The Place of Percutaneous Treatment In Rheumatic Valve Disease

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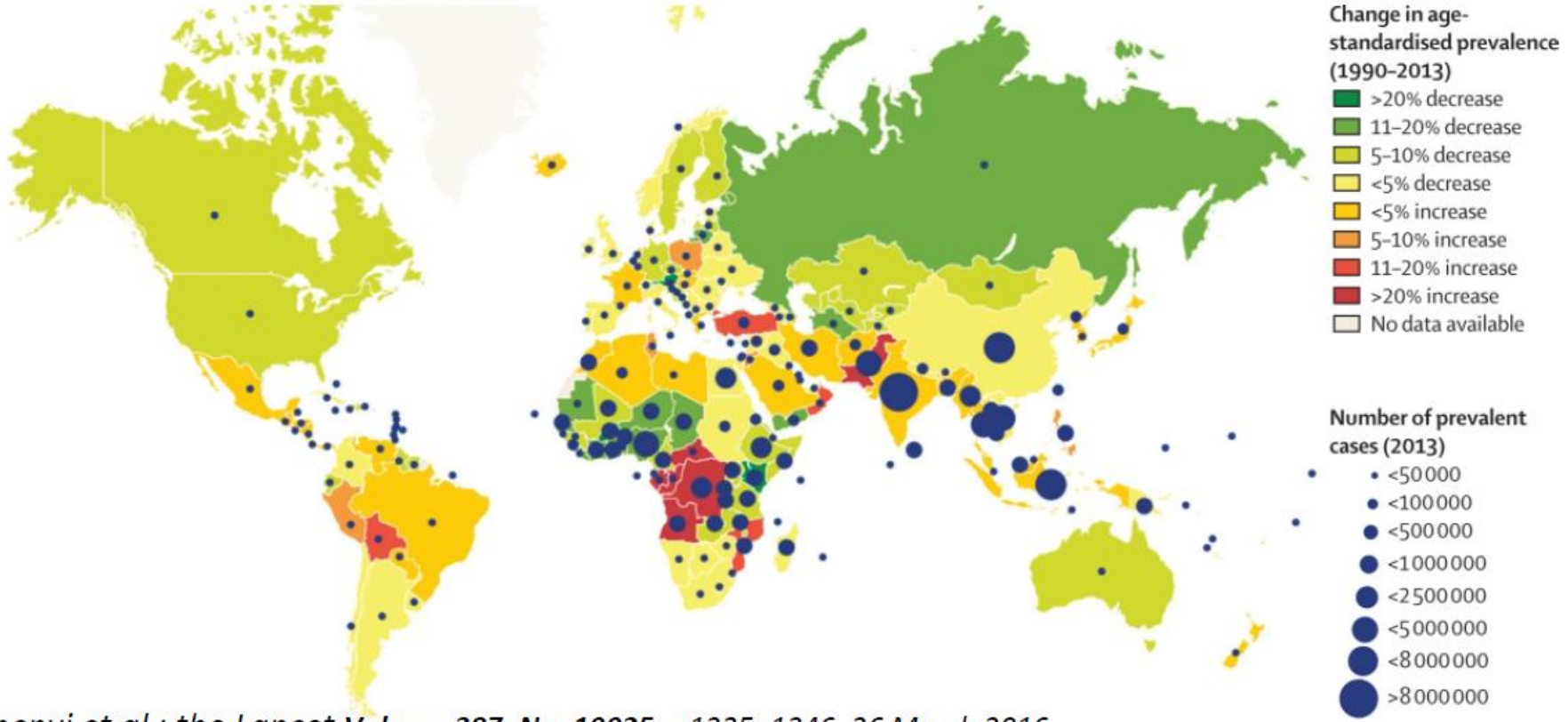
Incidence Rheumatic Heart Disease

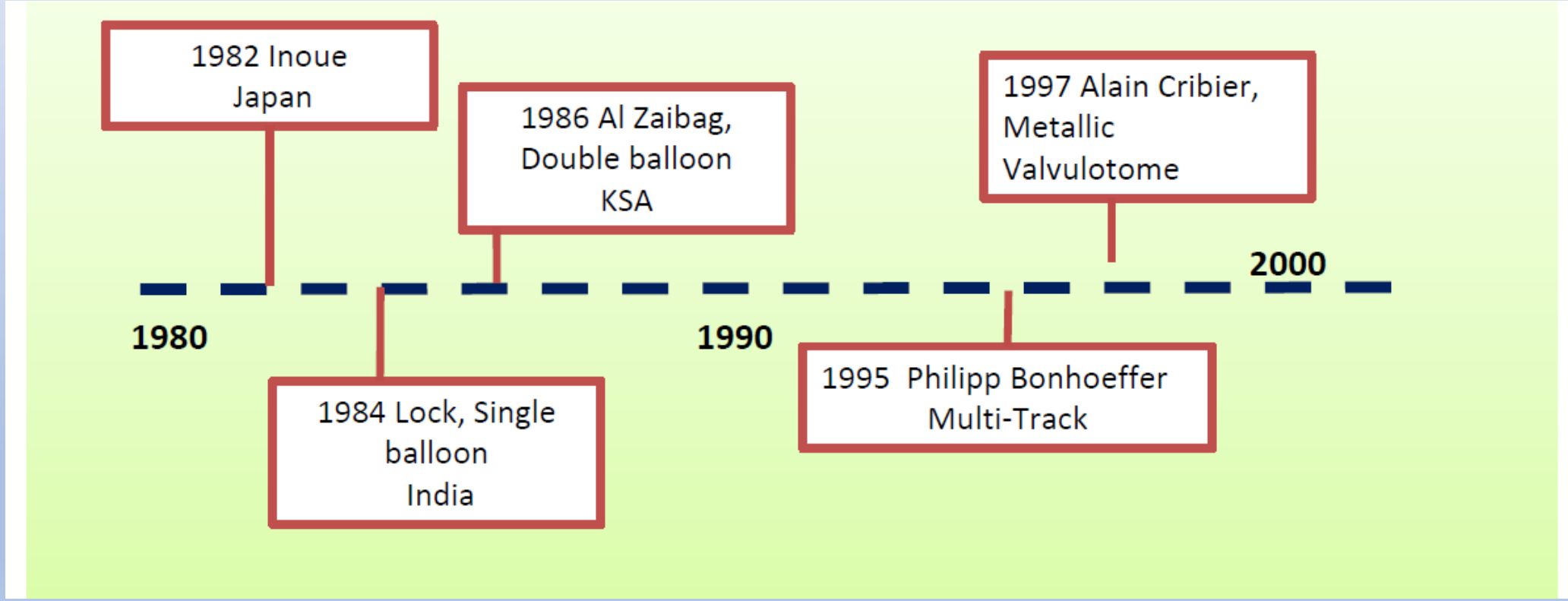
Rheumatic heart disease (RHD) is a significant public health concerns around the world.



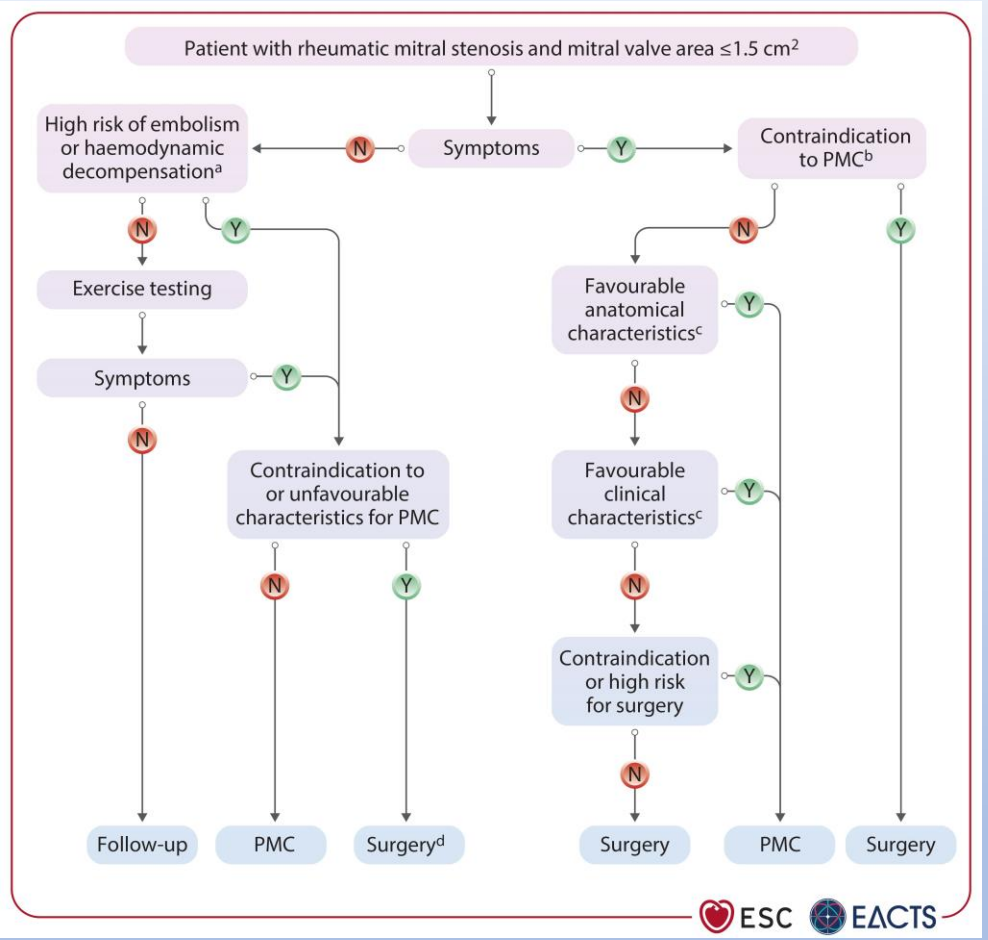
Remenyi et al : the Lancet ***Volume 387. No. 10025****. p1335–1346. 26 March 2016*

Percutaneous Treatment of Mitral Stenosis

- Since its introduction, MBV has demonstrated good intermediate and mid-term results
- Considered standard non-surgical treatment of rheumatic mitral stenosis



Options for Management of Mitral Stenosis (MVA ≤1.5cm^2)



2025 ESC/EACTS Guidelines for the management of valvular heart disease. EHJ 2025 00, 1-102

Indications for PTMC in clinically significant MS (MVA ≤1.5cm^2)

PMC is recommended in symptomatic patients in the absence of unfavourable characteristics for PMC.[c] 651–653,662,665	I	B

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Unfavourable characteristics for PTMC

1. Clinical characteristics

i. Old age
ii. History commissurotomy
iii. NYHA Class IV
iv. Permanent AF
v. Severe PHT

2. Anatomical characteristics

i. Wilkins Score >8
ii. Cormier Score 3 (any calcification)
iii. Very small MVA
iv. Severe TR

[c]Unfavourable characteristics for PMC can be defined by the presence of several of the following characteristics. Clinical characteristics: old age, history of commissurotomy, New York Heart Association class IV, permanent AF, severe pulmonary hypertension. Anatomical characteristics: echocardiographic score >8, Cormier score 3 (calcification of mitral valve of any extent as assessed by fluoroscopy), very small MVA, severe tricuspid regurgitation. For the definition of scores, see *Supplementary Table 8*.

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Wilkins Score

Grade	Mobility	Thickening	Calcification	Subvalvular thickening
1	Highly mobile valve with only 1 leaflet tips restricted	Leaflets near normal in thickness (4-5 mm)	A single area of increased echo brightness	A single area of increased echo brightness
2	Leaflet midportions and base portions have normal mobility	Midleaflets normal, considerable thickening of margins (5–8 mm)	Scattered areas of brightness confined to leaflet margins	Scattered areas of brightness confined to leaflet margins
3	Valve continues to move forward in diastole, mainly from the base	Thickening extending through the entire leaflet (5–8 mm)	Brightness extending into the midportion of the leaflets	Thickening extending to the distal third of the chords
4	No or minimal forward movement of the leaflets in diastole	Considerable thickening of all leaflet tissue (>8–10 mm)	Extensive brightness throughout much of the leaflet tissue	Extensive thickening and shortening

Grading of mitral valve characteristics according to Wilkins score.

