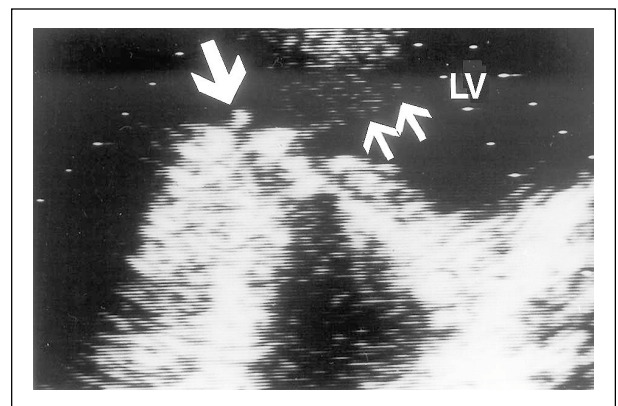


Figure 3. Transthoracic modified 4 chamber apical view in a patient with a mitral mechanical prosthetic valve, where the disease was only evident on the ventricular side of the valve itself (large arrow), which was masking its presence by the transoesophageal approach. The two small arrows indicate a spontaneous echo contrast small diastolic jet through the stenotic prosthetic valve, due to ingrowing tissue (see text). LV = left ventricle

technically inadequate or indicates an intermediate clinical probability of IE [6].

It is also important to say that the course of antibiotic therapy was influenced only by the clinical profile and not by the echo results [6].

Another paper by Irani et al. [7] concludes that a negative TTE obviates the need for TEE in patients with suspected native valve IE.

The paper deals with 180 patients referred for suspected native valve IE. Due to technically inadequate TTE 46 patients (or 25 %) were excluded from the analysis. The remaining 134 patients formed the study group for the head to head comparison of TTE and TEE [7].

The agreement between TTE and TEE for the presence or absence of vegetations was 98 %.

When compared to TEE, TTE detected vegetation with a sensitivity of 68 % and a specificity of 100 %.

TTE was non-diagnostic, defined as presence of leaflet thickening, calcifications and/or more than a trace regurgitation, but no definite vegetation in 47 patients or 35 %.

The authors conclude that in case of native valves and where TTE is technically adequate and either negative or positive for IE no further investigation is required. Patients with non-diagnostic or technically inadequate TTE should be further evaluated with TEE [7].

Trying to discuss further some issues on the potential incremental value of TEE as compared to TTE we can accept that TEE provides, in general, more detailed information than TTE in IE.

We have to say, however, that, in clinical practice, often this information does not alter the management significantly in IE.

We have also to remember that the cost of TEE is greater than TTE, taking into consideration both reimbursement and organization [2].

We can not forget also that TEE examination carries a small but definite risk of serious complications and inconvenience to patients [2].

The Position of a Selected Approach to TEE in Suspected IE

The position of a selected approach to TEE in suspected IE is further supported by Bayer et al. in the American Heart Association Scientific Statement on diagnosis and management of infective endocarditis and its complications [4].

They stated that echocardiography is not an appropriate screening test in the evaluation of patients with fever or a positive blood culture that is unlikely to reflect IE. Nevertheless, some form of echocardiography should be performed in all patients suspected of having IE.

TTE should be considered not sufficient and TEE should be also performed in high initial patient risk, moderate to high clinical suspicion or difficult imaging. Subsequent TEE can be performed if the clinical picture changes, if there is no improvement with therapy, or if complications are suspected [4].

In low initial patient risk and low clinical suspicion a good quality negative TTE is generally adequate to rule out IE. In patients with positive TTE results responsive to treatment and no high risk echo features TEE can be avoided, unless clinical status deteriorates or new echo findings are detected [4].

Open Questions

There are finally two open questions which are very pertinent to this debate.

The first question is related to when, if indicated, TEE should be performed during the clinical course. It is evident

that a very early examination in a low probability clinical environment should result more easily in a negative result or in a false positive, leading to a subsequent need for a repeat TEE examination. At least some of these examinations should be then considered as inappropriate.

