



AR Complicating TAVR

How to Prevent and How to Treat

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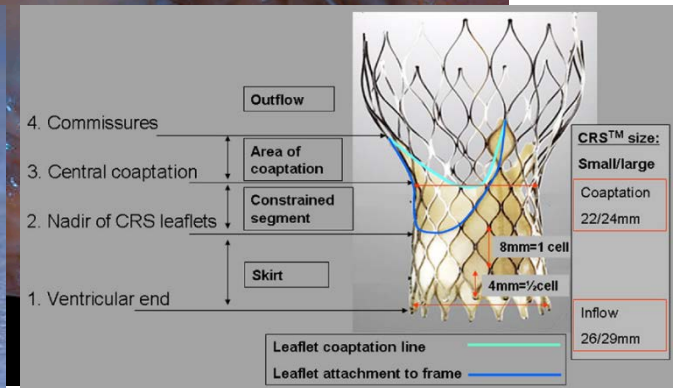
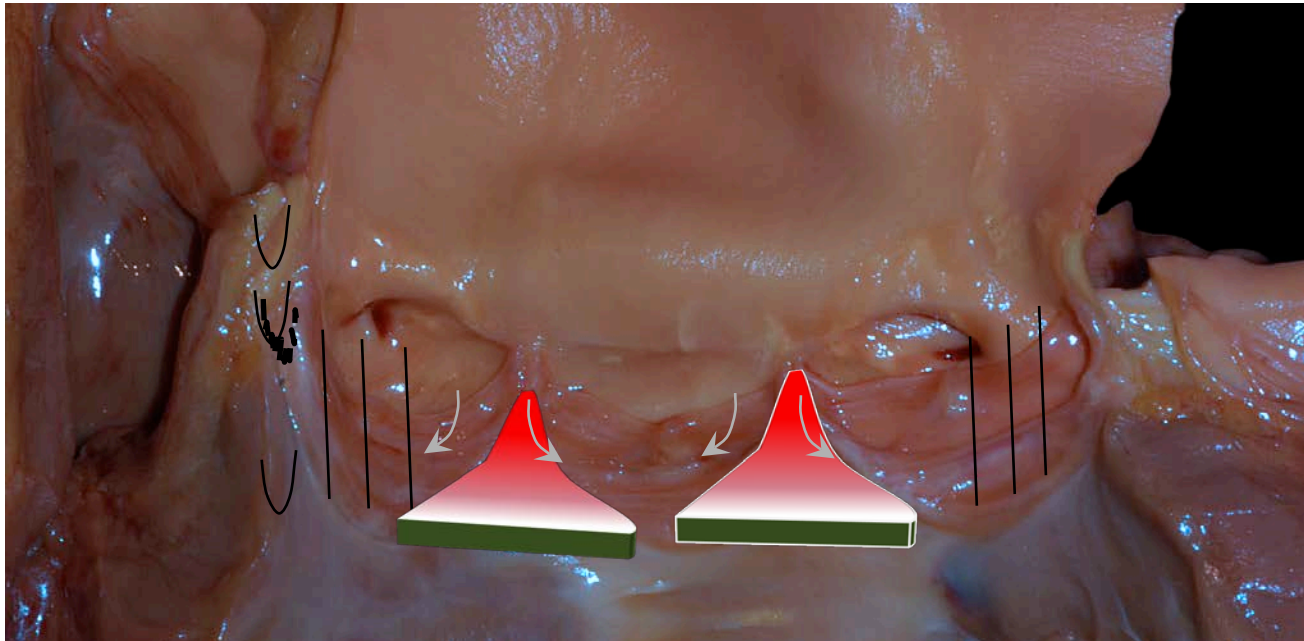
How to Prevent and Manage PVL

- **Prevention**
 - Sizing
 - Positioning
 - Device selection
- **Management**
 - **Assessment**
 - Echocardiography (TEE or TTE)
 - Angiography
 - Hemodynamics
 - **Treatment**
 - Post dilation
 - Valve in valve
 - Plug

