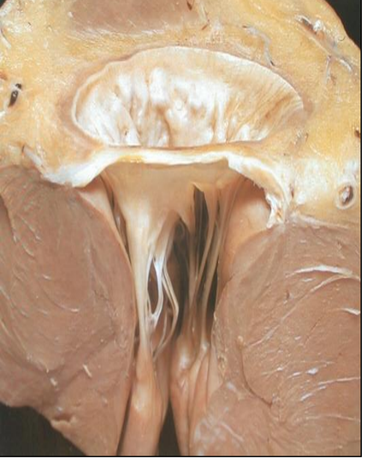
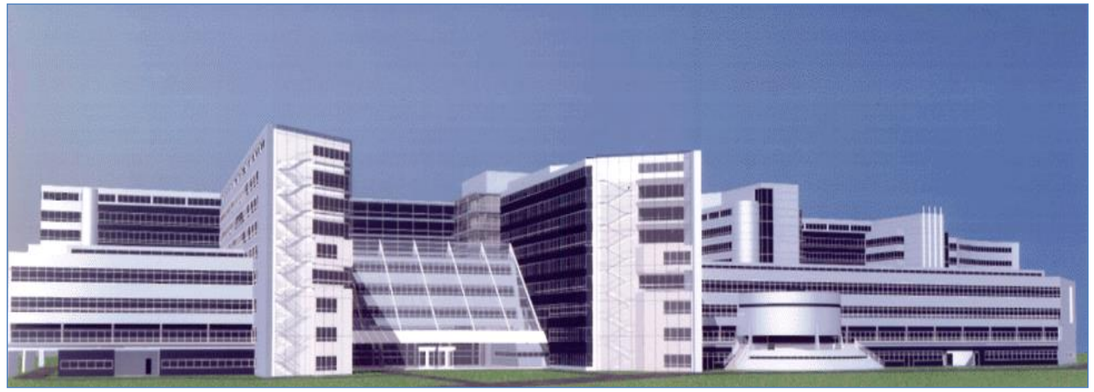


5 Key Insights on Mitral Valve Anatomy and Morphology

A.Berrebi, M.D.



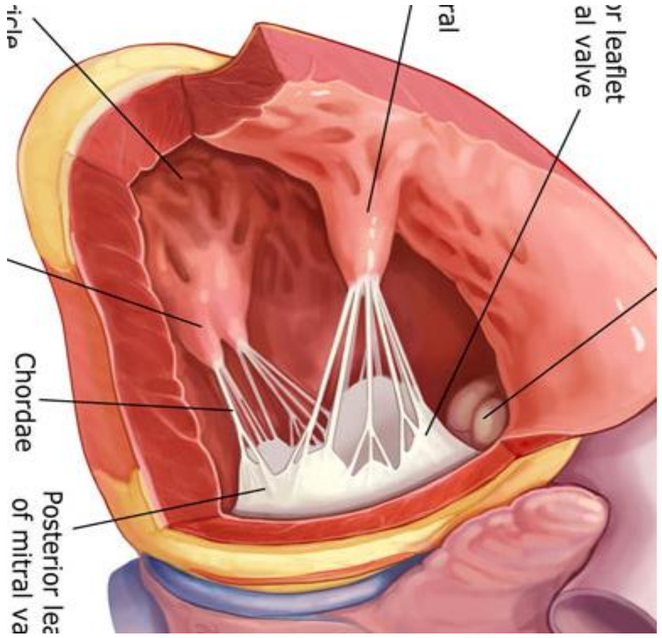
HEGP – Université Paris Cité

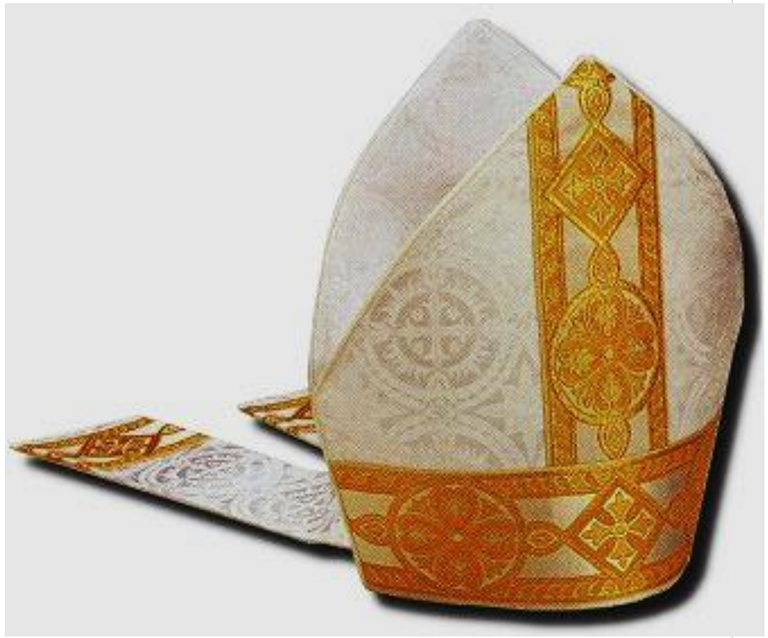
Institut Mutualiste Montsouris, Paris

No Disclosure

Historical terminology

Vesale - 1543



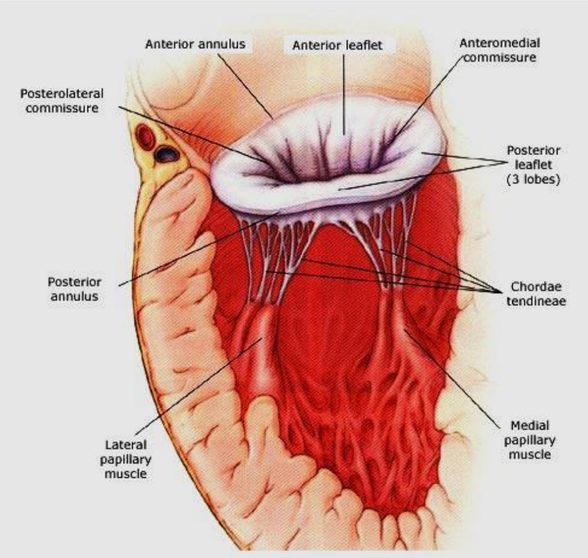


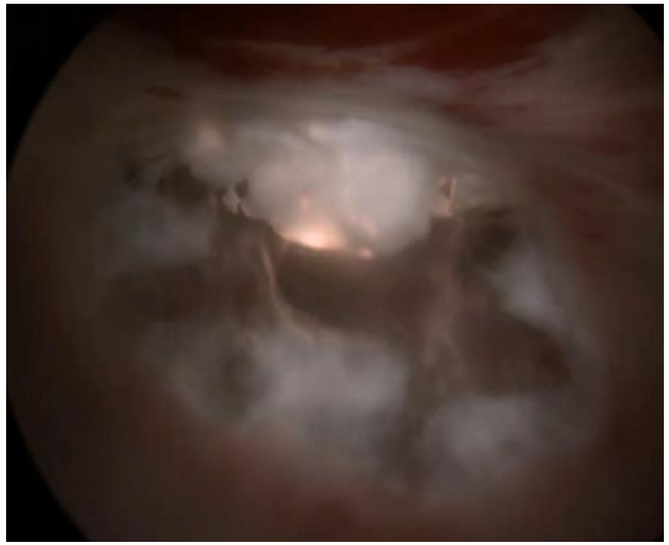
Bishop’s mitr

« Anatomy is a destiny »

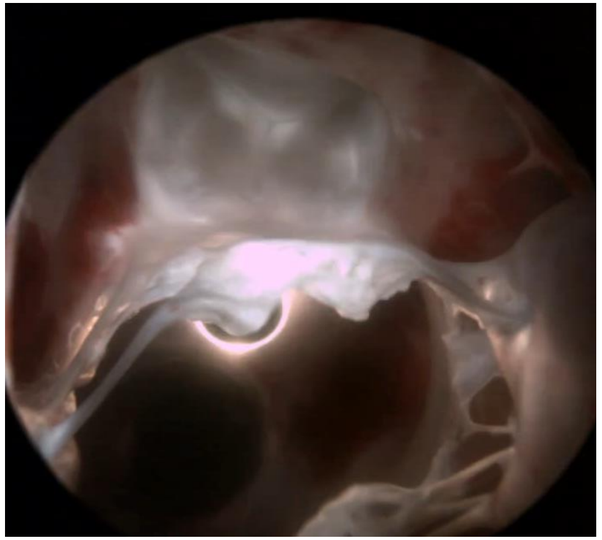
(B.Lytle)

A complex functional unit: function driven by anatomy

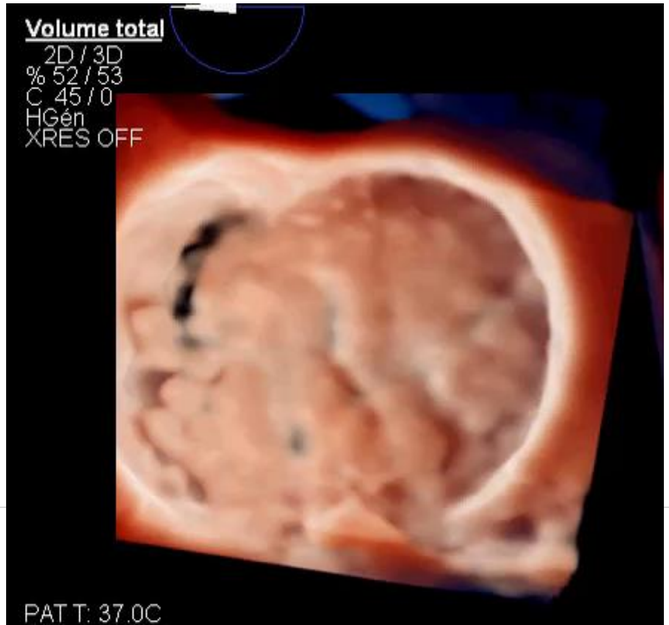


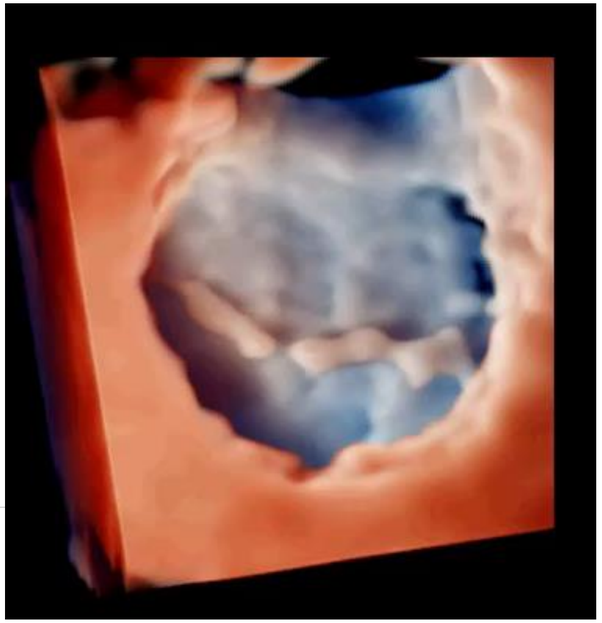


Atrial view



Ventricular view





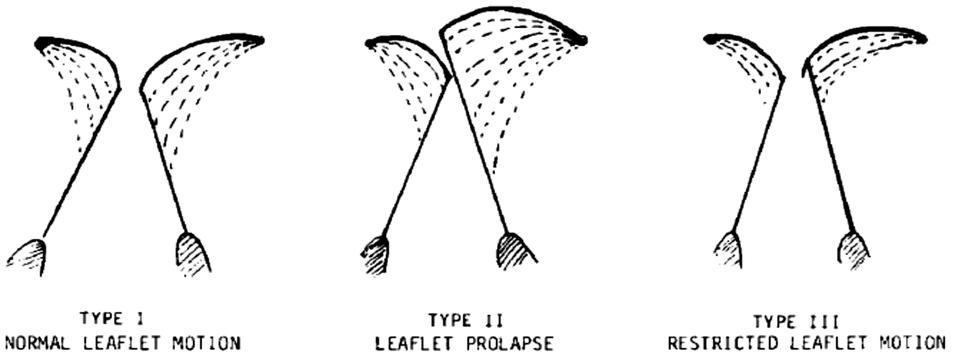
Beyond anatomy: the « functional approach »

Volume 86, Number 3 September 1983

The Journal of THORACIC AND CARDIOVASCULAR SURGERY

J THORAC CARDIOVASC SURG 86:323-337, 1983

Honored Guest's Address



Cardiac valve surgery—the "French correction"

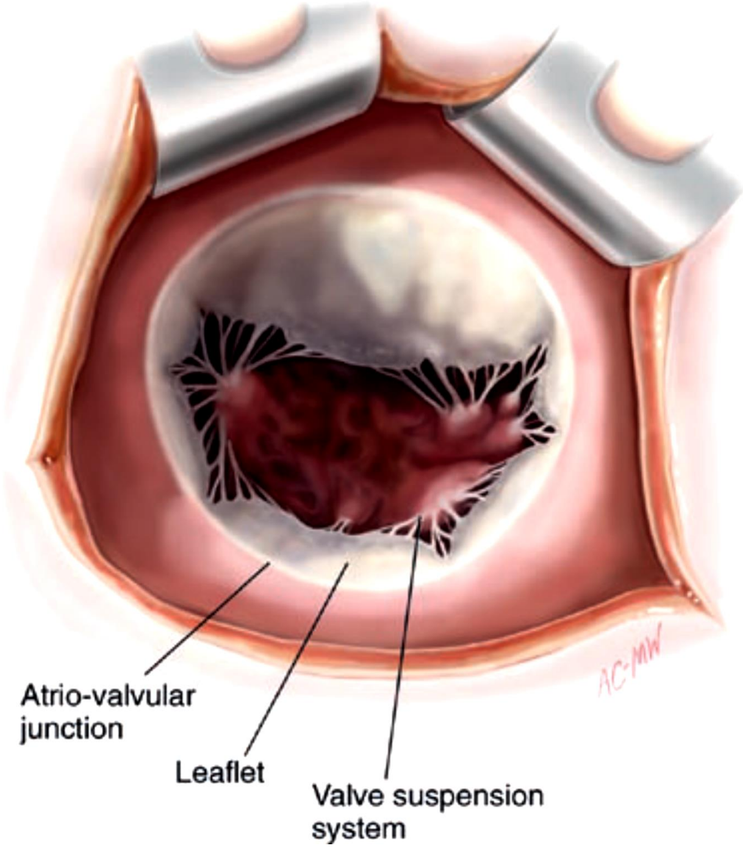
Alain Carpentier, M.D., *Paris, France*

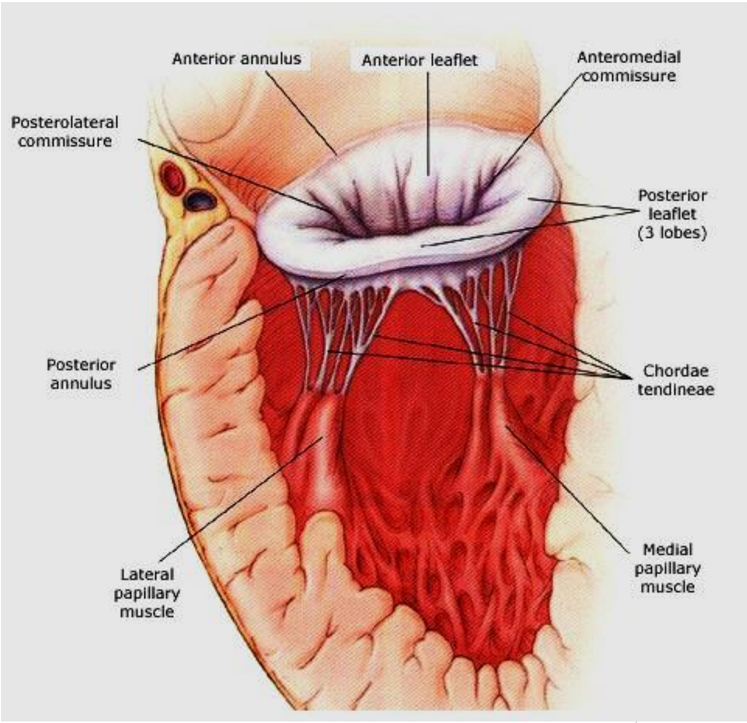
The "functional approach." Surgeons are not basically concerned with lesions. We care more about function. Therefore one may define the aim of a valve reconstruction as restoring normal valve function rather than normal valve anatomy. This functional approach has led to a significant simplification. There are only two