Alternative Scores for Predicting of Outcome in PTMC

Assessment of mitral valve anatomy according to the Cormier score[19]	
Echocardiographic group	Mitral valve anatomy
Group 1	Pliable non-calcified anterior mitral leaflet and mild subvalvular disease (i.e. thin chordae ≥10 mm long)
Group 2	Pliable non-calcified anterior mitral leaflet and severe subvalvular disease (i.e. thickened chordae <10 mm long)
Group 3	Calcification of mitral valve of any extent, as assessed by fluoroscopy, whatever the state of subvalvular apparatus

Echo score 'Revisited' for immediate outcome prediction[20]	
Echocardiographic variables	**Points for score (0 to 11)**
Mitral valve area ≤1 cm^2	2
Maximum leaflet displacement ≤12 mm	3
Commissural area ratio ≥1.25	3
Subvalvular involvement	3

Risk groups for Echo score 'Revisited': low (score 0–3); intermediate (score 4–5); high (score 6–11).

Reproduced from Baumgartner H et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. *Eur Heart J* 2017;**38**:2739–2791, by permission of Oxford University Press on behalf of the European Society of Cardiology.[21]

Indications for PTMC in clinically significant MS (MVA ≤1.5cm^2)

PMC is recommended in symptomatic patients in the absence of unfavourable characteristics for PMC.[c] 651–653,662,665	I	B
PMC is recommended in any symptomatic patients with a contraindication or a high risk for surgery.	I	C

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Indications for MV surgery if not suitable for PMC

PMC is recommended in symptomatic patients without unfavourable characteristics[c] for PMC.[360,363–365,367]	I	B
PMC is recommended in any symptomatic patients with a contraindication or a high risk for surgery.	I	C

Mitral valve surgery is recommended in symptomatic patients who are not suitable for PMC in the absence of futility.	I	C

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Indications for PTMC in clinically significant MS (MVA ≤1.5cm²)

PMC is recommended in symptomatic patients without unfavourable characteristics[c] for PMC.[360,363–365,367]	I	B
PMC is recommended in any symptomatic patients with a contraindication or a high risk for surgery.	I	C
Mitral valve surgery is recommended in symptomatic patients who are not suitable for PMC in the absence of futility.	I	C
PMC should be considered as initial treatment in symptomatic patients with suboptimal anatomy but no unfavourable clinical characteristics for PMC.[c]	IIa	C

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Indications for PTMC in clinically significant MS (MVA ≤1.5cm^2)

PMC should be considered in asymptomatic patients without unfavourable clinical and anatomical characteristics[c] for PMC and: • High thromboembolic risk (history of systemic embolism, dense spontaneous contrast in the LA, new-onset or paroxysmal AF), and/or • High risk of haemodynamic decompensation (systolic pulmonary pressure >50 mmHg at rest, need for major NCS, desire for pregnancy).	**IIa**	**C**

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Indications for TMVI

TMVI may be considered in symptomatic patients with extensive MAC and severe MV dysfunction at experienced Heart Valve Centres with expertise in complex MV surgery and transcatheter interventions.[542,680,681]	IIb	C

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Contraindications for PTMC

Contra-indications
Mitral valve area >1.5 cm^2 *
Left atrial thrombus
More than mild mitral regurgitation
Severe or bi-commissural calcification
Absence of commissural fusion
Severe concomitant aortic valve disease, or severe combined tricuspid stenosis and regurgitation requiring surgery
Concomitant CAD requiring bypass surgery

**PMC may be considered in patients with valve area >1.5 cm^2 with symptoms that cannot be explained by another cause and if the anatomy is favourable.*

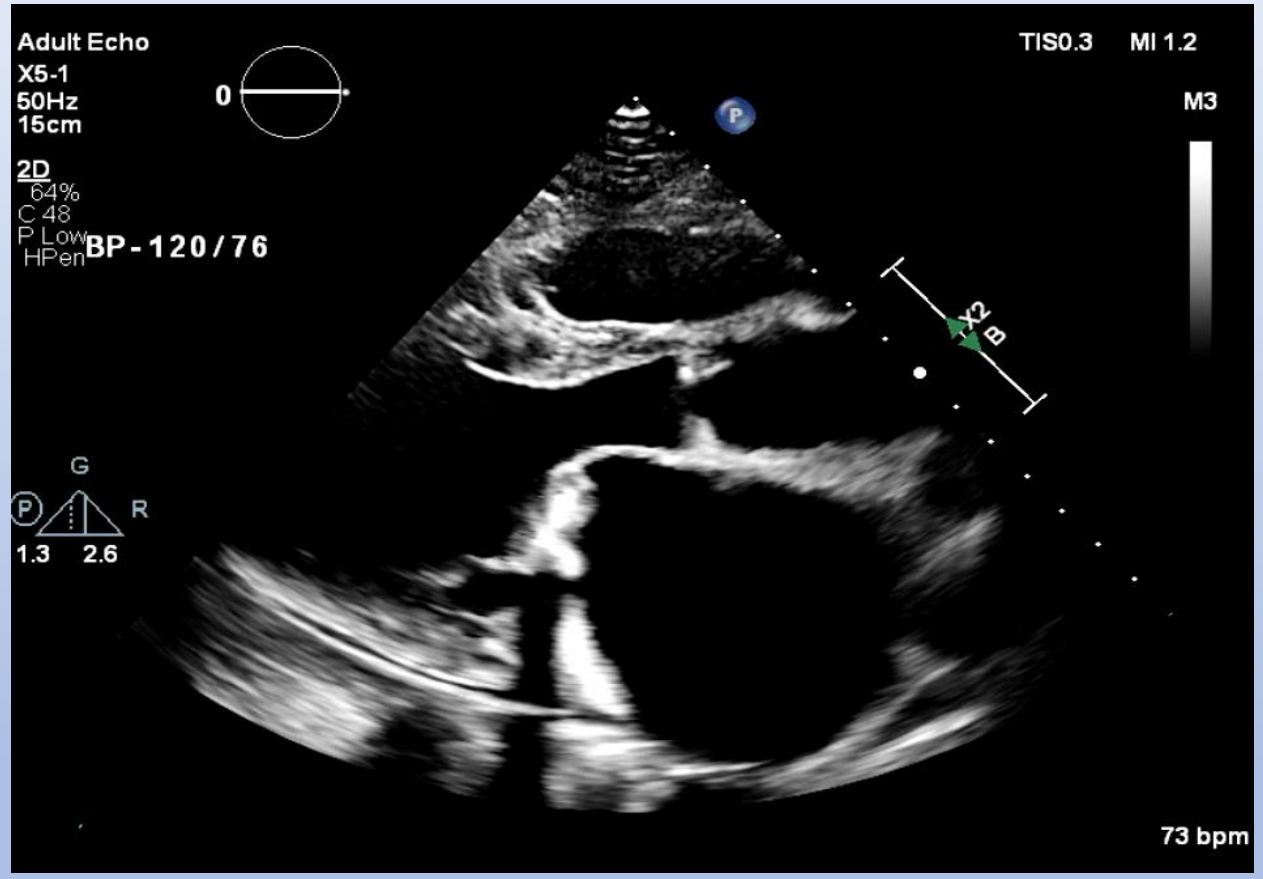
2025 ESC/EACTS Guidelines for the management of valvular heart disease. EHJ 2025 00, 1-102

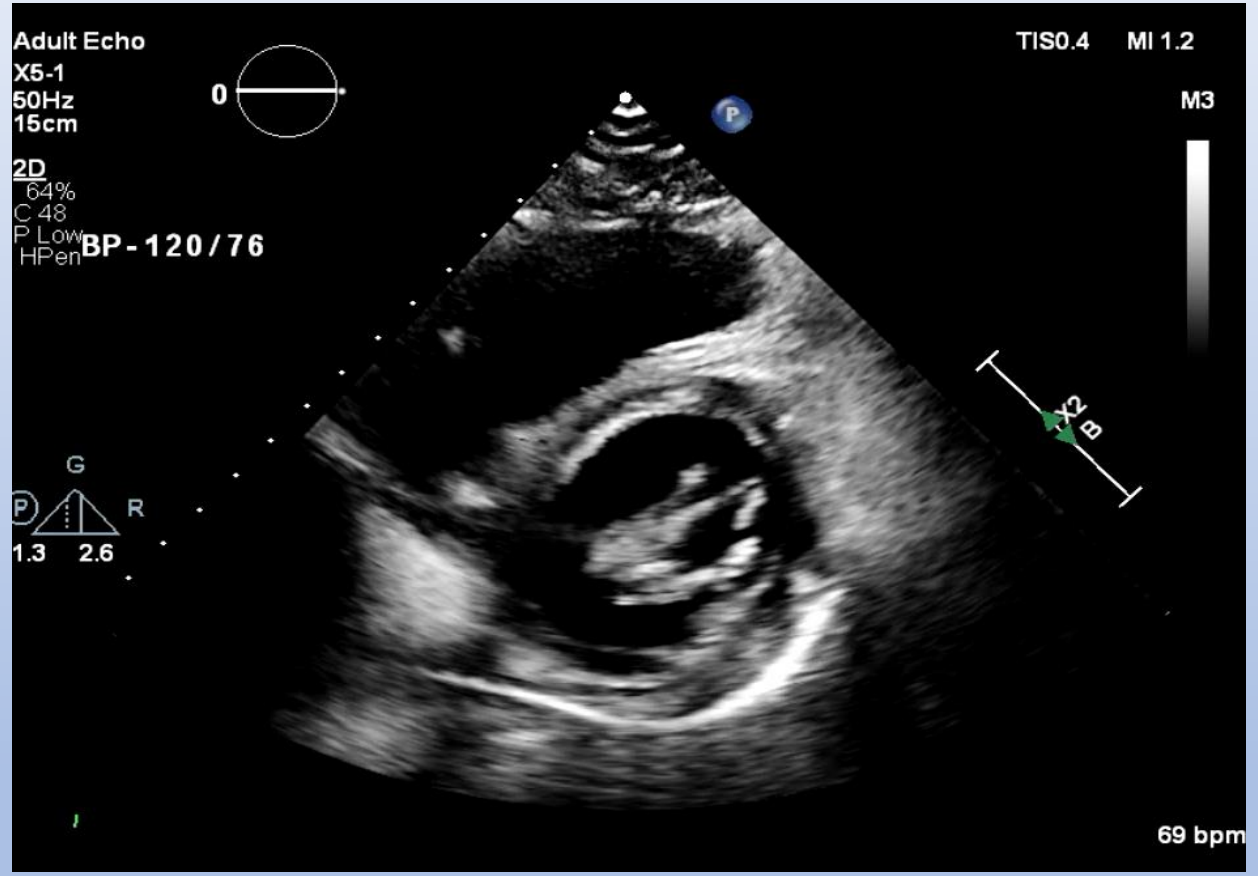
Case Presentation

- 49 year old gentleman originally from Afghanistan
- NYHA 3 breathlessness
- IHD – previous PCI to LAD 2014 – unobstructed coronaries 2022
- Deviated nasal septum awaiting ENT intervention
- Current 20/day smoker

