EAE RECOMMENDATIONS FOR TRANSESOPHAGEAL ECHO.

Cardiac Sources of Embolism

Luigi P. Badano, MD, FESC
TOE IN CARDIAC SOURCES OF EMBOLISM

Background

• Stroke is the 3° cause of death in several industrial countries;
• Embolism accounts for 15-30% of ischemic strokes;
• Diagnosis of cardioembolic stroke is often uncertain and relies on the identification of a potential source of embolism;
• Both TTE and TOE serve as a cornerstone in the evaluation and diagnosis of these patients.
Recommendations for echocardiography use in the diagnosis and management of cardiac sources of embolism

European Association of Echocardiography (EAE) (a registered branch of the ESC)

Mauro Pepi\textsuperscript{1*}, Arturo Evangelista\textsuperscript{2}, Petros Nihoyannopoulos\textsuperscript{3}, Frank A. Flachskampf\textsuperscript{4}, George Athanassopoulos\textsuperscript{5}, Paolo Colonna\textsuperscript{6}, Gilbert Habib\textsuperscript{7}, E. Bernd Ringelstein\textsuperscript{8}, Rosa Sicari\textsuperscript{9}, and Jose Luis Zamorano\textsuperscript{10} on behalf of the European Association of Echocardiography
## TOE IN CARDIAC SOURCES OF EMBOLISM

### Potential cardioembolic sources

<table>
<thead>
<tr>
<th>Major risk sources</th>
<th>Minor or unclear risk sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial fibrillation</td>
<td>Mitral valve prolapse</td>
</tr>
<tr>
<td>Recent myocardial infarction</td>
<td>Mitral annulus calcification</td>
</tr>
<tr>
<td>Previous myocardial infarction (LV aneurysm)</td>
<td>Calcified aortic stenosis</td>
</tr>
<tr>
<td>Cardiomyopathies</td>
<td>Atrial septum aneurysm</td>
</tr>
<tr>
<td>Cardiac masses</td>
<td>Patent foramen ovale</td>
</tr>
<tr>
<td>Rheumatic valve disease (Mitral stenosis)</td>
<td>Giant Lambl’s excrescenses</td>
</tr>
<tr>
<td>Aortic arch atheromatous plaques</td>
<td></td>
</tr>
<tr>
<td>Endocarditis</td>
<td></td>
</tr>
<tr>
<td>Mechanical valve prostheses</td>
<td></td>
</tr>
</tbody>
</table>
Intracardiac Thrombus in Myocardial Infarction

• Prevalence 7-20% of pts. Higher in anterior or apical infarction;
• with chronic ventricular aneurysm prevalence may increase up to 50%;
• Sensitivity and specificity of echo in detecting LV thrombus is around 95% and 86% respectively
• Limited role for TOE in this setting
• Importance of contrast for LV opacification
TOE IN CARDIAC SOURCES OF EMBOLISM
Intracardiac Thrombus in Myocardial Infarction
TOE IN CARDIAC SOURCES OF EMBOLISM
Cardiomyopathies

- Pts with dilated cardiomyopathy are at increased risk of LV thrombus formation;
- Among them pts with idiopathic LV non-compaction represent particular diagnostic challenges;
- Limited role of TOE in this setting
# TOE IN CARDIAC SOURCES OF EMBOLISM

## Atrial Fibrillation

<table>
<thead>
<tr>
<th>Transthoracic Approach</th>
<th>Transesophageal Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired LV function</td>
<td>Increased LA size, Impaired LV function, Mitral valve stenosis</td>
</tr>
<tr>
<td>Increased LA size</td>
<td>LA/LAA thrombus/Sludge/Spontaneous echo contrast</td>
</tr>
<tr>
<td>Mitral valve stenosis</td>
<td>Low (&lt;20 cm/s) LAA emptying velocities</td>
</tr>
</tbody>
</table>

![Transesophageal Ultrasound Image](image1.png)

![Transesophageal Ultrasound Image](image2.png)
TOE IN CARDIAC SOURCES OF EMBOLISM
Atrial Fibrillation
TOE IN CARDIAC SOURCES OF EMBOLISM
Atrial Fibrillation: Guiding Cardioversion

Therapeutic anticoagulation at time of TEE
(heparin or warfarin)

Options:
- LA or LAA Thrombus
  - 4 week warfarin Tx.
  - Repeat TEE
    - Thrombus resolved: Cardioversion
    - Thrombus persist: Rate control

- No Thrombus
  - Cardioversion
  - 4 week warfarin Tx.

TOE IN CARDIAC SOURCES OF EMBOLISM
Atrial Fibrillation: Indications

• In clinically selected cases:
  • pre-ablation of AF;
  • pre-closure of LAA;
  • suspected aortic arch atherosclerosis;
  • recurrence of embolism during correct anticoagulation

• In determining the risk of future embolism (study of LAA function);

• Guiding short term anticoagulated cardioversion.
TOE IN CARDIAC SOURCES OF EMBOLISM
Patent Foramen Ovale

- TOE has traditionally been considered the gold standard for detecting PFO, however with good acoustic windows TTE may be sufficient;
- caution in assuming an etiological role of PFO in unexplained stroke.
TOE IN CARDIAC SOURCES OF EMBOLISM
Atrial Septal Aneurysm
TOE is indicated when suprasternal TTE images are inadequate to reliably rule out atheromas or define plaque characteristics;
• In pts with peripheral embolism when TTE fails to identify the source.
TOE IN CARDIAC SOURCES OF EMBOLISM

Cardiac Masses

- TOE is indicated when TTE images are inadequate or to better characterize the mass in order to properly address management.
TOE IN CARDIAC SOURCES OF EMBOLISM

Endocarditis

• TOE is needed in cases of initially negative TTE with high level of pre-test likelihood;
  • in pts with valve prostheses;
  • in pts with catheters or devices;
  • to rule out complications
TOE IN CARDIAC SOURCES OF EMBOLISM

Prosthetic valves

• TOE is indicated in every pts with valve prosthesis who suffered an embolic event, even if TTE is negative;
• in pt with valve thrombosis for management (high risk with large thrombus (> 0.8 cm²);
• to follow up after thrombolytic/anticoagulant therapy for prosthesis thrombosis.
TOE IN CARDIAC SOURCES OF EMBOLISM

Intracardiac devices

• TOE is needed in cases of inadequate image quality at TTE or with negative TTE and high level of pre-test likelihood
TOE IN CARDIAC SOURCES OF EMBOLISM
Conclusions

• A potential cardiac source of embolism should be considered in all pts with stroke or TIA;
• Echo serves as a cornerstone in the evaluation, diagnosis and management of these pts;
• TOE has revolutionized the search for cardiac sources of embolism because of its (near) noninvasive nature and its relatively good sensitivity and high specificity.