The second question is strictly related to the other, and deals with the issue of how many times TEE should be repeated during the clinical course. It is clear that the answer could change if TEE procedures are usually performed routinely by protocol or control TEEs are indicated only on clinical grounds or TTE echo findings. In the situation of routine control TEE procedures a number of unnecessary TEE examinations should be expected, with a very low probability of altering significantly the management of the patient.

On the other hand an example of the importance of performing a control TEE as an indication based on the clinical course or echo findings is shown in Figure 4. The picture shows two short axis transoesophageal views, 15 days apart, from an elderly patient with calcific aortic valve and infective endocarditis.

In the first examination a vegetation could not be identified since the echogenic nodularities were indistinguishable from fibrocalcific deposits. The patient had fever, diagnosis was not evident, blood cultures were still negative and the clinical course was not dramatically improving.

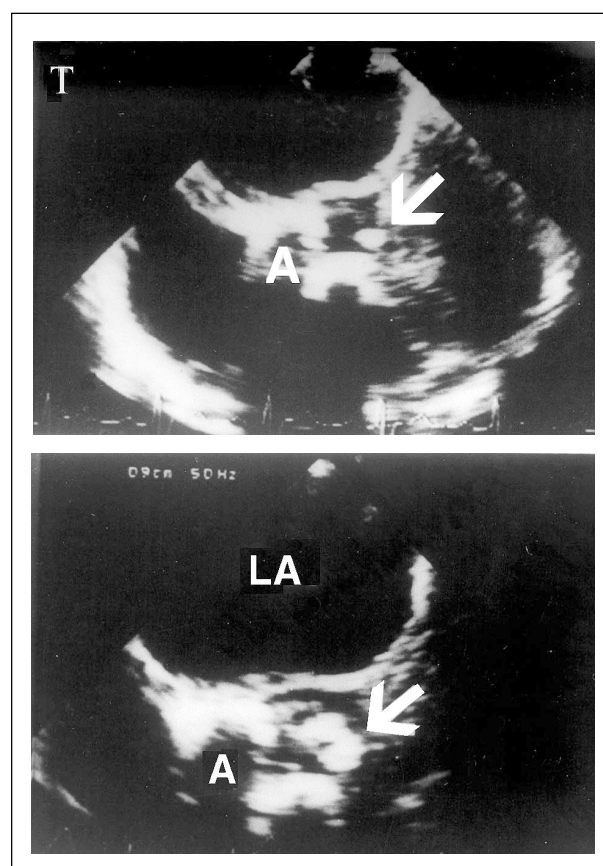


Figure 4. Two short axis transoesophageal views, 15 days apart, from an elderly patient with calcific aortic valve and infective endocarditis. In the first examination (top) a vegetation could not be identified since the echogenic nodularities were indistinguishable from fibrocalcific deposits (arrow). In the second examination (bottom) a vegetation was diagnosed on the aortic valve for the evident increase in size of one of the nodularities (arrow) which was still not mobile in real time (see text). A= aortic valve; LA= left atrium

In the second examination a vegetation was diagnosed on the aortic valve for the evident increase in size of one of the nodularities, which was still not mobile in real time. At that point in time, however, the decision to start antibiotic therapy had already been made and was not influenced by the echo results.

Concluding Remarks

In conclusion, the position of a selected indication to TEE in patients with suspected IE should be probably considered as a part of a more general controversy on the appropriate use of medical technology and resources.

In fact the answer to the question when TEE should be performed could change if we are taking into account an environment where the resources are considered practically unlimited. In this setting the answer could be: what is easily available is needed.

In the more realistic environment of limited resources or, better to say, in the cost/benefit arena the answer should be: what is appropriate is needed. And this makes much more sense for a clinician who likes clinically guided indications to technology and is expecting a clear cut increased value from the decision to perform a second step examination.

The position of a selected indication to TEE in patients with suspected IE should be then strongly supported. The indication to TEE should be based on clinical guidance and TEE should be always preceded by a high technical standard TTE examination. A possible further improvement of TTE by second harmonic tissue imaging in this setting should be further evaluated.

A definite expected increased value should guide the indication to TEE.

It is essential to optimize the timing during the clinical course to avoid unnecessary and inappropriate repeat TEE.

And finally, the indication to follow-up TEE should not be considered as a routine protocol, but always be guided by clinical data and TTE findings.

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