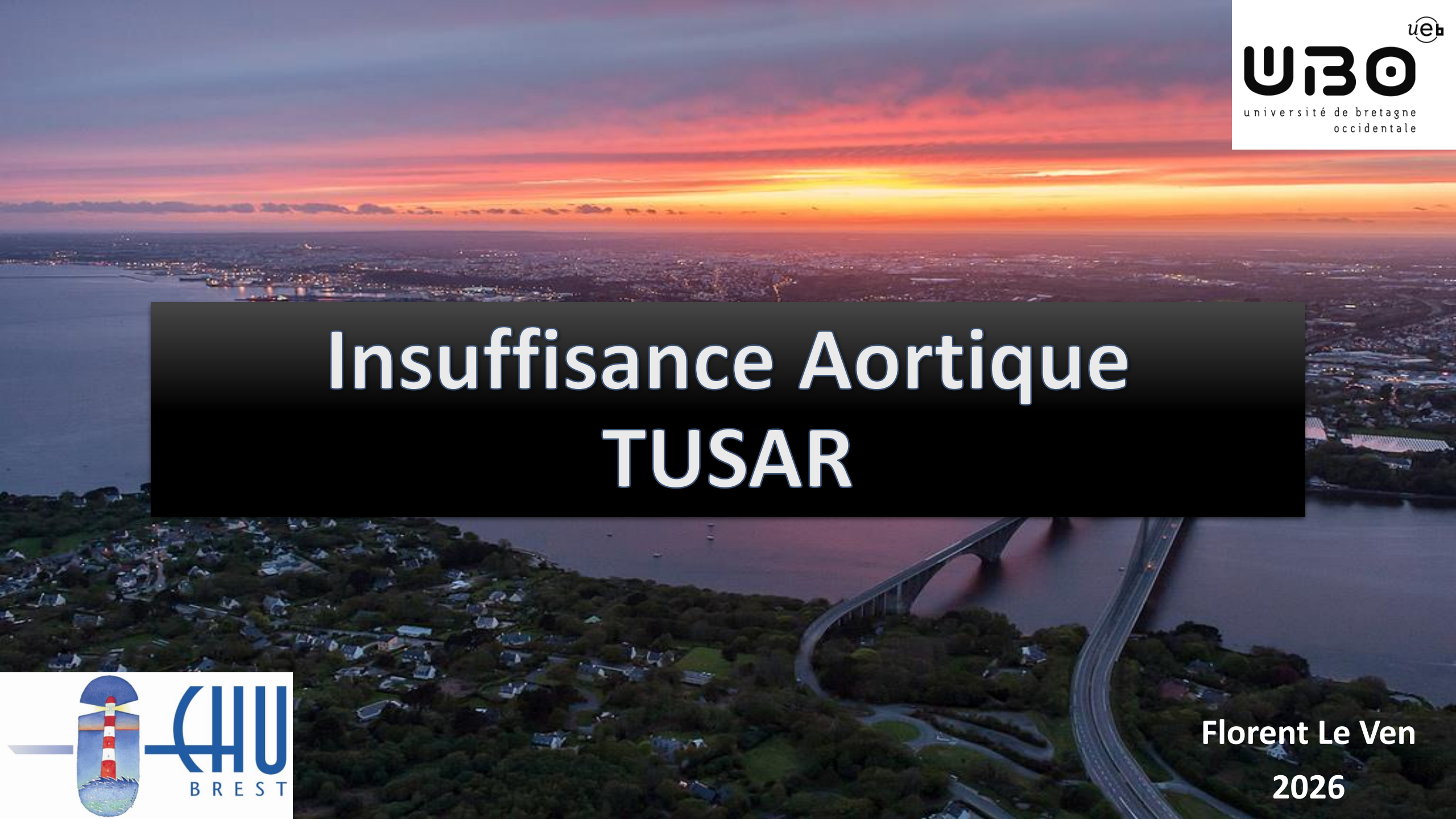
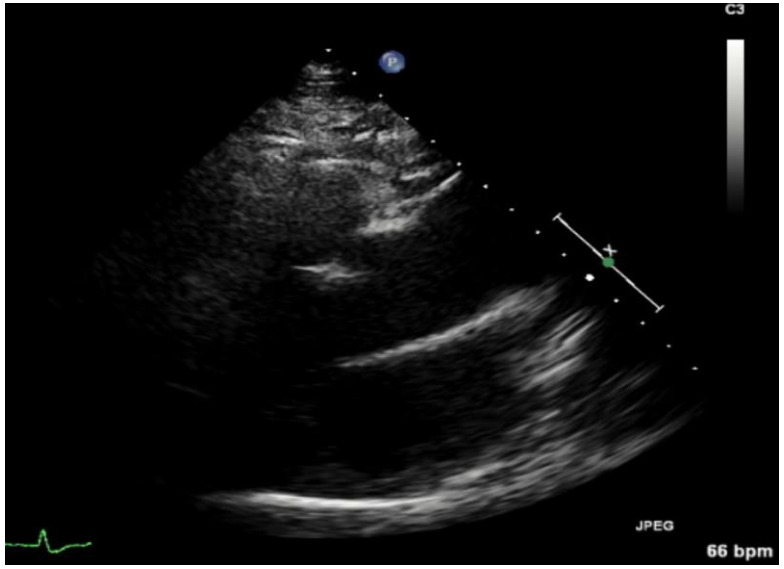


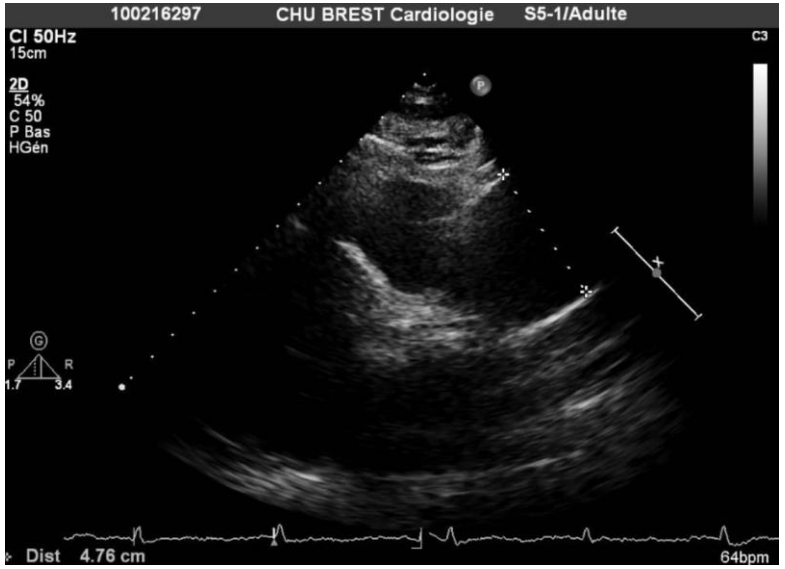
Insuffisance Aortique
TUSAR

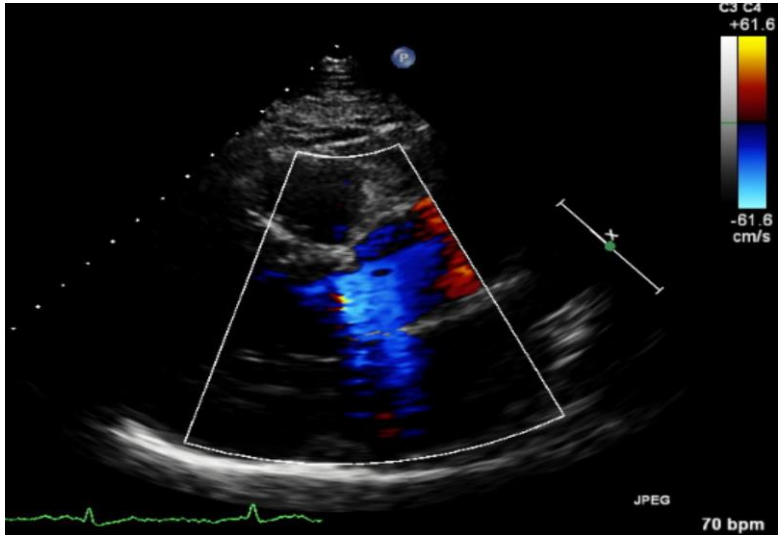
Florent Le Ven

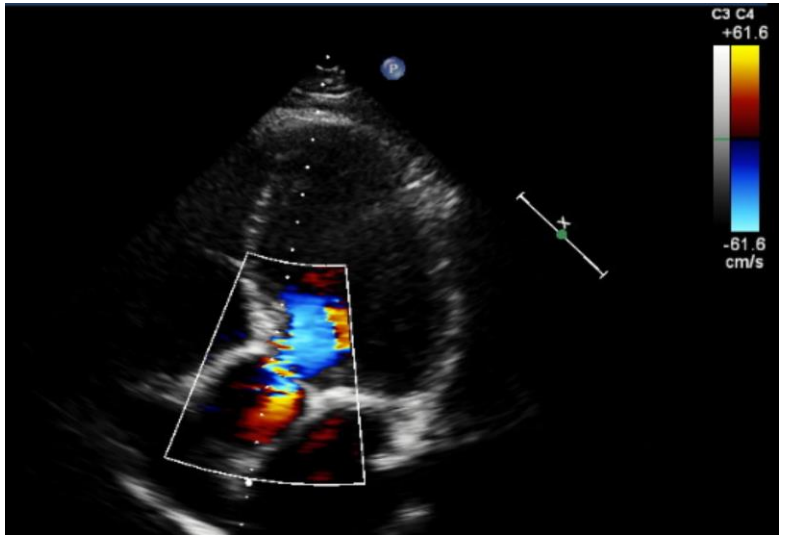
2026

MAN 57yo


C3
JPEG
66 bpm

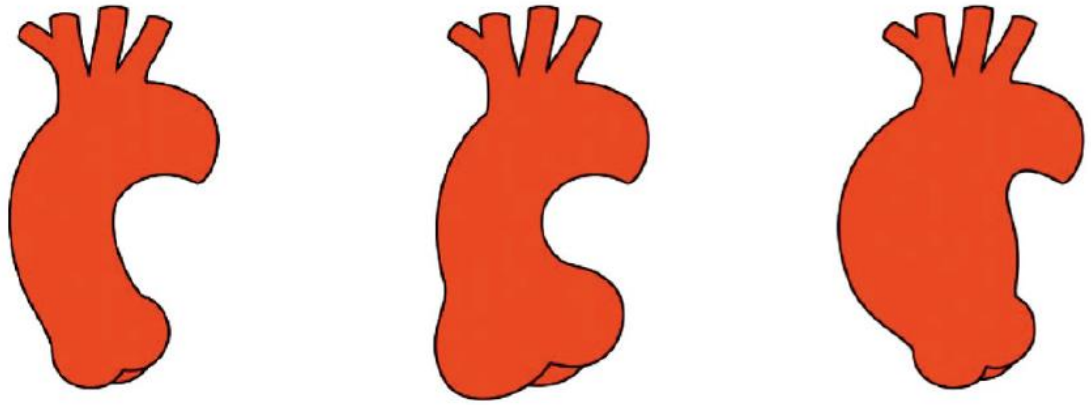

100216297
CHU BREST Cardiologie
S5-1/Adulte
CI 50Hz
15cm
2D
54%
C 50
P Bas
HGén
C3
Dist 4.76 cm
64bpm


C3 C4
+61.6
-61.6
cm/s
JPEG
70 bpm


C3 C4
+61.6
-61.6
cm/s

Mechanism

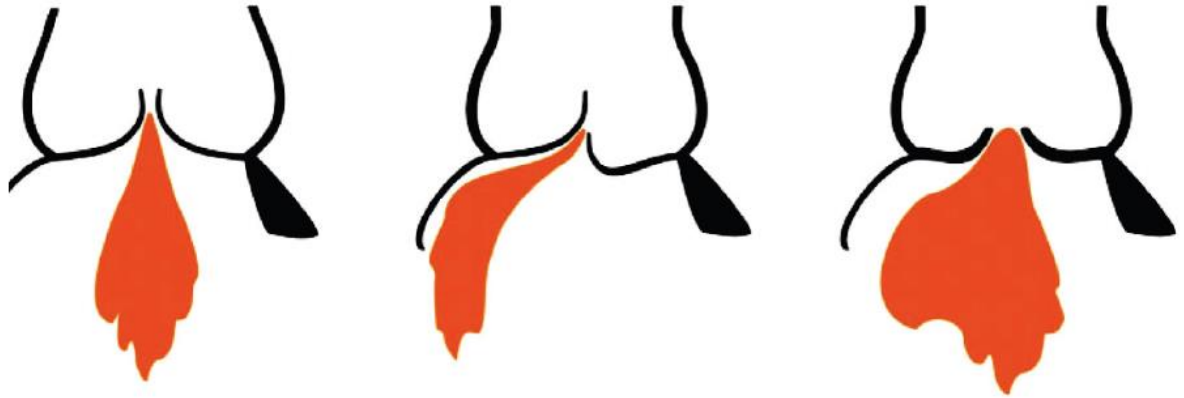
Phenotypes of Aortic Root and Ascending Aorta