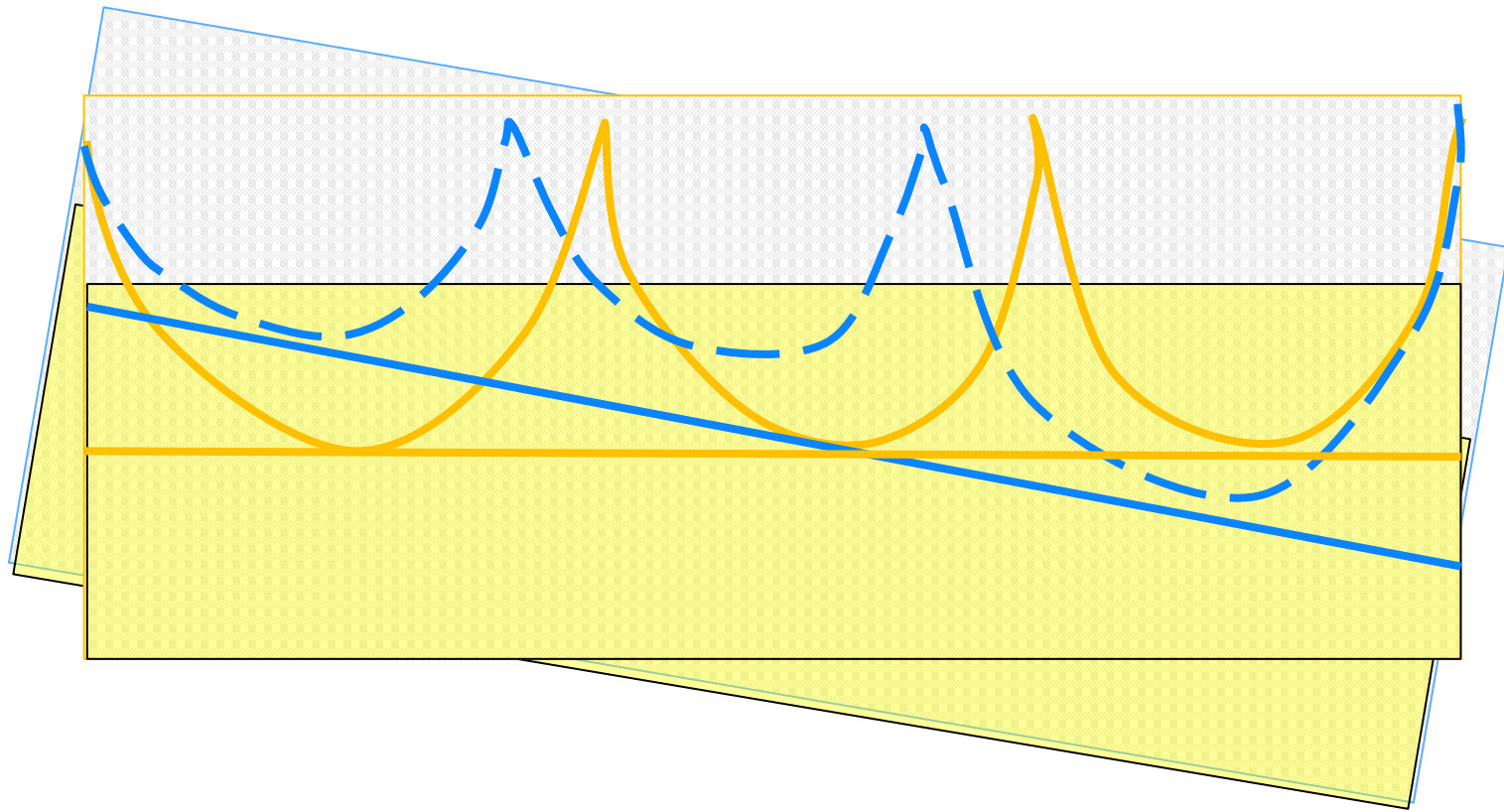
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Anatomy Aortic Valve, Prosthesis and Important for sizing and positioning



