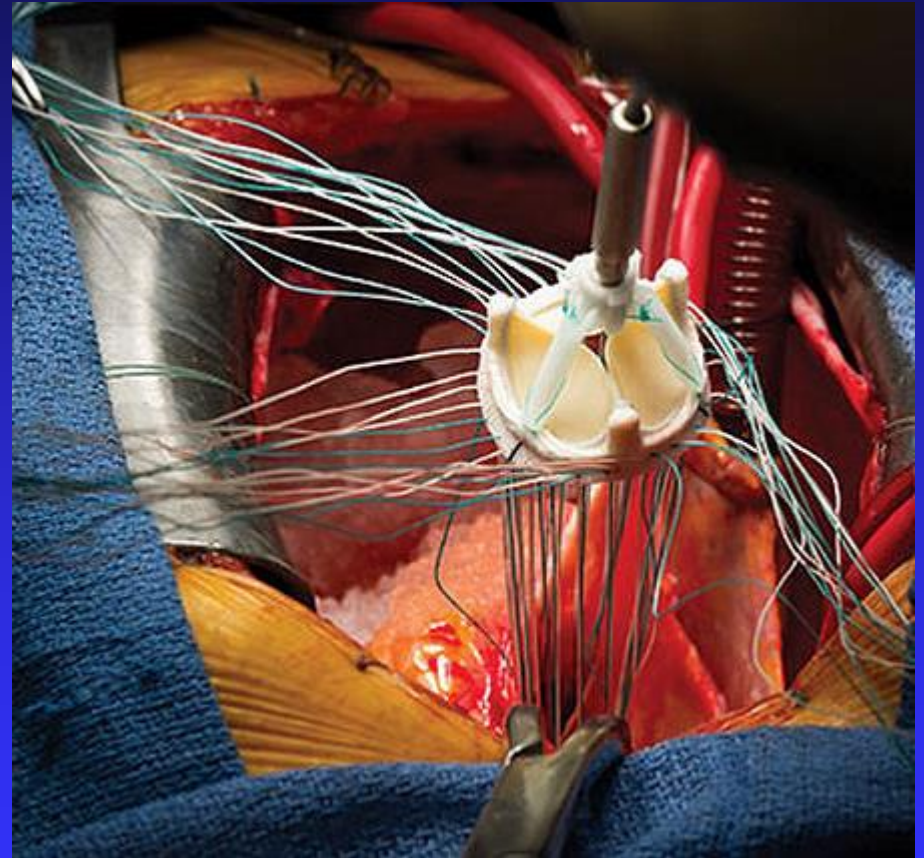


Ecocardiografia e Insuficiência Mitral

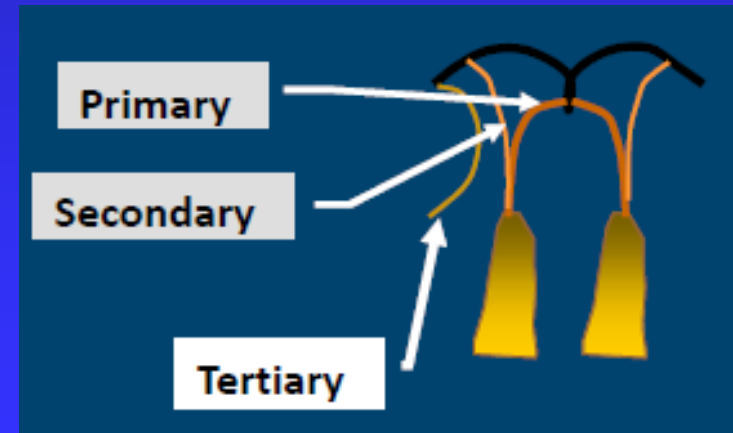
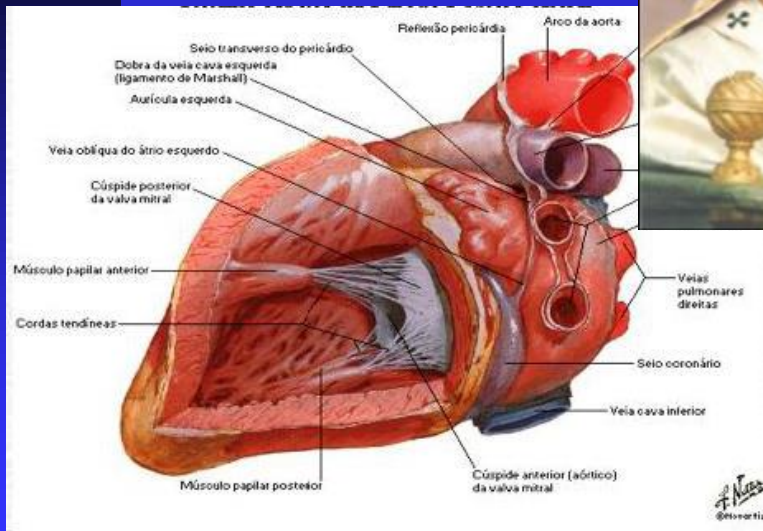
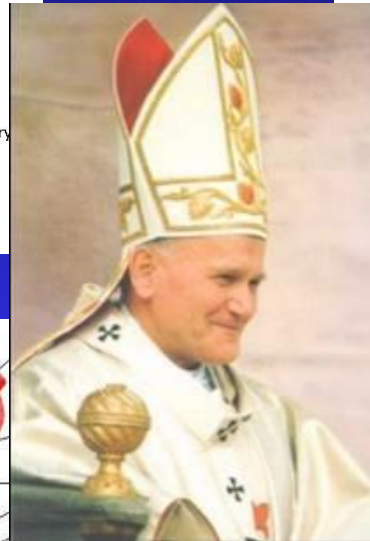
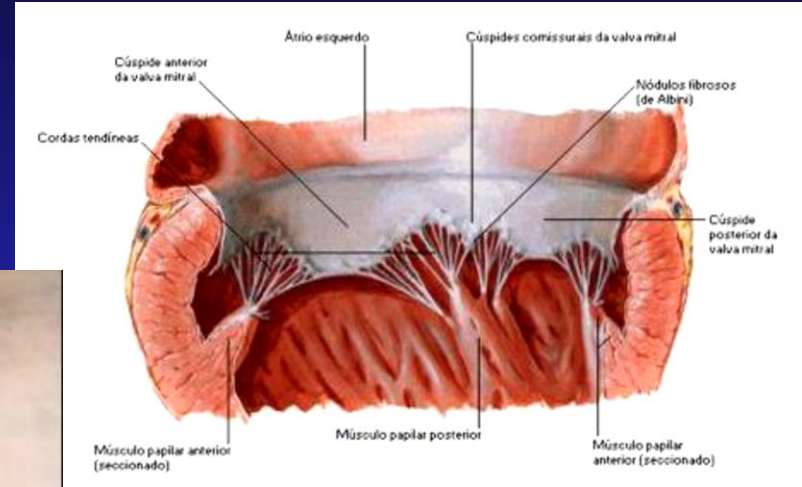
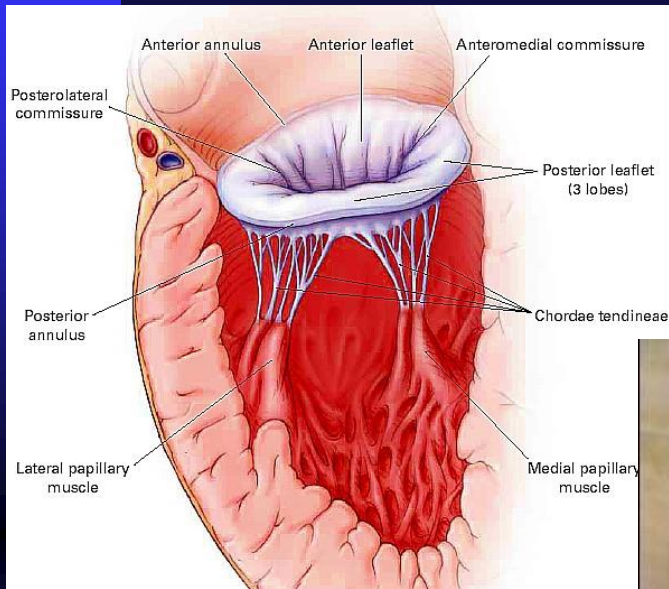
Dr. Manuel Paredes Horna

HCor- Hospital do Coração

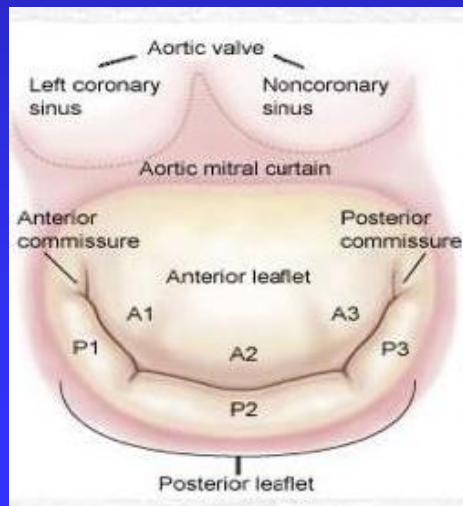
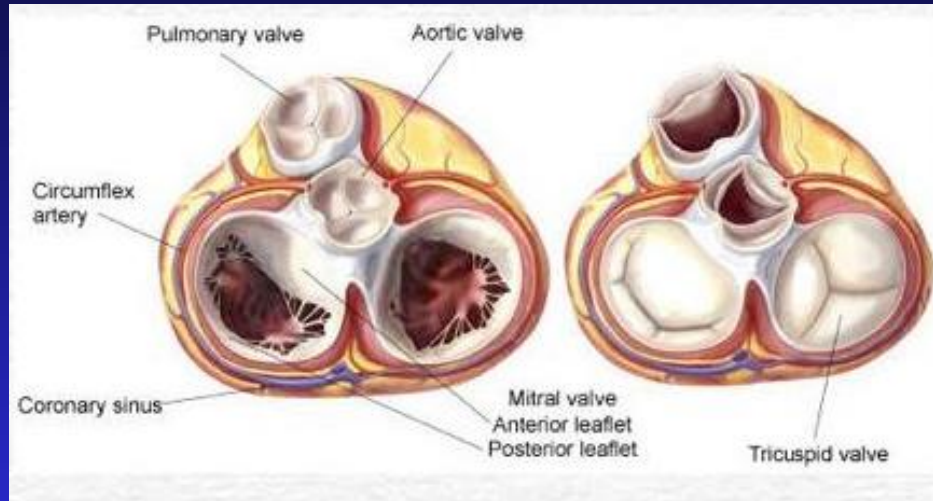
HAOC – Hospital Alemão Oswaldo Cruz



