FLAIL MITRAL VALVE

ECHOCARDIOGRAPHY IN THE INTENSIVE CARE UNIT

February 9, 2019.

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Consultant Cardiologist
Non-invasive Lab - HMC

Overview

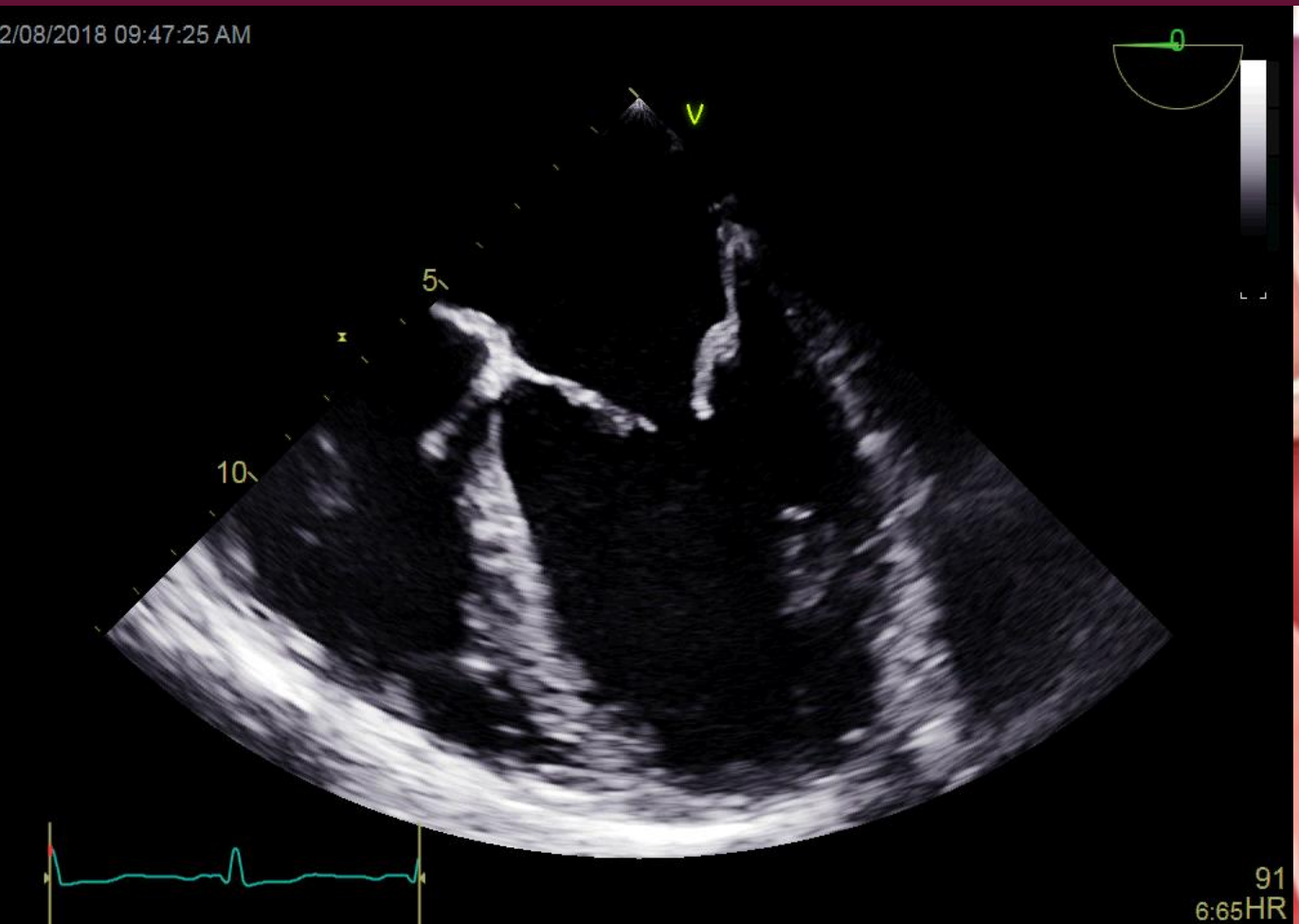
- Introduction and Anatomy.
- Chronic mitral Regurgitation 2ry to Flial MV.
- Acute mitral Regurgitation 2ry to Flail MV.

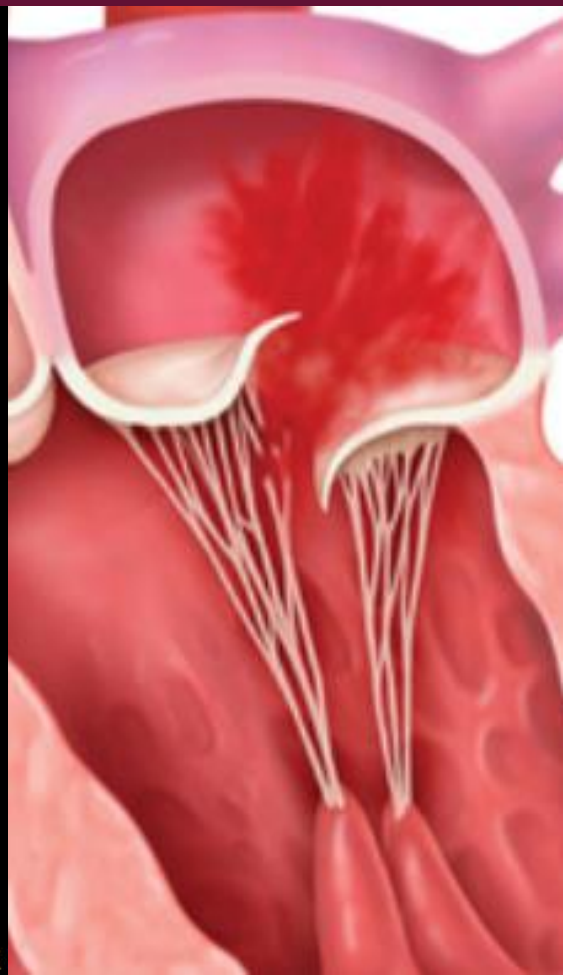
Flail Mitral Valve

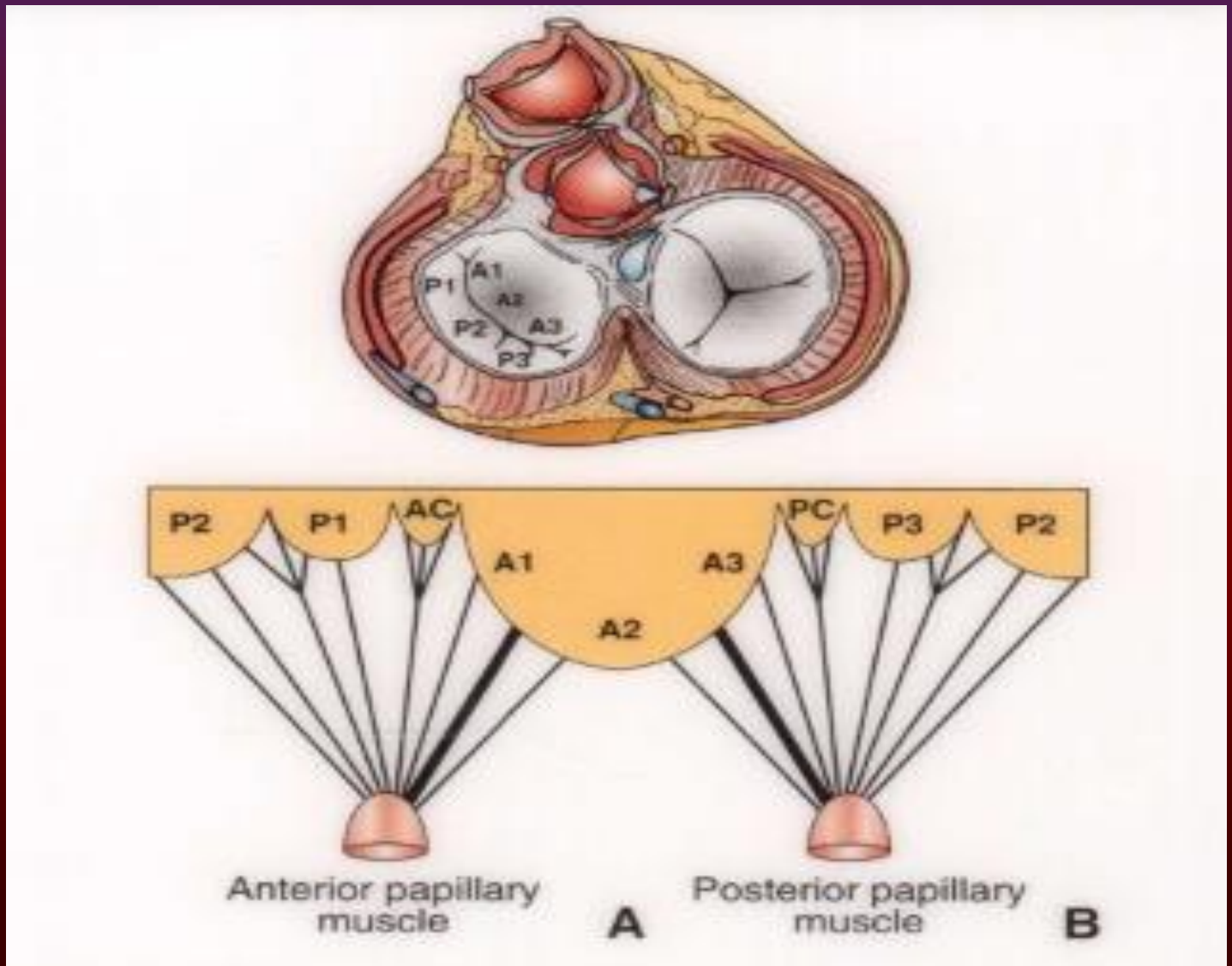
- Failure of leaflets coaptation with rapid systolic movement of the involved leaflet into the left atrium, due to rupture chordae tendineae or papillary muscle.

- May result in acute, subacute or chronic MR.

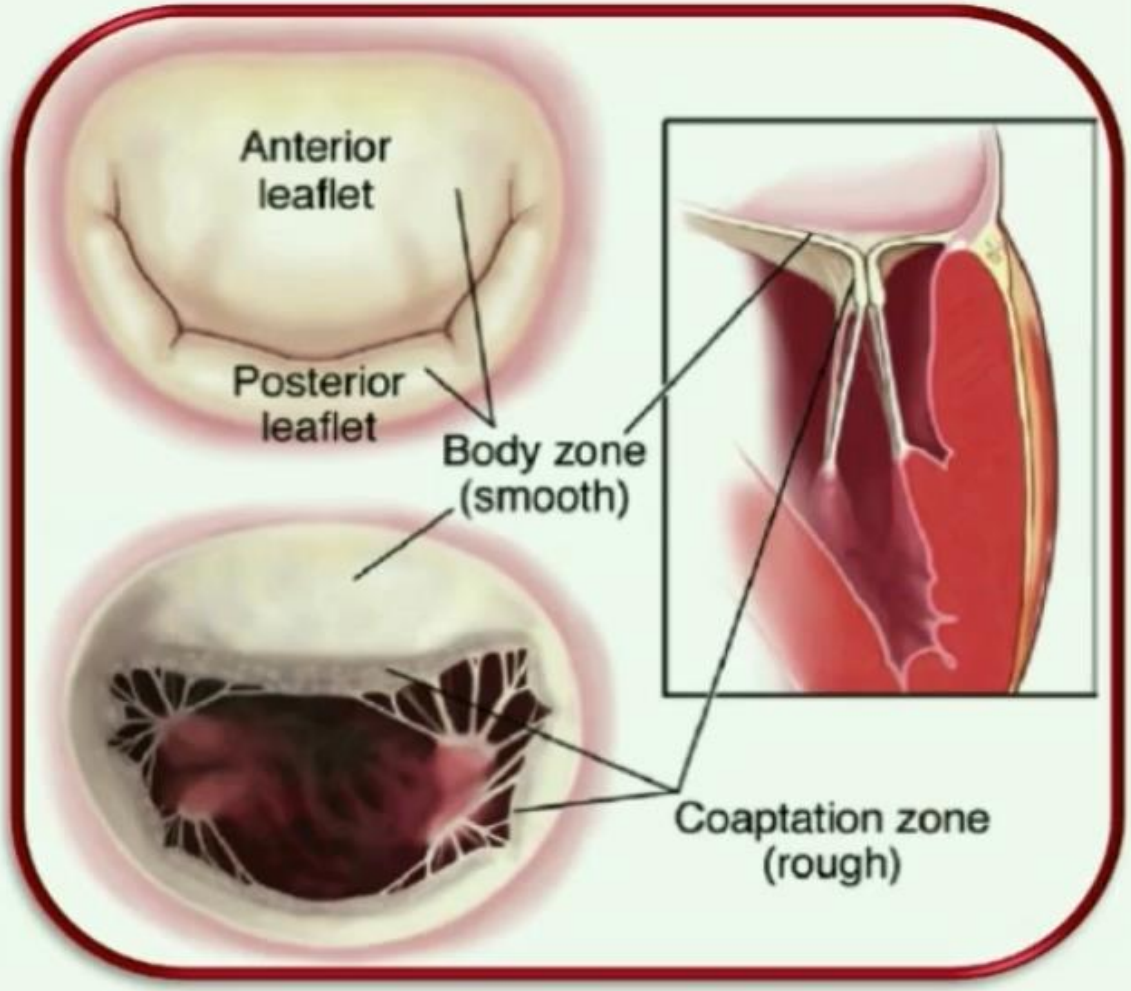
ANATOMY

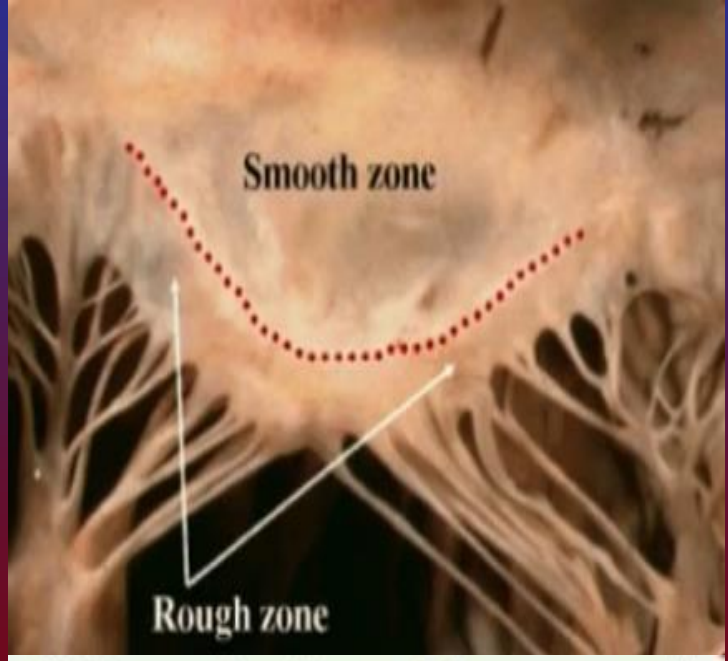




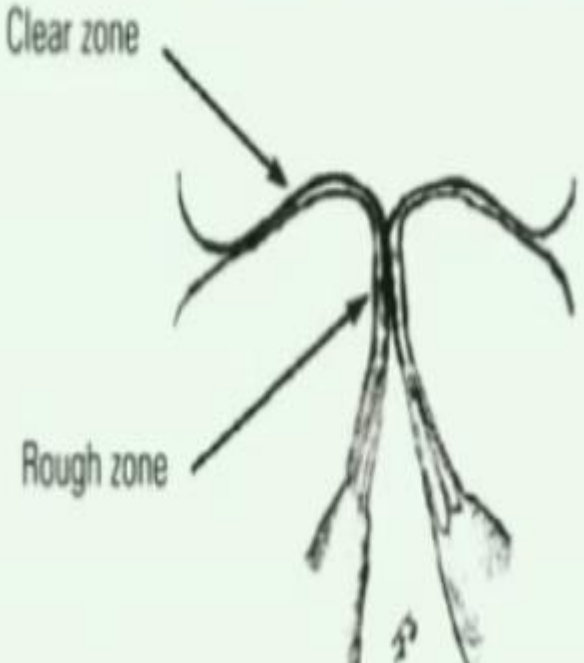

P1
A1
A2
P2
A3
P3
P2
P1
AC
A1
A2
A3
PC
P3
P2
Anterior papillary muscle
A
Posterior papillary muscle
B

