Aorta and aortic valve -
- basic principle of 2D echo assessment

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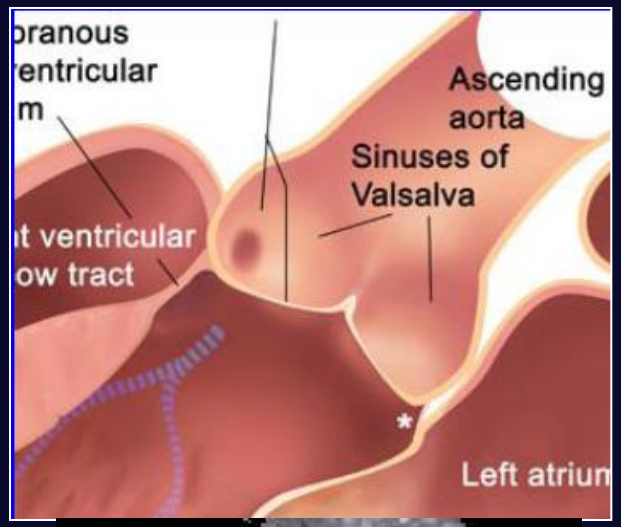
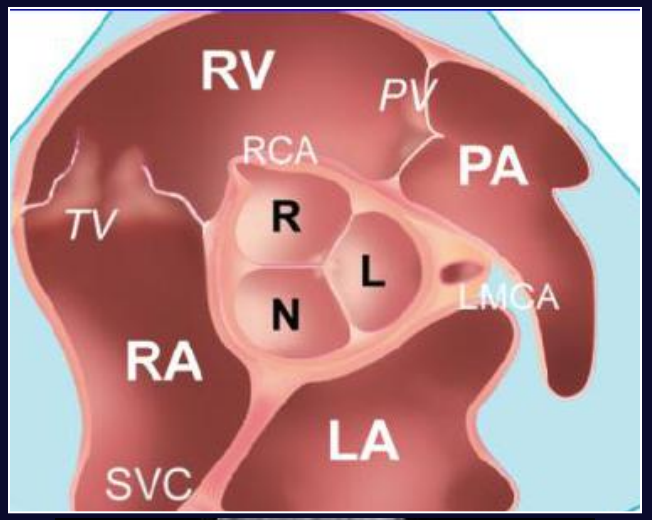
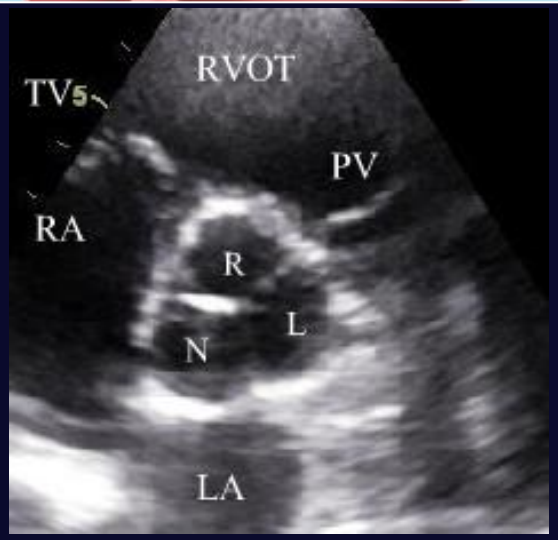
Adults Echo laboratory

How do we see the aortic valve ?



