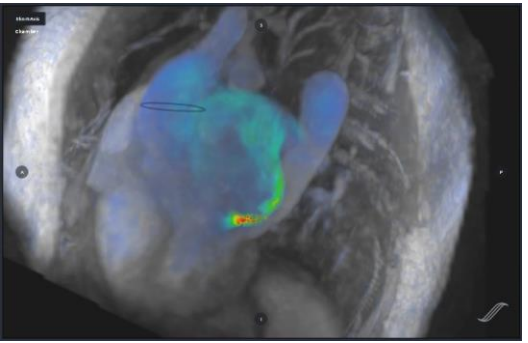
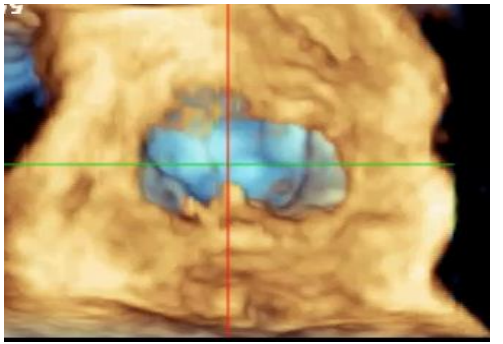
EUROVALVE
& STRUCTURAL CARDIOMYOPATHIES
NH PALERMO

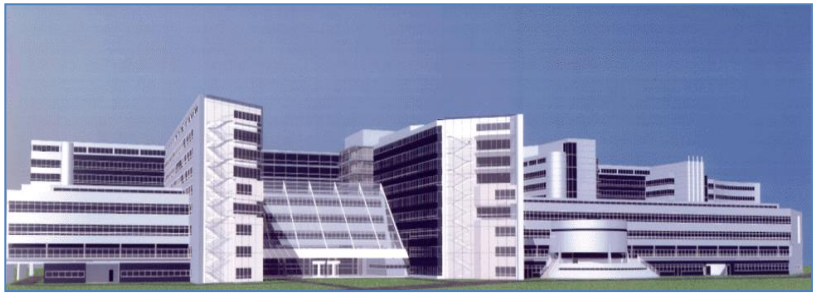
OCTOBER
24&25 2024



Anatomy and Morphology in AR



A.Berrebi, M.D.



HEGP – University of Paris Cité

Institut Mutualiste Montsouris, Paris

No Disclosure

Anatomy and Morphology in AR

- Aortic Root Anatomy and Dynamics

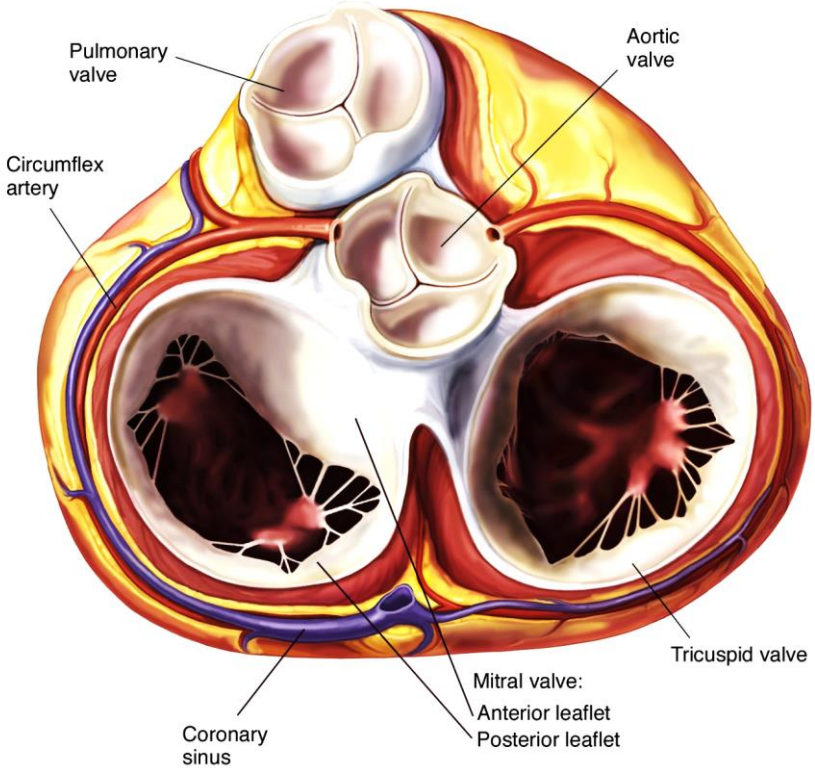
- Functional anatomy and Surgeon’s needs