Coaptation Zone

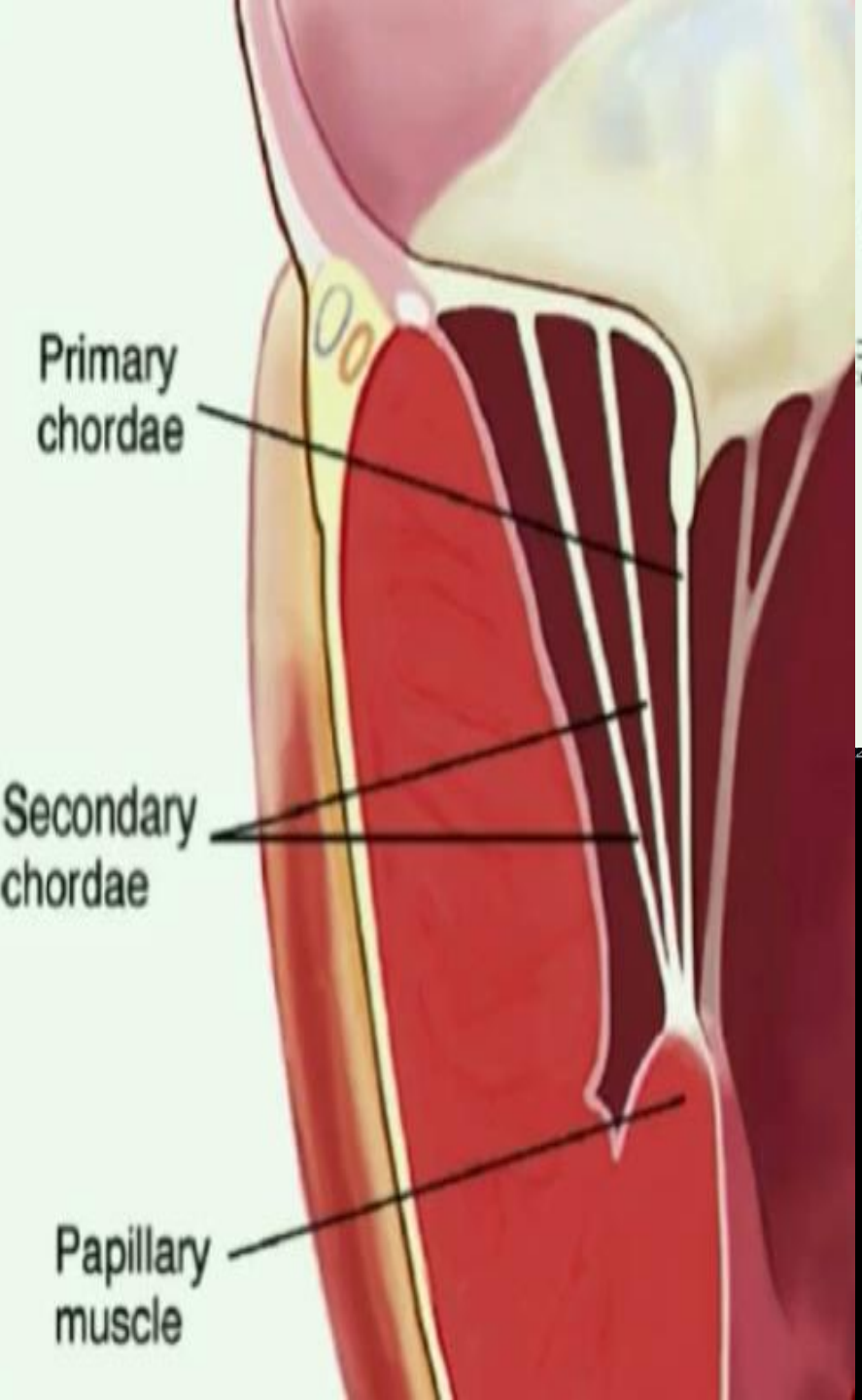


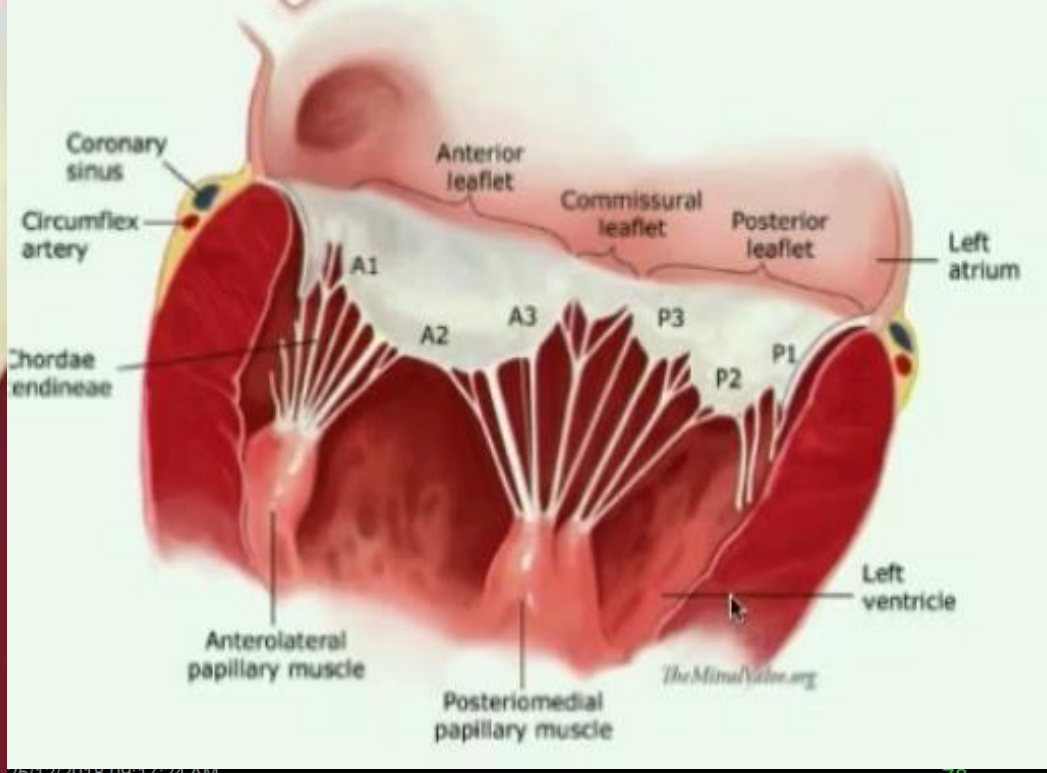


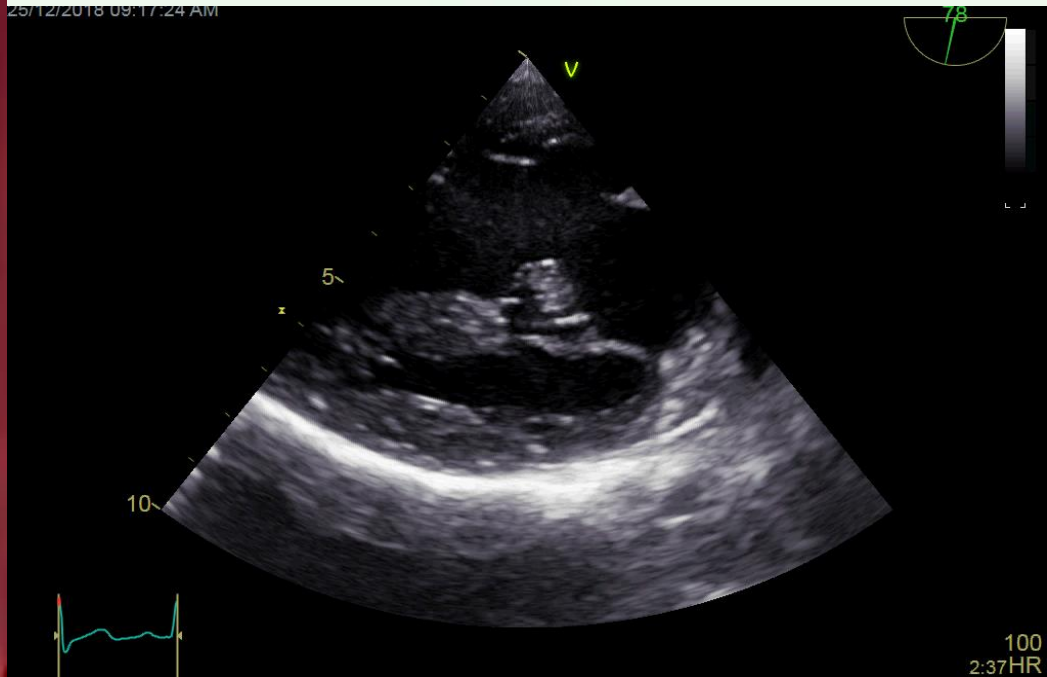
"Coaptation Reserve"



journal of cardiothoracic and vascular anesthesia volume 23 no 4 August 2009 pp 531543
Gregory W. Fischer, MD, Anelechi C. Anyanwu, MD, David H. Adams, MD


Primary chordae
Secondary chordae
Papillary muscle


Coronary sinus
Circumflex artery
Anterior leaflet
Commissural leaflet
Posterior leaflet
Left atrium
A1
A2
A3
P1
P2
P3
Chordae tendineae
Left ventricle
Anterolateral papillary muscle
Posteriomedial papillary muscle
TheMitralValve.org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V
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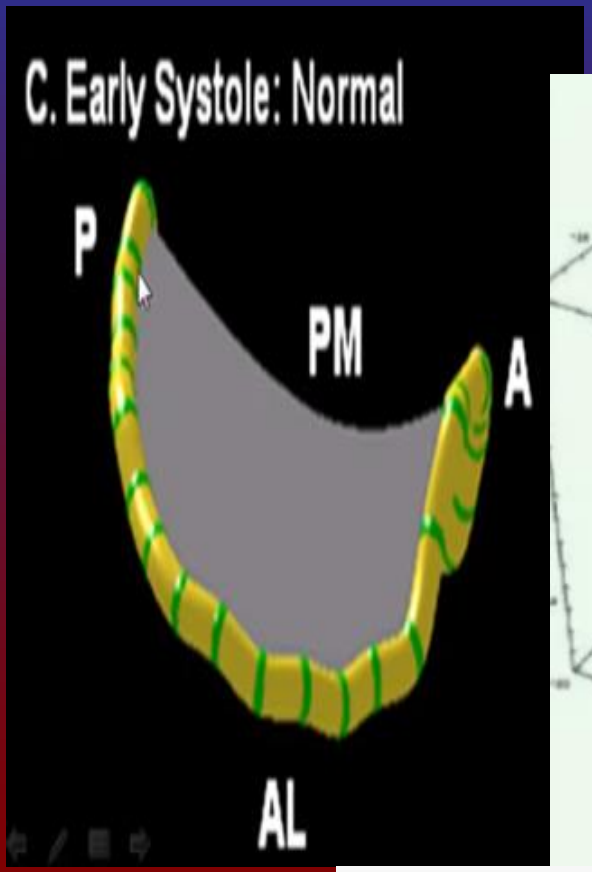
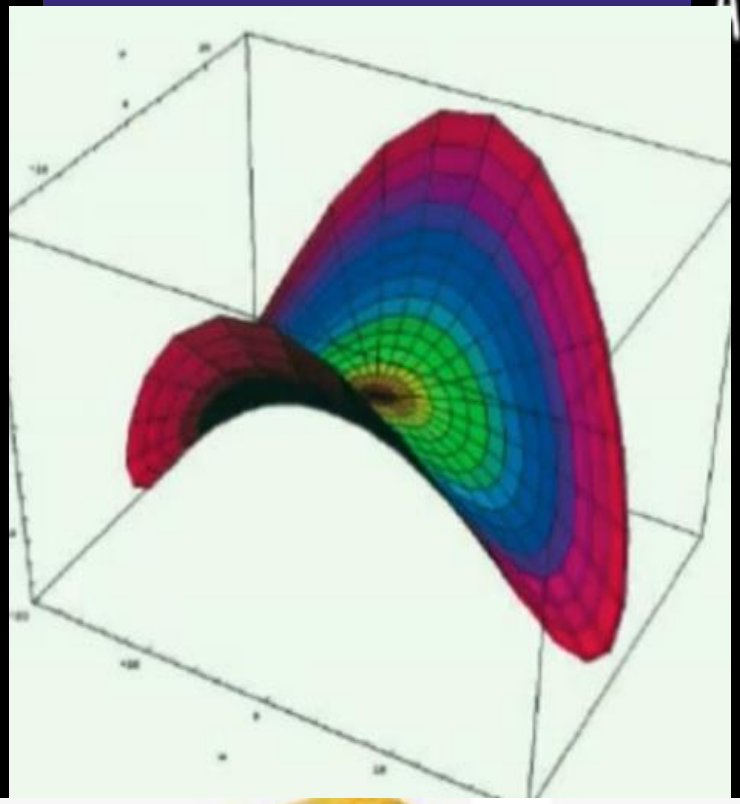
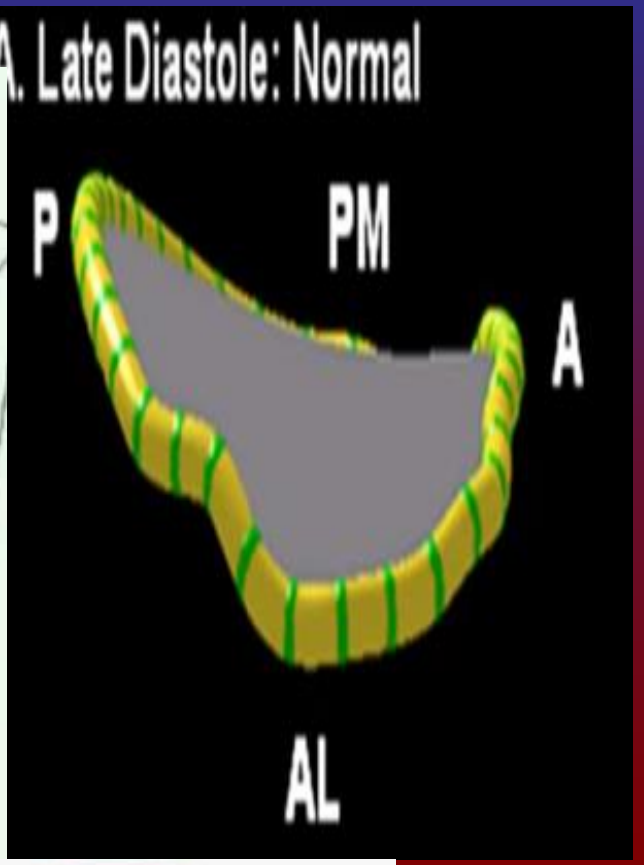
10
100
2:37HR