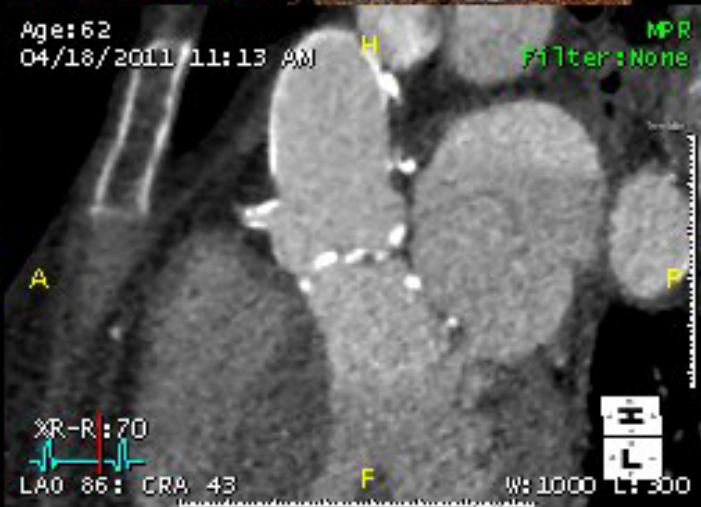
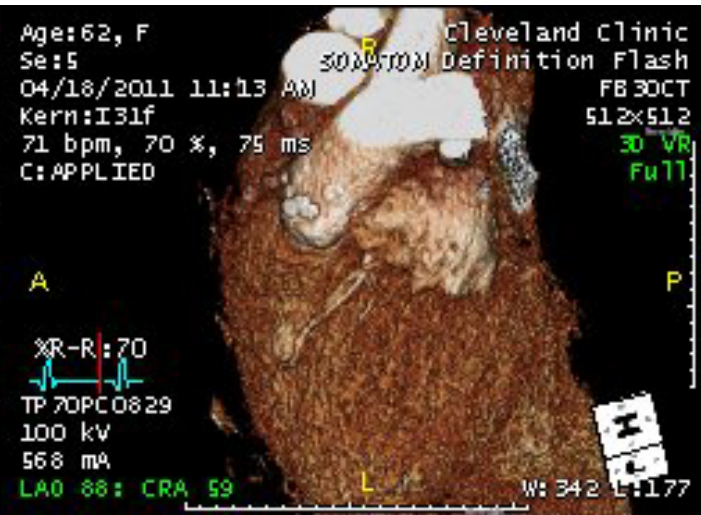
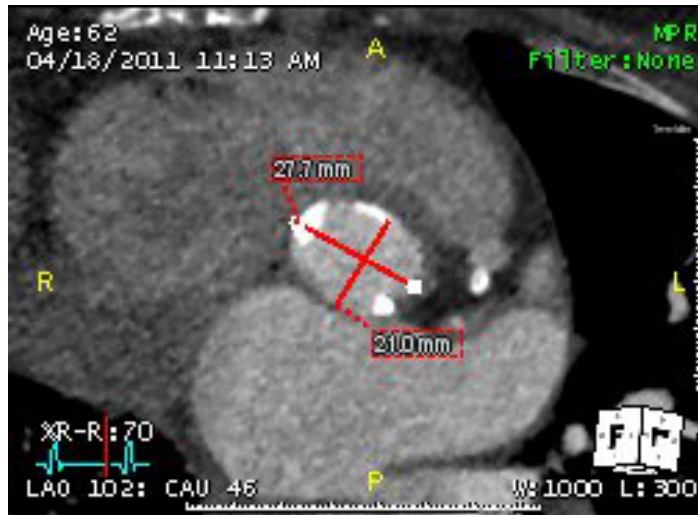
PVL – How to prevent?



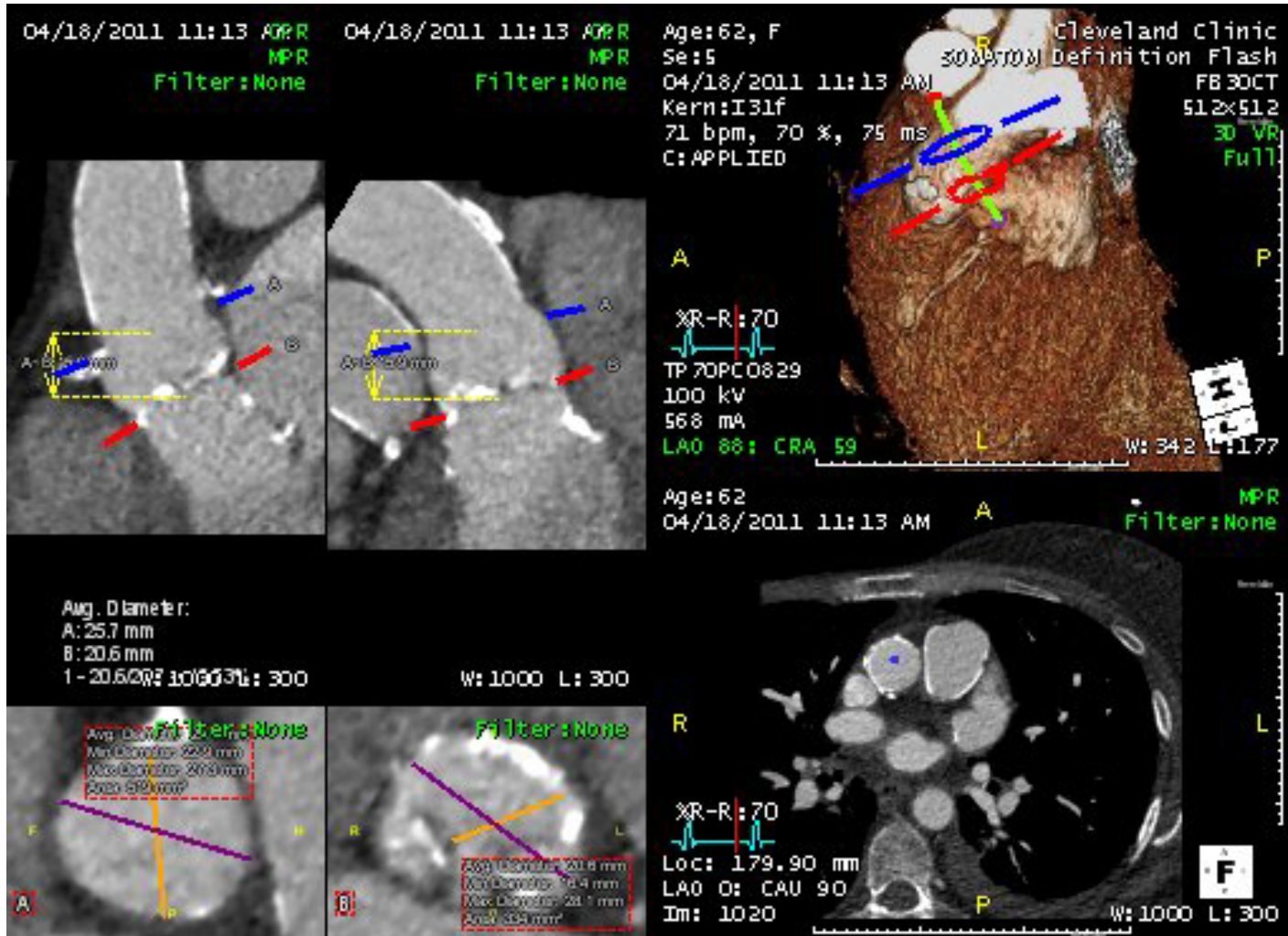
PVL – How to prevent?