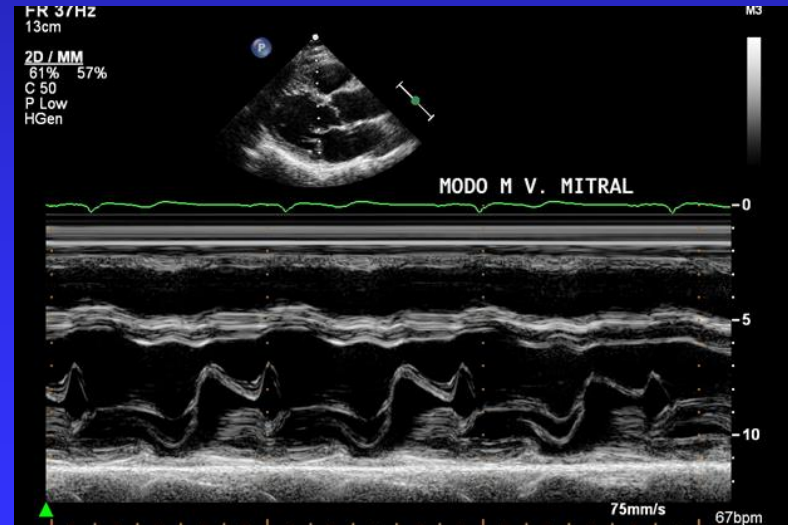
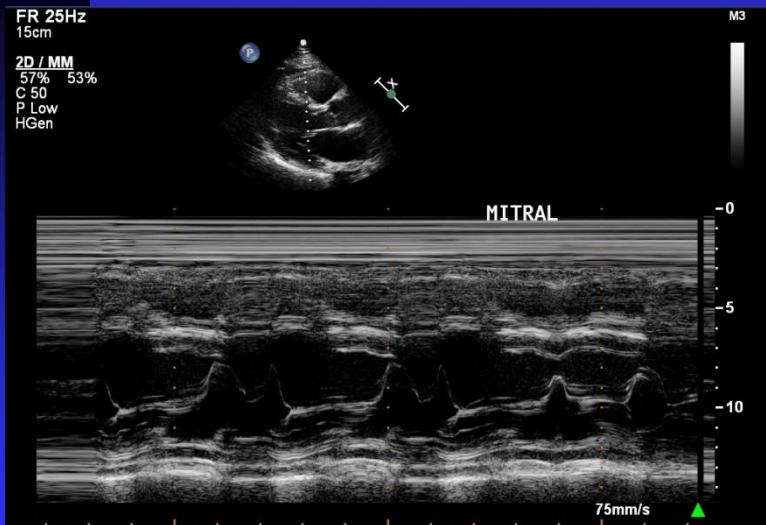
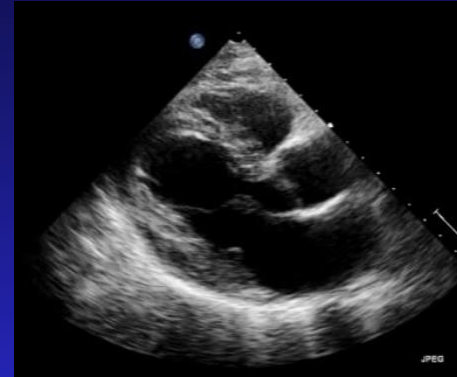
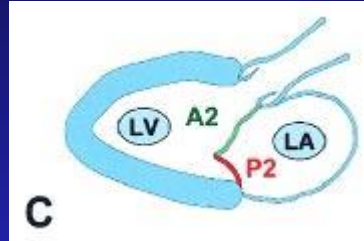
Anatomia Aparelho Valvar Mitral



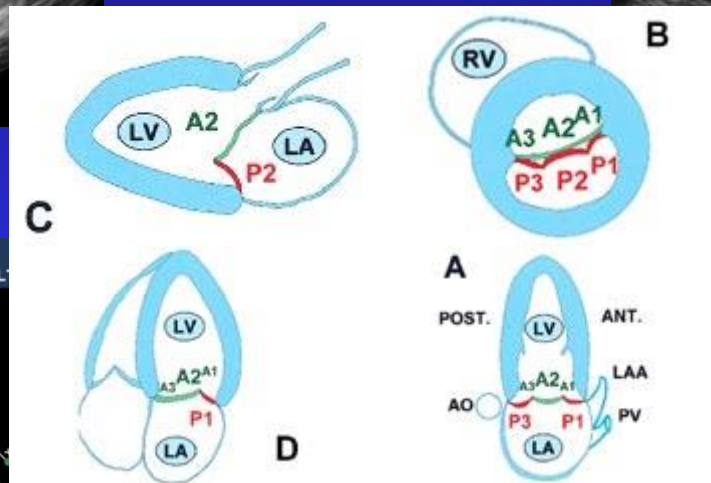
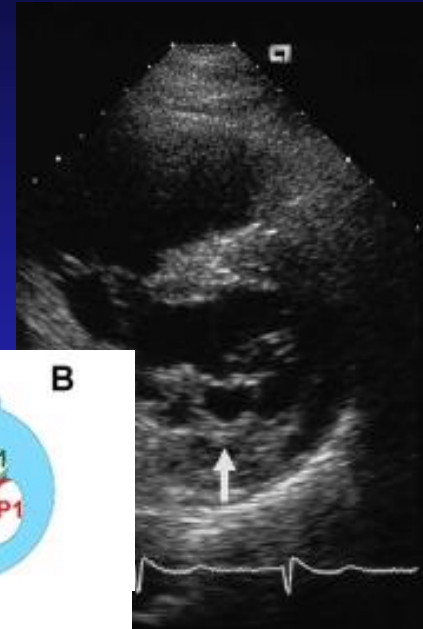
Anatomia Aparelho Valvar Mitral



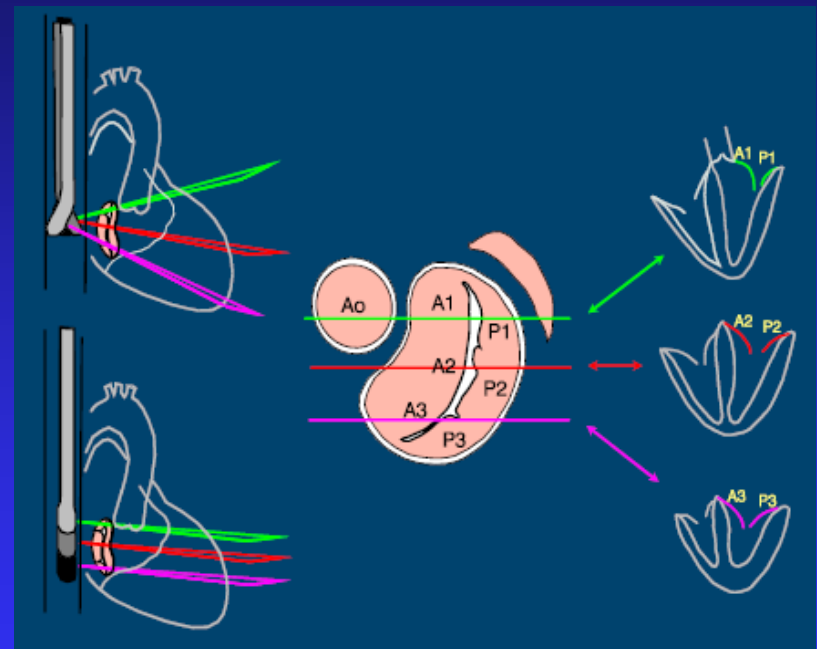
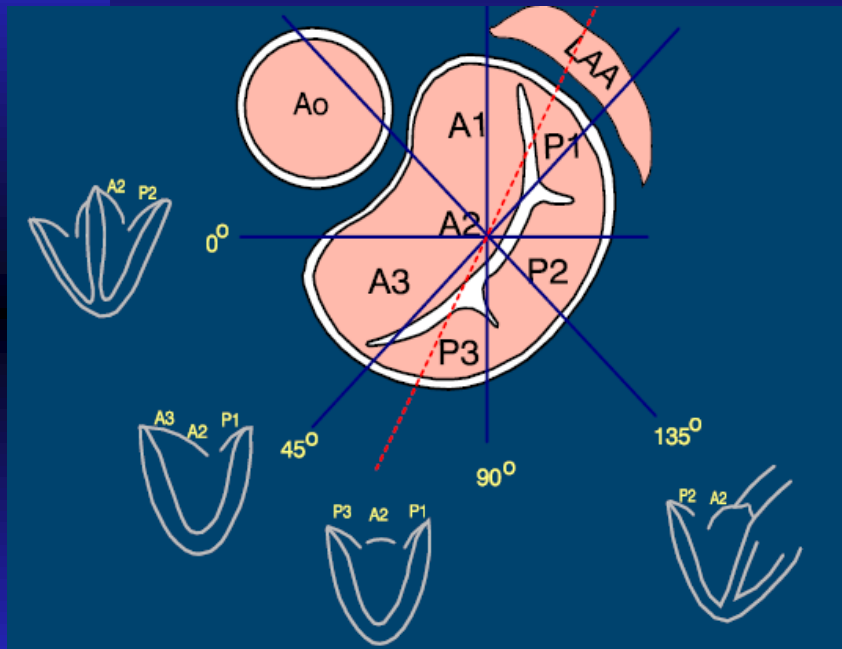
Anatomia Mitral: modo M



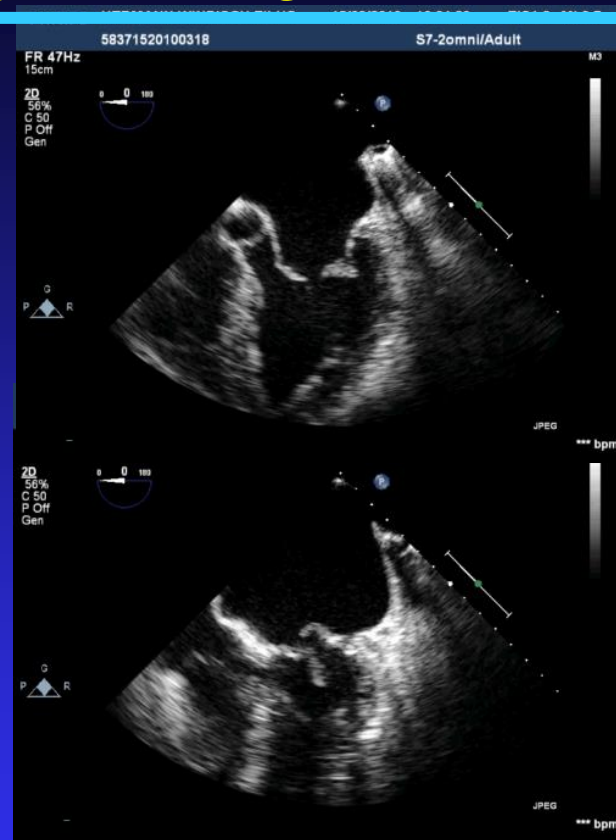
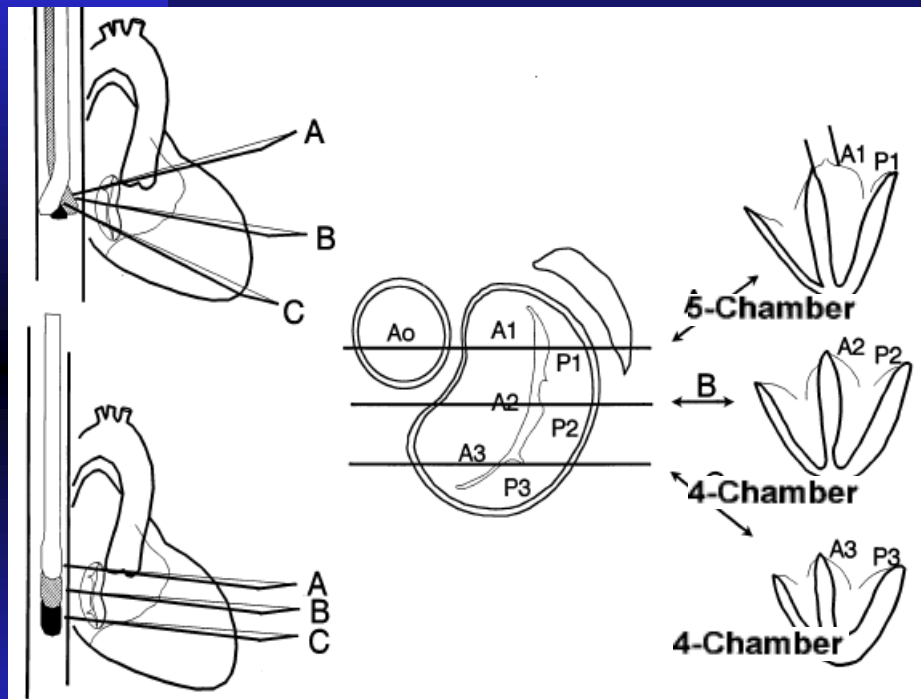
Anatomy Mitral 2D TT