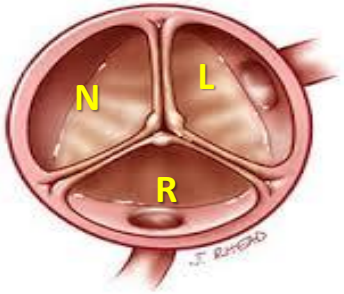
Anatomy and Morphology in AR

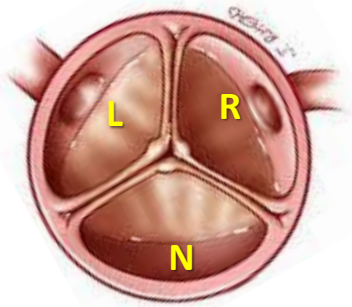
- **Aortic Root Anatomy and Dynamics**

- **Functional anatomy and Surgeon's needs**

Aortic Valve in the Center of the Heart

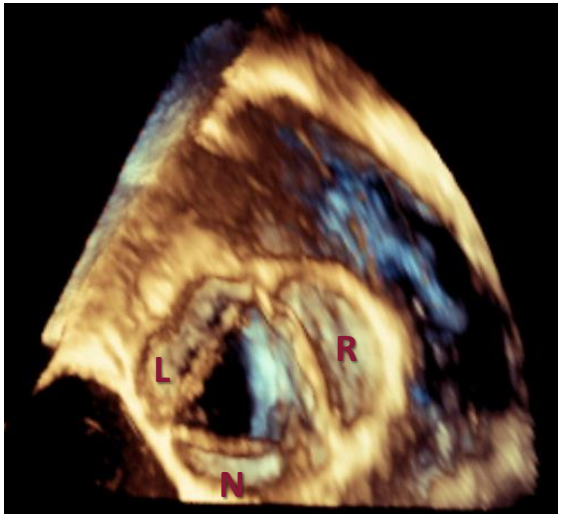


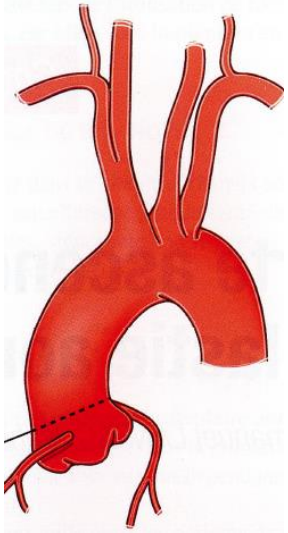




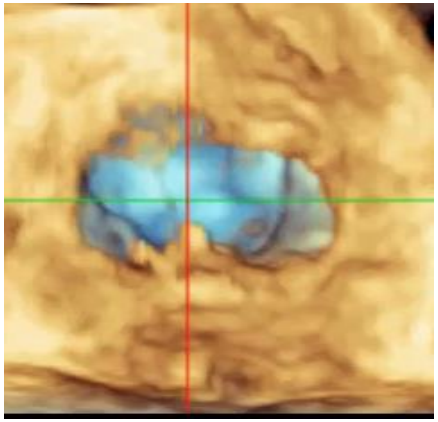
Echo view

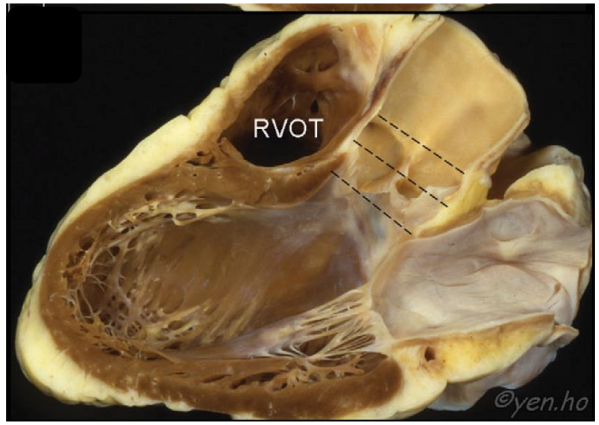
Surgical view



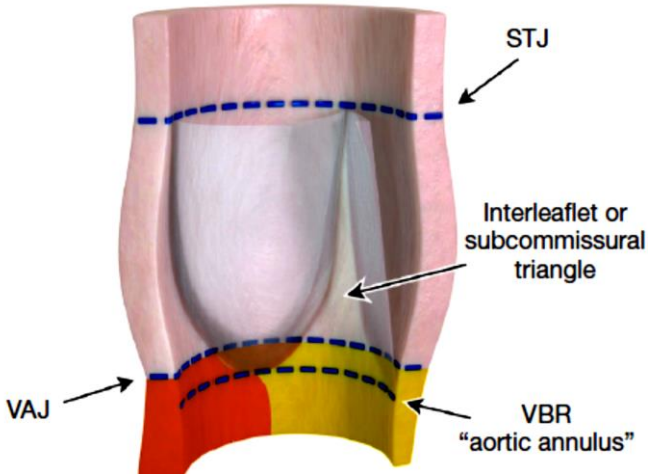


Aortic Root and Aortic Valve





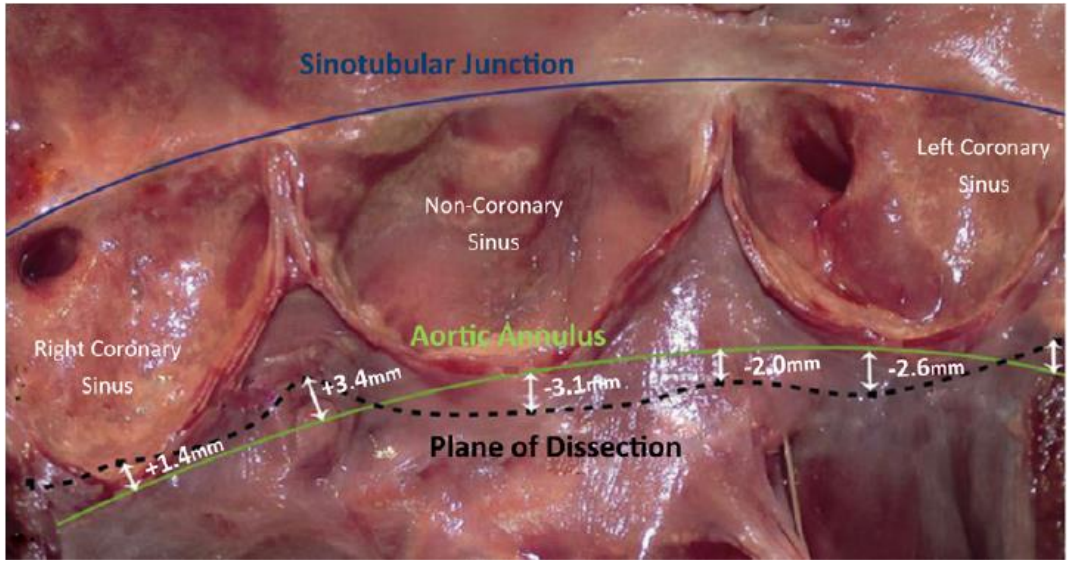
- STJ
- Sinus
- VAJ
- VBR « aortic annulus »

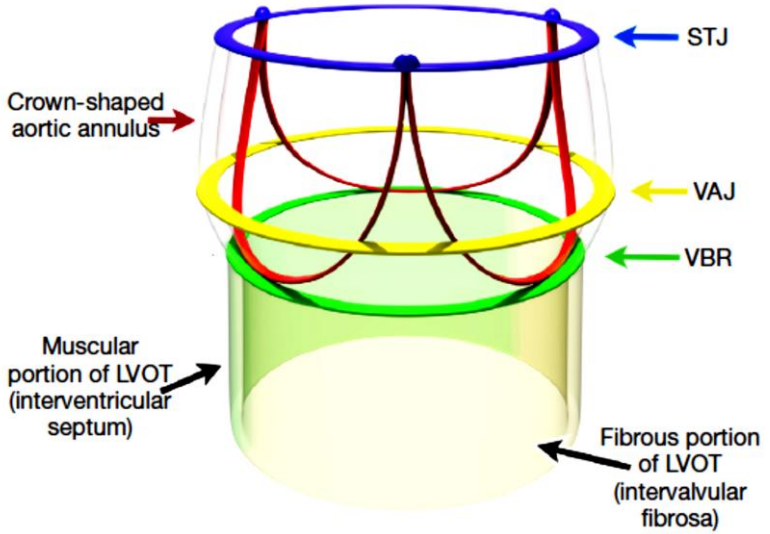


Aortic Root Functional Unit

Aortic root opened with cusps removed

« Crown like » shape

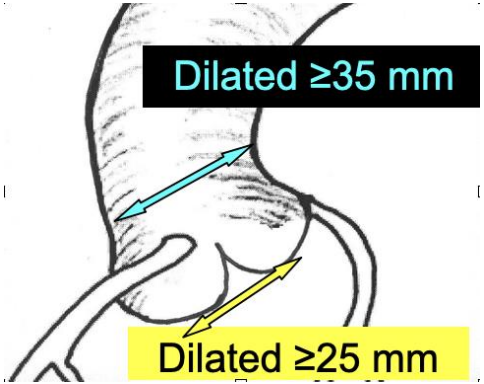


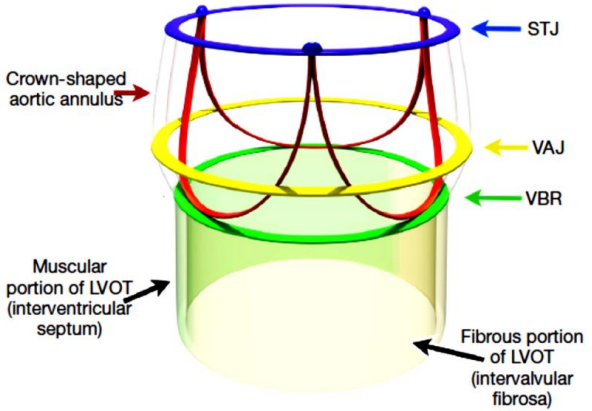


Khelil N, Lansac E 2015

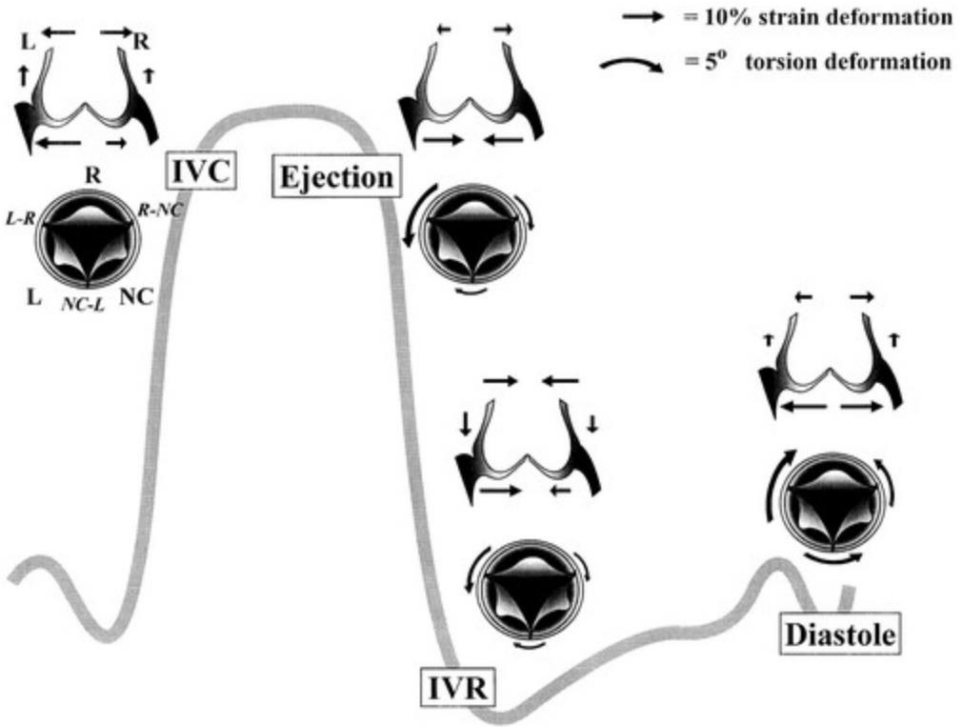
STJ/annulus: 1.2

	Roman 1987	Kim 1996	Nistri 1999	Varnous 2003	Maselli 2005	Babaee 2007	Tamas 2007	Soncini 2009	Bierbach 2010	Zhu 2011
N	1132									
Annular Ø	22.3±1,4 (20.5-32.4)									
STJ Ø	26.7±2.2 (31.2-23.4)									
STJ/ annulus	1.2±0.1 (1.1-1.3)									