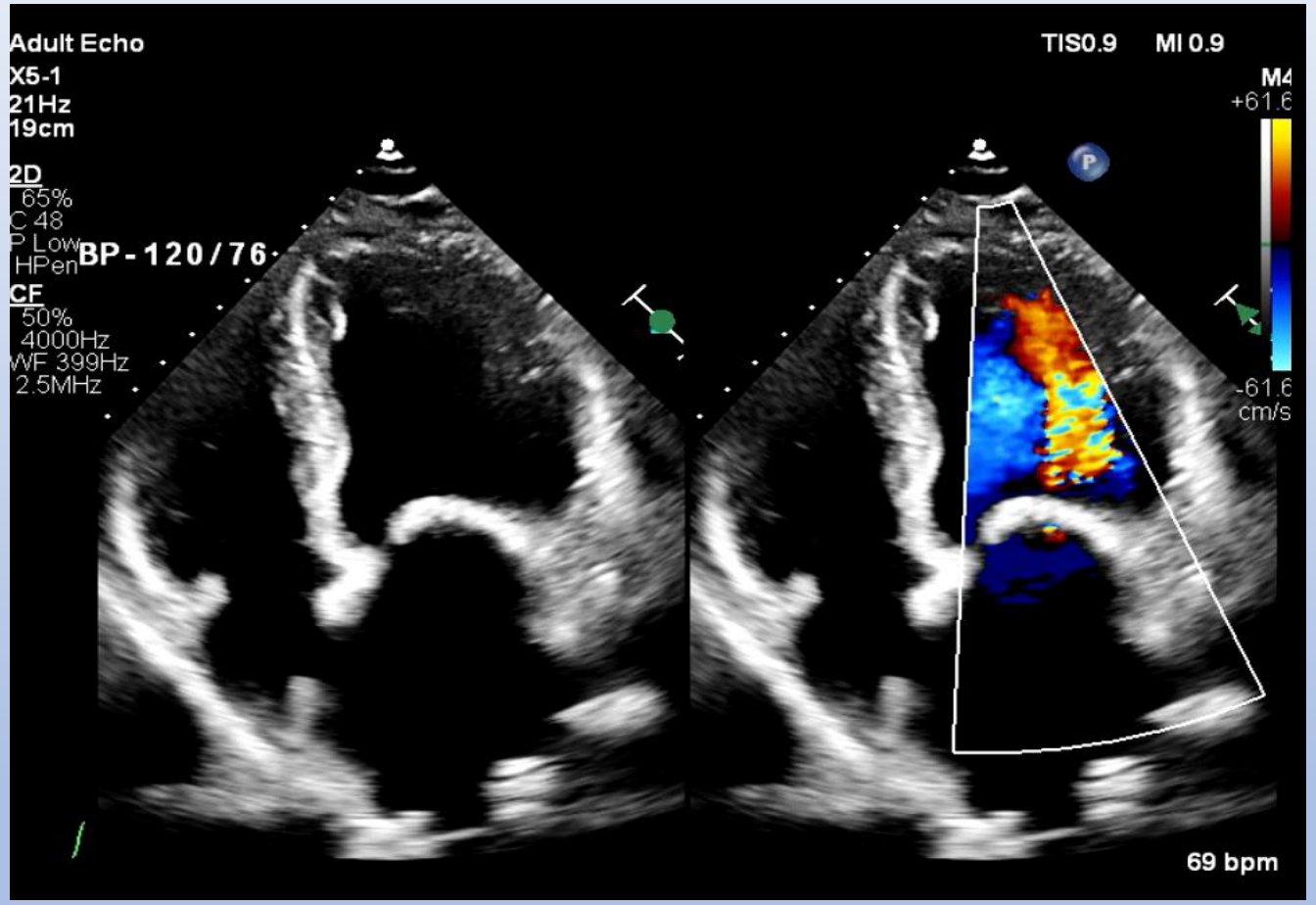
- **TTE:** moderate-severe MS. Normal biventricular function. Mild+ AR

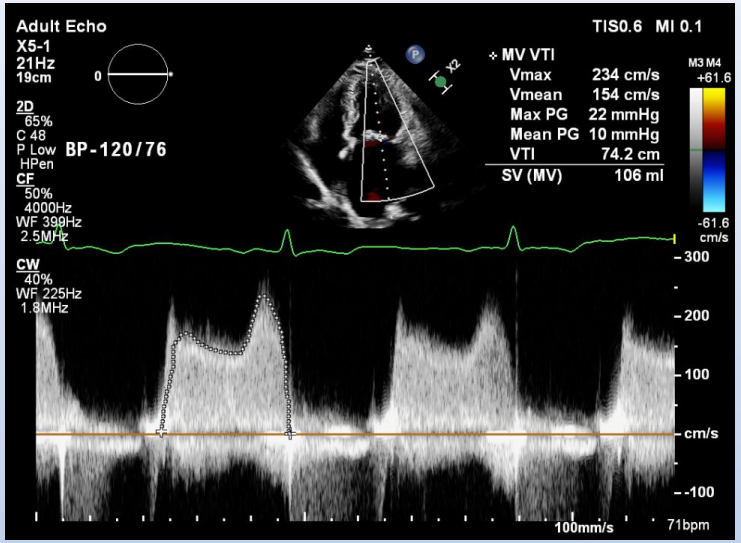
Transthoracic Echo

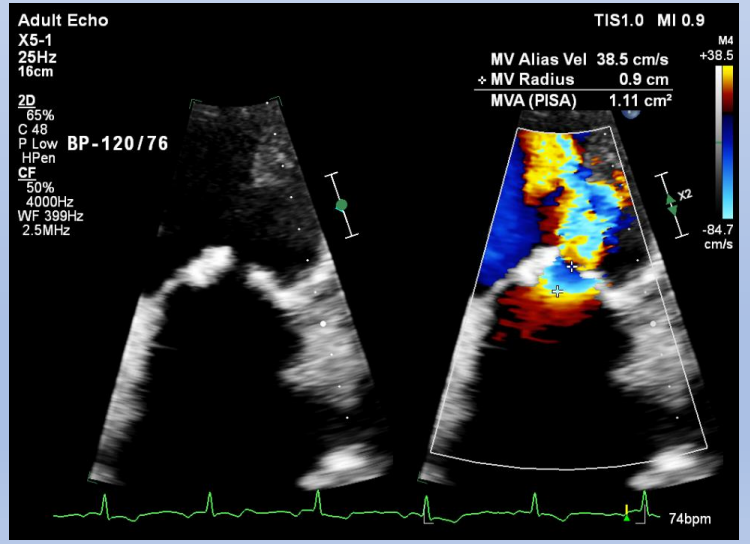




Transthoracic Echo







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Grading of mitral valve characteristics according to Wilkins score.

What does the Wilkins Score actually predict?

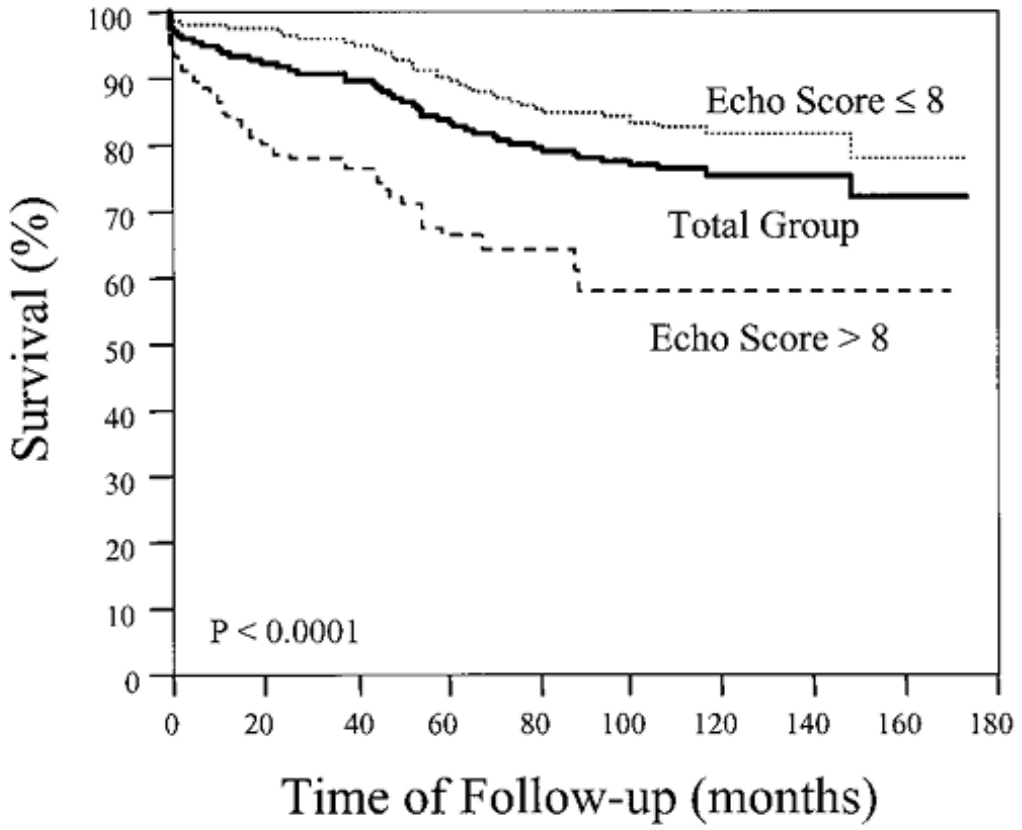
Br Heart J 1988;**60**:299–308

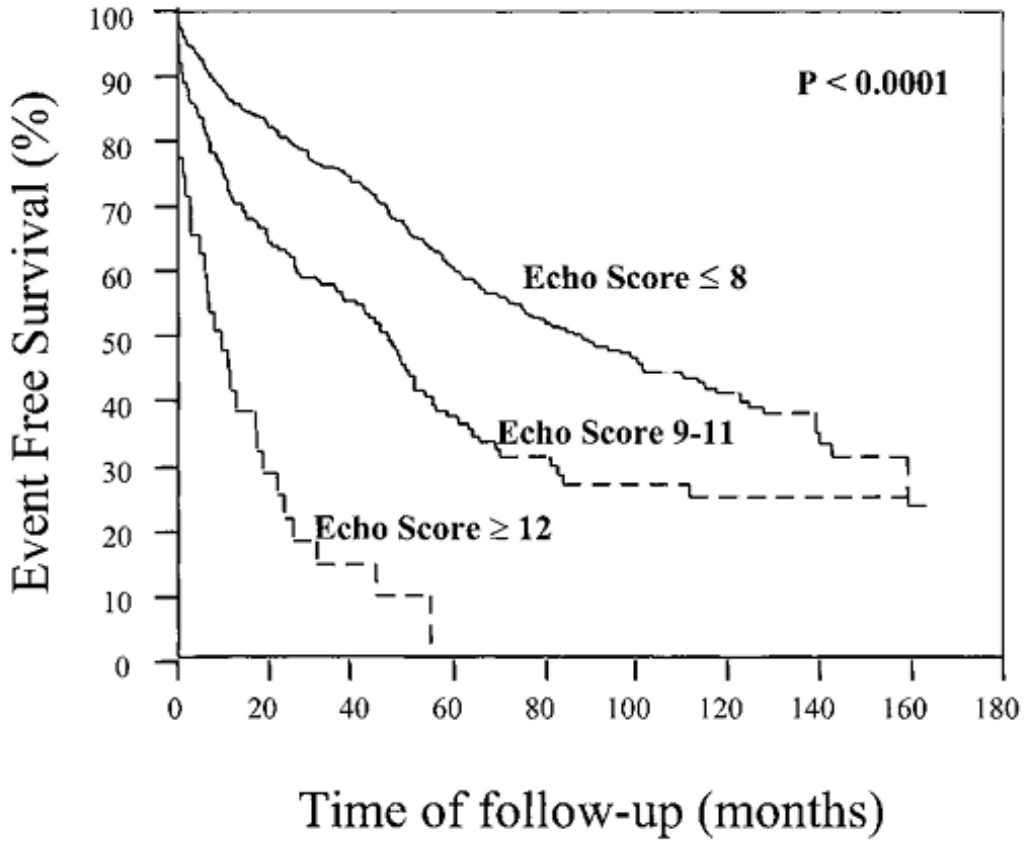
Percutaneous balloon dilatation of the mitral valve: an analysis of echocardiographic variables related to outcome and the mechanism of dilatation

GERARD T WILKINS, ARTHUR E WEYMAN, VIVIAN M ABASCAL, PETER C BLOCK, IGOR F PALACIOS

From the Cardiac Unit, Department of Medicine, Massachusetts General Hospital, and Harvard Medical School, Boston, Massachusetts, USA

Wilkins Score – Predictor of Outcome in PTMC





Circulation.2002;105:1465-1471.