Multi-planar Reconstruction



Curved multi-planer reconstruction (CPR)



Perimeter and Area of Different Sizes

Valve	Perimeter	Area
20 mm	62 mm	314 mm ²
23 mm	72 mm	415 mm ²
26 mm	82 mm	531 mm ²
29 mm	91 mm	661 mm ²

Which is better?

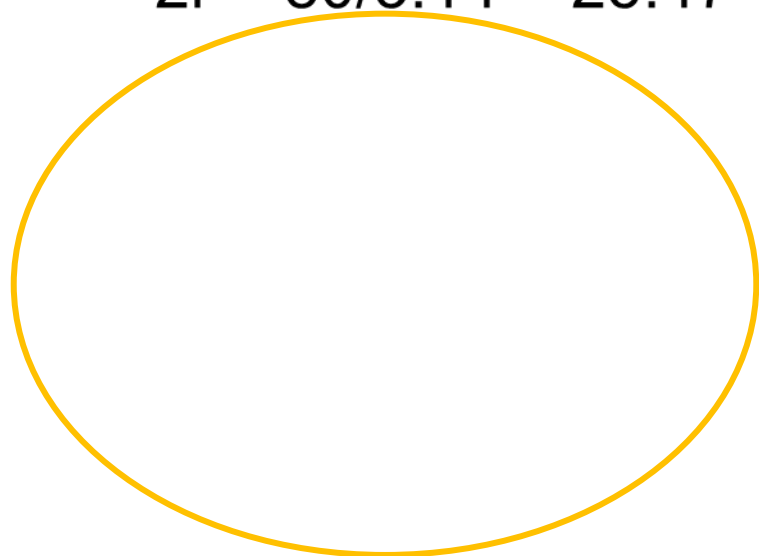
- If the valve becomes circular, annular area after deployment will be closer to area derived measurements
- If not circular, closer to perimeter derived diameter

Annular Measurement

$$\text{Perimeter} = 80$$

$$2\pi r = 80$$

$$2r = 80/3.14 = 25.47$$



$$\text{Area} = 450$$

$$\pi r^2 = 450$$

$$r^2 = 143.31$$

$$2r = 23.94$$

Core Valve (confirms to annulus)

$$\begin{aligned} \text{\% oversize by D} &= 26/25.27 \\ &= 2\% \end{aligned}$$

$$\begin{aligned} \text{\% oversize by perimeter} &= 82/80 \\ &= 2.5\% \end{aligned}$$

Edwards (circular)

$$\begin{aligned} \text{\% oversize by D} &= 26/23.94 \\ &= 8.6\% \end{aligned}$$

$$\begin{aligned} \text{\% oversize by area} &= 531/450 \\ &= 18\% \end{aligned}$$