	Etiology	Lesion	Dysfunction
Echo	++	+	+++
Surgeon	++	+++	+

Anatomy

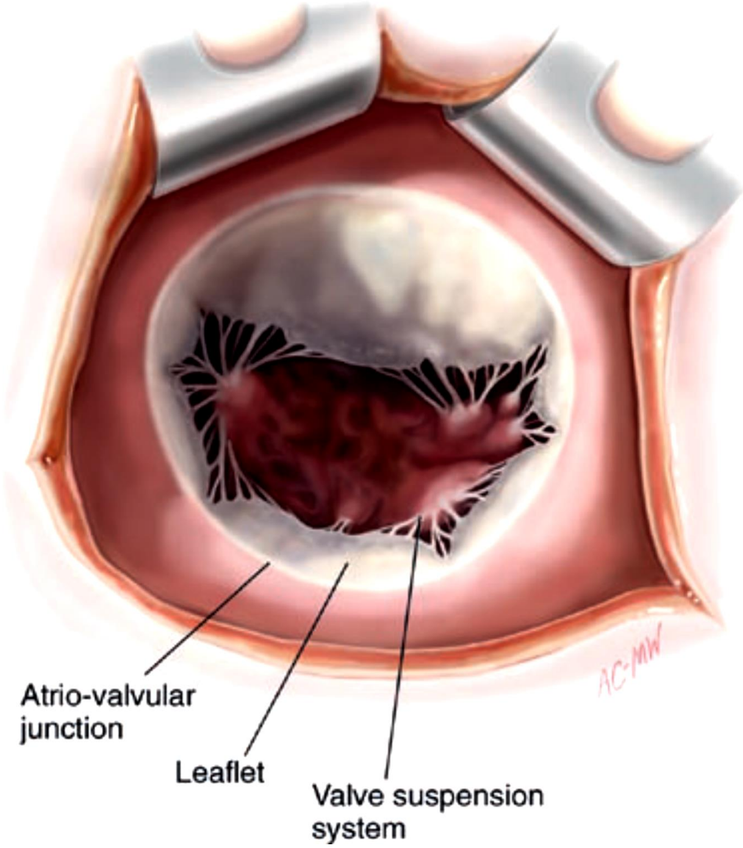
Normal Mitral Valve Anatomy

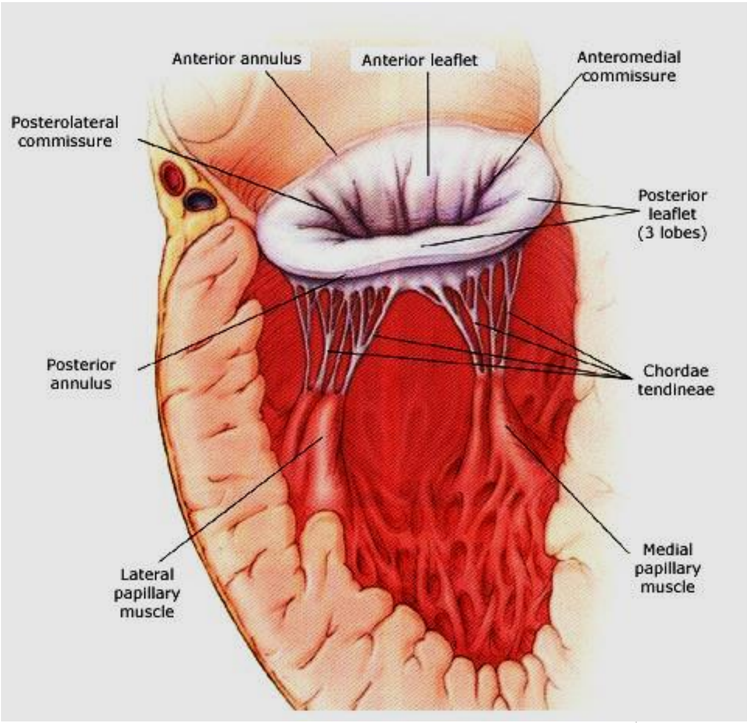




- A-V Junction
- The Leaflets
- The suspension system and LV

Normal Mitral Valve Anatomy



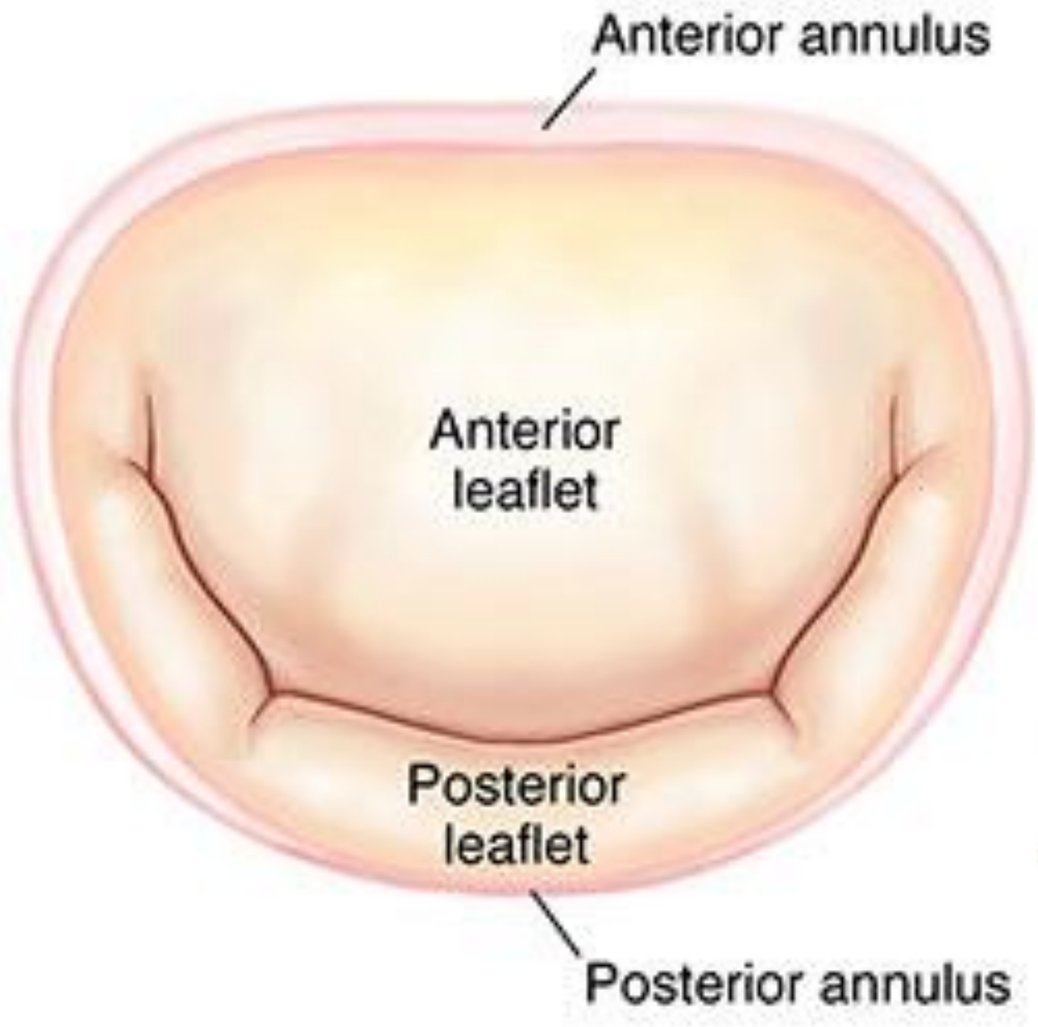


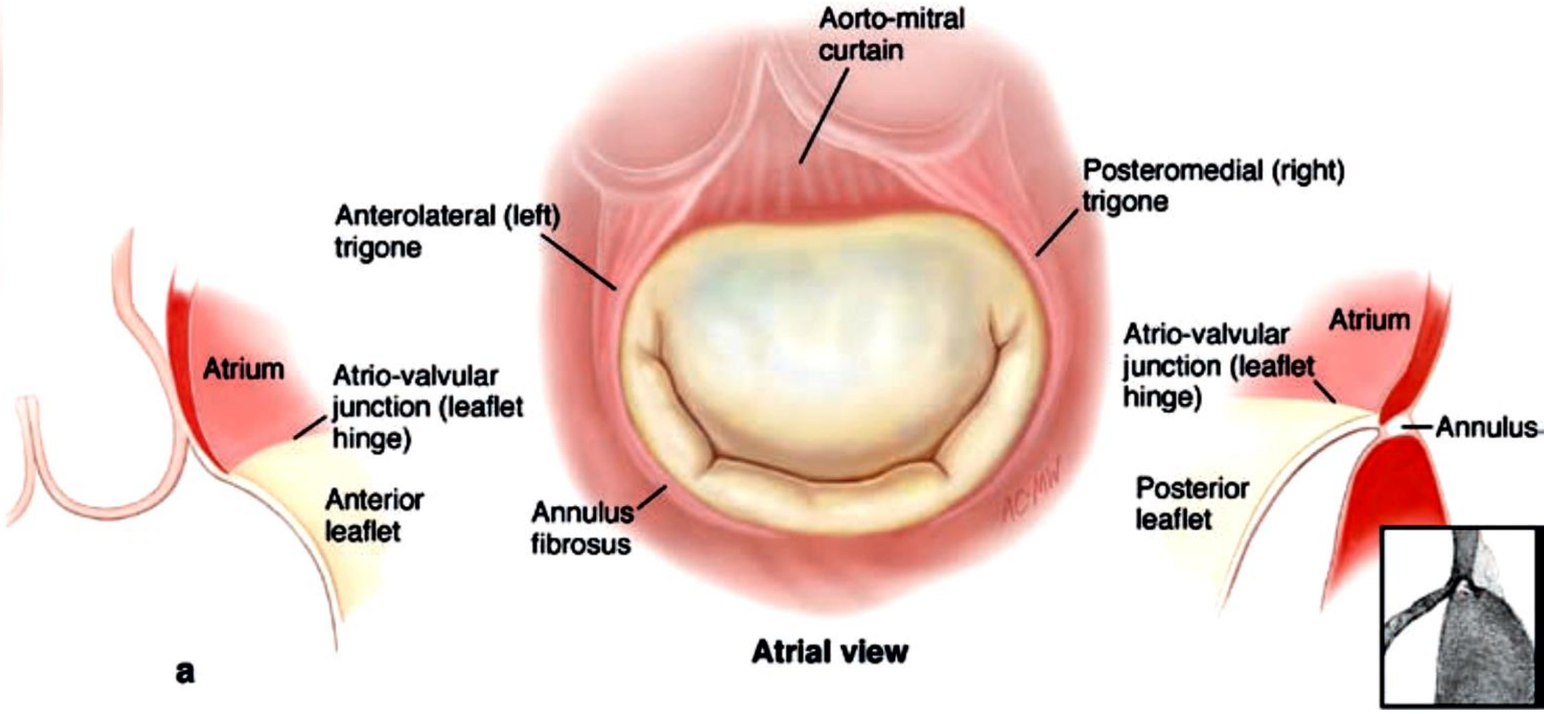
- **A-V Junction**
- **The Leaflets**
- **The suspension system and LV**

A-V Junction

Annulus of the mitral valve is not visible from the atrium.