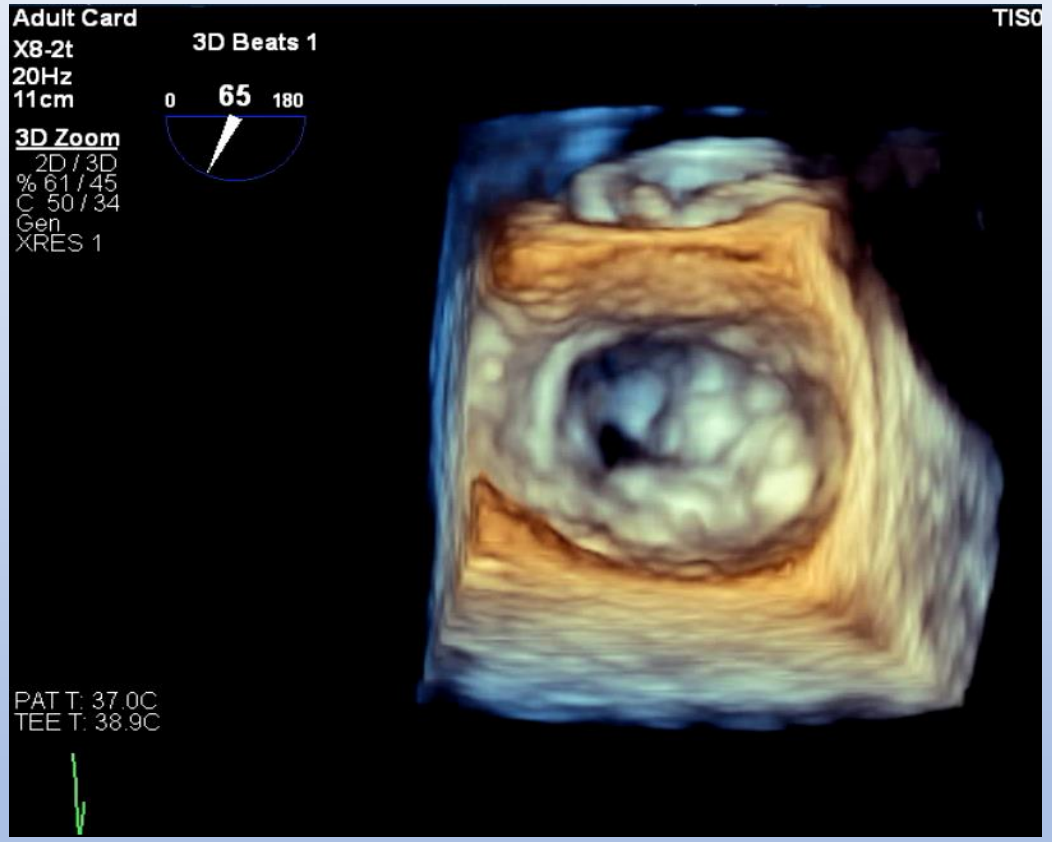
Wilkins Score – Predictor of Outcome in PTMC

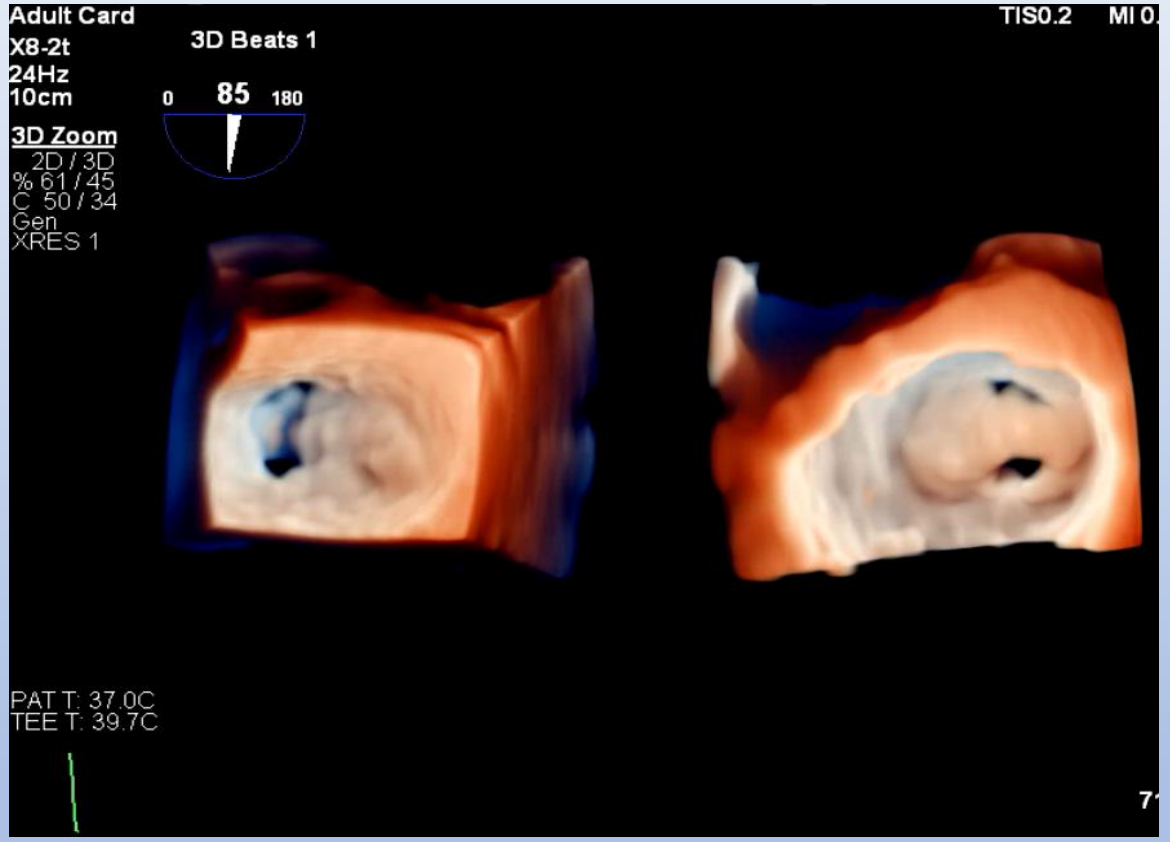
TABLE 3. Independent Predictors of Immediate PMV Success (Multiple Stepwise Logistic Regression Analysis)

Variables	Odds Ratio	Lower	Upper	*P*
Pre-PMV MVA	13.05	7.74	22.51	<0.00001
Less degree of pre-PMV MR	3.85	2.27	6.66	<0.00001
Younger age	3.33	1.41	7.69	0.006
Absence of prior commissurotomy	1.85	1.20	2.86	0.004
Male sex	1.92	1.19	3.13	0.008
Echocardiographic score ≤8	1.69	1.18	2.44	0.004

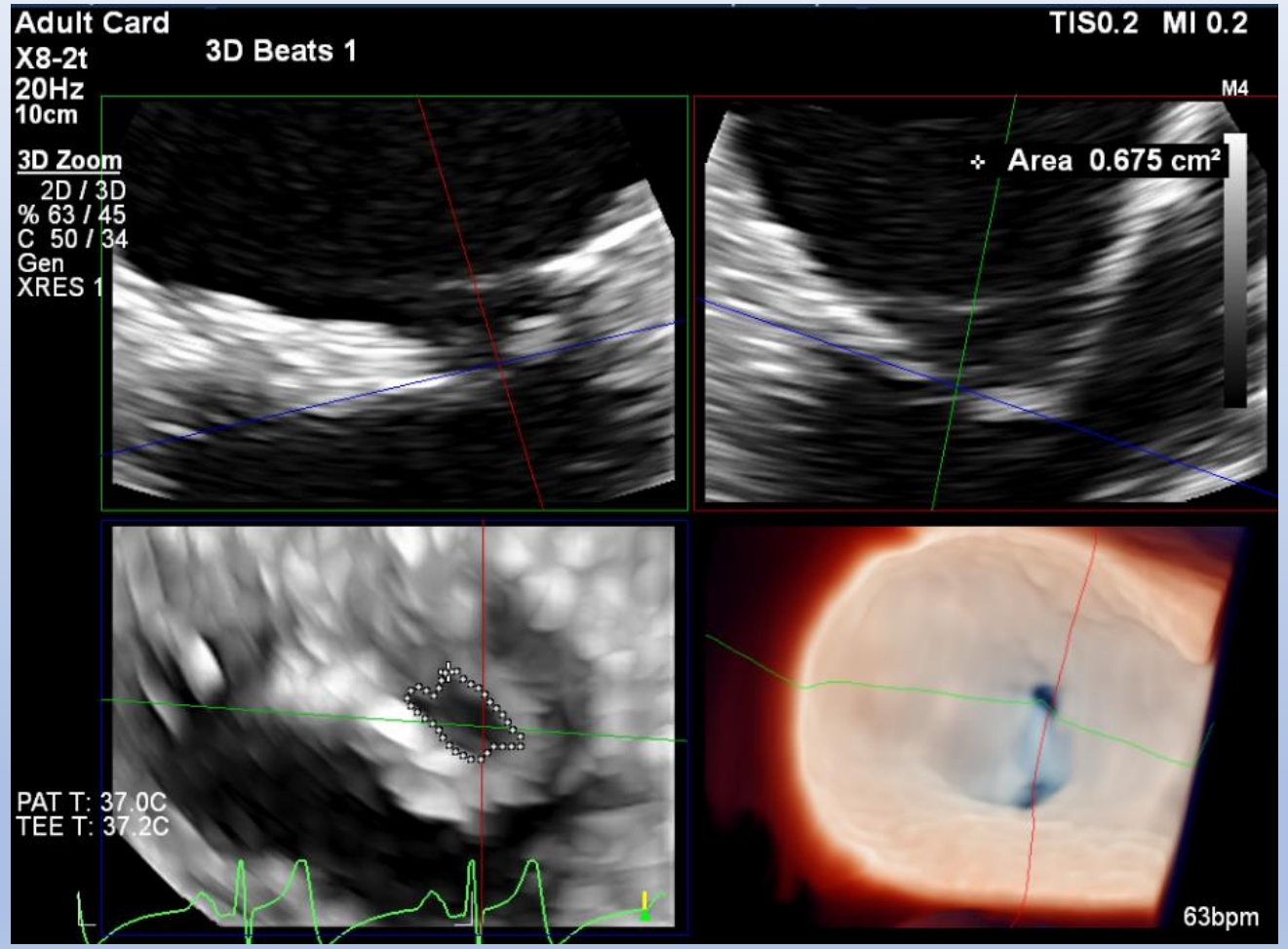
Circulation.2002;105:1465-1471.