Normal aorta | Aortic root dilation | Ascending aorta dilation

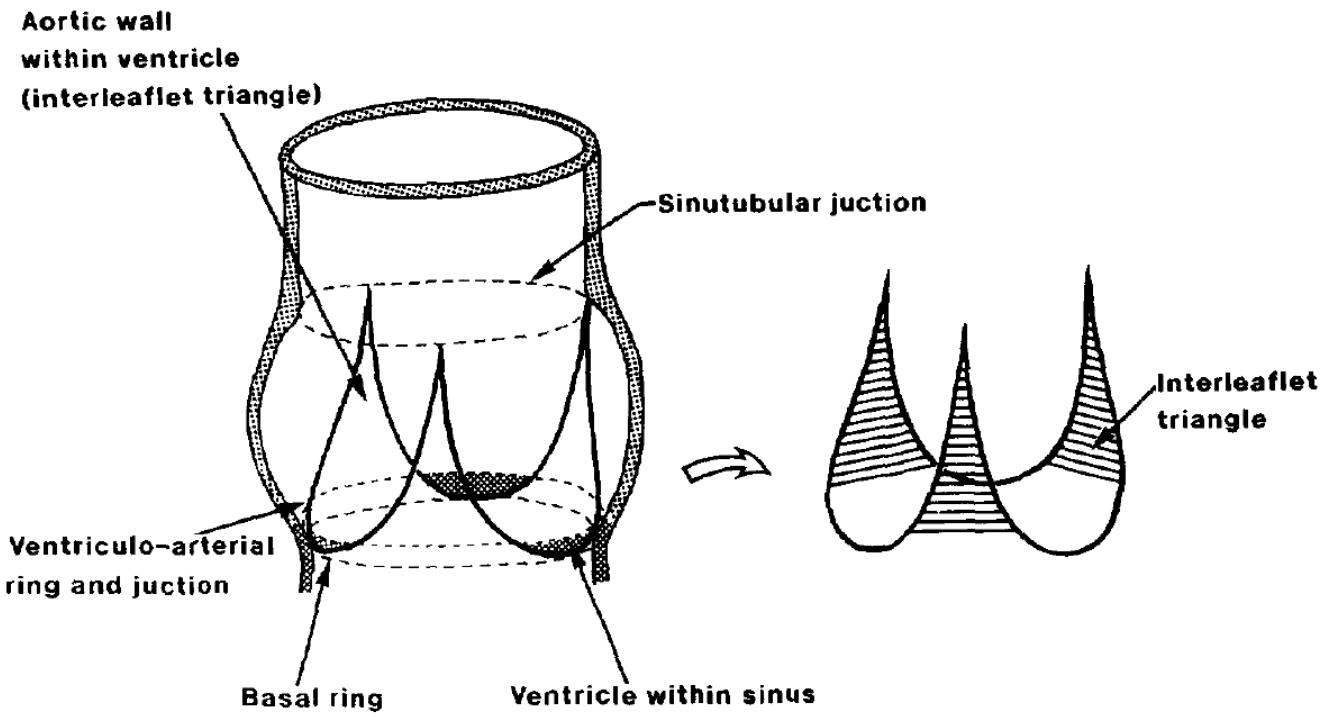
Mechanisms of AI Classification

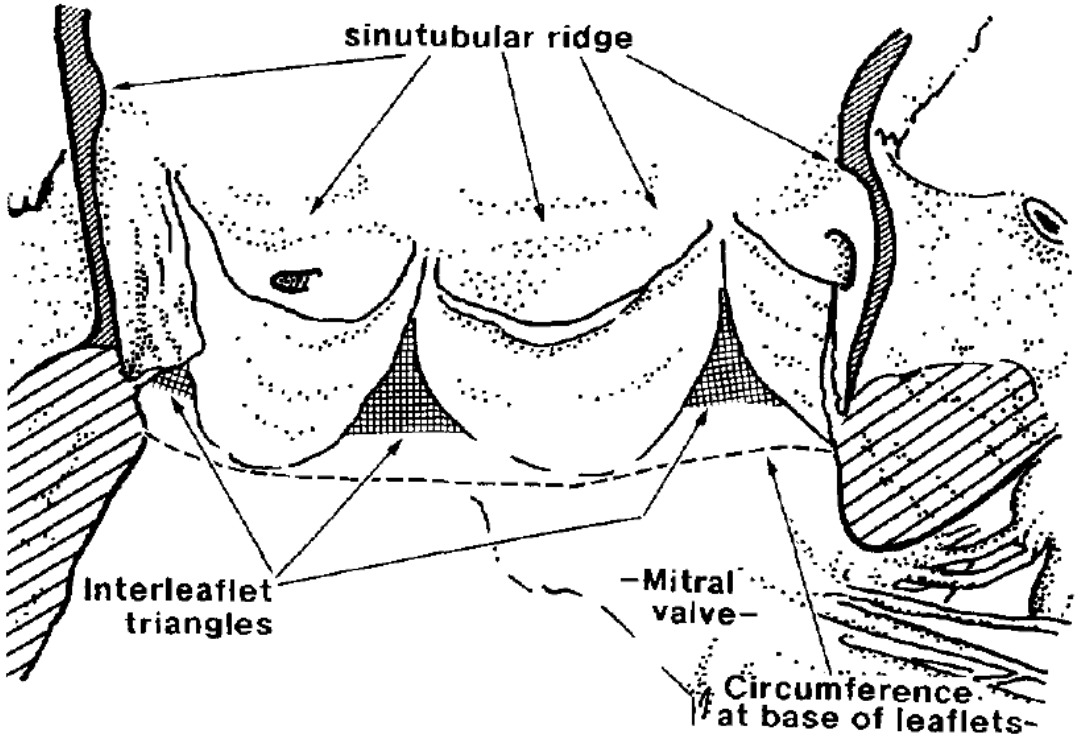
Type I	Type II	Type III
Normal cusp movements related to aortic root or ascending aorta dilation with central jet	Cusp prolapse with eccentric jet	Cusp retraction with poor tissue quality or quantity with large central and/or eccentric jet



Berrebi et al. *Ann Cardiothorac Surg* 2019;8(3):331-341

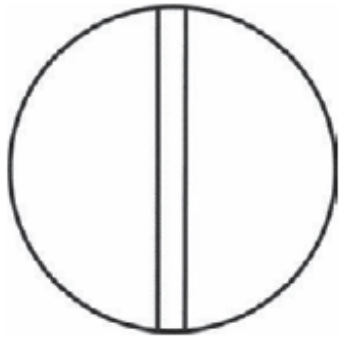
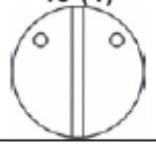
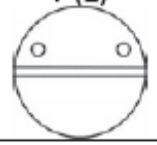
Standard Anatomy





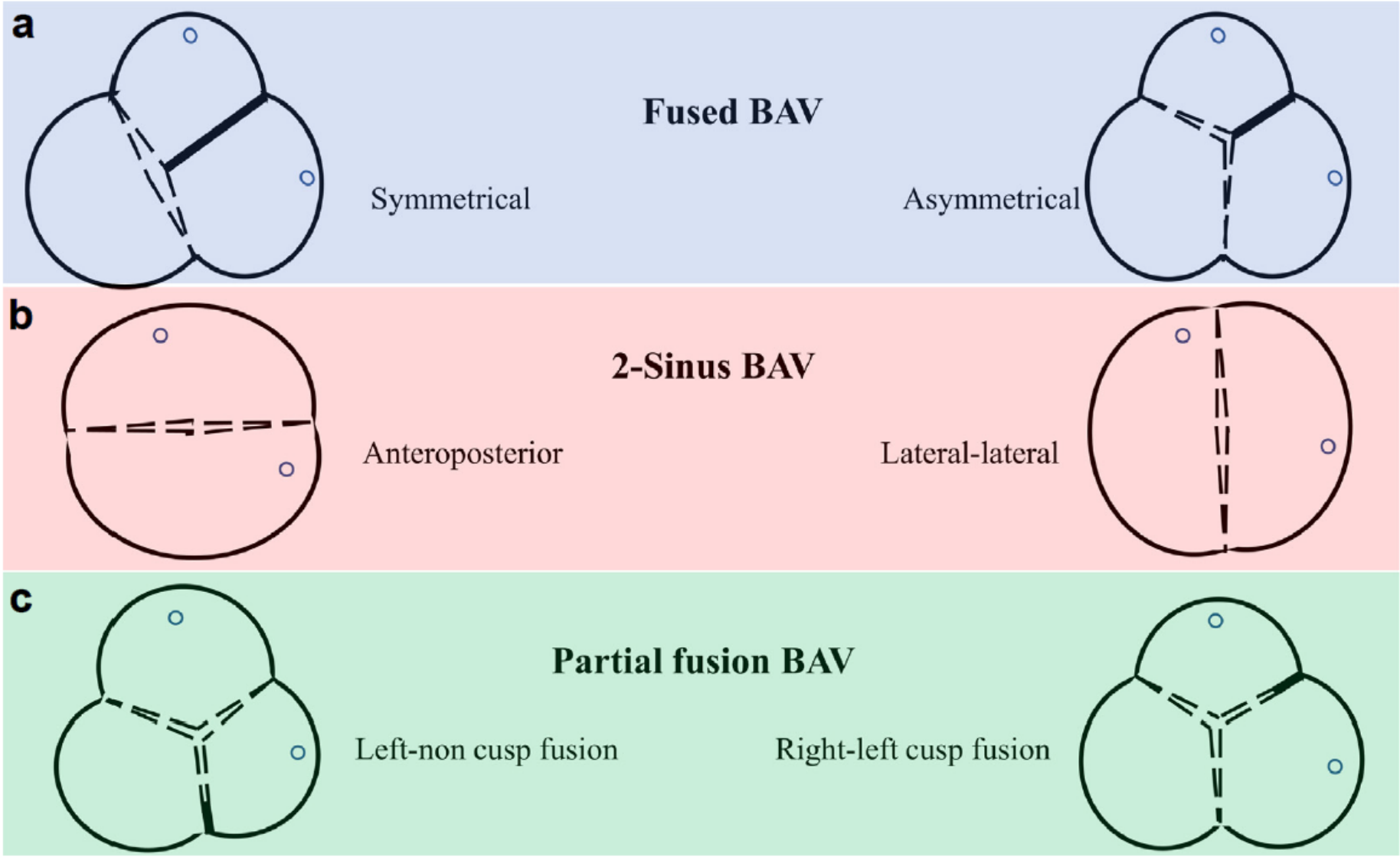
Sutton et al. Ann Thorac Surg1995;95:419-27

Classification morphologique

main category: number of raphes	0 raphe - Type 0		1 raphe - Type 1			2 raphes - Type 2
						
	21 (7)		269 (88)			14 (5)
1. subcategory: spatial position of cusps in Type 0 and raphes in Types 1 and 2	lat 13 (4) 	ap 7 (2) 	L – R 216 (71) 	R – N 45 (15) 	N – L 8 (3) 	L – R / R – N 14 (5) 
2. subcategory:						
VALVULAR FUNCTION I	6 (2)	1 (0.3)	79 (26)	22 (7)	3 (1)	6 (2)
VALVULAR FUNCTION S	7 (2)	5 (2)	119 (39)	15 (5)	3 (1)	6 (2)
VALVULAR FUNCTION B (I + S)		1 (0.3)	15 (5)	7 (2)	2 (1)	2 (1)
VALVULAR FUNCTION No			3 (1)	1 (0.3)		

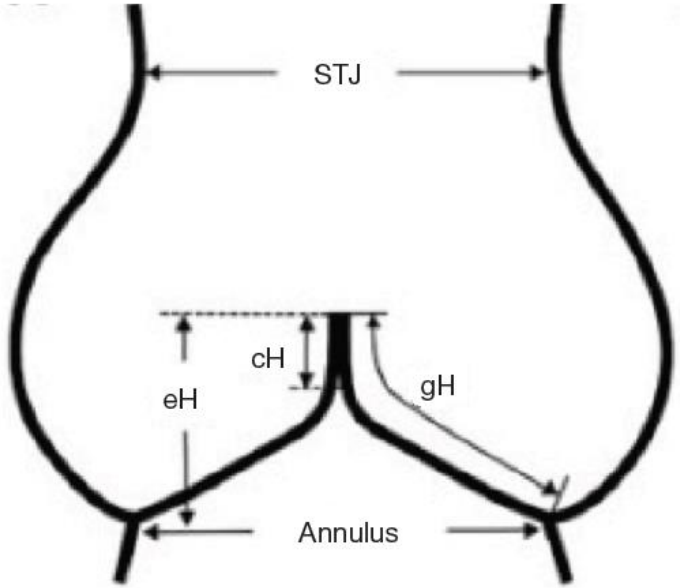
Sievers HH. JTCS 2007;133:1226-1233.