Sizing

PVL versus Annular Rupture

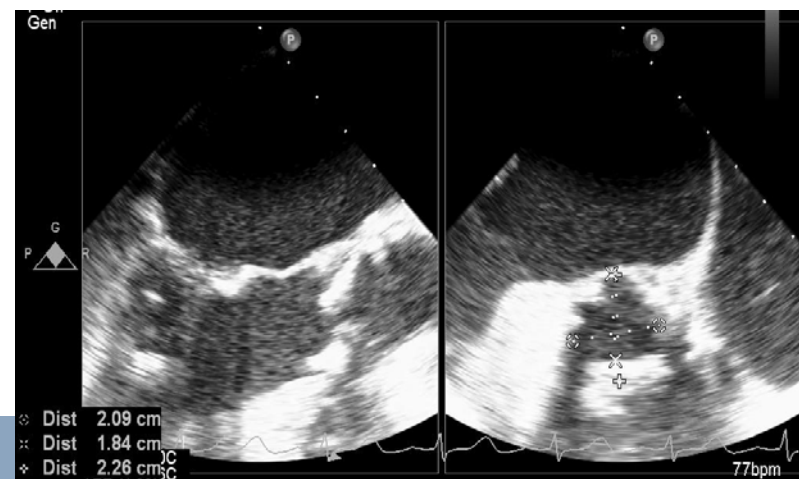
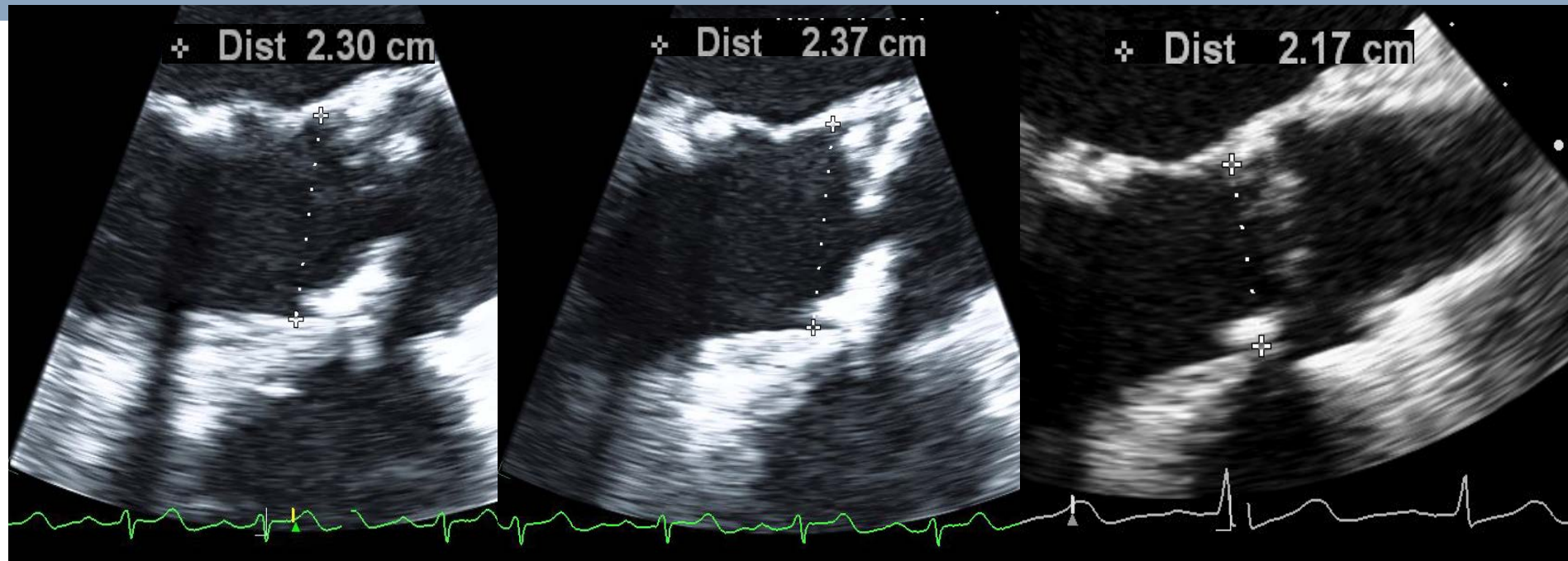
Anatomical and Procedural Features Associated with Aortic Root Rupture During Balloon-Expandable Transcatheter Aortic Valve Replacement