Aortic Root Dynamics: systolic expansion

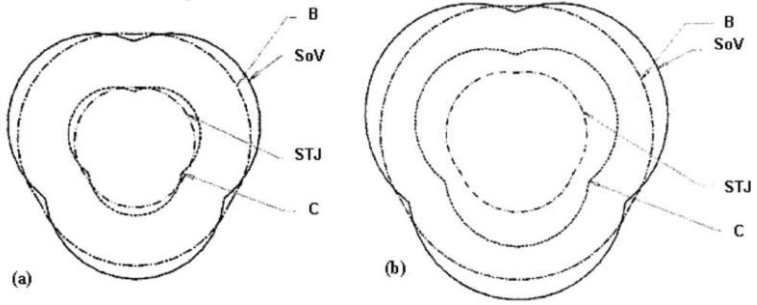


Deformational Dynamics of the Aortic Root

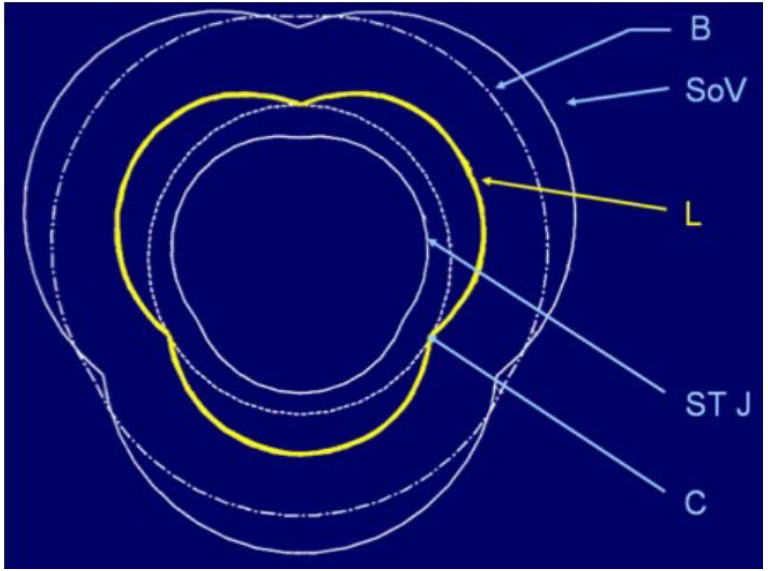
Modes and Physiologic Determinants

Paul Dagum, G. Randall Green, Francisco J. Nistal, George T. Daughters,

Clover shaped orifice of the aortic valve



E. Lansac et al. / European Journal of Cardio-thoracic Surgery 22 (2002) 497–503

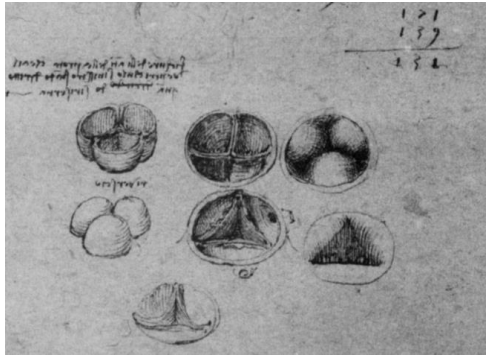


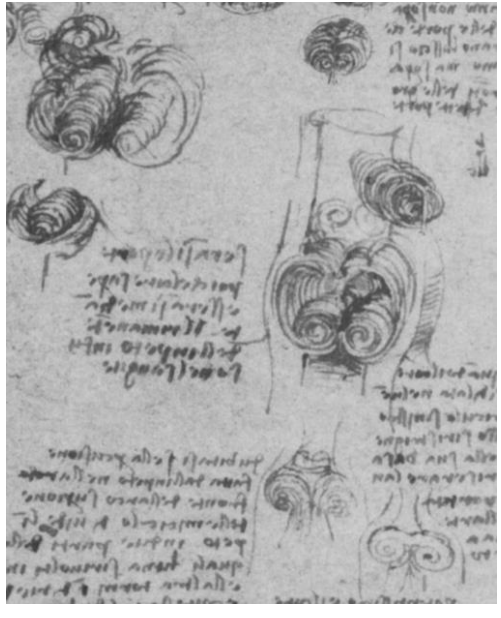
Ann Cardiothorac Surg 2019;8(3):351-361

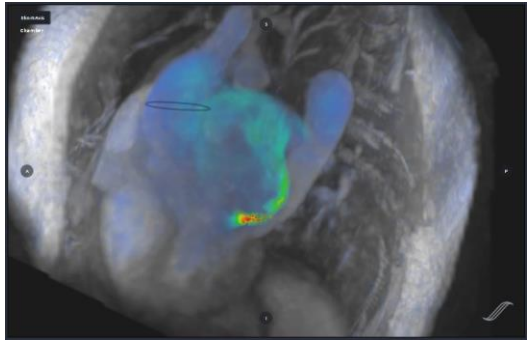
DA VINCI 1543

Leonardo da Vinci and the Sinuses of Valsalva

Francis Robicsek, MD







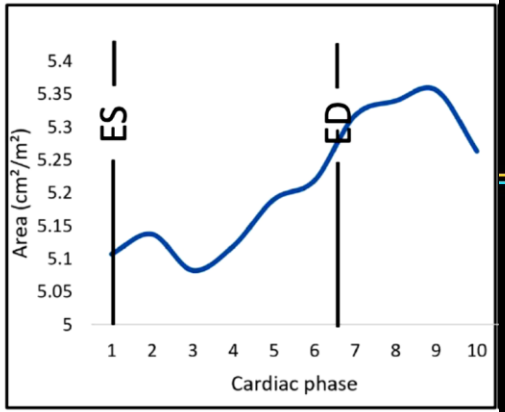
Morphological and dynamic analysis of the normal aortic valve with 4D computed tomography

Amine Fikani [a,*], Damian Craiem [b], Elie Mousseaux [c], Gilles Soulat [c], Aymeric Rouchaud[d], Cyrille Boulogne[e], Elie Martins[e] and Jerome Jouan[a]

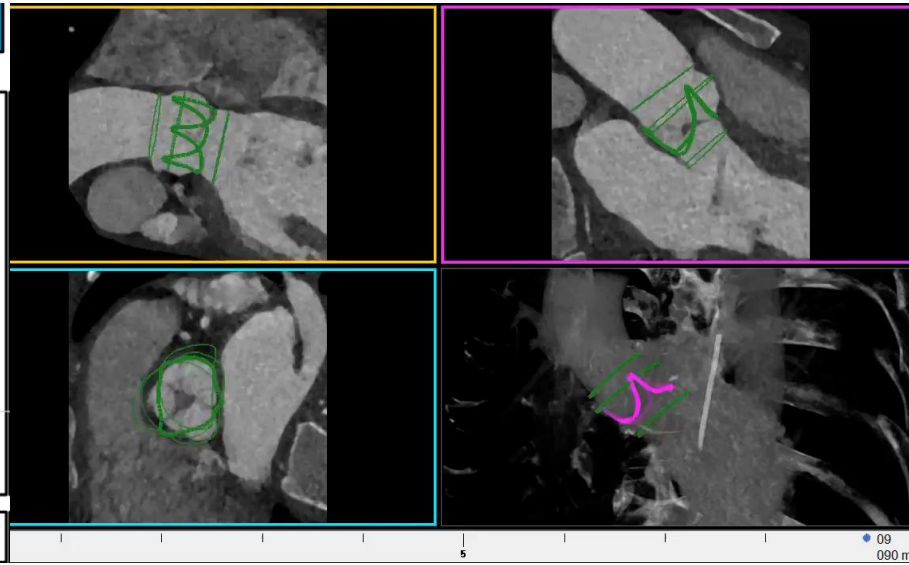
4D analysis of the normal aortic valve

Summary

- Using ECG-gated multiphase computed tomography and dedicated software developments, we retrospectively analyzed 30 patients with a normal functioning aortic valve.
- We demonstrated specific features in dynamics and morphometrics of the aortic root and annulus.
- Virtual basal ring analysis significantly underestimates the dimensions of the true aortic annulus.