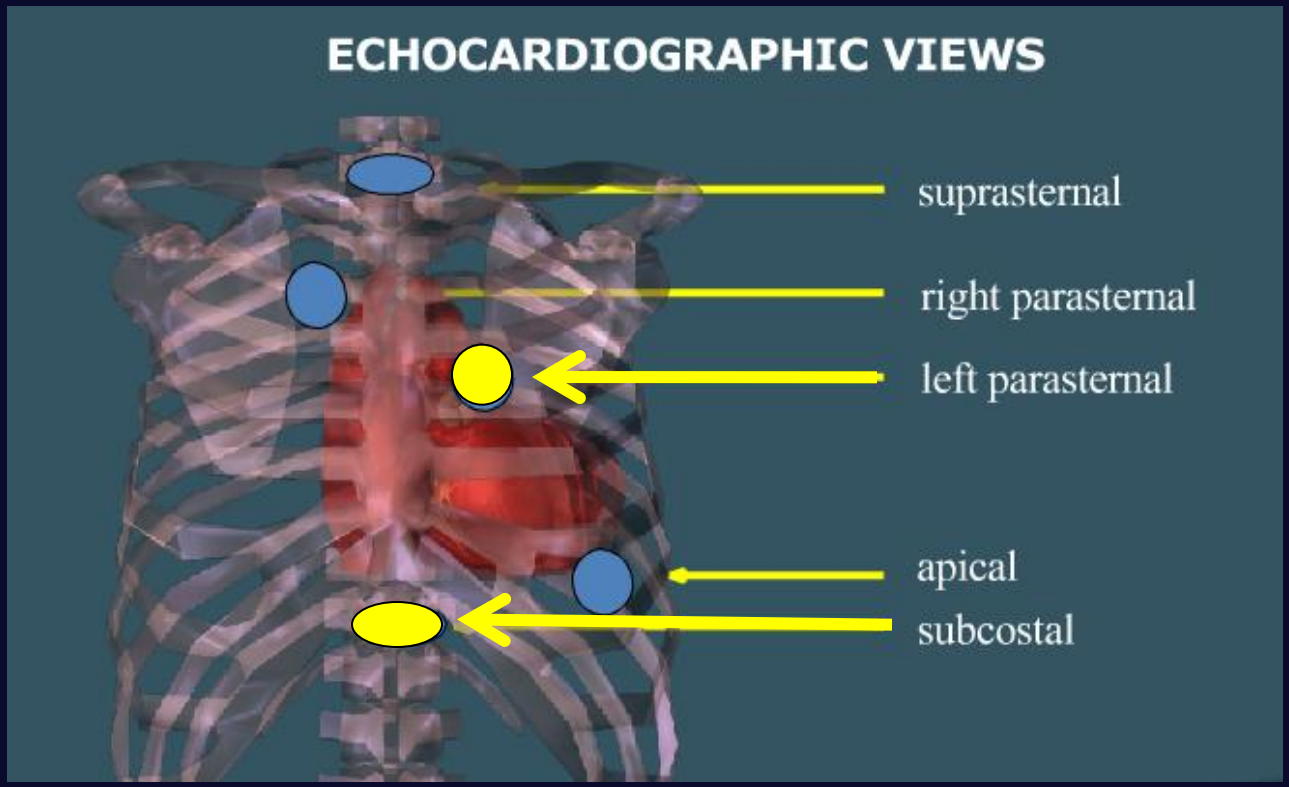




Planar views of valve anatomy in standard views

Aortic valve – oriented TTE views

Left parasternal short axis

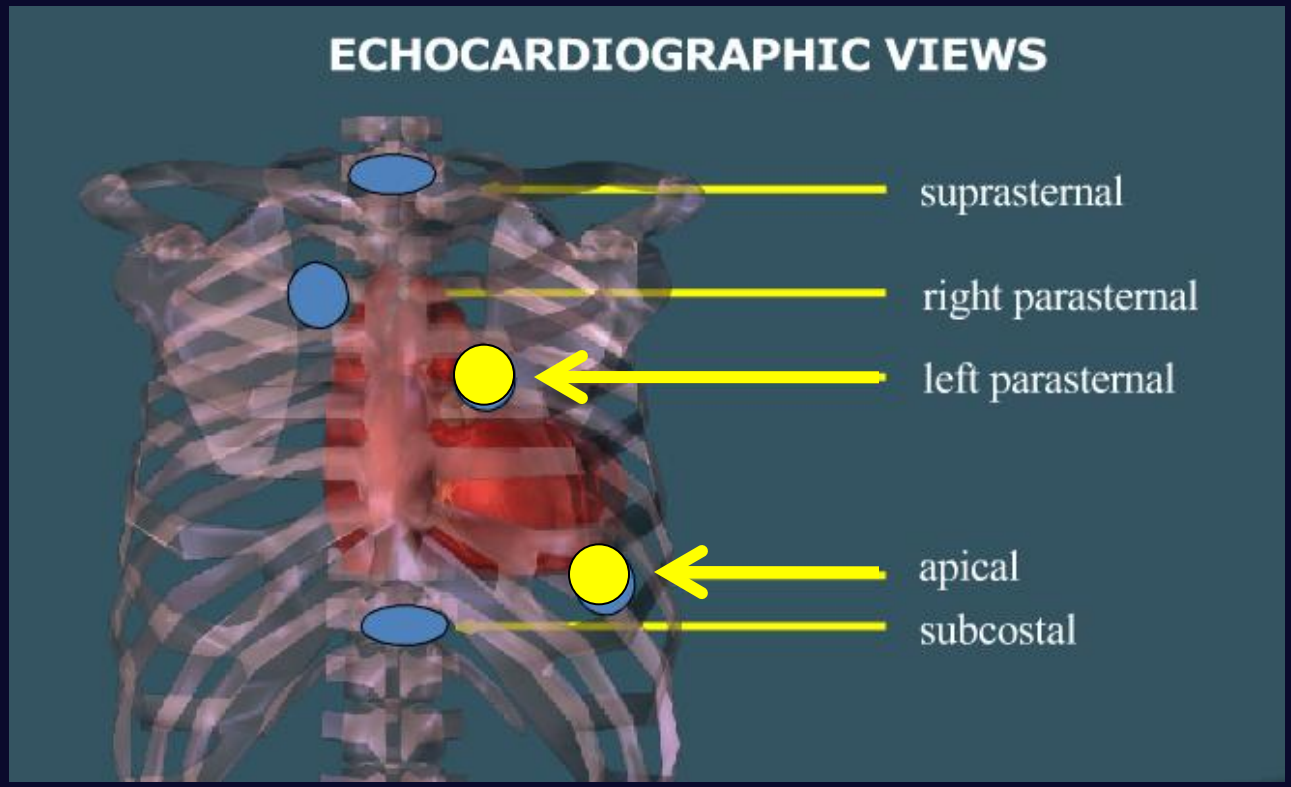


Subcostal view

Adapted from A.Hagendorfer-EAE basic course

AV and Aorta-oriented TTE views

Left parasternal long axis

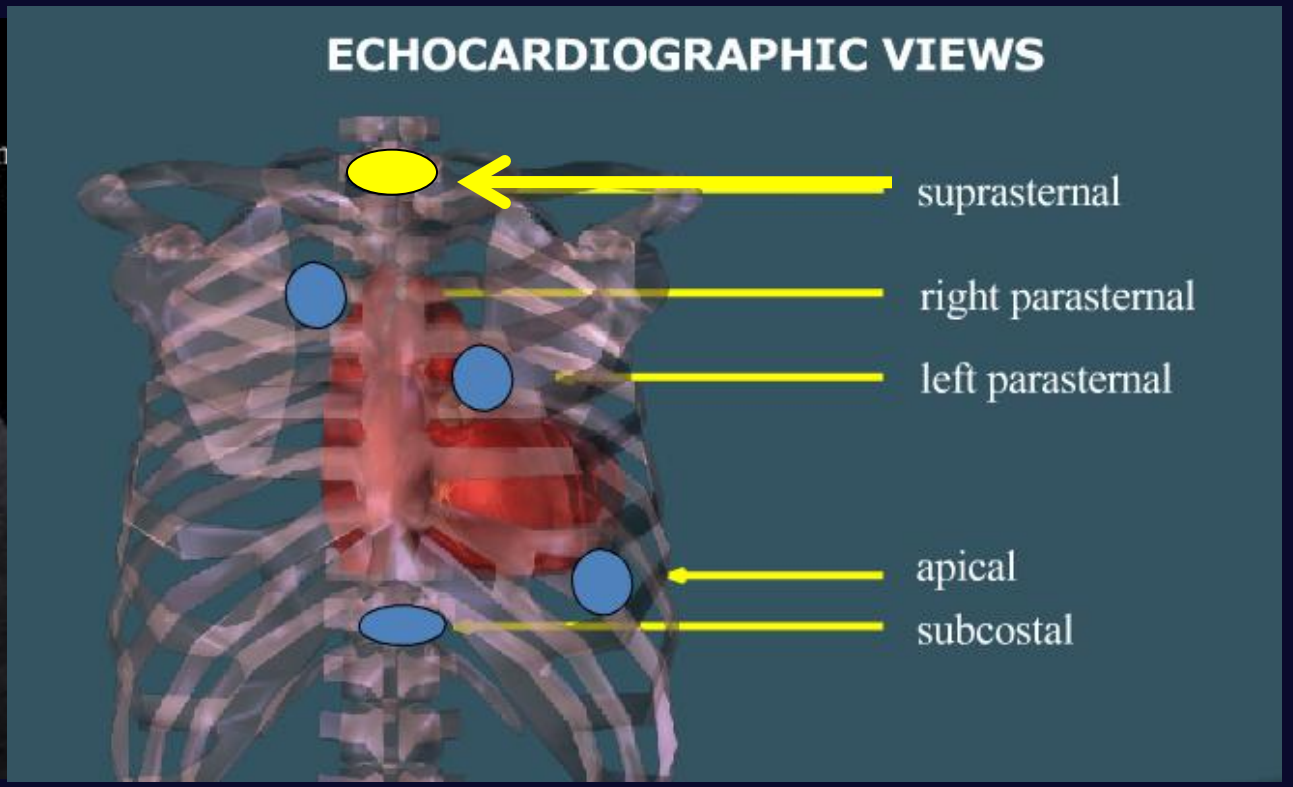


Apical long axis

Adapted from A.Hagendorfer-EAE basic course

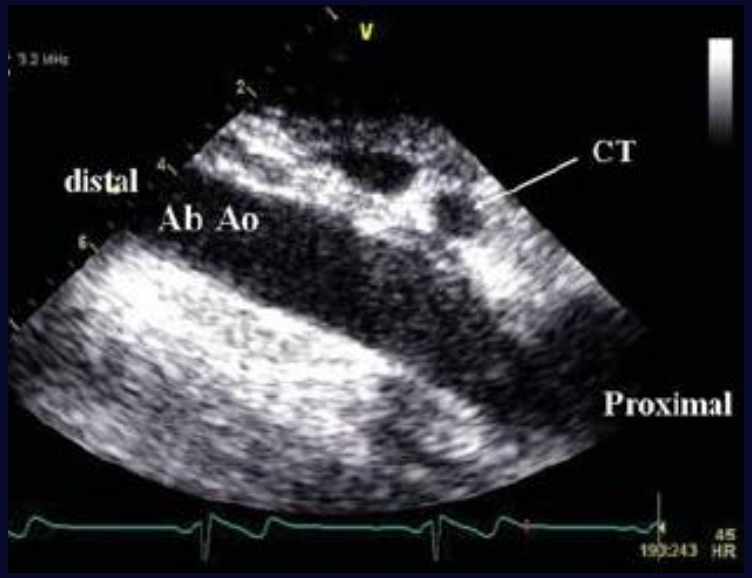
Aorta- oriented TTE views

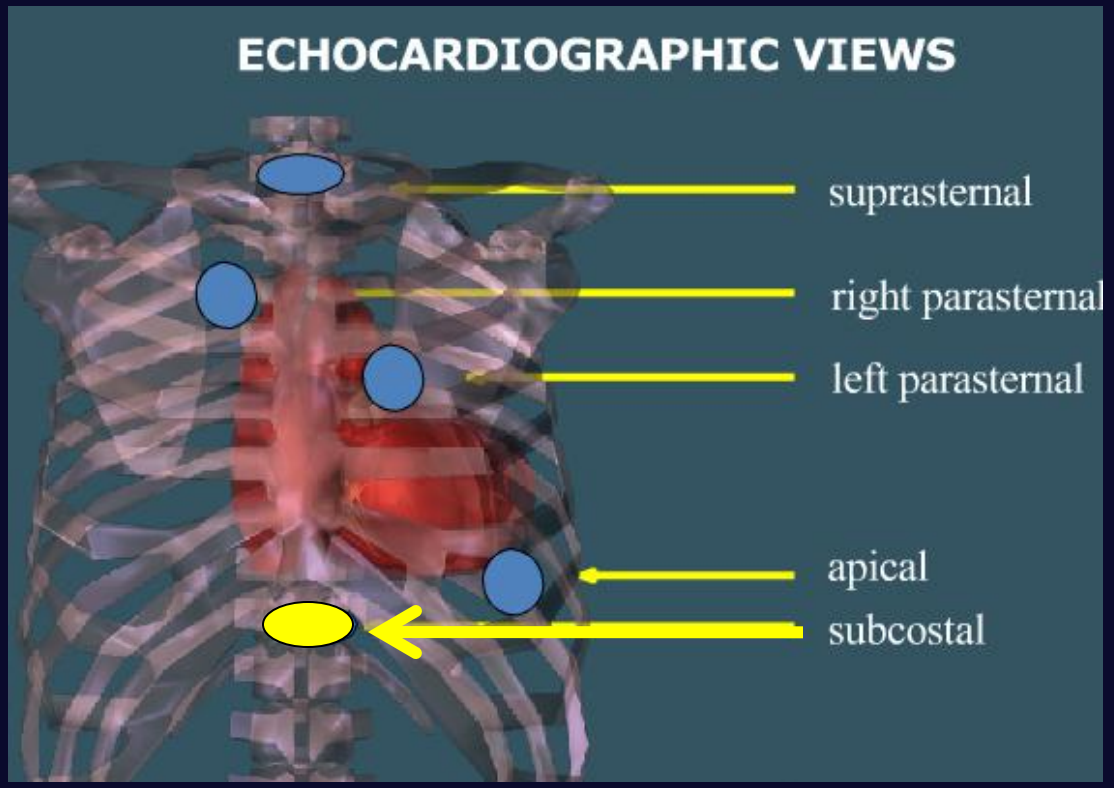
Suprasternal view



Adapted from A.Hagendorfer-EAE basic course

Aorta- oriented TTE views

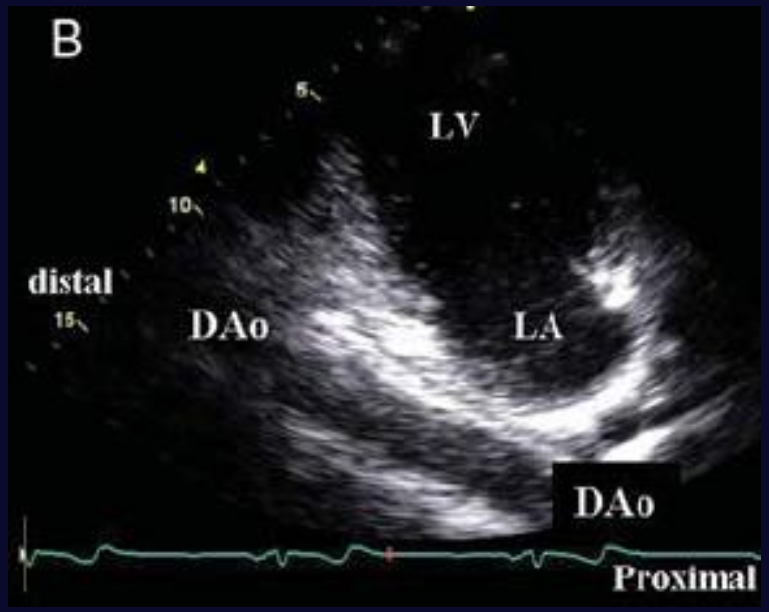


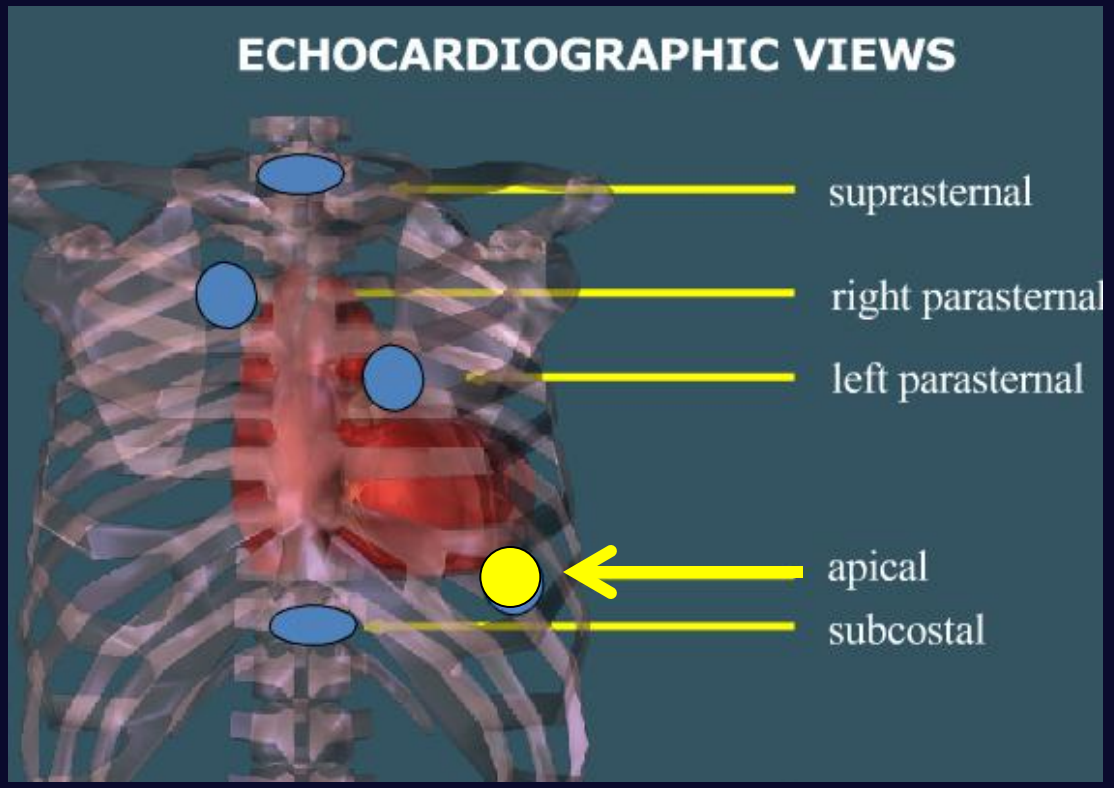


Subcostal view

Adapted from A.Hagendorfer-EAE basic course

Aorta- oriented TTE views



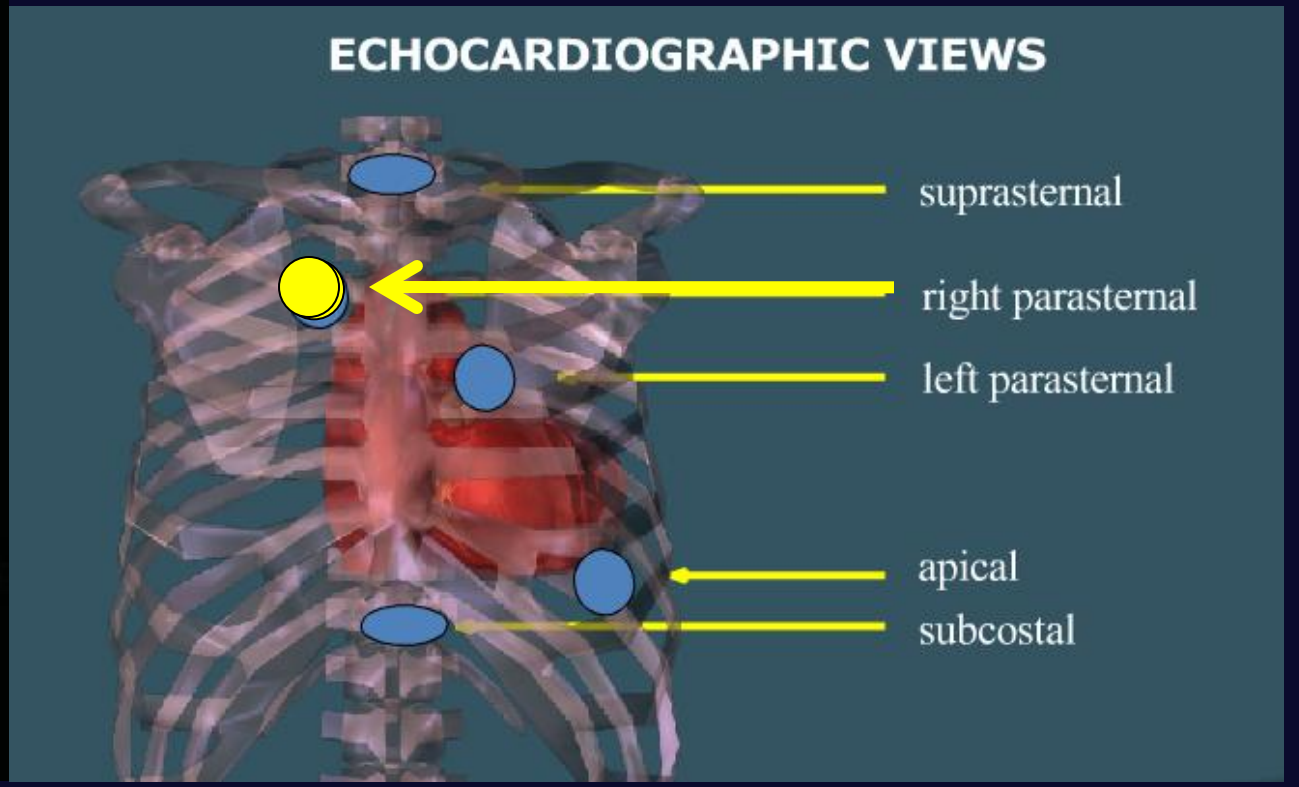