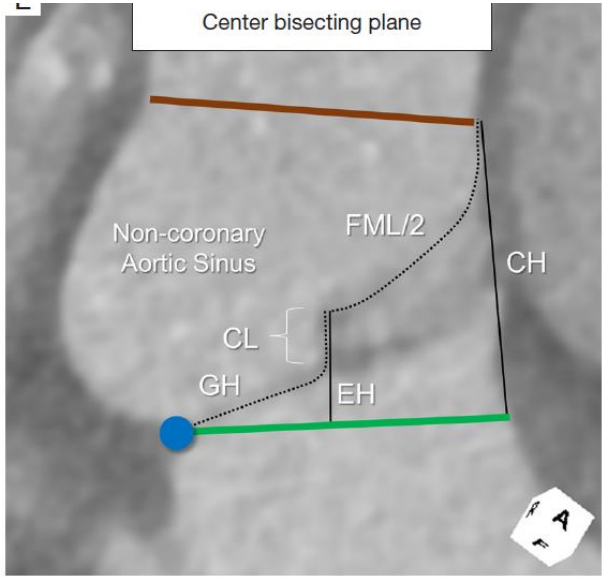
Bicuspid Aortic Valve

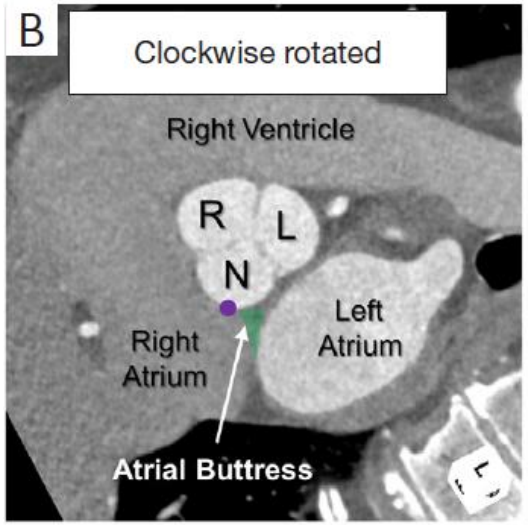


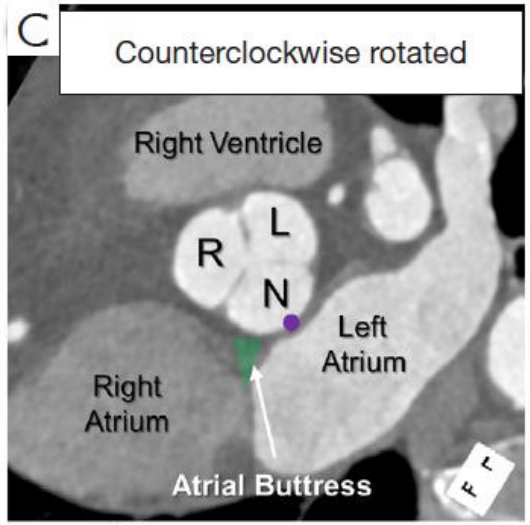
Kalra et al. Structural Heart (2024) 100227

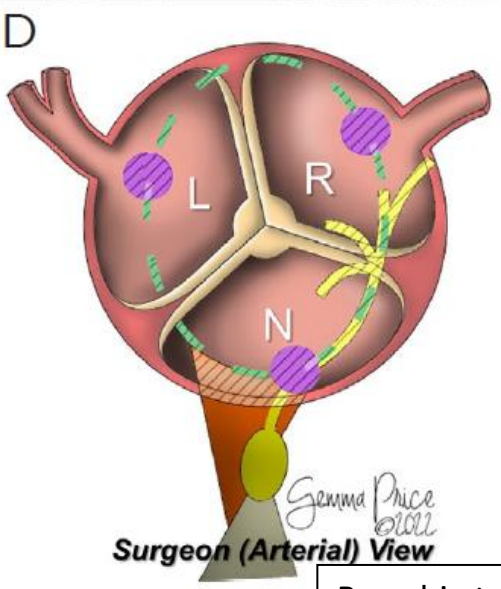
« Advanced » Parameters

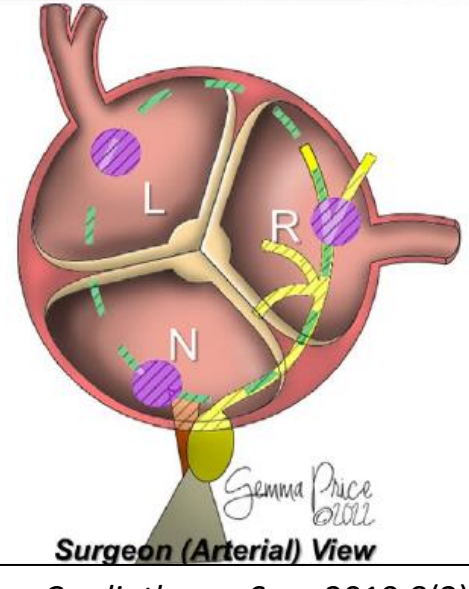




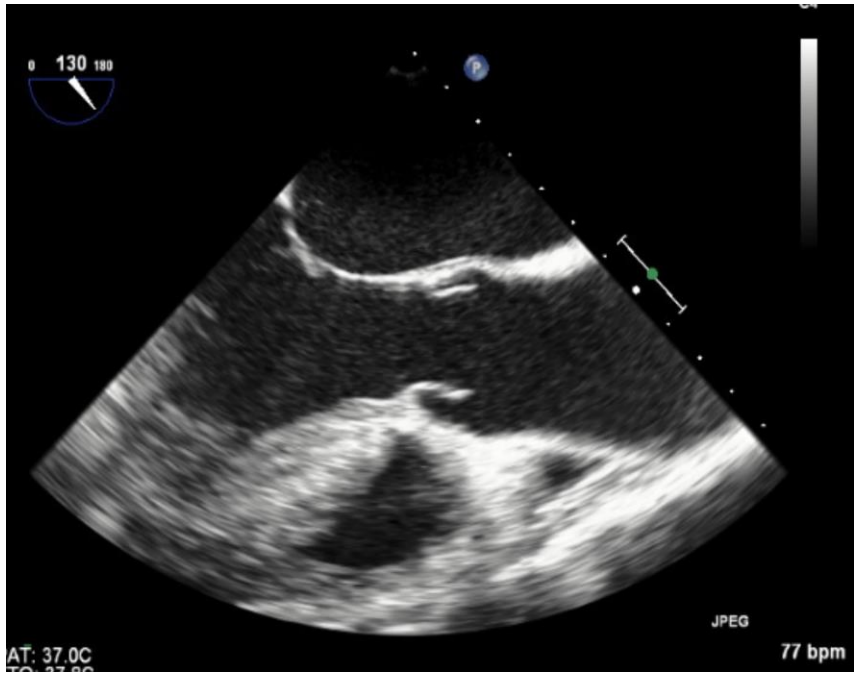


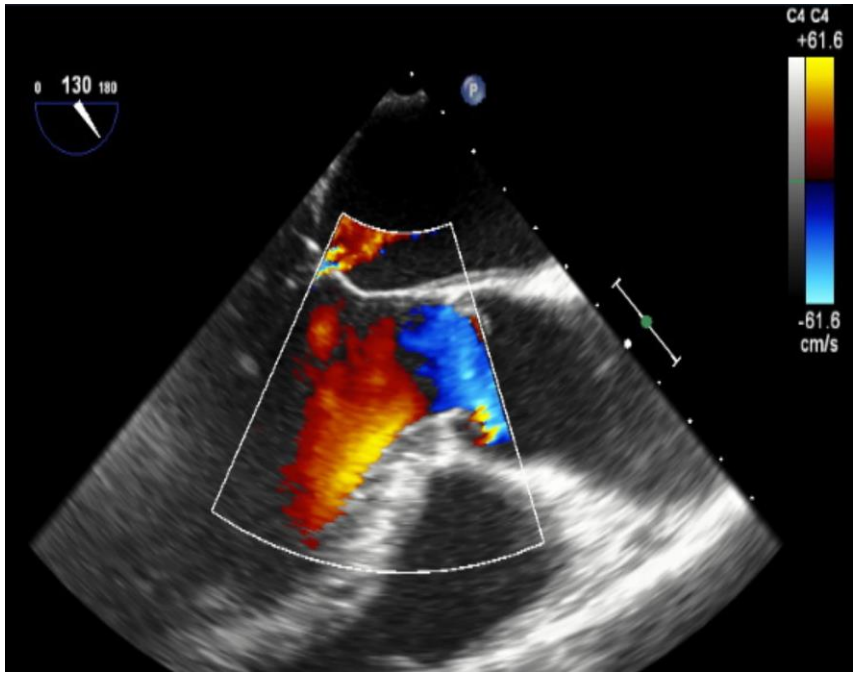


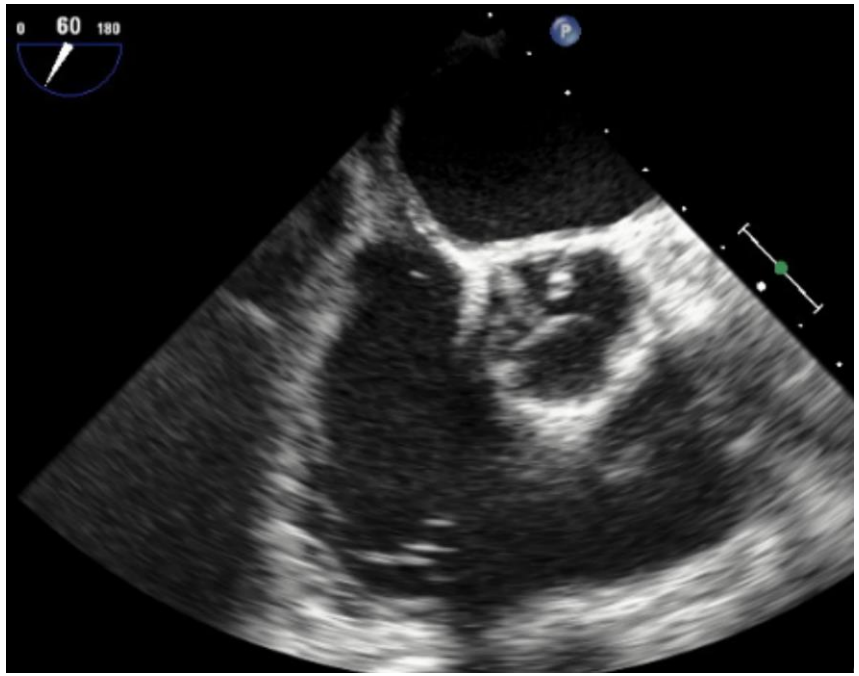


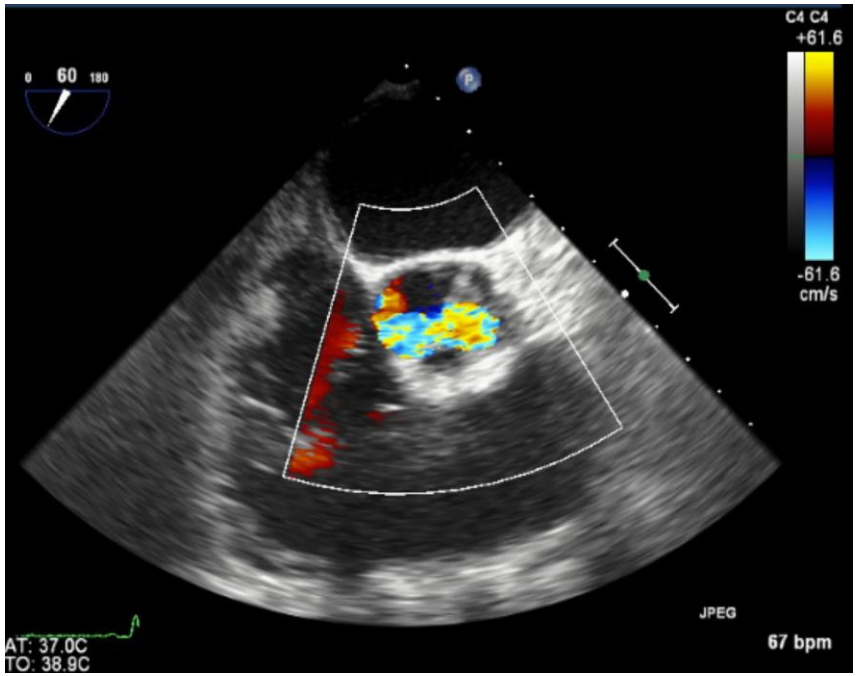


Berrebi et al. *Ann Cardiothorac Surg* 2019;8(3):331-341;
Tretter et al. *Ann Cardiothorac Surg* 2023;12(4):295-317