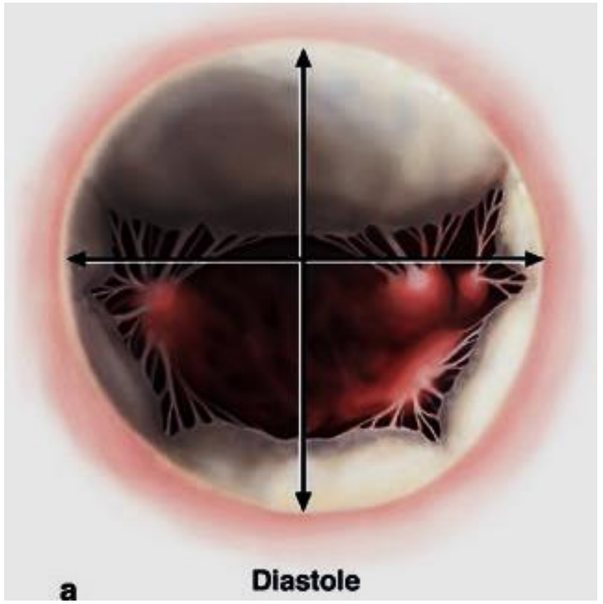
It is deeper and 2 mm external to the visible hinge of the leaflets

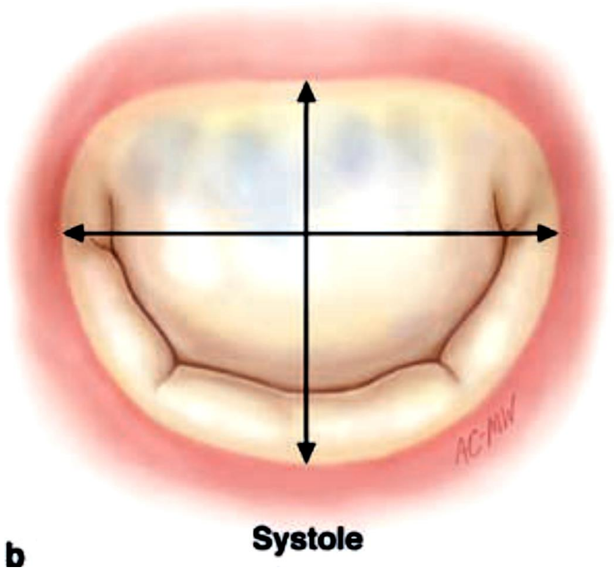


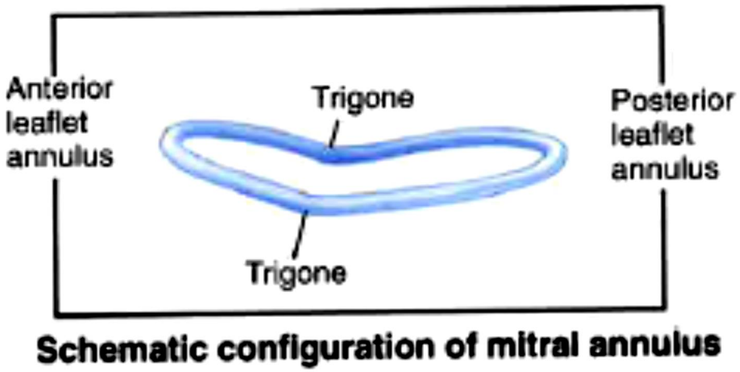


Annulus

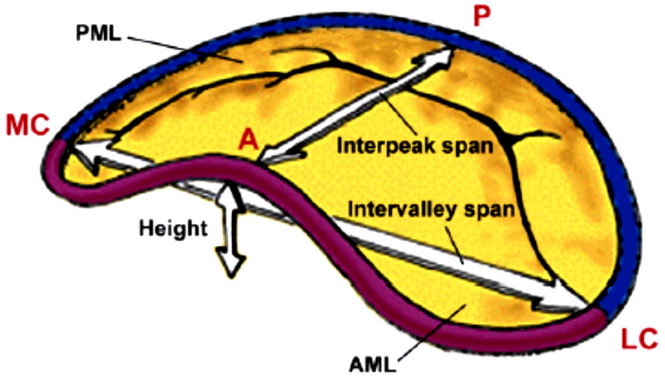
Saddle Shape and Functional Ratio

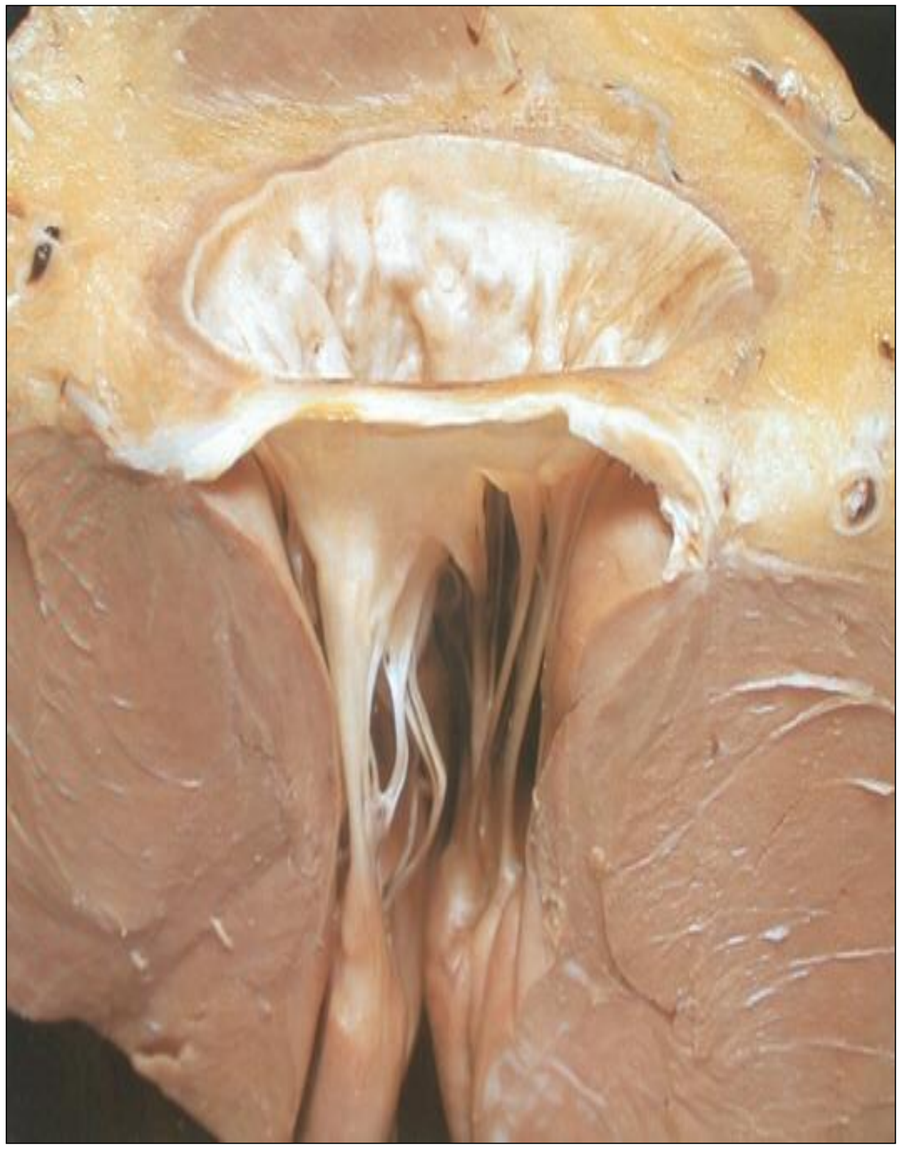




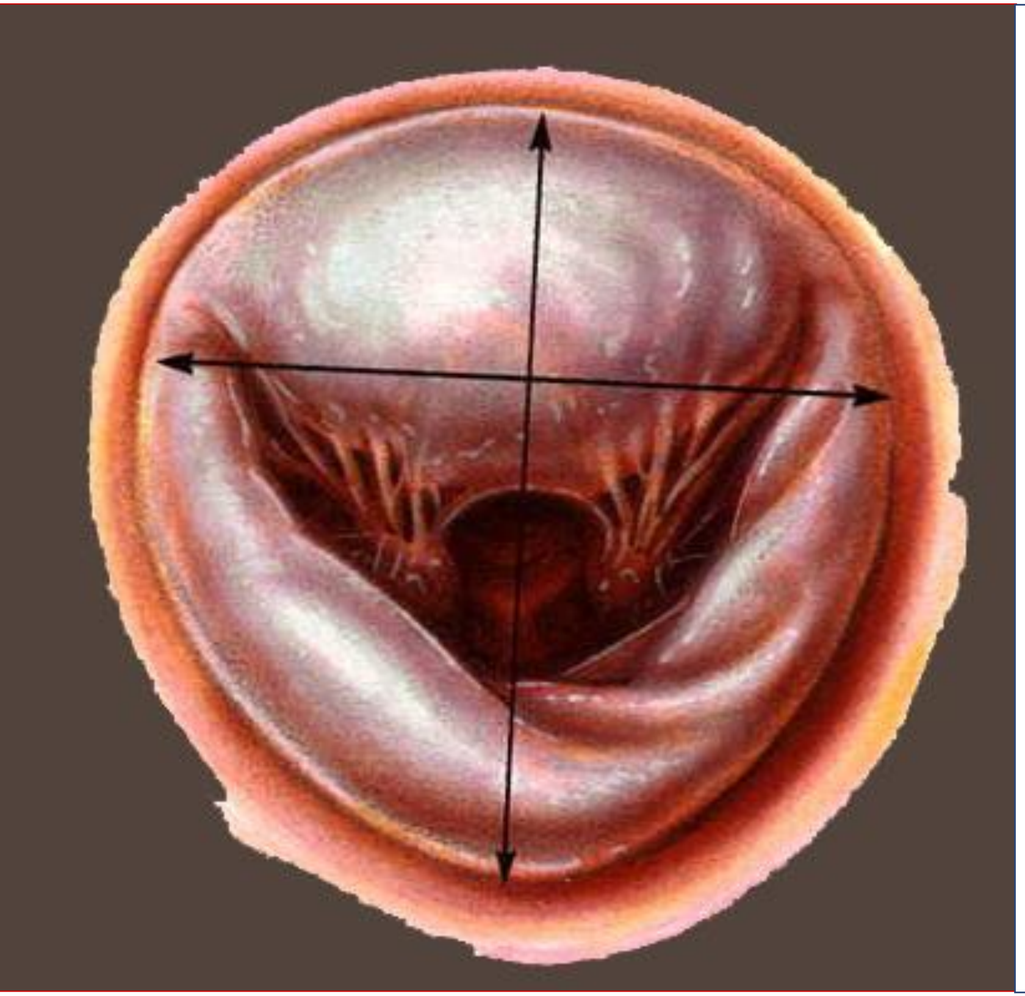


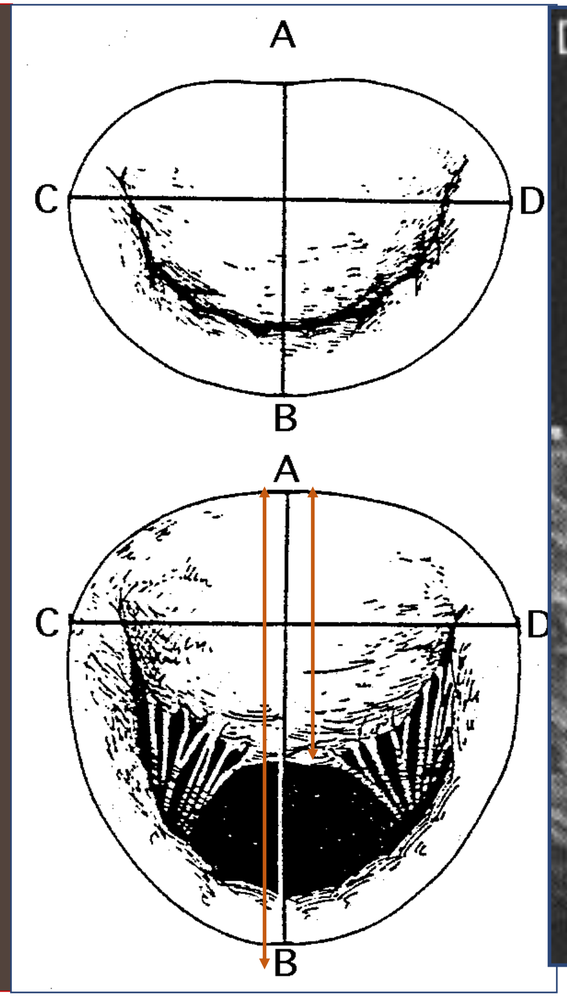
Schematic configuration of mitral annulus