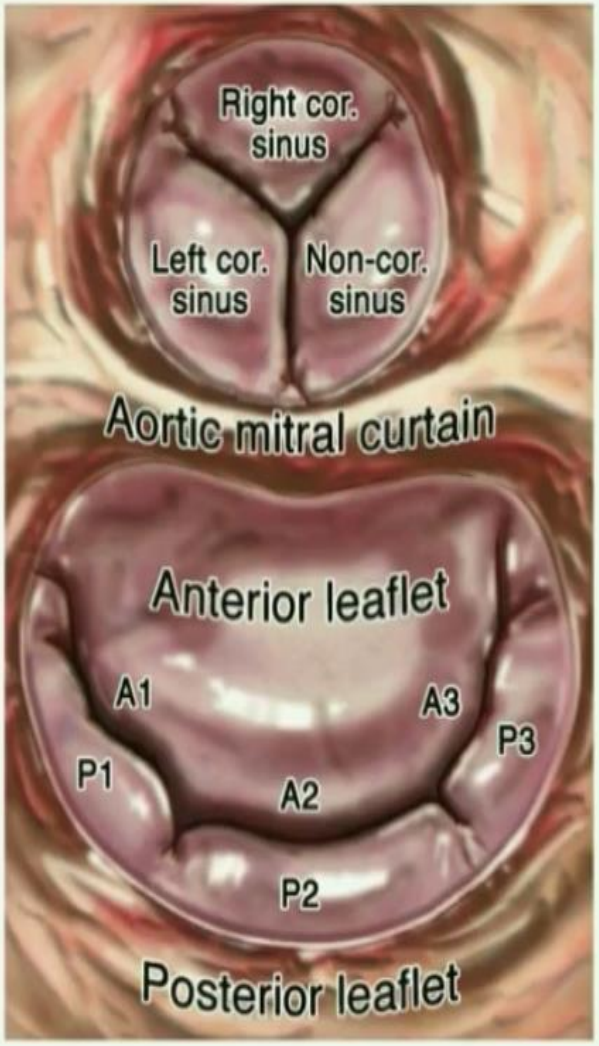


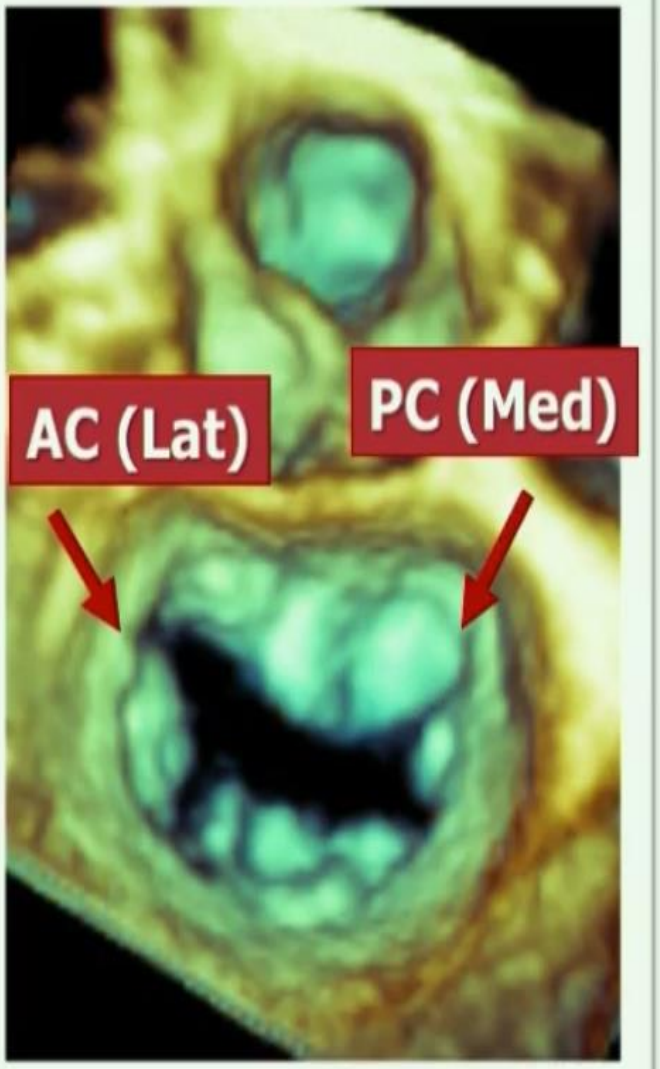




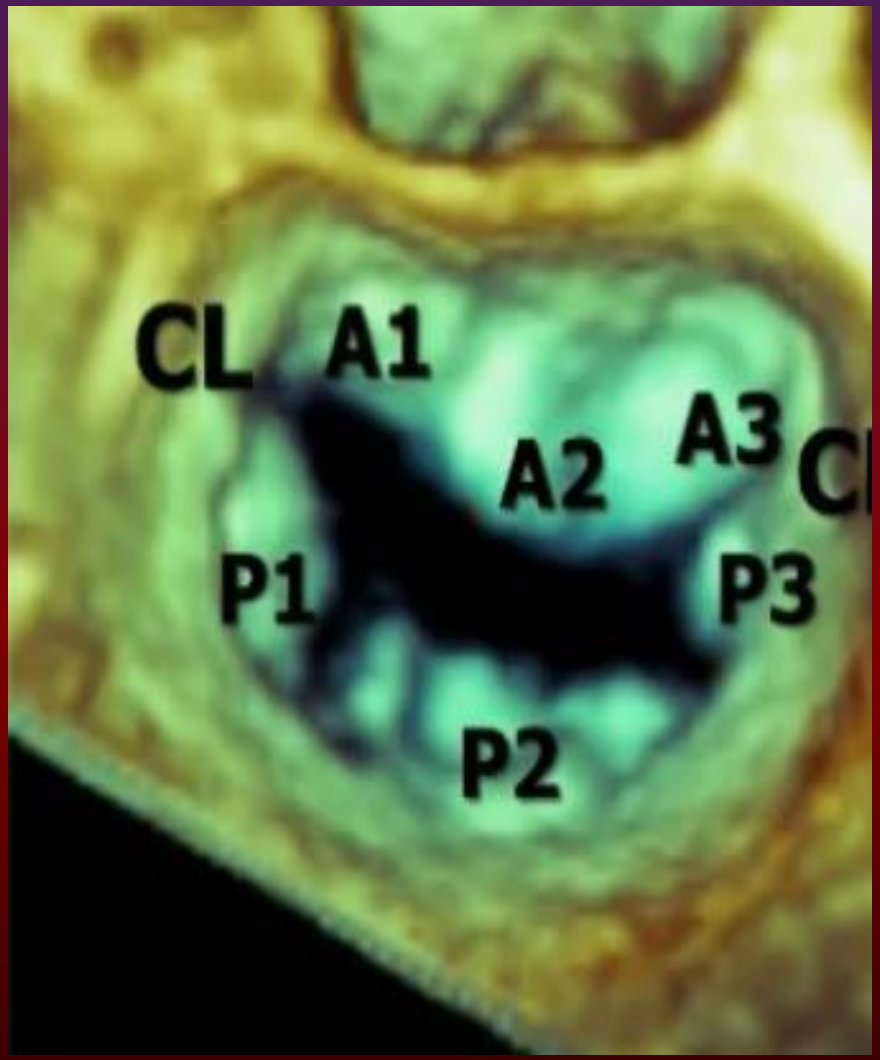
The mitral va figuration during diasto

I.S. Salgo, J.H. ture in reducing mitral

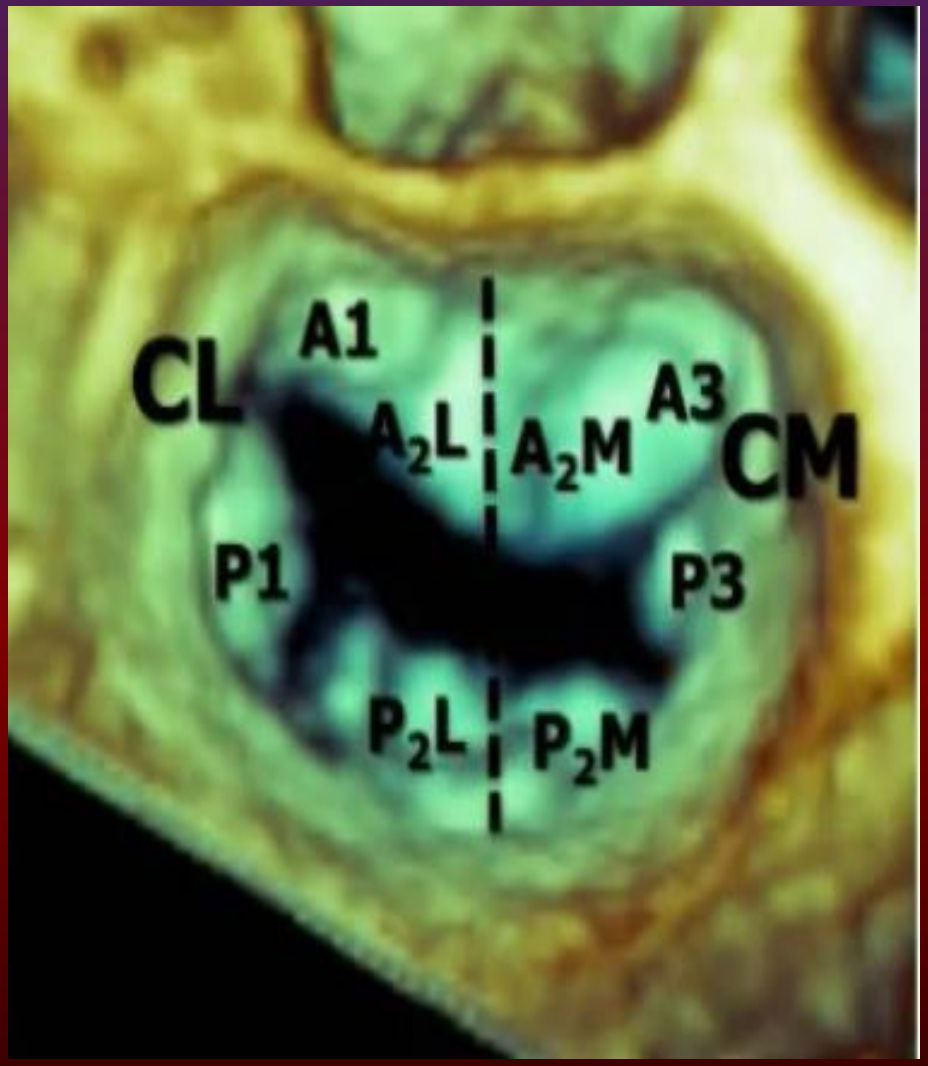




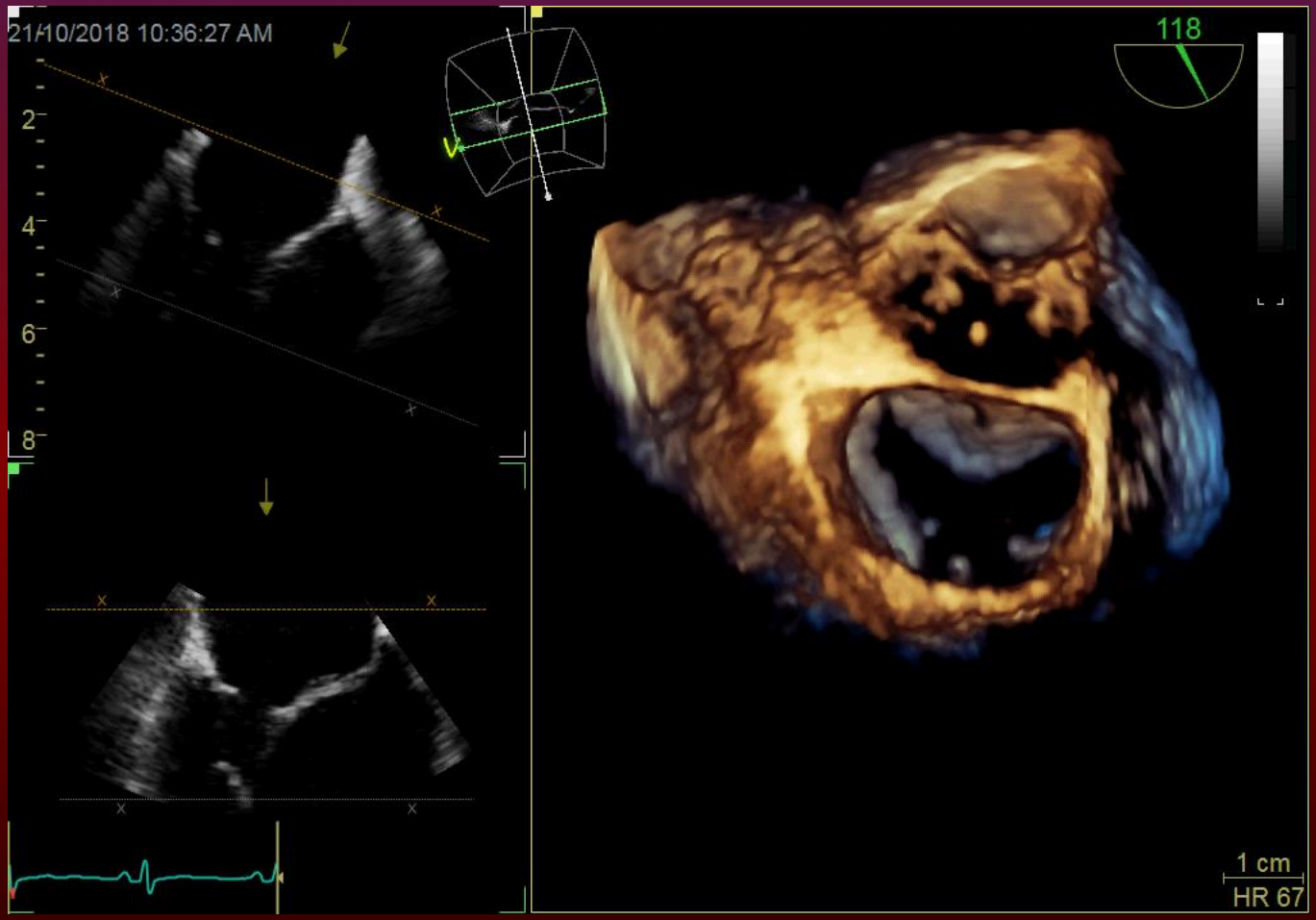
Lang RM, Tsang W, Weinert L, Mor-Avi V, Chandra S. J Am Coll Cardiol 2011 November 1;5 8(19):1933-1944.