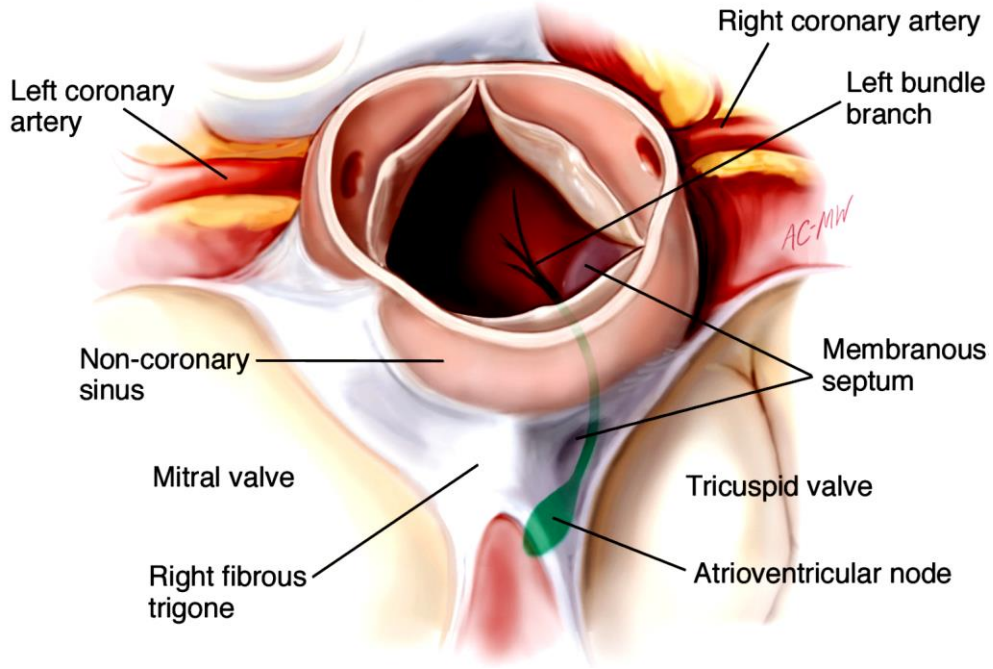


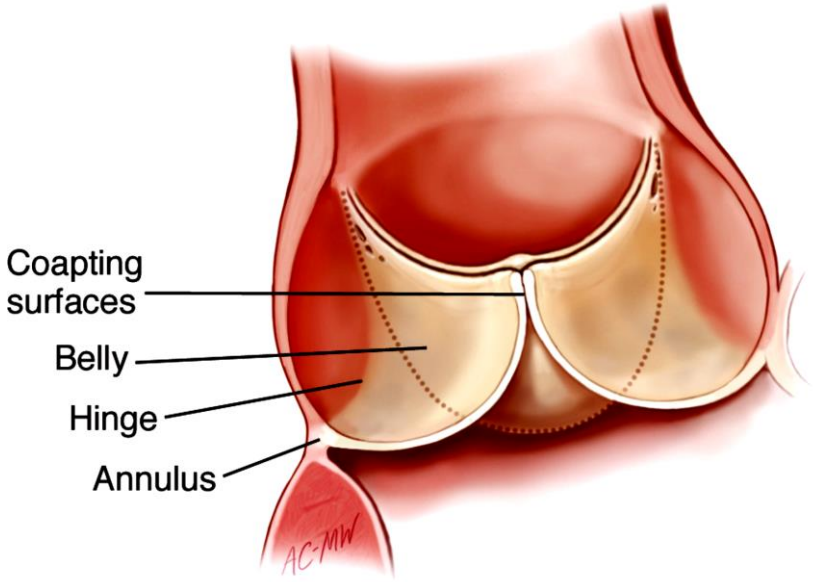
Legend: Indexed aortic annulus area change during the cardiac cycle (ES: end-systole, ED: end-diastole)

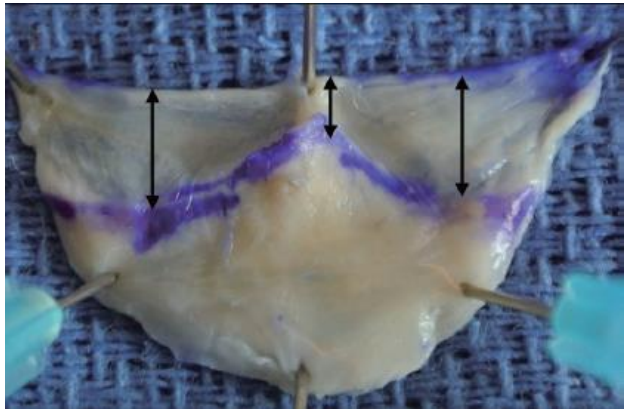


Eur J Cardiothorac Surg 2024; doi:10.1093/ejcts/ezae113.

Aortic Valve Leaflets or « cusps







Anatomy and Morphology in AR

- Aortic Root Anatomy and Dynamics

- **Functional anatomy and Surgeon's needs**

Keynote Lecture Series

Systematic echocardiographic assessment of aortic regurgitation—what should the surgeon know for aortic valve repair?

Alain Berrebi, Jean-Luc Monin, Emmanuel Lansac

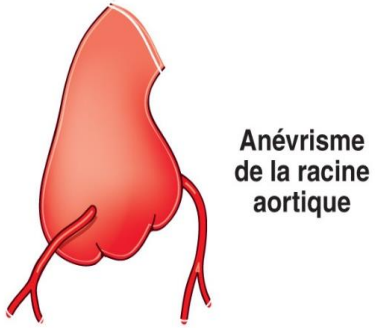
Department of Cardiac Pathology, Institut Mutualiste Montsouris, Paris, France

Correspondence to: Alain Berrebi. Department of Cardiac Pathology, Institut Mutualiste Montsouris, 42 Boulevard Jourdan, 75014 Paris, France. Email: alain.berrebi@imm.fr.

Aortic valve (AV) repair is the preferred surgical treatment in young patients with aortic regurgitation (AR) and/or proximal aorta aneurysm, as noted in the recent European Society of Cardiology (ESC) guidelines. However, this surgical option is still underused in clinical practice. This emphasizes the need to build a heart team dedicated to AV repair with expert surgeons and echocardiographists. Surgical techniques are now standardized in their approaches to enhance the reproducibility and expansion of AV repair. The objective of this keynote is to also demonstrate the need for a standardized pre-pump intra-operative echocardiography protocol to fulfill surgeon's needs in providing a road map and predicting techniques to be used for an effective and durable repair.

