



UNIVERSITÀ DEGLI STUDI DI TORINO



TURIN
October
24th-26th
2019

31 GIORNATE CARDIOLOGICHE TORINESI

*Everything you always
wanted to know about*
Cardiovascular Medicine



Atrial fibrillation and left atrial remodelling assessed by 2D and 3D echocardiography

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*Cardiologia Ospedaliera,
Policlinico di Bari
Past-president SIECVI*



2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC)

- **TTE** is recommended in all AF patients to guide treatment decisions. **Class I, LOE C**
- TTE should be used to identify structural disease (e.g. valvular disease) and assess LV size and function (systolic and diastolic), **atrial size**, and right heart function.



2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

- **TOE** is useful to further assess valvular heart disease and to exclude intracardiac thrombi, **especially in the LAA**, to facilitate early cardioversion or catheter ablation.
- Delayed-enhancement **MRI** of the left atrium using gadolinium contrast, T1 mapping using cardiac MRI, and intracardiac echo may help to guide treatment decisions in AF, but **require external validation in multicentre studies**



Rimodellamento e disfunzione atriale

1. Scegliere chi cardiovertire e chi lasciare in FA cronica (sì / no) **TT >> TE**
2. Scegliere il farmaco in acuto ed in cronico **TT**
3. Cardioversione guidata con eco **TE**
(classe I B già nelle Linee Guida FA 2010)
4. Orientare la terapia anticoagulante e i nuovi anticoagulanti **TT e TE**



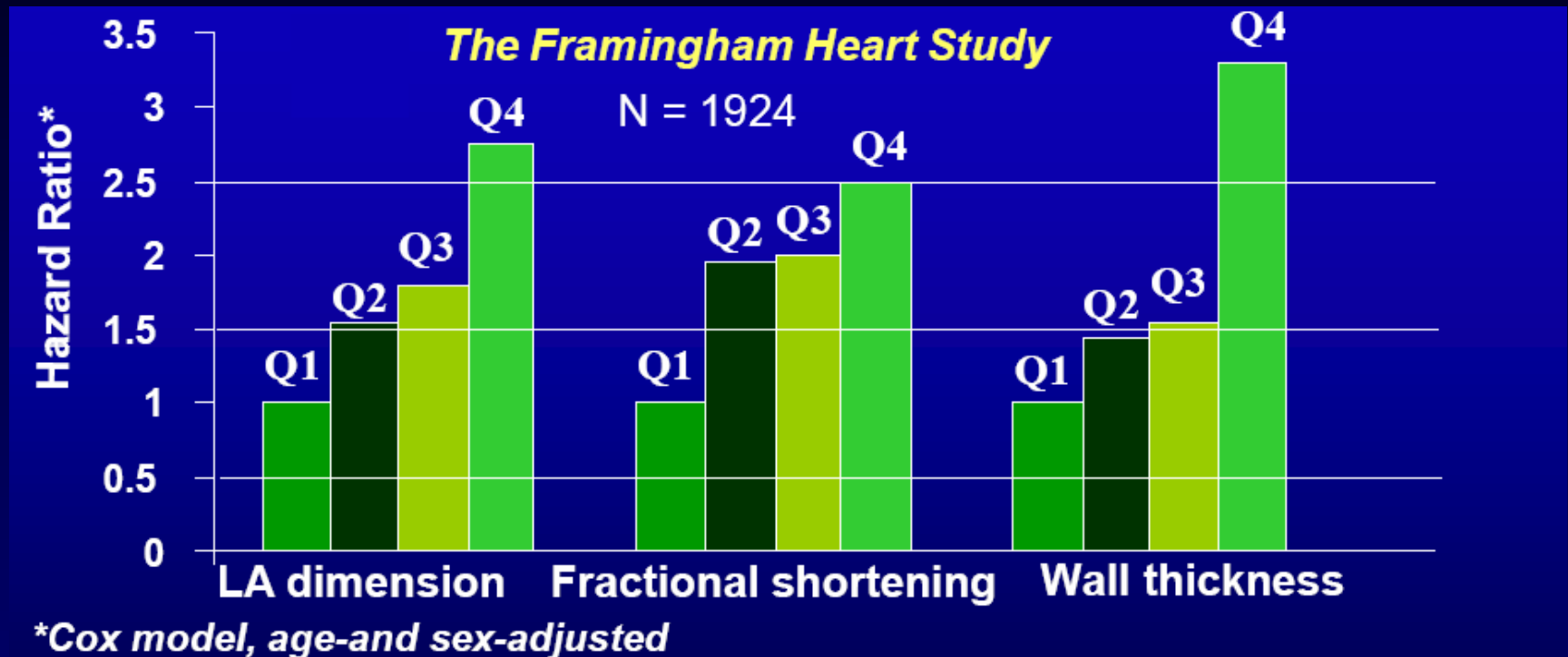
Rimodellamento e disfunzione atriale

- 1. Indicazione alla cardioversione (sì / no)**
 - Diagnosi eziologica di FA
 - Funzione VS
- 2. Indicazione ai farmaci da utilizzare**
 - Dimensioni / stato AS
 - Funzione auricolare sinistra
- 3. Cardioversione guidata con eco TE**
 - Altre fonti emboligene
- 4. Ausilio nella scelta warfarin / nuovo AC**



Echocardiographic predictors of 1st occurrence of non-rheumatic A Fib

Vaziri, Circulation '94

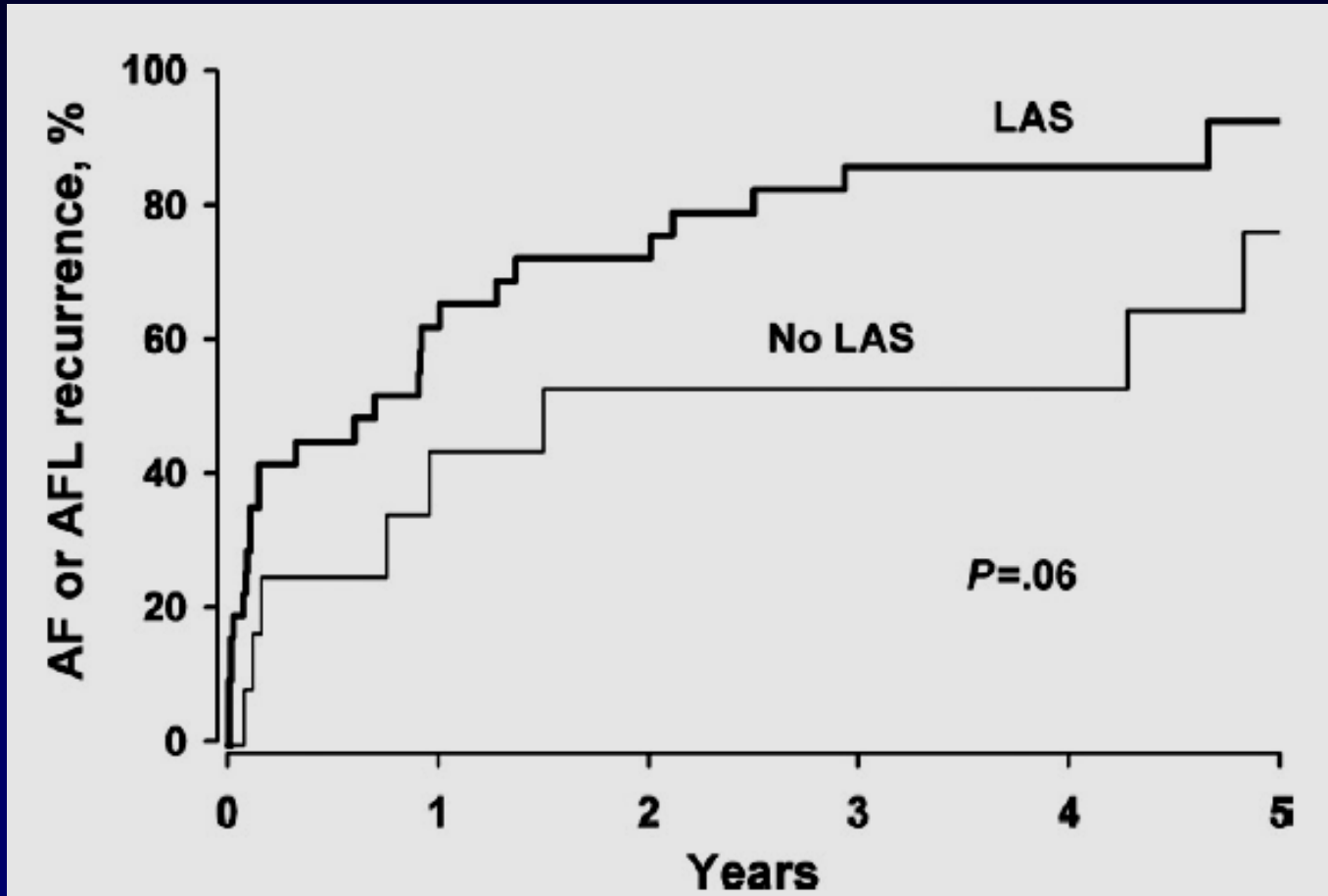


	Quartile 1	Quartile 2	Quartile 3	Quartile 4
LA dimension, mm	≤ 35	36-39	40-43	≥ 44
LV fractional shortening, %	≤ 35	36-38	39-41	≥ 42
Sum of LV wall thicknesses, mm	≤ 15	16-17	18-19	≥ 20



New insights into the predictors of LA stunning after successful cardioversion

Melduni, JASE '08



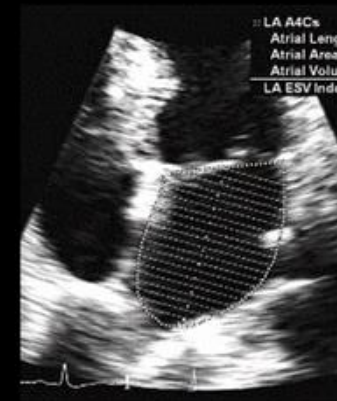
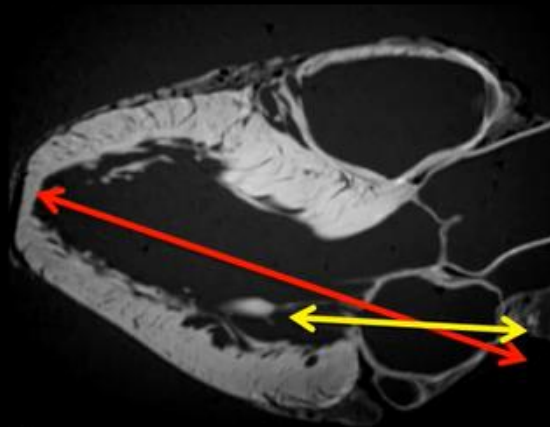
Immediate post-C analysis; 71% pts with stunning