Carpentier



Modified Carpentier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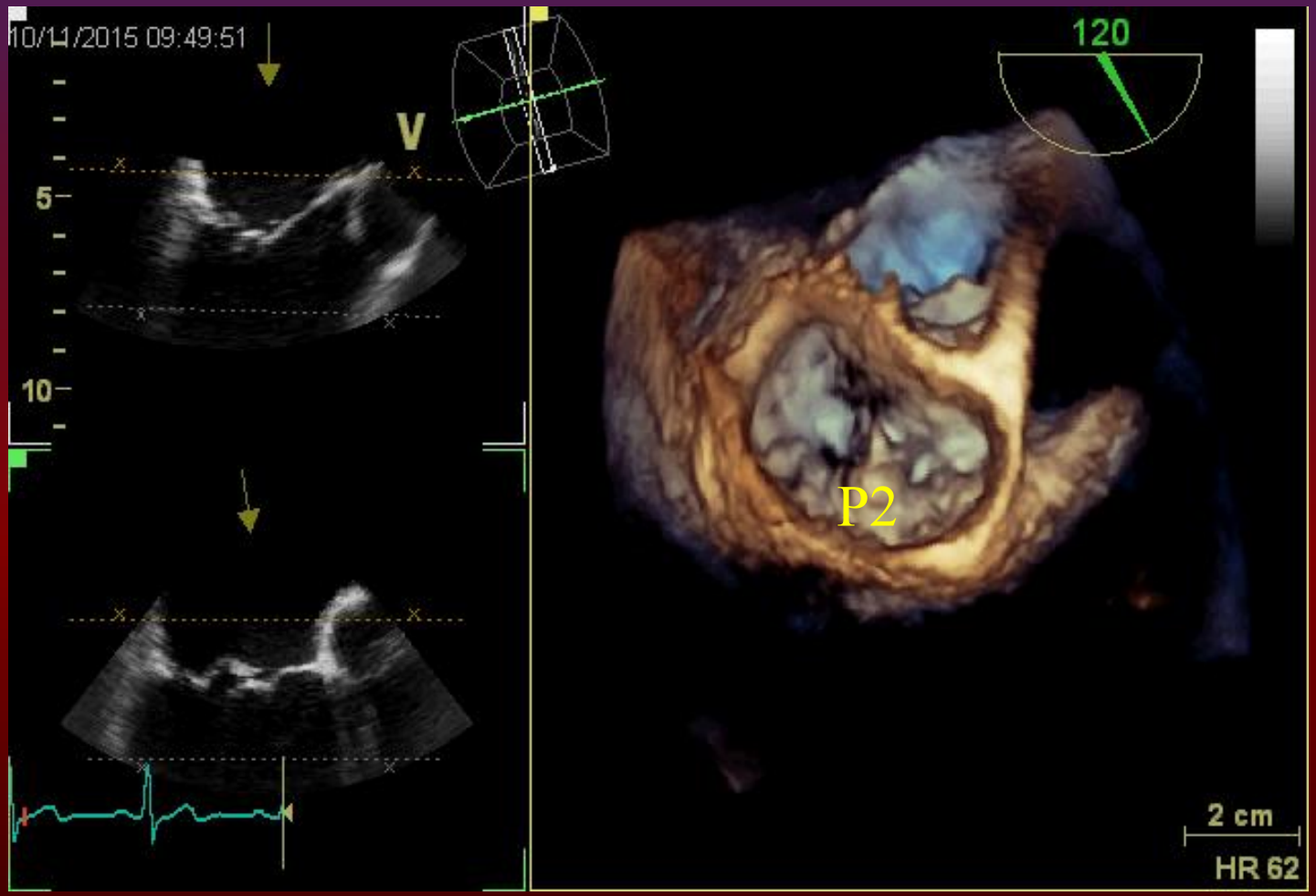
2
4
6
8
118
1 cm
HR 67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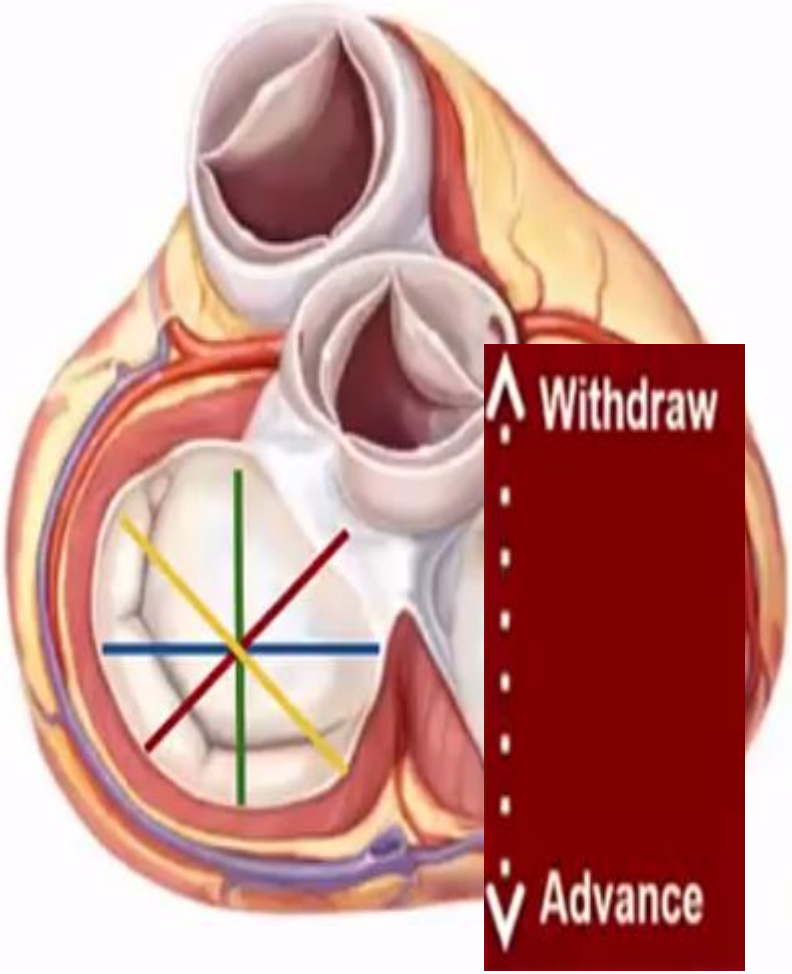
V
5
10
120
P2
2 cm
HR 62