0 130 180
JPEG
AT: 37.0C
77 bpm


C4 C4
+61.6
0 130 180
-61.6
cm/s

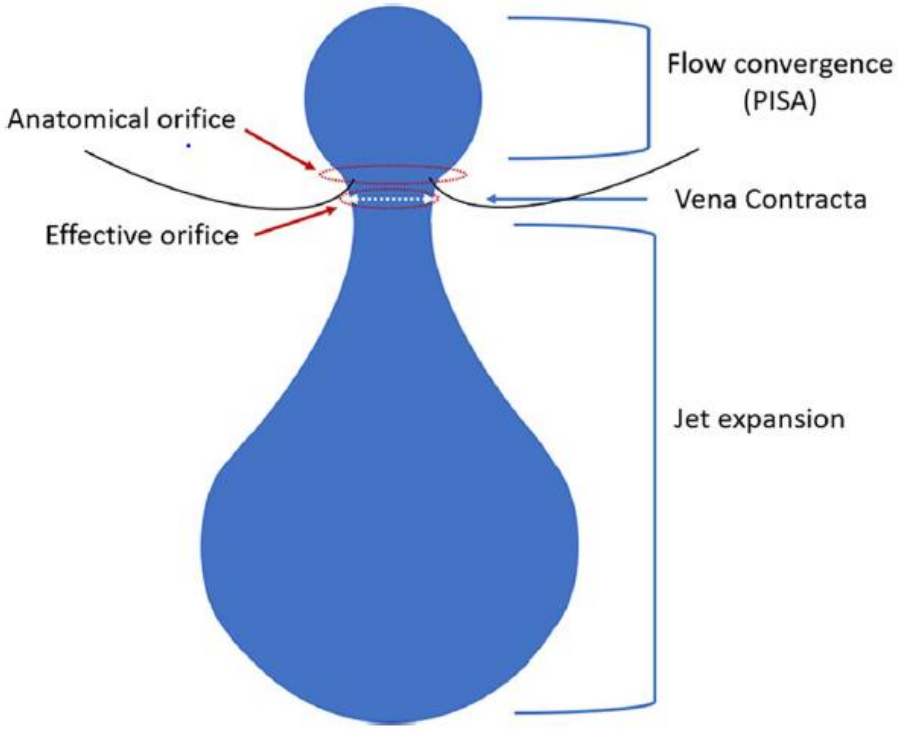

0 60 180


C4 C4
+61.6
0 60 180
-61.6
cm/s
JPEG
AT: 37.0C
TO: 38.9C
67 bpm

Fenestration

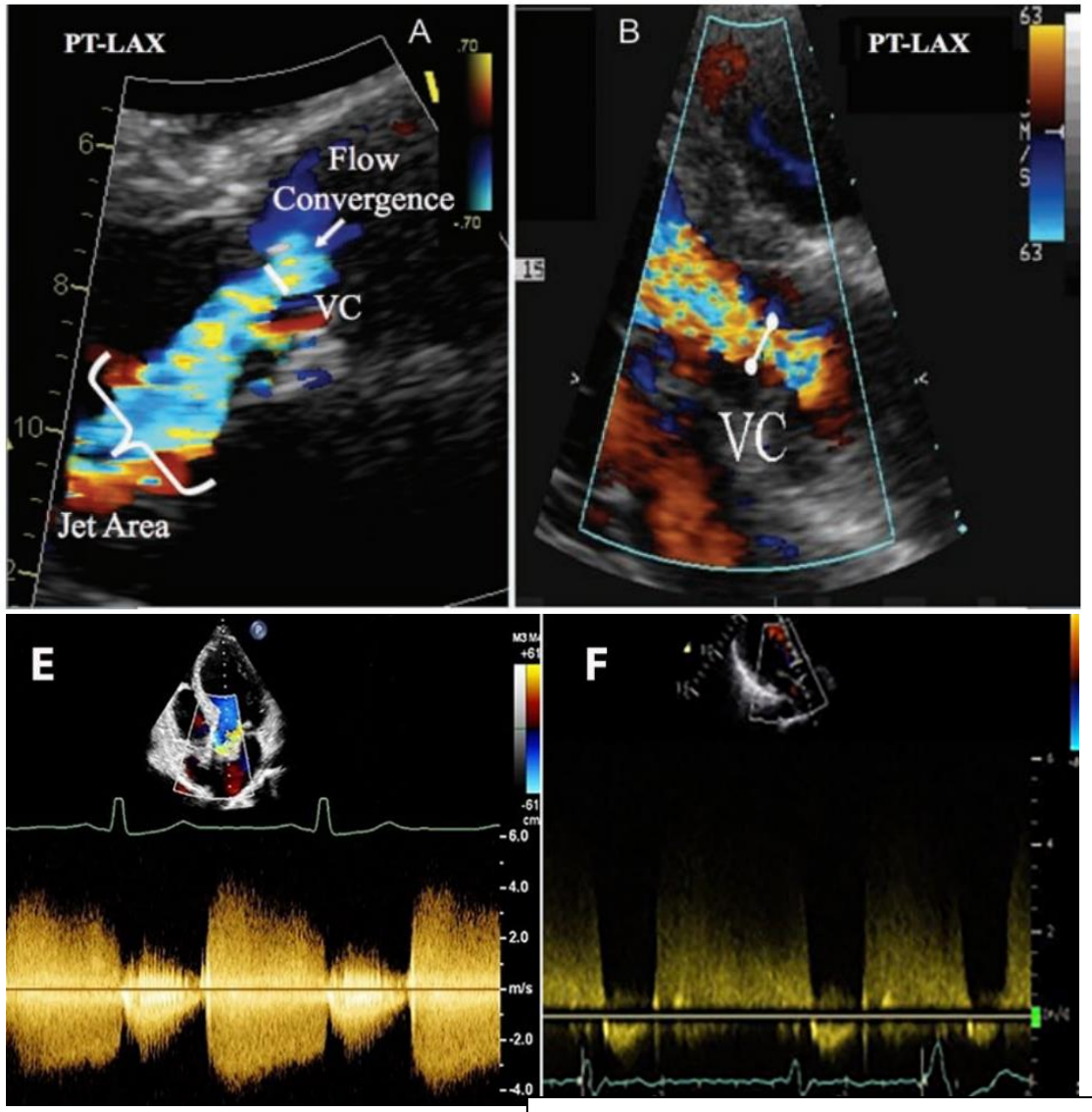
Blaszyk et al. *Cardiovasc Pathol 1999;8:213–216*

Doppler Analysis



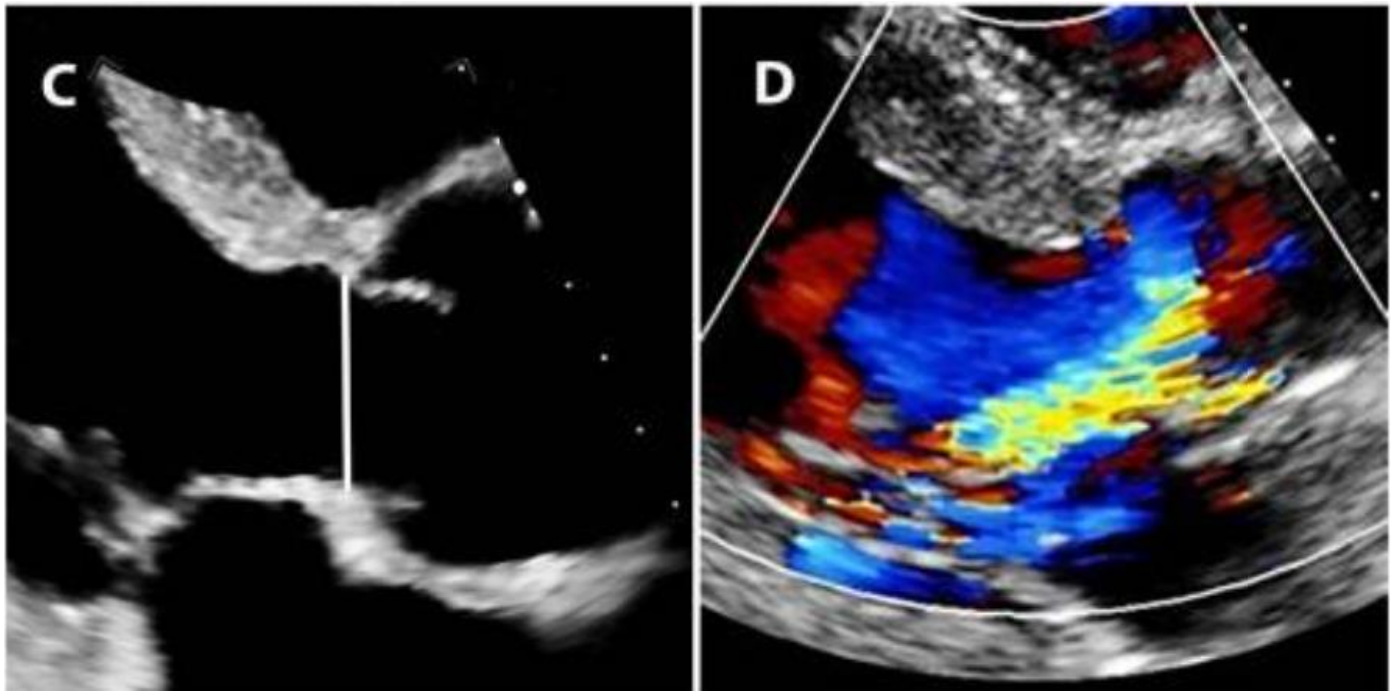
< 3mm = mild regurgitation

> 6mm = severe regurgitation



Victor et al. Echo Research & Practice (2025) 12:3

Jet Width/LVOTd

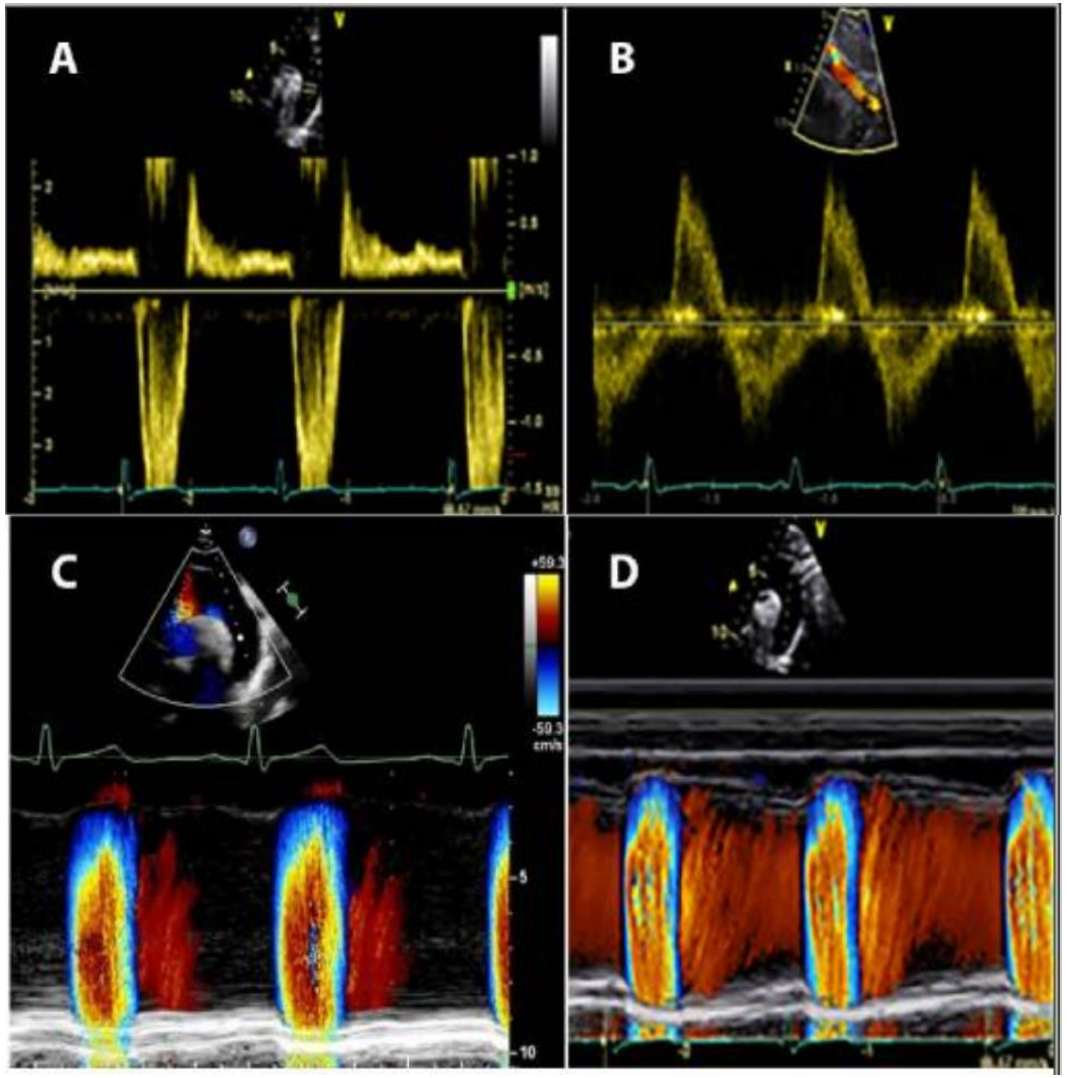


<25% = mild regurgitation

>65% = severe regurgitation

Victor et al. Echo Research & Practice (2025) 12:3

Aorta flow reversal



≥ 20 cm/s (descending)

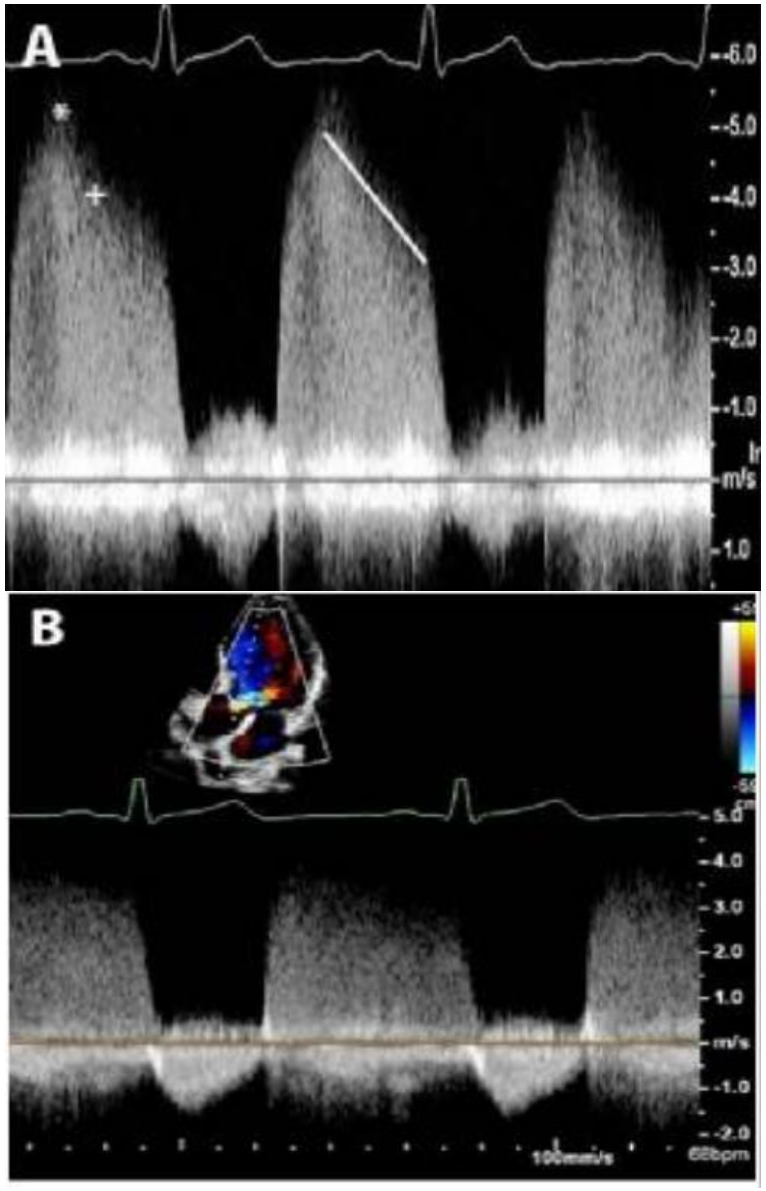
or

Diastolic reversal (abdominal)