LA Assessment

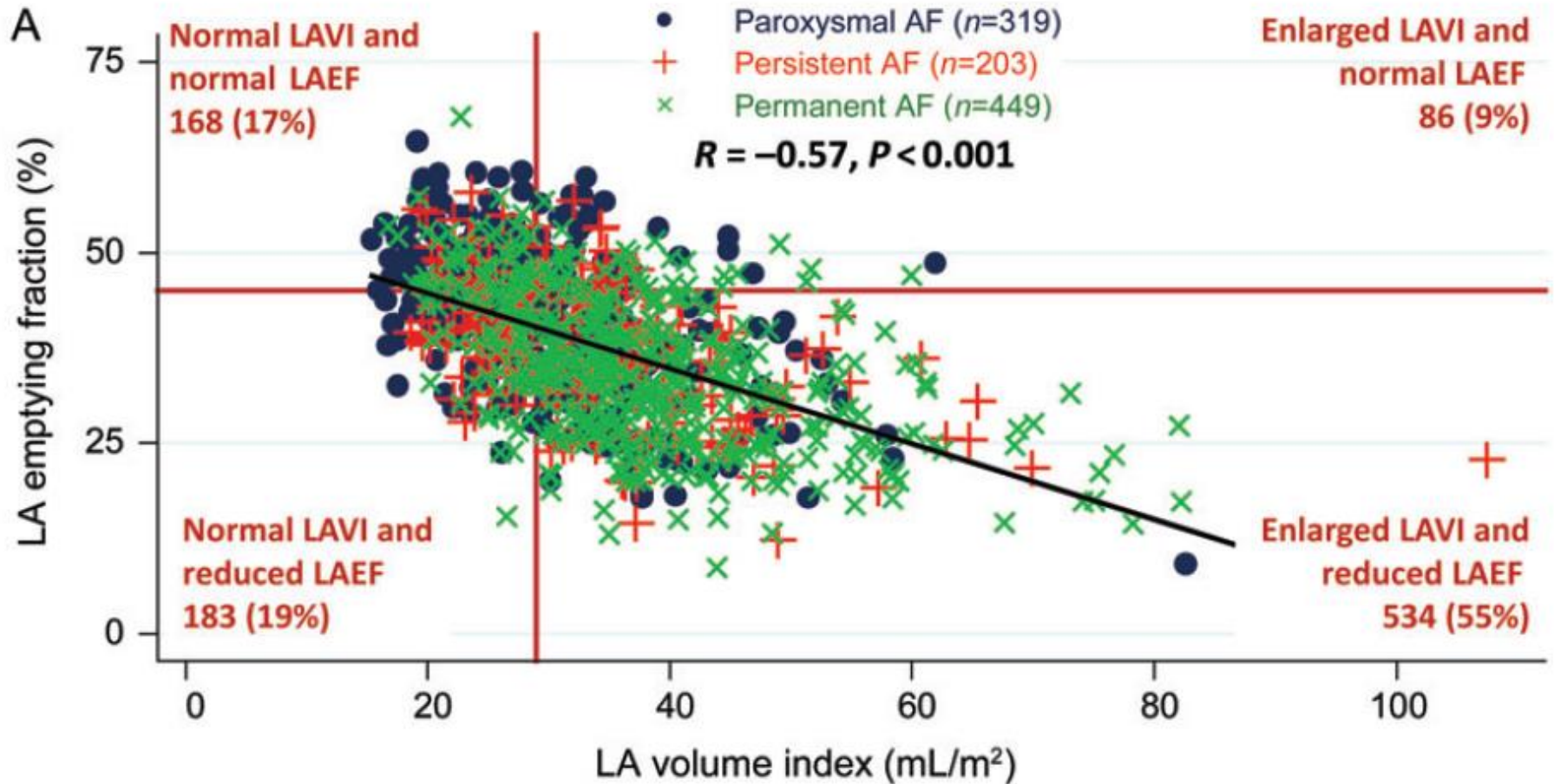
Dedicated, non-foreshortened LA views

– Long-axis of the LA is different from the LV



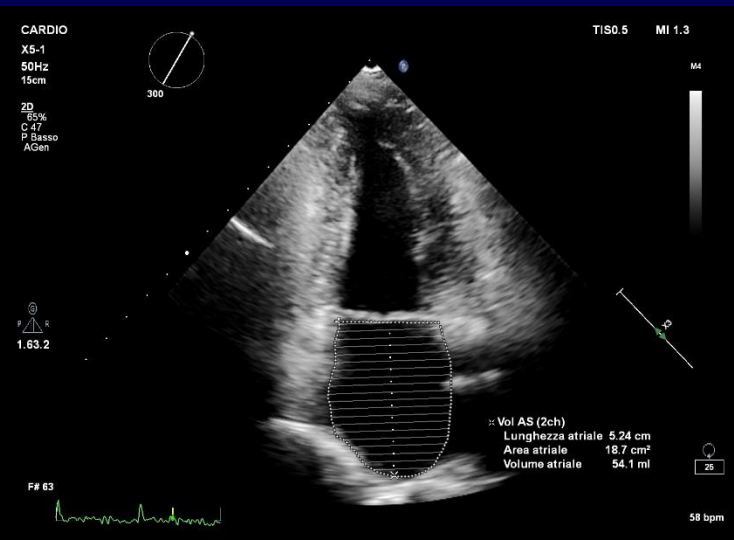
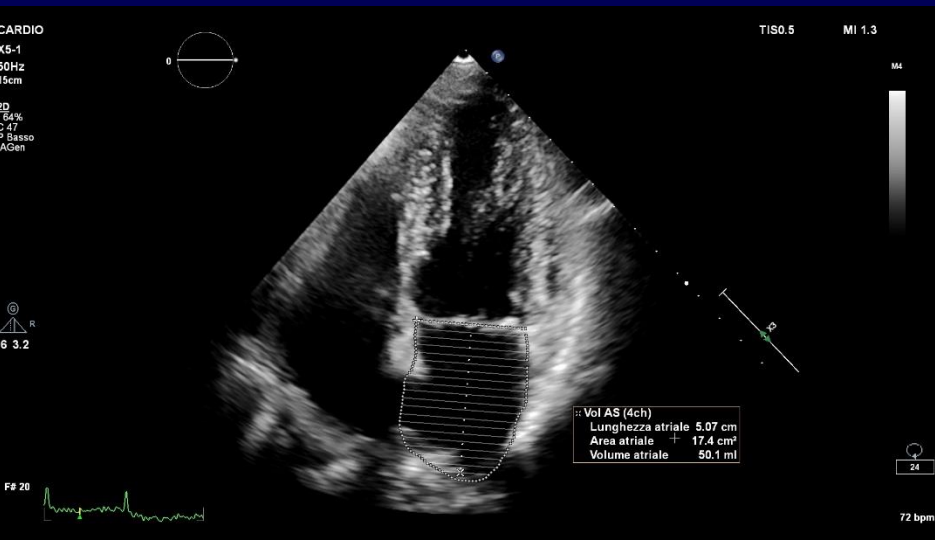
Left atrial structure and function in atrial fibrillation: ENGAGE AF-TIMI 48

Gupta, Eur Heart J 2014



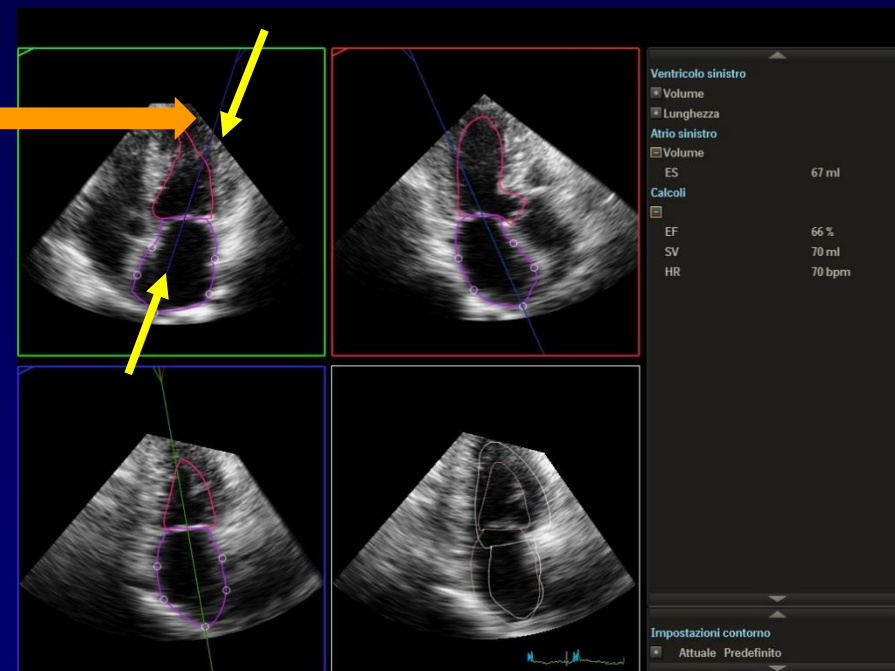
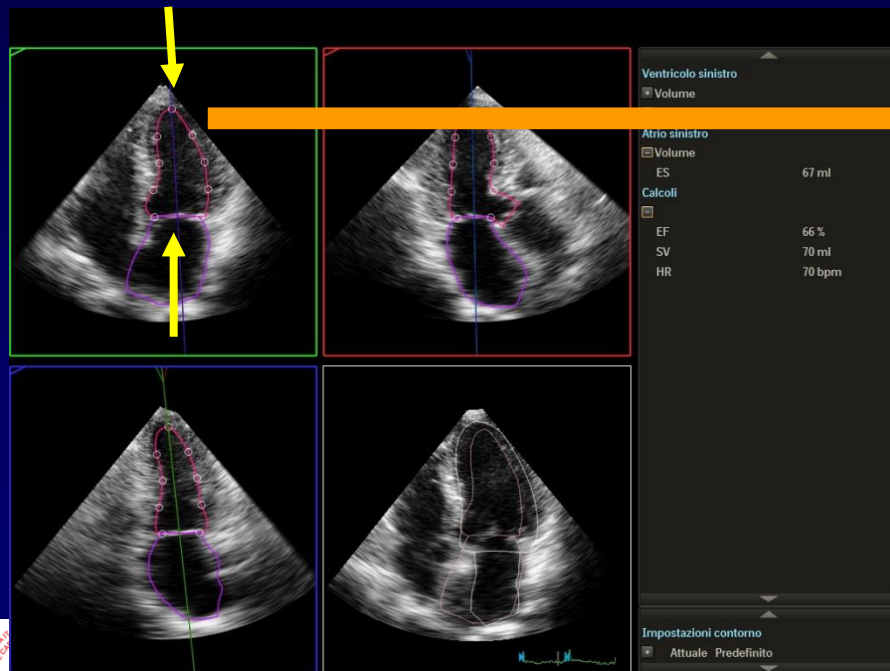
Valutazione volume AS al 2D

- Solitamente 2 cicli differenti,
- Rischi sul corretto allineamento
- Scelta arbitraria dell'evento telesistolico
- Valutazione basata su Simpson («pensato» per VS...)



Valutazione al 3D Heart Model

- Evento fully-automated
- Correzione automatica asse corretto
- Scelta evento telesistolico basato su riconoscimento automatico displacement anello





Fully Automated Quantification of Left Ventricular and Left Atrial Volumes from Transthoracic Three-Dimensional Echocardiography: A Validation Study

Wendy Tsang¹, Ivan S. Salgo², Lyubomir Zagorchev², Scott Settlemyer², Nicole Bhawe¹, Juergen Weese², Irina Waechter-Stehle², Michael Cardinale², Aldo Prado¹, Lynn Weinert¹, Amit R. Patel¹, Roberto M. Lang¹



JACC 2016

Ventricolo sinistro	
<input type="checkbox"/> Volume	
ED	260 ml
ES	174 ml
<input type="checkbox"/> Lunghezza	
ED	10.5 cm
ES	9.3 cm
Atrio sinistro	
<input type="checkbox"/> Volume	
ES	113 ml
Calcoli	
<input type="checkbox"/>	
EF	33 %
SV	86 ml

HeartModel parameters

EF 3D HM	33 %
EDV 3D	260 ml
ESV 3D	174 ml
LA 3D Vol	113 ml



Cardiac MR parameters

LV EF	36 %
LV EDV	309 ml
LV ESV	195 ml
LA Vol	128 ml

Echo parameters

EF Simpson	40 %
EDV 2D	220 ml
ESV 2D	132,5 ml
LA AL Vol	102 ml



LA volume measurement by 3D echo

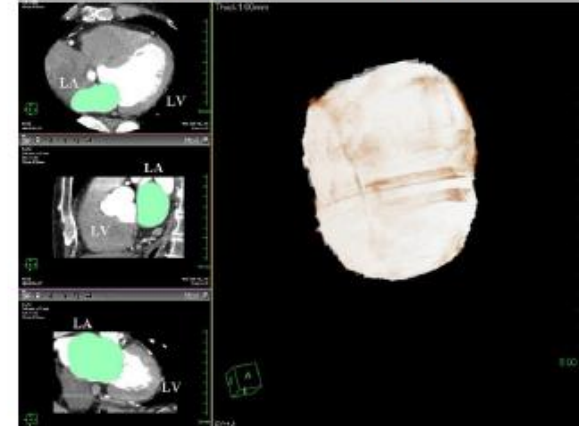
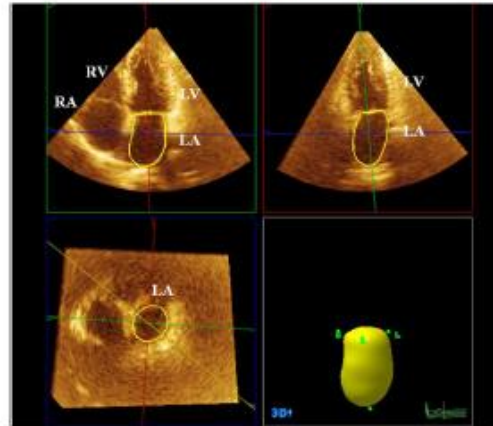
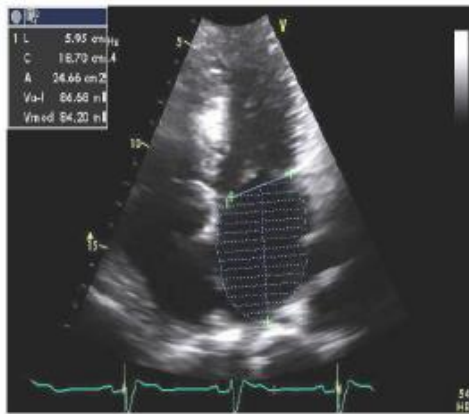
2D biplane area-length

VS.

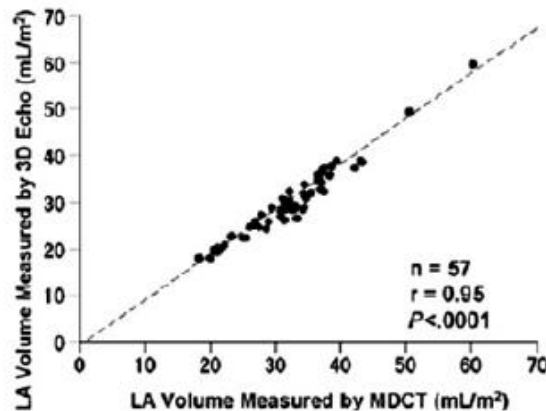
3D measurement

VS.