Marco Barbanti, Tae-Hyun Yang, Josep Rodés-Cabau, Corrado Tamburino, David A. Wood, Hasan Jilaihawi, Philipp Blanke, Raj R. Makkar, Azeem Latib, Antonio Colombo, Giuseppe Tarantini, Rekha Raju, Ronald K. Binder, Giang Nguyen, Melanie Freeman, Henrique B. Ribeiro, Samir Kapadia, James Min, Gudrun Feuchtner, Ronen Gurtvich, Faisal Alqoofi, Marc Pelletier, Gian Paolo Ussia, Massimo Napodano, Fabio Sandoli de Brito, Jr., Susheel Kodali, Bjarne L. Norgaard, Nicolaj C. Hansson, Gregor Pache, Sergio J. Canovas, Hongbin Zhang, Martin B. Leon, John G. Webb and Jonathon Leipsic

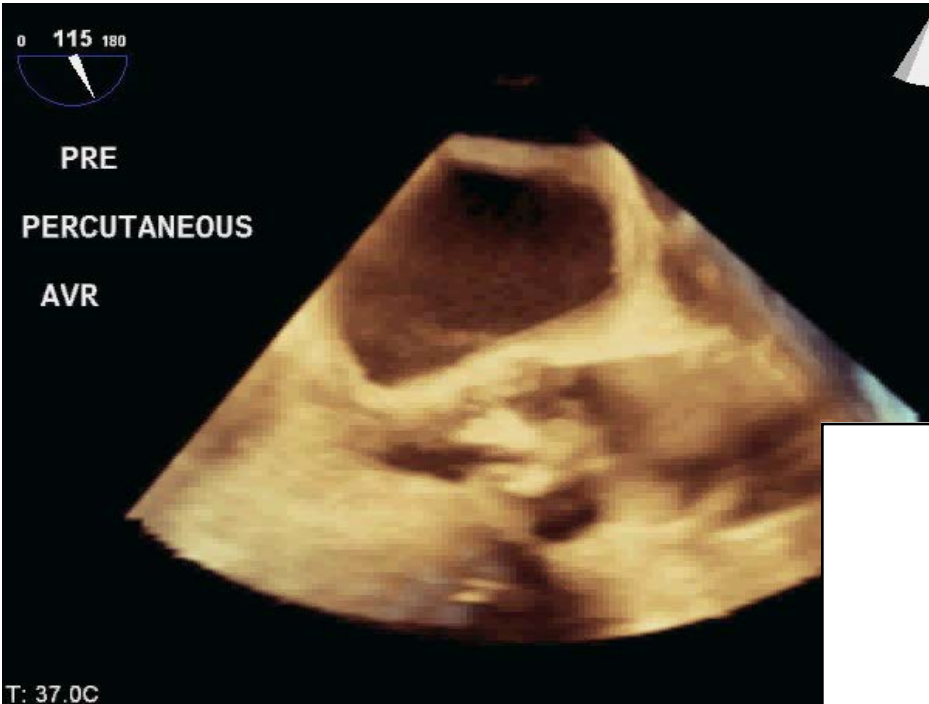
Univariate		
Predictors of aortic root rupture	Odds Ratio (95%CI)	P value
LVOT calcifications moderate/severe area	10.92 (3.23-36.91)	<0.001
Prosthesis oversizing \geq 20%	8.38 (2.67-26.33)	<0.001



