

# EAE TEACHING COURSE 2010

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## ACUTE CENTRAL and PERIFERAL EMBOLISM

Maria João Andrade Lisbon, PT



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RECOMMENDATIONS

## 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<sup>1</sup>\*, Arturo Evangelista<sup>2</sup>, Petros Nihoyannopoulos<sup>3</sup>, Frank A. Flachskampf<sup>4</sup>, George Athanassopoulos<sup>5</sup>, Paolo Colonna<sup>6</sup>, Gilbert Habib<sup>7</sup>, E. Bernd Ringelstein<sup>8</sup>, Rosa Sicari<sup>9</sup>, and Jose Luis Zamorano<sup>10</sup> on behalf of the European Association of Echocardiography

Document Reviewers: Marta Sitges<sup>a</sup> and Pio Caso<sup>b</sup>

## BACKGROUND

Stroke is a leading cause of mortality and long-term disability worldwide

Cardioembolism accounts for 20% of all ischemic strokes (in another 30%, the aetiology cannot be established)

The diagnosis of a cardioembolic source of stroke is frequently uncertain and relies on the identification of a potential cardiac source of embolism in the absence of significant autochthonous cerebrovascular occlusive disease

Because of its high sensitivity and specificity for defining detailed structure and function of the cardiovascular system, TTE and TEE has become an invaluable investigation in pts with cardioembolic events

## CARDIAC SOURCES OF EMBOLISM

High Risk	Medium or Uncertain Risk		
Atrial dysrhythmias • Atrial fibrillation • Sick sinus syndrome • Atrial flutter	Interatrial septal abnormalities • Patent foramen ovale • Atrial septal defect* • Atrial septal aneurysm		
Left atrial thrombus • Atrial dysrhythmias • Mitral valve stenosis	Pulmonary arteriovenous malformation		
Left ventricular thrombus <ul> <li>Acute myocardial infarction</li> <li>Dilated cardiomyopathy</li> </ul>	Spontaneous echo contrast ("smoke")		
Primary cardiac tumors • Myxoma • Papillary fibroelastoma	Mitral valve prolapse		
Metastatic tumors to the heart*	Valvular calcification <ul> <li>Mitral annular calcification</li> <li>Aortic valve sclerosis/stenosis</li> </ul>		
Vegetations • Infective • Noninfective (marantic)	Valvular strands		
Prosthetic cardiac valve			
Complex aortic atheroma			

#### Doufekias E et al. J Am CollCardiol 2008;51:1049-59

## CLINICAL AND IMAGING FINDINGS INDICATING CARDIOEMBOLIC STROKE MECHANISM

Abrupt onset of stroke symptoms, particularly in AF with lack of preceding TIA and severe first-ever stroke

**Striking stroke severity in the elderly** (NIH-Stroke Scale ≥10;age ≥70 years)

**Previous infarctions in various arterial distributions** 

**Multiplicity in space** (1/4infarct in both the anterior and posterior circulation, or bilateral)

Multiplicity in time (1/4infarct of different age)

Other signs of systemic thromboembolism

**Territorial distribution of the infarcts** involving cortex, or subcortical 'large lenticulostriate infarct'

Hyperdense MCA sign (as long as without severe ipsilateral internal carotidestenosis)

Rapid recanalization of occluded major brain artery

## CARDIAC SOURCES OF EMBOLISM LV THROMBUS

Prevalence 7-20%

Higher in anterior or apical infarction

Up to 50% with chronic LV aneurysm

Echo Sensitivity and specificity in the range of 95 and 86%, respectively

TOE has little to offer in the detection of LV thrombus





## USE OF CONTRAST



## CARDIAC SOURCES OF EMBOLISM CARDIOMYOPATHY







### CARDIAC SOURCES OF EMBOLISM CARDIOMYOPATHY



## CARDIAC SOURCES OF EMBOLISM CARDIOMYOPATHY



(1) It is recommended that echocardiography should be perfomed as the first-line imaging test in patients with known or suspected cardiomyopathyto determine the extent of LV and/or RV dysfunction

(2) Echocardiography must be **used to identify LV thrombus** and the use of contrast may increase its diagnostic accuracy

(3) Patients with dilated, poorly contracting ventricles, AF, a previous thromboembolic event or LV thrombus should be anticoagulated

## CARDIAC SOURCES OF EMBOLISM AF AND ATRIAL THROMBI

Atrial fibrillation causes about 25% of strokes and

increases stroke rate by five times

Over 90% of these embolic strokes are from

clots originating in the left atrial appendage



"The Left AtrialAppendage: Our Most Lethal Human Attachment!"