Apical view

Adapted from A.Hagendorfer-EAE basic course

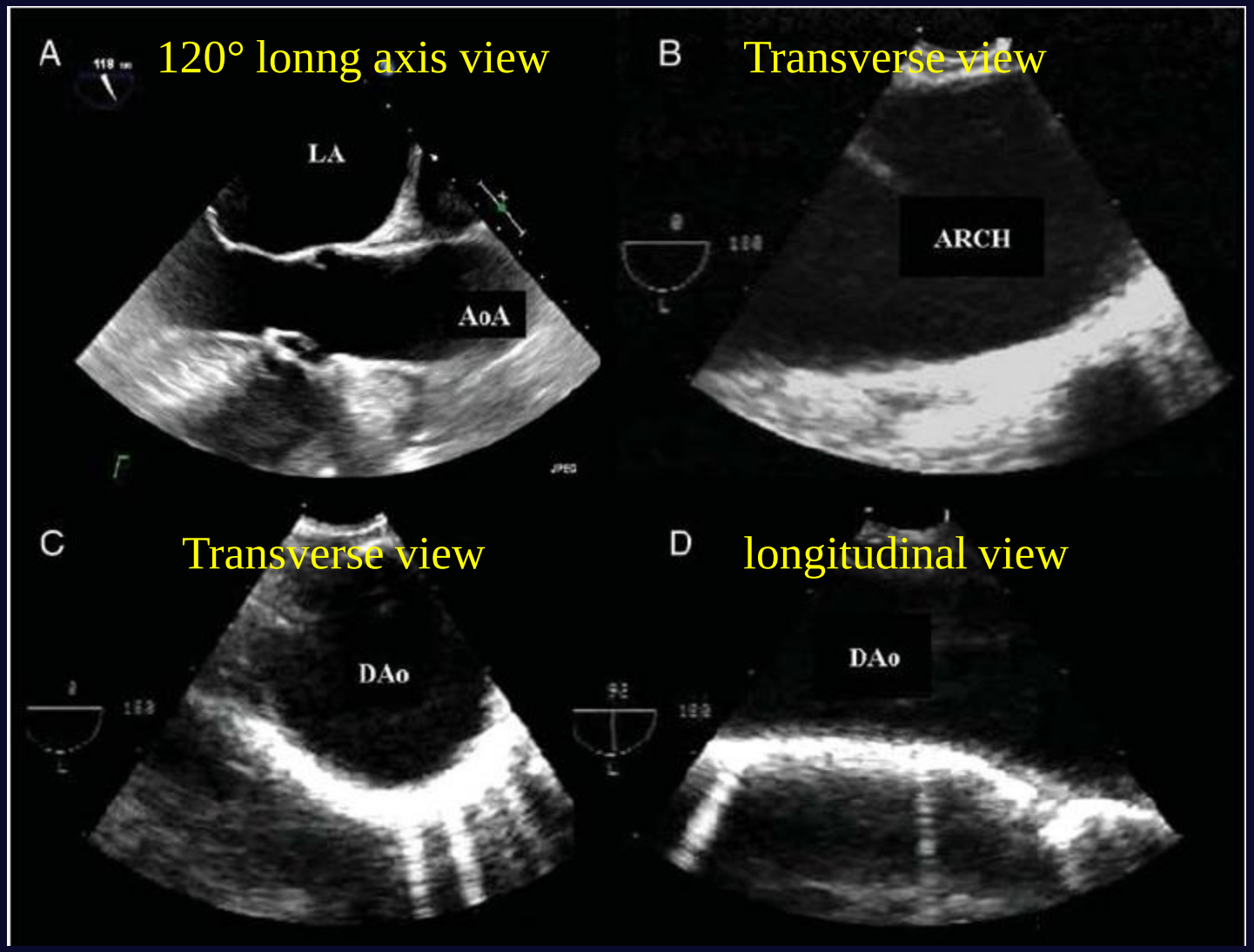
Aorta- oriented TTE views

Right parasternal long axis



Adapted from A.Hagendorfer-EAE basic course

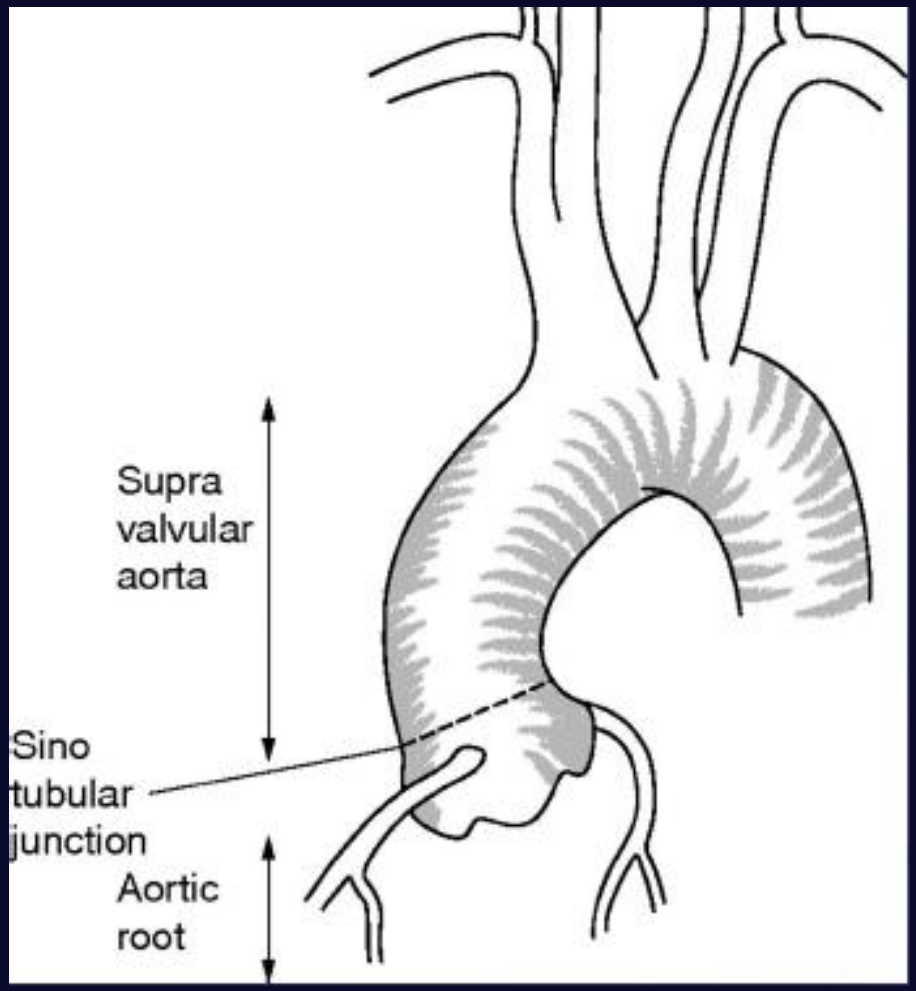
Aorta-oriented-TEE views



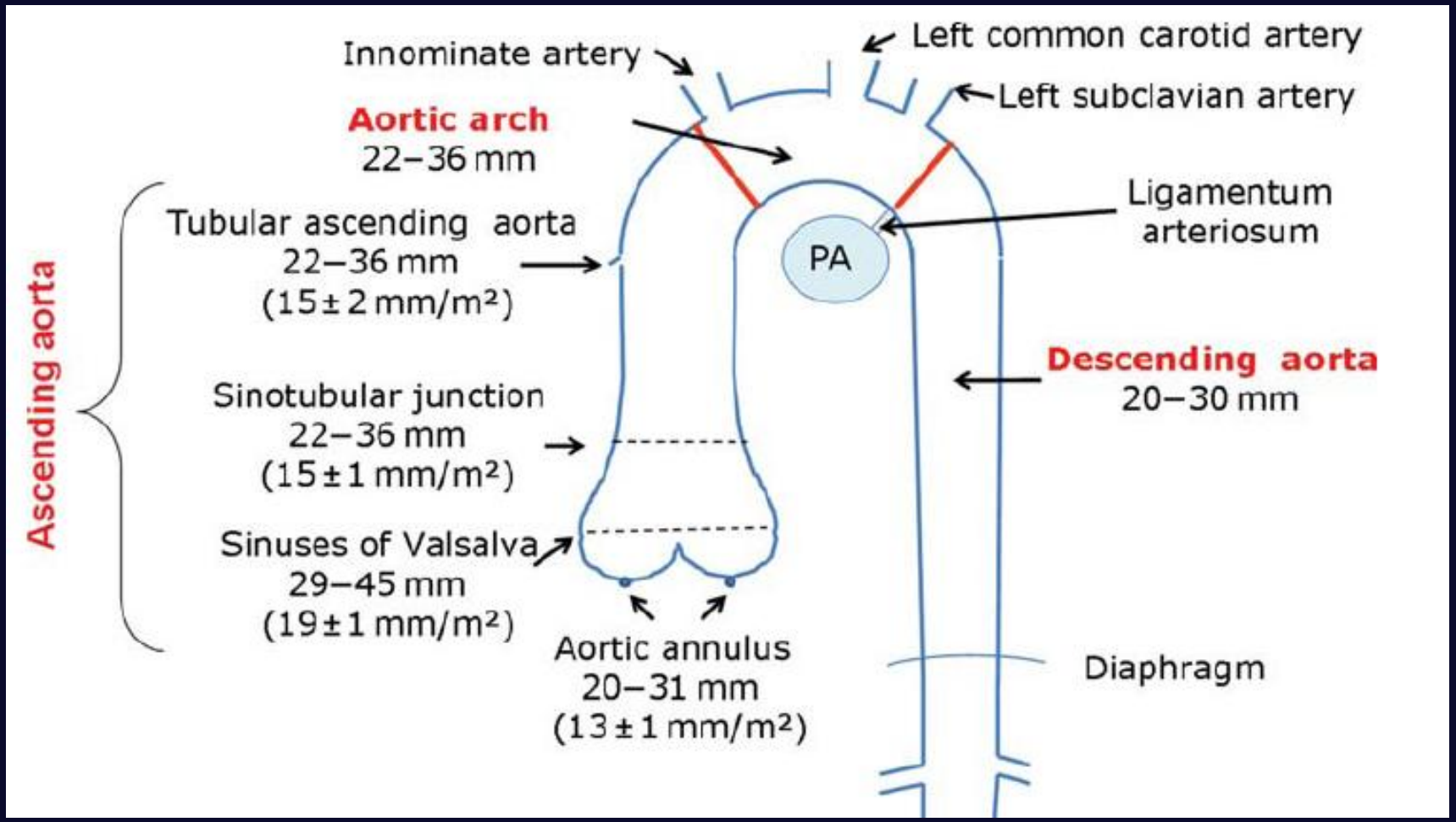
European Journal of Echocardiography (2010) 11, 645–658

Aortic disease

Anatomy of the ascending aorta



Nataf, P et al.Heart 2006;921345-52



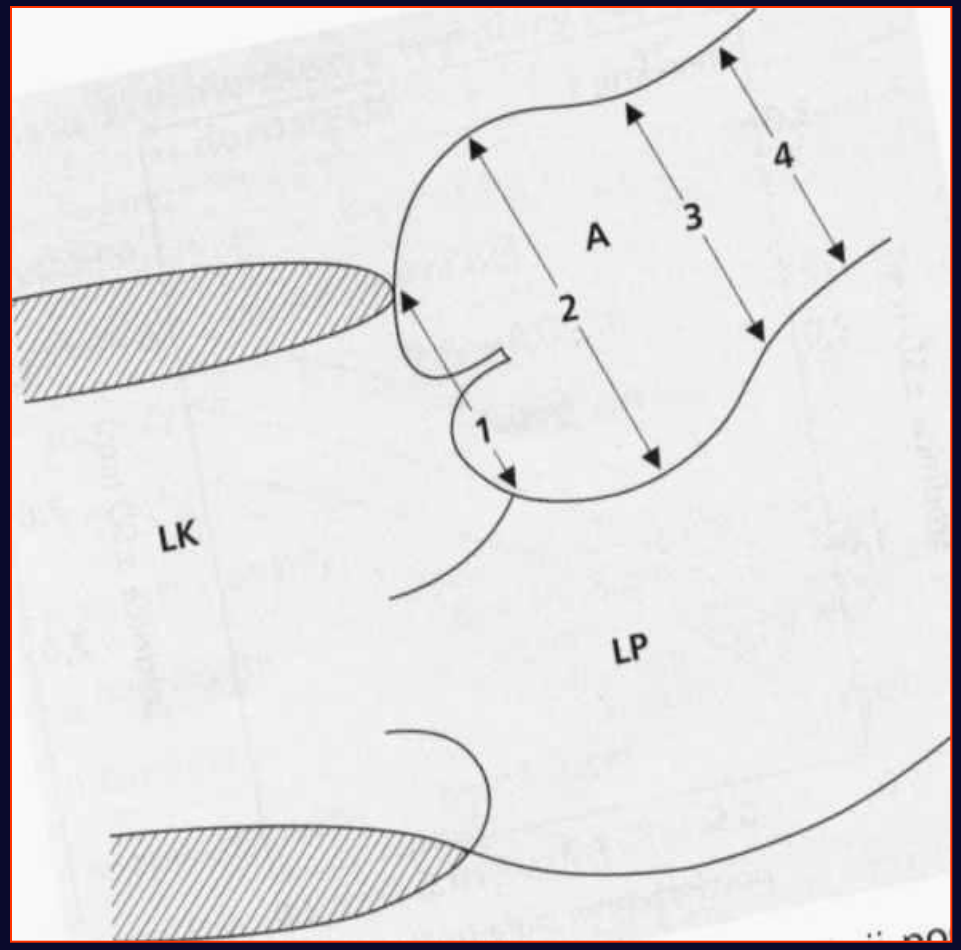
European Journal of Echocardiography (2010) 11, 645–658

How to measure ascending aorta ?

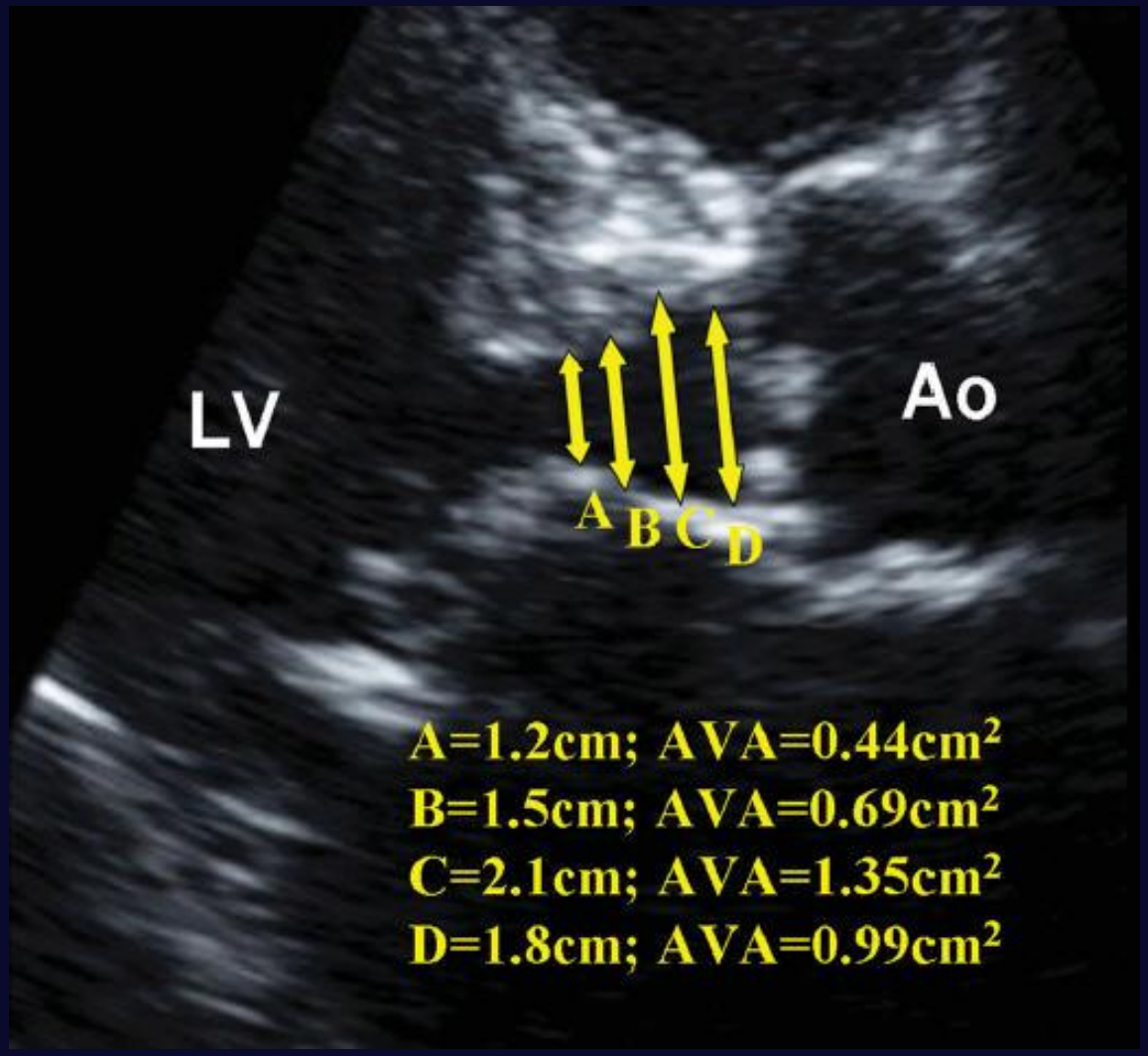
Algorytm obliczania **należnego wymiaru** aorty wstępującej- wzór Roman'a (TTE)

wiek (lata)	wymiar pnia aorty wstępującej (cm)
< 18	1.02 + (0.98 x BSA*)
18-40	0.97 + (1.12 x BSA)
> 40	1.92 + (0.74 x BSA)