= Severe regurgitation

Victor et al. Echo Research & Practice (2025) 12:3

Pressure Half Time

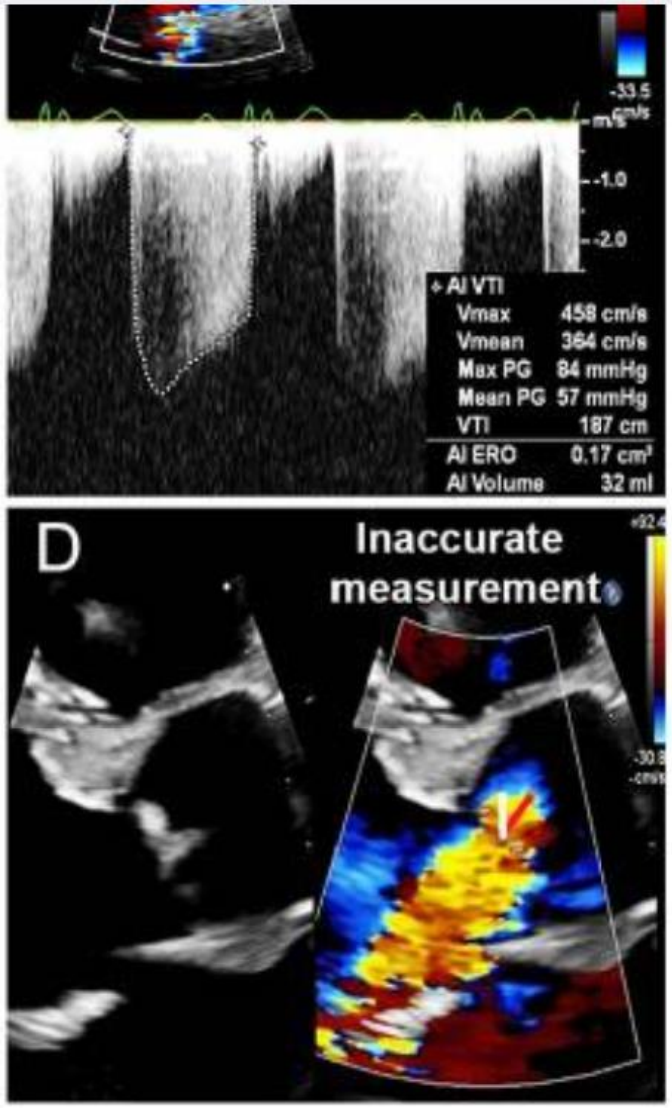


> 500 ms = mild regurgitation

< 200 ms = severe regurgitation

Victor et al. Echo Research & Practice (2025) 12:3

PISA



EROA < 0.1 cm²

RV < 10 ml — Mild

RF < 30%

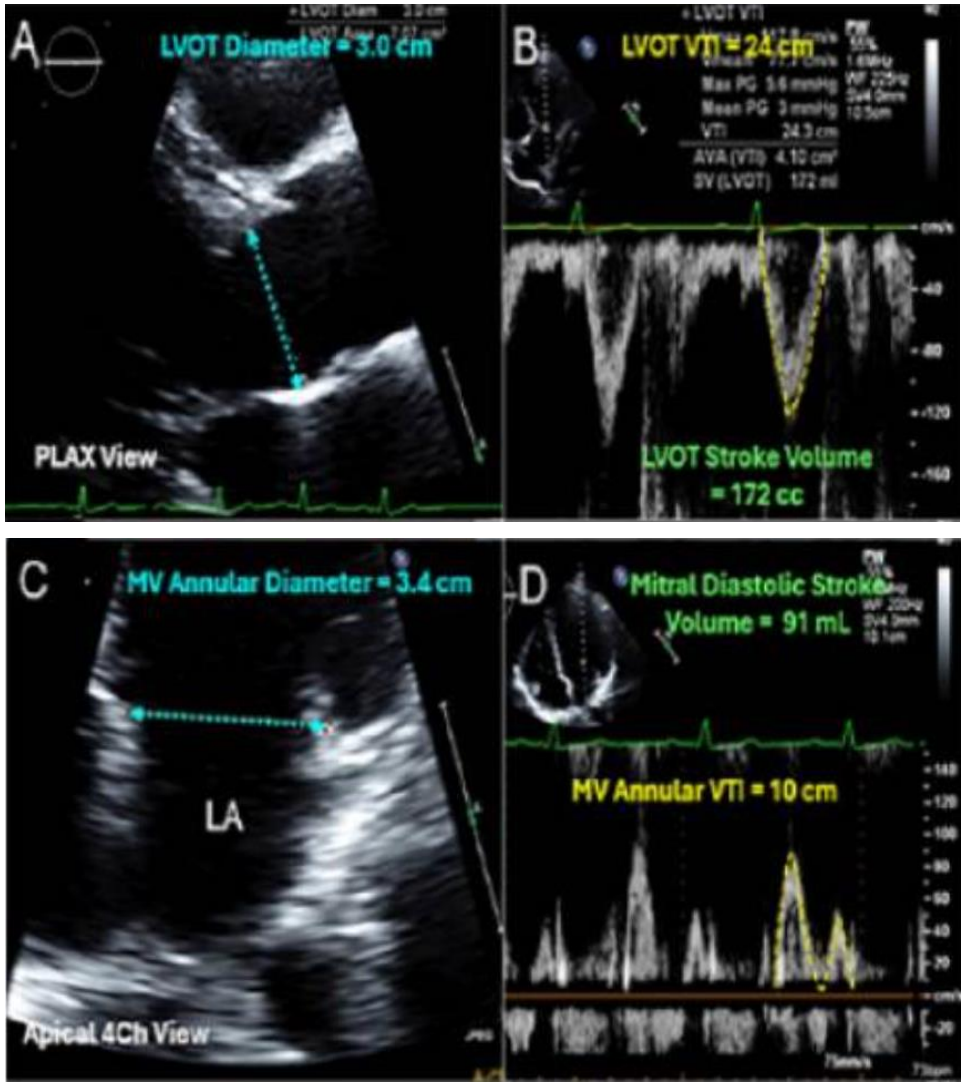
EROA >0.3 cm²

RV > 60 ml — Severe

RF > 50%

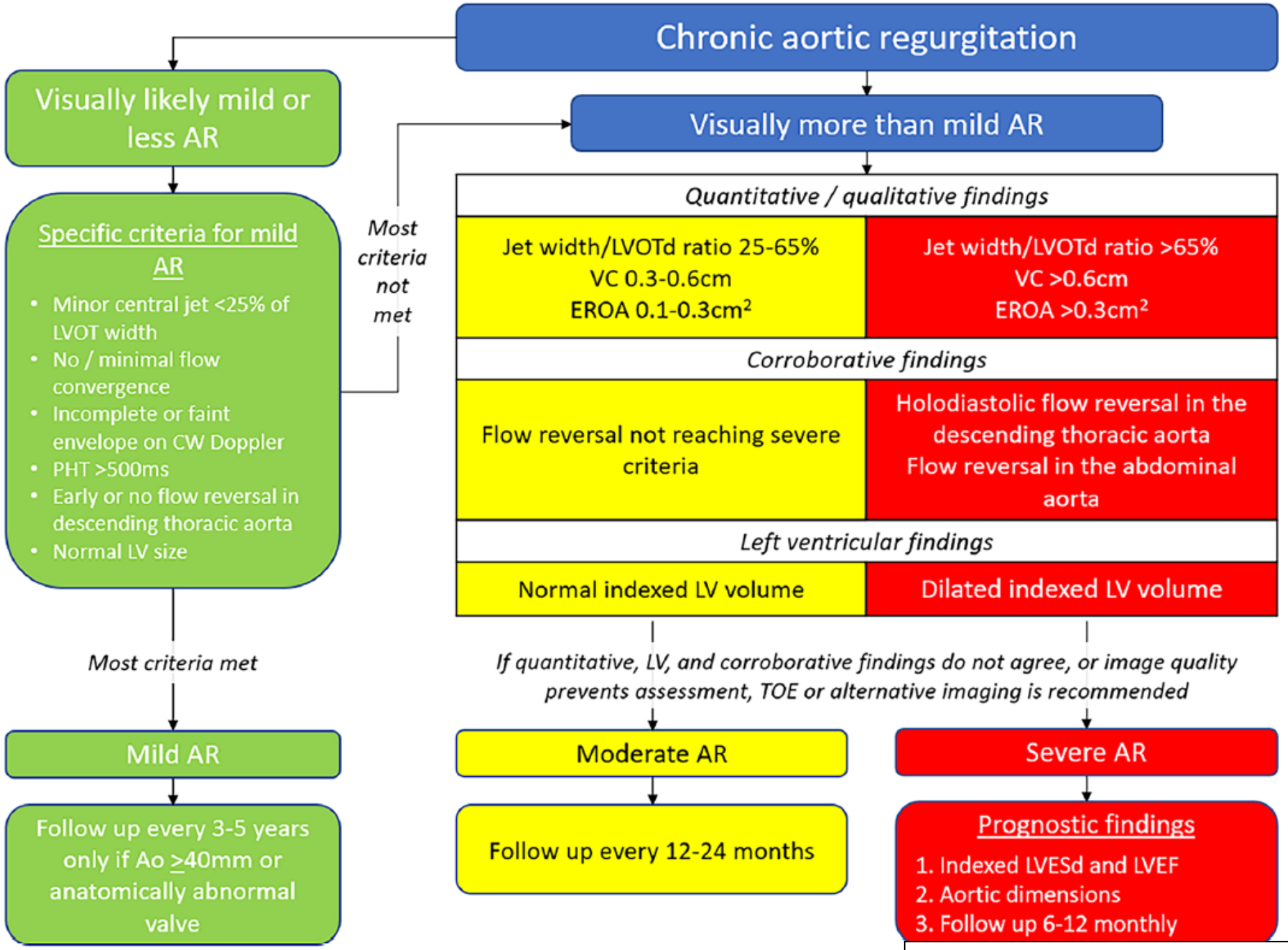
Victor et al. Echo Research & Practice (2025) 12:3

Volumetric Method

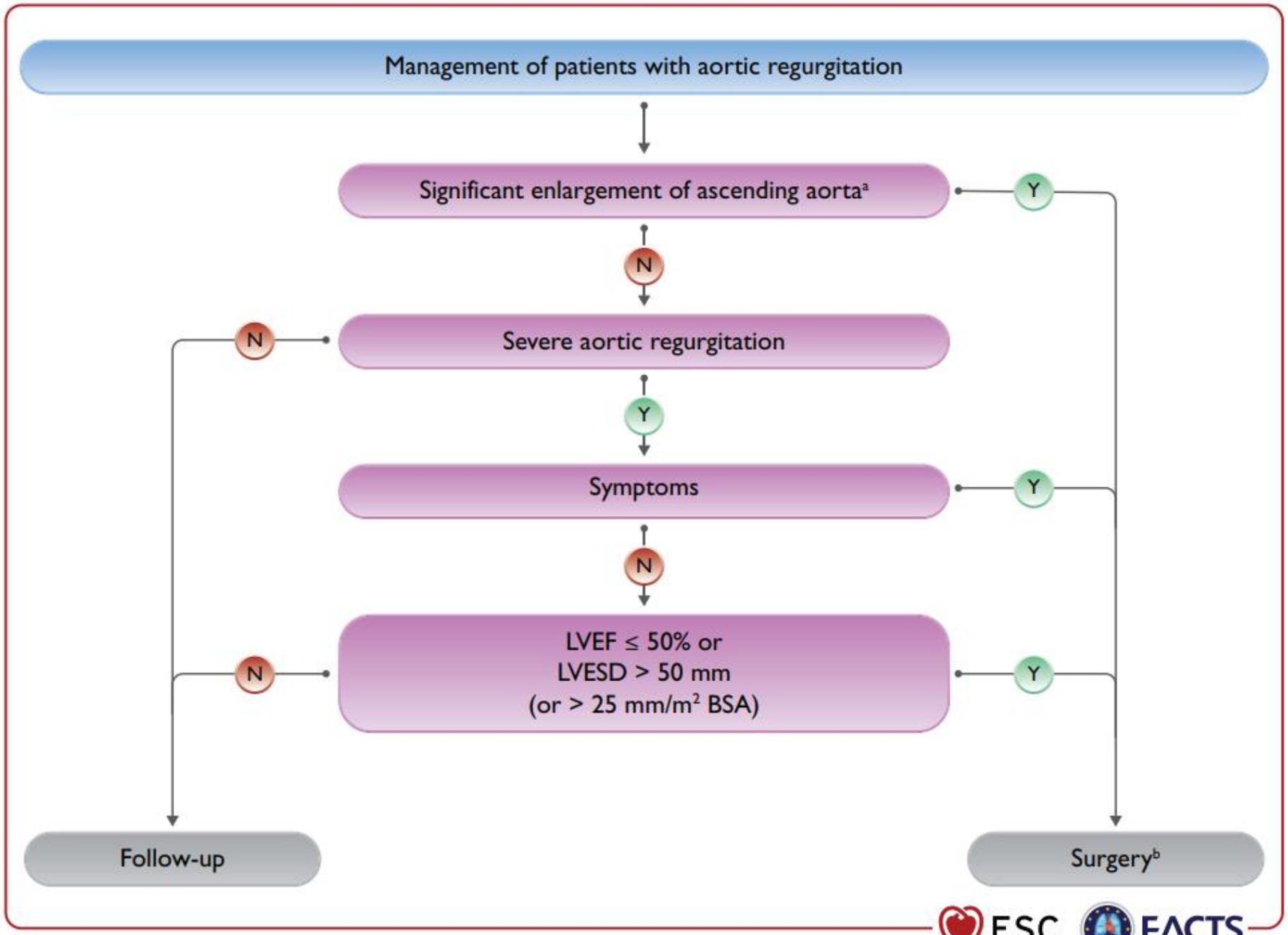


EROA < 0.1 cm^2	
RV < 10 ml	Mild
RF < 30%	
EROA >0.3 cm^2	
RV > 60 ml	Severe
RF > 50%	