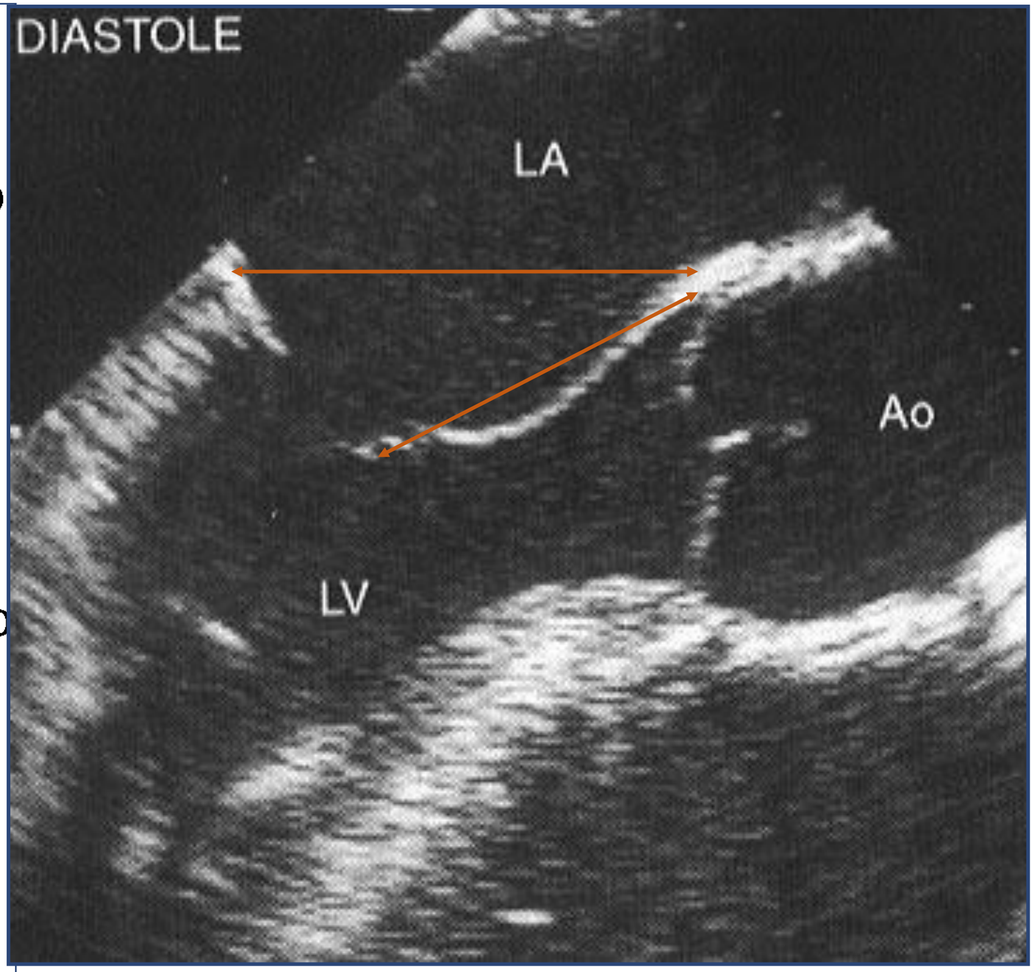




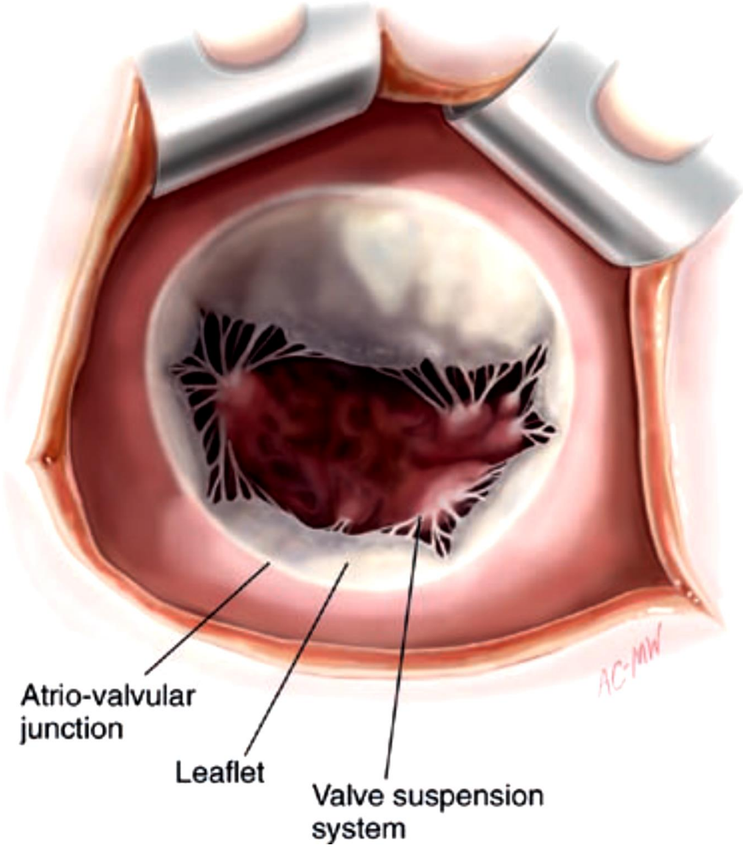
Annular dilation: Aφ / A2 ≥ 1.3

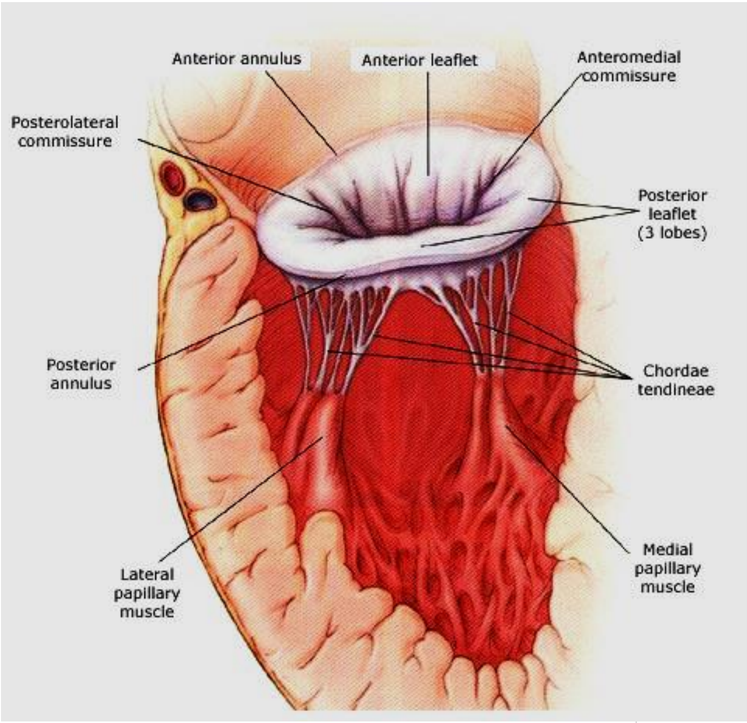






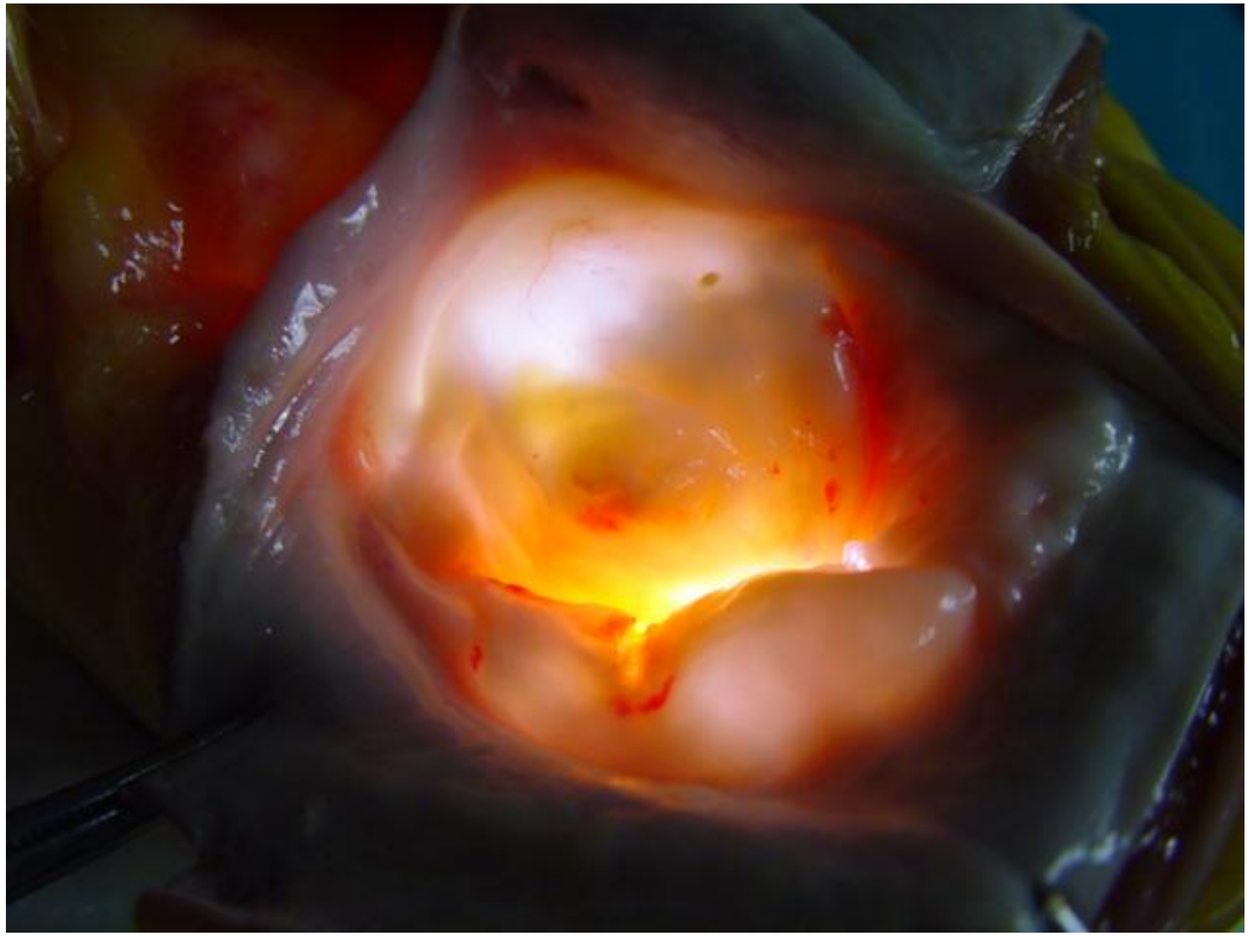
Normal Mitral Valve Anatomy

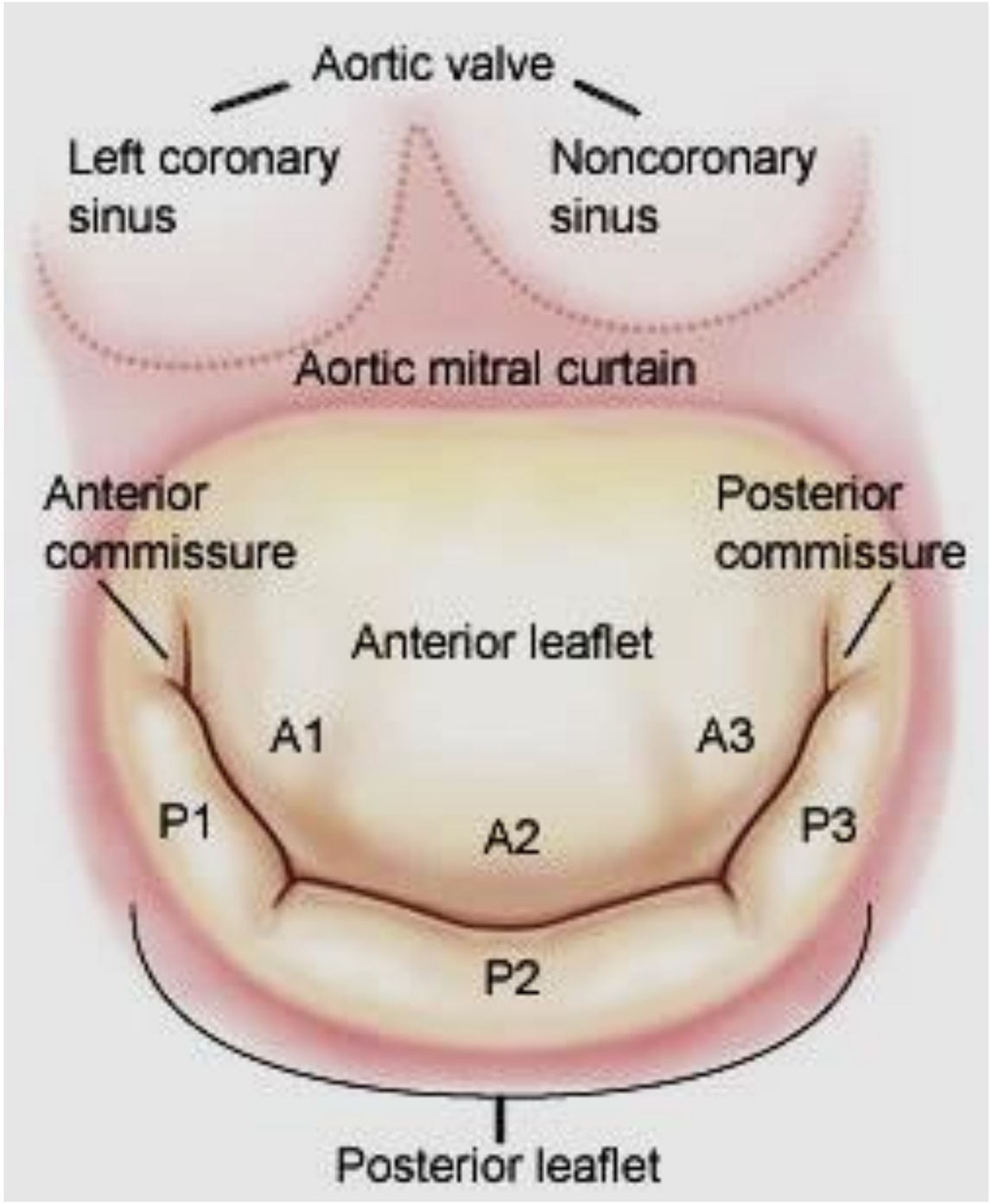




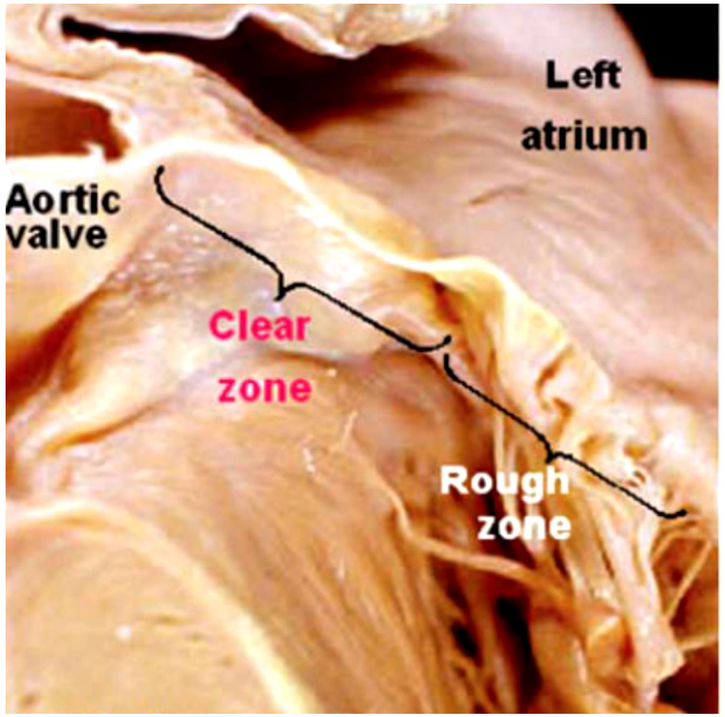
- A-V Junction
- **The Leaflets**
- The suspension system and LV

Mitral Leaflets

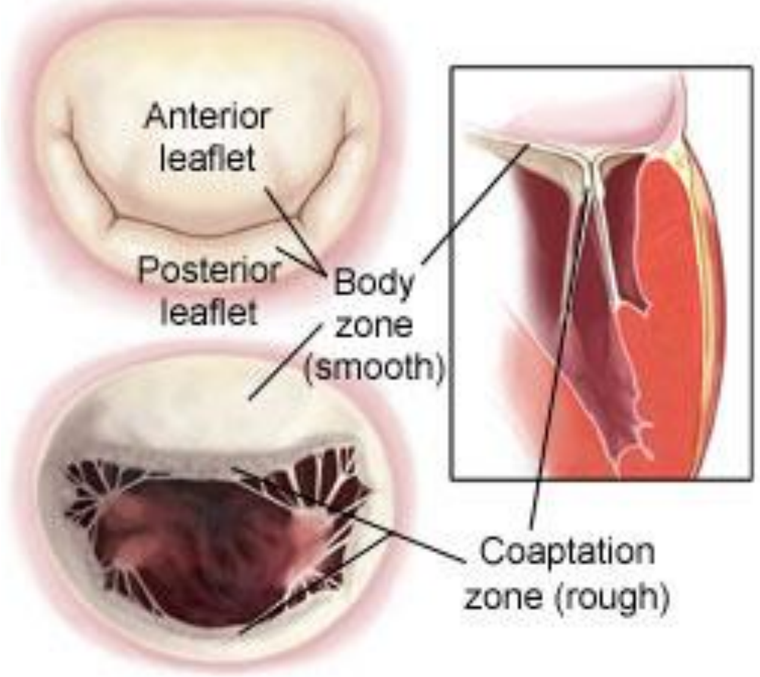


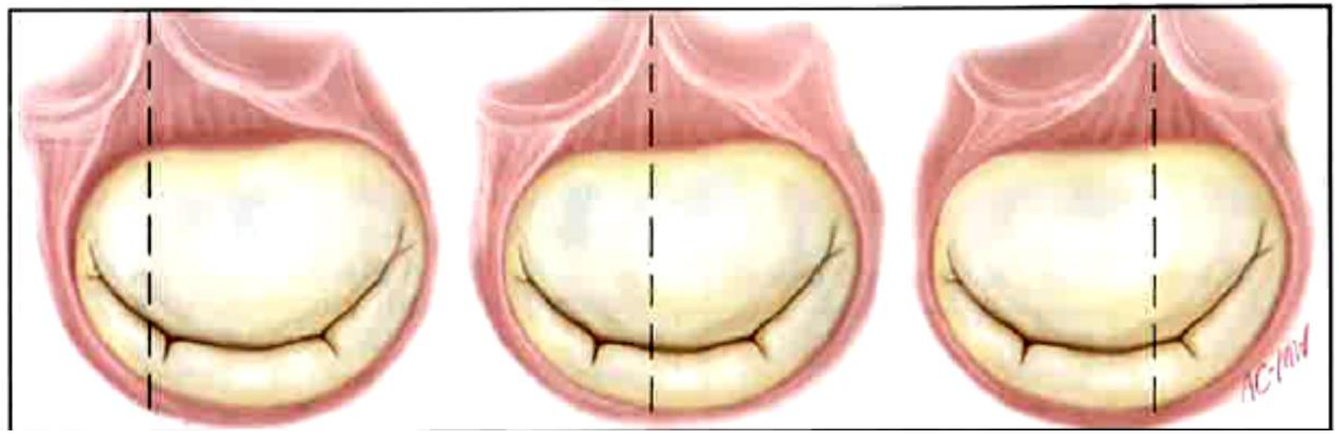


Leaflets



Dimensions of Leaflets, from Carpentier[6]				
	Anterolateral Commissure	Anterior Leaflet	Posteromedial Commissure	Posterior Leaflet
Insertion length (mm)	12 ± 3.3	32 ± 1.3	17 ± 0.8	55 ± 2.2
Height (mm)	8 ± 1	23 ± 0.9	8 ± 1	P1: 9 ± 1 P2: 14 ± 0.9 P3: 10 ± 1.2
Coaptation zone height (mm)	4 ± 0.5	8 ± 1.1	4 ± 0.6	P2: 8 ± 0.9