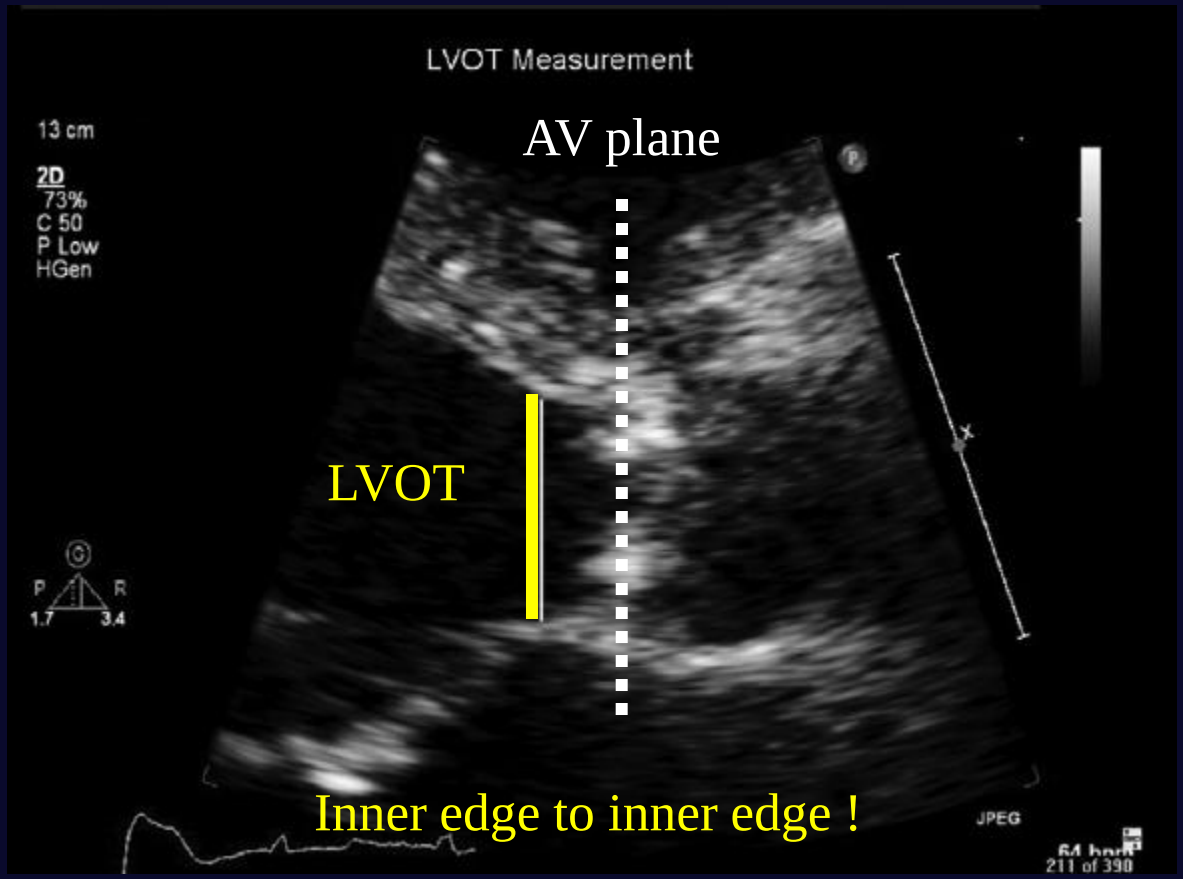
TTE LV outflow and ascending aorta



How to measure LVOT diameter ?



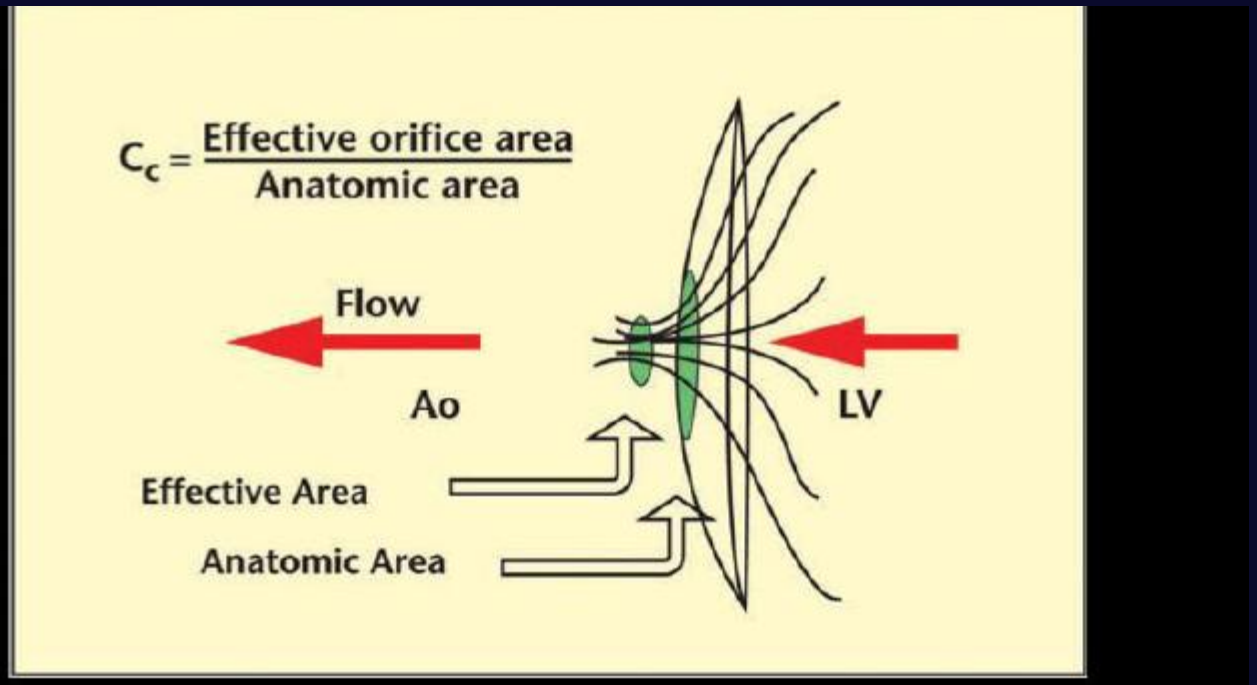
How to measure LVOT diameter ?



LVOT diameter is measured in the parasternal long-axis view in mid-systole from the white–black interfaceof the septal endocardium to the anterior mitral leaflet, parallel to the aortic valve plane and within 0.5–1.0 cm of the valve orifice.

European Journal of Echocardiography (2009) 10, 1–25

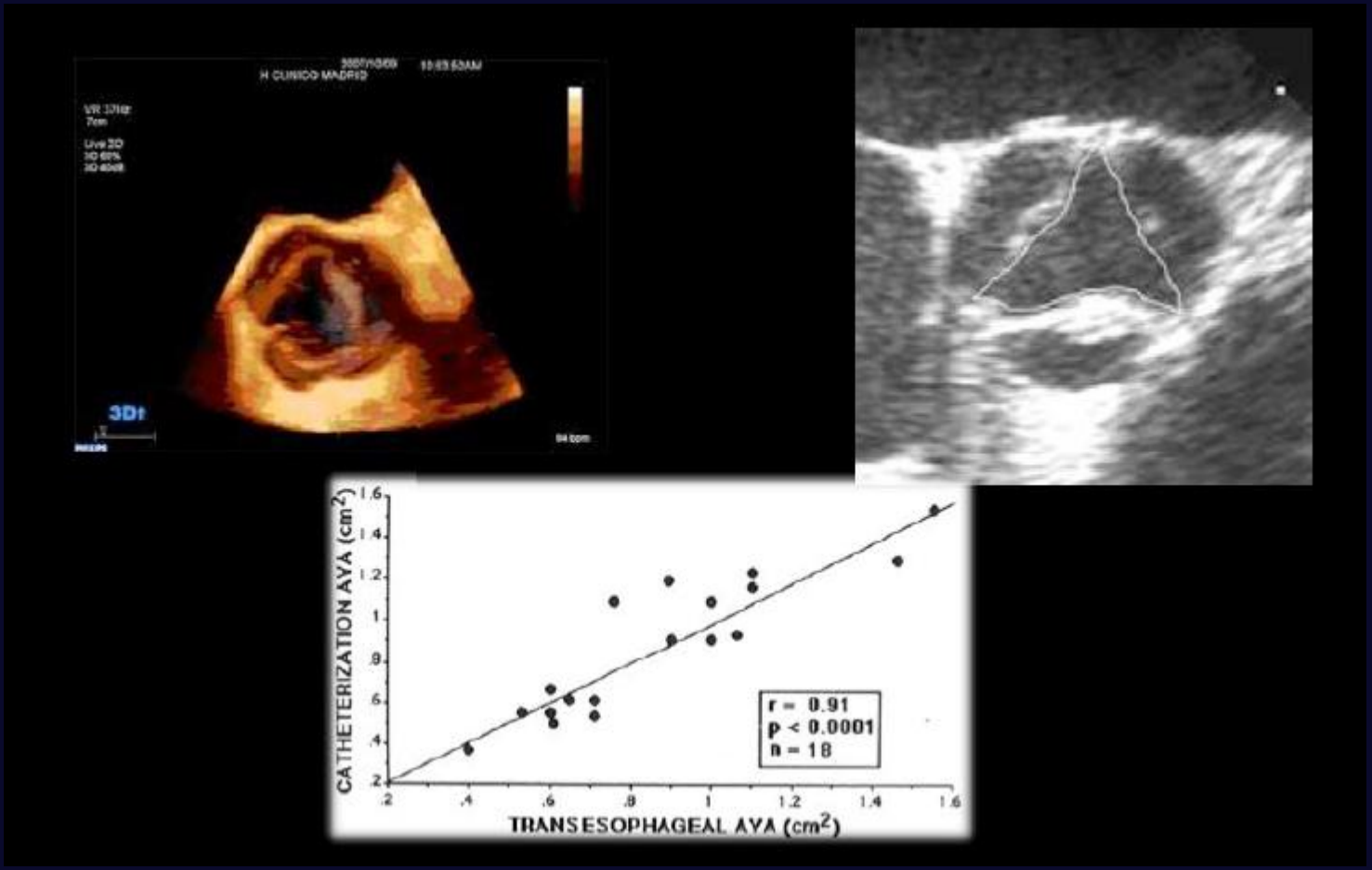
How to measure aortic valve area ?