Victor et al. Echo Research & Practice (2025) 12:3



Victor et al. Echo Research & Practice (2025) 12:3

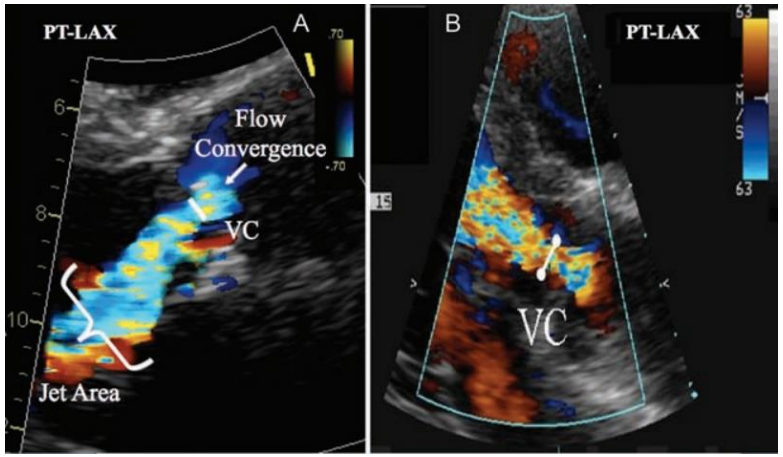


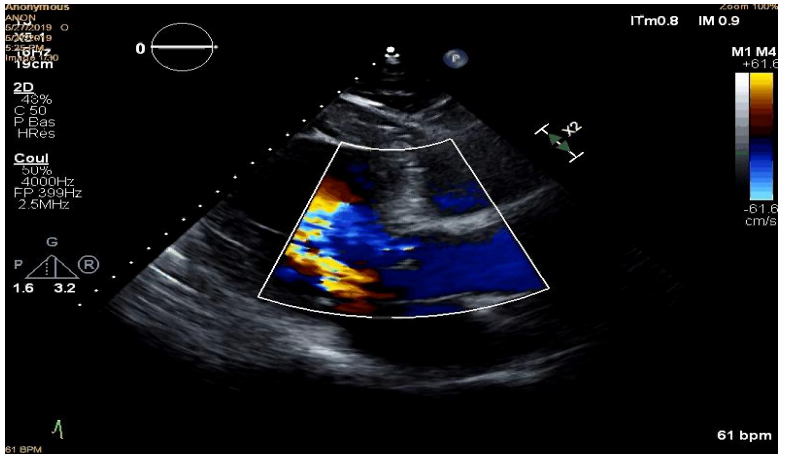
Vahanian et al. European Heart Journal (2022) 43, 561–632

In real life …


ADVERTISEMENTS

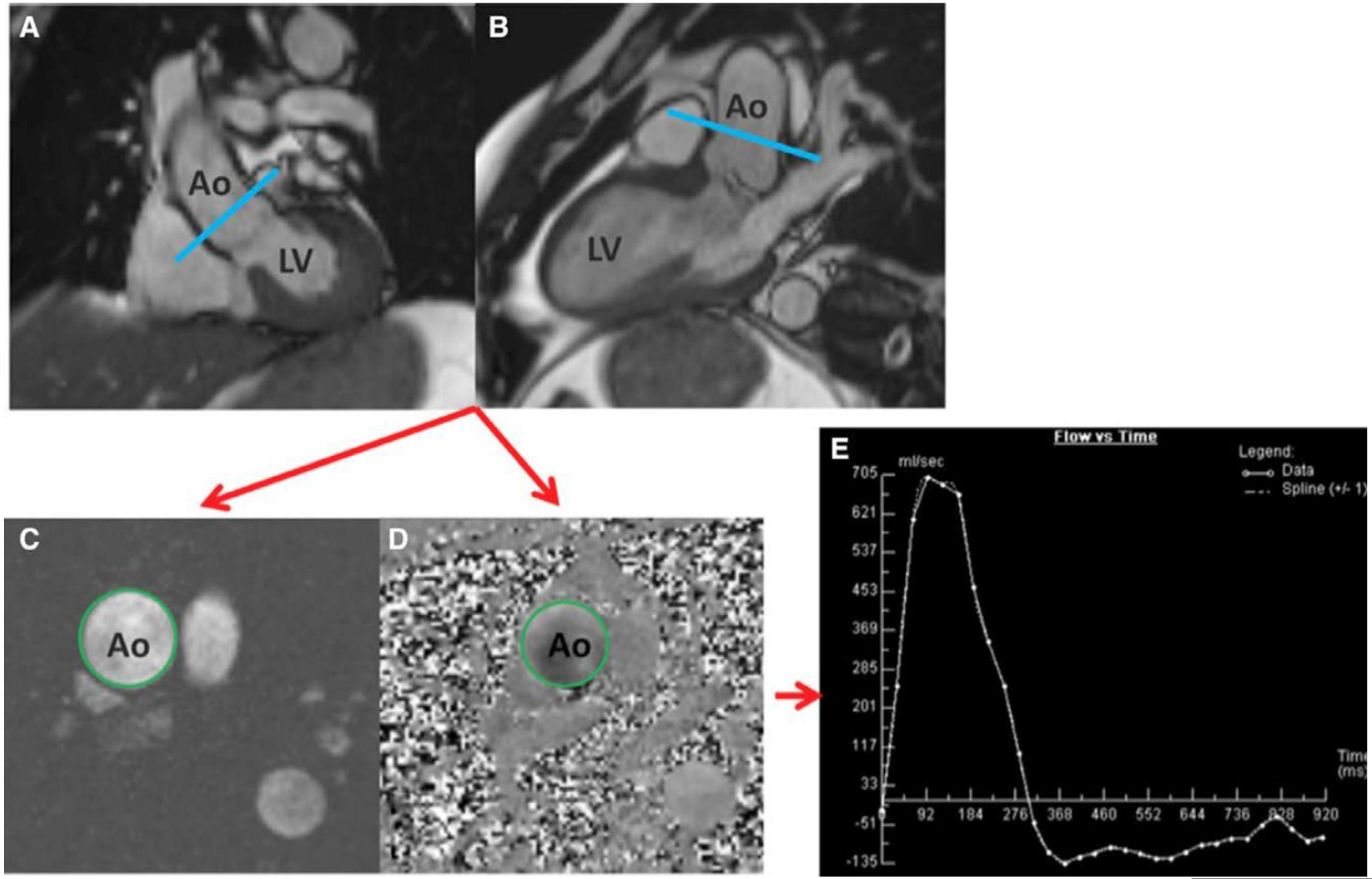

ACTUAL BURGER
- MOST ATTRACTIVE ANGLE


PT-LAX
A
Flow
Convergence
VC
Jet Area
B
PT-LAX
VC


ITm0.8
IM 0.9
M1 M4
2D
Coul
61 bpm

MRI

Phase contrast imaging



Lee JKT et al. Circulation 2018

Man, 70 yo. Hospitalization for Heart Failure

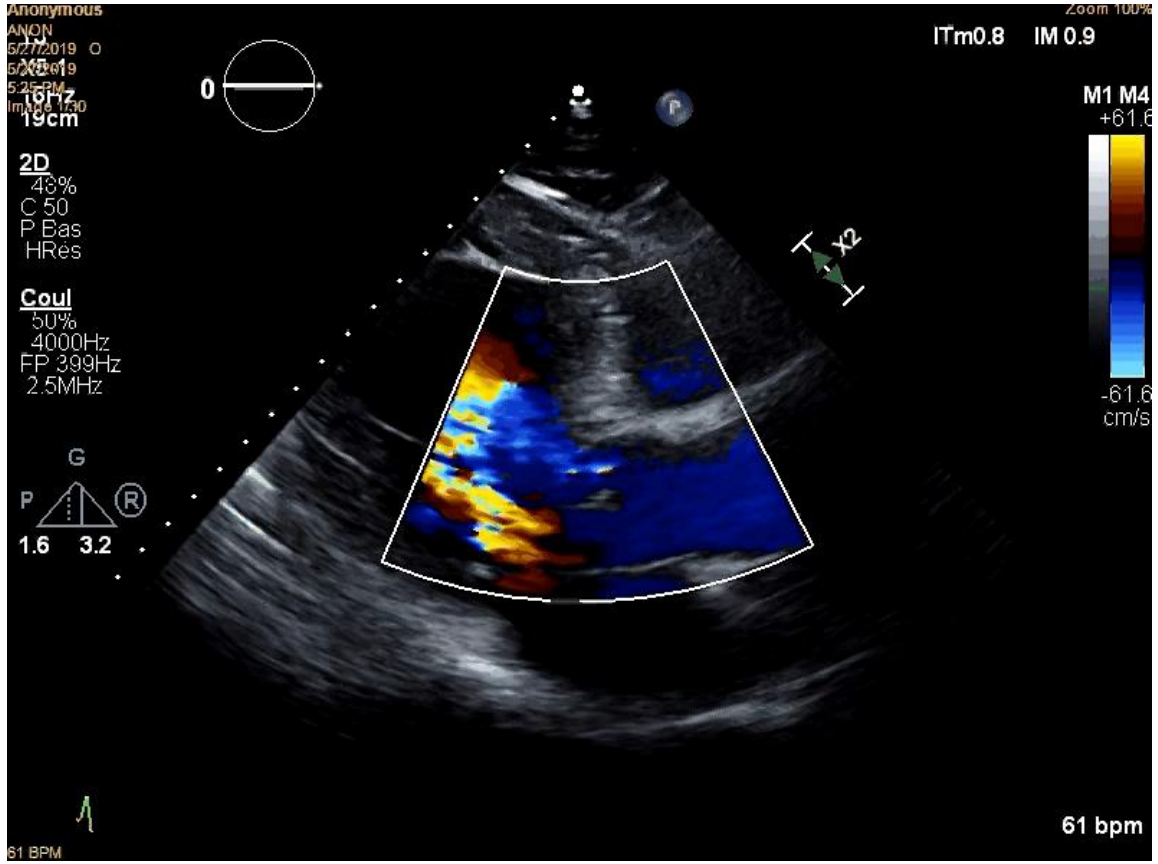
Vena contracta:?

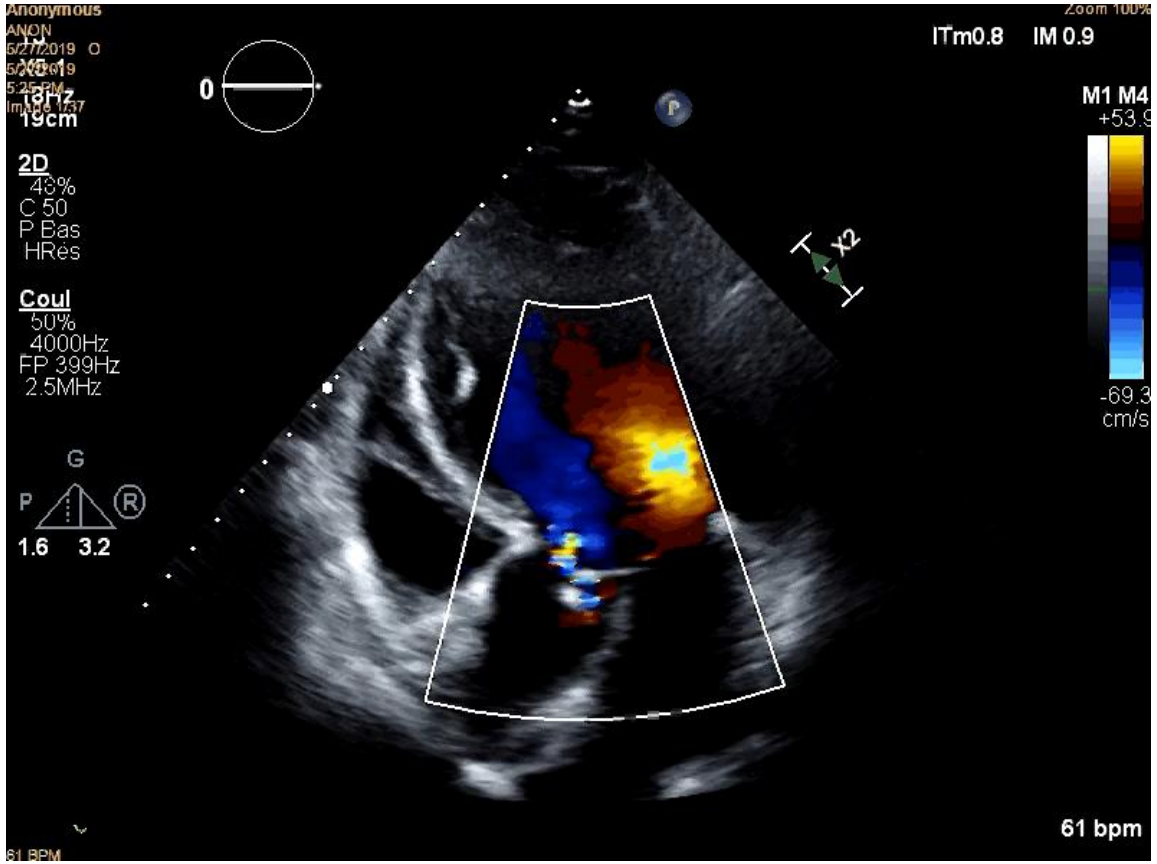
PISA:?