Anatomy Revisited



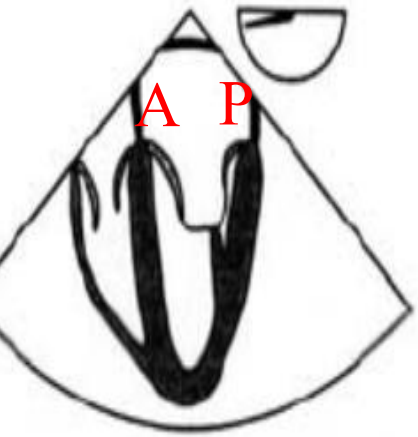
0°: Midesophageal 4-chamber

60°: Commisural view

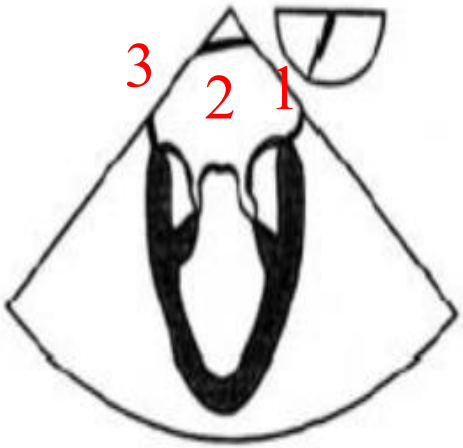
90°: Midesophageal 2-chamber

120°: Midesophageal long axis

Carpentier's *Reconstructive Valve Surgery*

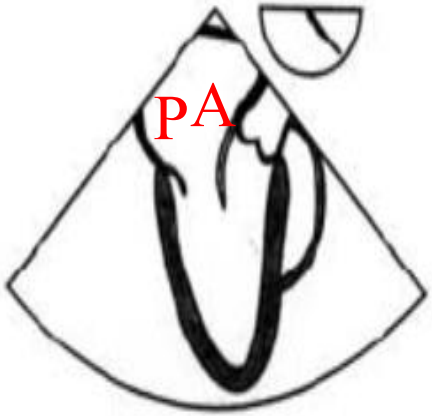


a. ME four chamber

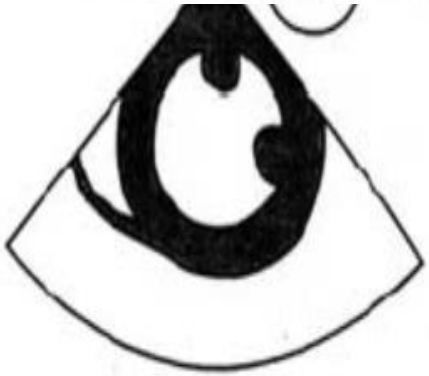


g. ME mitral commissural

b. ME two chamber



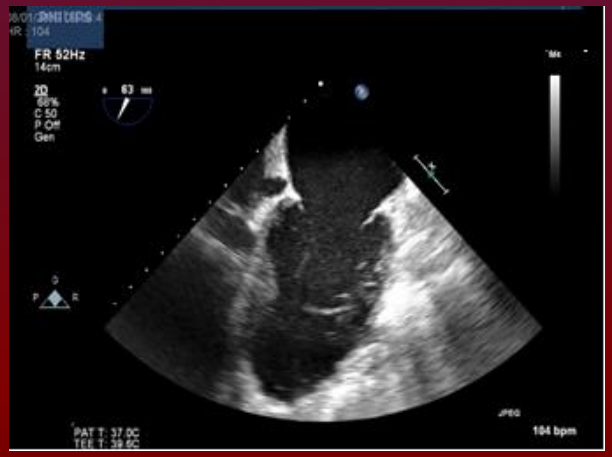
c. ME LAX



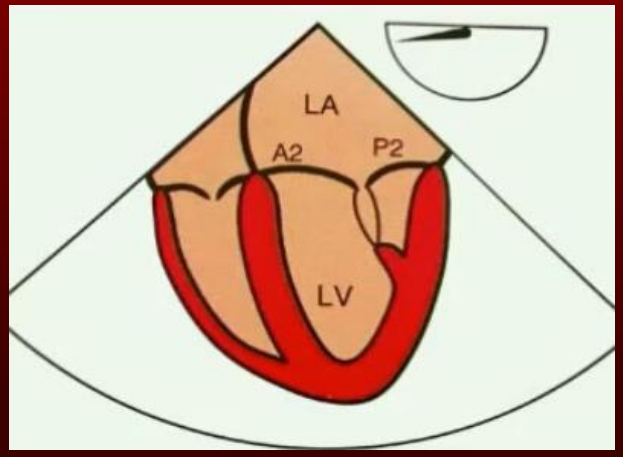
d. TG mid SAX

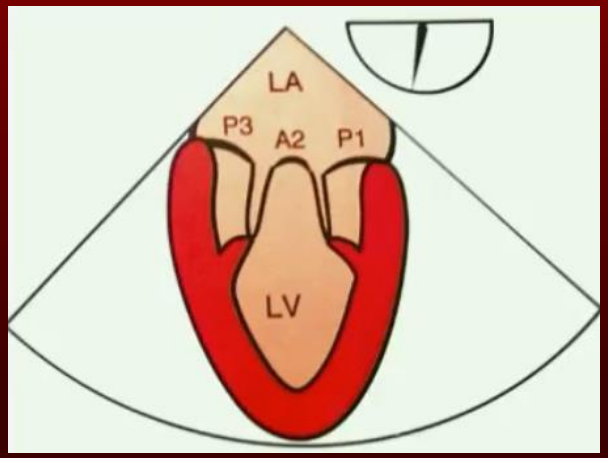
e. TG two chamber

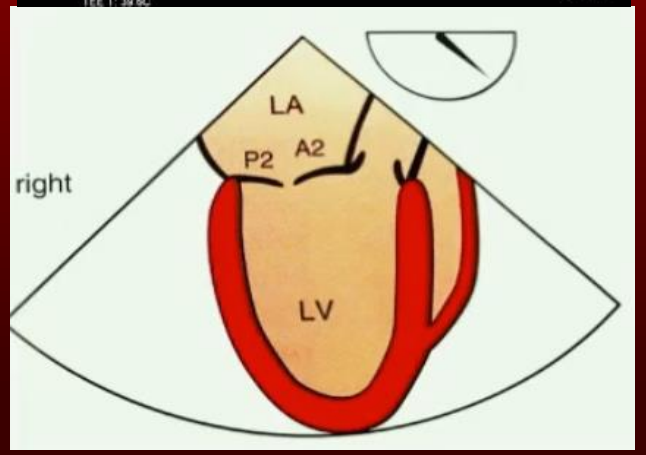

FR 52Hz
12cm
103 bpm

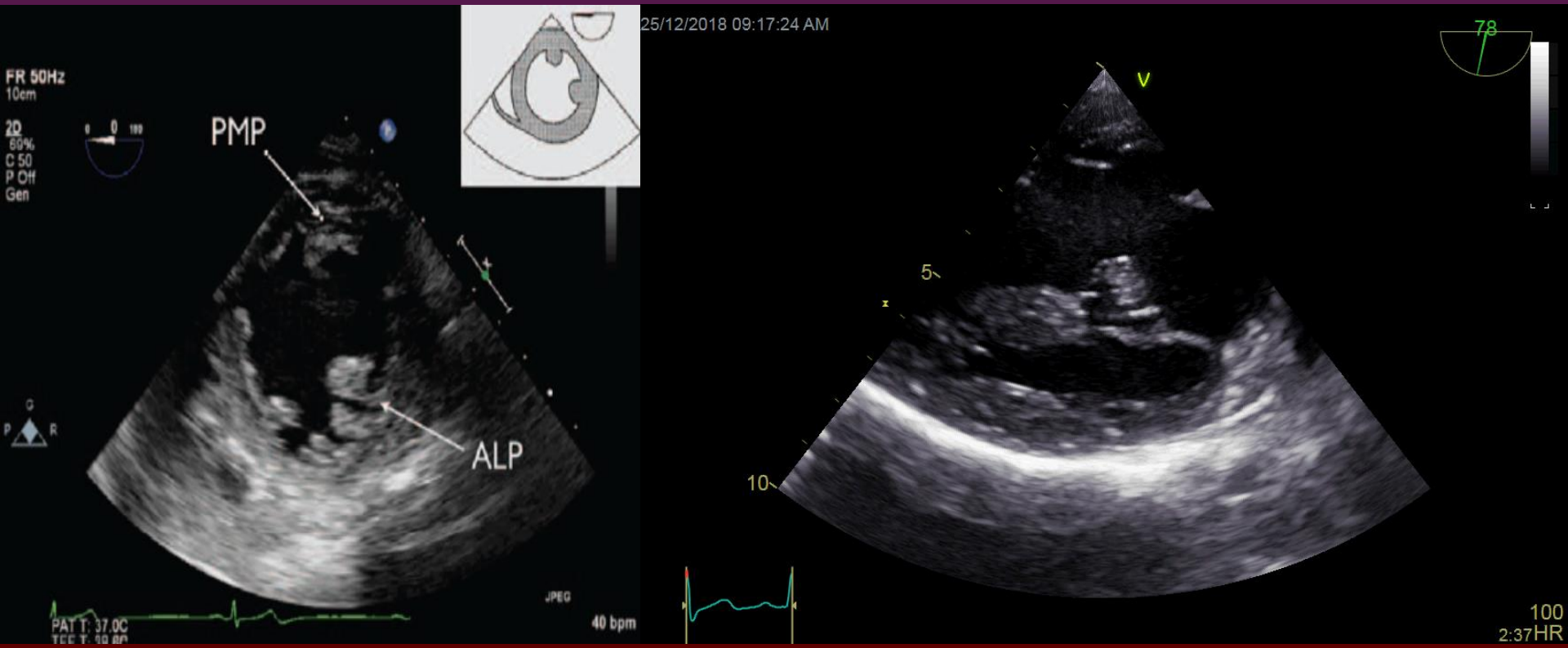

FR 52Hz
14cm
104 bpm


FR 52Hz
14cm
104 bpm


LA
A2
P2
LV


LA
P3
A2
P1
LV


LA
P2
A2
right
LV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10cm
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78
V
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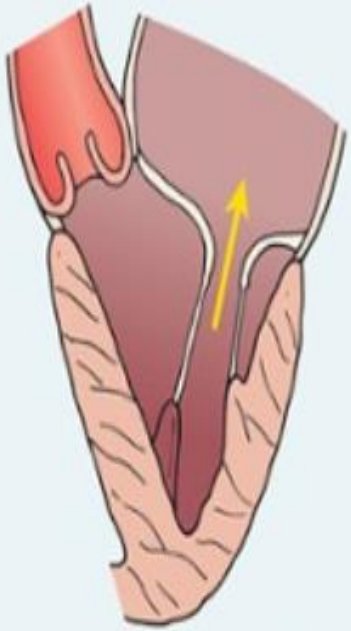
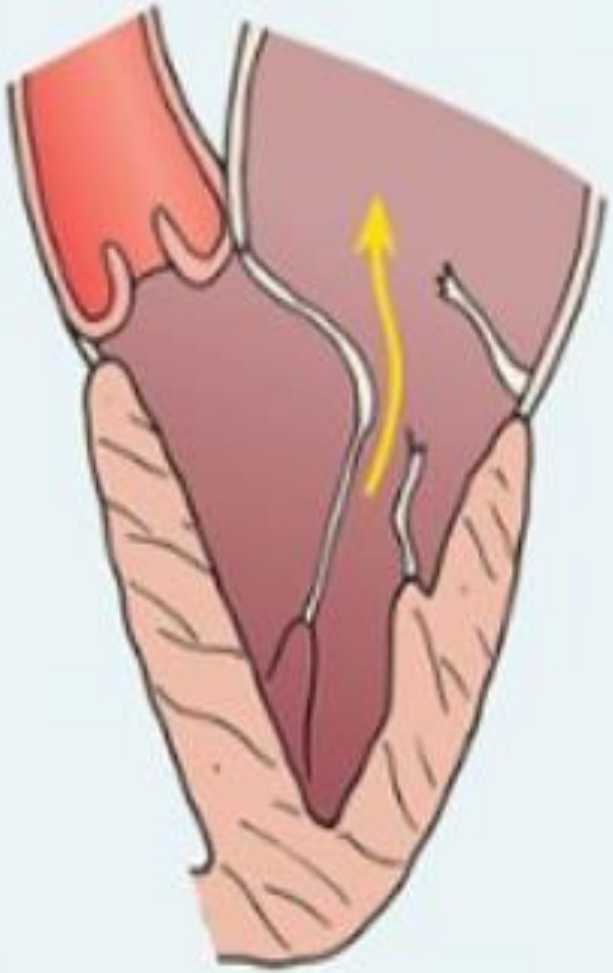
Carpentier mitral valve

Type I:
Normal leaflet motion



Annulus dilation
Leaflet perforation

Type II:
Increased leaflet motion



Ruptured chordae
Elongated chordae and/or papillary muscle

Type IIIb:
Diastolic leaflet restriction

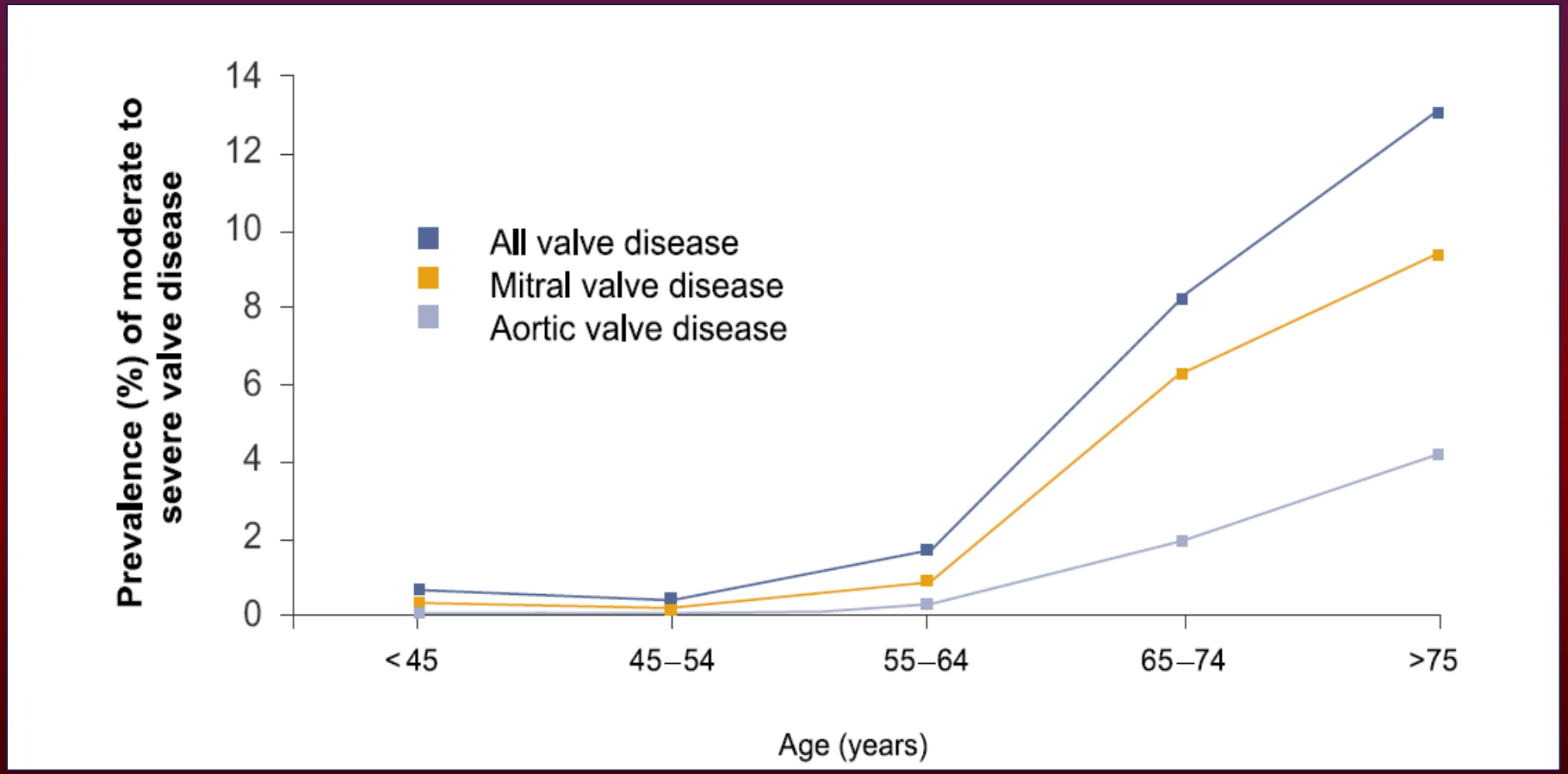
Ventricular dilation
Ventricular dyskinesia

Reproduced from Carpentier *sc Surg* 1983;86:323-337.

Flail Mitral Valve

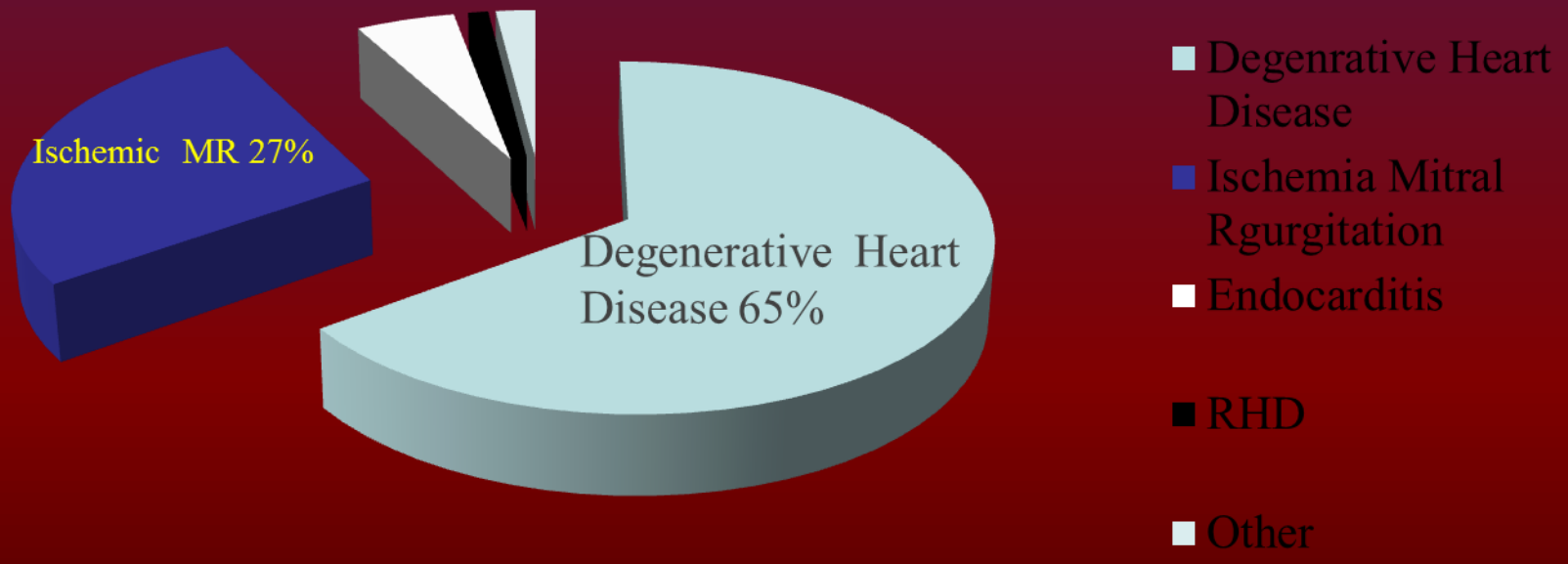
- ✓ *Chronic Mitral Regurgitation*
- ✓ *Acute Mitral Regurgitation*

Chronic Mitral Valve Disease

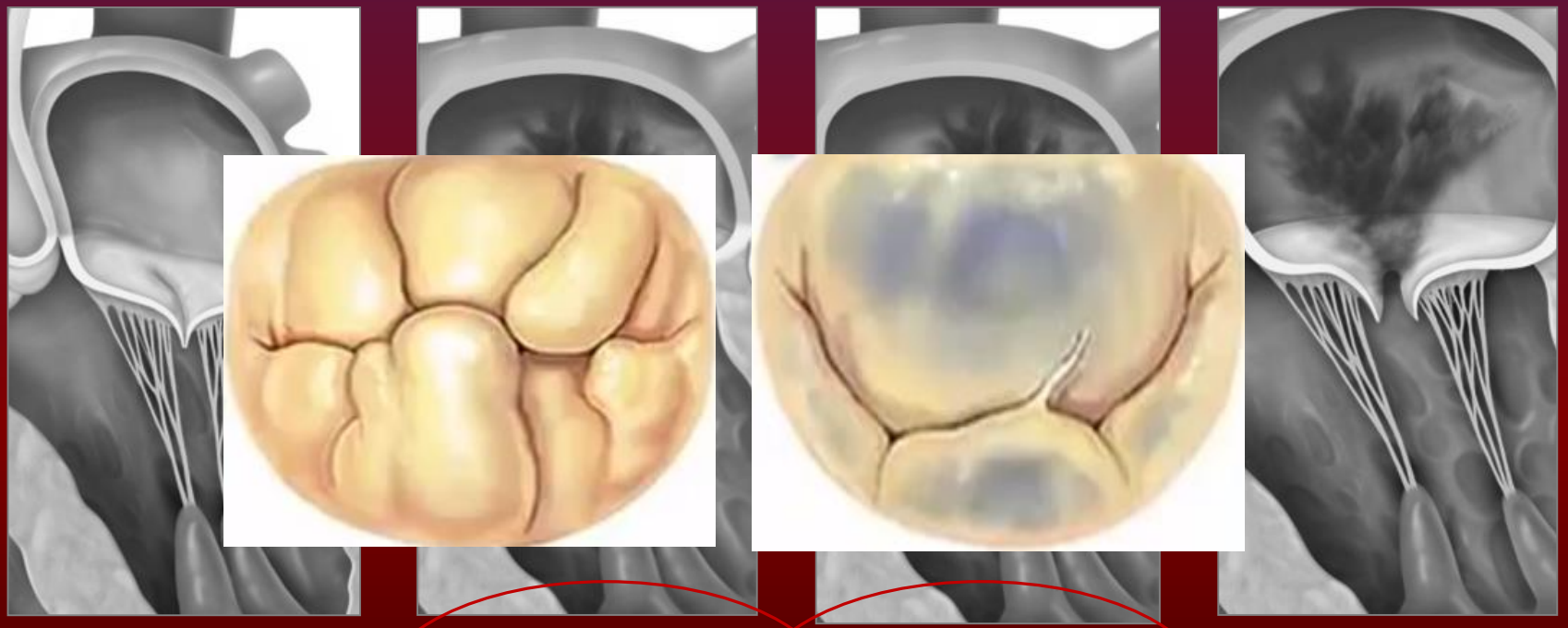


1. Heart Disease and Stroke Statistics 2010 Update: A Report From the American Heart Association. *Circulation.* 2010;121:e46-e215.
2. Nkomo VT et al. *Lancet*. 2006; 368:1005-1011.