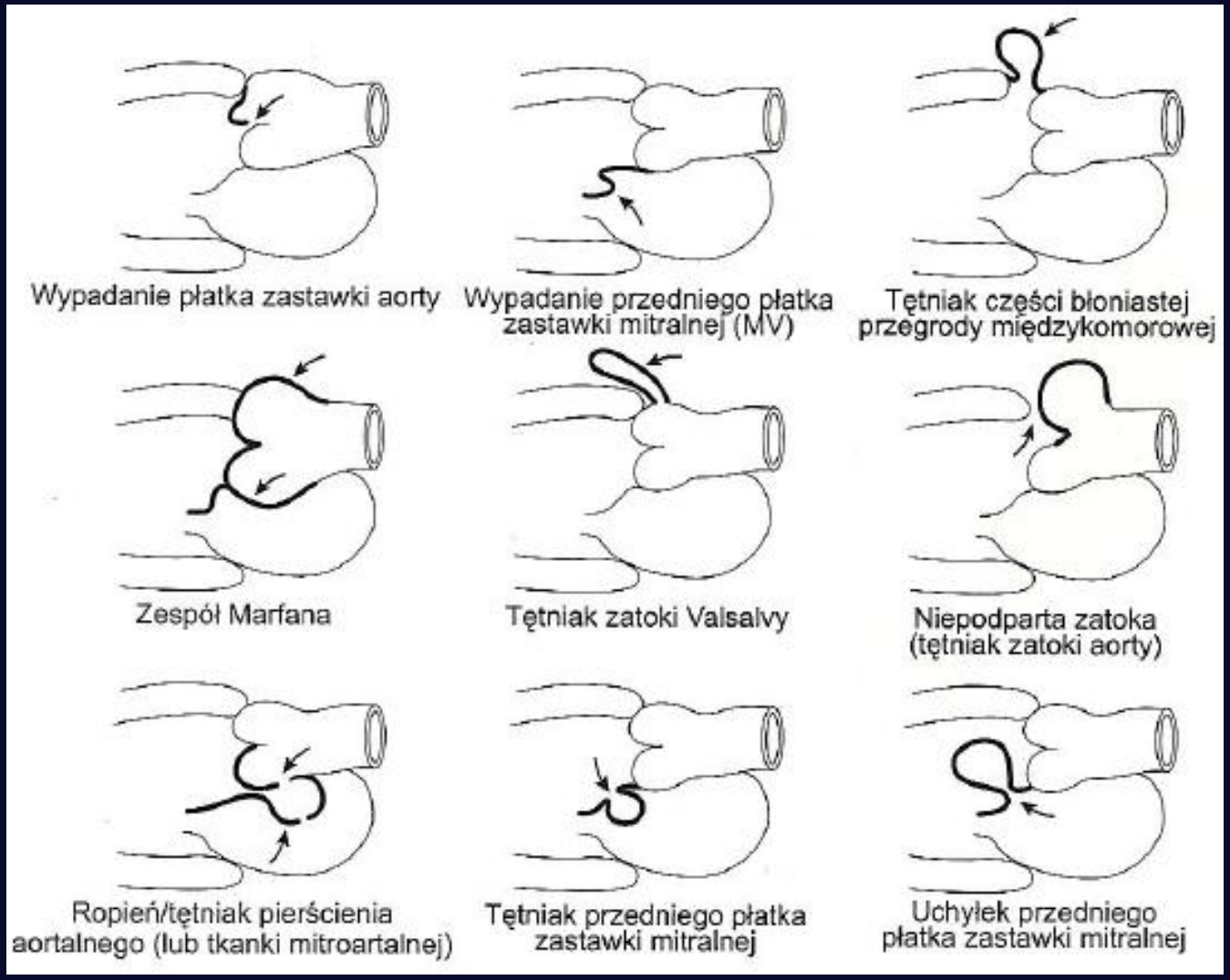
Catheterization formulae for valve area attempt to derive the *anatomic area* whereas the Doppler continuity equation reports the area to which the flow is constricted or *effective valve area.*

Rev Cardiovasc Med. 2005;6(1)23-32

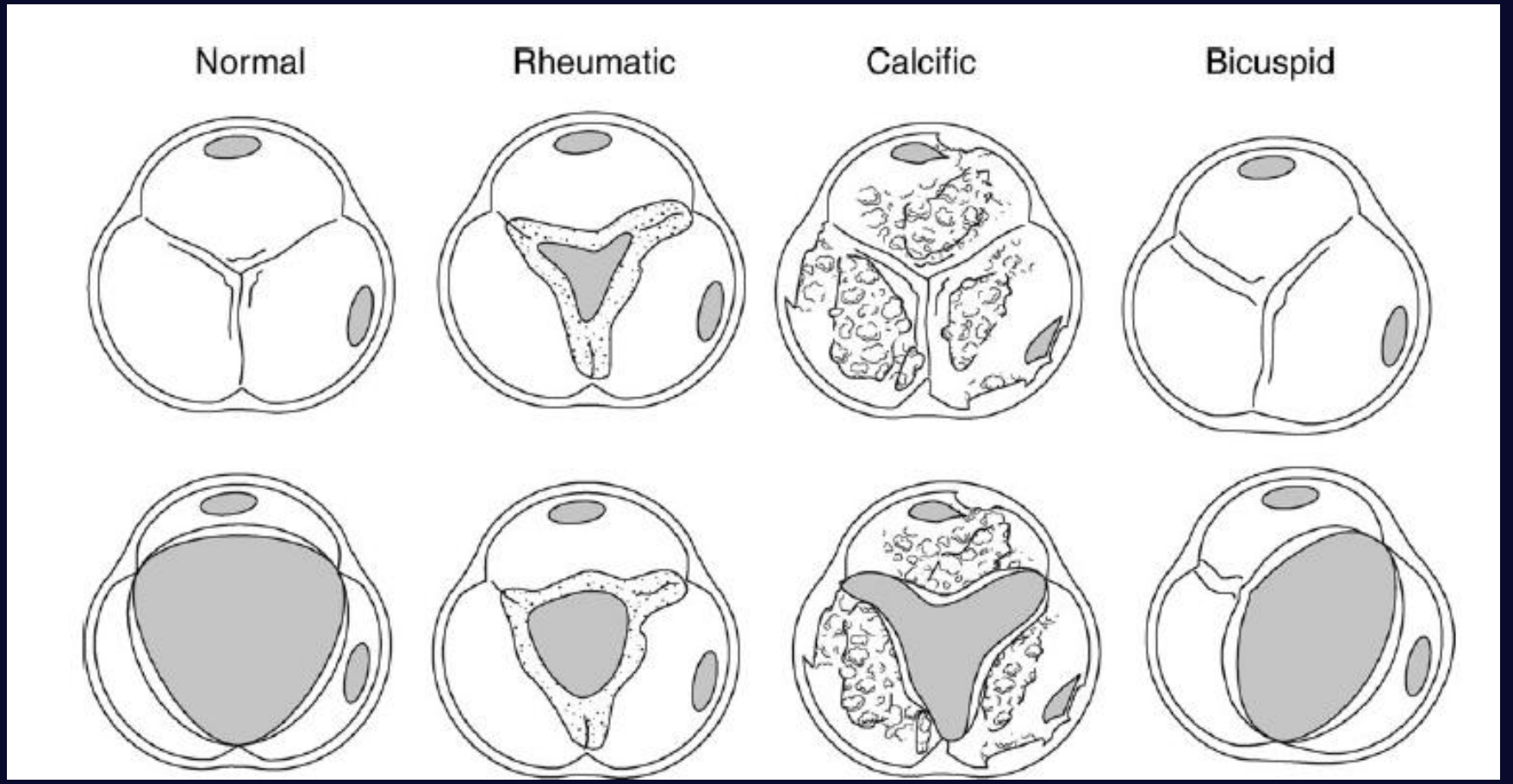
How to measure aortic valve area ?



Important morphologic findings in parasternal view



Aortic stenosis aetiology



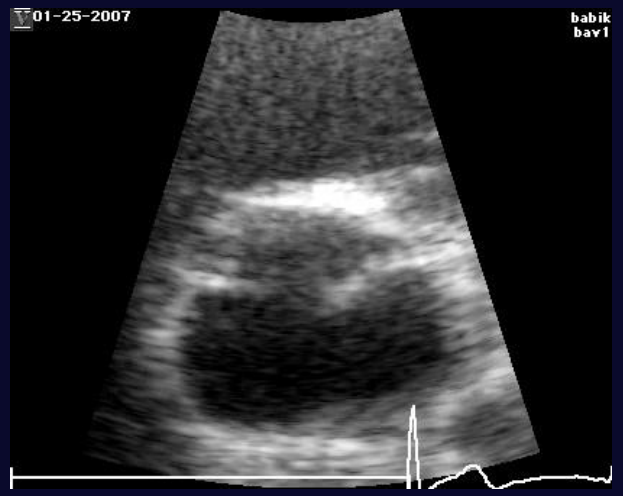
C. Otto, Principles of Echocardiography, 2007

Aortic stenosis

Etiology

Calcific Aortic Stenosis

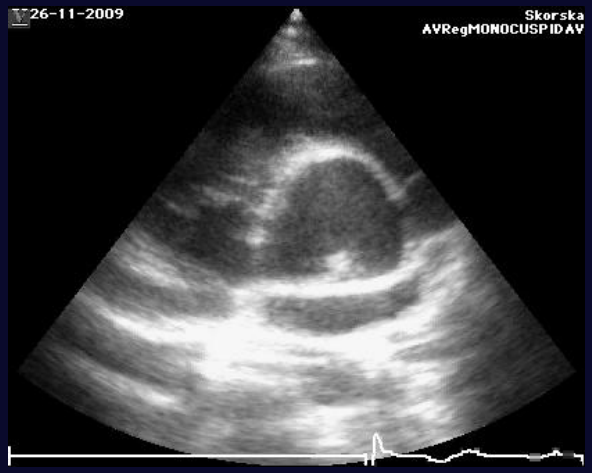
Rheumatic Aortic Stenosis



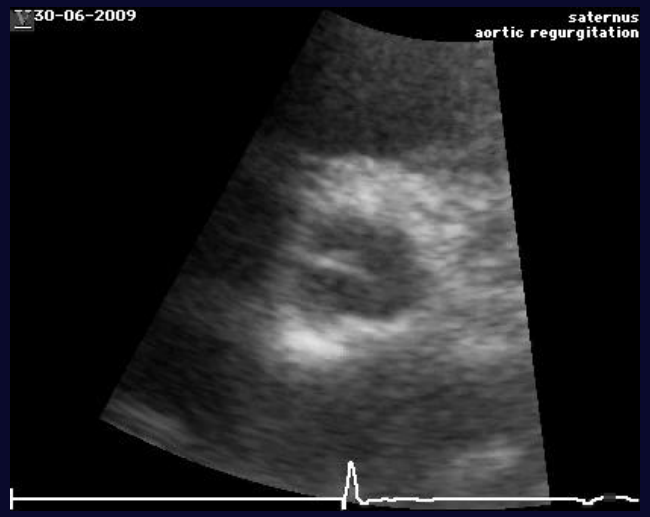
Bicuspid Aortic Stenosis

Aortic stenosis

Congenital Etiology



Monocusp aortic stenosis



Quadricusp aortic stenosis

Aortic stenosis

Risk Stratification: Valve Calcifiation

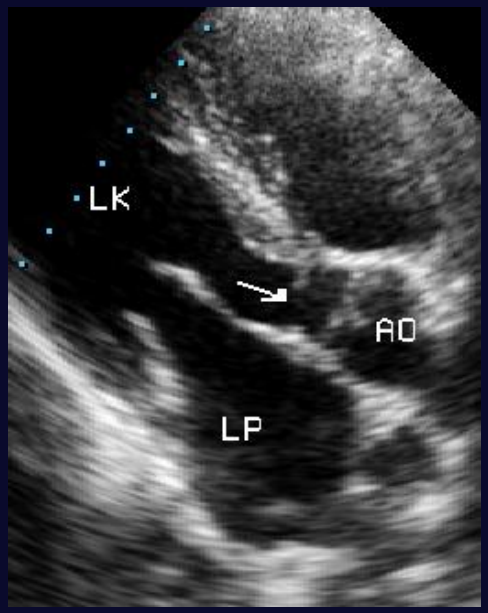
Mild calcification

Moderate calcification

Severe calcification

Aortic stenosis

Differential diagnosis



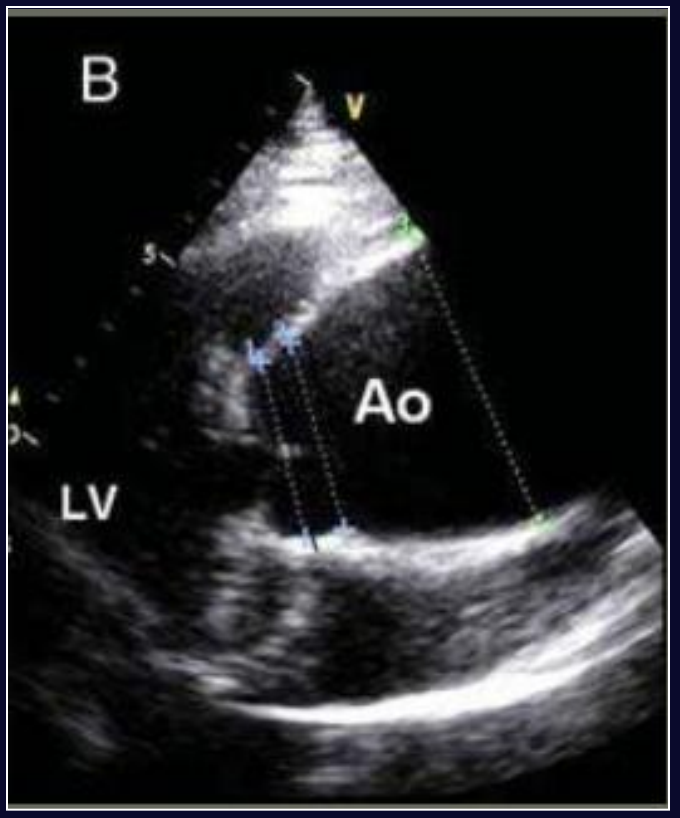
Subvalvular aortic stenosis

Supravalvular aortic stenosis

Hypetrophic Obstructive cardiomyopathy

Anuloartic ectasia and - ascending aorta aneurysm

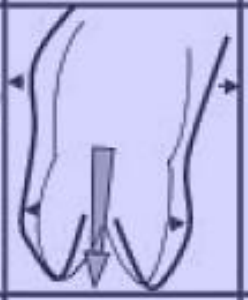
Annuloaortic ectasia
with pyriform morphology



Ascending aorta aneurysm located
in the upper part of the
sinotubular junction.