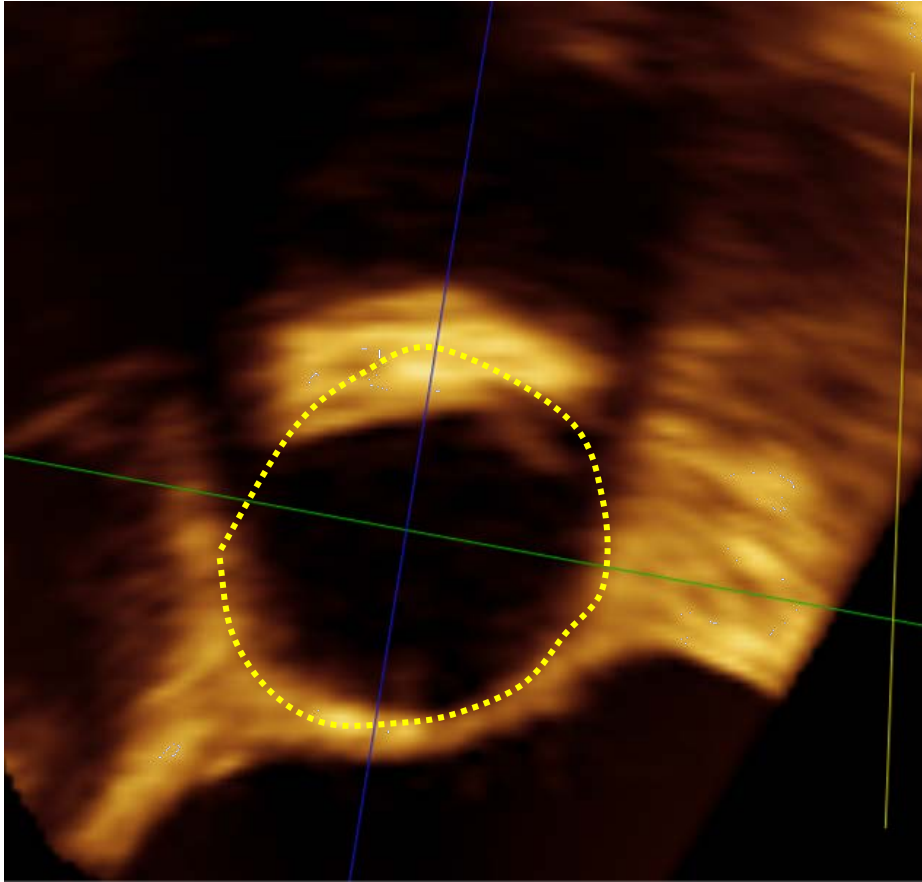
TEE measurements



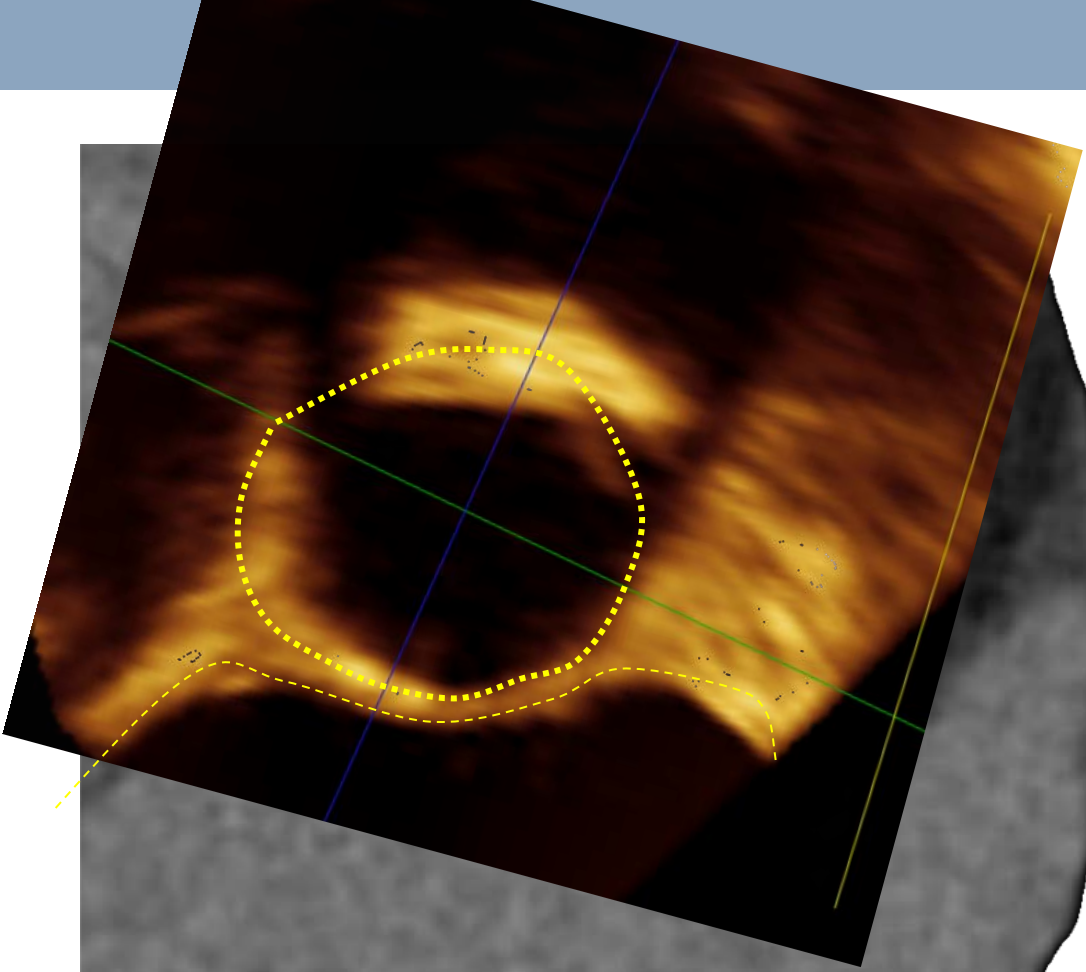
3D TEE



3D TEE Recnstruction



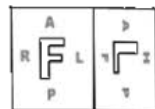
Major diameter=23
Minor diameter=21
Area = 3.4 mm²
Perimeter = 62 mm