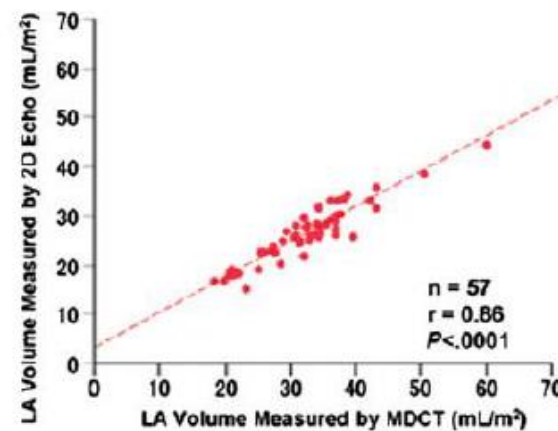
CT measurement



A 3D: underestimation 8%



B 2D: underestimation 19%

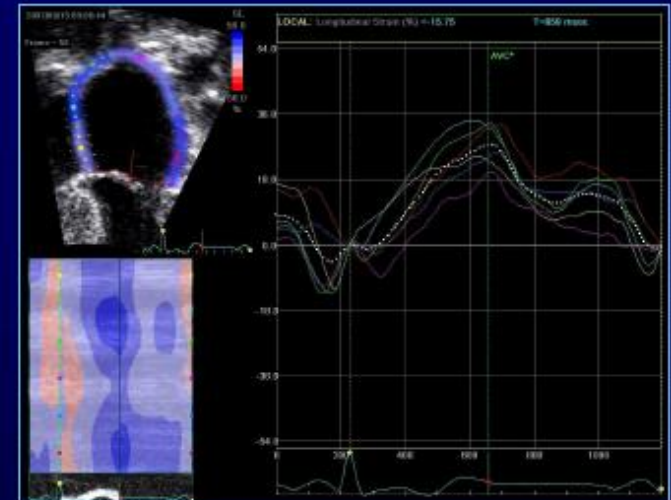


Left atrial function indices

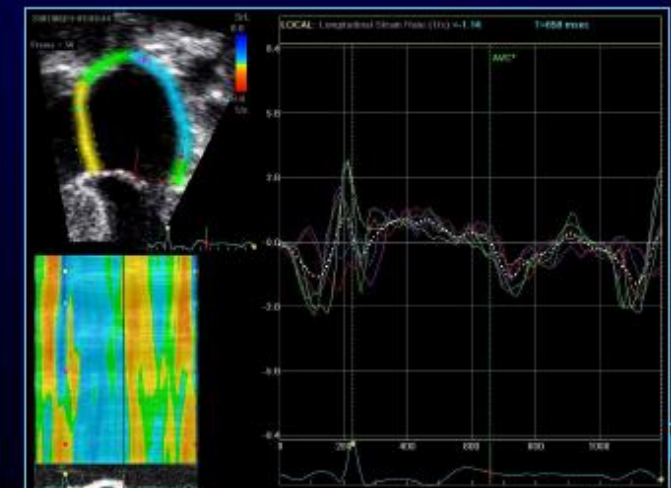
Speckle tracking in normals



Strain



SR



Rimodellamento e disfunzione atriale

1. **Indicazione alla cardioversione (sì / no)**
 2. **Indicazione ai farmaci da utilizzare**
 3. **Cardioversione guidata con eco TE**
 4. **Indicazioni terapia anticoagulante (insieme a criteri clinici)**
- Diagnosi eziologica
 - Funzione VS
 - Dimensioni / stato AS
 - **Funzione auricolare sinistra**
 - **Altre fonti emboligene**



Echocardiography in atrial fib: information for clinical decisions

EAE recommendations, EJE '10

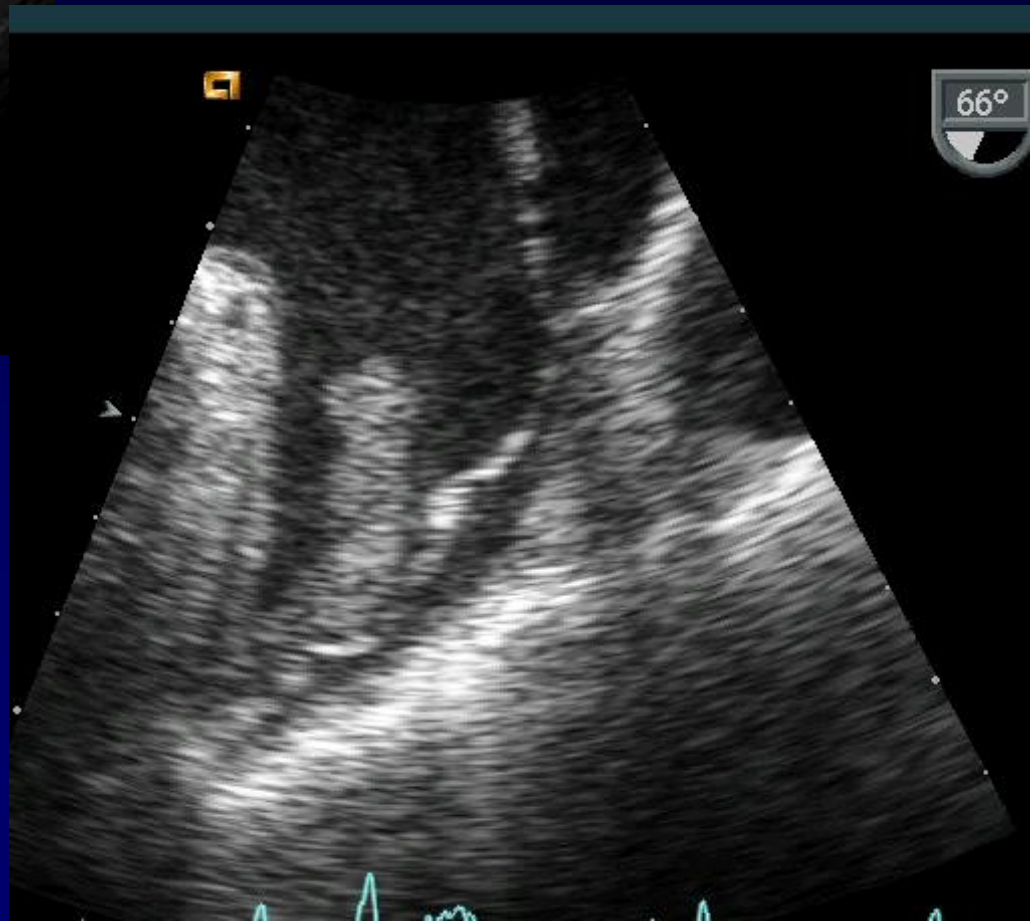
1. Thrombi
2. Spontaneous echocontrast
3. LA appendage velocities
 - LV function and thrombi
 - Patent foramen ovale
 - Complex aortic plaques



Atrio auricular
function

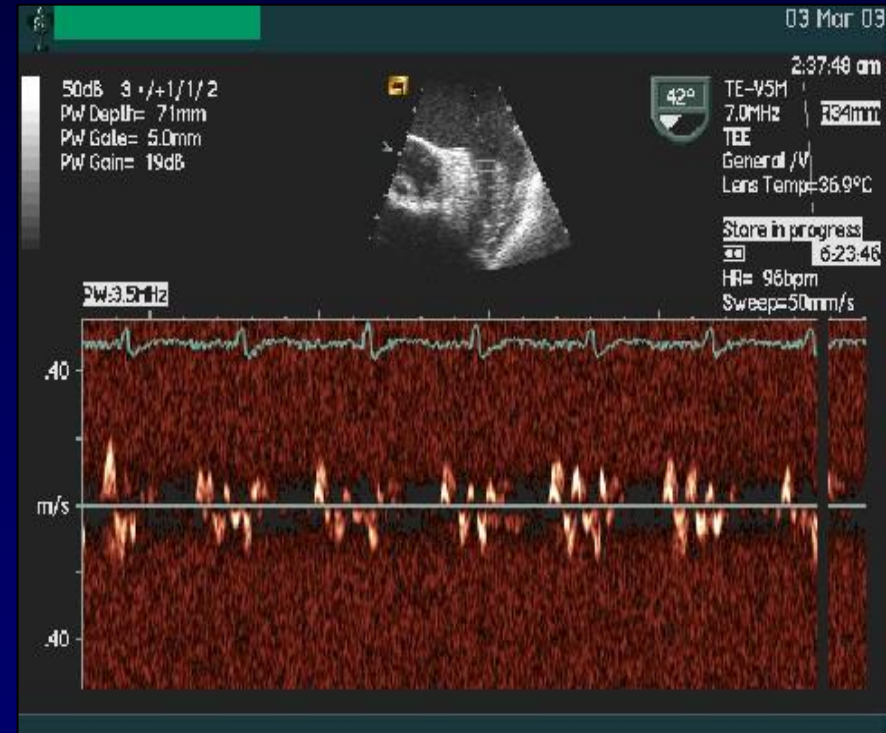
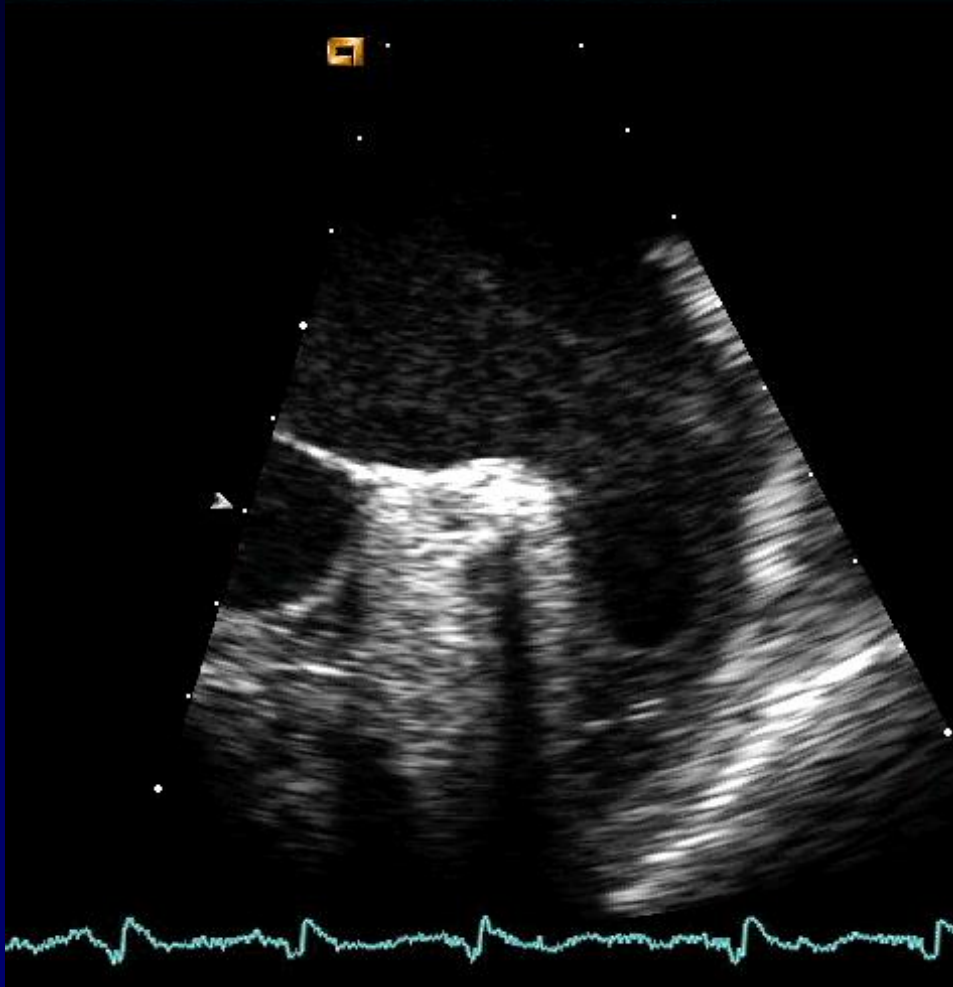
Only with TOE





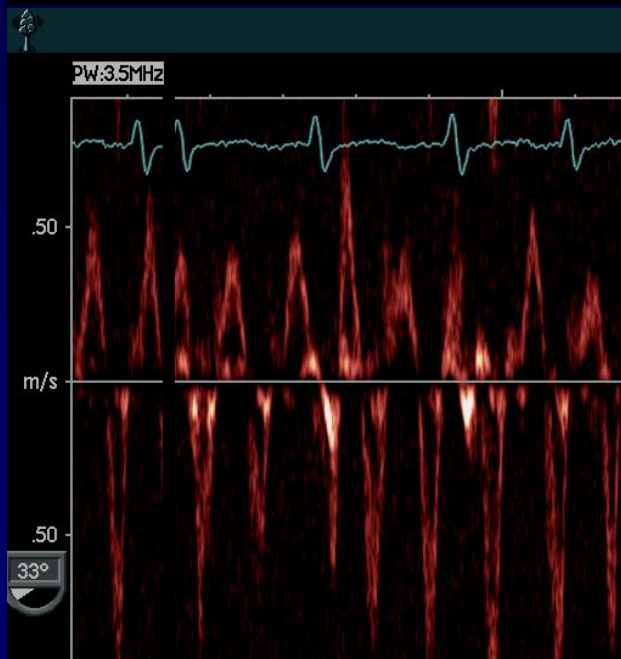
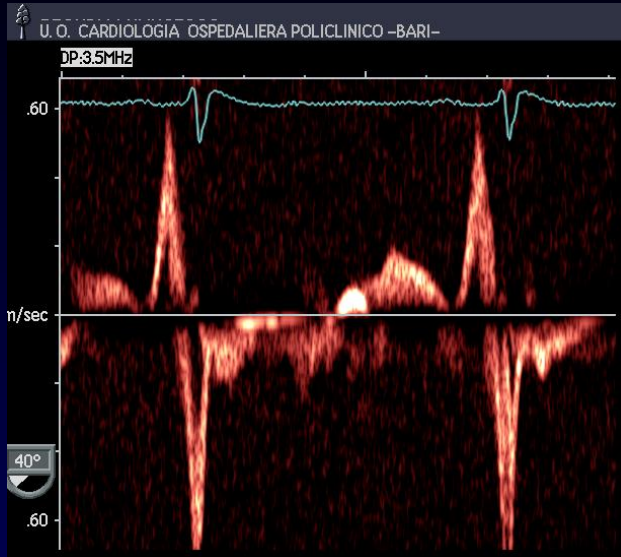
Left atrial appendage dysfunction