PHT: unoptimal

Flow reversal: unoptimal ≈ 18 cm/s

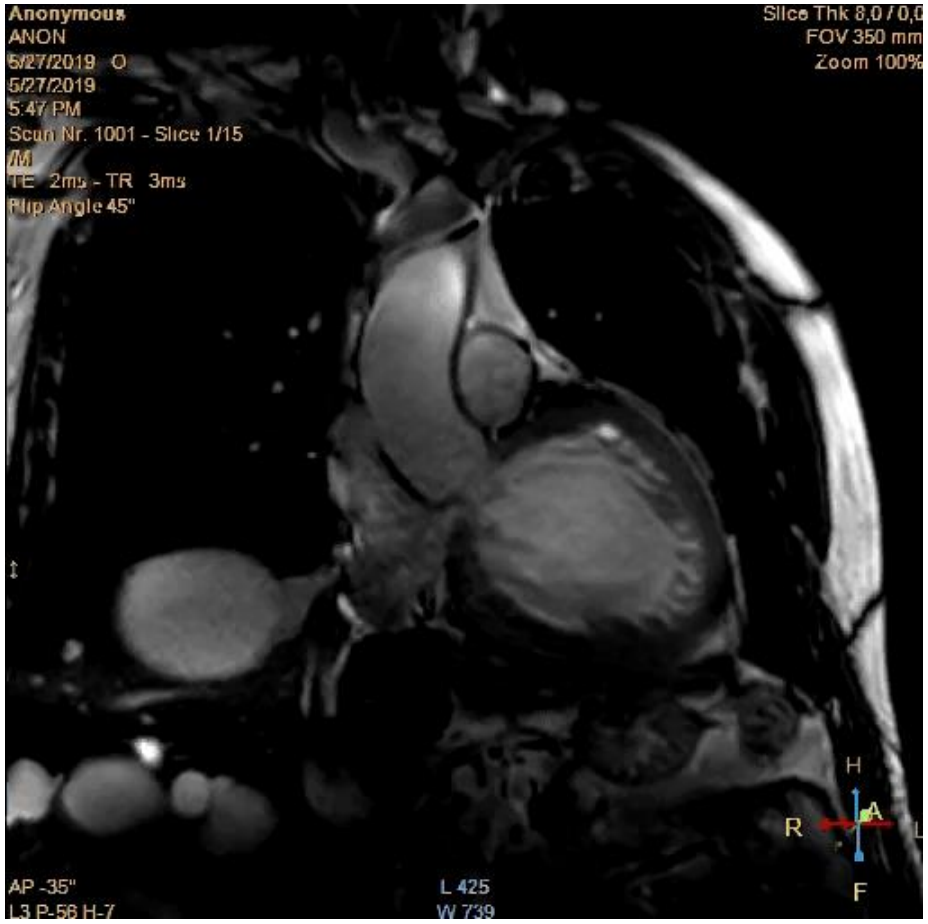
?





LVEF = 30%, normal coronary angiography

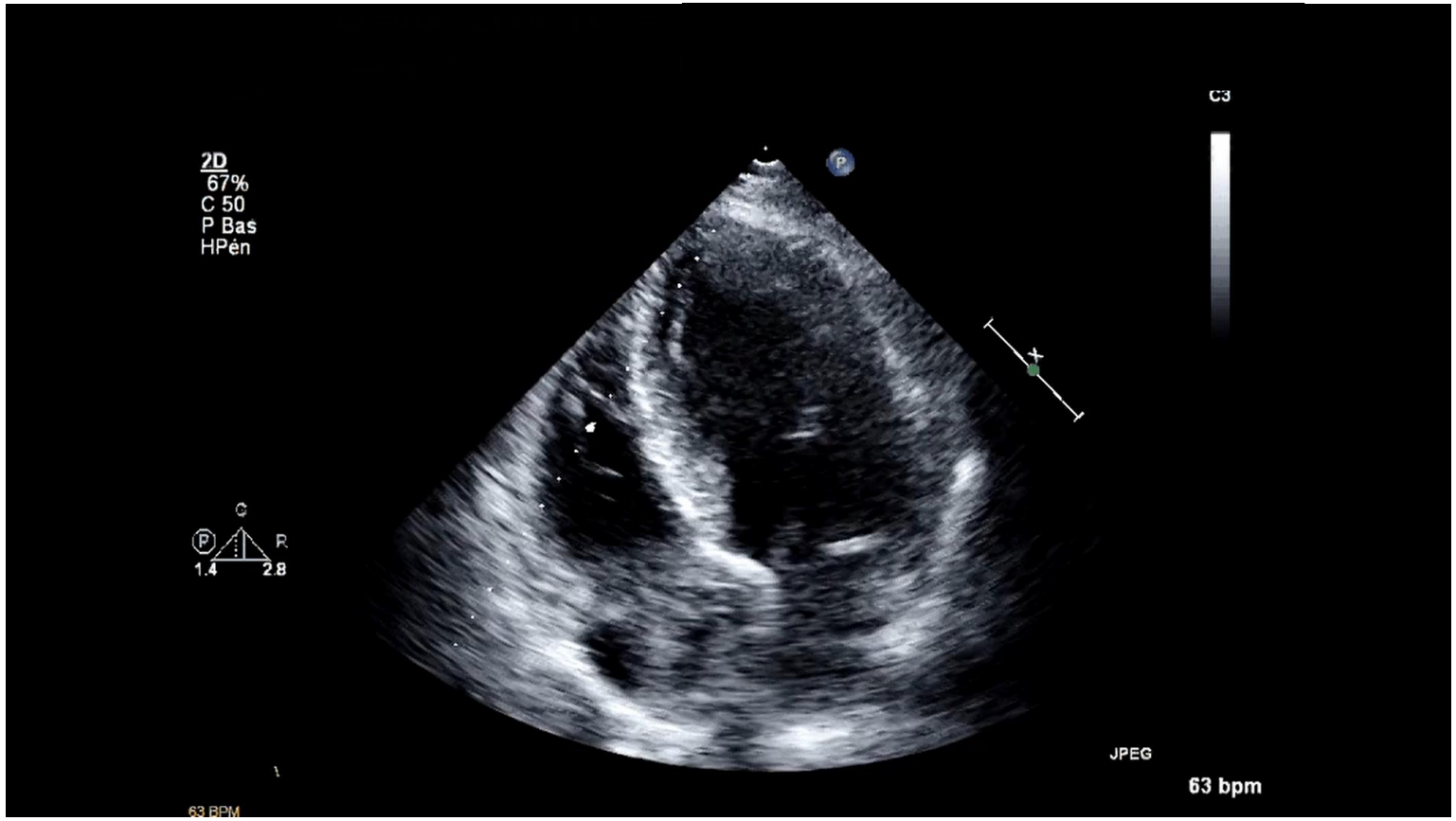
Man, 70 yo. Hospitalization for Heart Failure