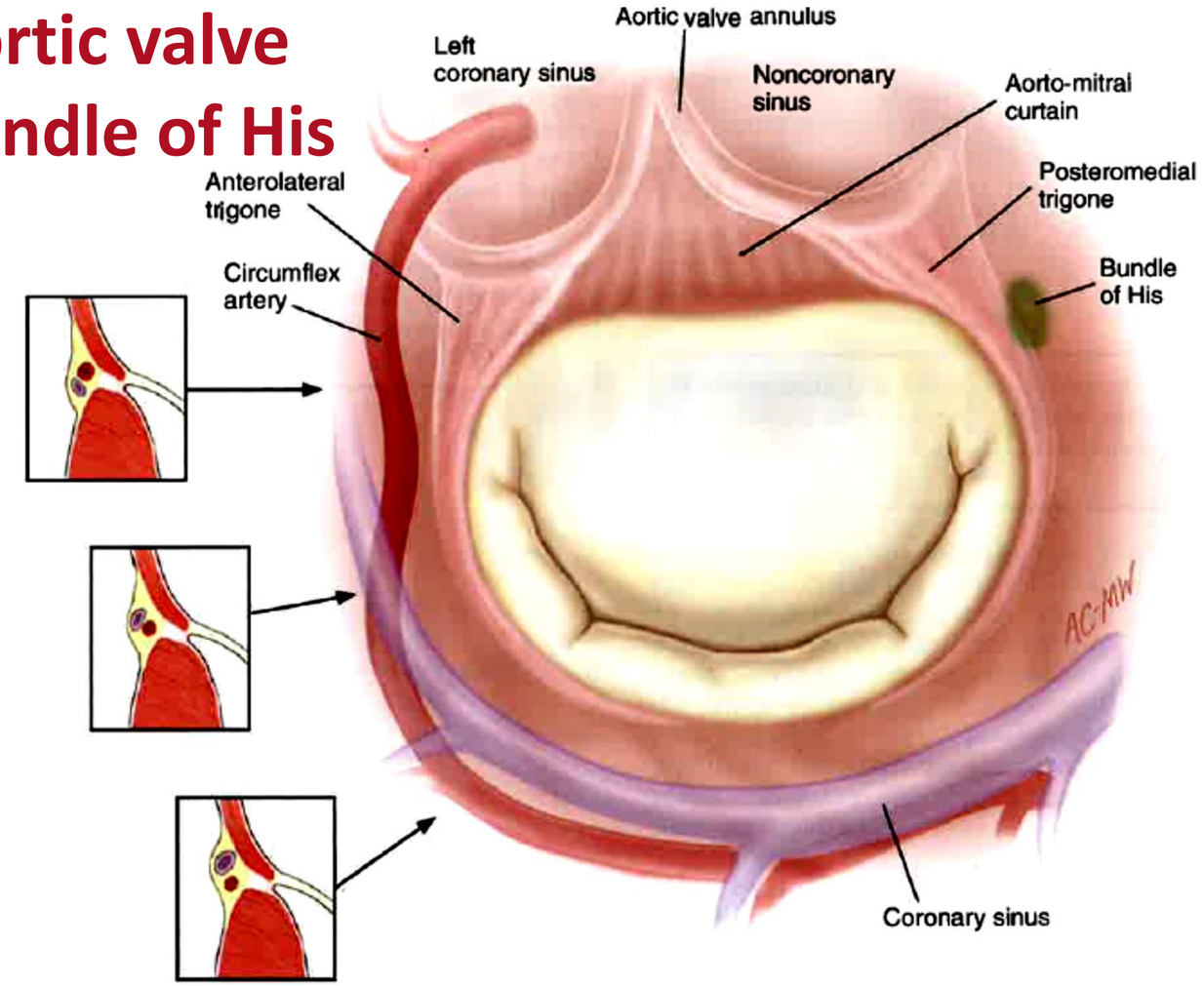


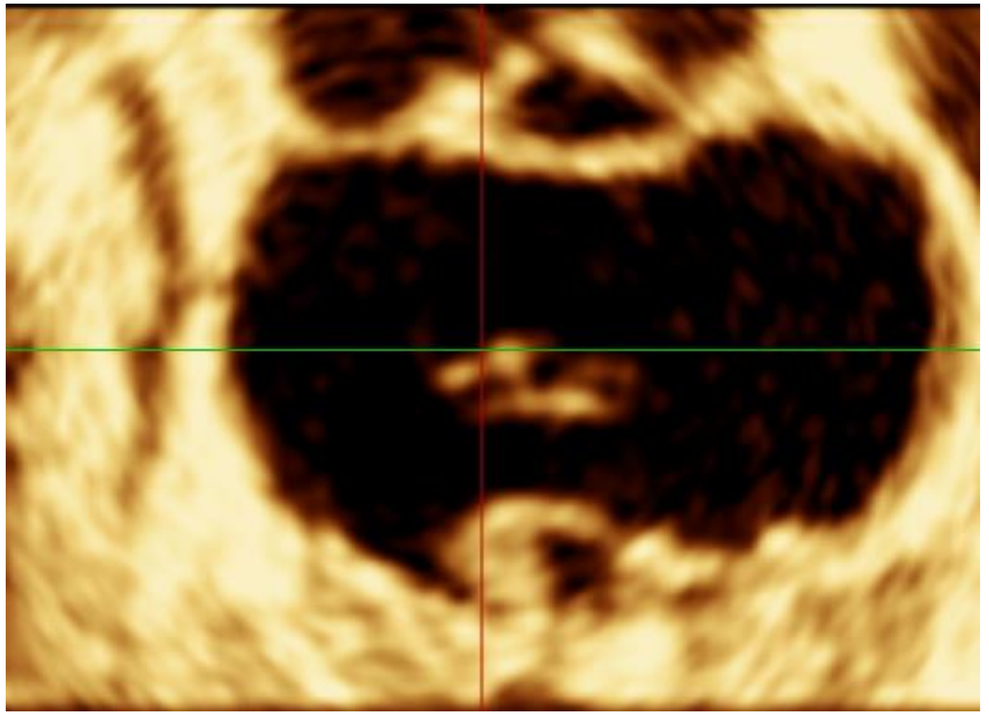


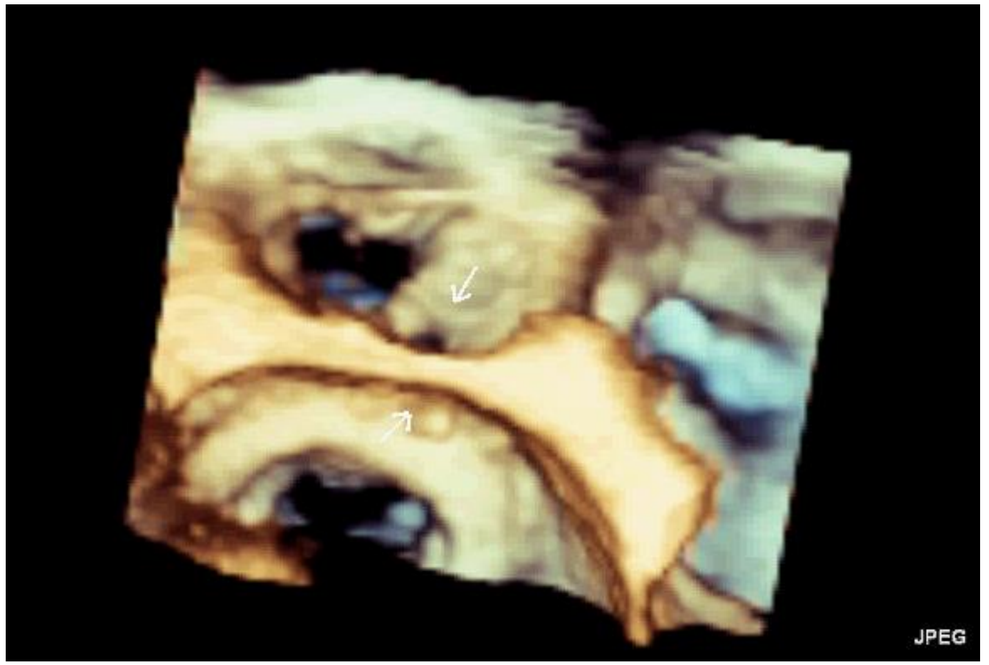
Surrounding structures

3 Areas at risk during Interventions:

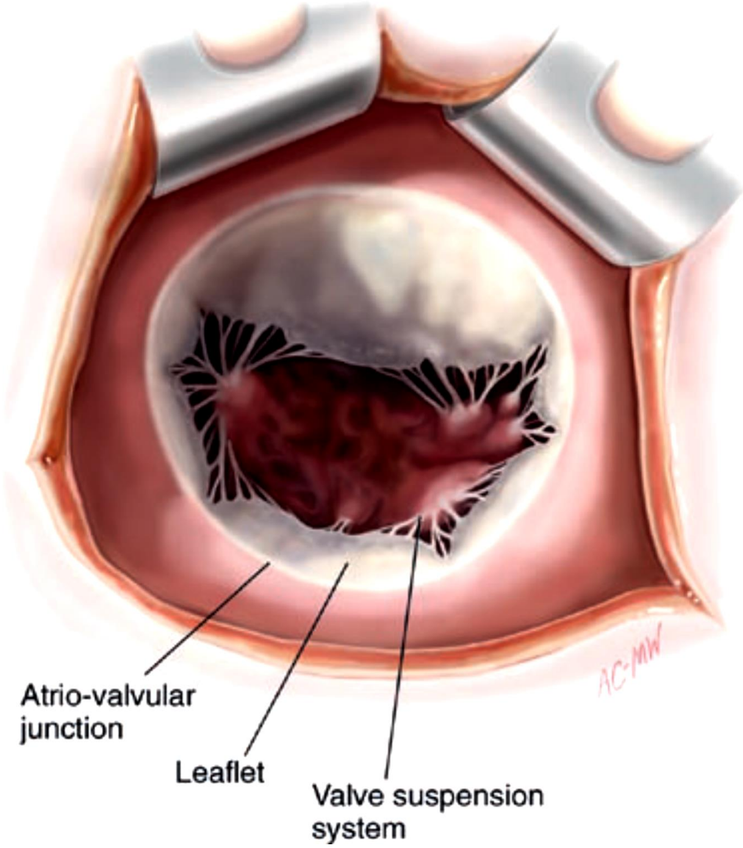
1) Circumflex artery
2) Aortic valve
3) Bundle of His