Mitral Regurgitation Etiologies



Mitral Regurgitation Etiologies



Normal Mitral Valve

Degenerative MR: Prolapse

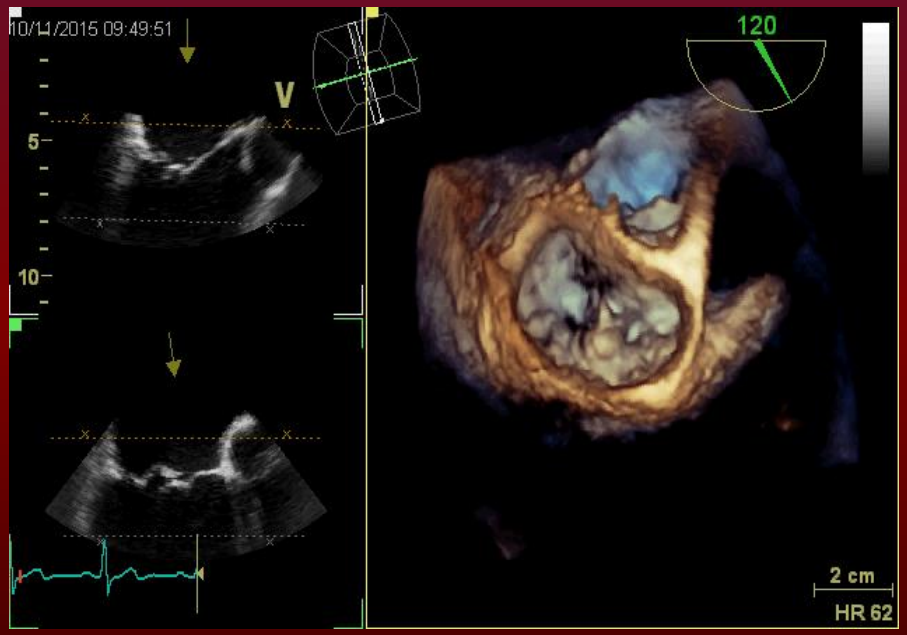
Degenerative MR: Flail

Functional MR

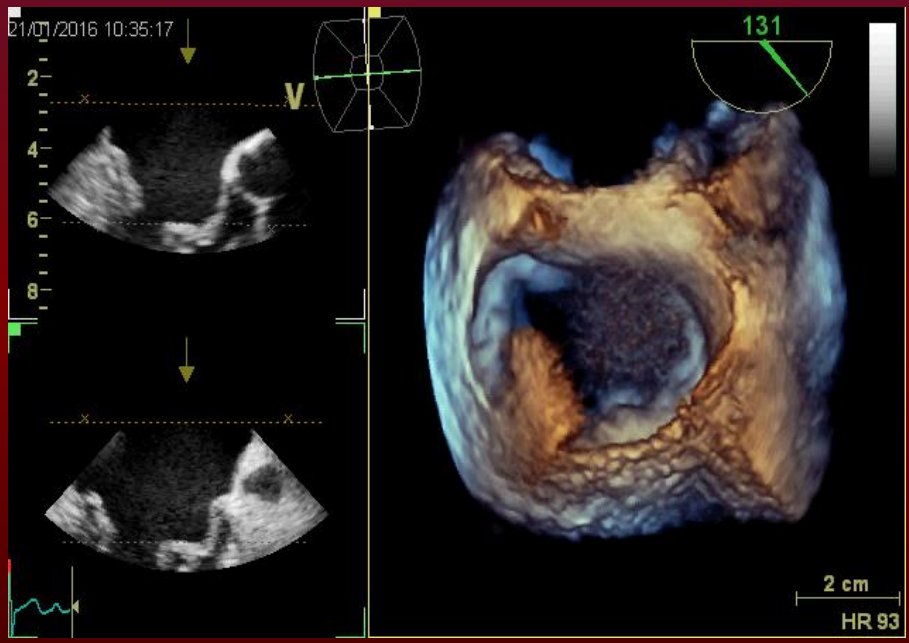
Source: Enriquez-Sarano, M et al. *Lancet*. 2009;373:1382-94.

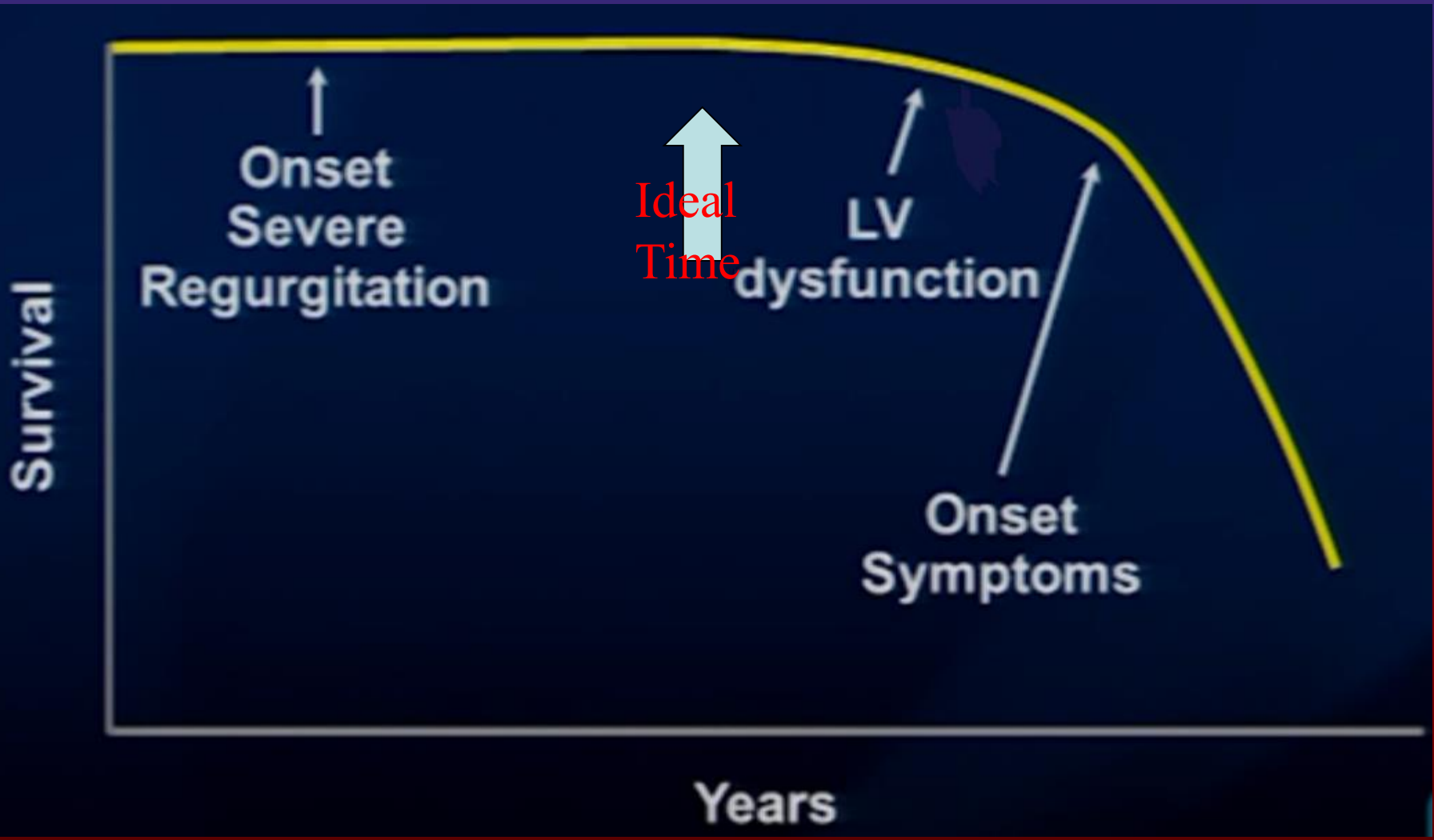
Differentiating Characteristics	Barlow Disease	Fibroelastic Deficiency
Pathology	Excess leaflet tissue due to accumulation of mucopolysaccharides	Loss of mechanical integrity due to impaired production of connective tissue
Typical age at diagnosis	Younger (< 40 years old)	Older (> 60 years old)
Duration of disease	Years to decades	Days to months
Physical exam	Midsystolic click and late systolic murmur	Holosystolic murmur
Leaflet involvement	Multisegmental	Unisegmental
Chordal lesions	Chordal thickening and elongation	Chordal elongation and chordal rupture
Complexity of valve repair	More complex	Less complex

Fibroelastic Deficiency



Barlow Disease





Once the patient's EF becomes <60% and/or becomes symptomatic, mortality rises sharply.

Indications for Repair/Replacement

	ESC/EACTS	ACC/AHA
Symptomatic and LVEF > 30%	I	I
Asymptomatic and LVEF 30%-60%	I	I
Asymptomatic and LVESD ≥ 40 mm		I
Asymptomatic and LVESD ≥ 45 mm	I	
Asymptomatic with flail leaflet and LVESD ≥ 40 mm with low surgical risk and high likelihood of repair	IIa	
Asymptomatic and new onset atrial fibrillation or sPAP ≥ 50 mm Hg	IIa	IIa
MV repair reasonable in asymptomatic patients (LVESD < 40 mm and LVEF ≥ 60%) when **likelihood of successful and durable repair without residual MR is > 95% with an expected mortality rate < 1%** when performed at a Heart Valve Center of Excellence		IIa
Asymptomatic with left atrial dilation (≥ 60 mL/m2) or pulmonary hypertension on exercise (sPAP ≥ 60 mm Hg) when there is a low surgical risk and high likelihood of repair.	IIb	

Indications for Repair/Replacement

- Symptoms (II-IV) at rest or exercise.

- Asymptomatic:

  LV dysfunction - EF < 60%.

  - ESD > 40 mm.

- Prophylactic

MitraClip Therapy

Filling a Treatment Gap

Less Invasive

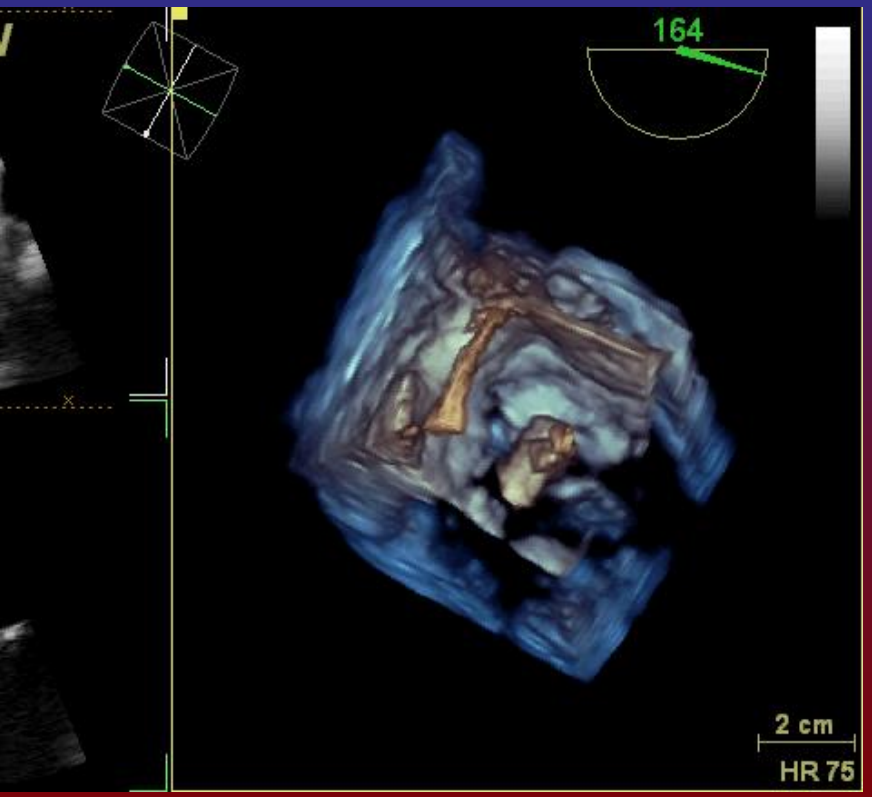
Medical Therapy

MitraClip

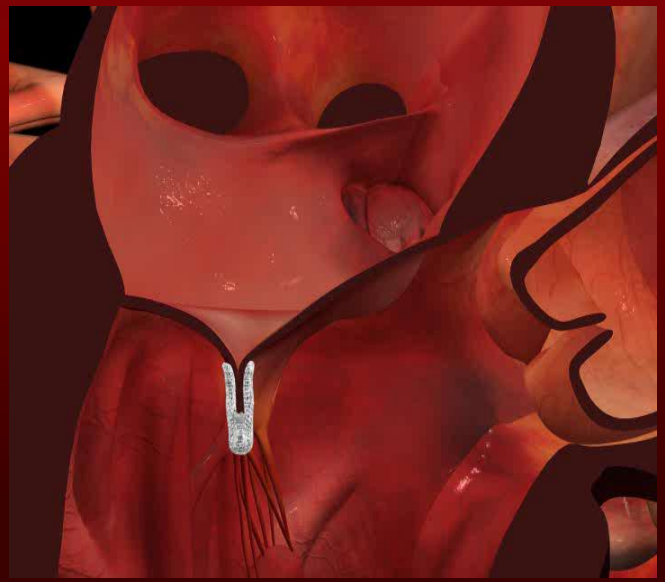
MV Surgery

Increased MR Reduction

MitraClip System is currently not approved for sale in Canada. Information contained herein intended for physician training within Canada only.