The Case: PTMC (GA): Wilkins Score 8





PTMC

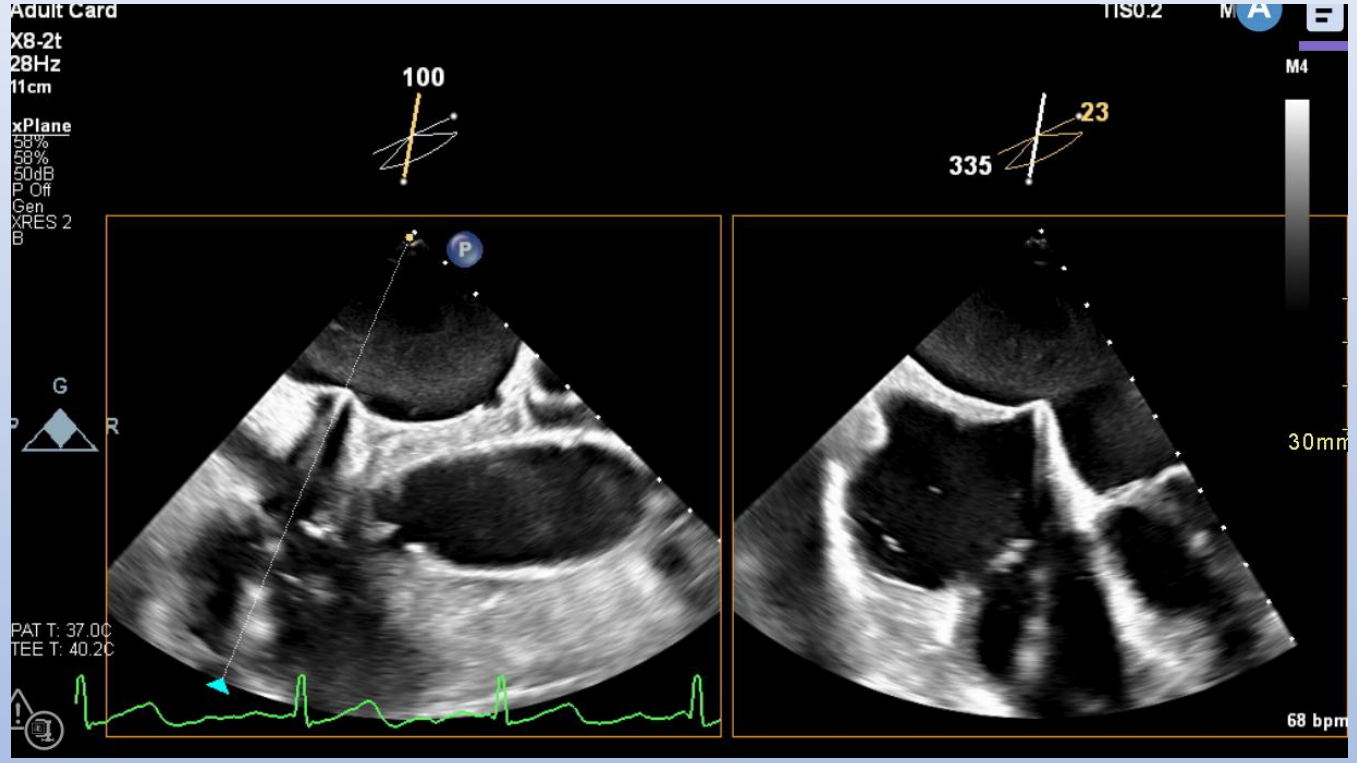

Adult Card
X8-2t
20Hz
10cm
3D Beats 1
TIS0.2 MI 0.2
M4
3D Zoom
2D / 3D
% 63 / 45
C 50 / 34
Gen
XRES 1
Area 0.675 cm²
PAT T: 37.0C
TEE T: 37.2C
63bpm

PTMC

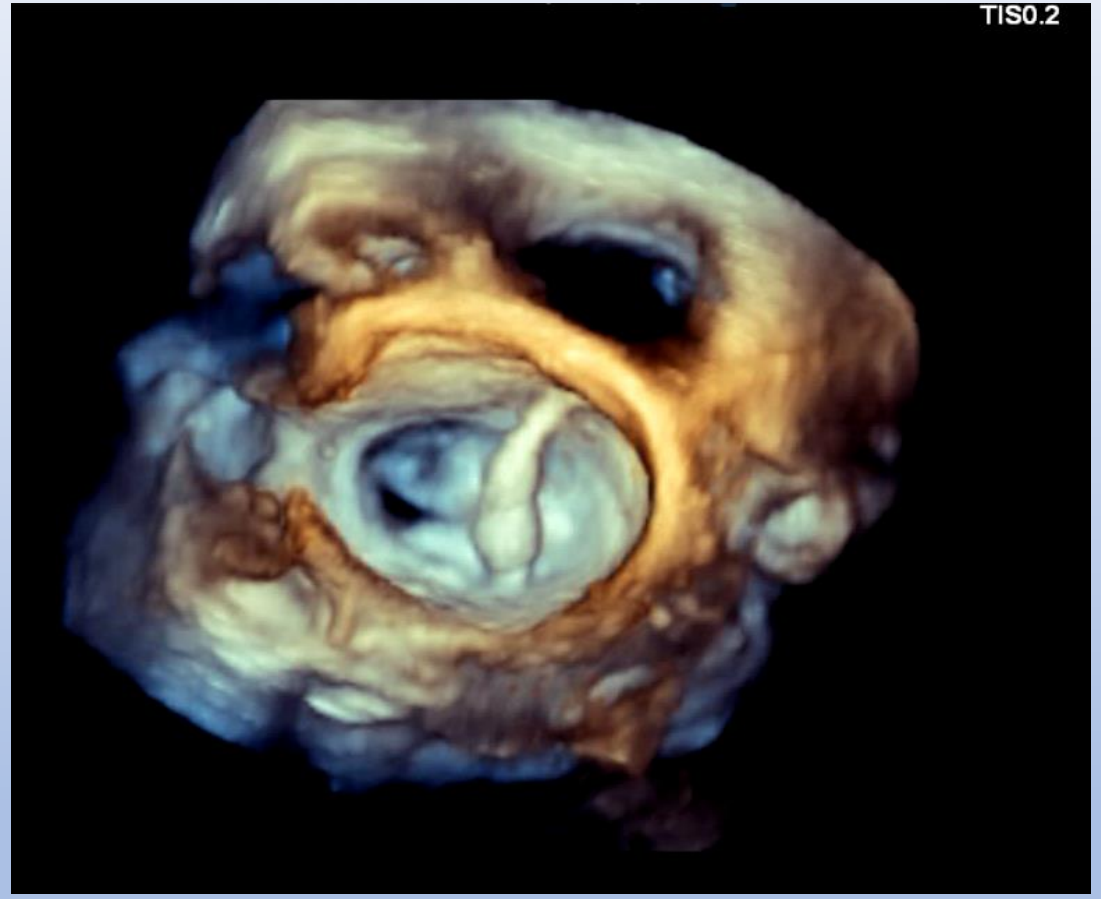
- **Pre-procedure**
- LA pressure v 21 mean 18
- LVEDP 9
- Invasive trans-mitral gradient 9mmHg

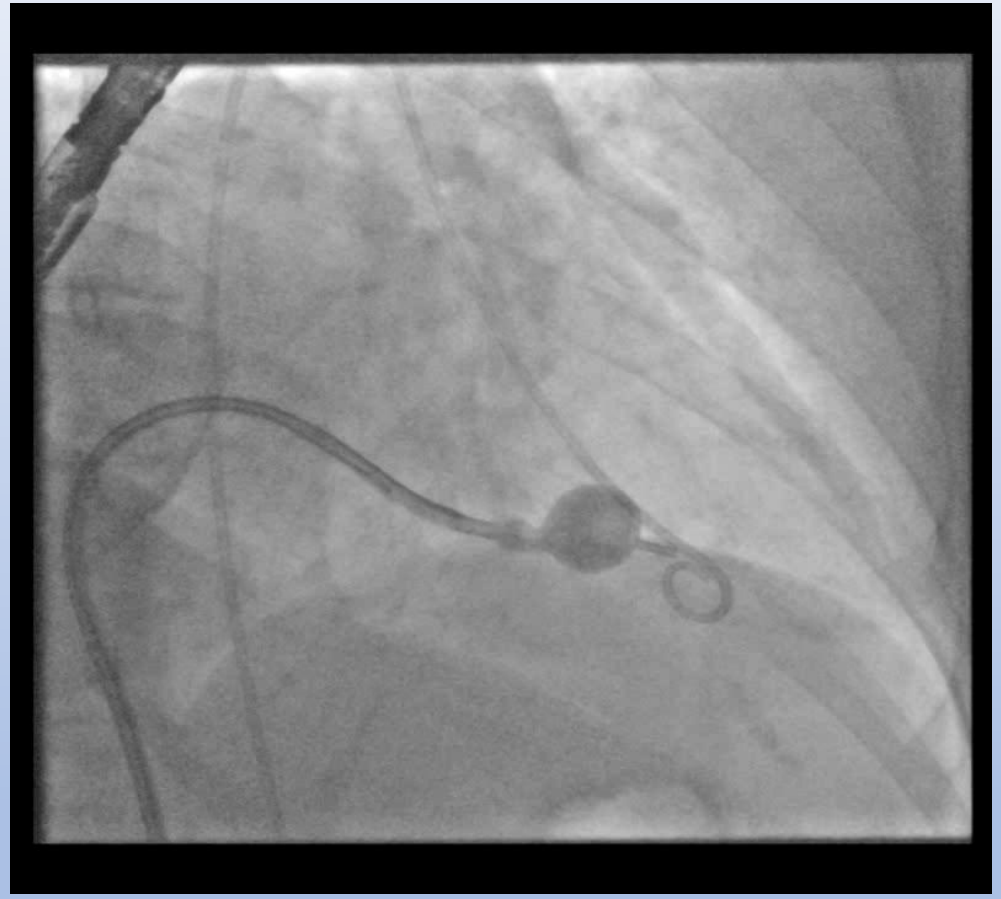
PTMC

- 9F right femoral venous access
- 5F right femoral arterial access
- 6F pigtail to LV apex
- SL0 and BRK transeptal puncture