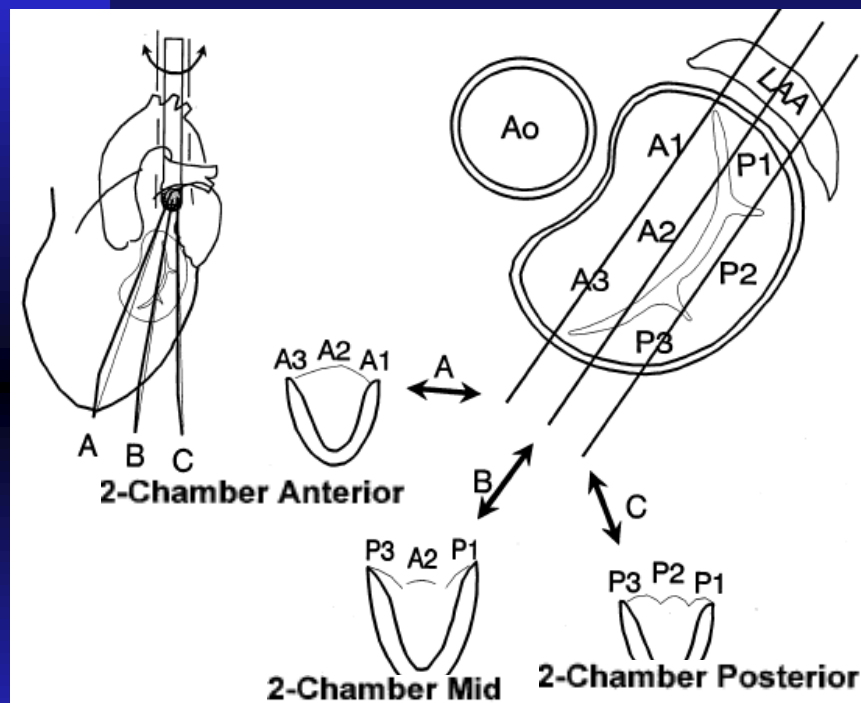
Anatomia Mitral 2D TE



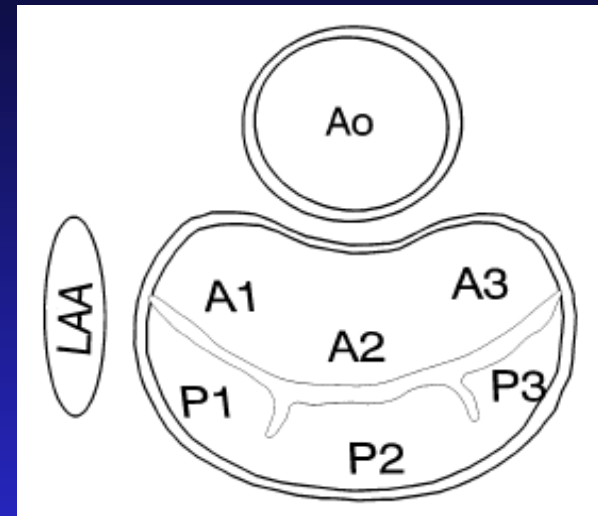
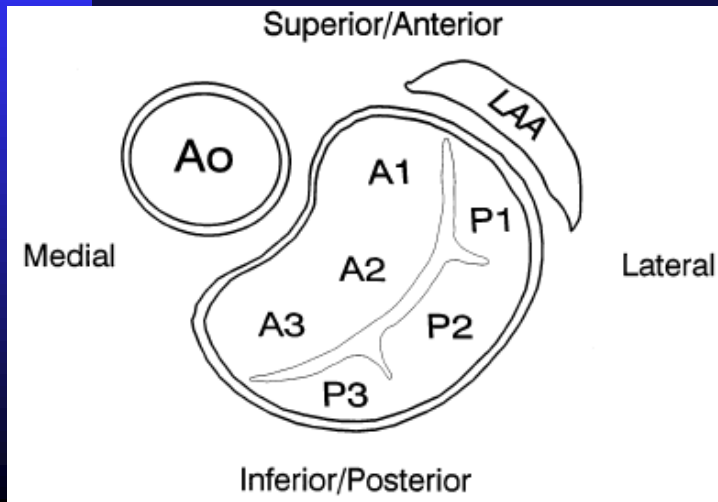
Anatomia Mitral TE 2D: Topografía segmentos



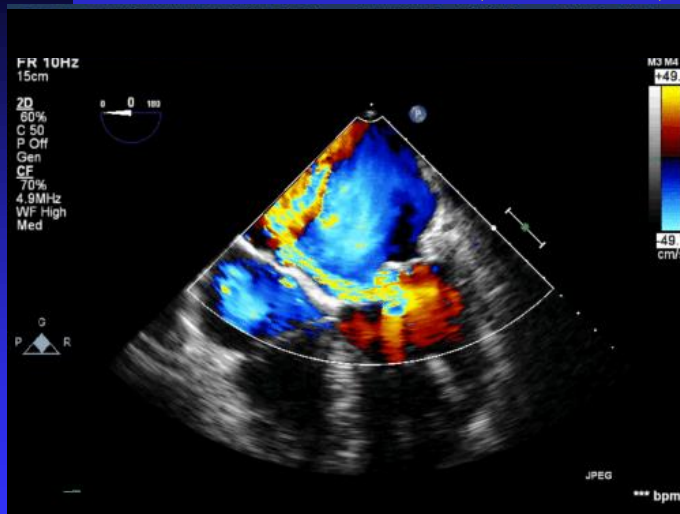
Anatomy Mitral TE 2D



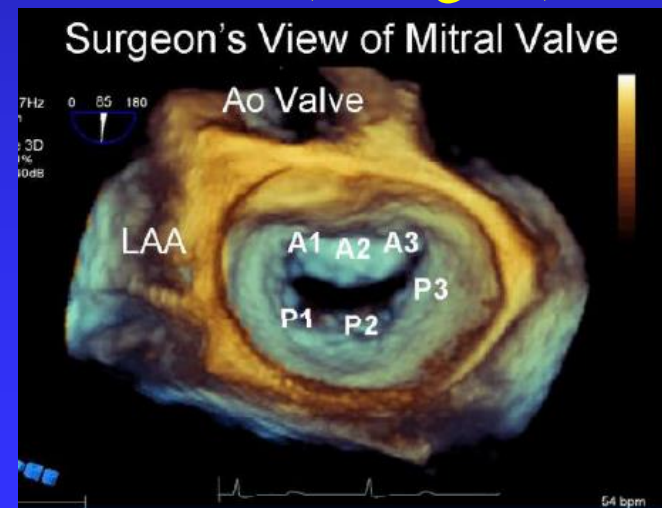
Anatomy Mitral TE 3D



Vista ventricular (TE 2D)



Vista atrial (cirúrgica)



Lesões Regurgitantes



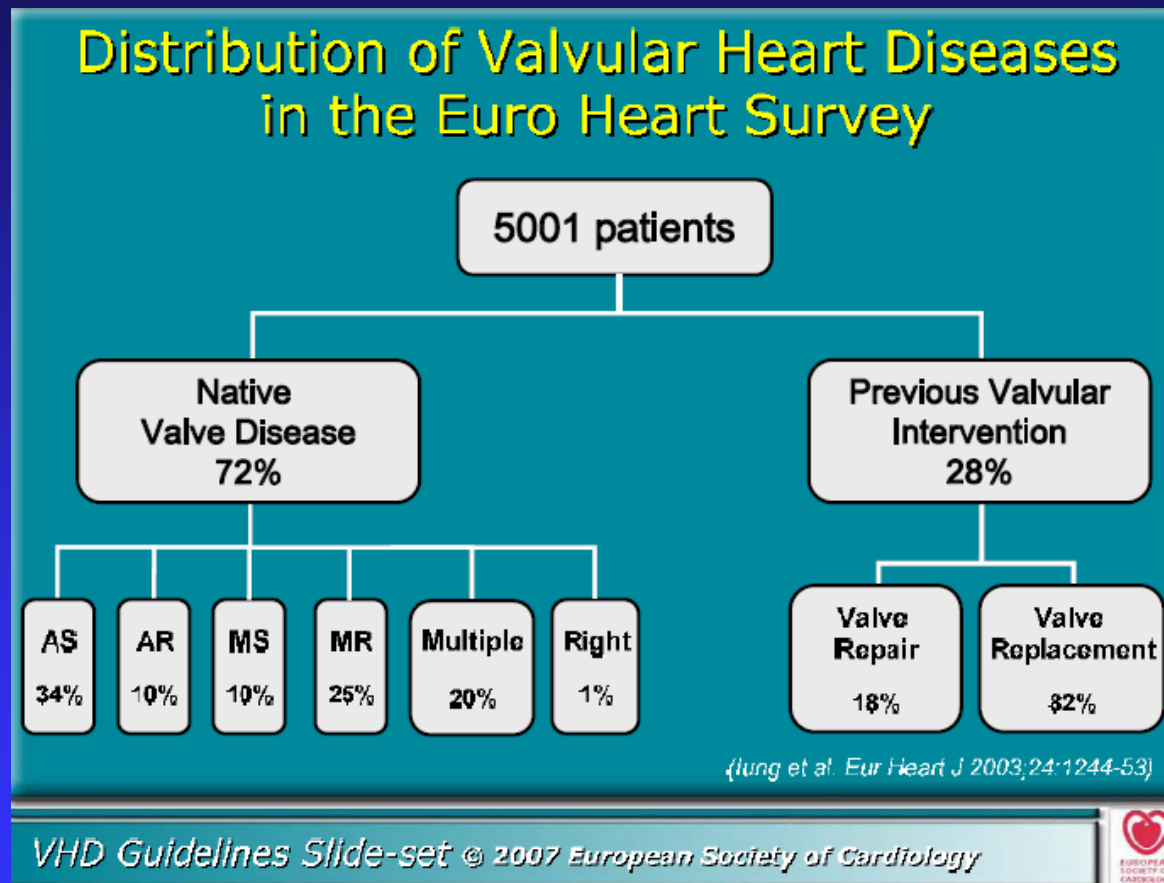
Epidemiologia Insuficiência Mitral

Patient Characteristics in the Euro Heart Survey

	Age (years)	≥ 70 years (%)	≥ 1 comorbidity (%)
AS	69±12	56	36
AR	58±16	25	26
MS	58±13	18	22
MR	65±14	44	42