164
2 cm
HR 75

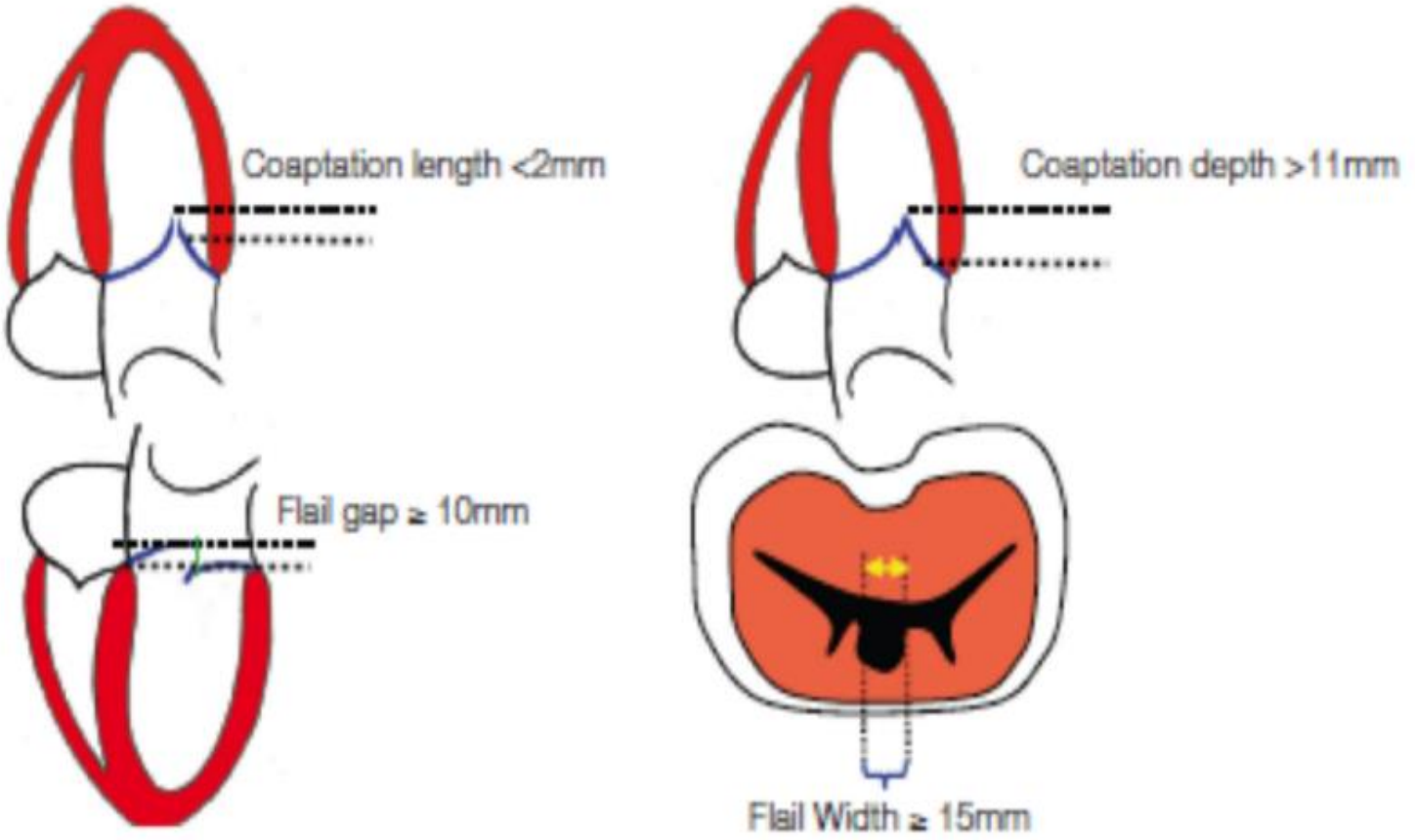

03/12/2015 16:43:39
V
124
5
10



Selection Criteria for MitraClip Insertion

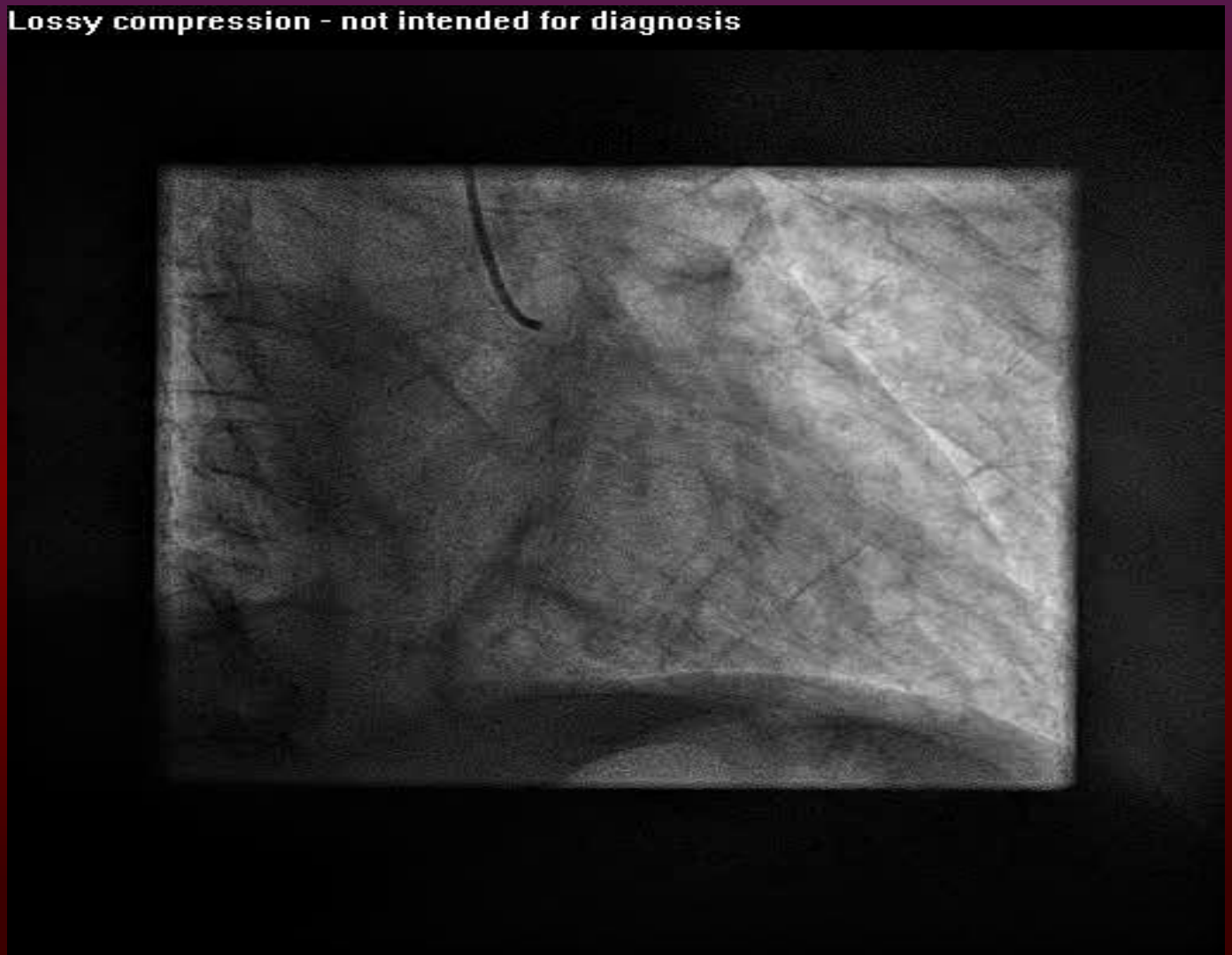
- Grade 3 or more out of 4 grades
- Pathology in A2-P2 area
- Flail gap < 10 mm
- Flail width < 15 mm
- Mitral valve orifice area > 4 cm^2
- Mobile leaflet length > 1 cm

MV anatomical exclusions: Mitral valve orifice area <4.0cm²

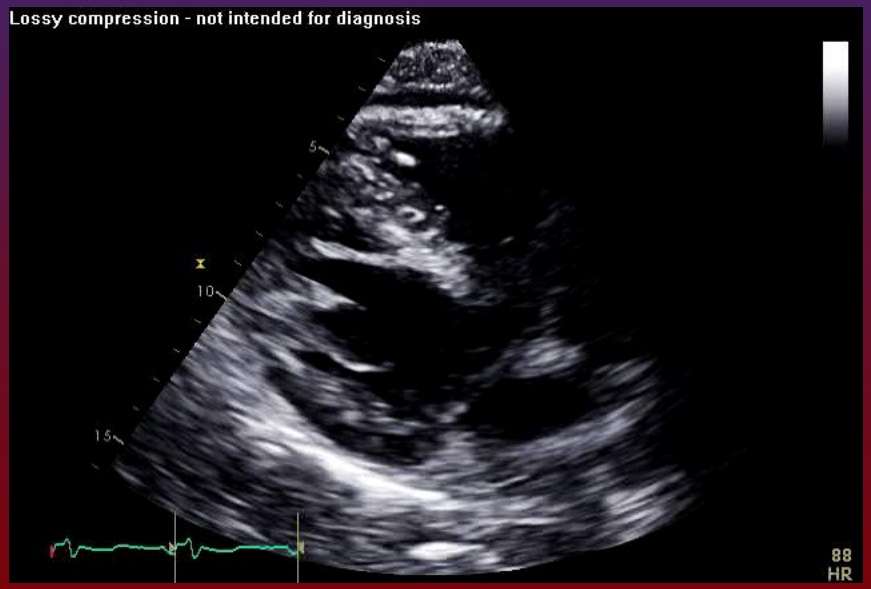


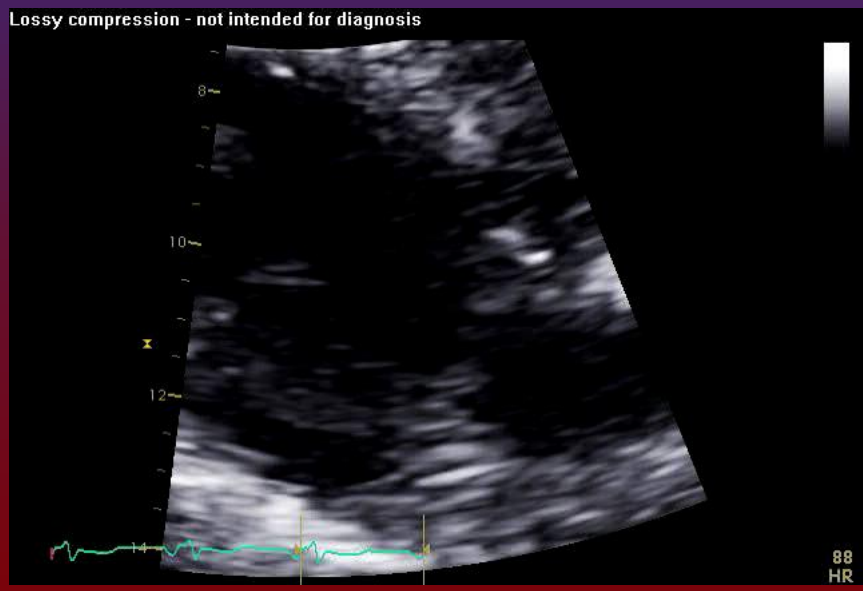
Acute Flail Mitral Valve

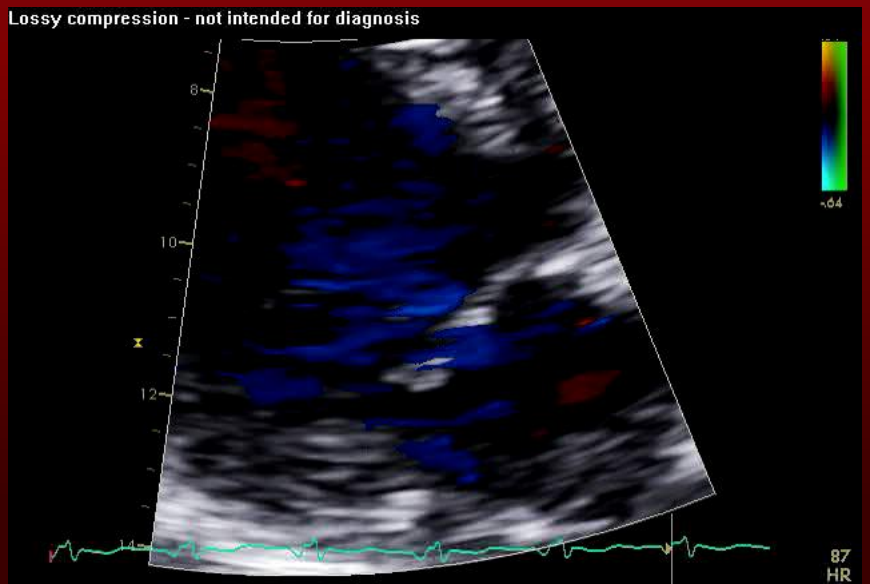
58 year old male patient. H/O DM, dyslipidemia and smoking. Admitted as a case of inferior STEMI.



Day after patient developed sudden SOB, and desaturation. New apical soft murmur and bilateral lung crackles.





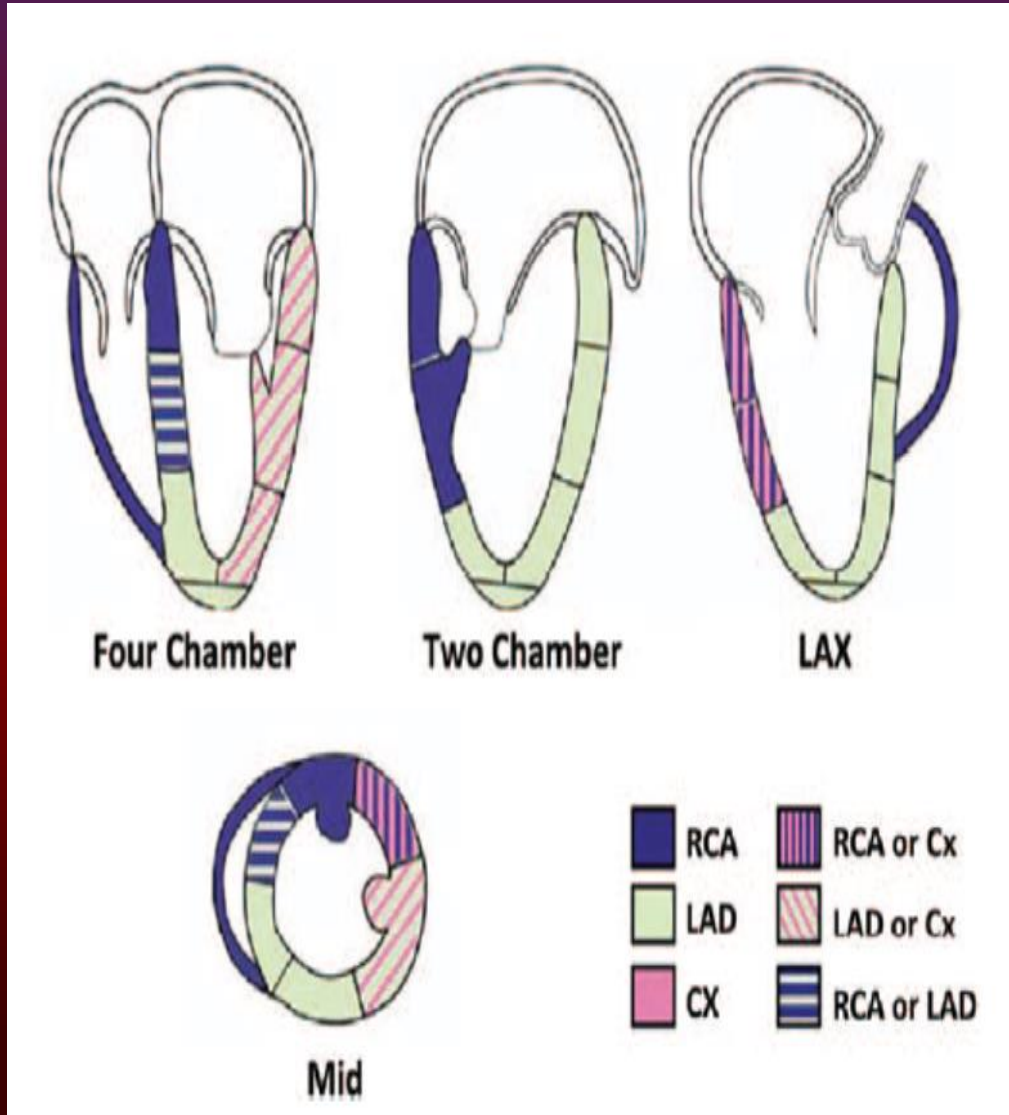


Acute mitral regurgitation 2ry to flail MV

- Complication of myocardial infarction or Infective Endocarditis.
- Partial or total rupture of a papillary muscle induced sudden massive MR.
- Total rupture of a LV papillary muscle is often fatal.
- Partial rupture of papillary muscle is not necessarily overwhelming MR.

Acute Flail MV due to STEMI

- Approximately 1%.
- posteromedial > anterolateral.
- Occurs with a relatively small infarction.
- Rupture of a RV papillary muscle is unusual.



- ✓ Acute rupture/ flail induced sudden massive MR
- ✓ Large amount of blood into small and noncompliant LA.
- ✓ Rapid equalization of pressures between the LA and LV.