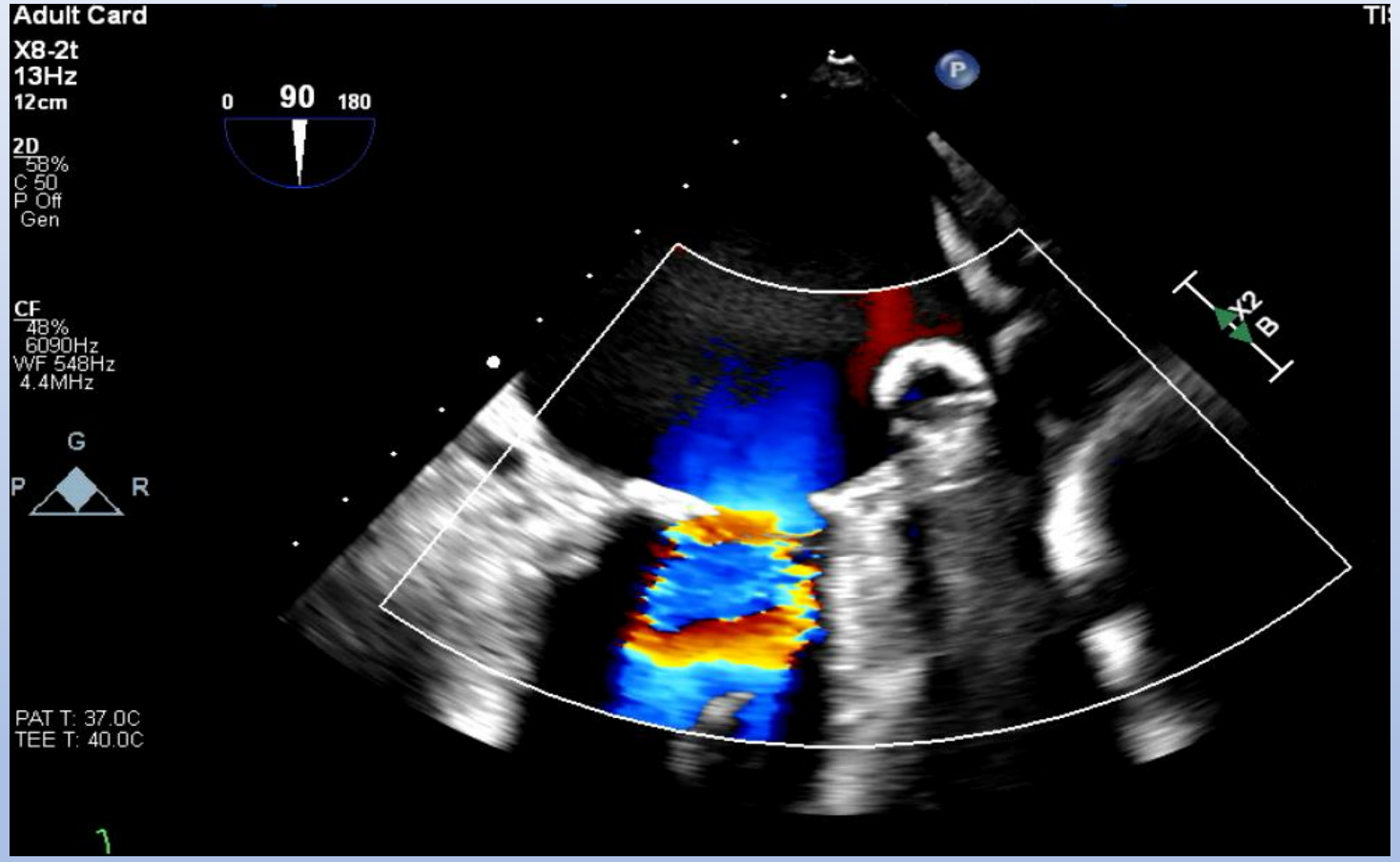
PTMC



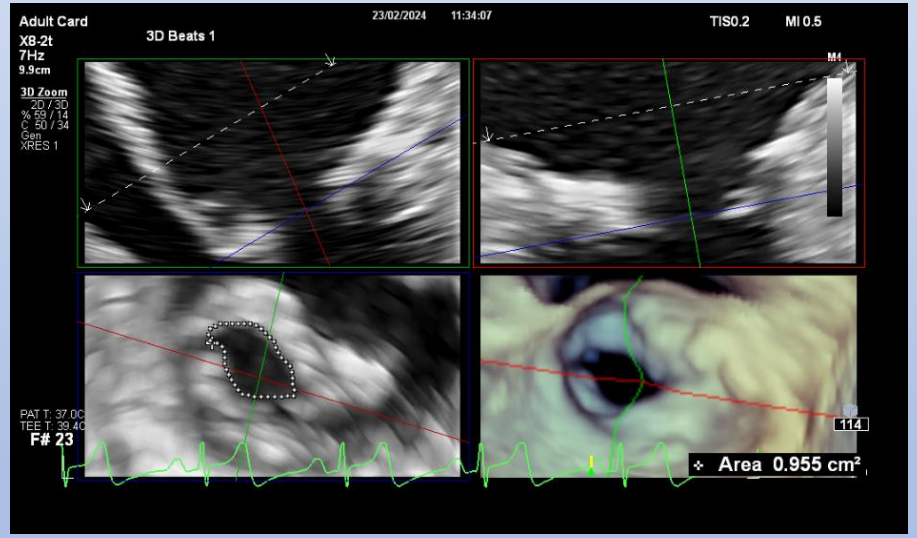


- Sequential inflations: 24, 26 then 28 mm

PTMC

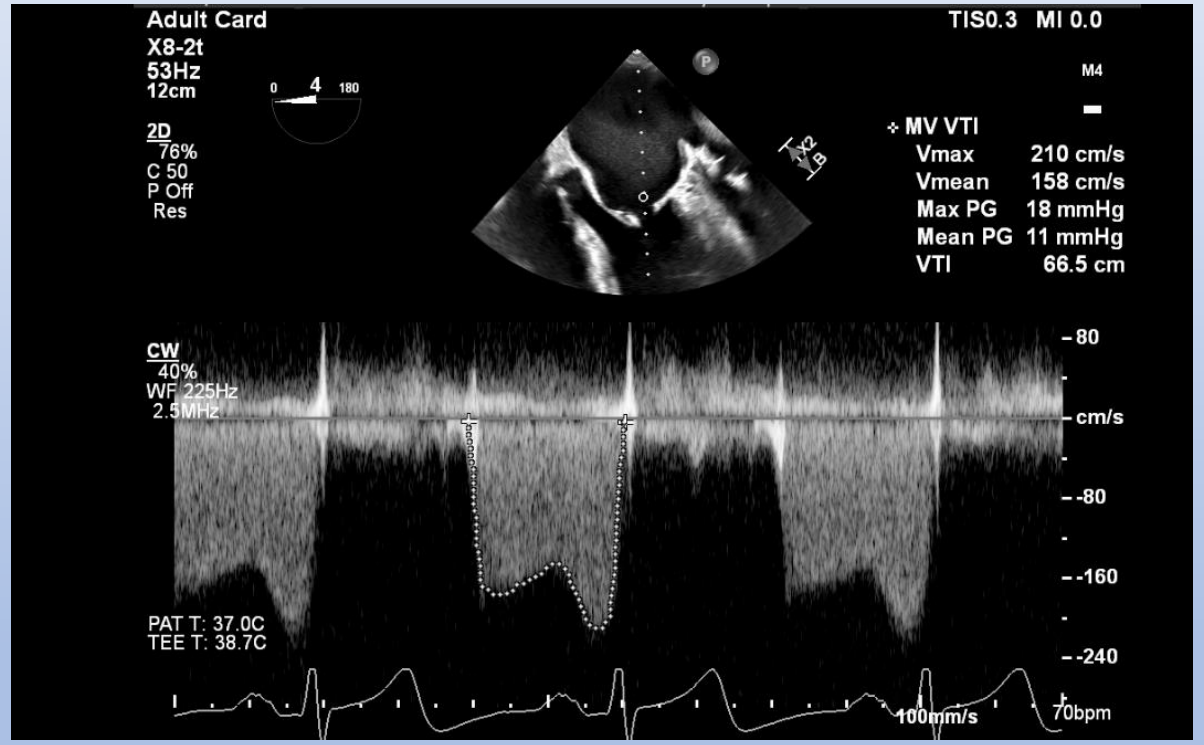


- **Post-procedure**
- LA v 16 mean 10, LVEDP 10
- Invasive MVG gradient 0

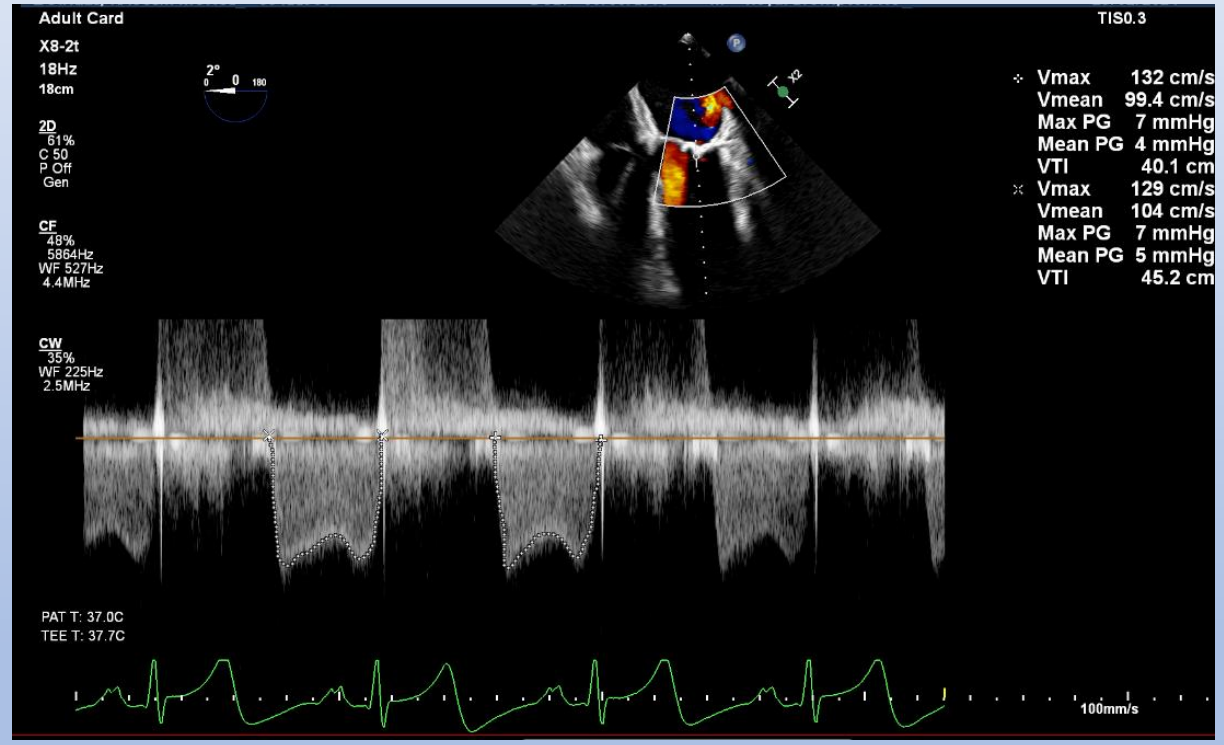


PTMC

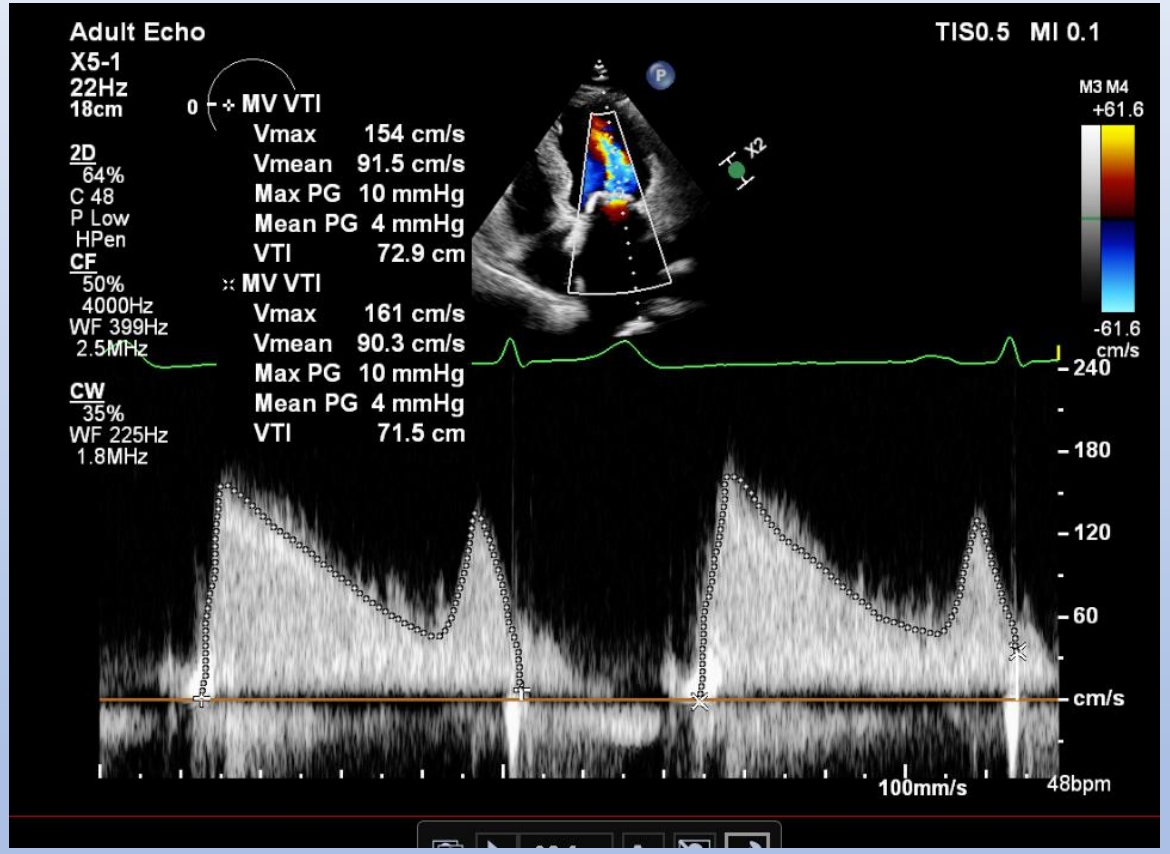
PRE

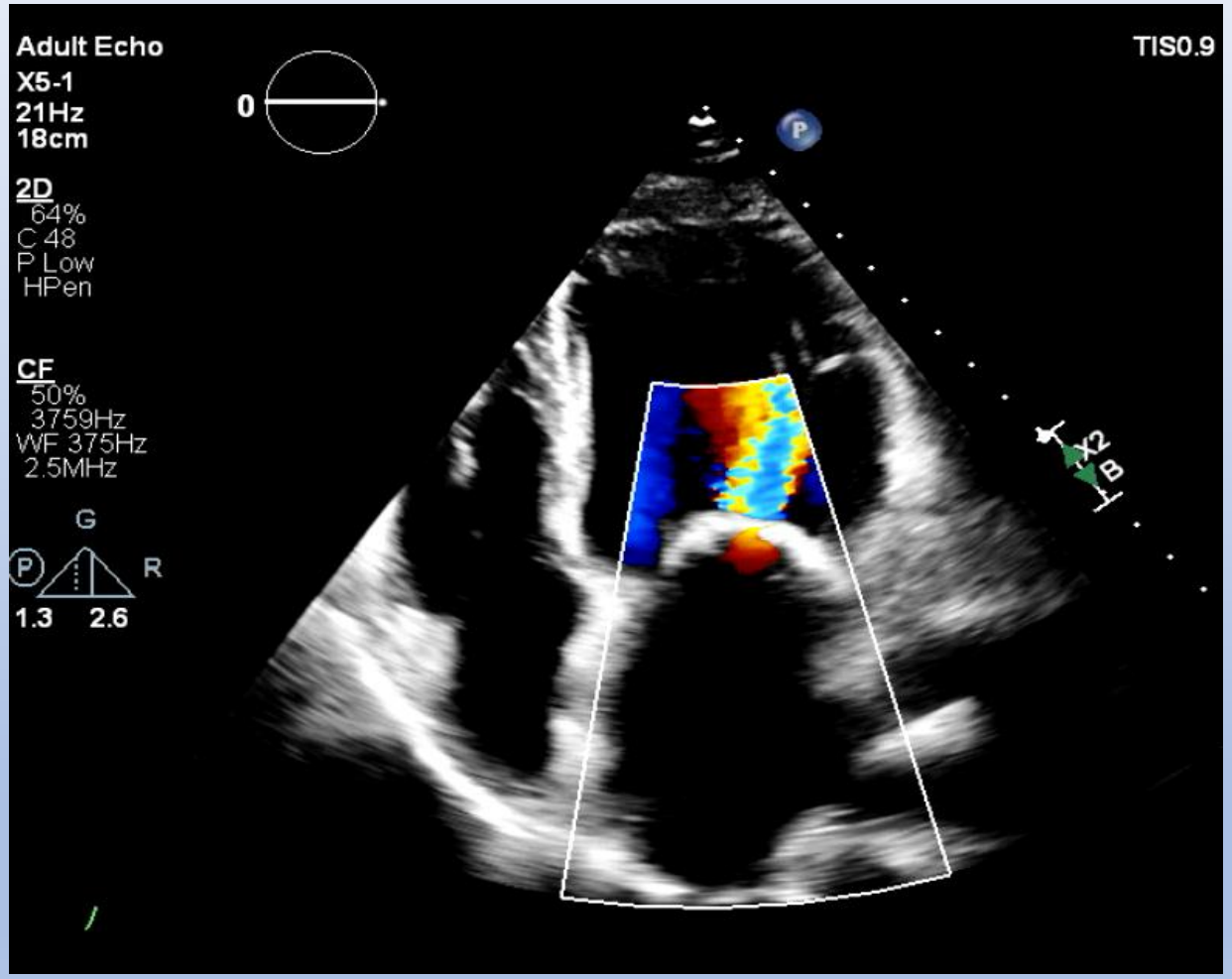


POST



Pre-discharge Echo





Complications

LIMITATIONS OF WILKINS

- Echocardiography limited in ability to differentiate nodular fibrosis from calcification
- **Assessment of commissural involvement** is not included or underestimated.
- Doesn't account for uneven distribution of pathologic abnormalities.
- Doesn't account for relative contribution of each variable (no weighting of variables).
- Frequent underestimation of subvalvular disease.
- Doesn't use results from TEE or 3D echocardiography

Therefore be prepared during PTMC….