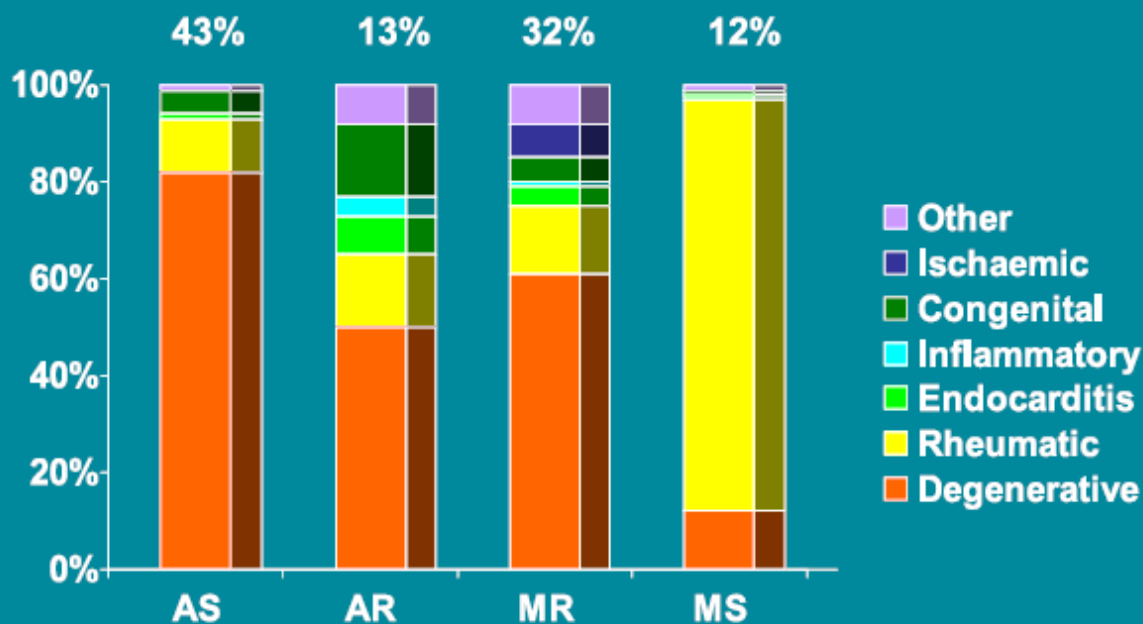
(Iung et al. Eur Heart J 2003;24:1244-53)

Epidemiologia Insuficiência Mitral



Etiologia

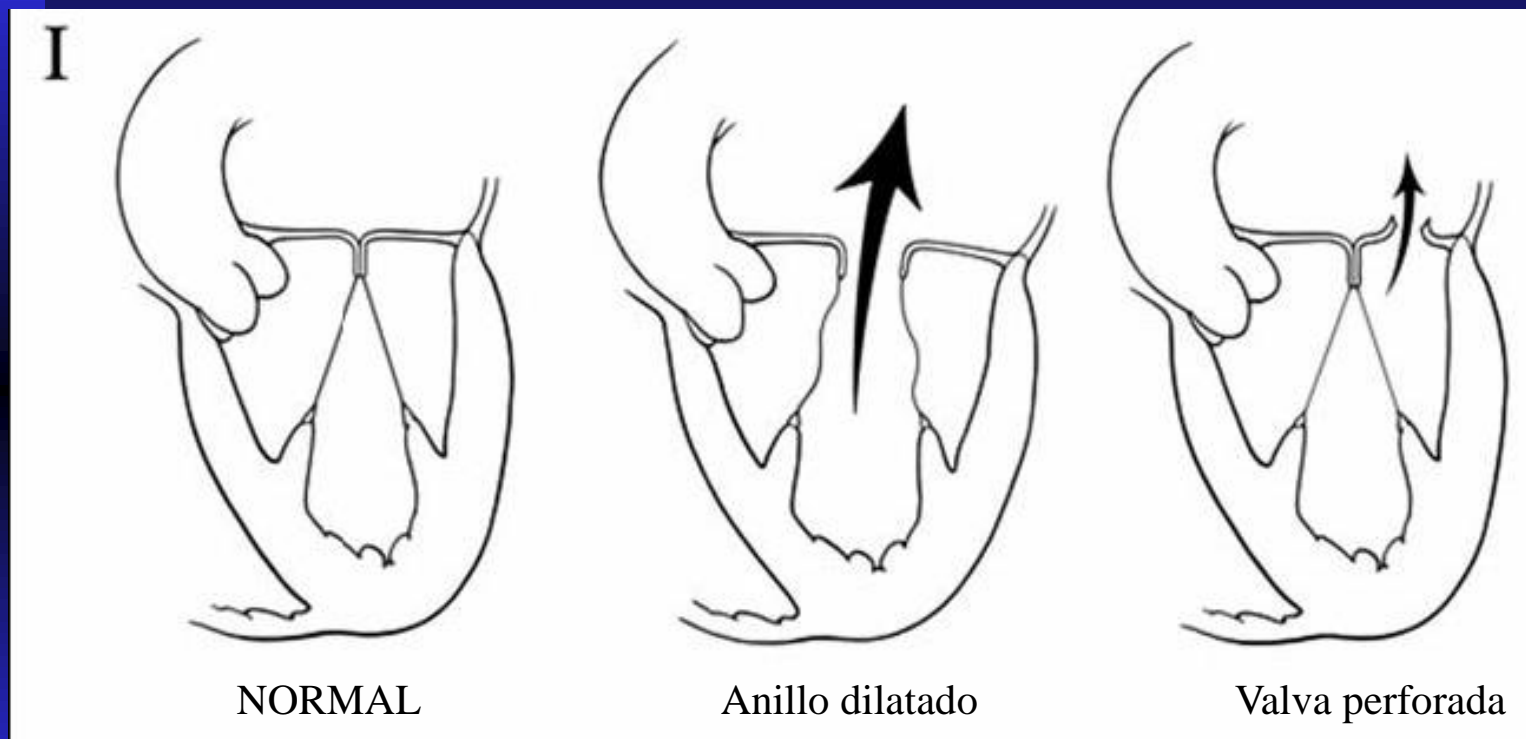
Aetiologies of Single Valvular Heart Diseases in the Euro Heart Survey



(lung et al. Eur Heart J 2003;24:1244-53)

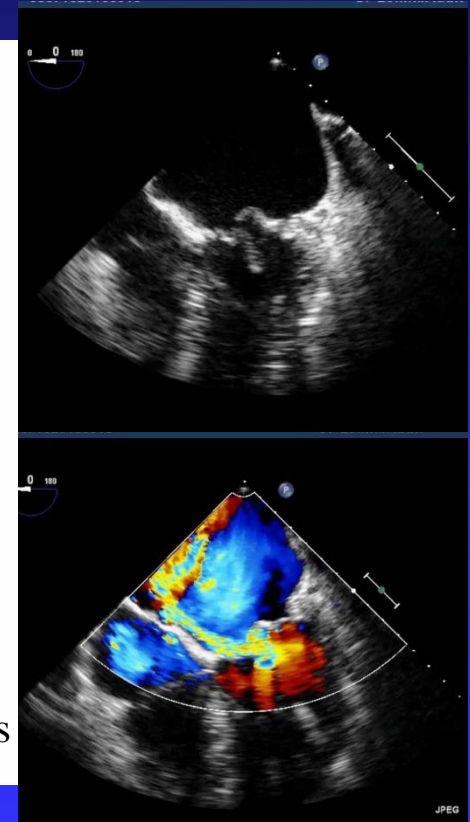
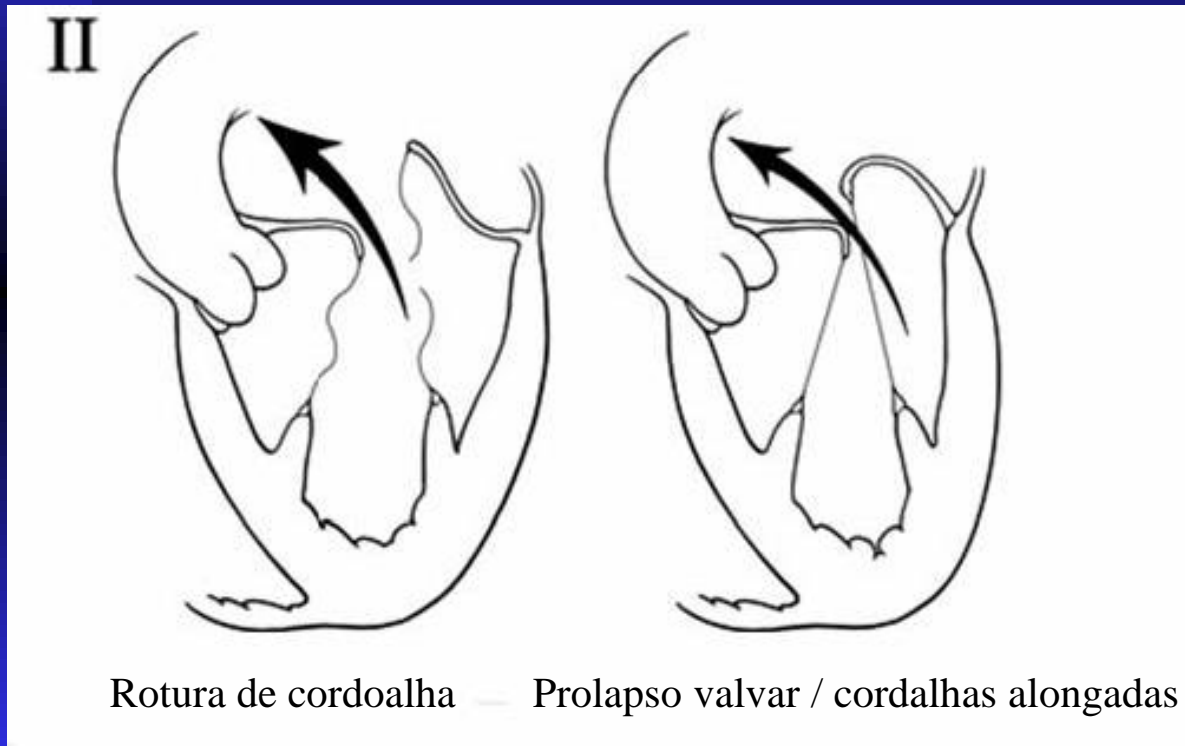
Mecanismos Insuficiência Mitral