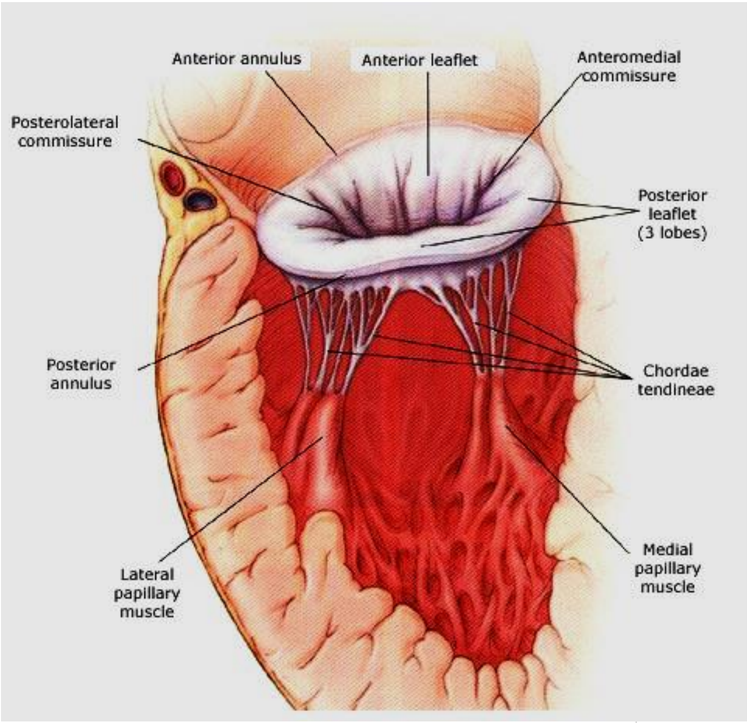




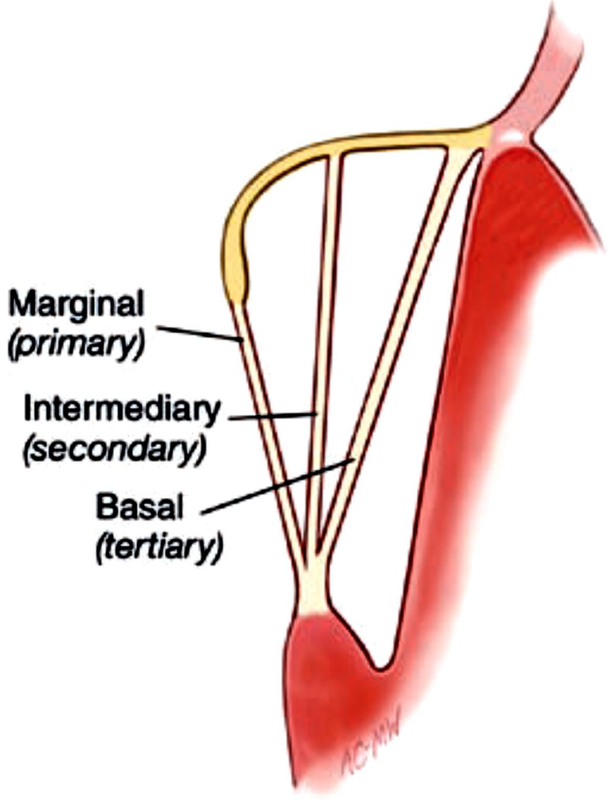


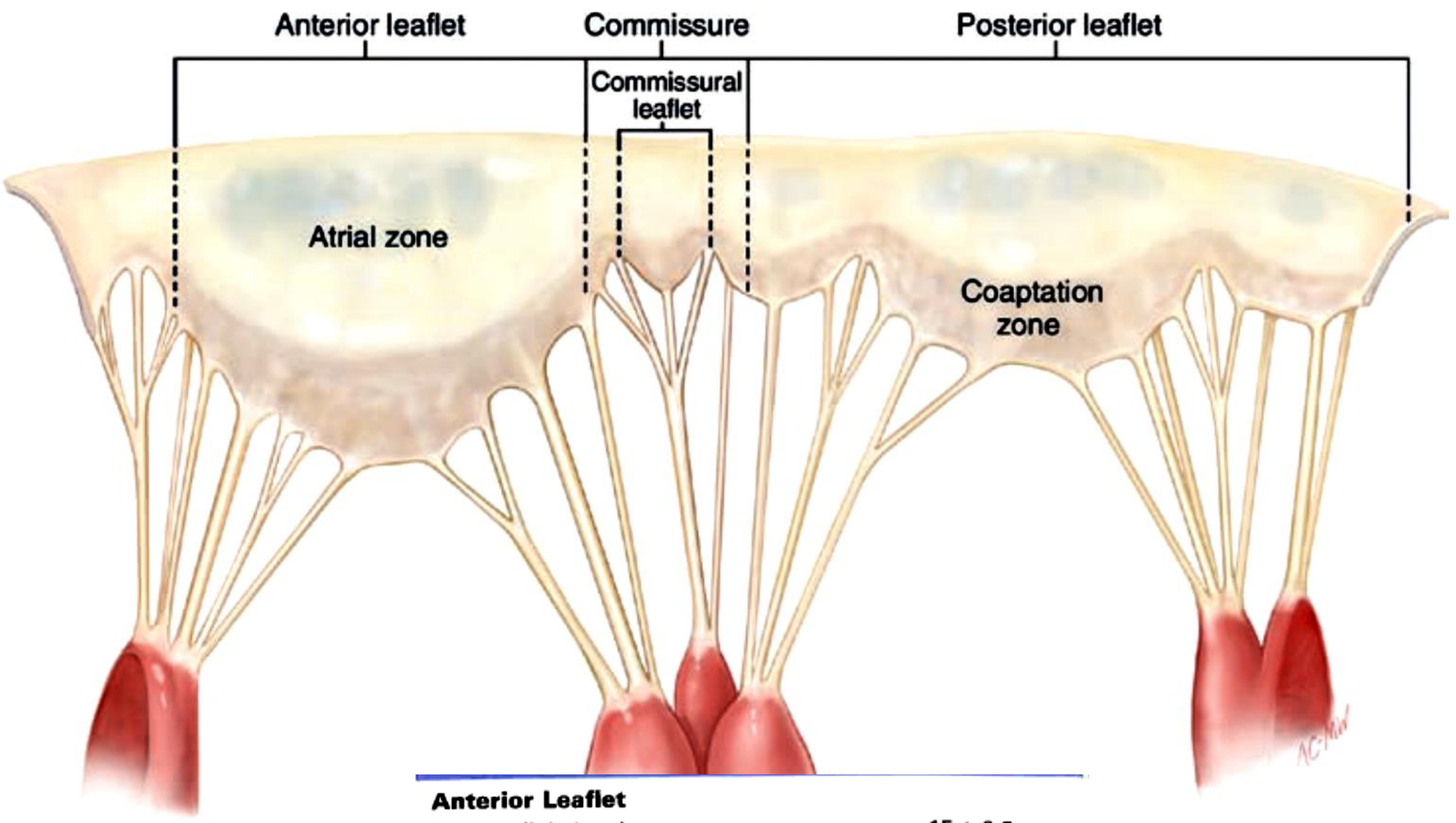
Normal Mitral Valve Anatomy





- A-V Junction
- The Leaflets
- **The suspension system and LV**

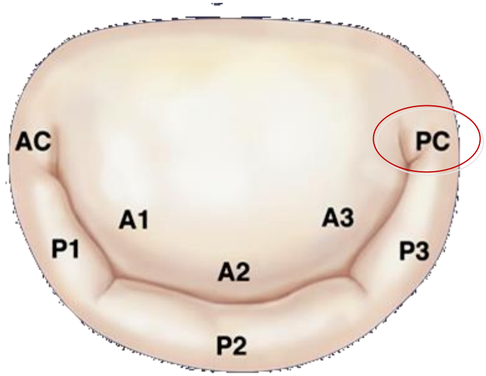


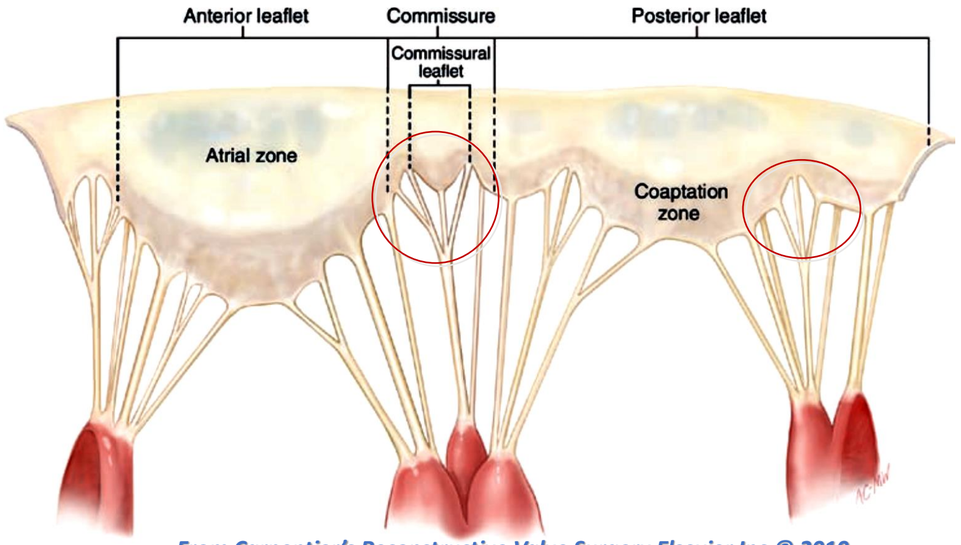


Anterior Leaflet	
Paramedial chordae	15 ± 0.5 mm
Main postero-medial chordae	17 ± 0.2 mm
Main antero-lateral chordae	19 ± 0.4 mm
Para-commissural chordae	17 ± 0.5 mm
Posterior Leaflet (P2)	
Marginal chordae	14 ± 2.9 mm
Intermediary chordae	14 to 8 mm
Basal chordae	8 ± 1 .7 mm
Commissures	
Antero-lateral	13 ± 0.2 mm
Postero-medial	15 ± 0.1 mm

« Fan Shape » chordae: to optimize a full opening motion

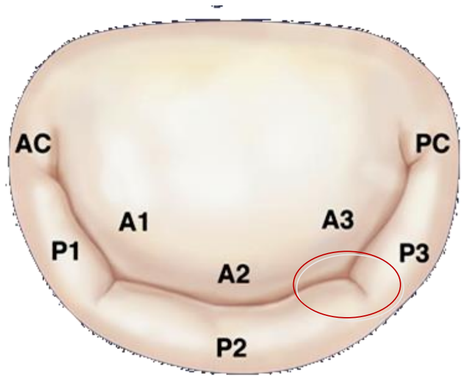
Commissure

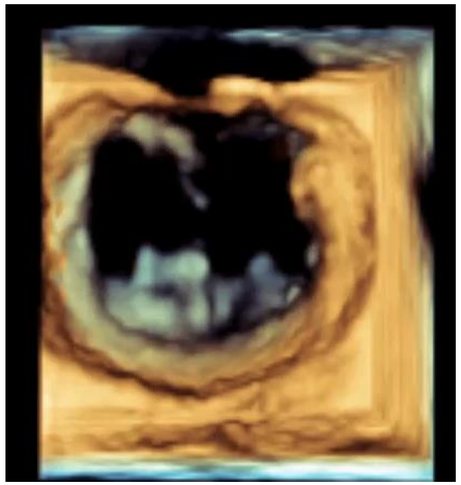


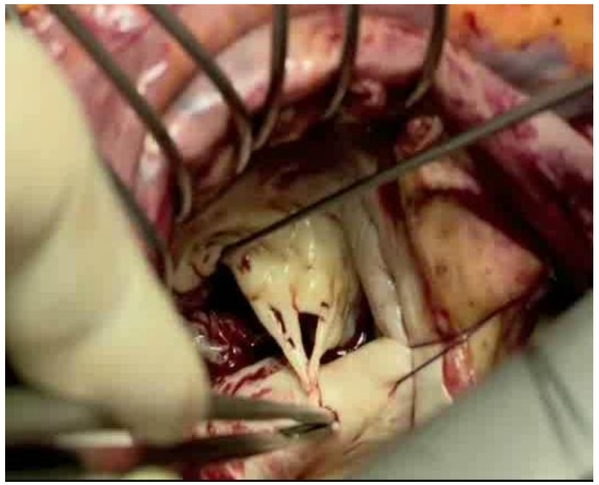


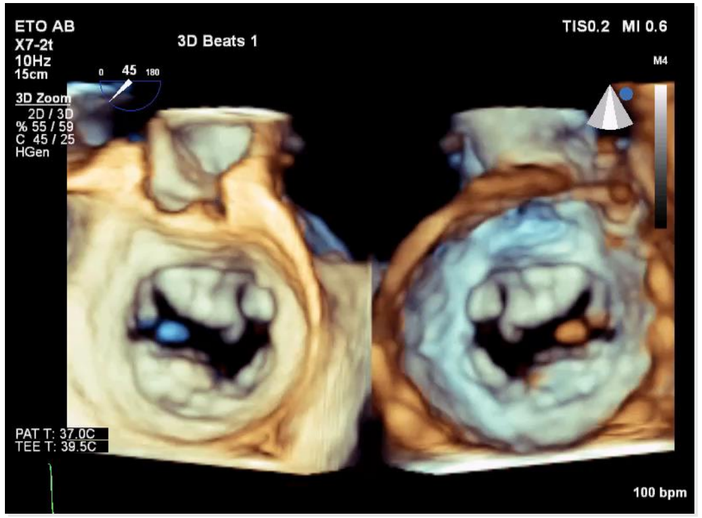
From Carpentier's Reconstructive Valve Surgery Elsevier Inc.© 2010