CARDIOLOGIA 1 OSPEDALIERA POLICLINICO BARI



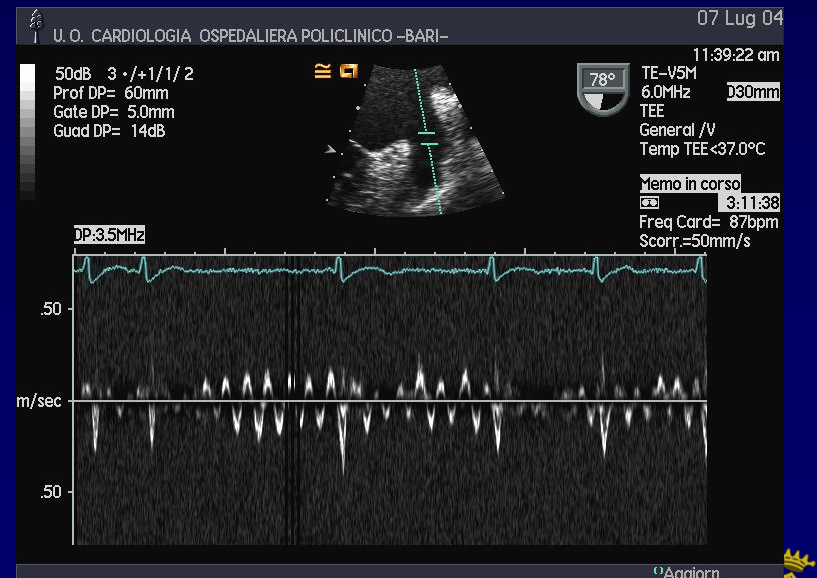
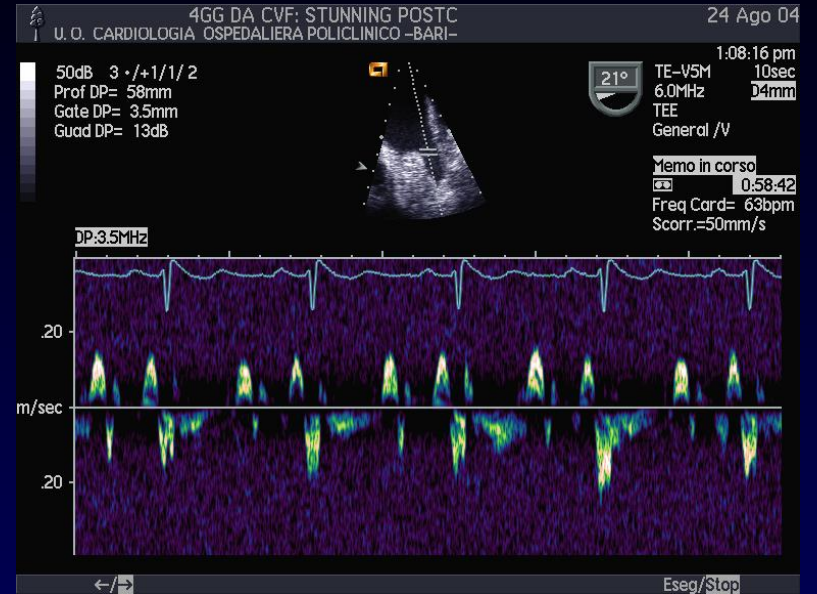
Normofunctioning LAA

SR

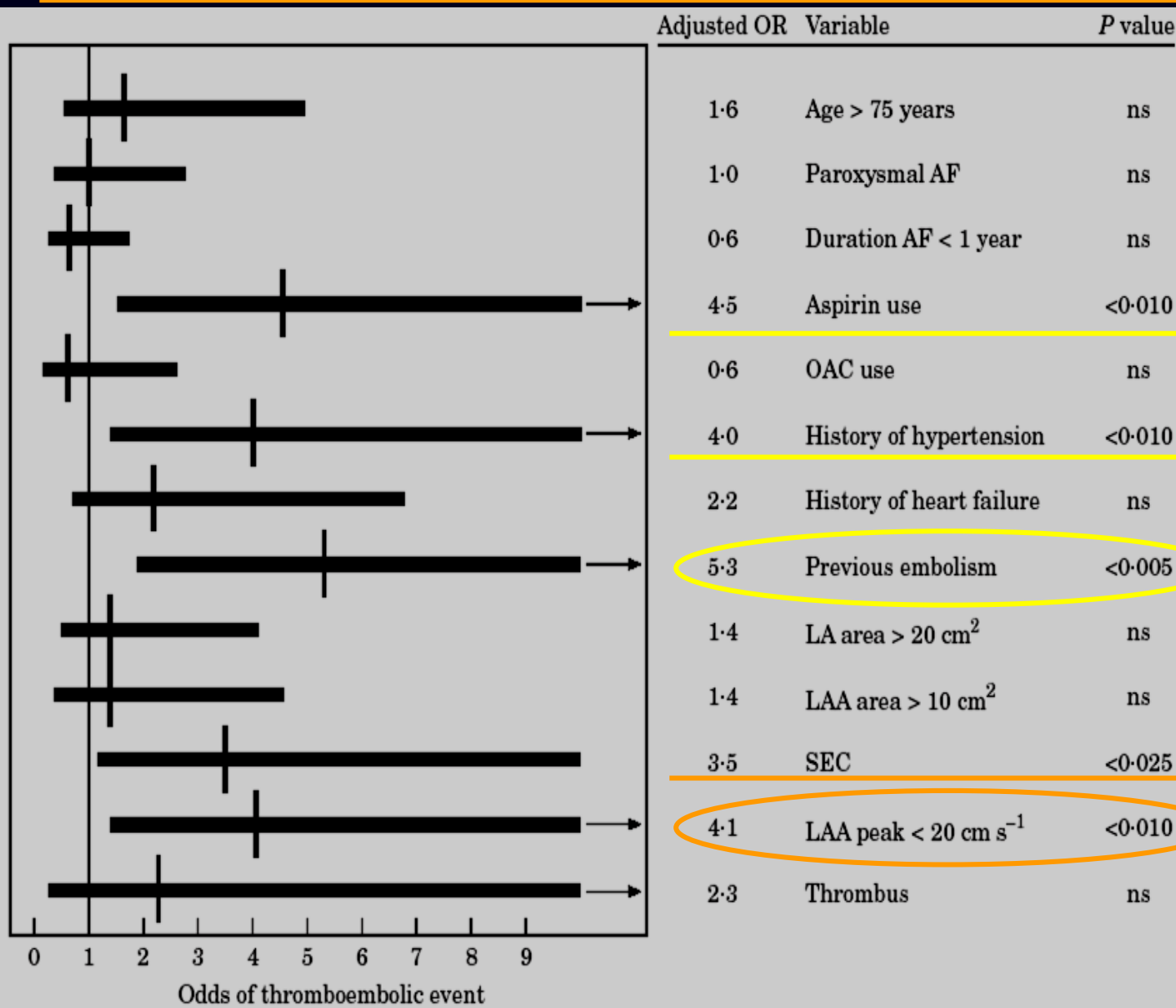


AF

Dysfunctioning LAA



Importance of LAA flow as a predictor of thromboembolism in patients with AF



Clinical risk factors

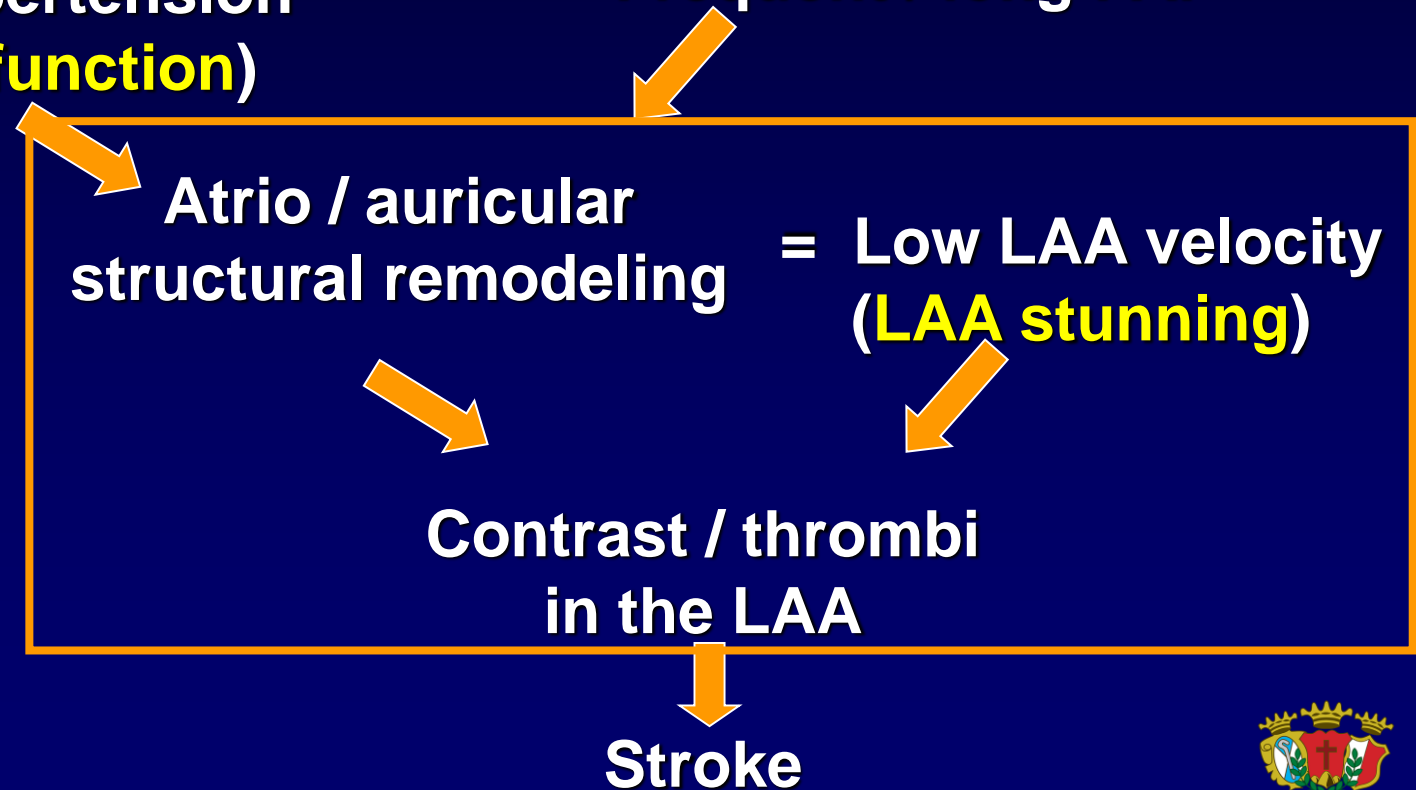
Echographic risk factors

Pathophysiologic cascade of LAA stunning in AF

Colonna P, editorial Rev Arg Cardiol 2013

Clinical risk factors
(age + hypertension
+ **LV dysfunction**)

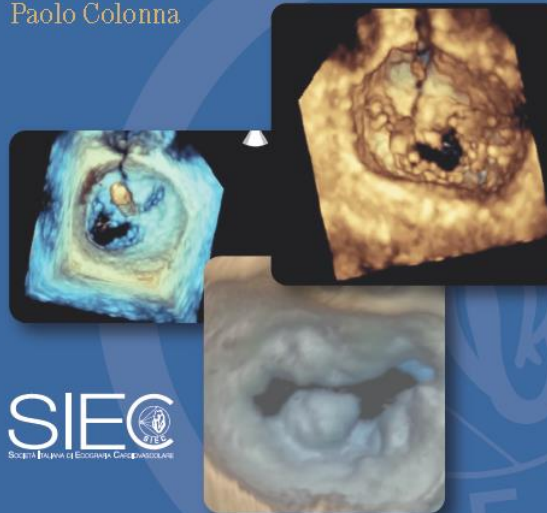
Long lasting AF or
Frequent / long PAF



Manuali della formazione 2017-19

Manuale di ecocardiografia tridimensionale

A cura di
Rodolfo Citro
Mauro Pepi
Paolo Colonna

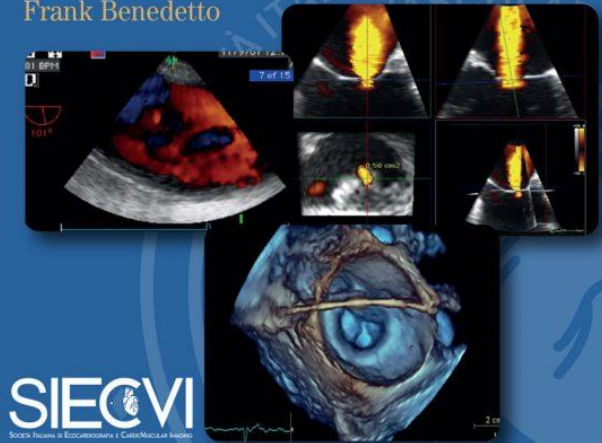


SIEC
Società Italiana di Ecocardiografia Cardiovascolare

 Il Pensiero Scientifico Editore

Manuale di ecocardiografia transesofagea

A cura di
Sofia Miceli
Ines Monte
Paolo Colonna
Frank Benedetto



SIECVI
Società Italiana di Ecocardiografia e Cardiologia Vascolare

 Il Pensiero Scientifico Editore

Manuale di ecocardiografia tridimensionale

A cura di Rodolfo Citro, Mauro Pepi, Paolo Colonna

Manuale di ecocardiografia da stress

A cura di Graziana Labanti, Marco Campana, Paolo Colonna

Manuale di ecocardiografia in emergenza-urgenze

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Manuale di ecocardiografia transtoracica