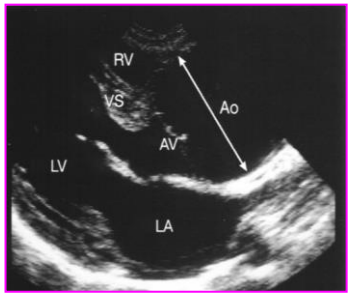
Ann Cardiothorac Surg 2019;8(3):331-341

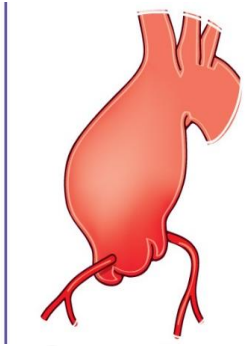
3 Phenotypes of the ascending aorta



Aortic root aneurysm

Valsalva ≥ 45 mm

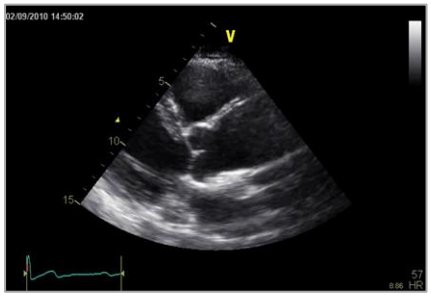


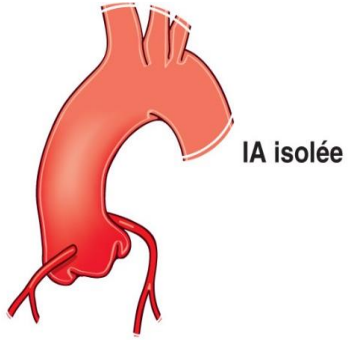


Supra-coronary aneurysm

Valsalva < 40 mm

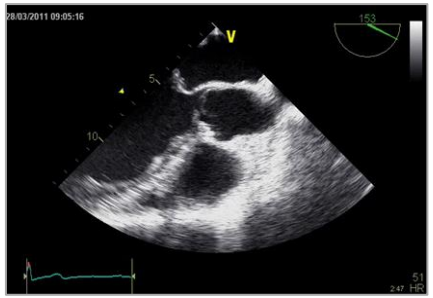
Supra coronary aorta > 45 mm



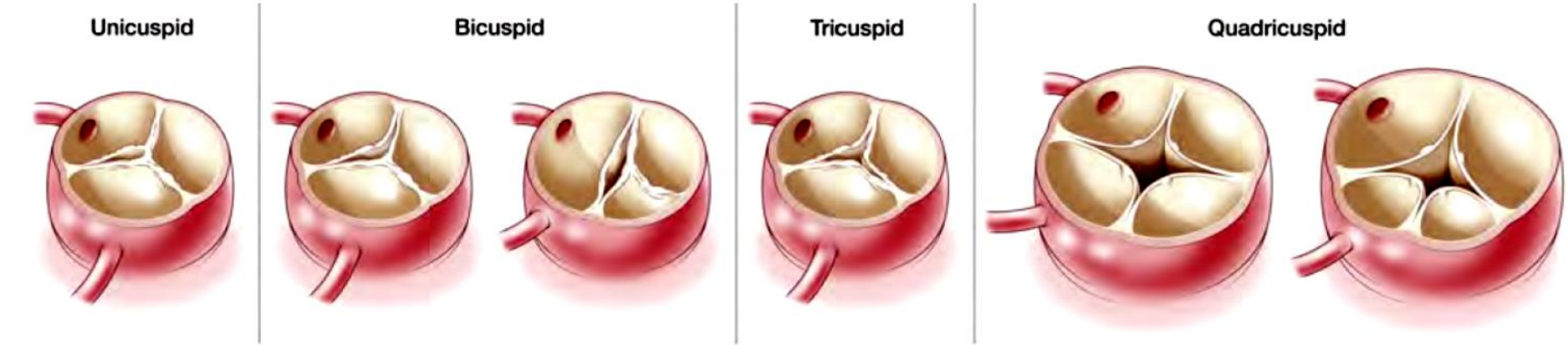


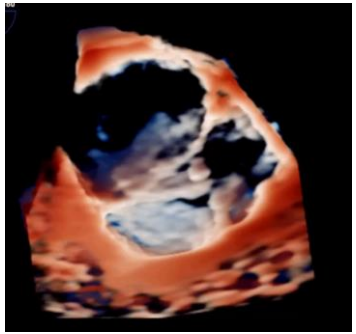
Isolated AR

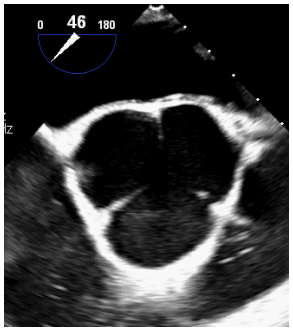
All Ø < 40 mm

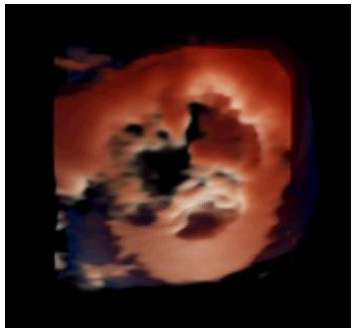


Etiology

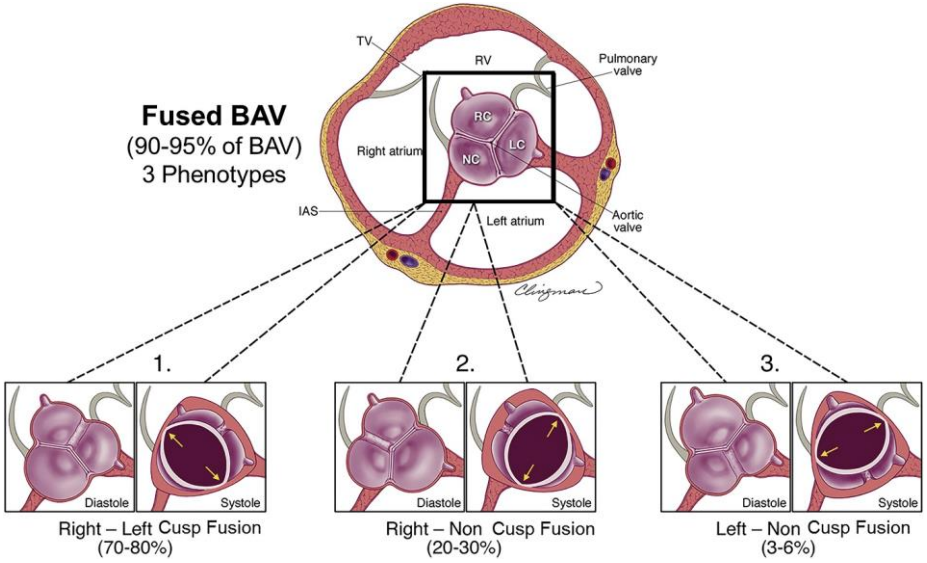






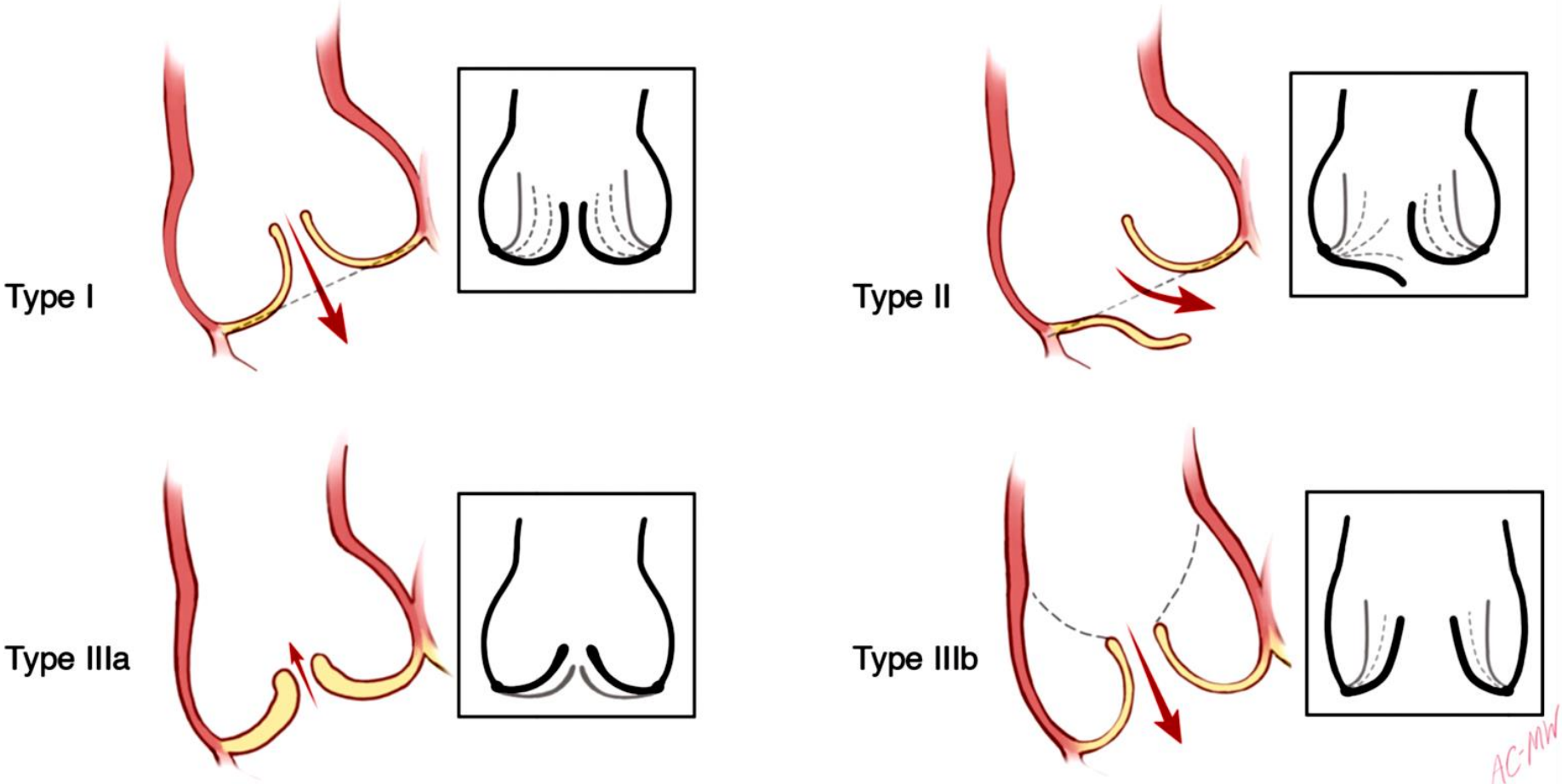


Bicuspid Fused type L/R: 3D TEE Surgical View



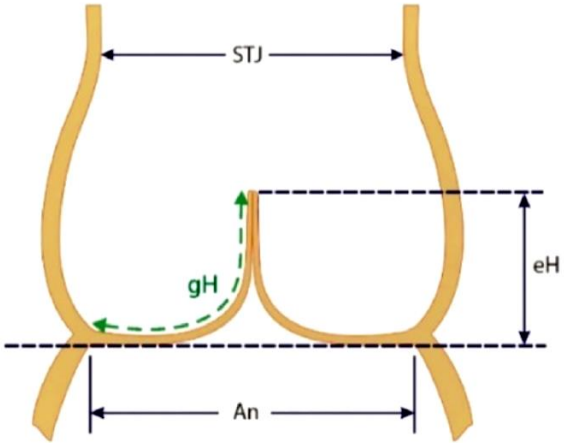
(J Thorac Cardiovasc Surg 2021;162:e383-414)