Indentation

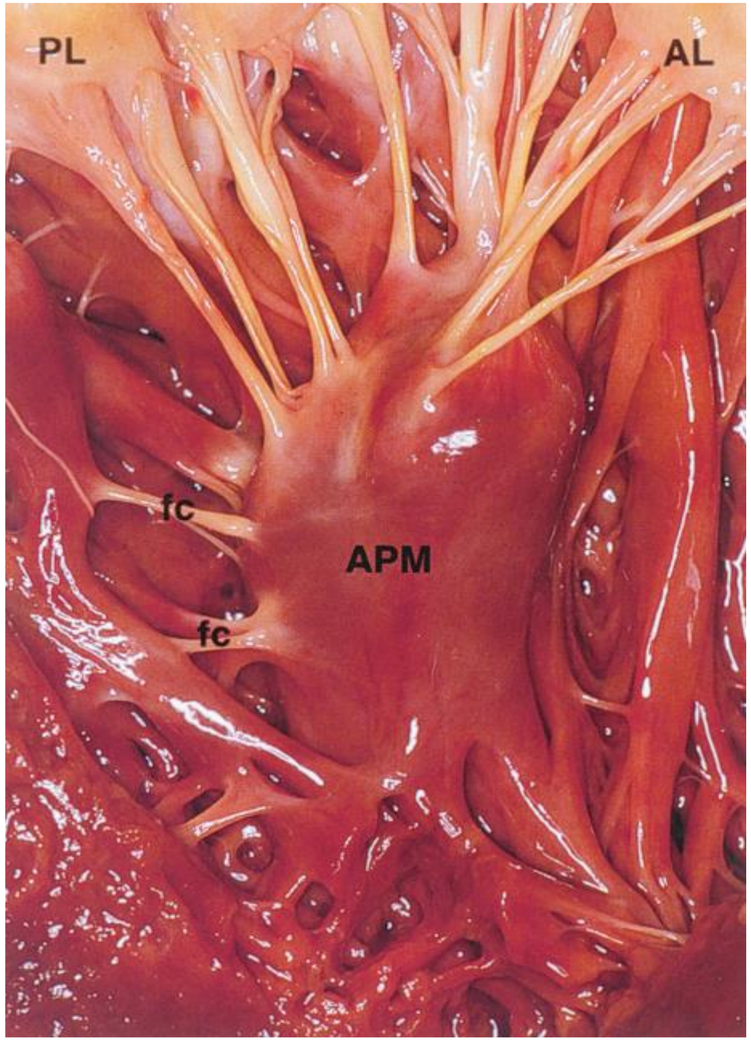


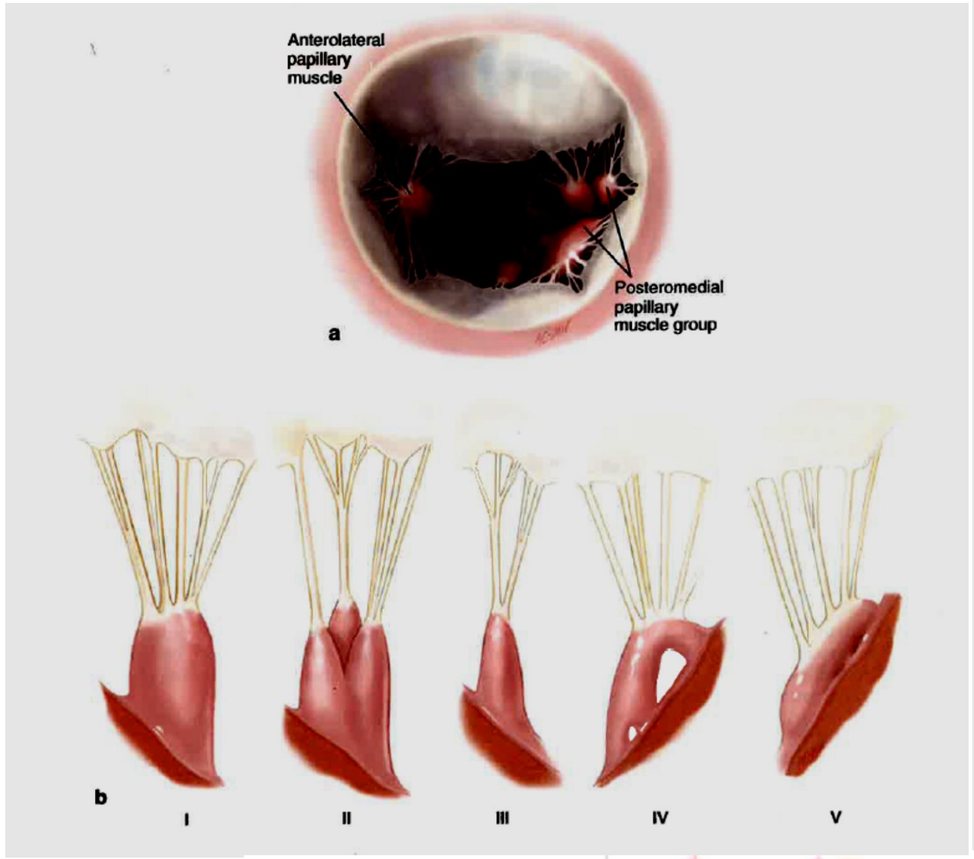


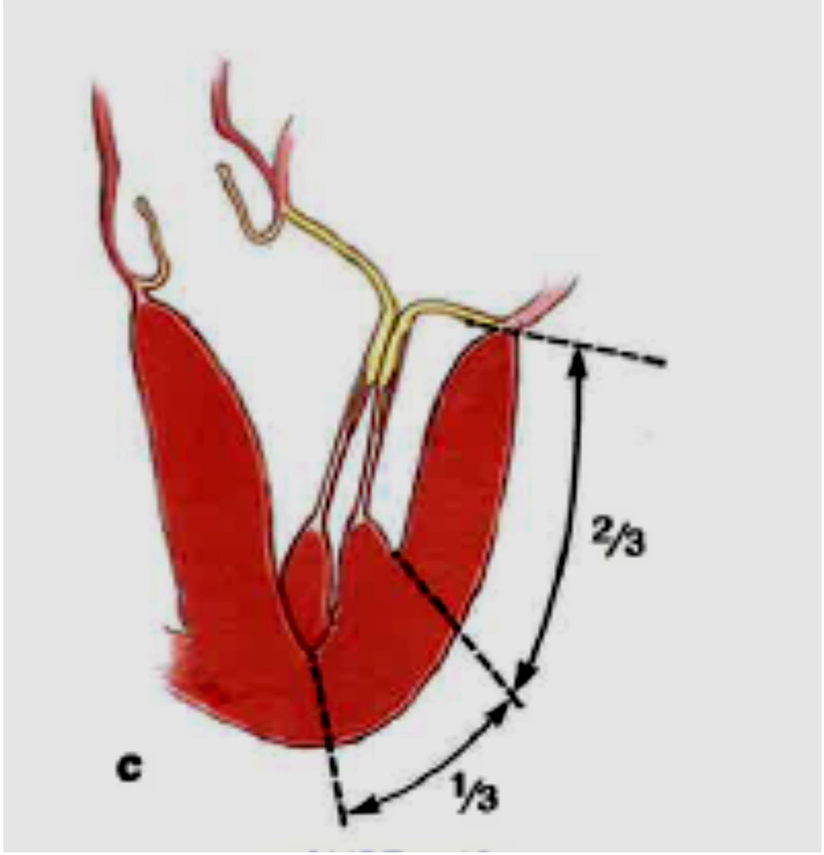


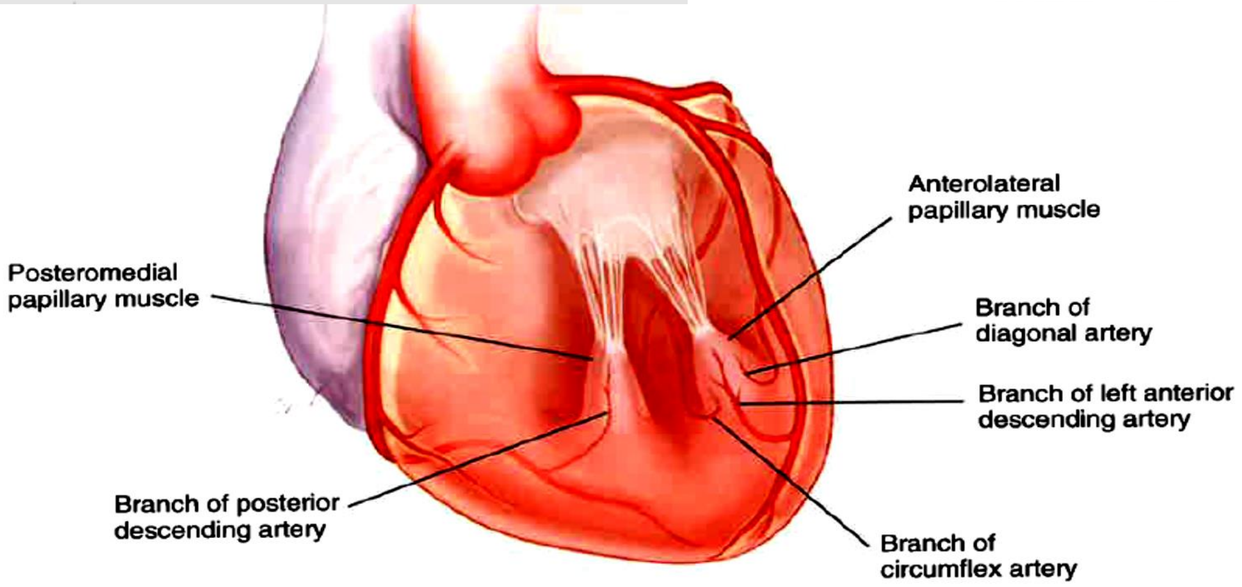


Papillary muscle





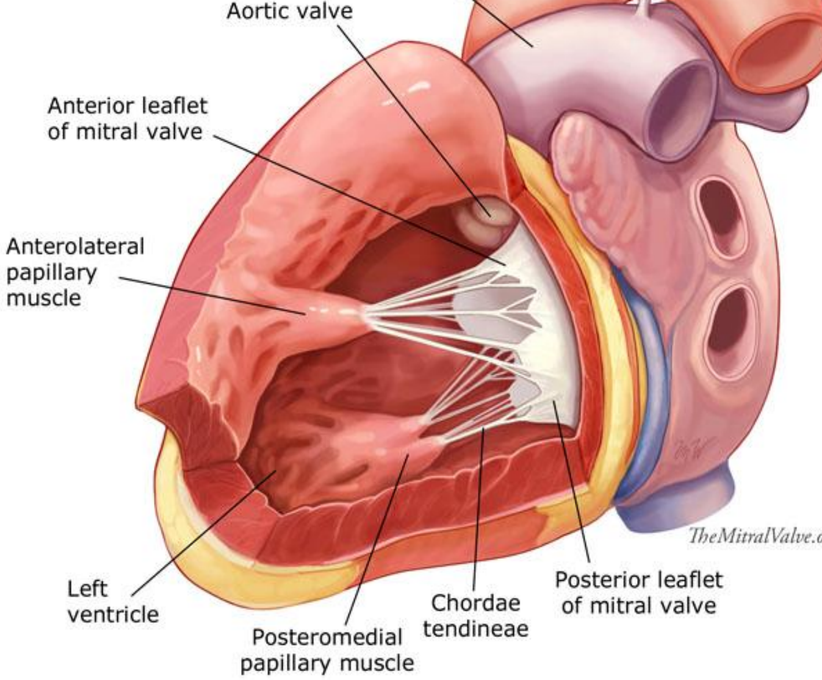


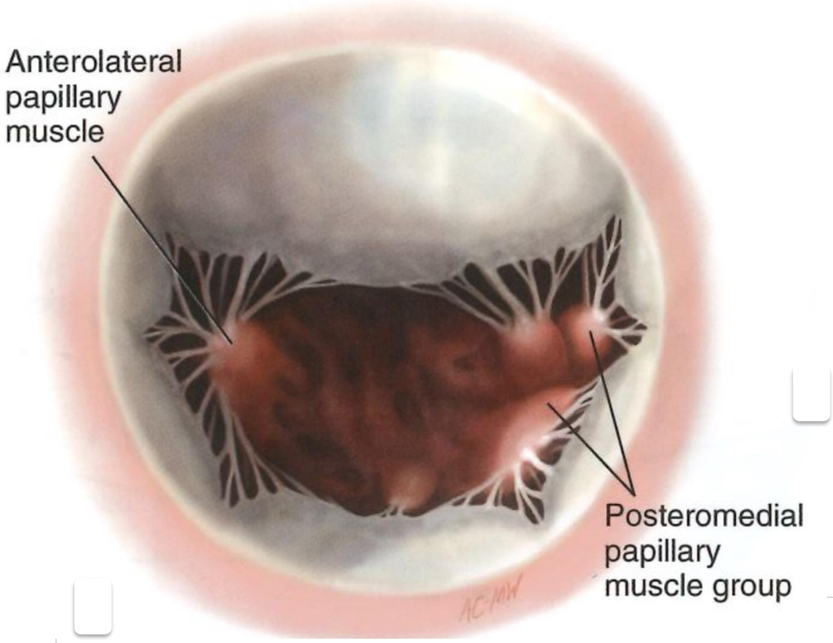


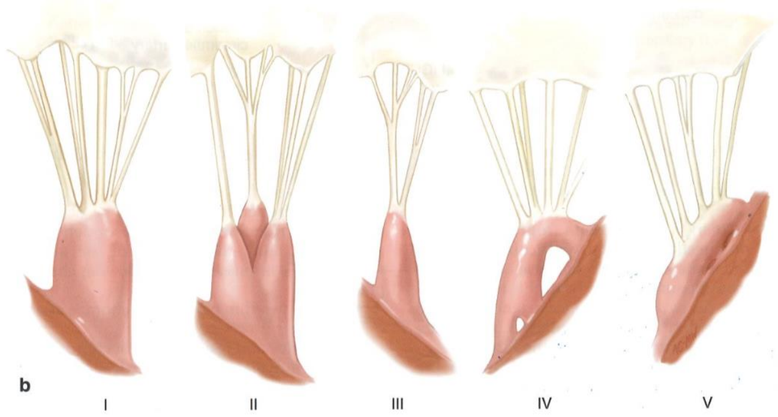
Anterolateral muscle : LAD + LCx

Papillary muscle rupture

- 2 papillar muscles
- Partial or complete rupture.
- Posteromedial rupture = x 5 to 10 common since vascularized by posterior descending artery only







Posteromedial muscle : Posterior descending artery

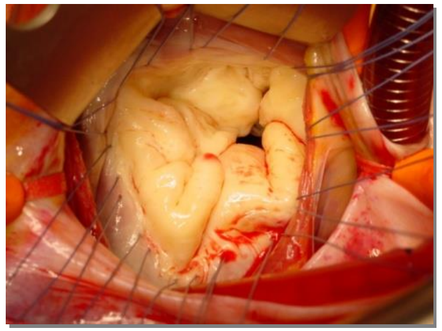
: from dominant artery , (RC > LCx)

Morphology

Etiology

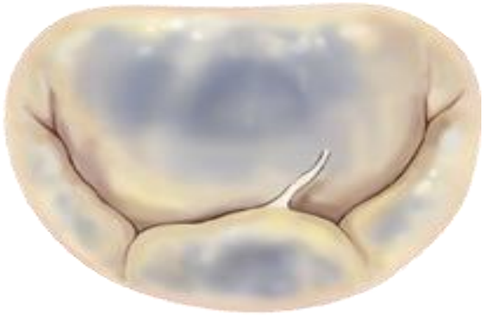
Spectrum of Degenerative MR*

**A.Carpentier. J Thorac Cardiovasc Surg 1983*

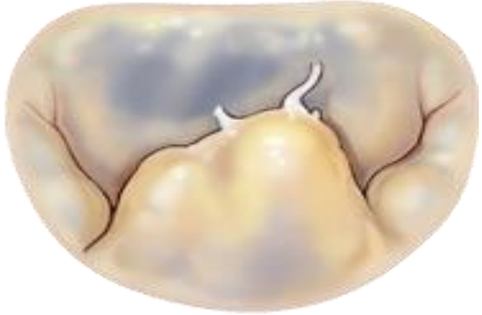


Excess of tissue ? A2 ≥ 34 mm

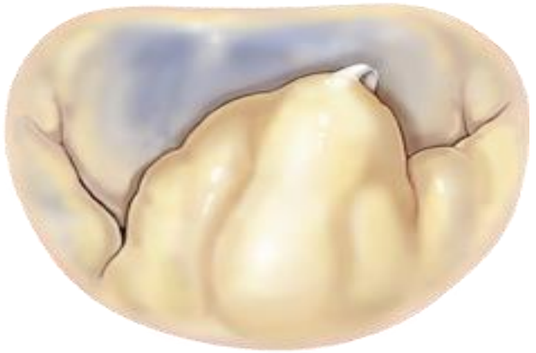
FED



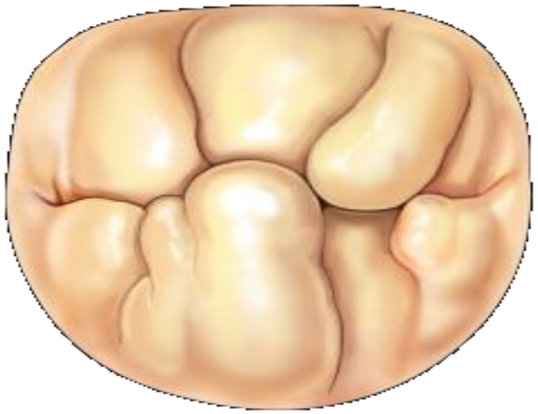
FED+

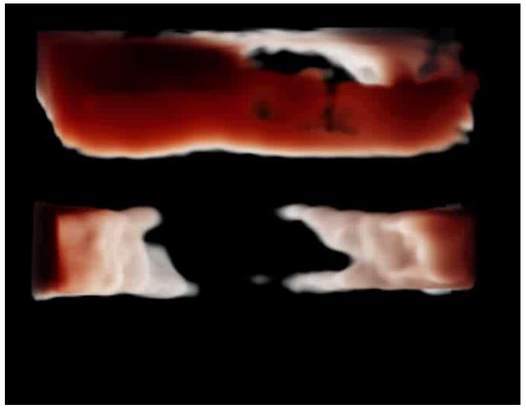


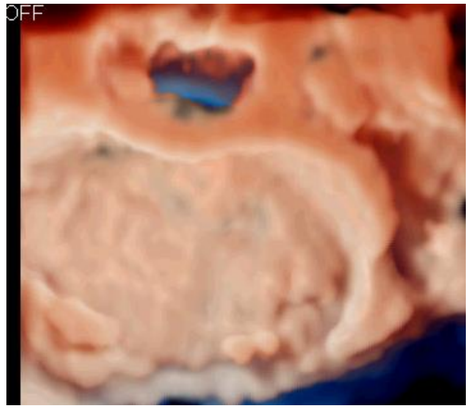
Form Fruste

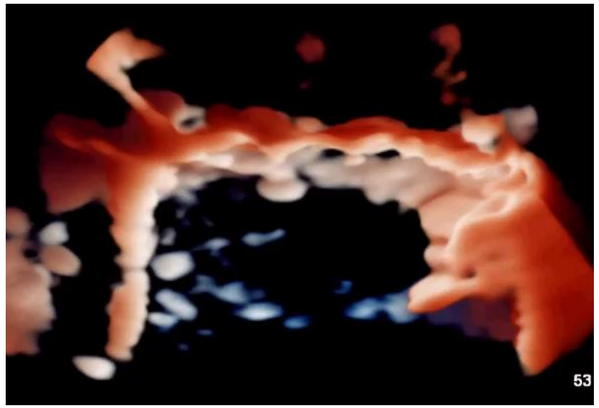


Barlow's







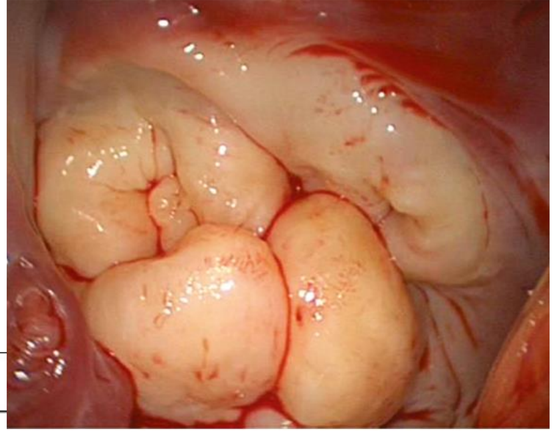


Review

Characterization of Degenerative Mitral Valve Disease: Differences between Fibroelastic Deficiency and Barlow's Disease