Tipo I: Mobilidade Normal das Valvas (jato insuficiente central)



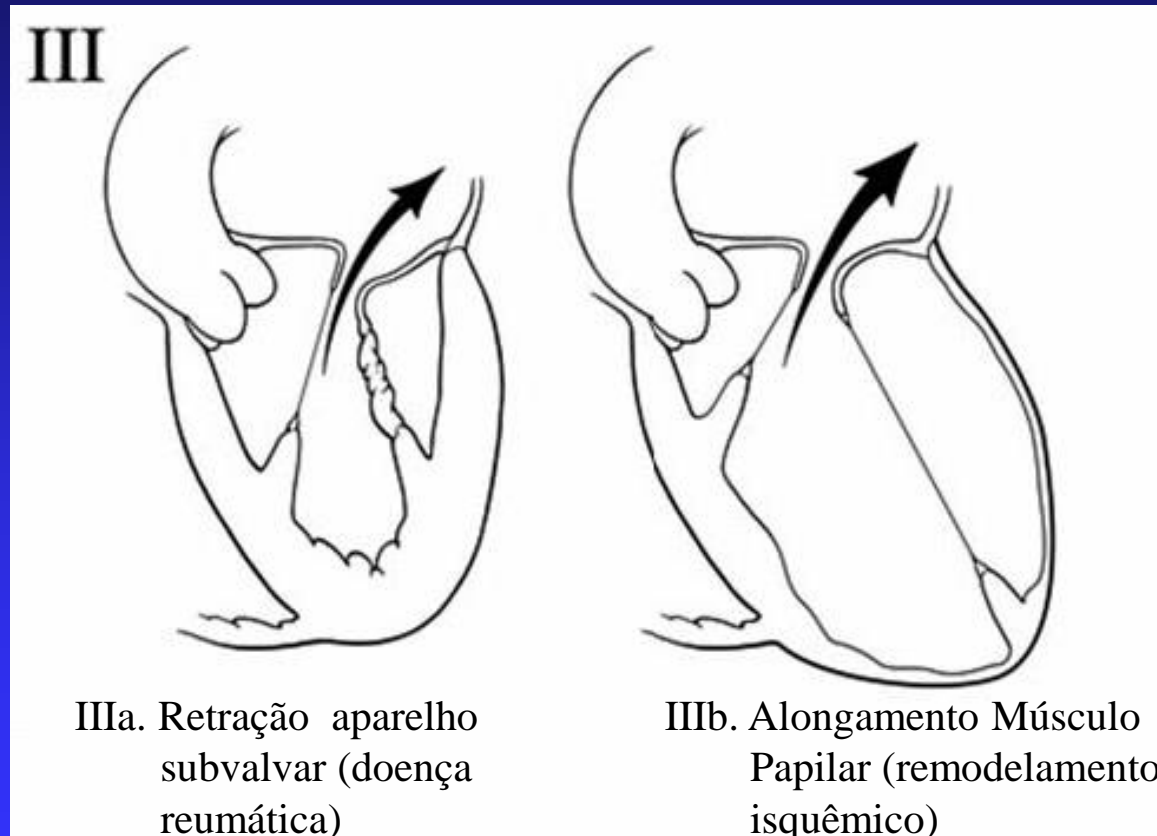
Mecanismos Insuficiência Mitral

Tipo II: Mobilidade Excessiva das Valvas (jato insuficiente lado oposto à valva afetada)



Mecanismos Insuficiência Mitral

Tipo III: Mobilidade Restrita (jato insuficiente mesmo lado da valva afetada)



Etiologia

- Doença reumática
- Prolapso VM / Degeneração mixomatosa / Flail
- Endocardite / perfuração
- Doença isquêmica
- Calcificação do anel mitral
- Doença do tecido conectivo: S. Marfan, etc.
- **Funcional**: isquêmica, CMP dilatada, CP hipertrófica
- Agentes anorexígenos: fenfluramina, fentermina, dexfenfluramina
- Ruptura corda tendinea
- Ruptura / disfunção músculo papilar
- Congênitas: “cleft” anterior ou fenestração folhetos

Etiologia Estrutural

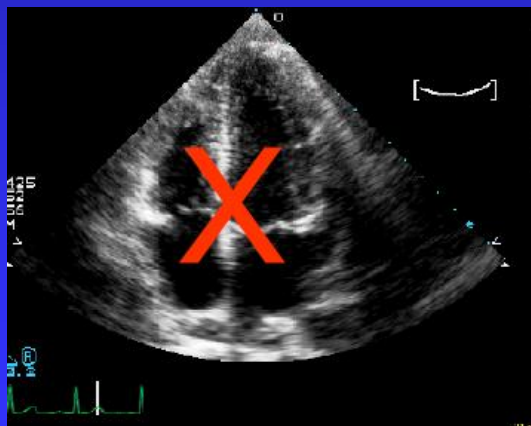
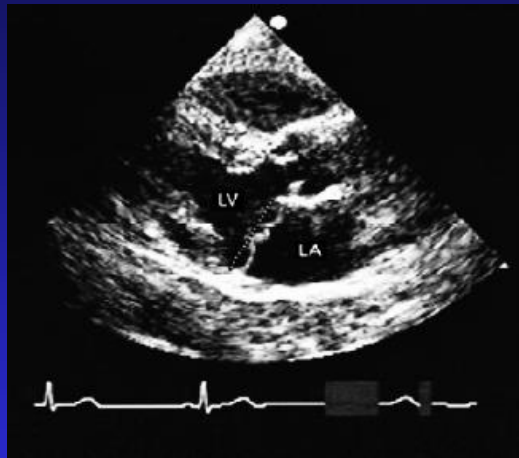


TABLE 1. PREVALENCE OF MITRAL-VALVE PROLAPSE.

TYPE OF MITRAL-VALVE PROLAPSE	ALL SUBJECTS (N=3491)	WOMEN (N=1845)	MEN (N=1646)
	number (percent)		
Classic	47 (1.3)	26 (1.4)	21 (1.3)
Nonclassic	37 (1.1)	24 (1.3)	13 (0.8)
Total	84 (2.4)	50 (2.7)	34 (2.1)