European Journal of Echocardiography (2010) 11, 645–658

Functional aortic regurgitation- summary

AI Class	Type I Normal cusp motion with aortic dilation			Type II Cusp Prolapse	Type III Cusp Restriction
	Ia	Ib	Ic	Id	
Mechanism					 
	STJ dilation	Sinus dilation	Annulus dilation	Cusp Perfor-ation	BAV	Rheumatic or BAV

Functional AR **Leaflet Disease**

Deetrminants of functional aortic regurgitation

regurgitation with anatomically normal aortic valve and ascending aorta aneurysm by TEE

- Annulus, Valsalva sinuses, sinotubular junction, and tubular tract dimensions
- Coaptation leaflet height: maximum distance between protodiastolic coaptation of the leaflet tips and the annulus plane.
- Diastolic tenting of the leaflets 8–10 mm
- Sinotubular junction/annulus ratio .1.6

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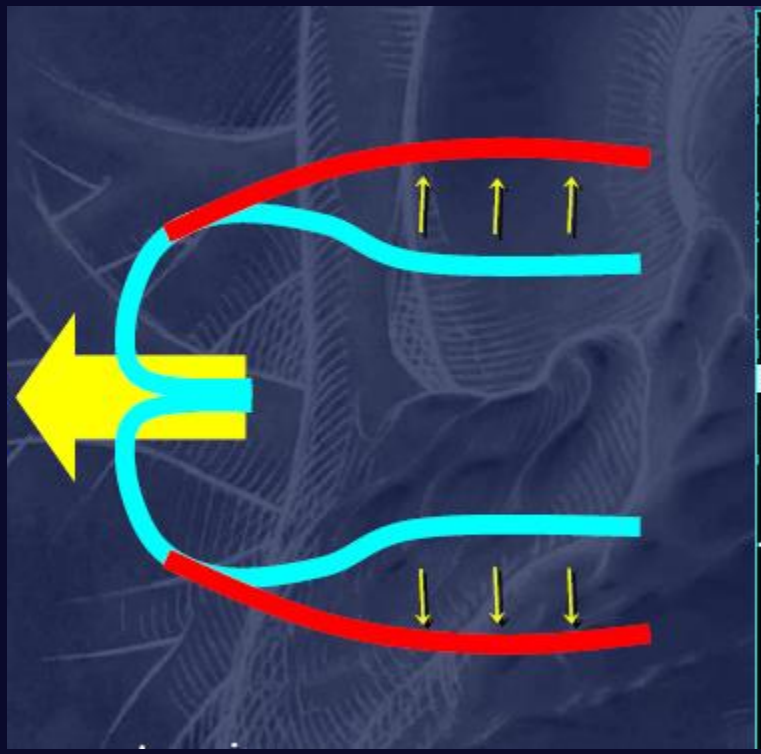
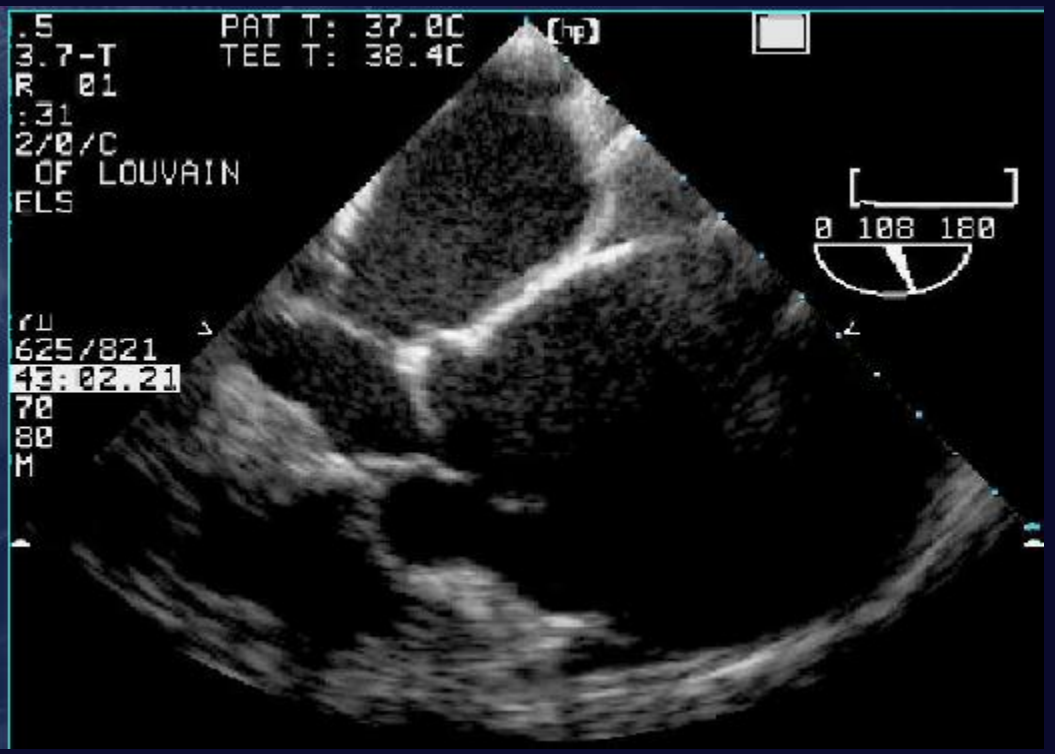
Aortic valve repairability