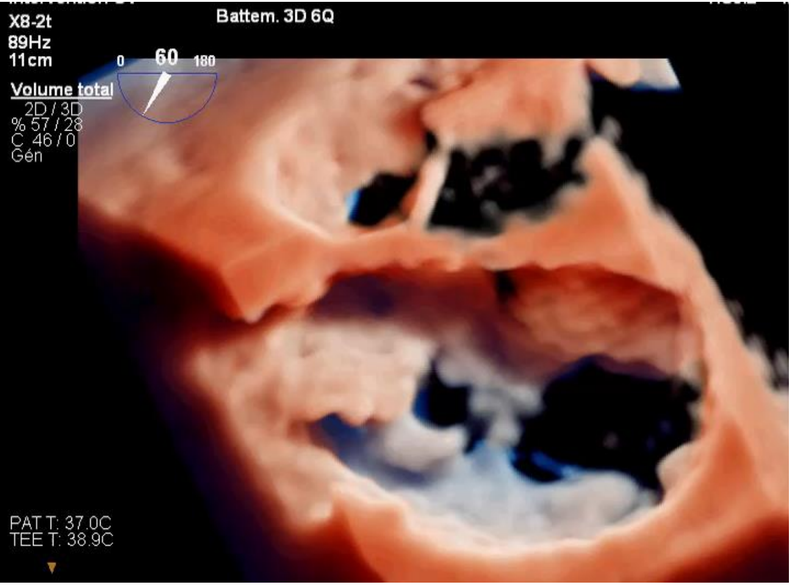
Aniek L. van Wijngaarden [1], Boudewijn P. T. Kruithof [1], Tommaso Vinella [2], Daniela Q. C. M. Barge-Schaapveld [3] and Nina Ajmone Marsan [1,*]

J. Cardiovasc. Dev. Dis. 2021, 8(2), 23

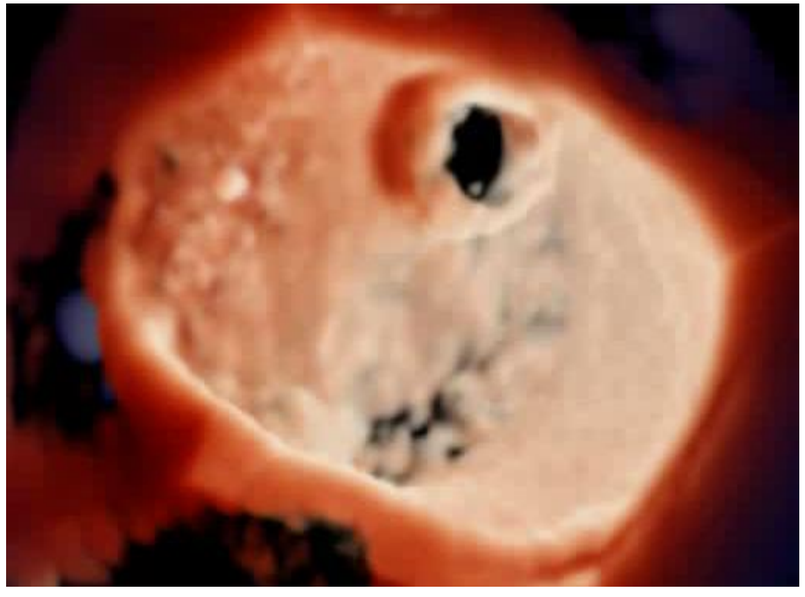


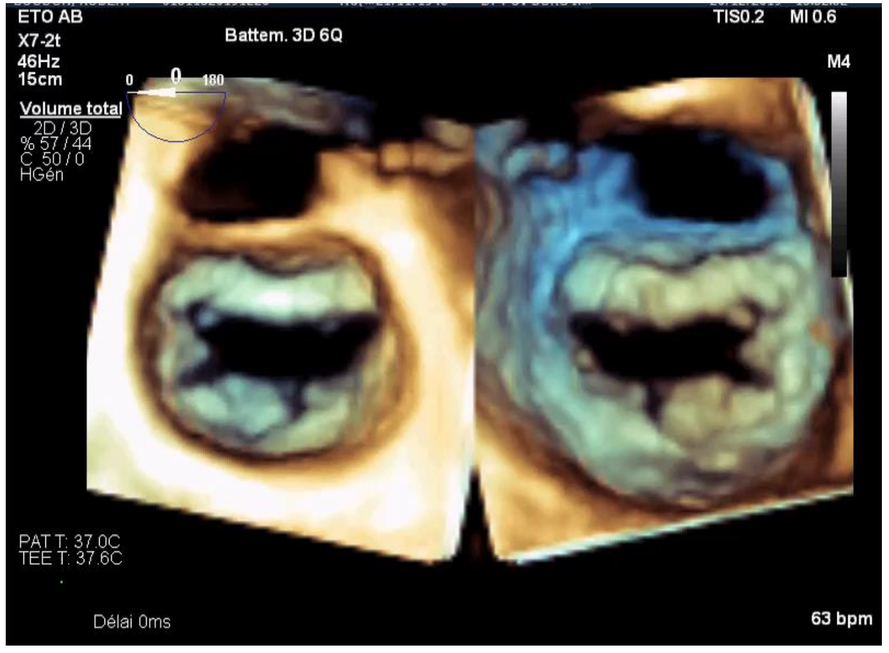
	Fibroelastic Deficiency	Barlow's Disease
Clinical Characteristics		
Age of onset	Older (>60 years)	Young (<60 years)
History	No history of murmur	Usually a long history of murmur
Duration of the disease	Months	Years to decades
Auscultation	Holosystolic murmur	Midsystolic click and late-systolic murmur
Echocardiographic Characteristics/Surgical Inspection and Approach		
Leaflets	Single segment (usually posterior) prolapse (flail) due to chordal rupture Thickened leaflet tissue (when present) is limited to the level of the prolapsing segment Thin/normal leaflet tissue in non-prolapsing segments	Diffuse excessive valve tissue with multiple segments, bi-leaflet prolapse Thickened leaflets
Annulus	Normal of moderate annular dilatation No calcifications	Severe annular dilatation Calcifications could be present Mitral annular disjunction Systolic outward motion during systole (curling)
Chordae	Chordal rupture of the involved segment	Elongated or ruptured Thickened and/or calcified
Repair approach	Respect tissue (annuloplasty and neochord implantation)	Resect tissue (annuloplasty, resection and sliding, neochord implantation)

Etiology

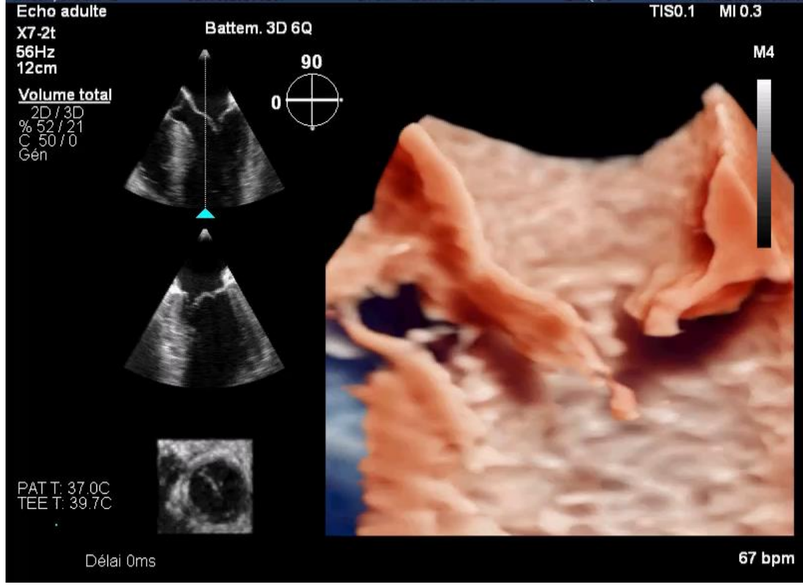


Endocarditis

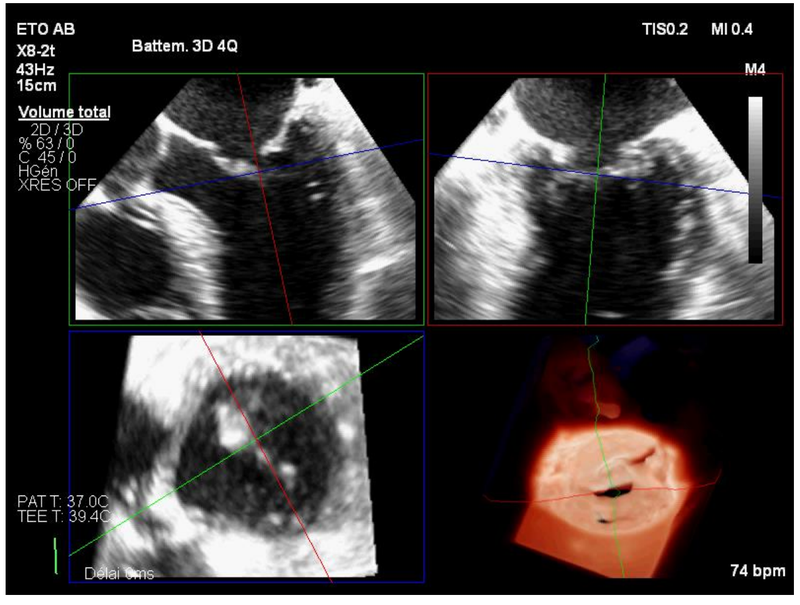




Secondary



HOCM



Rheumatic

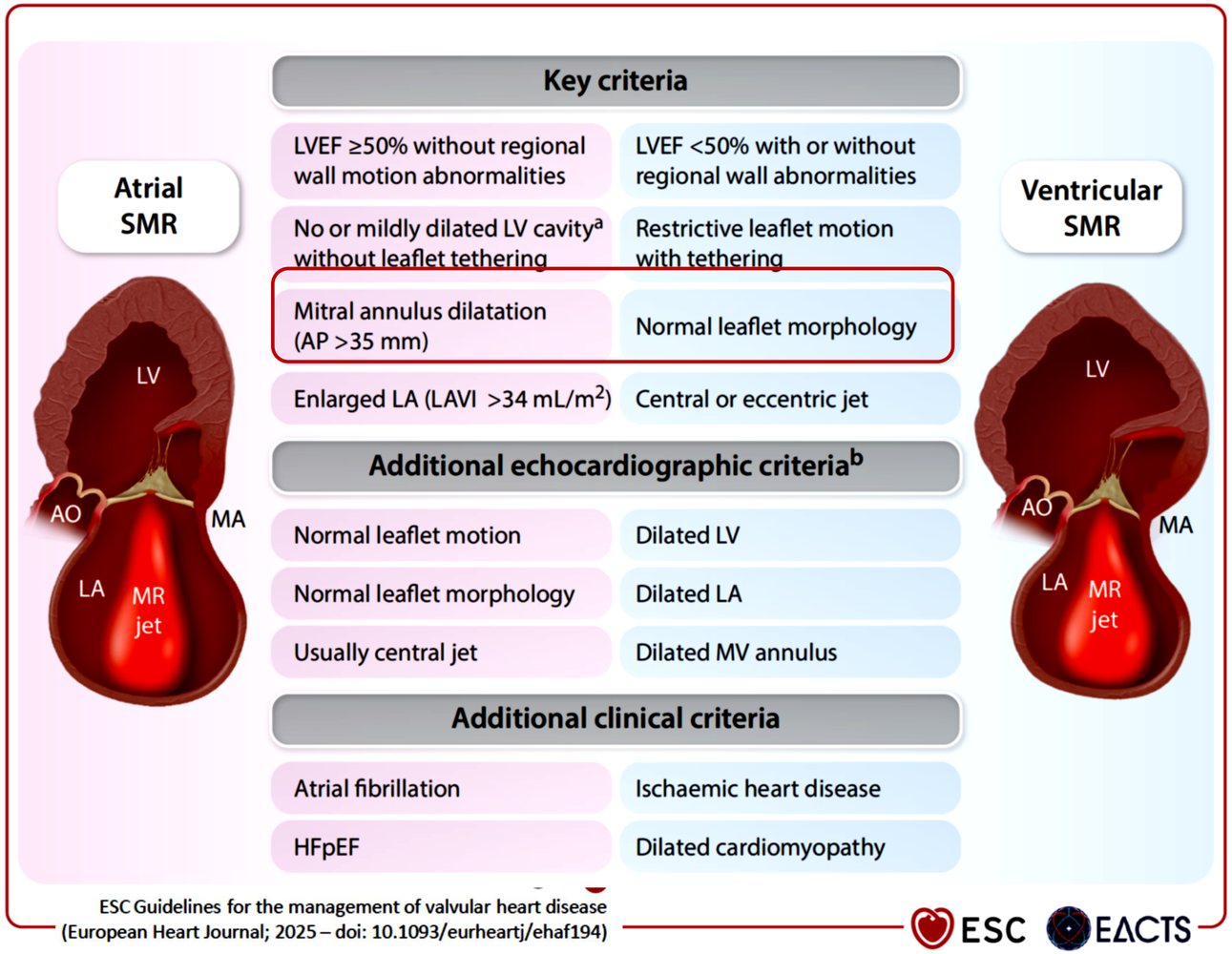
Secondary MR: Ventricular vs Atrial

Type I

Type IIIb (++)

ASMR

VSMR



ESC Guidelines for the management of valvular heart disease
(European Heart Journal; 2025 – doi: 10.1093/eurheartj/ehaf194)

ESC EACTS

Conclusion

5 key insights on mitral valve anatomy and morphology

1. Mitral valve is a complex functional unit +++
2. Functional anatomy is essential to communicate in a common language
3. Providing anatomical landmarks for imagers (3D views and orientation)
4. Understanding areas at risk during interventions
5. Spectrum of Primary MR (FED vs Barlow) and Secondary MR (V vs A)

PROGRAM
SEPTEMBER 25&26 2025

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