A cura di Mauro Giorgi, Scipione Carerj, Paolo Colonna

Manuale di ecocardiografia pediatrica

A cura di Vincenzo Manuppelli, Enrico Chiappini

Manuale di ecocardiografia transesofagea

A cura di Frank Benedetto, Sofia Miceli, Paolo Colonna

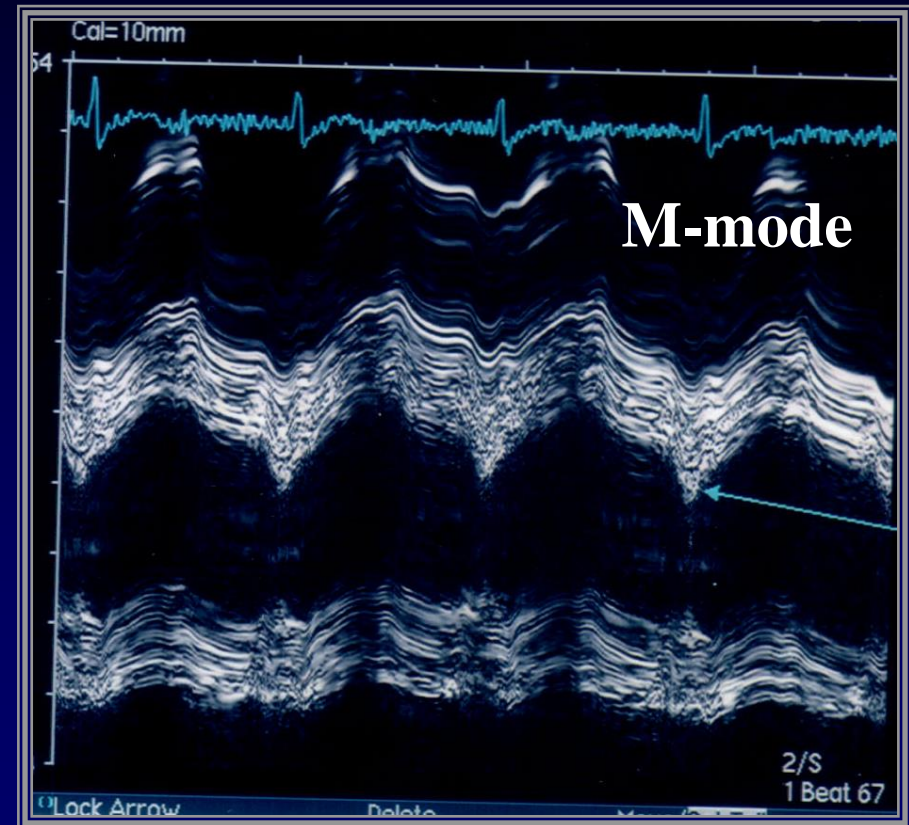
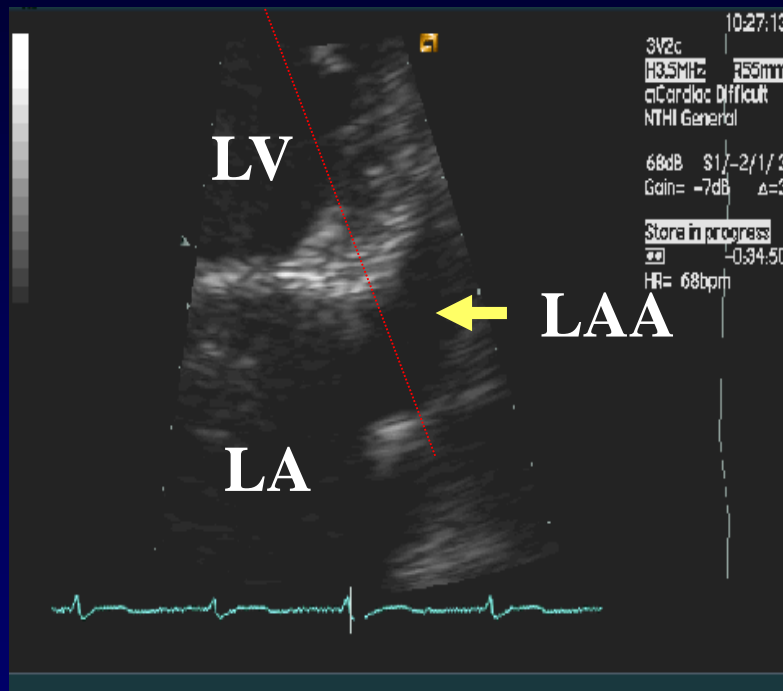
Manuale di ecografia vascolare

A cura di Francesco Antonini-Canterin, Danilo Giannini, Paolo Colonna



New monodimensional transthoracic echocardiographic sign of LAA function

De Luca, Colonna et al. JASE '07

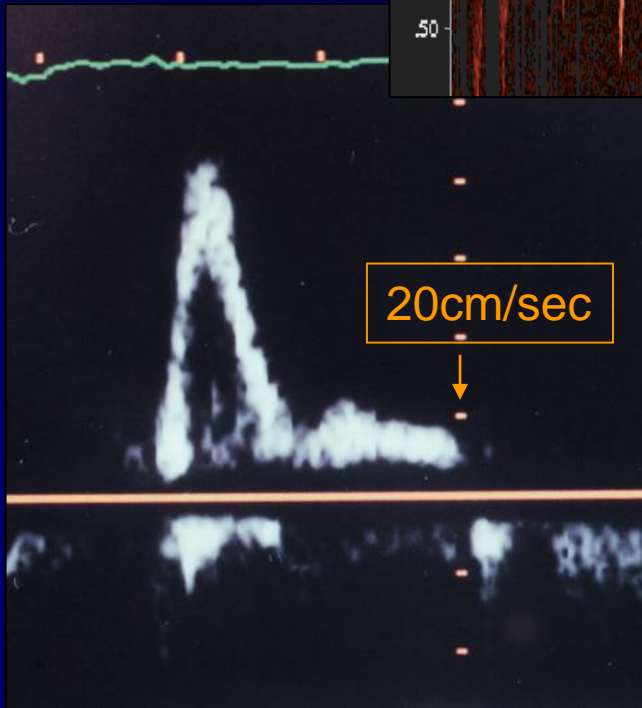
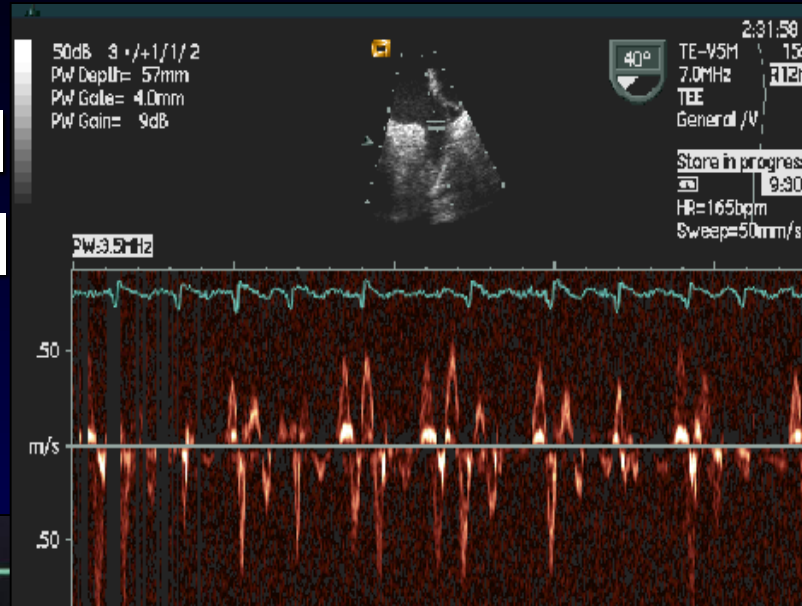


Transthoracic echocardiography

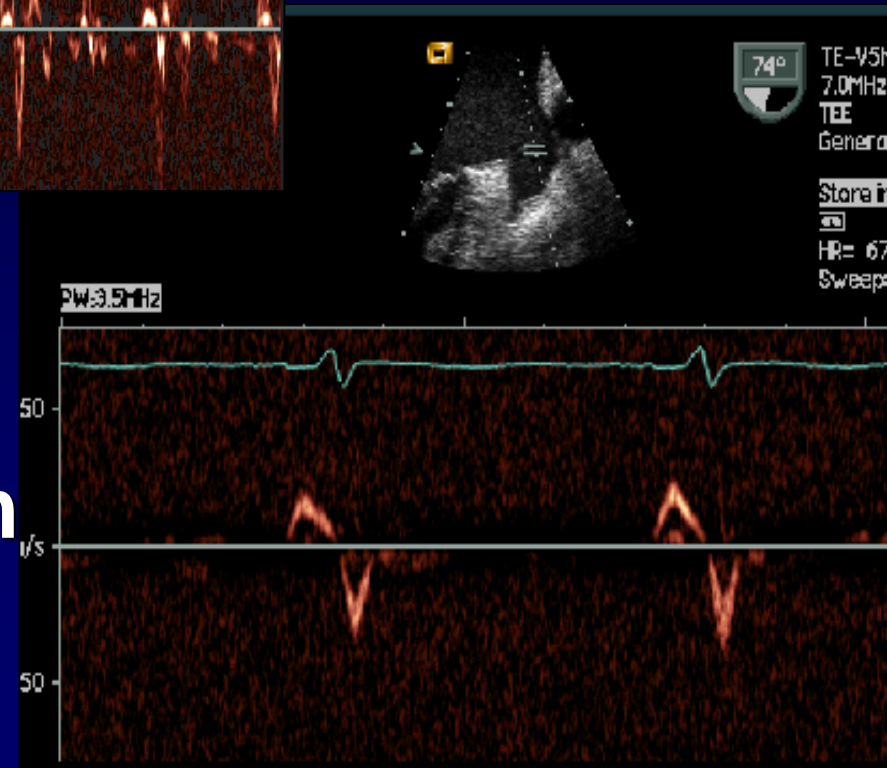


Post-cardioversion atrio - auricular stunning

atrial
fibrill



sinus
rhythm



LAA Common Morphologies

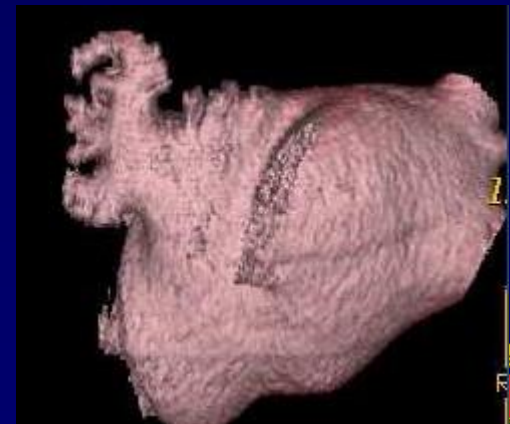
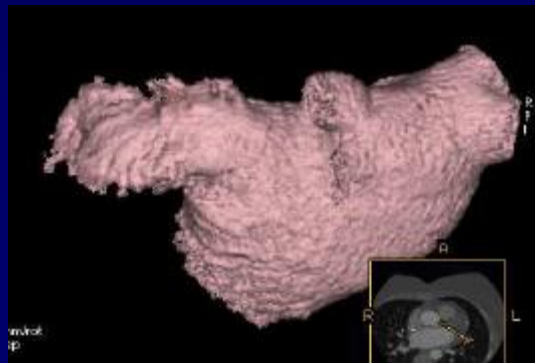
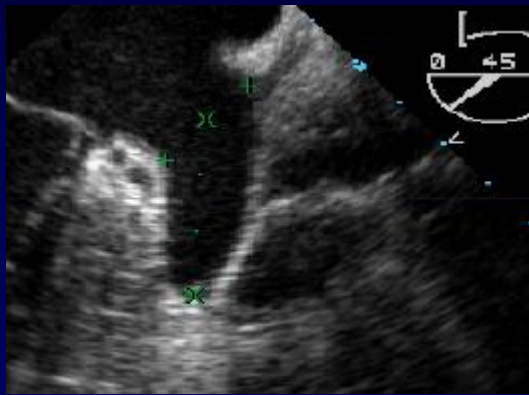
The Wind Sock Type