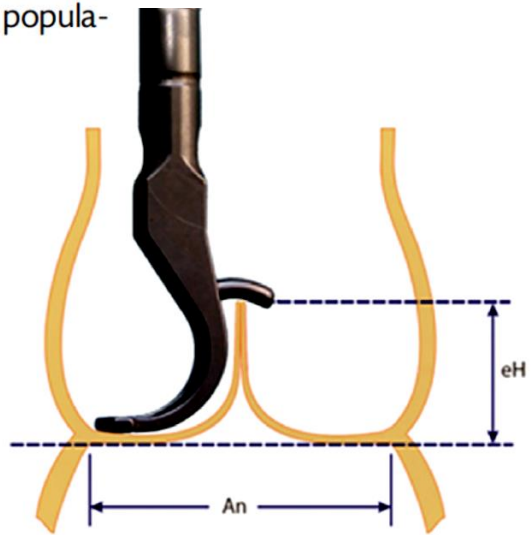
Dysfunction

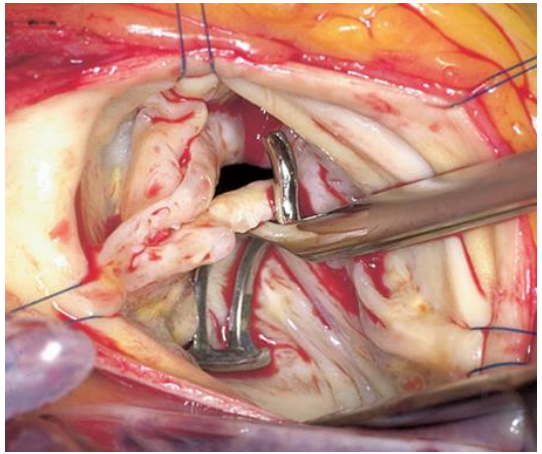


Dysfunction: Effective Height

The effective height (eH) is the orthogonal distance from the annulus to the middle of the free margin of the cusp. The eH can be measured by echocardiography and intraoperatively with a dedicated caliper. The normal eH in the adult population is close to 9 mm (8–10) [7].



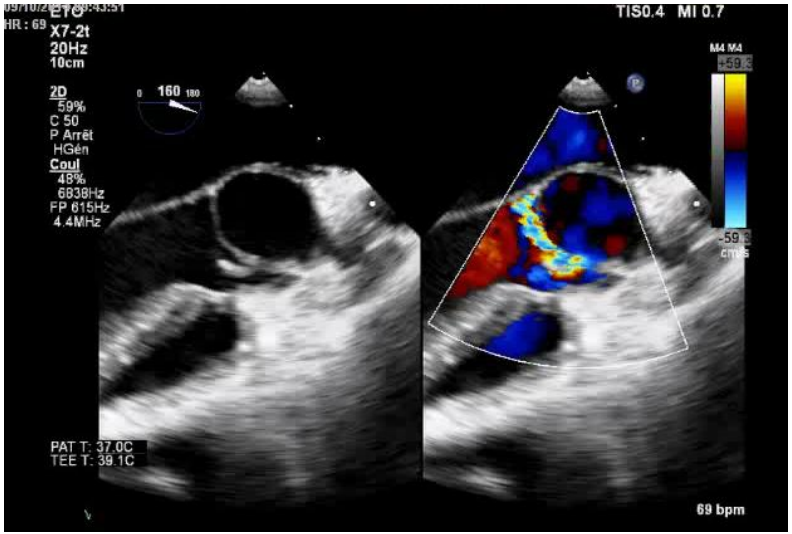




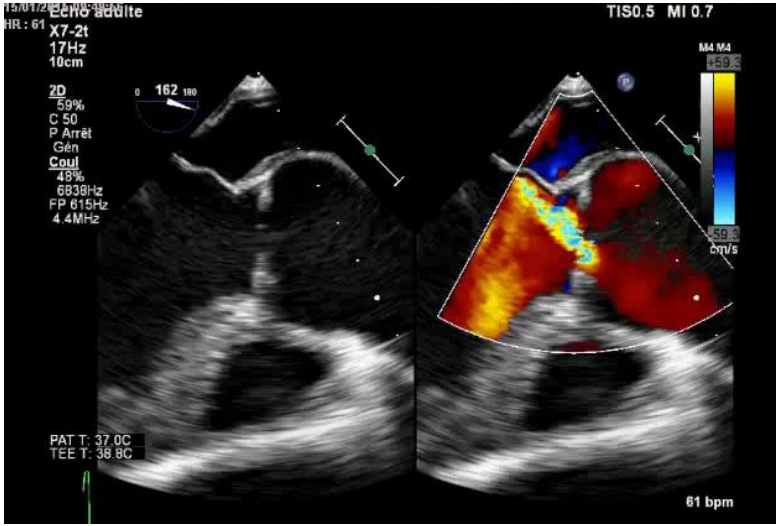
Bierbach et al. EJCS 38 (2010) 400-406

Cusp Prolapse: quantitative assessment with eH

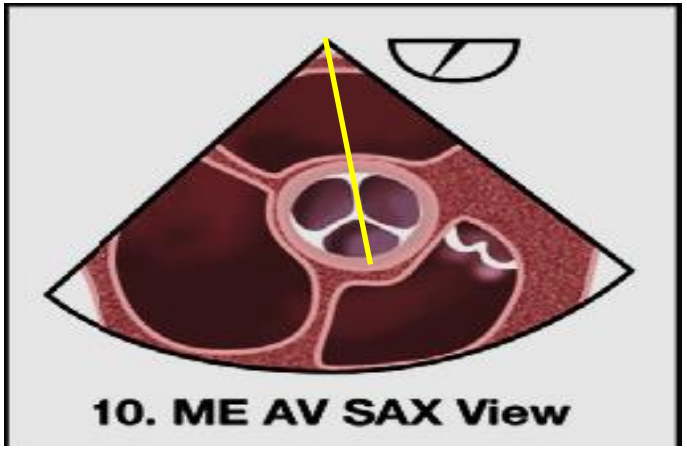
Complete (eH < 0)

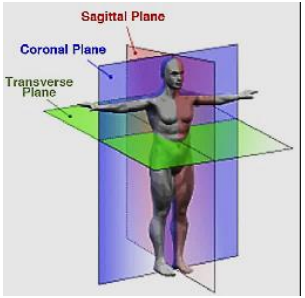


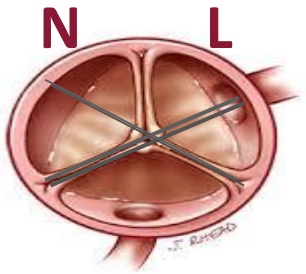
Incomplete (eH < 9 mm)