Etiologia Estrutural



Normal

Courtesy of R. Lang, MD

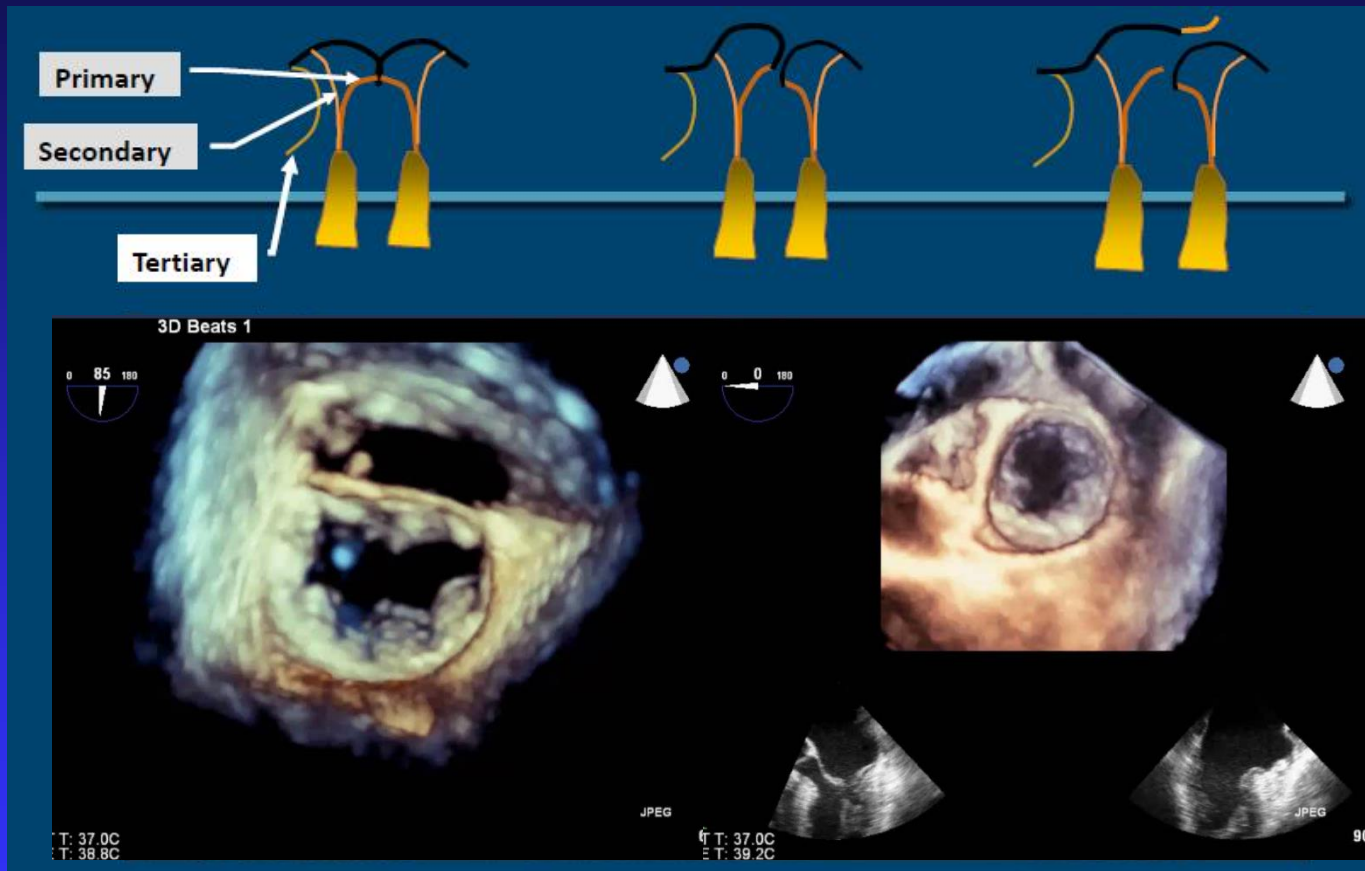


Prolapse

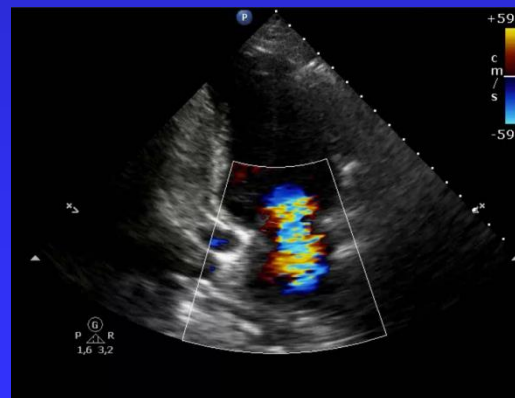
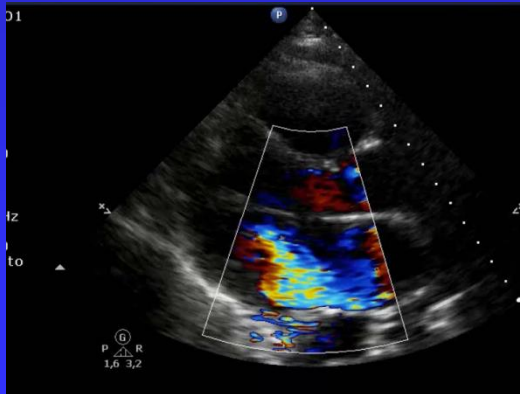
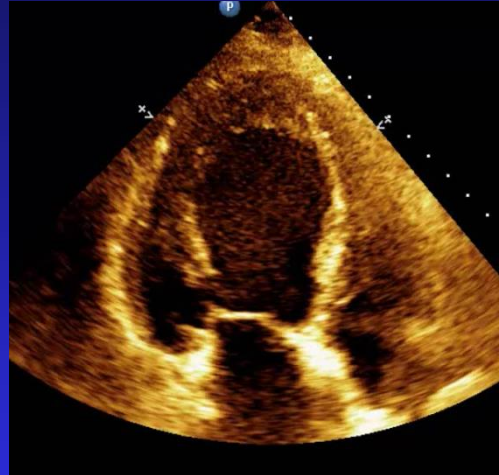


Flail with ruptured chord

Etiologia Estrutural



Etiologia Funcional



Papel da Ecocardiografia

- Quantificar refluxo
- Função ventricular (FE, volumes)
- Tamanho AE
- Sub-valvar
- Estimativa PAP
- Etiologia da IM – anatomia do aparato valvar
- Possibilidade de reparo

Cirurgia

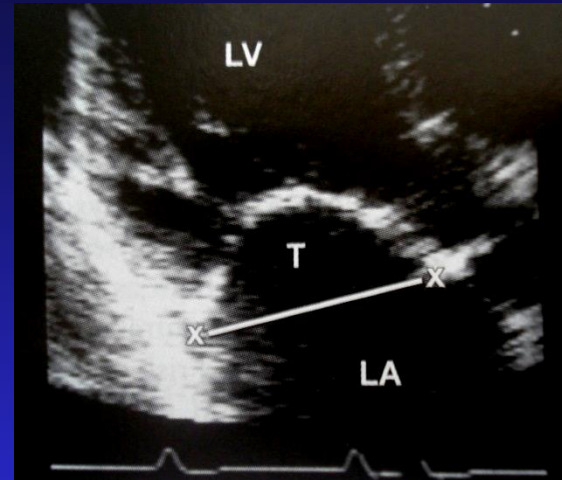
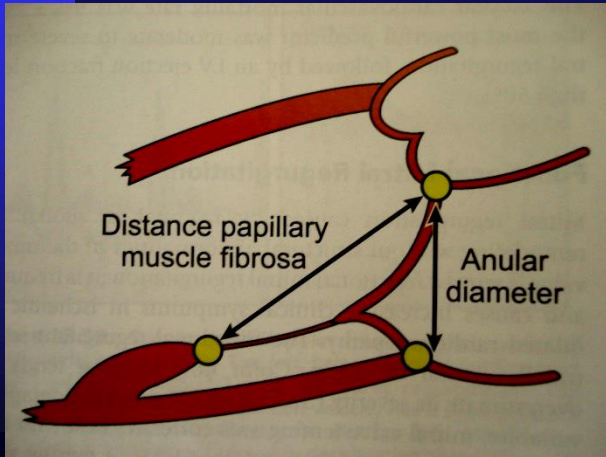
Preditores ecocardiográficos pior Px pós-op
(disf. VE, ICC, mortalidade)

- FE < 60%
- VSFVE > 60 ml/m²
- DSFVE > 45 mm (26 mm/m²)
- Stress sist. Final VE > 195 mmHg
- Dp/dt < 900 mmHg/seg

Doppler Echocardiography Evaluation in Severe MI

- Mitral valve tenting area
- Area of regurgitant jet
- Broad jet width on color-flow imaging
- Regurgitant volume, fraction, orifice area
- Systolic flow reversal in the pulmonary vein

Mitral valve tenting area



- Functional mitral regurgitation (ischemic, dilated CMP)
- Functional jet is usually central
- Color flow overestimate its severity
- Correlates best with severity MR (2D)

Variable

Mild

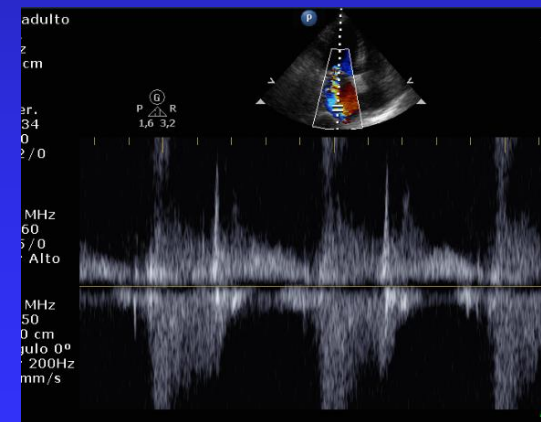
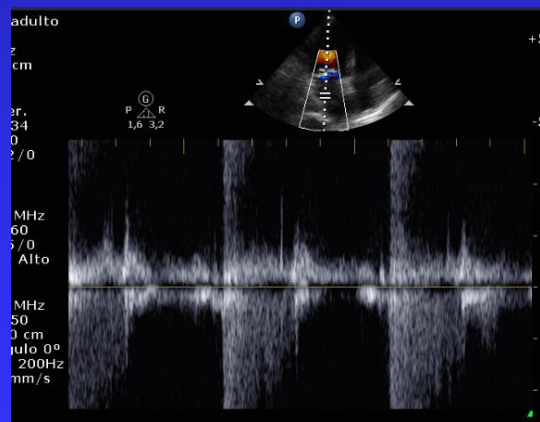
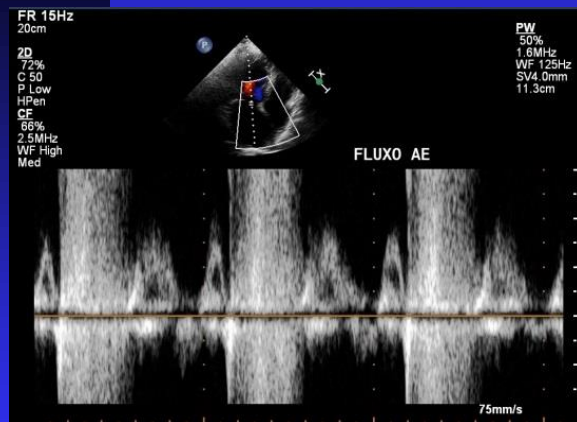
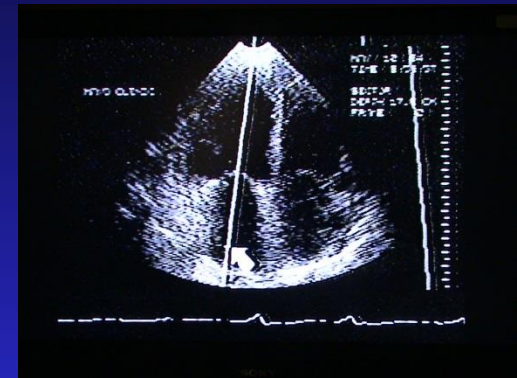
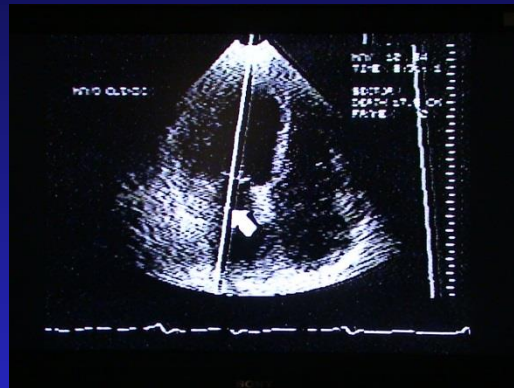
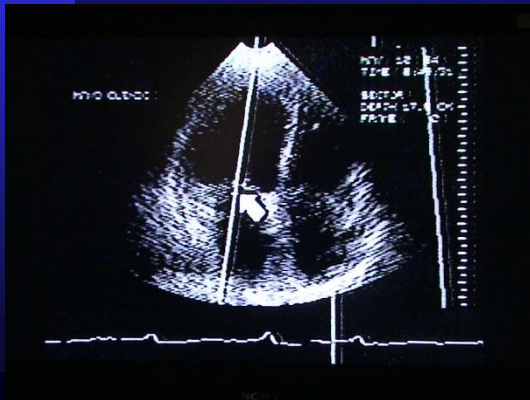
Moderate

Severe

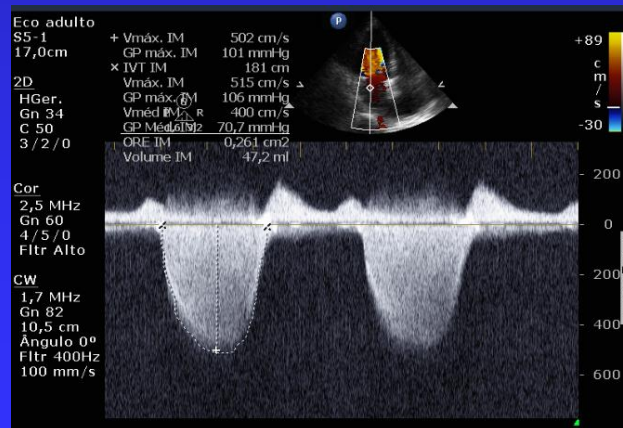
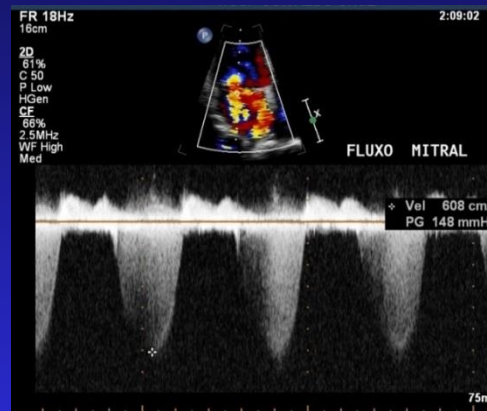
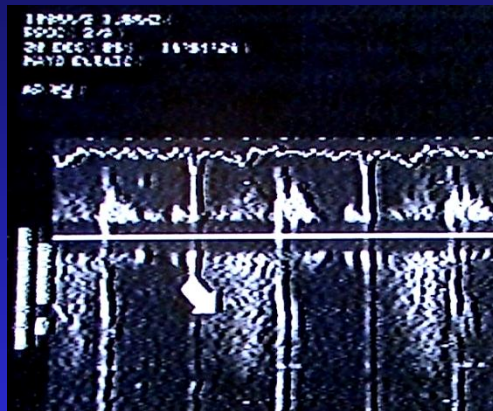
Mitral tenting area (cm²)