The Chicken Wing Type

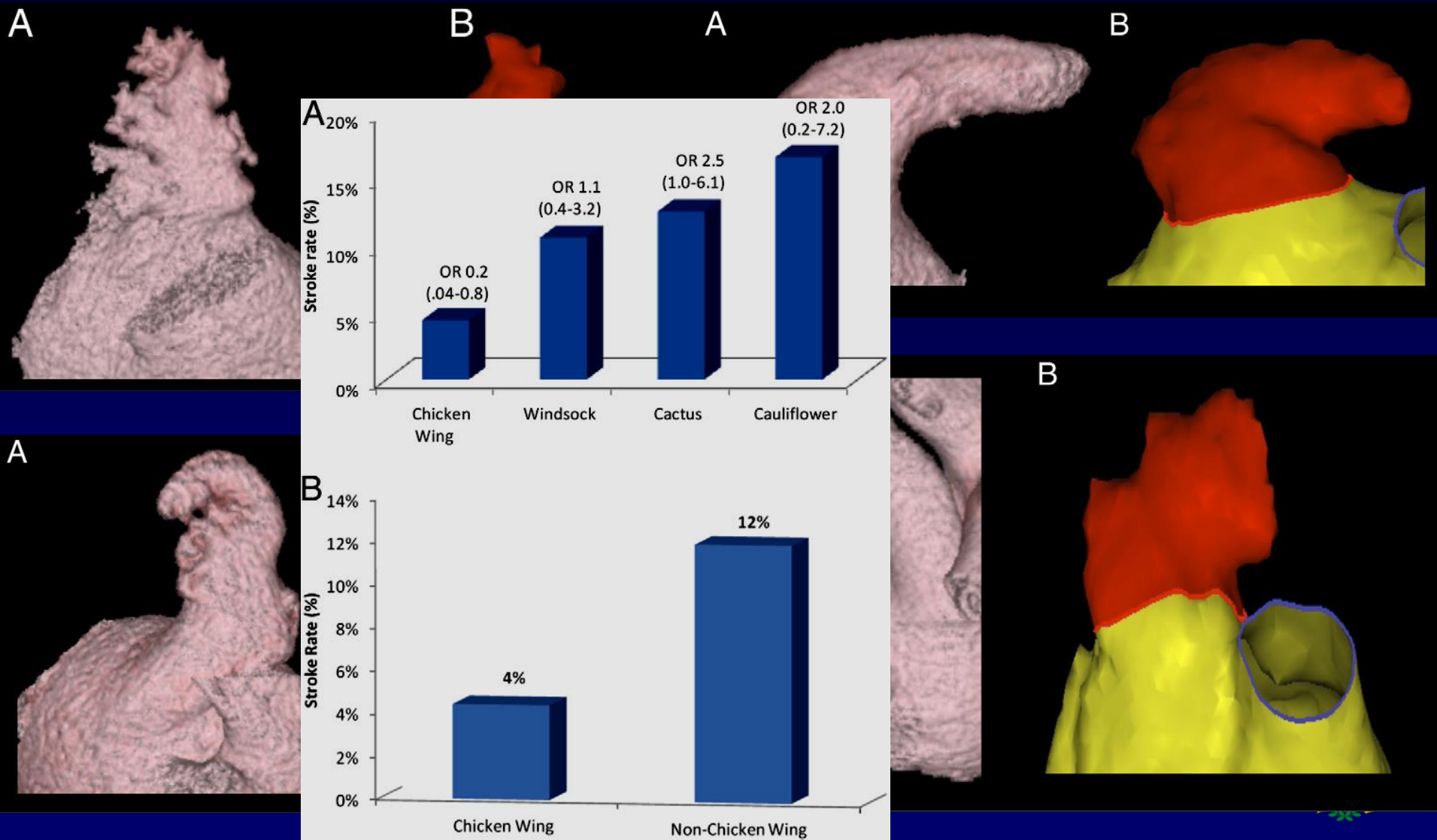


The Broccoli Type



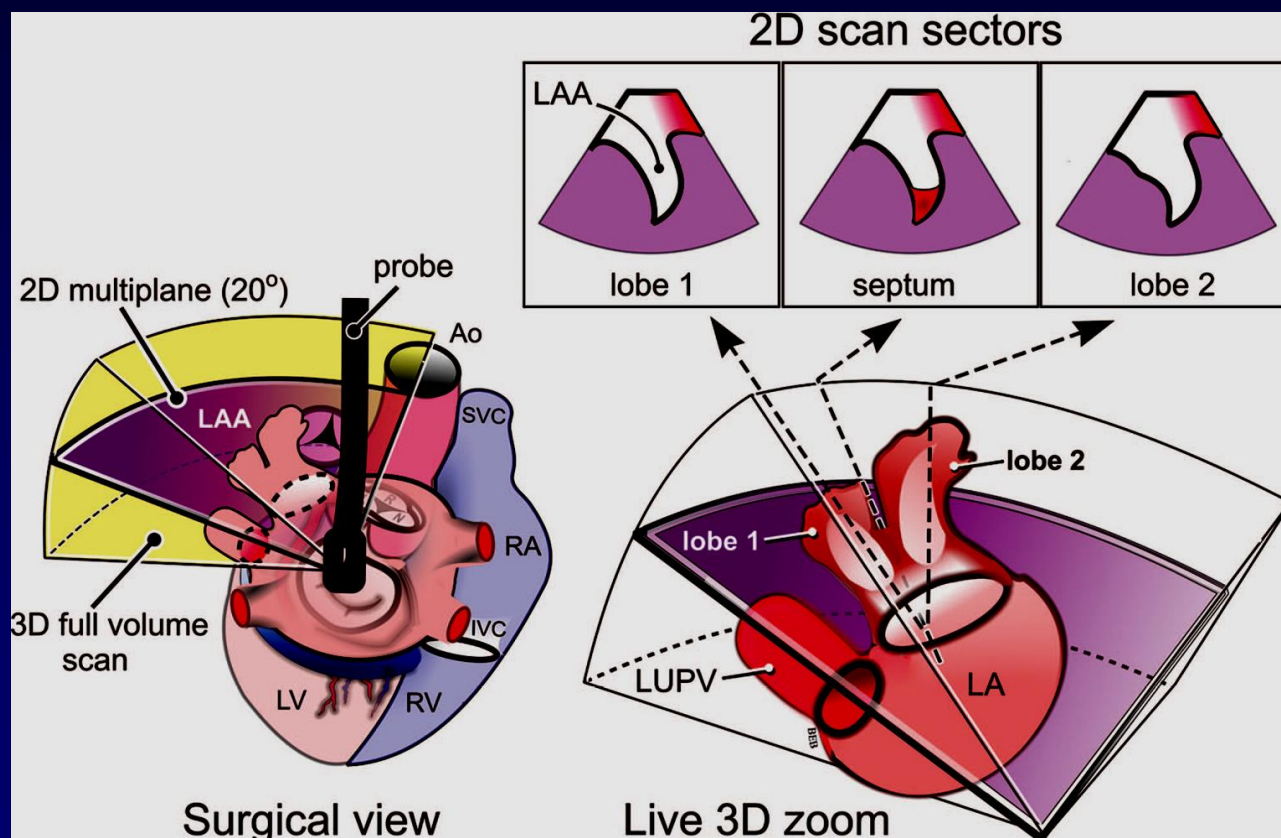
Does the left atrial appendage morphology correlate with the risk of stroke in patients with AF?

DiBiase et al, JACC 2012



Thrombus or bilobar left atrial appendage? Diagnosis by Real-Time 3D TEE

Mizuguchi, Anesth analg 2009



Thrombus or bilobar left atrial appendage? Diagnosis by Real-Time 3D TEE

Mizuuchi, Anesth analg 2009

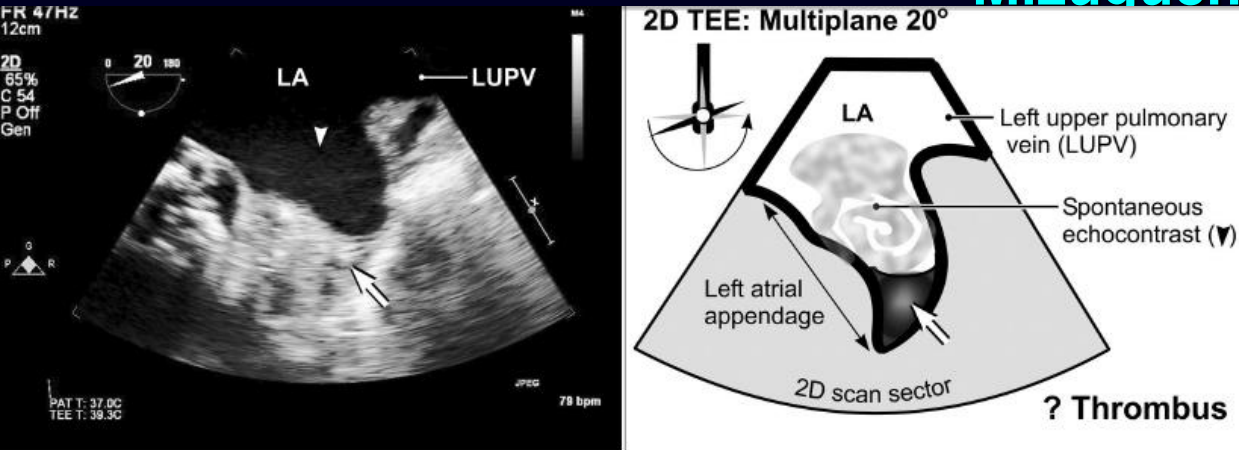
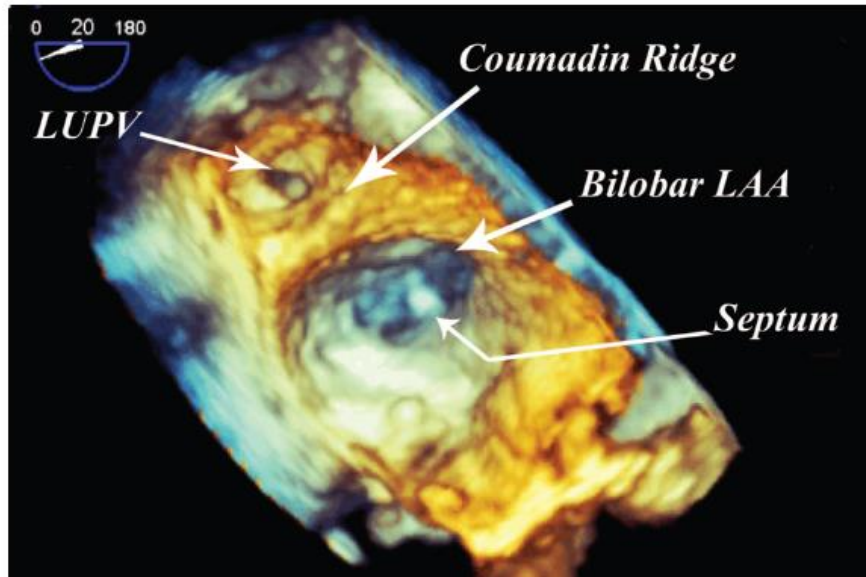


Figure 1. 2D TEE View of LAA. Mid-esophageal 20° 2D TEE view of the LAA showing spontaneous echo contrast and the questionable thrombus is noted on the left. A schematic of the view is noted on the right. The arrows in the figures point to the questionable thrombus and the arrowhead (left figure) points to the spontaneous echo contrast. 2D TEE = two-dimensional transesophageal echocardiography; LAA = left atrial appendage.



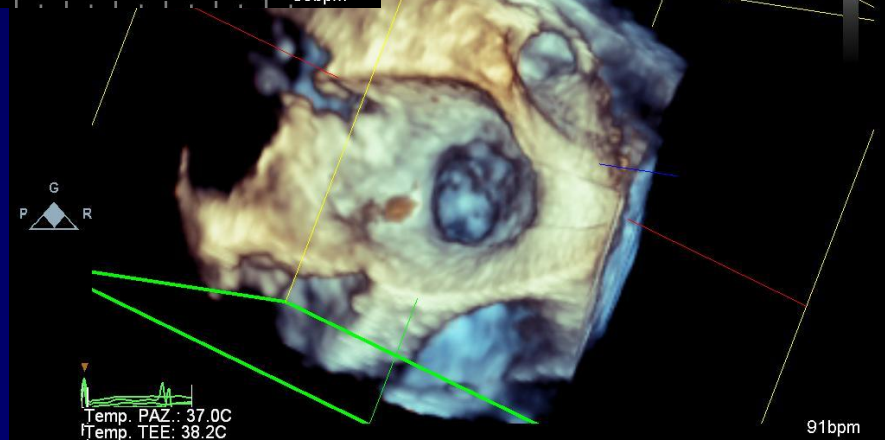
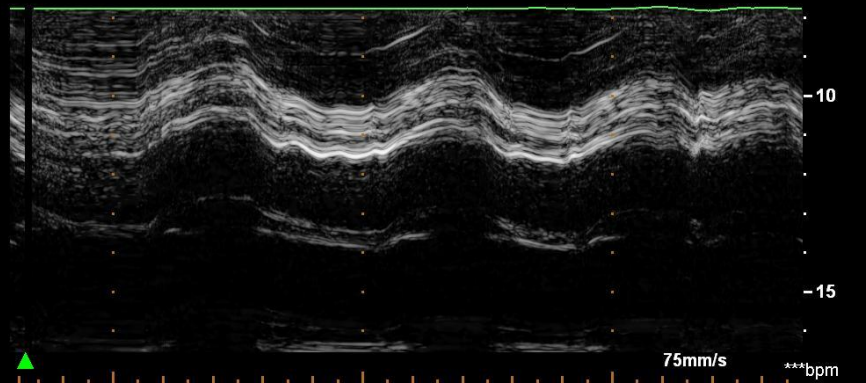
Evaluation of left atrial appendage function and thrombi in pts with AF: from TTE to RT3D TEE

Dentamaro, Colonna et al. Intern J CV Imag 2017

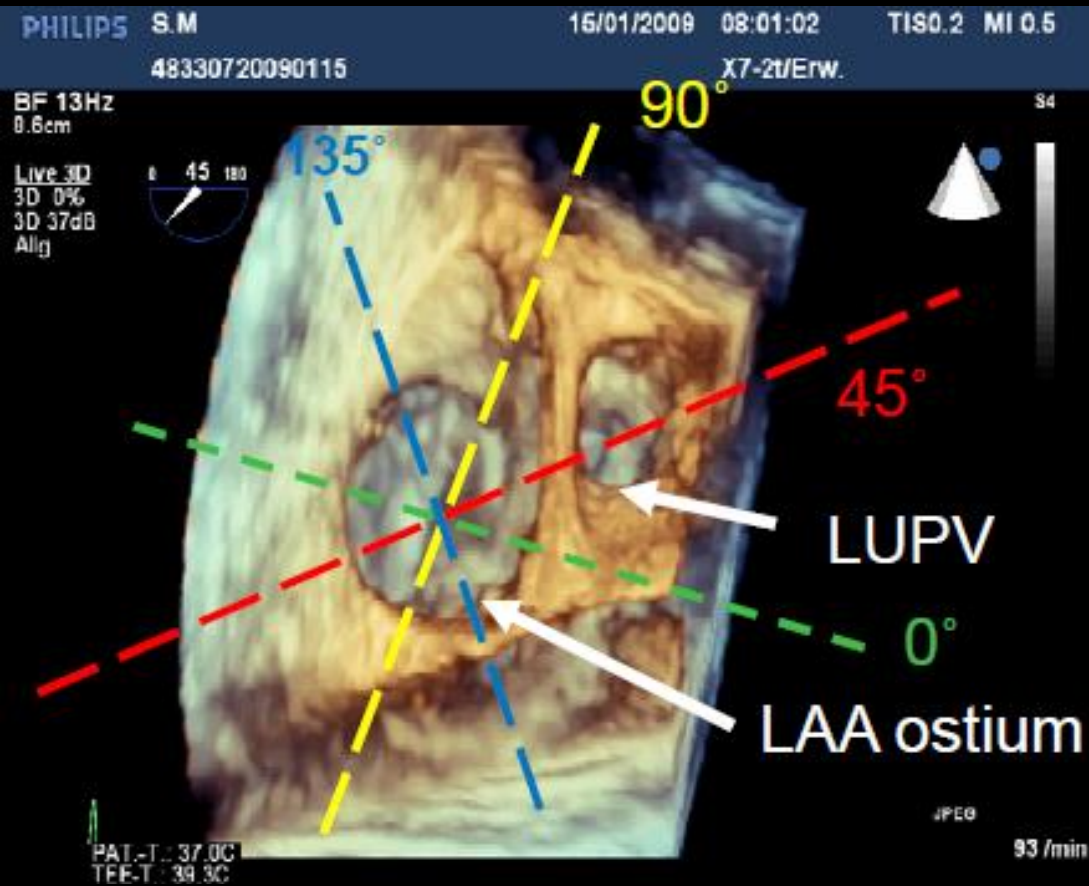
<i>2DTEE and RT3DTEE</i>	Total 93 patients
LAAeV definition, n (%)	93 (100)
LAAeV, cm/s (93/93)	41.3 ± 17.3
LAAeV < 40 cm/s (dysfunctional LAA), n (%)	49 (52.7)
LAAeV ≤ 20 cm/s (severely dysfunctional LAA), n (%)	10 (10.7)
LAArV, cm/s (67/93)	41.1 ± 15.4
Visualization of LAA, n (%)	93 (100)
Certain presence of thrombi at 2DTEE, n (%)	8 (8.6)
Diagnostic doubt for thrombosis at 2DTEE, n (%)	5 (5.4)
Certain presence of thrombi at RT3DTEE, n (%)	9 (9.7)
Presence of pectinate muscles at RT3DTEE, n (%)	4 (4.3)