X Plane: only valid for eH of RCC



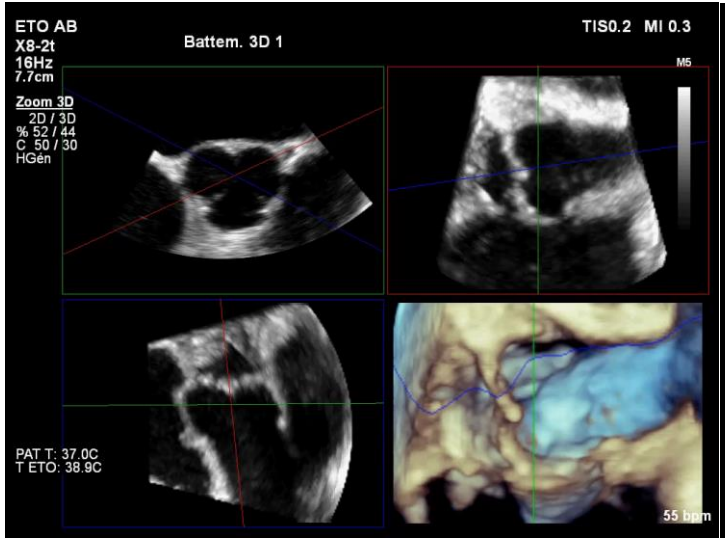


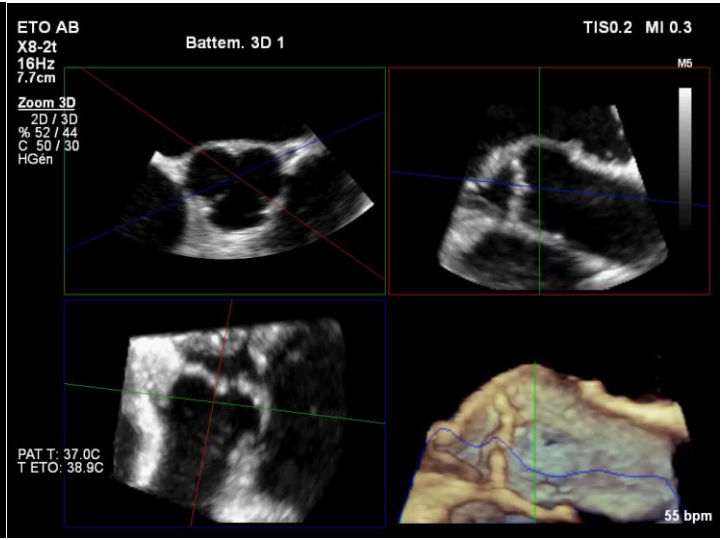


Multi Planar Reconstruction

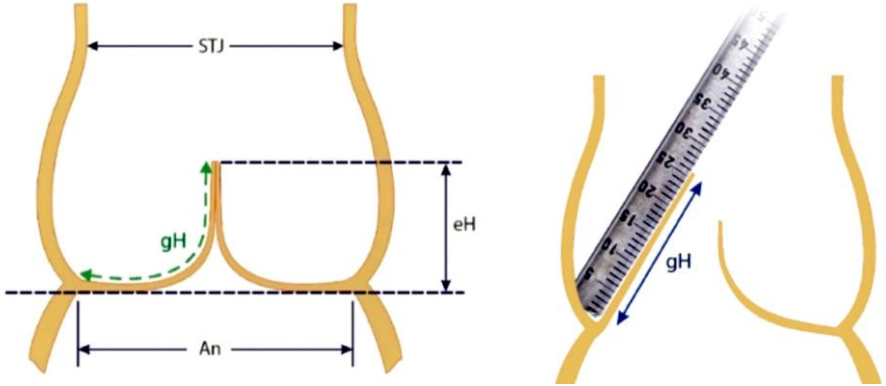
LCC

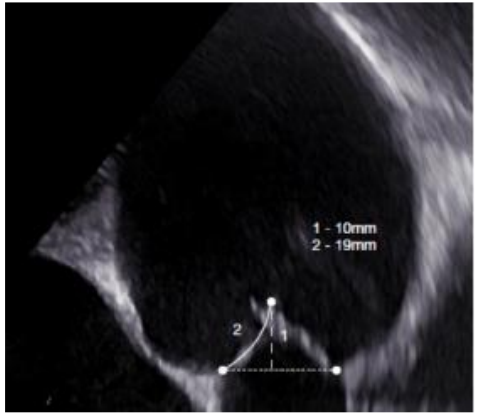
NCC





Lesion: Geometric Height (gH)

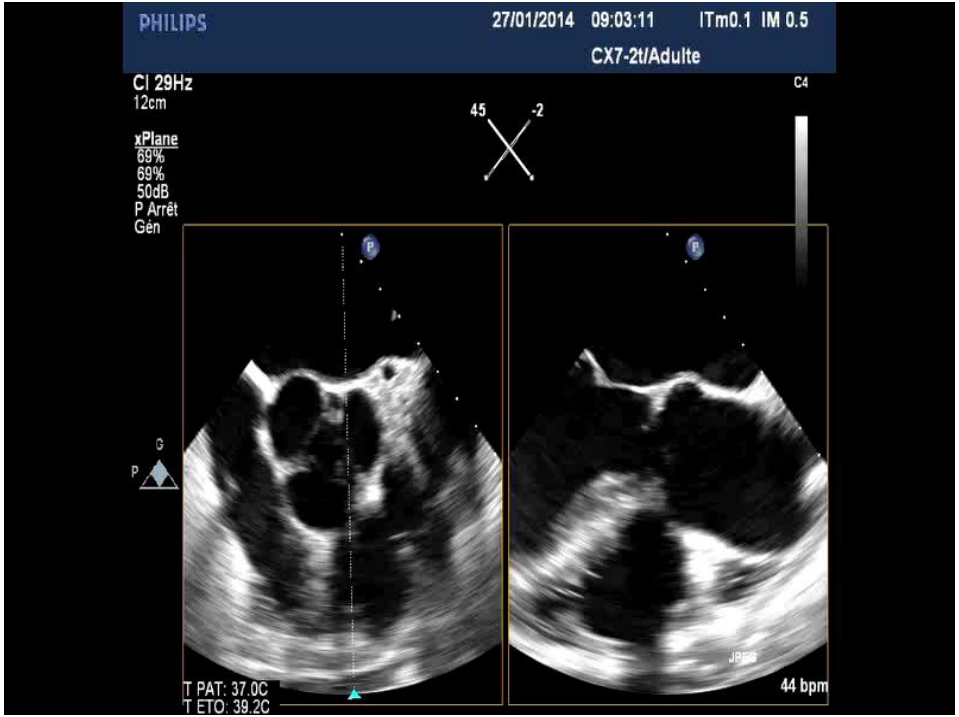




The geometric height (gH), also called the cusp height, is defined as the distance between the cusp nadir and the middle of the free margin. Intraoperatively, the gH is measured with a straight ruler along the aortic side of the cusp by applying gentle traction on the free margin to straighten the cusp tissue along the ruler. In adults, the cusp is considered retracted when the gH is 16 mm or less in TAVs and 19 mm or less in the bicuspid non-fused aortic cusp [8].

Lesion: amount and quality of tissue available

Restrictive motion ***with retraction****

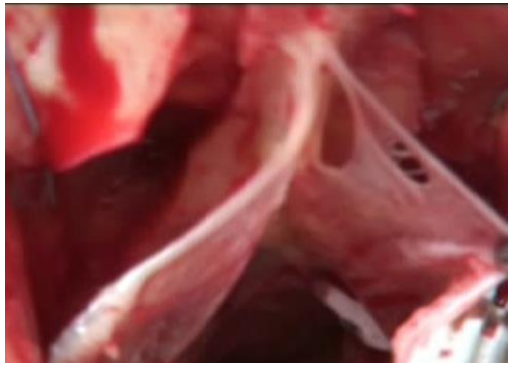


*retraction if geometric height: < 16 mm (tricuspid) or < 19 mm (bicuspid)