Johnson WD

## CARDIAC SOURCES OF EMBOLISM AF + MITRAL STENOSIS





## SEC

#### Spontaneous Echo Contrast intracavitaryswirling motion

#### LAA emptying velocity



SPAF STUDY Ann Intern Med 1998; 128;639

## CARDIAC SOURCES OF EMBOLISM AF AND ATRIAL THROMBI











#### TTE is clinically indicated in patients with AF

- (1) to detect an underlying pathology affecting management or therapeutic decisions (ischaemic heart disease, valvulopathy, cardiomyopathy, or reduced ventricular function)
  - (2) before cardioversion of atrial flutter
  - (3) to indicate, guide and follow-up invasive surgical procedures such as substrate AF ablation (RF or surgical) or LAA closure

#### The addition of TOE in patients with AF is indicated

- (1) In guiding short-term anticoagulatedcardioversion
- (2) In clinical selected cases (pre-ablation of AF and pre-closure LAA, suspected aortic arch atherosclerosis, recurrence of embolism during correct anticoagulation)
- (3) In determining the risk for future embolism study of LAA function

## CARDIAC SOURCES OF EMBOLISM FOP



## CARDIAC SOURCES OF EMBOLISM FOP WITH ASA



#### Recommendations

(1) TOE is traditionally the gold standard for the detection of PFO, however in the presence of good image quality, transthoracic echo is sufficient to detect the presence of a PFO. Performance of a valid Valsalvamanoeuvre or strong cough must be ensured with both methods.

(2) The aetiological role of paradoxical embolism through a PFO in unexplained stroke should be assumed with great caution and discussed with the neurologist.

**Factors that argue in favour of this mechanism** and that would suggest an indication for either anticoagulation or PFO closure are:

## (a) temporal relationship of the neurological event with venous thrombosis

(b) young age (typically ,55 years) and absence of other potential causes(c) presence of an atrialseptal aneurysm

(d) presence of a large spontaneous or provokableright-to left shunt

#### CARDIAC SOURCES OF EMBOLISM MYXOMA



## CARDIAC SOURCES OF EMBOLISM



#### PAPILLARY FIBROELASTOMA



## NORMAL VARIANTS

#### **CHIARI NETWORK**

#### LAMBL'S EXCRESCENCES



#### CARDIAC SOURCES OF EMBOLISM ENDOCARDITIS





#### CARDIAC SOURCES OF EMBOLISM PROSTHETIC VALVES



#### CARDIAC SOURCES OF EMBOLISM ENDOCARDITIS - INTRACARDIAC DEVICES



(1) TTE must be performed first in suspected IE

(2) Given to its better sensitivity, TOE must be performed in cases of initially negative TTE with a high level of clinical suspicion, in suspected prothetic valve endocarditis, and when TTE provides inadequate imaging

(3) The risk of embolism is related to the size, and mobility of vegetation, risk is increased in large (>10 mm) vegetations and particularly high with very mobile and large (>15 mm) vegetations

(4) The risk of new embolism is highest during the first days following initiation of antibiotic therapy and decreases after 2 weeks

## **INFECTIVE ENDOCARDITIS** PREVENTION OF EMBOLISM

<b>RECOMMENDATIONS: INDICATIONS FOR SURGERY</b>	TIMING	CLASS	LEVEL
PREVENTION OF EMBOLISM			
Aortic or mitral IE with large vegetations (>10 mm) following one or more embolic episodes despite appropriate antibiotic therapy	Urgent	I	В
Aortic or mitral IE with large vegetations (>10 mm) and other predictors of complicated course (HF, persistent infection, abcess)	Urgent	I	С
Isolated very large vegetations (>15 mm)*	Urgent	IIb	С

\* Surgery may be preferred if procedure preserving the native valve feasible

#### CARDIAC SOURCES OF EMBOLISM ATHEROMA OF THE AORTA

Prevalence 21-27 %

same magnitude as the prevalence of Atrial Fibrillation - 18-30 % carotid disease - 10-13 %

Related to the presence and grade of carotid stenosis Independent Risk of Future Embolic Stroke - 12% - 1year (odds ratio for risk future events - 4.3)



**"SEC" + Complex Plaque** 

marker of destabilizing local hemodynamics

Tunick et al, JACC 2000;35:545 FinKelhor et al, Am Heart J, 1999; 137

#### CARDIAC SOURCES OF EMBOLISM AORTIC COMPLEX PLAQUES

#### Protuding- plaque thickness >4 mm Ulceration Mobile lesions – any size









(1) No certain casual relationships between minor conditions and stroke have been established

(2) In patients with embolic events, **the coexistence** of MVP, MAC, or aortic stenosis**may be an incidental finding** on echocardiography

(3) Echocardiography is recommended in patients with known MVP, MAC, or aortic stenosis and an embolic event

#### CARDIAC SOURCES OF EMBOLISM

## CONCLUSION

A POTENTIAL CARDIAC SOURCE OF EMBOLISM SHOULD BE CONSIDERED IN ALL PATIENTS WITH STROKE, TIA OR PERIFERAL EMBOLISM

ECHOCARDIOGRAPHY (TTE AND TOE) IS NOT ONLY A POWERFUL TOOL FOR THE EVALUATION OF CARDIOEMBOLIC SOURCES OF STROKE, BUT ALSO TO ESTABLISH RECOMMENDATIONS FOR THE PRIMARY AND SECONDARY PREVENTION OF CARDIOEMBOLIC EVENTS