Evaluation of left atrial appendage function and thrombi in pts with AF: from TTE to RT3D TEE

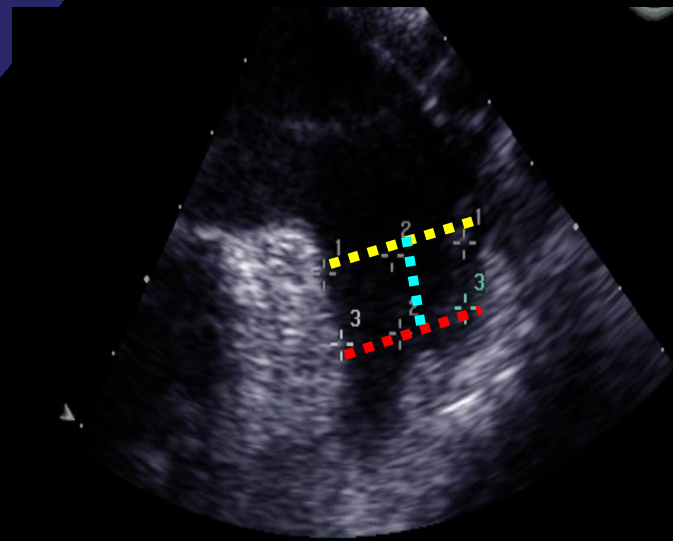
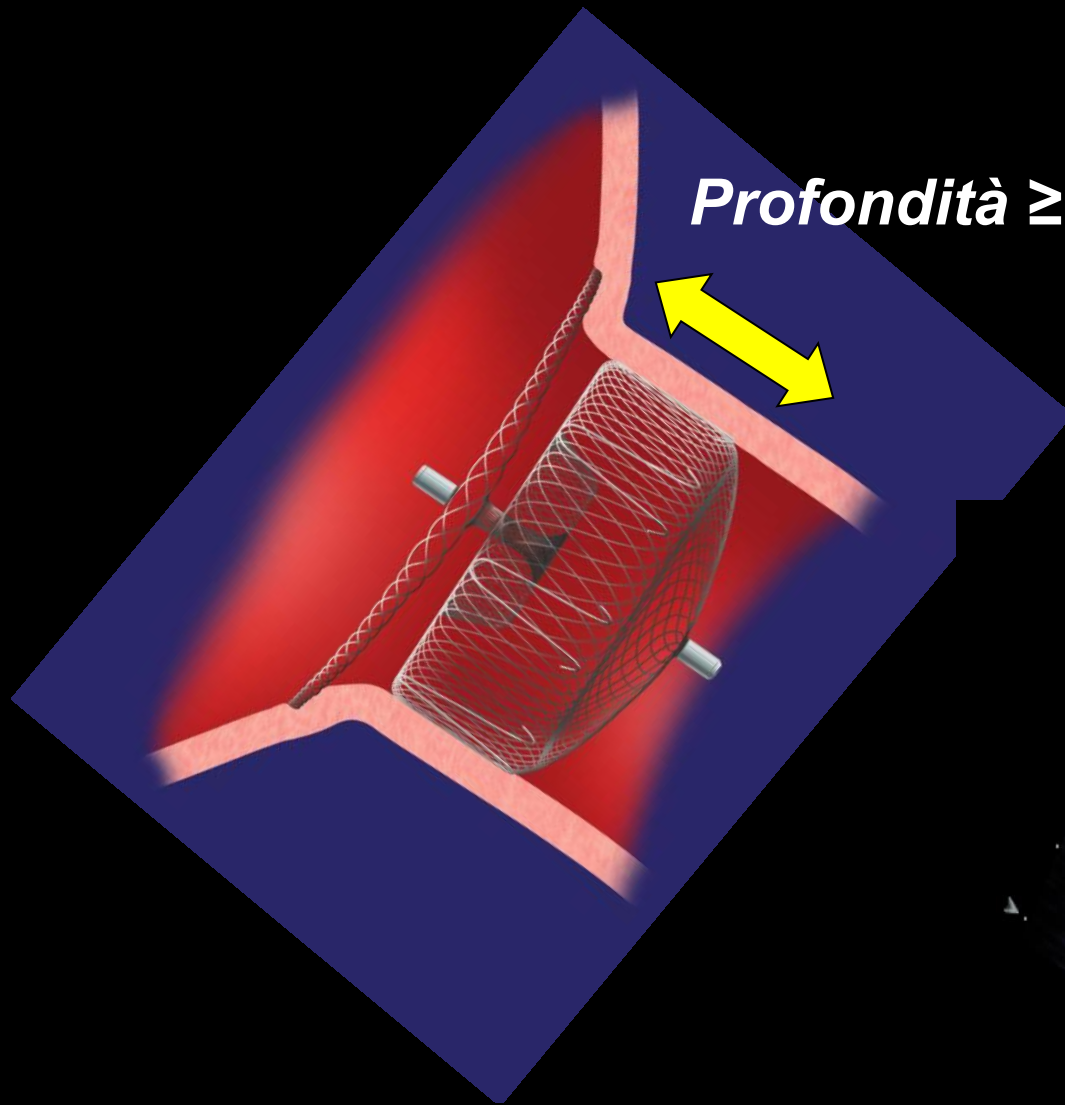
Dentamaro, Colonna et al. Intern J CV Imag 2017



MISURAZIONE ETE DELL'AURICOLA

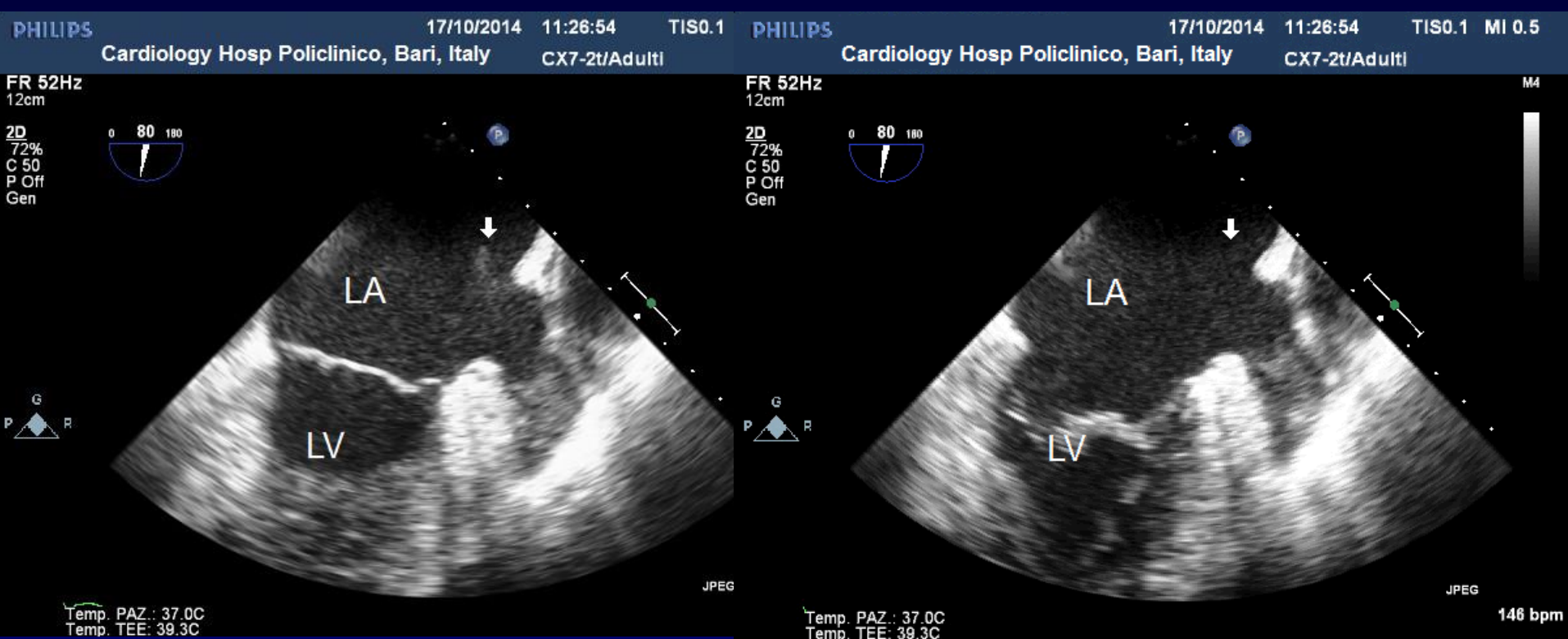


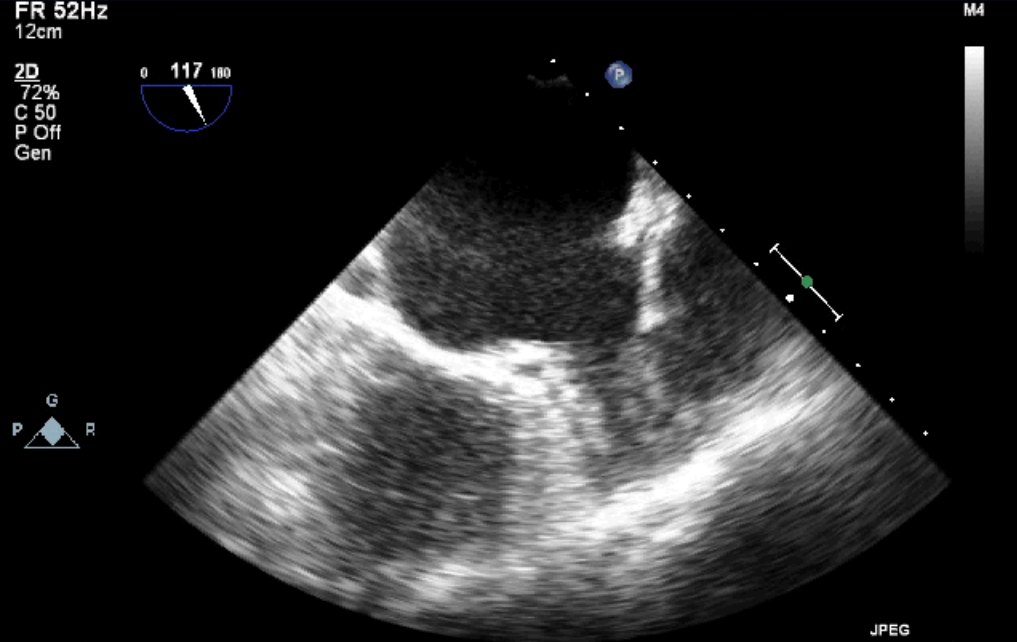
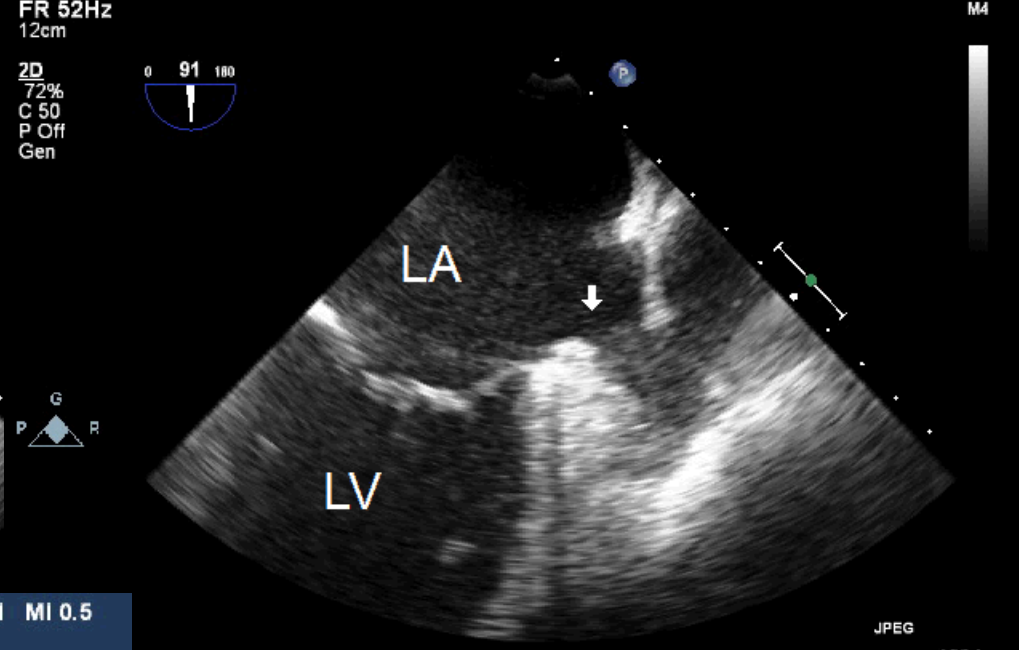
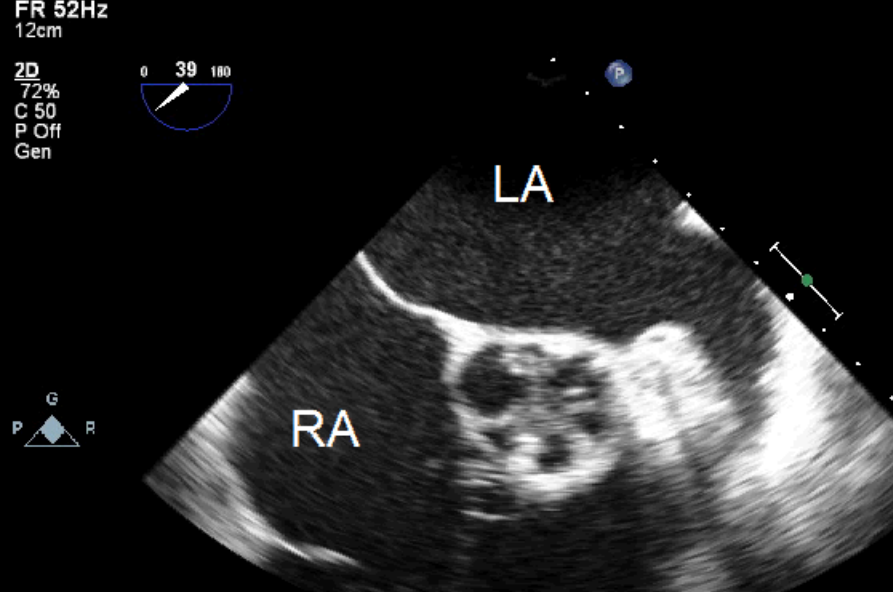
PROFONDITA' DELL'AURICOLA