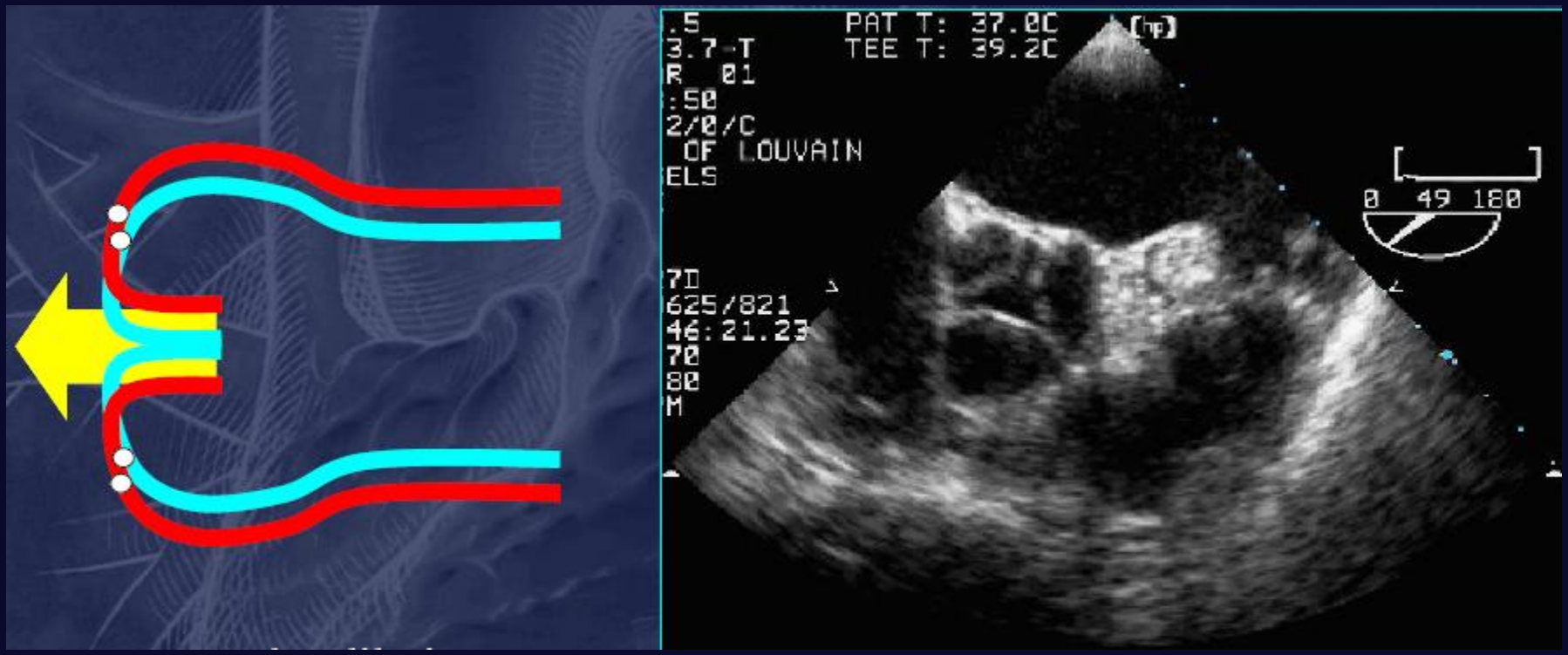


TYP I b

Aortic root and valsalva sinuss aneurysm

Adapted from G.Elkhoury-Euroecho 2010

Aortic valve repairability

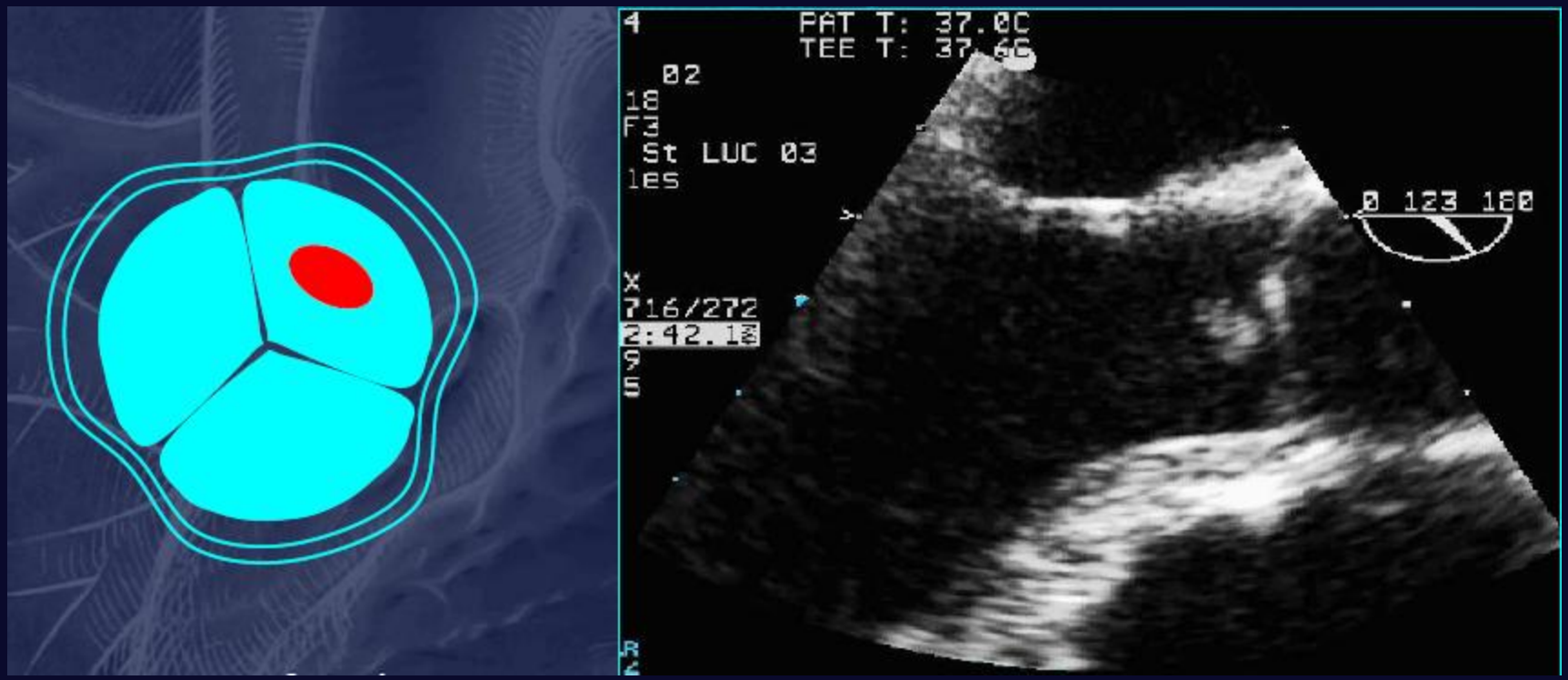


TYP I c

Annular dilatation

Adapted from G.Elkhoury-Euroecho 2010

Aortic valve repairability



TYP I d

Cusp perforation-Endocarditis

Adapted from G.Elkhoury-Euroecho 2010

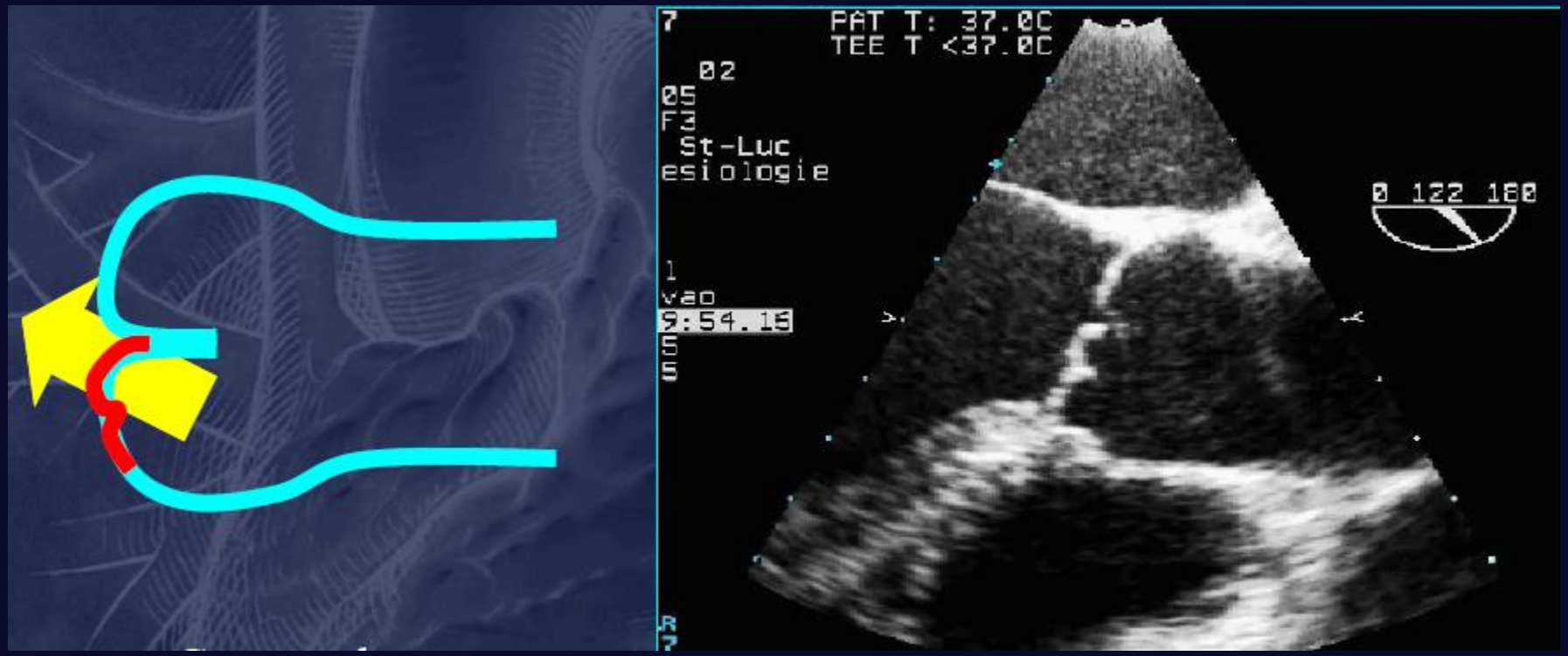
Aortic valve repairability

TYP II

Flailed aortic cusp –whole cusp prolaps

Adapted from G.Elkhoury-Euroecho 2010

Aortic valve repairability



TYP II

Partial cusp prolaps

Adapted from G.Elkhoury-Euroecho 2010

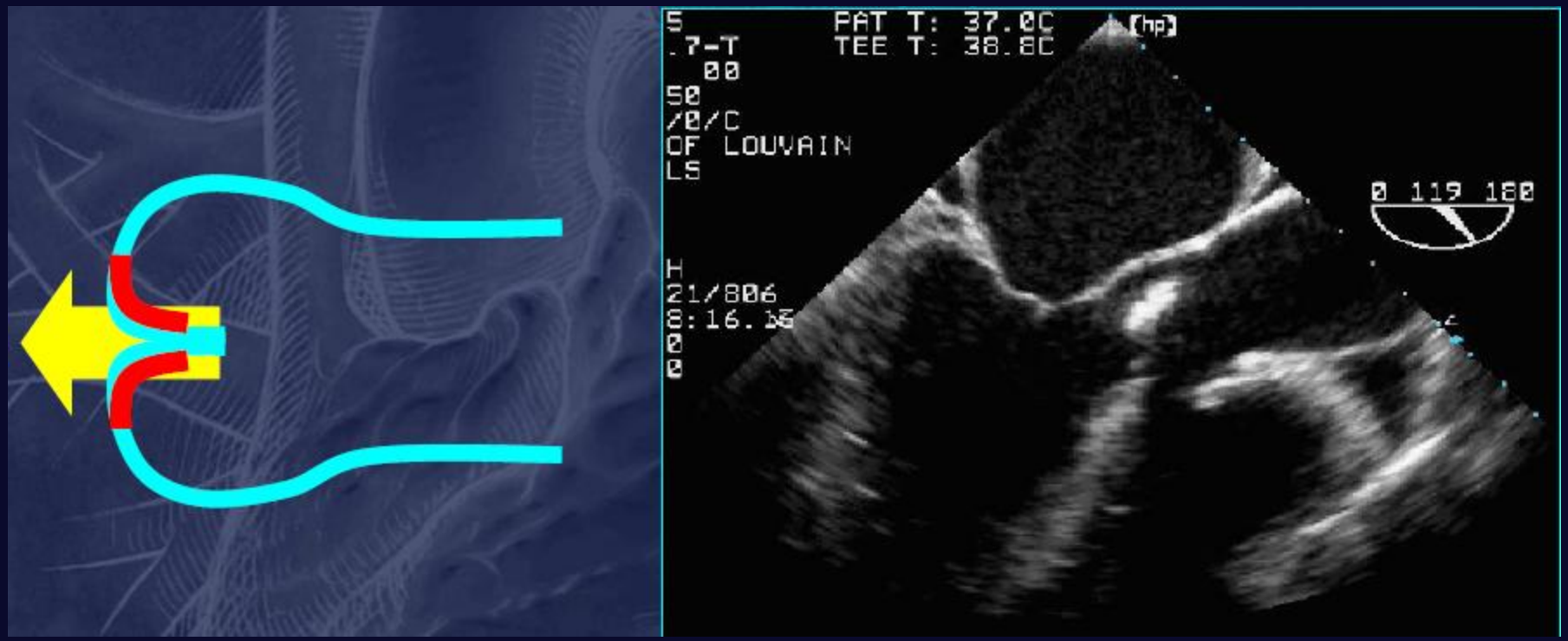
Aortic valve repairability

TYP II

whole cusp prolaps

Adapted from G.Elkhoury-Euroecho 2010

Aortic valve repairability

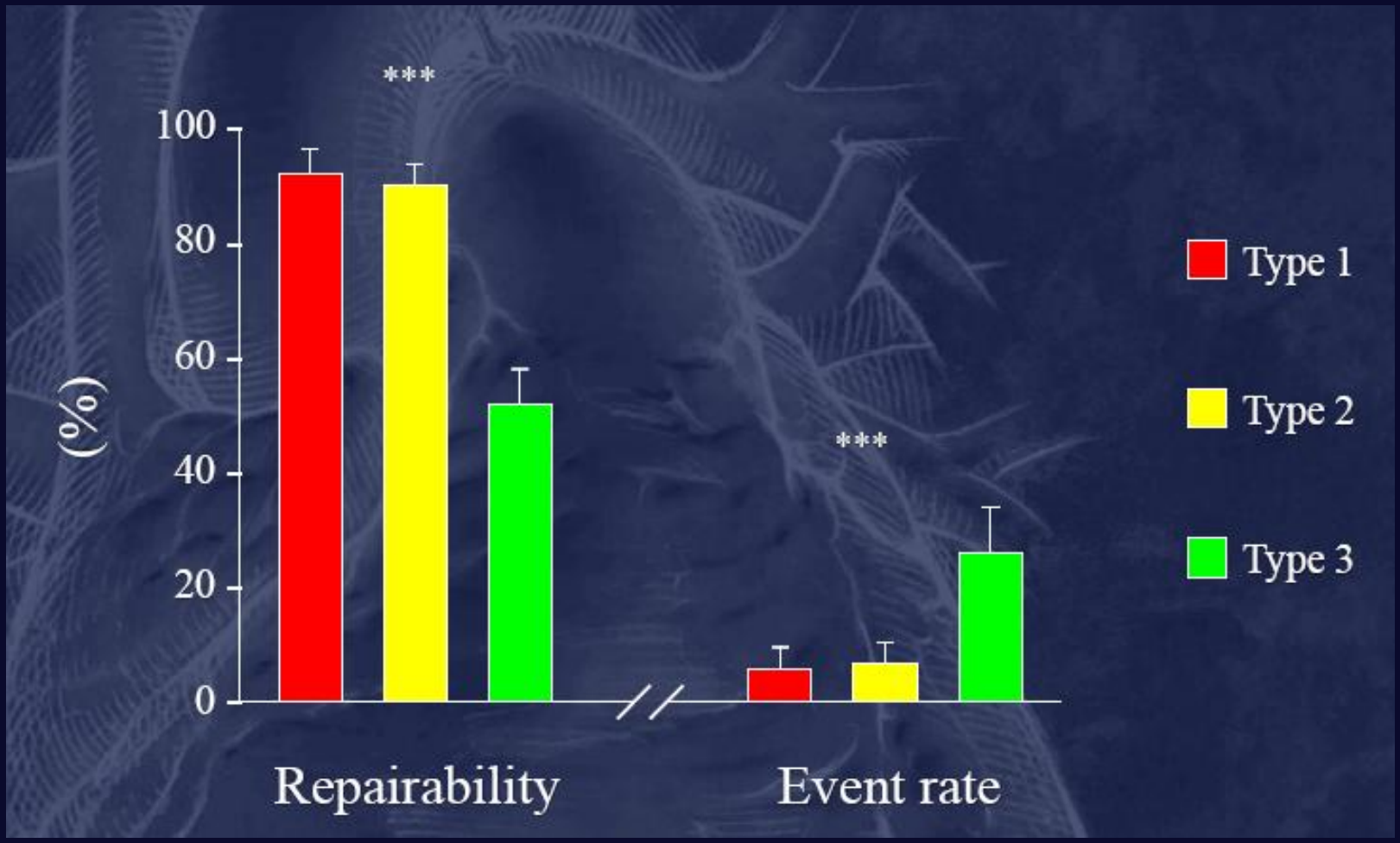


TYP III

Cusps restriction

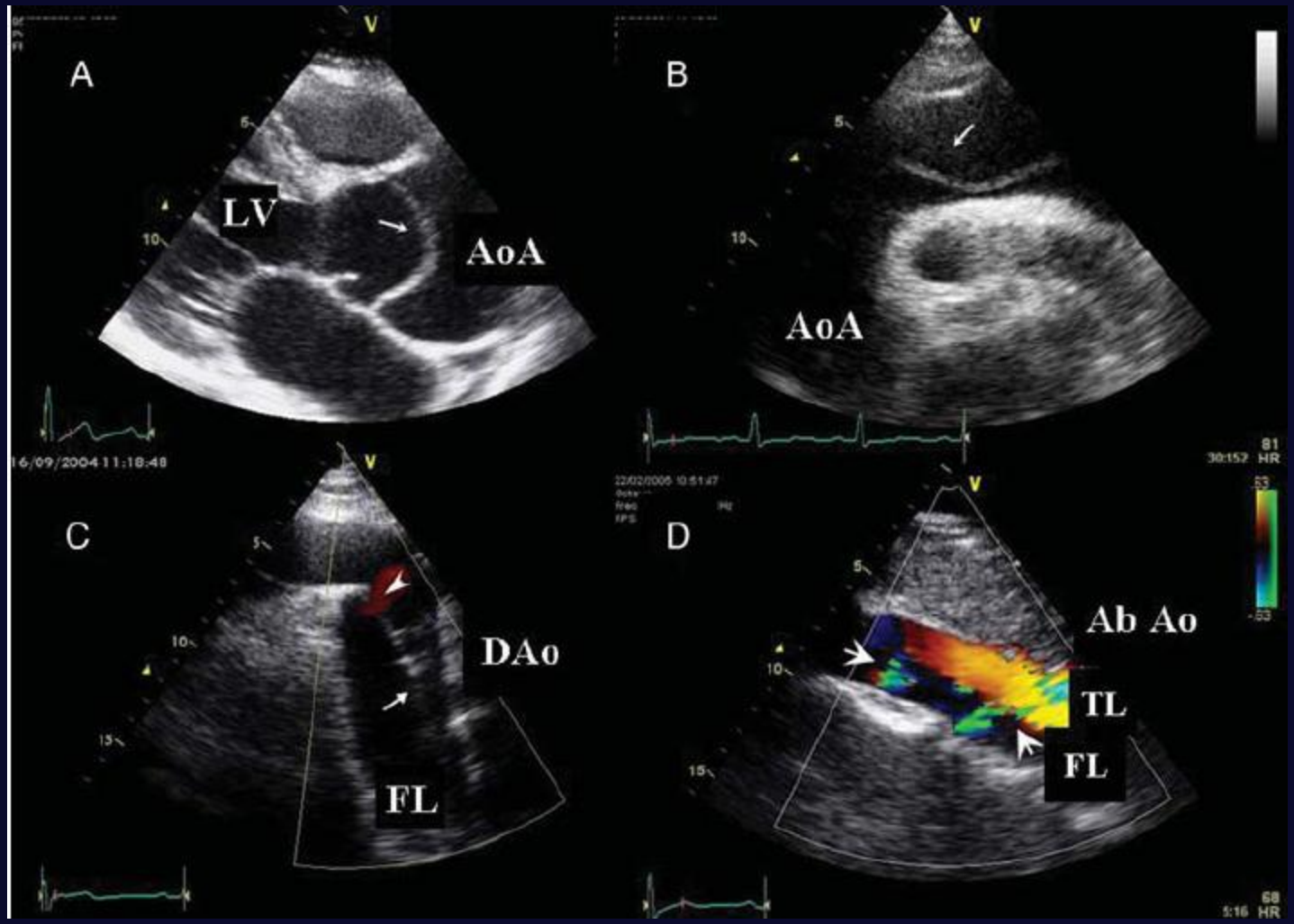
Adapted from G.Elkhoury-Euroecho 2010

Prediction of AV repairability



La Polaine de Waroux , Circulation 2007;116;I-264

Acute aortic dissection by TTE



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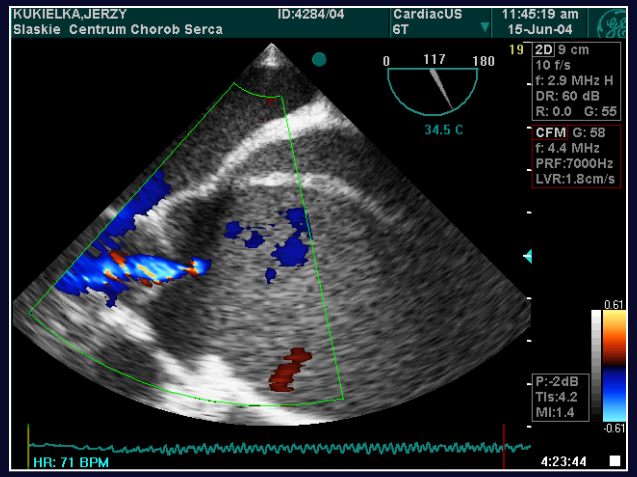
TEE-Additional information