≥ 6

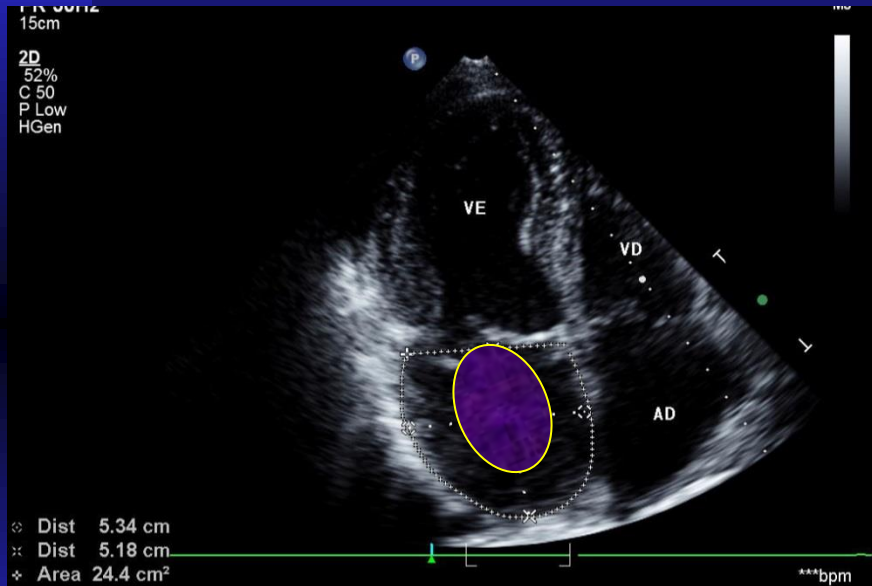
Avaliação Doppler Pulsado



Avaliação Doppler Contínuo



Area Jato Regurgitante/Area Átrio Esquerdo



AJR/AAE

< 20 %

20-40%

>40%

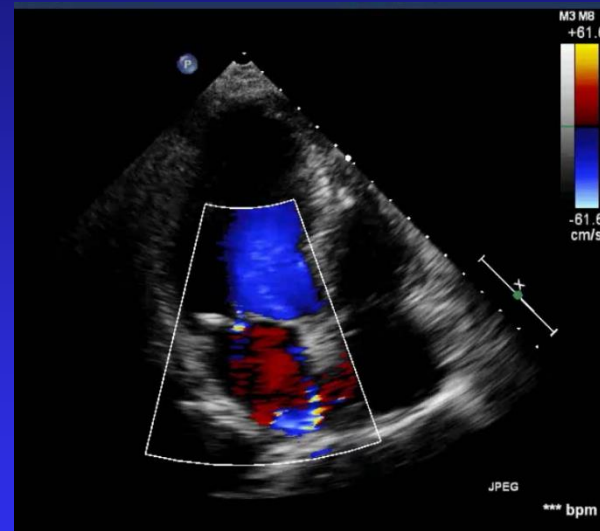
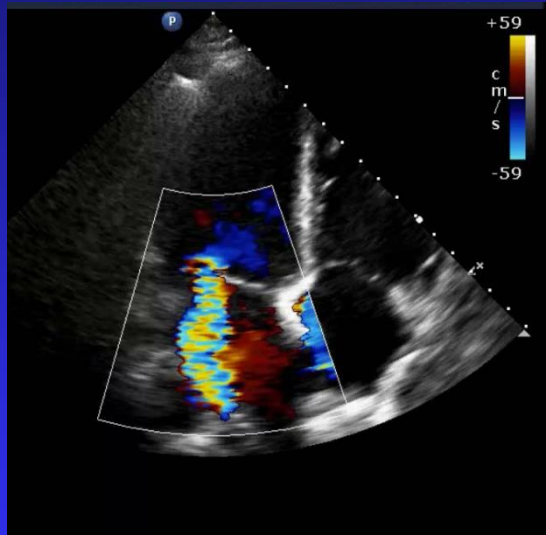
IM (cate)

Grau I

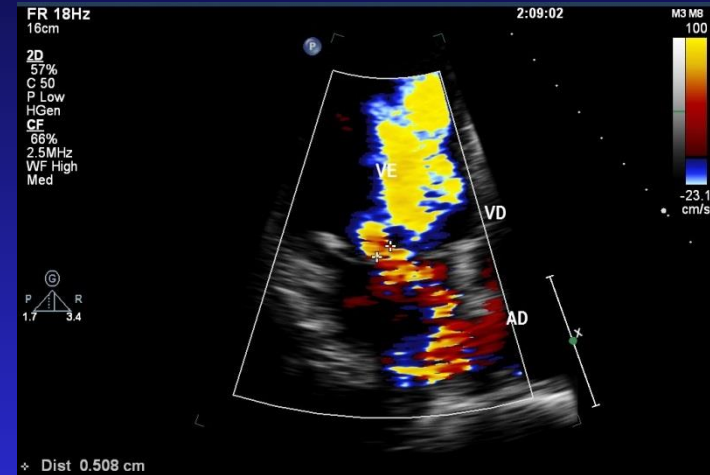
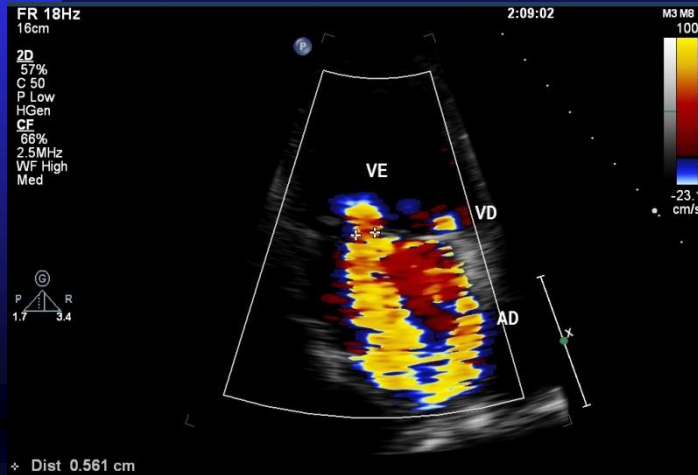
Grau II

Grau III

Efeito Coanda



Width of the Vena Contracta in MR



Variable

Width vena contracta (mm)

Mild

<3.0

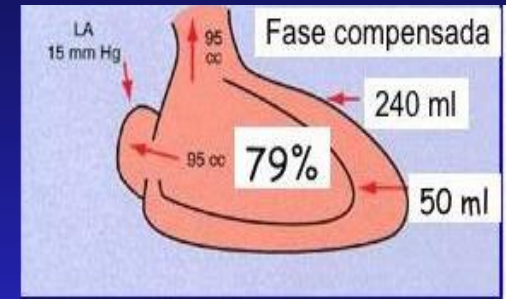
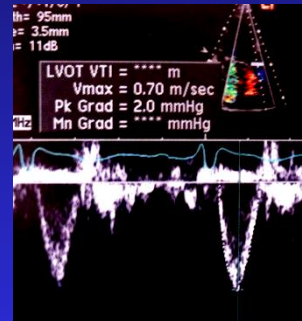
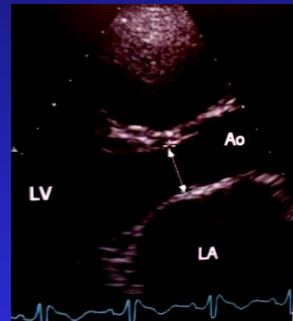
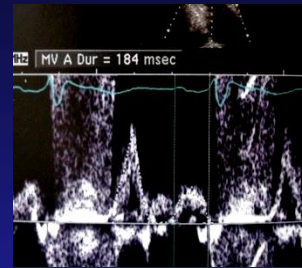
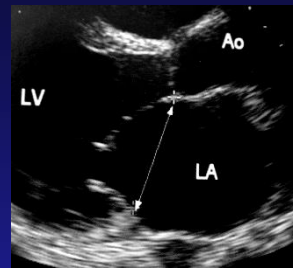
Moderate

3.0–7.0

Severe

>=7.0

Regurgitant volume and fraction in MR



$$\begin{aligned}
 \text{MV RegV} &= \text{Volume de entrada} - \text{volume saída} \\
 &= \text{MV flow} - \text{LVOT flow} \\
 &= (d^2 \times 0.785 \times \text{TVI}) - (d^2 \times 0.785 \times \text{TVI})
 \end{aligned}$$

Variable

Regurgitation volume (ml)

Mild

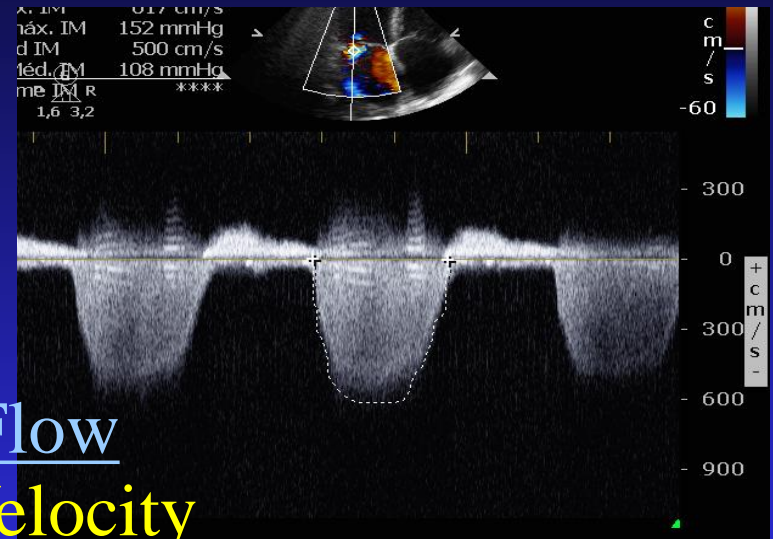
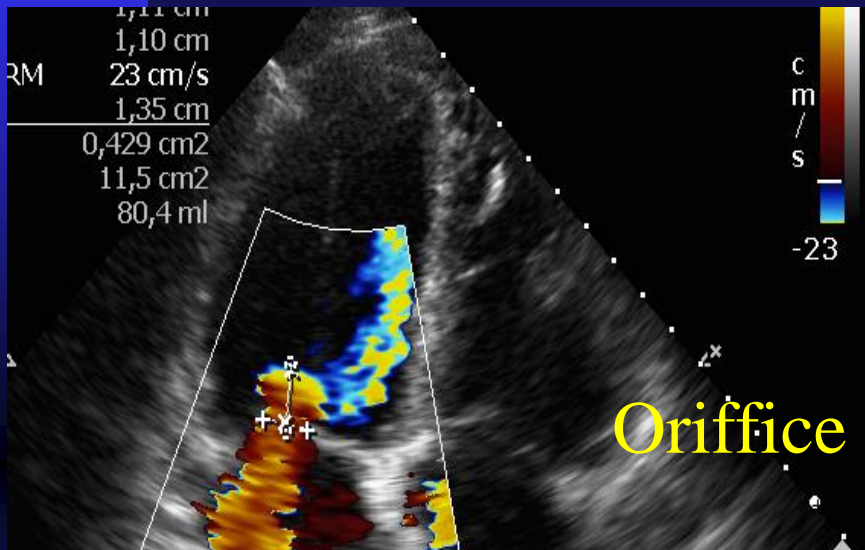
<