MRI

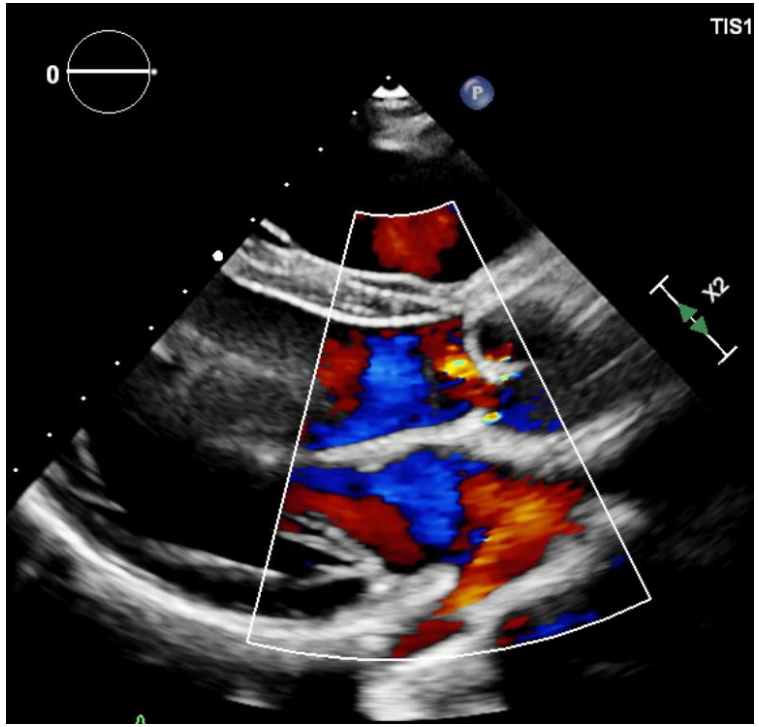
Regurgitant Fraction = 46%

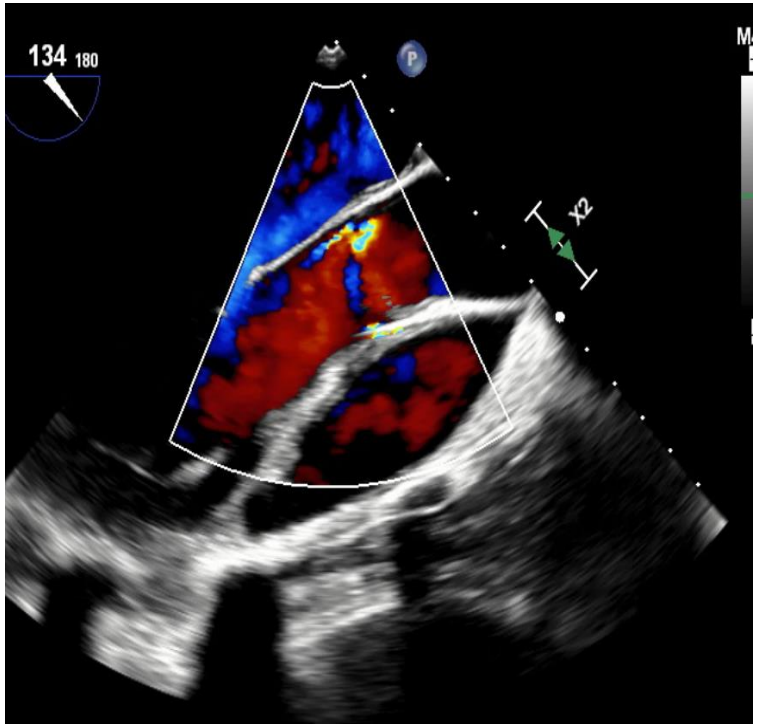
Volume = 42 ml

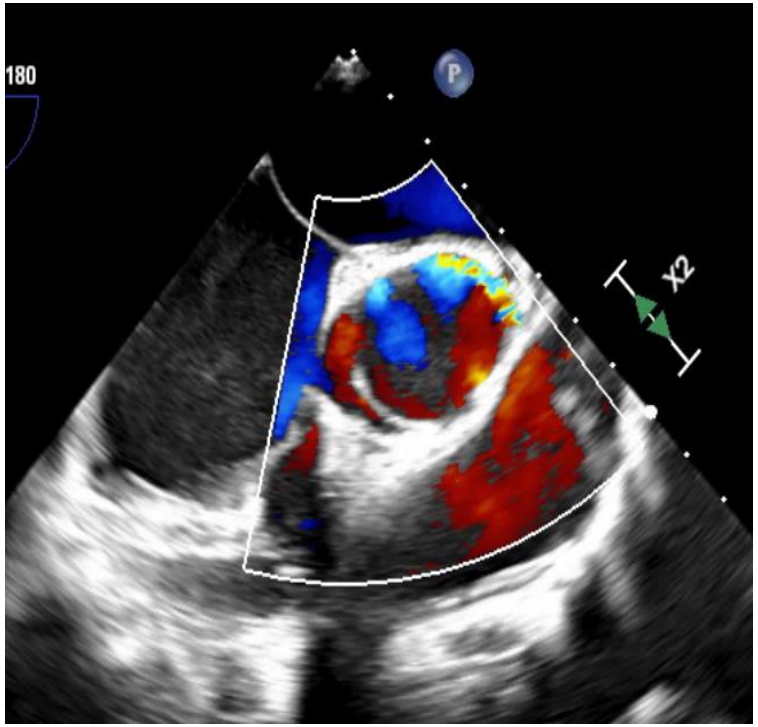


After aortic valve replacement

Man, 17 yo. Asymptomatic

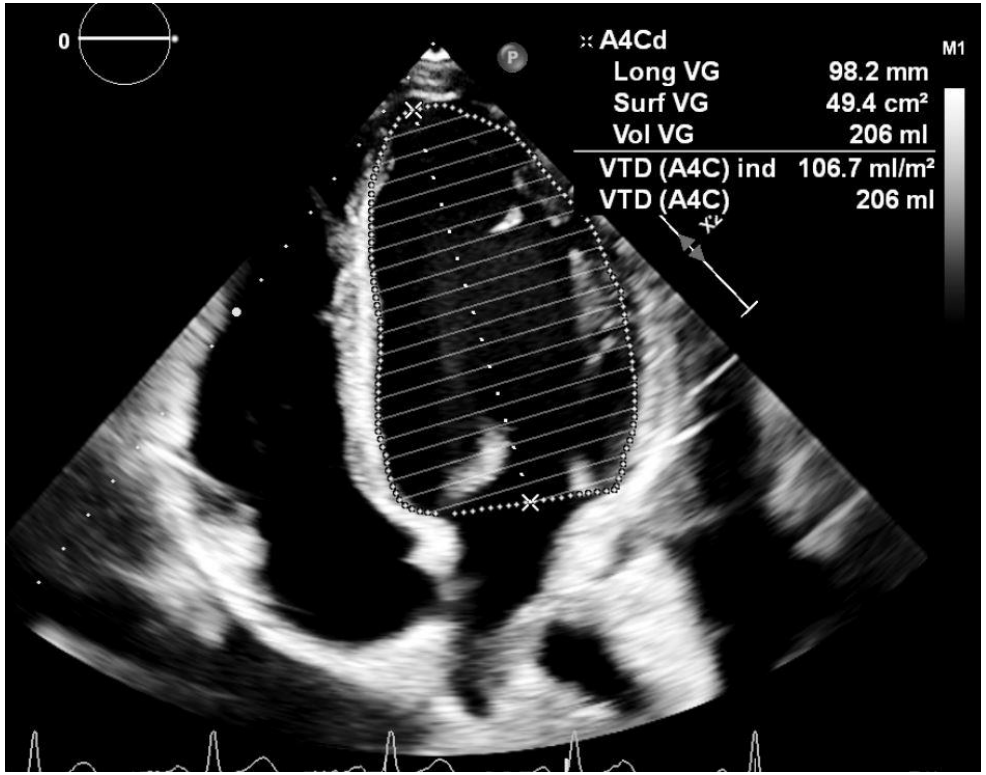






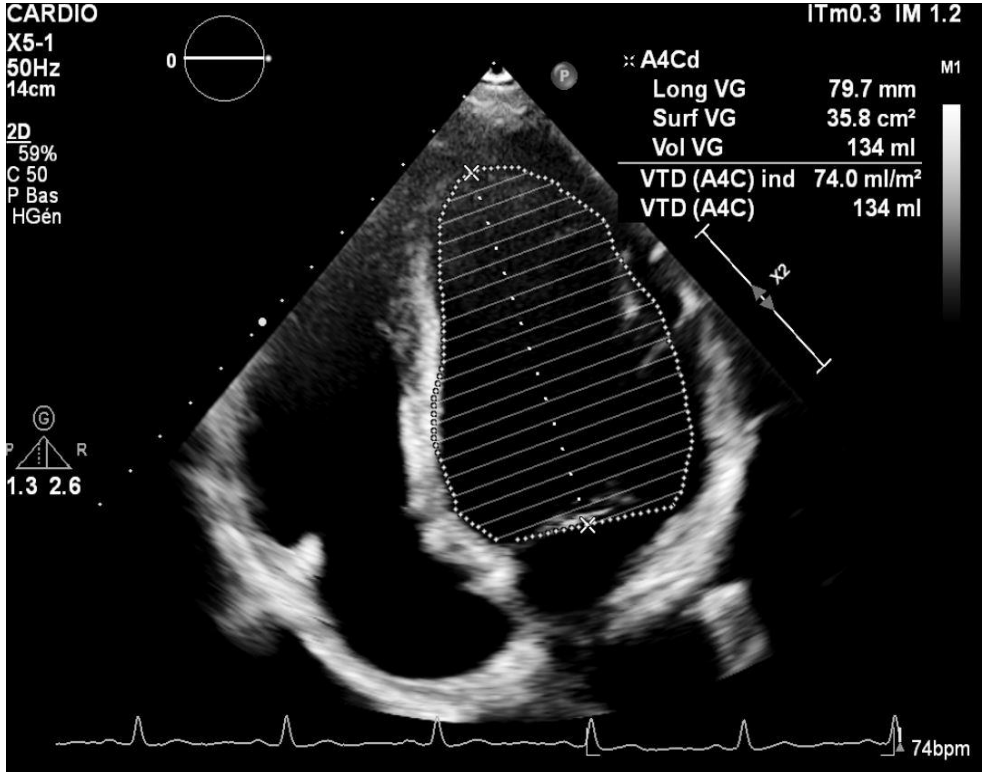
MRI regurgitation fraction = 41%

Man, 17 yo. Asymptomatic



Before surgery

VTD = 206 ml



1y after surgery

VTD = 134 ml

Discrepencies with Echo

	CMR Grade of Regurgitation				Echo Severe Regurgitation
	Mild	Moderate	Severe	Very Severe	
AR	<15	15-35	>35-40	>50	RF% >50
MR	<15-20	20-40	>40 RVol >55-60 ml	>50	RVol >60 ml

Myerson et al. JACC imaging 2020

Using MR as « Gold standard » (Moderate-Severe AR)

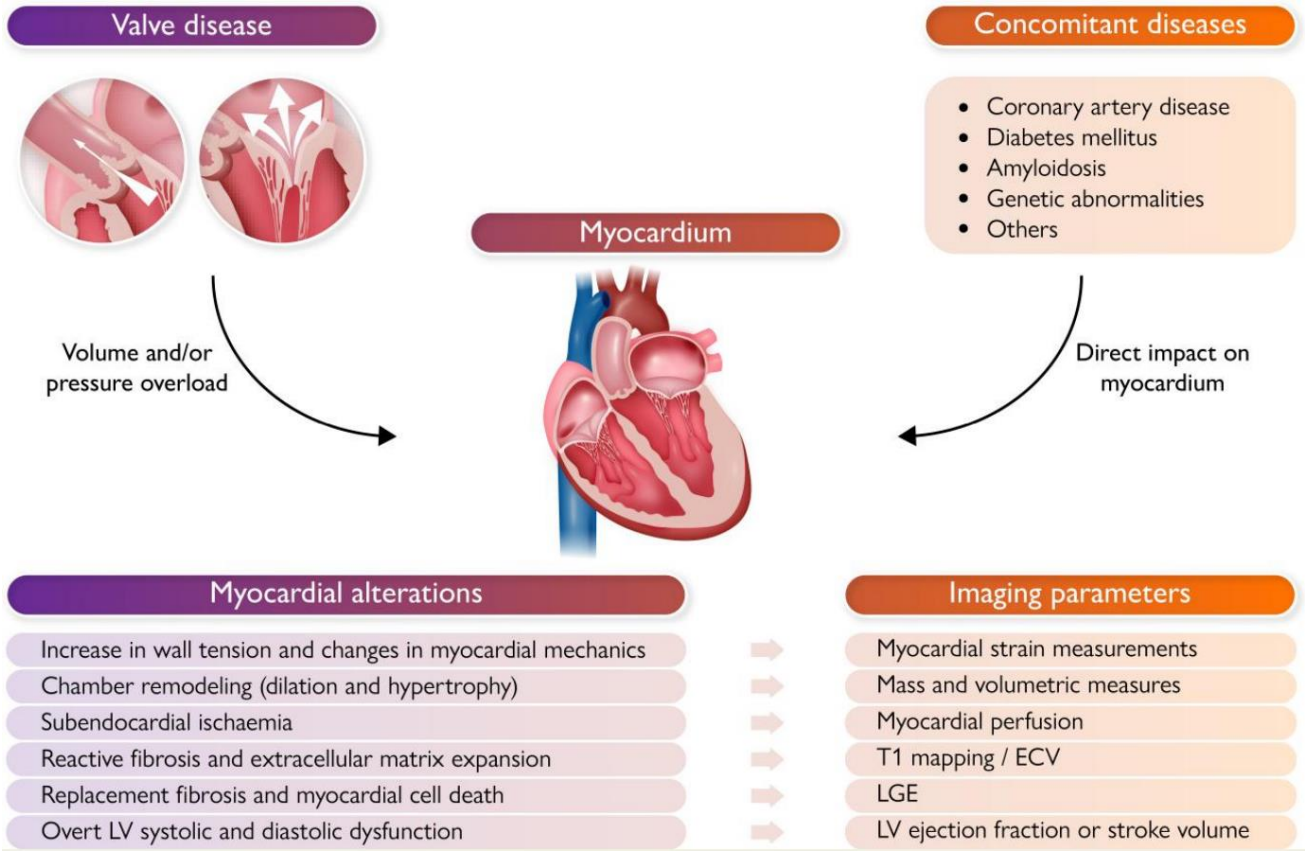
	Association With Moderate to Severe or Severe AR on CMR			
	Cut-Point	Sensitivity, %	Specificity, %	AUC
AR parameters (nonvolumetric)				
VCW, cm	≥0.5	92.3	86.5	0.89
Jet width/LVOT ratio, %	≥30	84.6	86.5	0.86
Indexed LVEDV, mL/m^2	≥82	86.7	85.7	0.86
Presence of reversed flow in the abdominal aorta	Yes/no	60.9	100.0	0.80
AV pressure half-time, ms	<455	66.7	85.1	0.74
End-diastolic velocity of reversed flow in the descending thoracic aorta, cm/s	≥20	50.0	93.8	0.72
AR volumetric quantitation				
RegV (mL) (LVOT – MA) [method 1]	≥40	90.0	88.0	0.89
RegV (mL) (LVOT – RVOT [method 2]	≥40	92.9	86.4	0.90
RegV (mL) (PISA) [method 3]	≥41	94.4	91.7	0.93
Average echo RegV (mL) [methods 1 + 2]	≥40	96.7	86.3	0.91
(LVEDV – LVESV) – MA SV, mL	≥39	83.3	85.4	0.84
(LVEDV – LVESV) – RVOT SV, mL	≥42	92.0	88.1	0.90

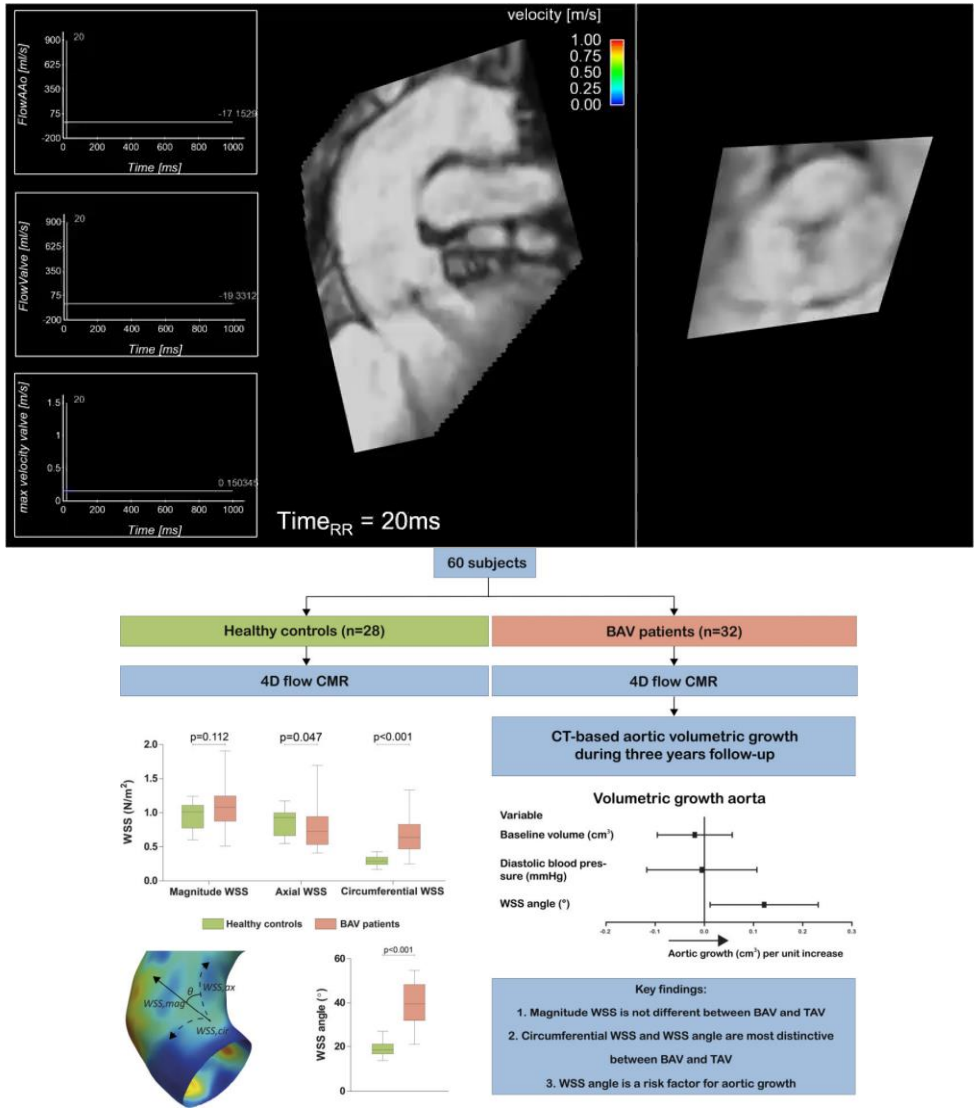
Feasibility
≈ 78%

Feasibility
PISA = 37% !

Attar R, et al. JACC Cardiovasc Imaging. 2025;18(4):403–417

Future Directions





Marsan et al. EHJ 2023; Minderhoud, Eur Heart J Cardiovasc Imaging 2022

Merci pour votre attention!