Scarso controllo con warfarin

- Dopo 4 settimane di warfarin con scarso controllo PT-INR (2 valori sotto 2) → TEE





p. PAZ.: 37.0C
p. TEE: 39.1C

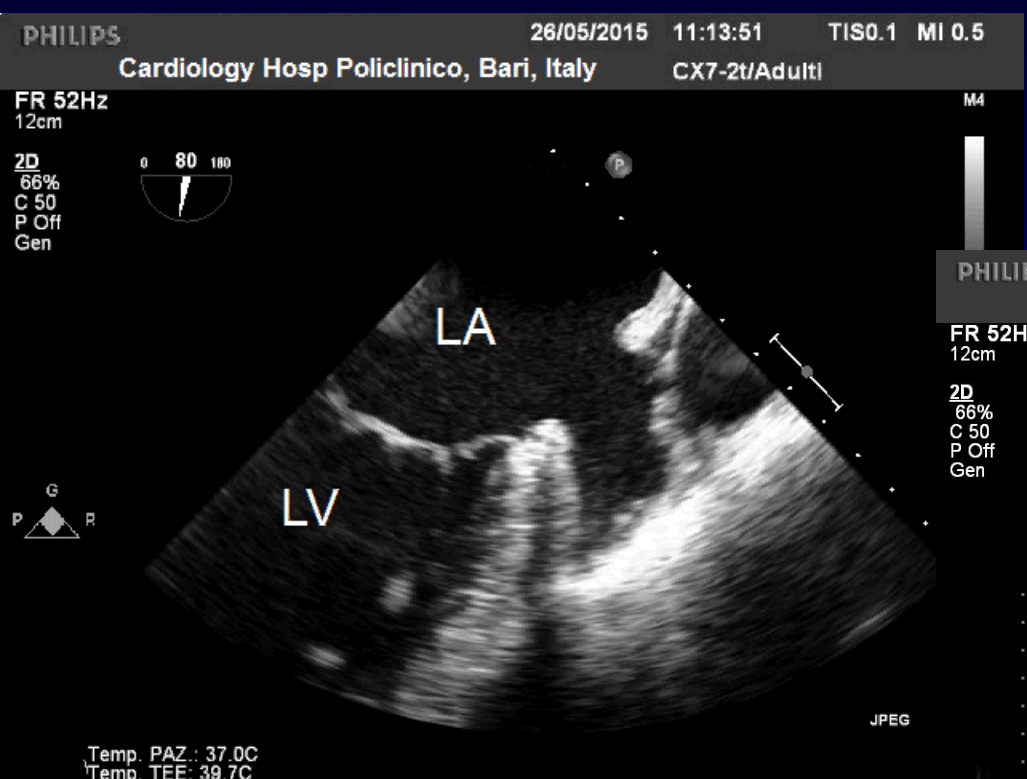
JPEG 123 bpm

Temp. PAZ.: 37.0C
Temp. TEE: 39.2C

JPEG 155 bpm

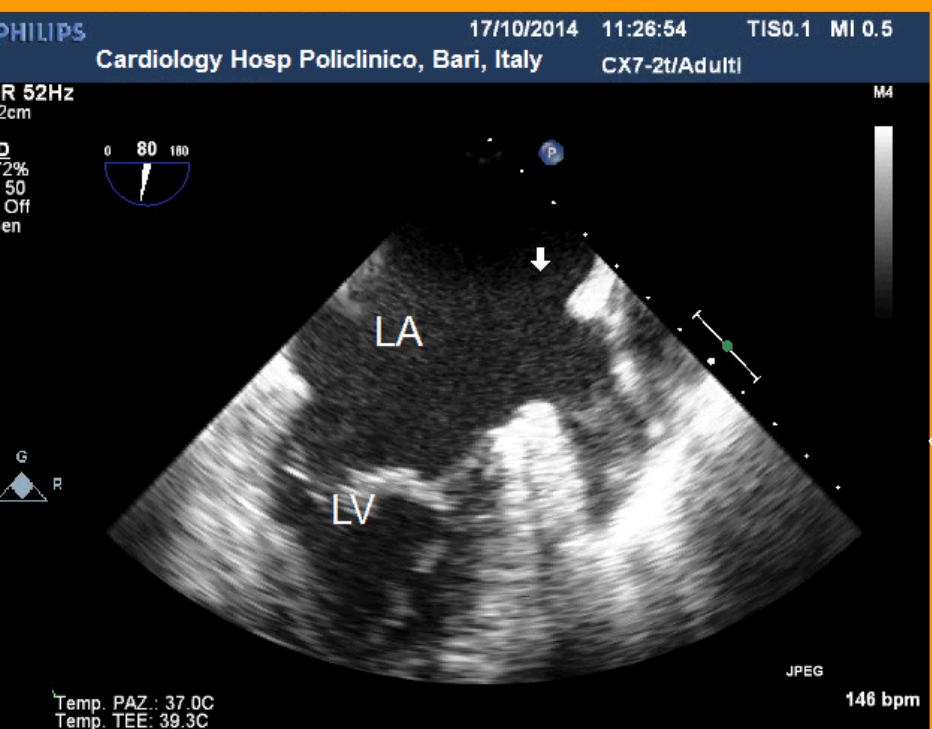
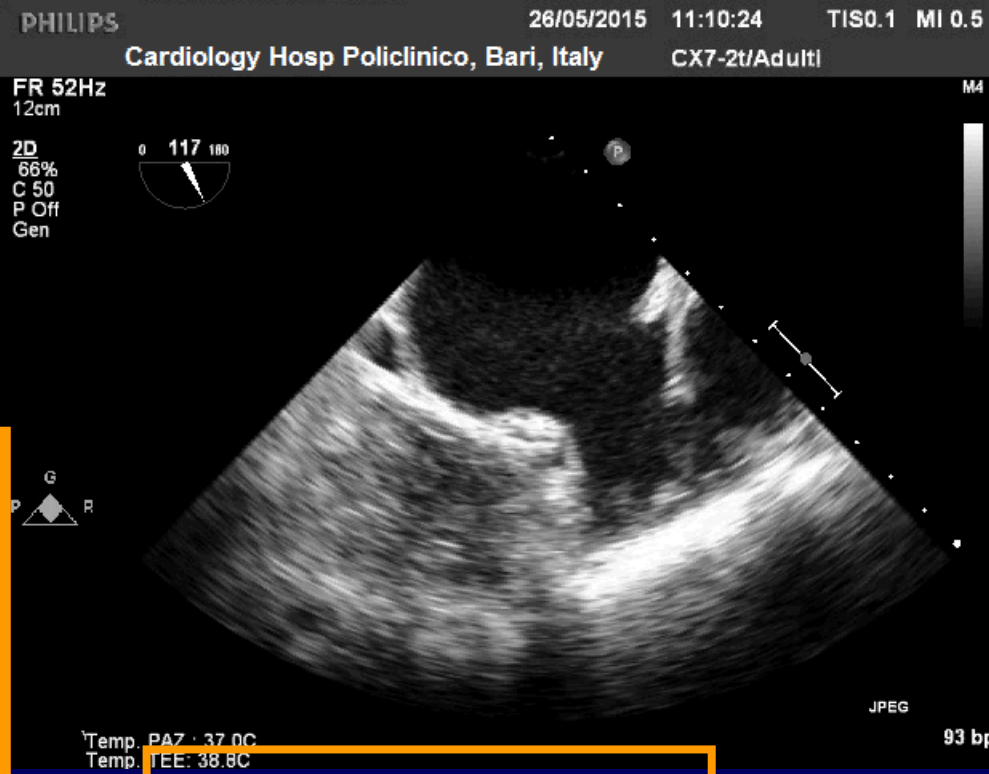
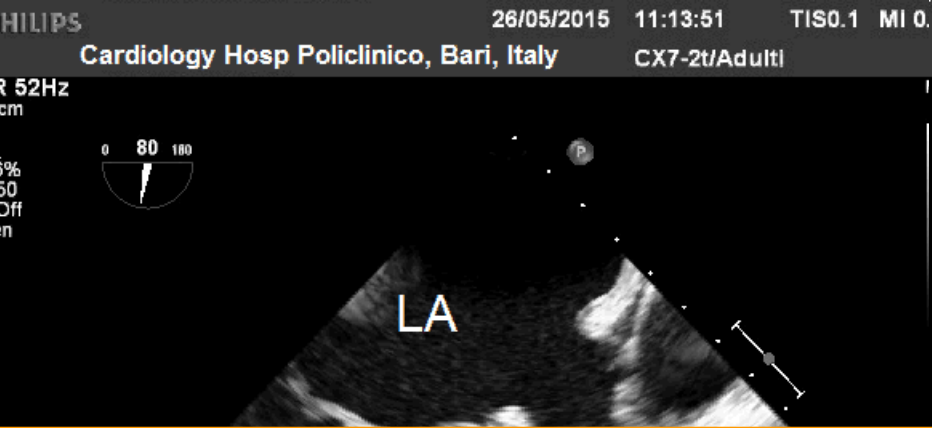


- Cardioversione ritardata
Per INR instabile passaggio a NOAC alta dose + nuovo TEE



3D echo LAA echocontrast regression after dabigatran and not with warfarin

Vestito and Colonna, JCVEcho '16



Sludge in LAA, pre-therapy



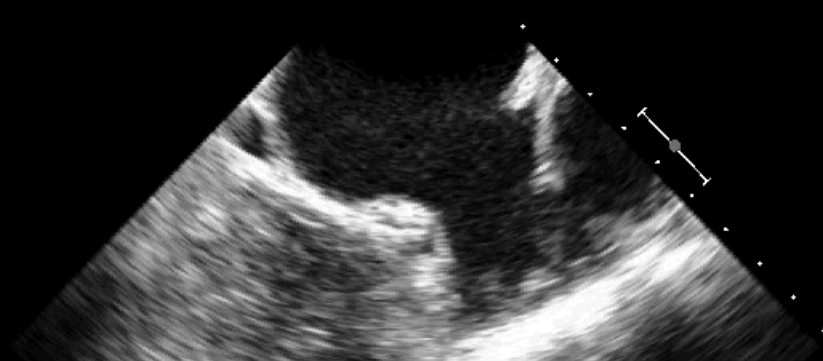
3D TEE 1 mese dopo

PHILIPS

26/05/2015 11:10:27 TIS0.1 MI 0.5

Cardiology Hosp Policlinico, Bari, Italy CX7-2t/AdultI

22Hz



PHILIPS

26/05/2015 11:19:28 TIS0.2 MI 0.5

Cardiology Hosp Policlinico, Bari, Italy CX7-2t/AdultI

FR 26Hz
12cm

Live 3D
3D 47%
3D 40dB
Gen



M4



72 bpm

p. PAZ.: 37.0C
p. TEE: 39.9C

PHILIPS

26/05/2015 11:19:28 TIS0.2 MI 0.5

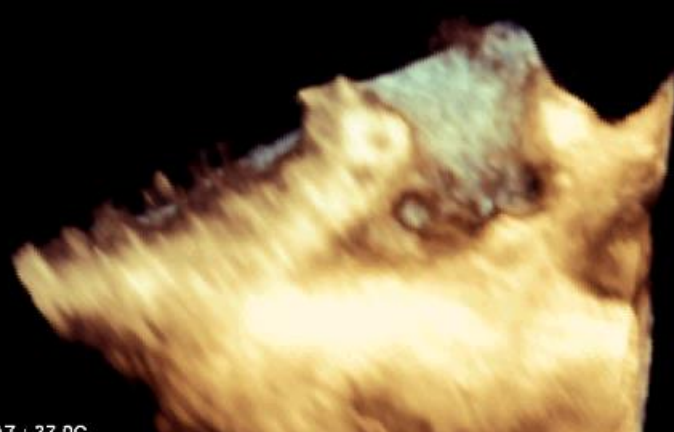
Cardiology Hosp Policlinico, Bari, Italy CX7-2t/AdultI

FR 26Hz
12cm

Live 3D
3D 47%
3D 40dB
Gen



M4



JPEG

72 bpm

Temp. PAZ.: 37.0C
Temp. TEE: 39.9C



Guidelines for study of LA / LAA: do they apply to all patients?

- Imaging useful to ...identify difficult diagnosis (masses, endocardites, PFO, thrombi, etc)
- ... study all patients with A Fib for stratification (some of them with TOE)
- ... use new + “old” technology for better diagnosis

Bari, Italy