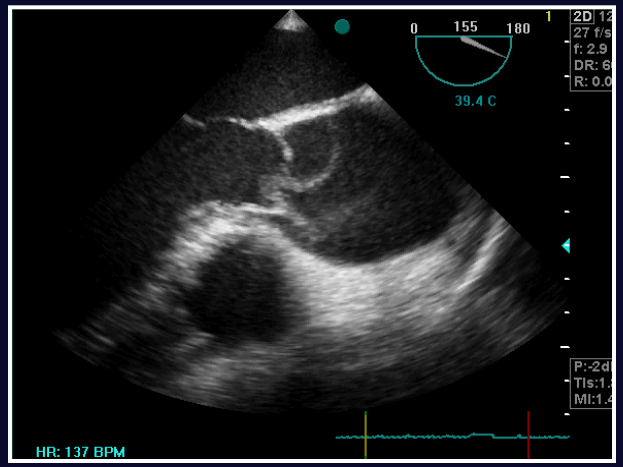
Entry tear location and size

TEE-Additional information

Quantification and Mechanisms of AR

Dilataton of the aortic annulus secondary to dilatation of the ascending aorta
Rupture of the annular support and tear in the implantation of one of the valvular leaflets
Assymetrical dissections, the heamatoma itself may displace a sigmoid below coaptation
Prolapse of the intima in the LV outflow tract through the valvular orrifice
Previous aortic valve disease





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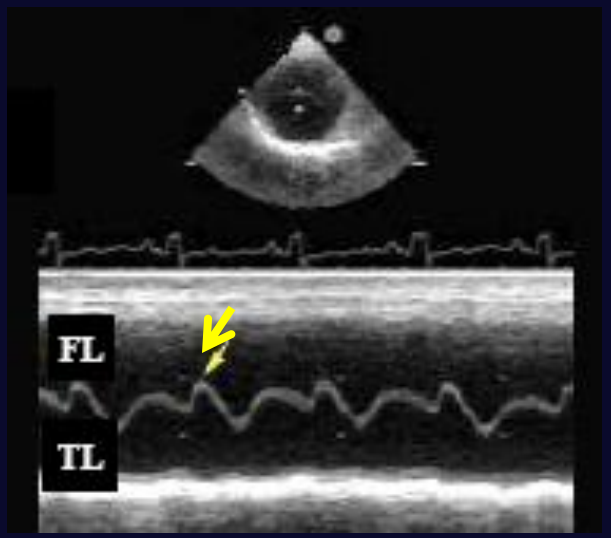
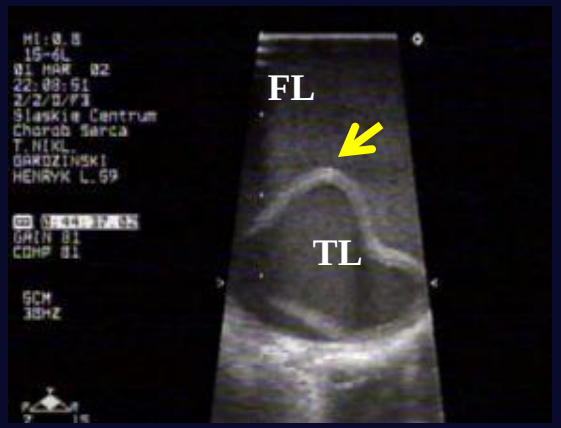
TEE -Additional information

True lumen identification

	True lumen	False lumen
Size	True<false	Most often: false>true lumen
Pulsation	Systolic expansion	Systolic compression
Flow direction	Systolic antegrade	Systolic antegrade flow reduced or absent or retrograde flow
Communication flow	From true to false lumen	
Contrast echo flow	Early and fast	Delayed and slow





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„Atypical” Aortic Dissection (Intramural Haematoma)

Typical=Dissection flap and false lumen
„Artypical”=No dissection flap: Medial haematoma

Aortic hematoma

Crescentic intramural haematoma in ascending aorta adjacent to the left main coronary ostium

Intramural haematoma in descending aorta

Penetrating aortic ulcer deforming the adventitia

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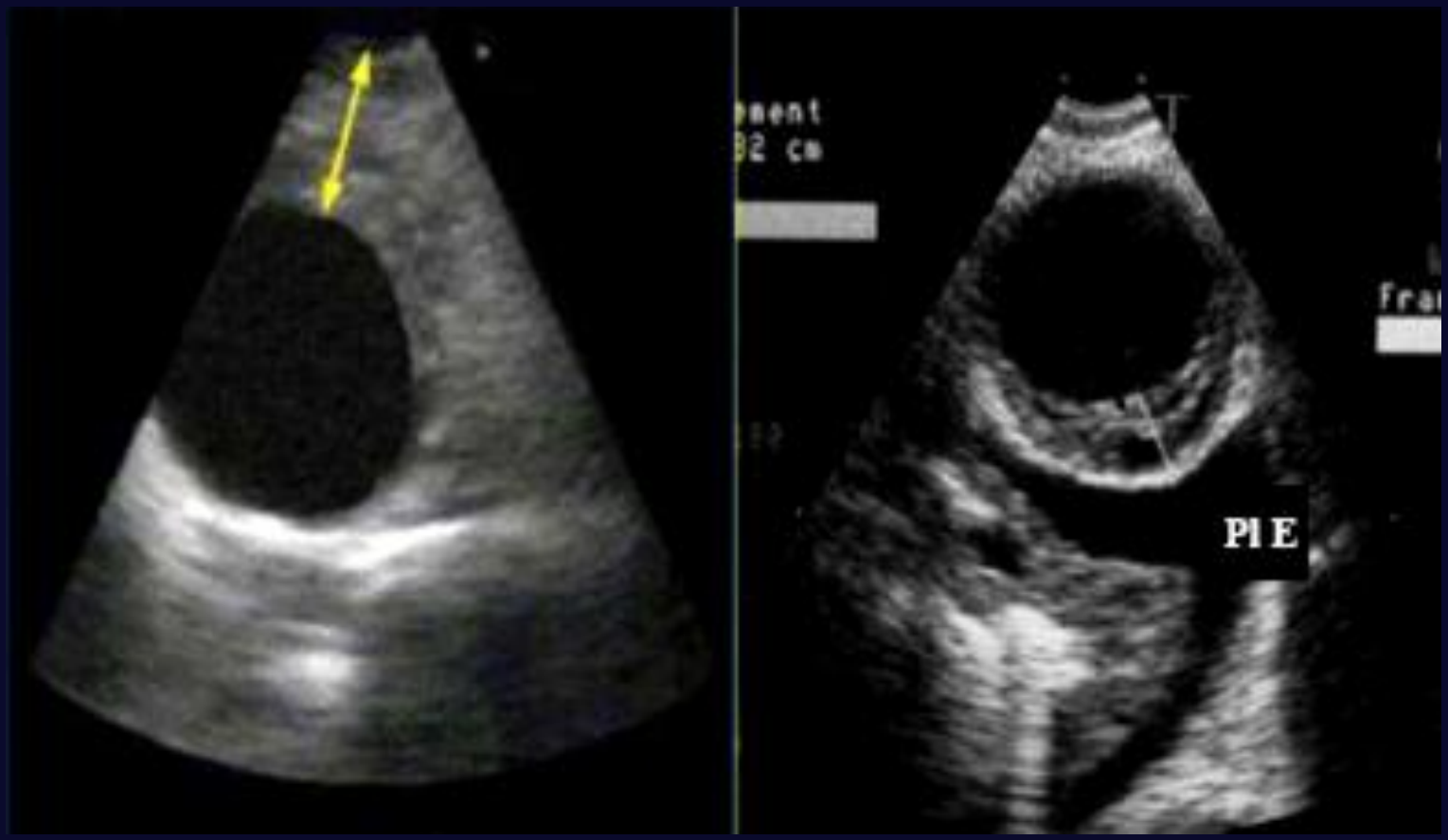
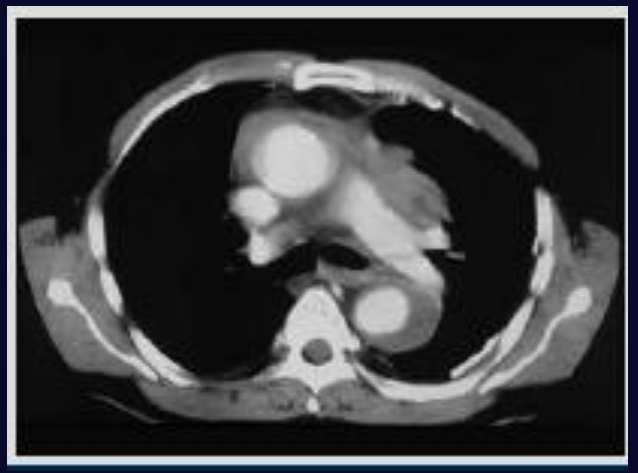
Periaortic haematoma-thoracic aorta



Periaortic hematoma- thoracic aorta

CMR

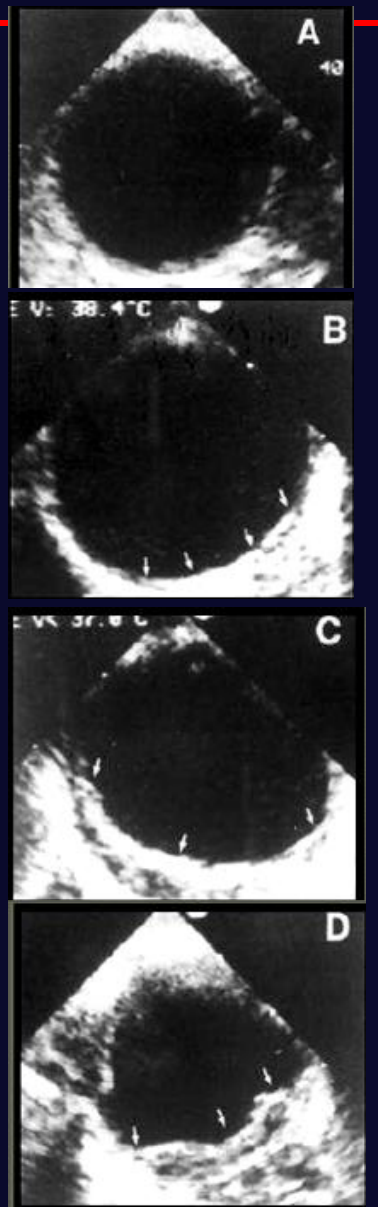


CT

TEE

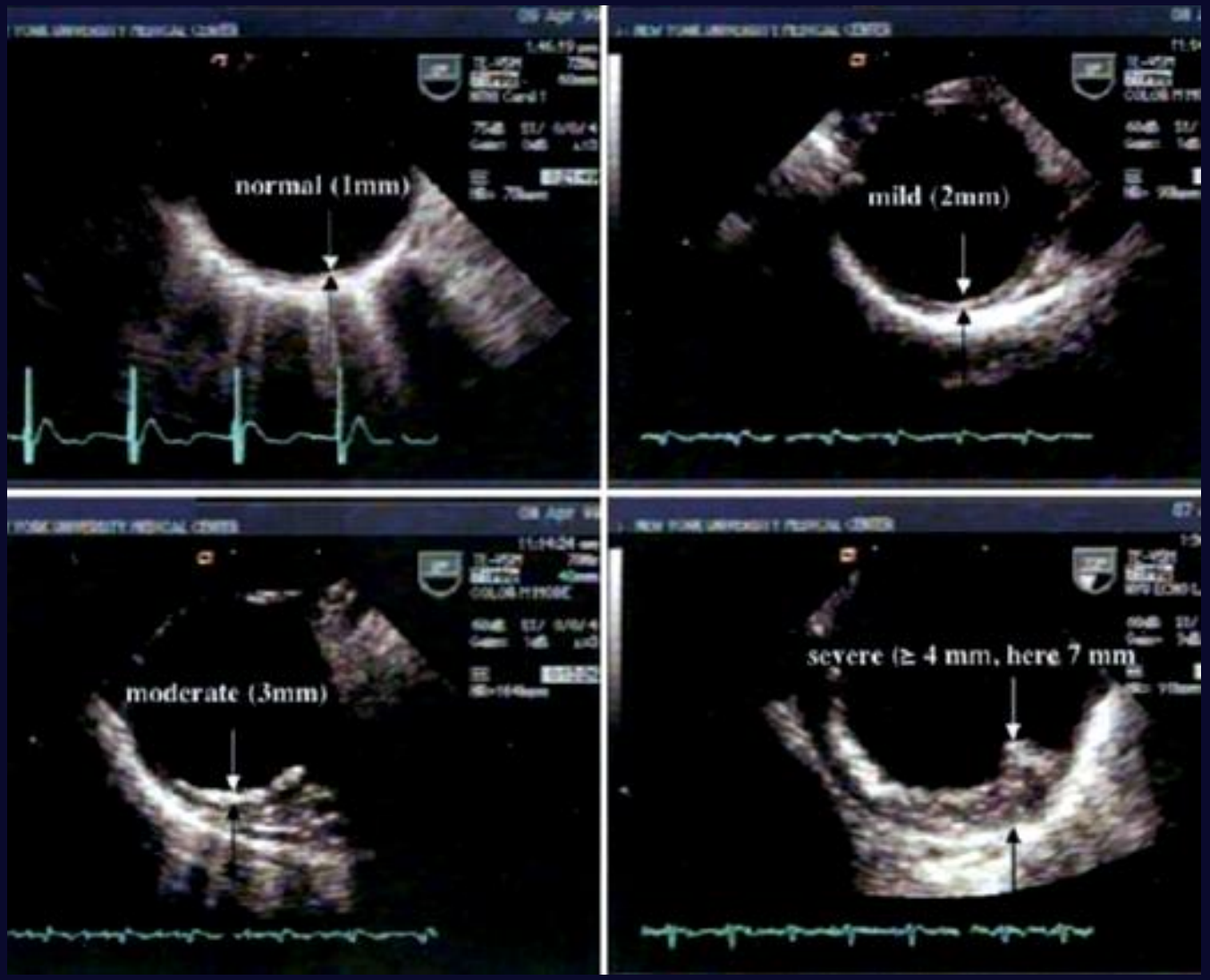
Grading aortic atherosclerosis

- Grade I: Normal intima or mild irregularities
- Grade II: Plaques< 3mm
- Grade III: Plaques >3 mm
- Grade IV: Protruding plaque



Koury Z, et al. Am J Cardiol1997;79:23-27

Thoracic aorta atheromatosis



Summary

Two-dimensional echocardiograohy using TTE, TEE and epicardial approach is the „first line” diagnostic tool to study morphological and functional changes of aortic valve and aorta disease