46 year old female

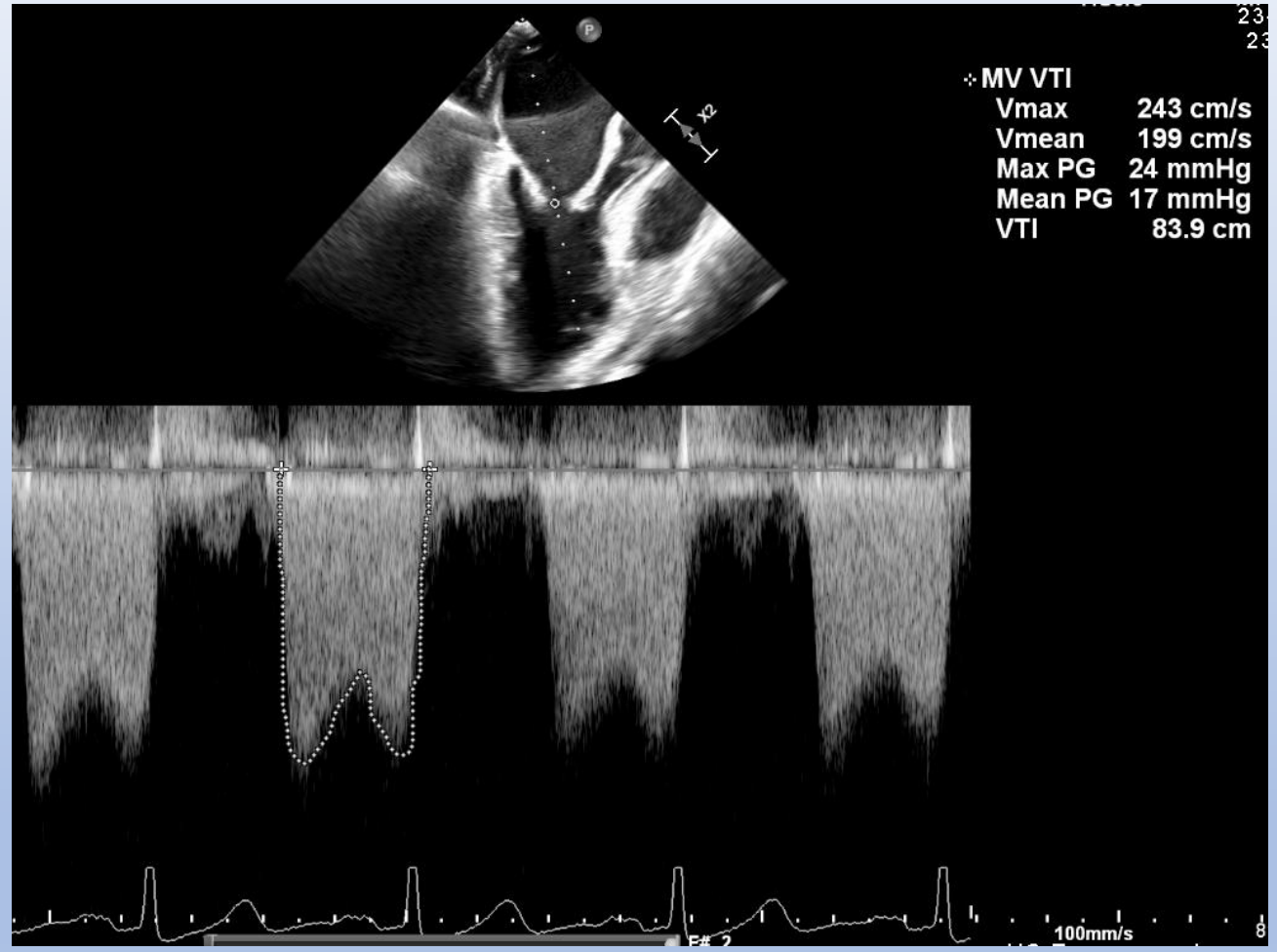
Severe rheumatic MS

Surgical turn-down

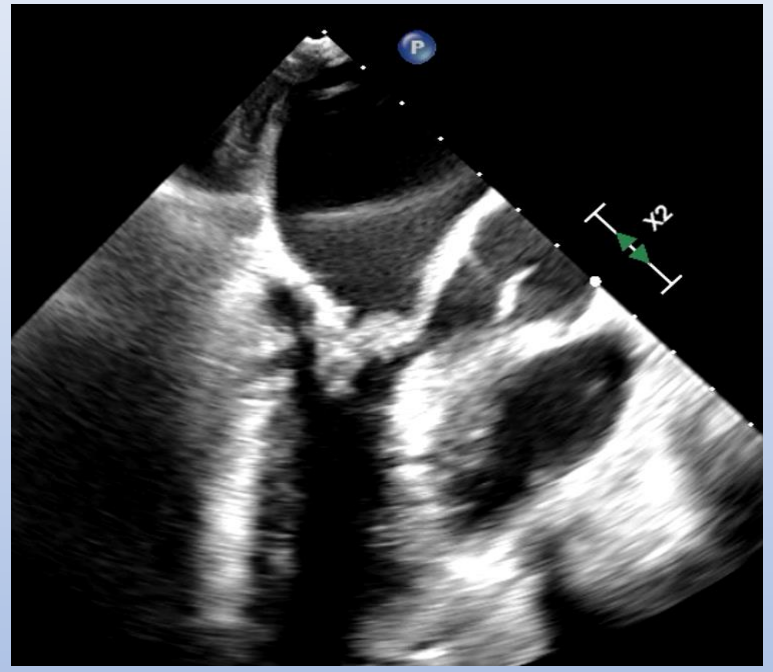
Wilkins Score <8

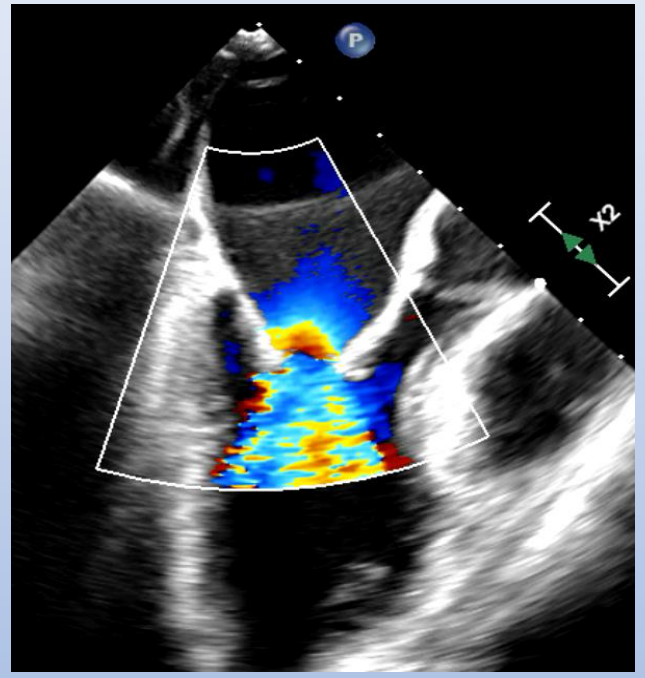
thickened leaflets

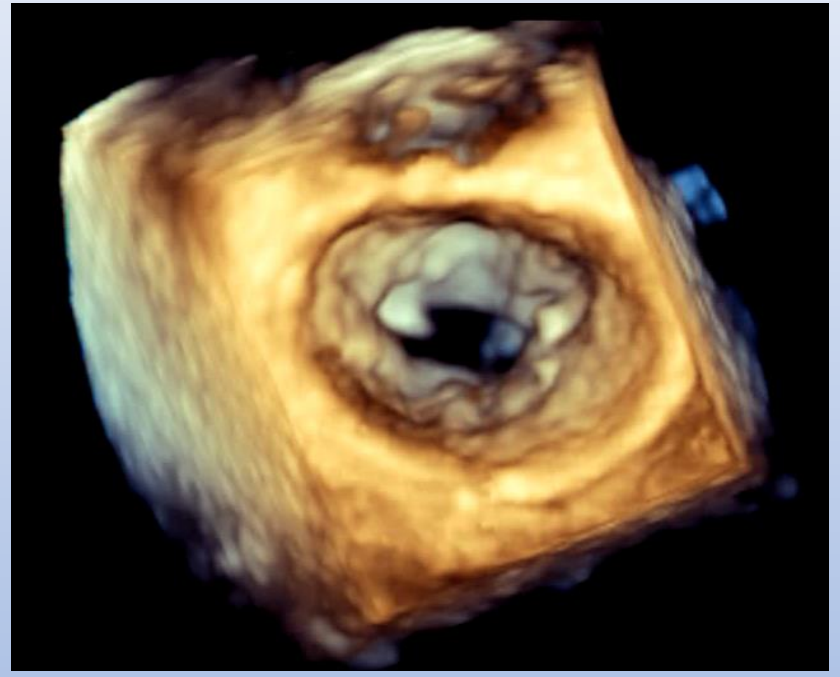
true commissural fusion



Pre-procedural imaging





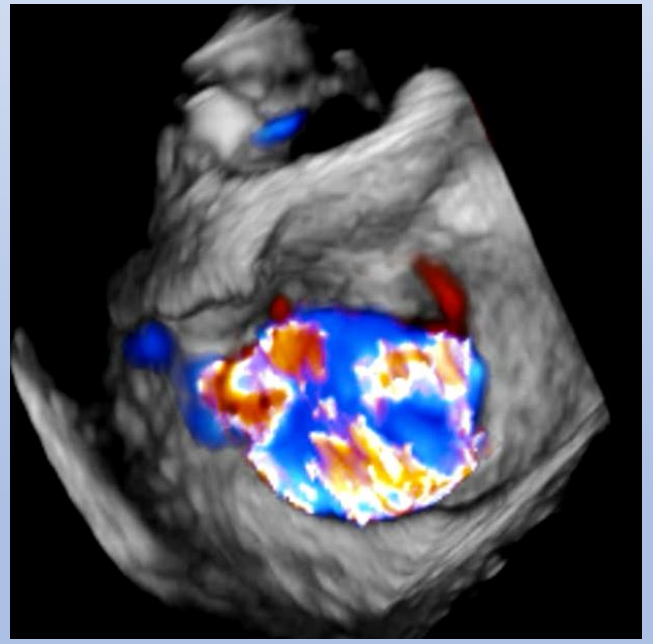


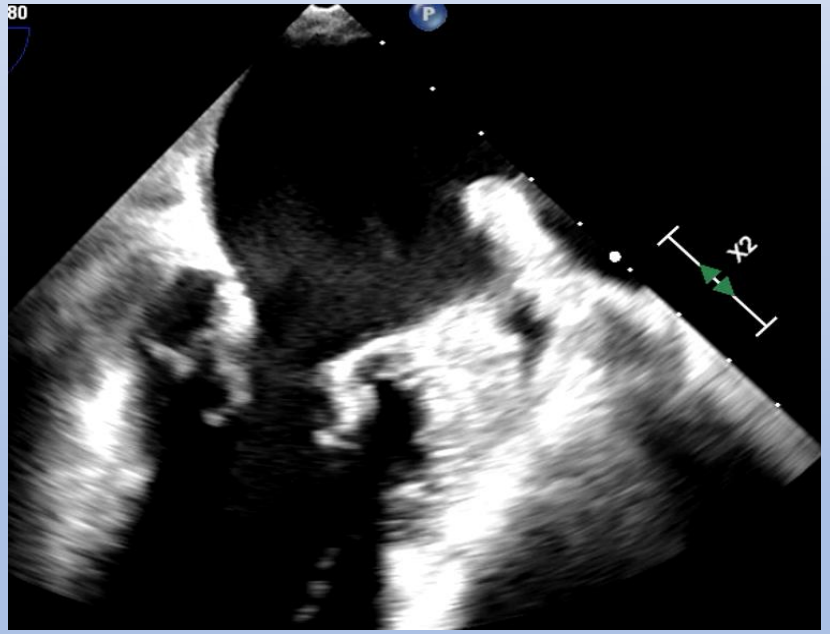
Prepare during PTMC

Calculated use 26mm balloon

Started with 22mm balloon

Single inflation





Recent Case Series: n=104 undergoing PTMC

Ann Med Surg (Lond). 2022 Nov 15;84:104867. doi: 10.1016/j.amsu.2022.104867

A study of Clinical Profile and in Hospital Outcomes of patients undergoing Percutaneous Transvenous Mitral Commissurotomy at a Tertiary Care Center of Nepal

Sutap Yadav [a,*], Sangam Shah [b], Ratna Mani Gajurel [a], Chandra Mani Poudel [a], Roshan Ghimire [a], Nischal Shah [a]

- Mean age 41 years (22% males, 78% females)
- Baseline MVA 0.98 ± 0.19 mm^2 increased to 1.69 ± 0.19 mm^2 after PTMC
- Post PTMC MVA varied with Wilkin's score, with ≤8 having favourable outcomes
- Successful PTMC highly influenced by
- increasing age
- valve morphology (calcification, thickness, mobility)
- LA dimensions, pre PTMC MVA, baseline mitral regurgitation
- Post procedure MR usually well tolerated, in rare cases required surgical valve replacement

Recent Case Series

Comparison of outcomes of pre and post PTMC.

	Pre PTMC	Post PTMC	P value
Mitral valve area	1.98 ± 0.19	1.69 ± 0.19	<0.001
Systolic LA Pressure	39.95 ± 10.57	23.96 ± 7.87	
Diastolic LA pressure	18.52 ± 6.72	8.88 ± 4.57	
Diastolic gradient	13.08 ± 4.18	5.74 ± 2.35	
PASP	48.98 ± 10.21	36.28 ± 9.99	
MR severity			
None	18 (17.3%)	5 (4.8%)	<0.001
Trivial	45 (43.3%)	10 (9.6%)	
Mild	39 (37.5%)	67 (64.4%)	
Moderate	2 (1.9%)	19 (18.3%)	
Severe	0 (0%)	3 (2.9%)	

Yadav et al. Ann Med Surgery 2022

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Moderate	2 (1.9%)	19 (18.3%)	
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Complications in patient that underwent PTMC.

Local Vascular Access site related	Hematoma/oozing	7
	Femoral pseudoaneurysm	2
Cardiac	Severe Mitral Regurgitation	3
	Pericardial effusion/Hemopericardium	2
	Ventricular arrhythmias: Non sustained VT	3
	Sustained VT	1
	AV Block – 2:1	2
	Left ventricular perforation	0
	Cardiac Tamponade	1
	Need of MVR	2
	Myocardial infarction	1
Embolic events	CVA (Ischemic/Hemorrhagic)	1
	Coronary Embolization	1
Death		0

Yadav et al. Ann Med Surgery 2022

The Place of Percutaneous Treatment In Rheumatic Disease

Thank you very much for your kind attention

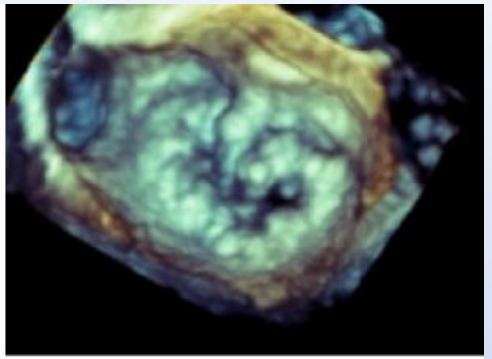
Modified echo scores

- Reid Score
  - Leaflet motion – expressed as a slope by dividing the height (H)and the length (L) of doming of anterior leaflet
  - Leaflet thickness – expressed as the ratio between the thickness of the tip of MV and thickness of posterior wall of aortic root
  - The score is assigned as 0 for mild affection 1 for moderate and 2 for severe affection
- Refai score
  - Scoring of calcification (0,2,4,6)
  - Scoring of subvalvular involvement (0,2,4,6)
  - The total score is the sum of the calcification score and the score of subvalvular involvement, expressed out of 12.

Modified echo scores

Nobuyoshi score

Component	Score	Definition
Leaflet mobility	1	Pliable leaflets with minimal restriction of leaflet tip mobility
	2	Semi-pliable leaflets with restriction of leaflet body mobility
	3	Minimal forward movement of the leaflets
Commissural disease	1	No commissural disease
	2	One commissural disease
	3	Both commissural disease
	4	Diffuse commissural disease
Subvalvular disease	1	Minimal thickening of chordae
	2	Thickening and shortening of chordae
	3	Fused subvalvular apparatus



Curr Cardiovasc Imaging Rep. 2011 Oct; 4(5): 370–377.
Published online 2011 Jul 9. doi: 10.1007/s12410-011-9099-z

New Scores for the Assessment of Mitral Stenosis Using Real-Time Three-Dimensional Echocardiography

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Mitral valve score based on real-time three-dimensional echocardiography

	Leaflets					
	Anterior leaflet			Posterior leaflet		
	A1	A2	A3	P1	P2	P3
[a]Thickness (0–6)	0–1	0–1	0–1	0–1	0–1	0–1
[a]Mobility (0–6)	0–1	0–1	0–1	0–1	0–1	0–1
[b]Calcification (0–10) (0 = no, 1–2 = calcified)	0–2	0–1	0–2	0–2	0–1	0–2
	[b]Subvalvular apparatus					
	Proximal third		Middle third		Distal third	
Thickness (0–3) (0 = normal, 1 = thickened)	0–1		0–1		0–1	

Total Score Grading

. Total score of mild MV involvement was defined as <8 points, moderate MV involvement 8–13,

- RT3D-TEE saves time & gives a detailed assessment of MV morphology before BMV.
- The application of the 3D scoring system can be obtainable in all patients regardless of their transthoracic image quality and underlying heart rhythm

Ideal Scoring system

- Inclusion of all points that proved to predict and affect outcome
- Easily applicable & interpretable by most cardiologists
- Validation in large studies (short and long term outcomes)
- ? Unified for both TTE and TEE

ESC / EACTS 2025 Guidelines: Percutaneous Guidelines MS

- PTMC limited to patients with clinically severe rheumatic MS (MVA <1.5 cm^2) in whom PMC is expected to have a significant impact on clinical outcome
- PTMC may be considered in symptomatic patients with an MVA of >1.5 cm^2 if symptoms not explained by another cause and if anatomy favourable
- PTMC 1st-line treatment anatomically suitable rheumatic MS and mild-moderate calcification without severe subvalvular impairment
- Selected patients unfavourable anatomical and clinical characteristics can still benefit from PMC, particularly if they are at increased surgical risk
- Surgical MVR for symptomatic restenosis after surgical commissurotomy or PMC
- Redo PTMC for selected candidates with favourable characteristics, if dominant mechanism is commissural refusion