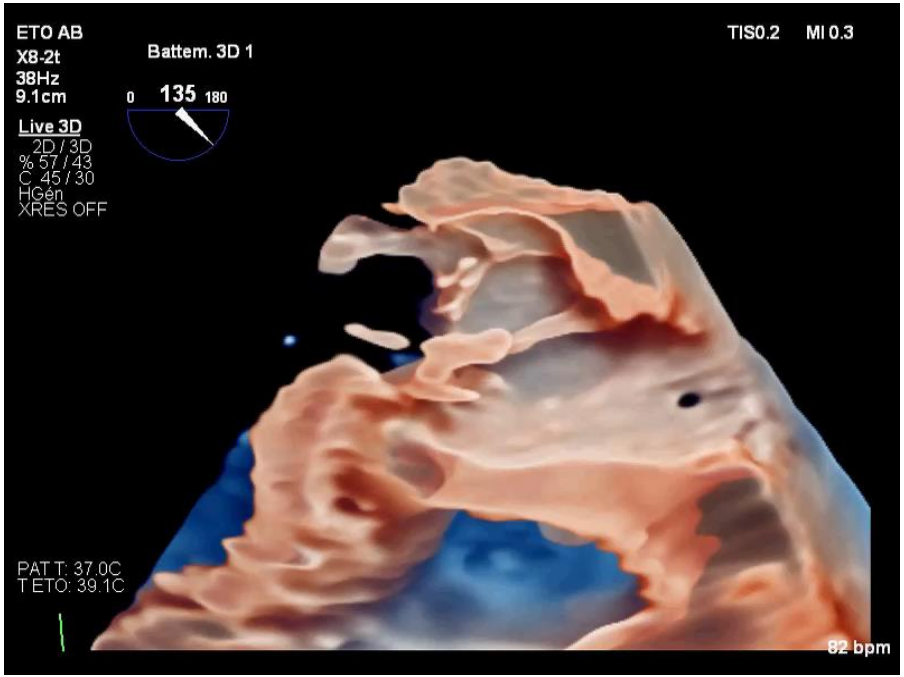
Fenestrations

Congenital lesions

Para-commissural coaptation zone

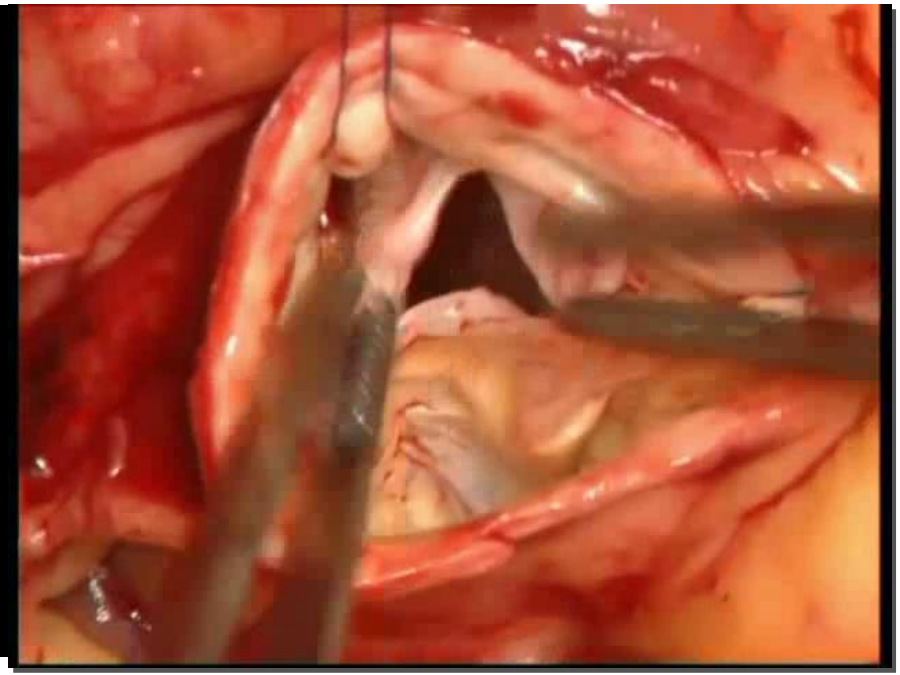


Pericardial patch if « fragile » or ruptured

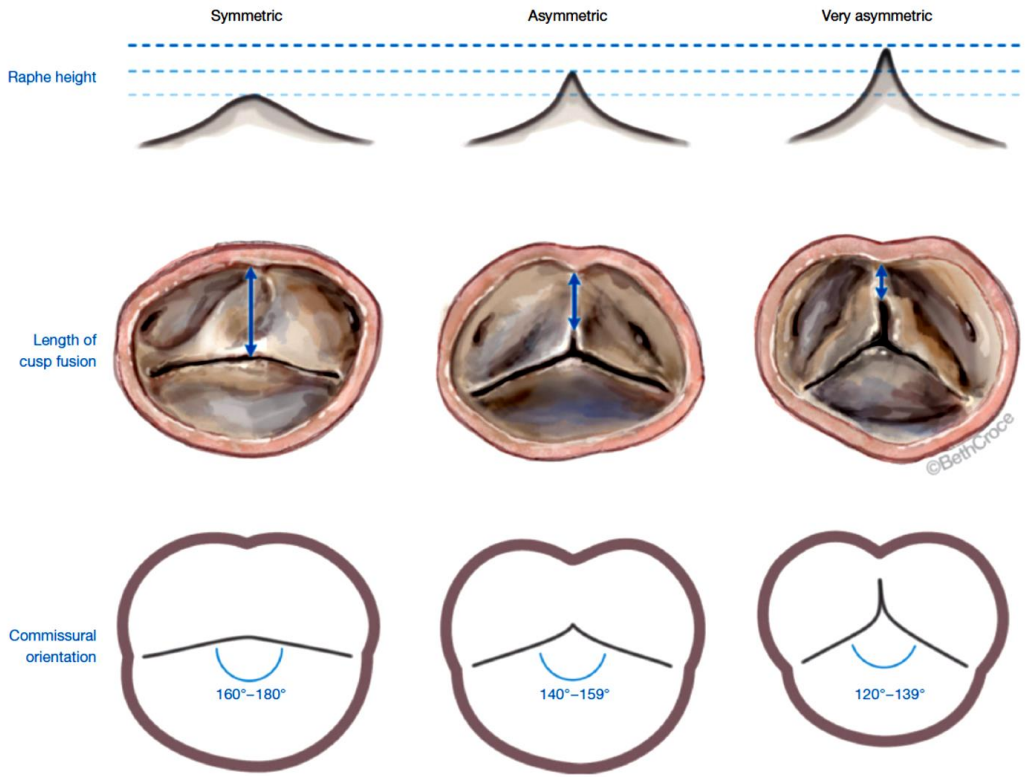


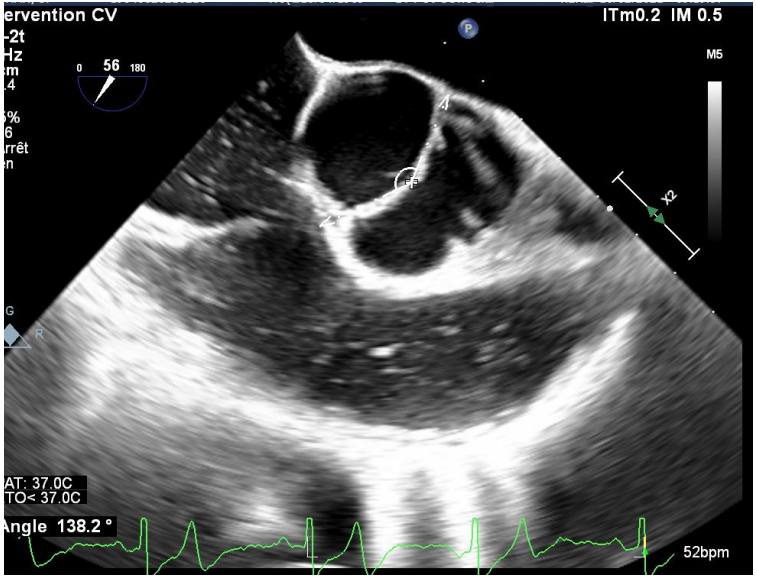
Schäfers et al, JTCVS 2009

Ruptured Fenestrations



Bicuspid Fused type: Commissural orientation
(angle between 2 functional commissures)





Jahanyar J et al. Ann Cardiothorac Surg 2023;12(3): 179-193

Conclusion

- Aortic root is a dynamic functional unit (expansibility)
- Aortic cusp configuration determine function
- Need for standardization with a systematic echo protocol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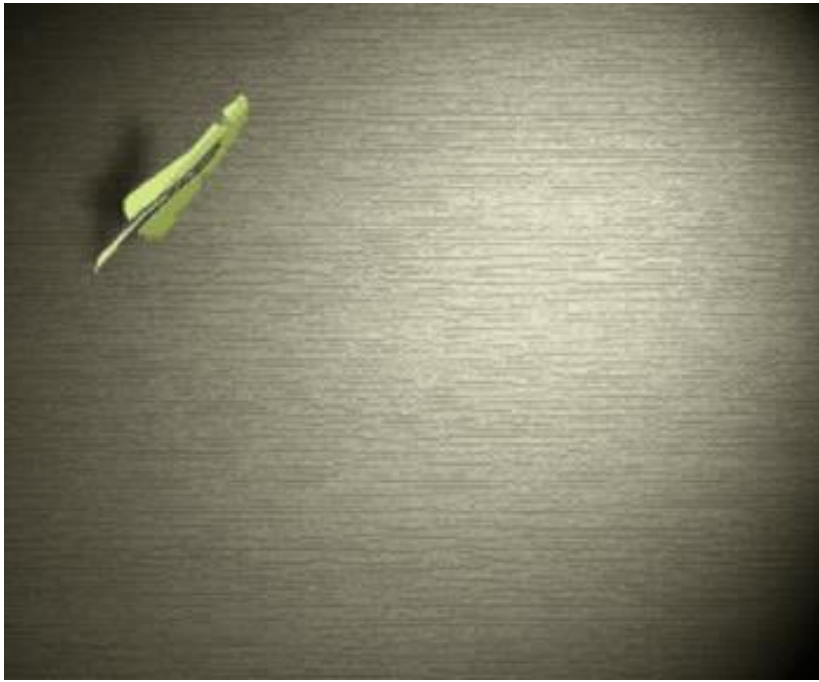
COURSE DIRECTORS
Patrizio Lancellotti, Belgium
Khalil Fattouch, Italy
Gilbert Habib, France
José Luis Zamorano, Spain
Philippe Pibarot, Canada
Mani Vannan, USA
Madalina Garbi, United Kingdom
Bernard Cosyns,Belgium
LOCAL HOST
Khalil Fattouch, Italy

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