Moderate

Severe

>=60

Effective Regurgitant Orifice in MR



$$\text{Oriffice} = \frac{\text{Flow}}{\text{Velocity}}$$

$$\begin{aligned} \text{Flow} &= \text{Velocity}_{\text{shell}} \times \text{PISA} \\ &= 0.23 \text{ m/seg} \times \text{PISA} \\ &= 0.23 \text{ m/seg} \times 2 \pi r^2 \\ &= 23 \text{ cm/seg} \times 2 \pi 1.1 \text{ cm}^2 \\ &= 265.3 \text{ ml/seg} \end{aligned}$$

$$\begin{aligned} \text{Velocity} &= 6.17 \text{ m/seg} \\ &= 617 \text{ cm/seg} \end{aligned}$$

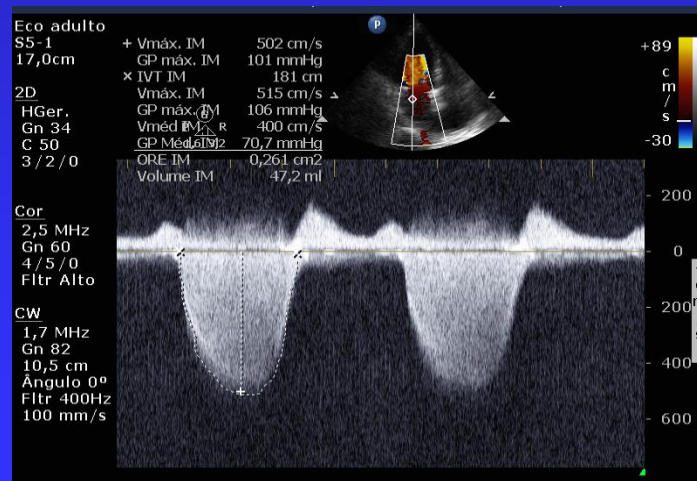
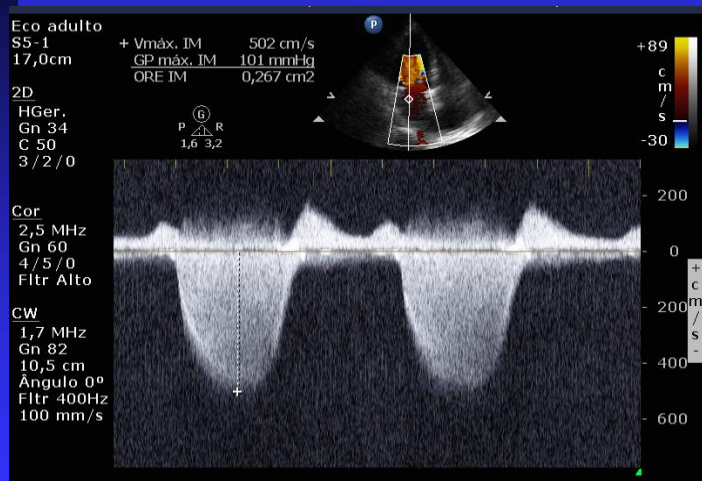
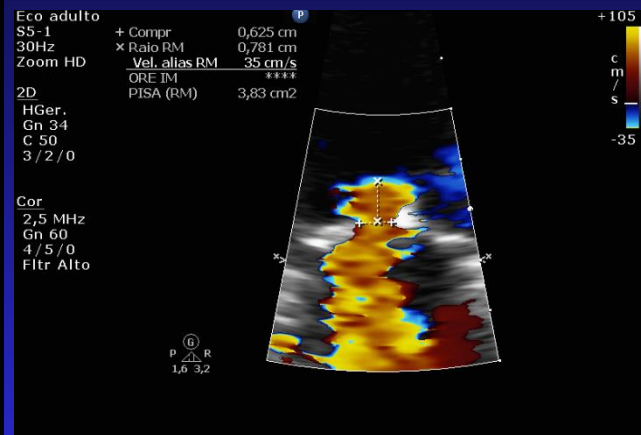
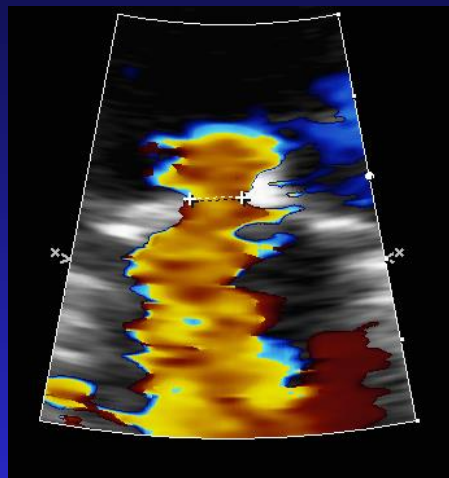
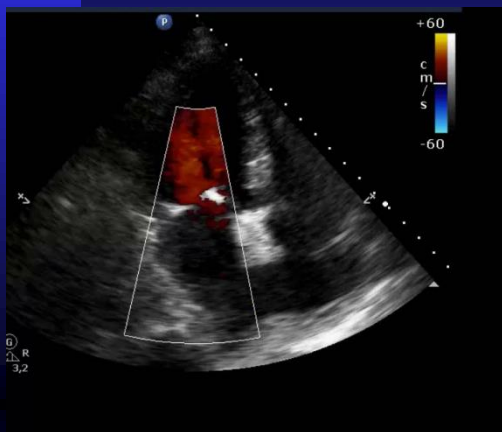
$$\text{Oriffice} = \frac{265 \text{ cm}^3/\text{seg}}{617 \text{ cm/seg}}$$

$$\text{Oriffice} = 0.43 \text{ cm}^2 = 43 \text{ mm}^2$$

Classification of the Severity of MR

Variable	Mild	Moderate	Severe
Jet area (% LA area)	< 20	20-40	>=40
Width vena contracta (mm)	< 3.0	3.0-7.0	>=7.0
Regurgitant volume (ml/beat)	< 30	30-60	>=60
Regurgitant fraccion (%)	<30	30-50	>=50
Effective regurg.orifice (mm ²)	<20	20-40	>=40

Caso



Critérios de Insuficiência Mitral grave

■ **AE > 57 mm**

■ **Diâmetros VE : DSF >40 mm (26 mm/m²)**

DDF > 69 mm (37 mm/m²)

■ **Volumes VE: VSF > 83 ml (43 ml/m²)**

VDF > 201 ml (97 ml/m²)

■ **FE < 60%**

■ **HAP > 50 mmHg (repouso) ou 60 mmHg**

(exercício)

Ecocardiografia e Insuficiência Mitral

Preditores de Má Evolução

■ **DD VE > 70mm ou 40mm/m²**

■ **VDF > 220ml/m²**

* ■ **DSVE > 45mm ou 28mm/m²**

■ **VSF > 50ml/m²**

* ■ **FE < 0.60**

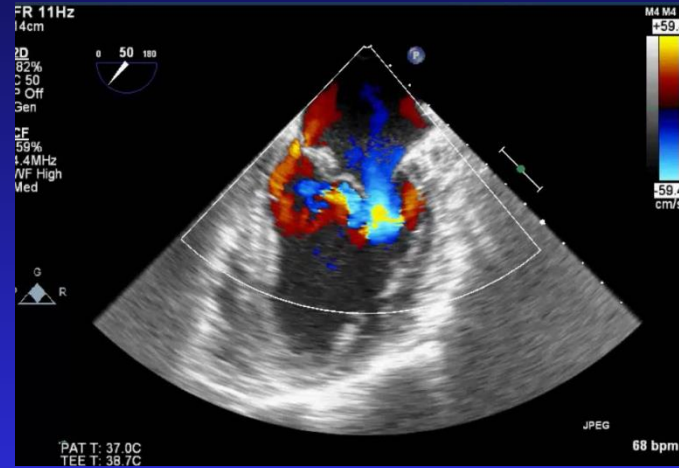
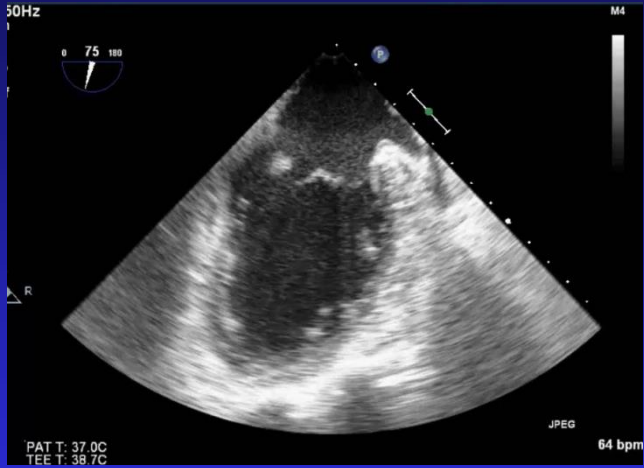
Clinical Applications of 3DE 3DE and MR – Conclusions

- Demonstration of spatial pathomorphology and mechanisms (3D TEE)
 - Quantification of lesion severity (3D color Doppler, Vena contracta area)
 - Pre- (and post-) operative evaluation, patient selection
- **3D is becoming an established tool for mitral valve evaluation!**



*Superior
to 2D
techniques*

3D



Surgical Considerations

Rupture of chordae tendineae or marked elongation

MV repair - excellent long-term survive

- superior to MV replacement (10-20y f-up)

Higher Risk Reop - Anterior leaflet MV repair

- Residual MR

Surgical centers experienced in MV repair

Heart failure, severity MR, atrial fibrillation, LV
systolic function, LV end-diastolic and end-systolic
volumes, pulmonary artery pressure

Fração de Ejeção

- Após cirurgia: queda média de 10 unidades (mais acentuada se TVMi sem preservação do sub-valvar)
- FE < 60% pré-op: alto risco para FE < 50% no pós-op
- ICC em 10 anos (Enriquez-Sarano et al)
 - 19% (FE pré-op > 60%)
 - 29% (FE “ 50 a 59%)
 - 70% (FE “ < 50%)