Abrupt increase LA and Wedge pressure

Low stroke volume

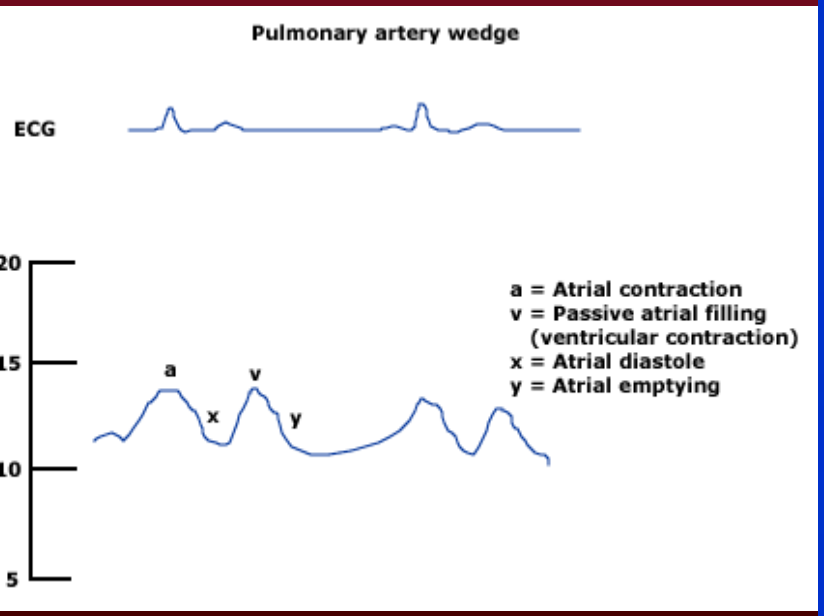
Significant V wave

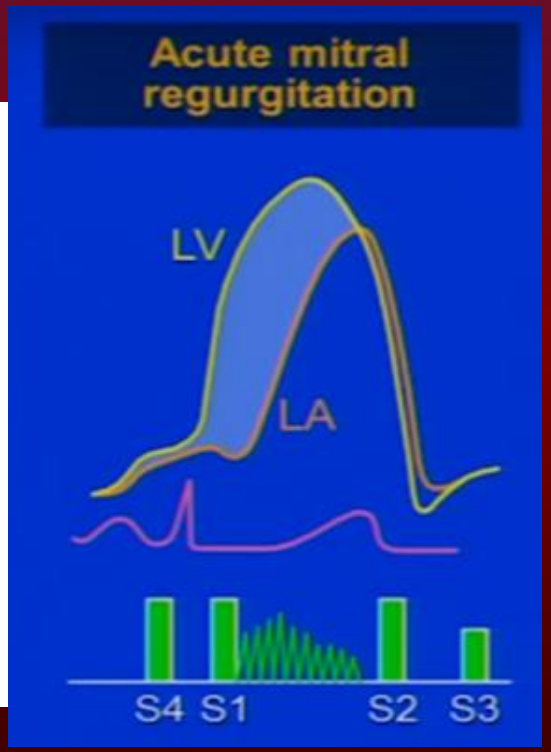
Tachycardia
LV hypercontractility

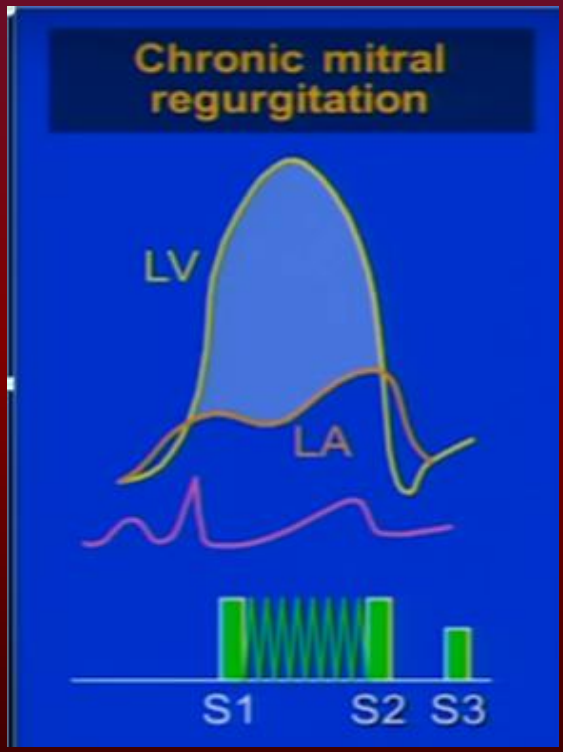
Pulmonary edema

Cardiogenic Shock

Ruptured chordae tendineae and acute mitral insufficiency



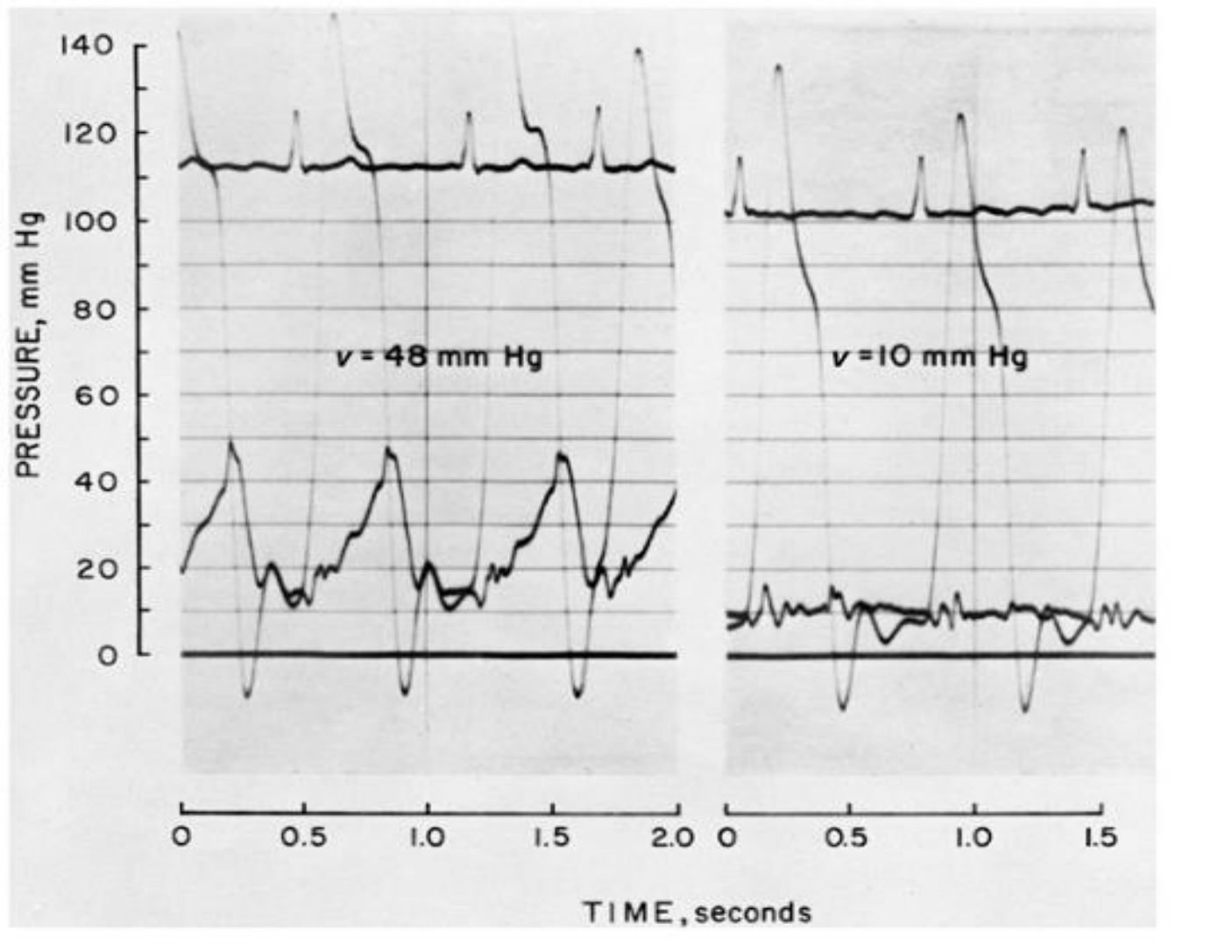




Management

- Invasive monitoring in most cases once recognition complication of STEMI.
- Vasodilator therapy, (nitroglycerin or nitroprusside), once systolic BP > 90 mm Hg.
- Inotropes may also be needed to support adequate cardiac output.
- IAB counterpulsation should be instituted rapidly (If pharmacologic therapy is not tolerated or fails to achieve)

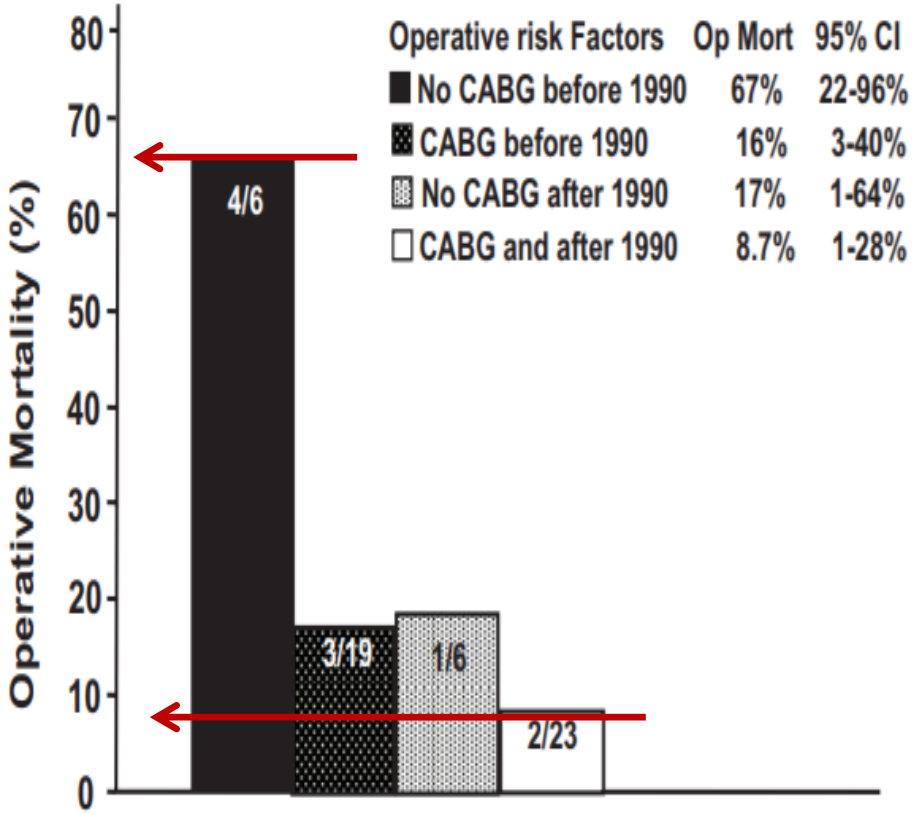
Sodium Nitroprusside effect



Grossman's Cardiac Catheterization

Surgery

- In most cases, surgery should not be delayed in patients with a correctable lesion and require pharmacologic and mechanical support.
- In a subset of patients whose hemodynamic status remains stable, the operation may be postponed for 2 to 4 weeks to allow some healing of the infarct.



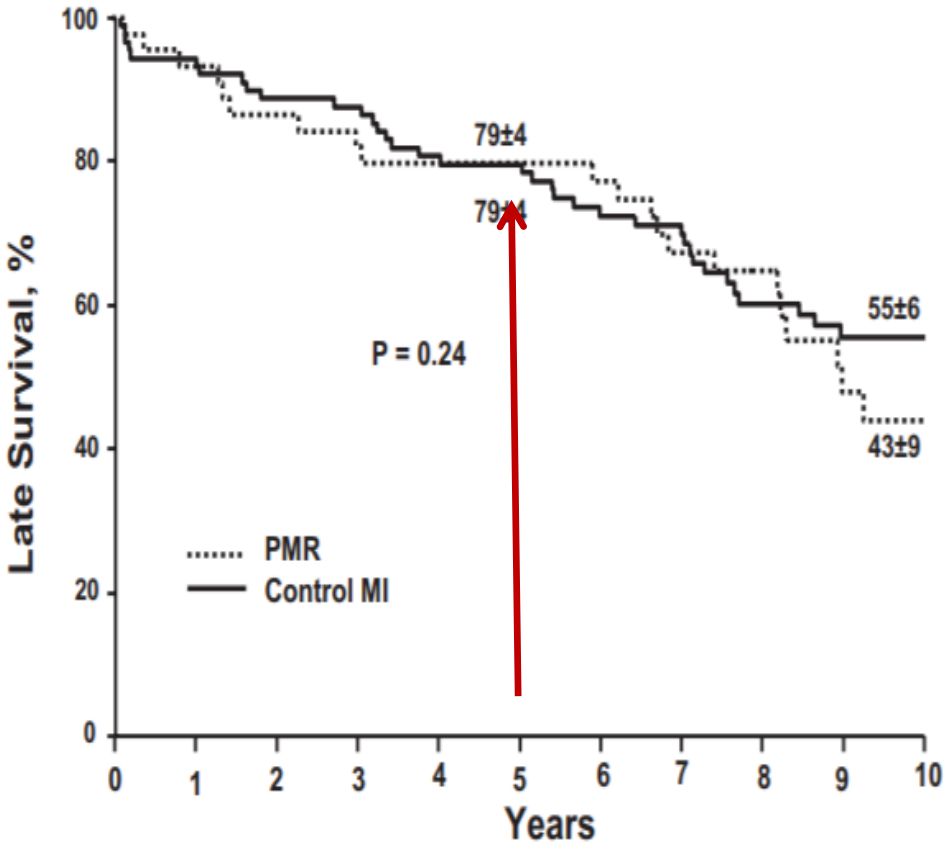
operative mortality (odds ratio, 0.18; 95% CI, 0.04 to 0.
after surgery after 1990 (odds ratio, 0.28; 95% CI, 0.06
from 67% up to 1990 without coronary artery bypass graf
5-year survival was 65±7%, and survival free of conge
operative survivors was 79±4%, identical (P=0.24) to
fraction, MI location, and MI year). Survival free of cong
(10-year survival, 28±8% versus 36±6%; P=0.46).

Conclusions—Surgery for post-MI PMR involves a notab
operative risk, particularly with associated coronary arte
to that of similar MI without PMR. These encouraging ob
aggressive therapeutic approach for patients incurring P

ılar Surgery

rgical Correction of Mitral apillary Muscle Rupture

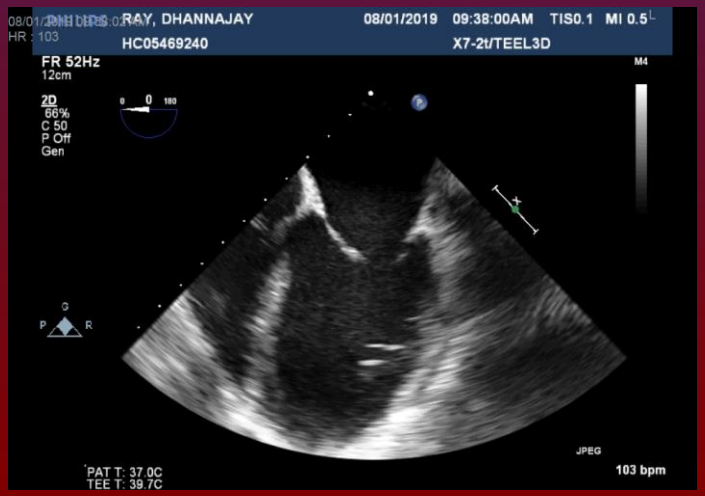
sco Grigioni, MD; Véronique L. Roger, MD, MPH;
zell V. Schaff, MD; Maurice Enriquez-Sarano, MD



STEMI with a loud systolic murmur

	VENTRICULAR SEPTAL RUPTURE	PAPILLARY MUSCLE RUPTURE	Dynamic LVOT Obstruction
Territory	Anterior and Inferior	Inferior > Antterior	Mainly Anterior
Sings	Thrill, SOB, hypotension, Biventricular failure.	SOB, hypotension, pulmonary edema	Hypotension, tachycardia.
TTE, TEE	Septal rupture with left-to-right shunt on color Dp pattern of RV overload	Hypercontractile LV, chaotic motion, flail MV leaflet, severe MR on color Dp.	SAM with LVOT Obstruction
Rt Heart Cath	High PCWP with Oxygen saturation > 10% RA ------ RV	Large *v* waves, very high PCWP. With No increase in oxygen saturation from the RA to RV.	
Treatment	Surgery/Intervention	Surgery	Medical therapy

Thank you


RAY, DHANNAJAY
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M4
2D
66%
C 50
P Off
Gen
0 0 180
P R
JPEG
PAT T: 37.0C
TEE T: 39.7C
103 bpm