44.9 mm

1mm/div

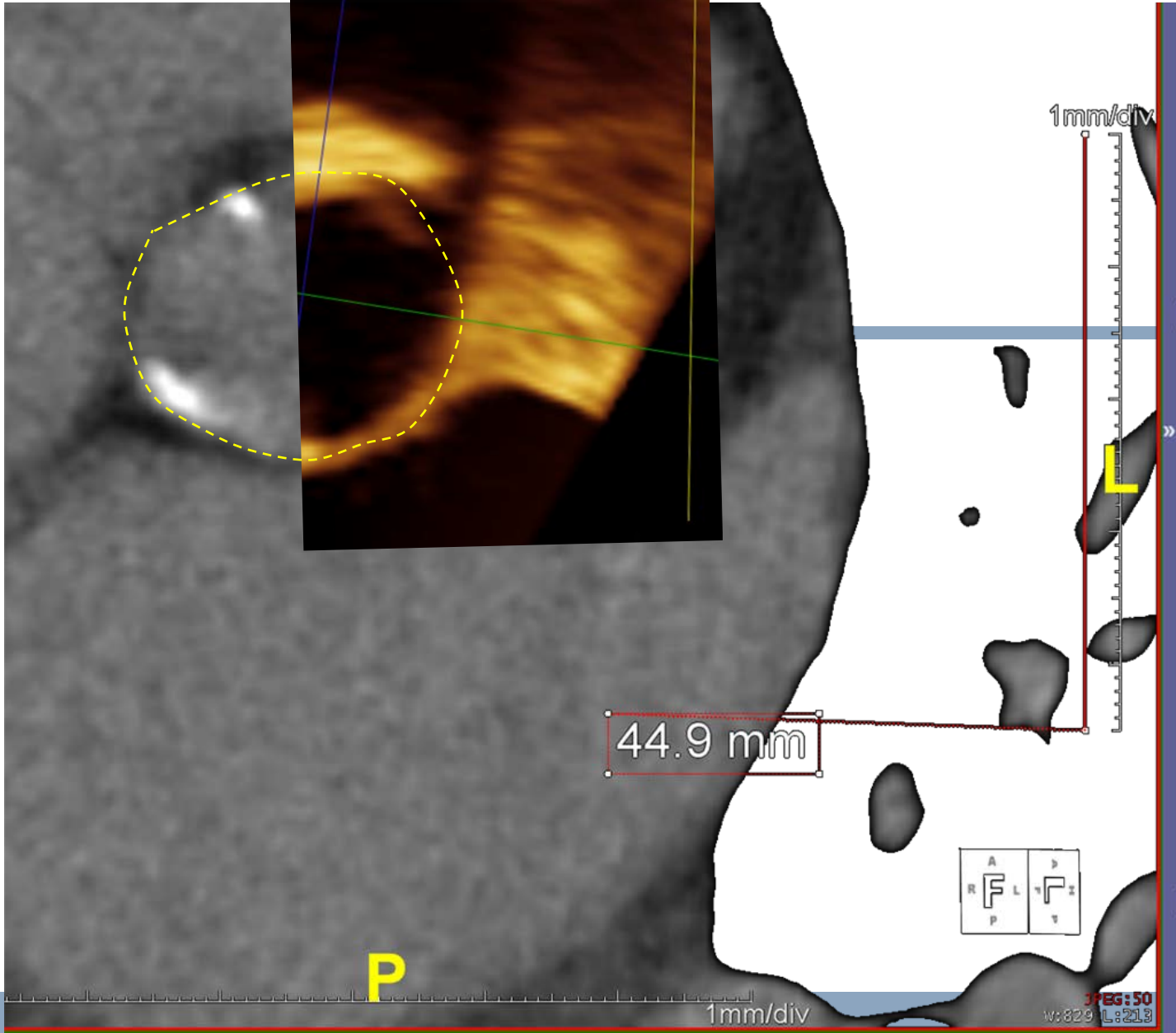
L



P

1mm/div

3PEG:50
w:829 L:213

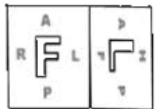


44.9 mm

1mm/div

P

L



1mm/div

JPEG: 50
w: 829 L: 213

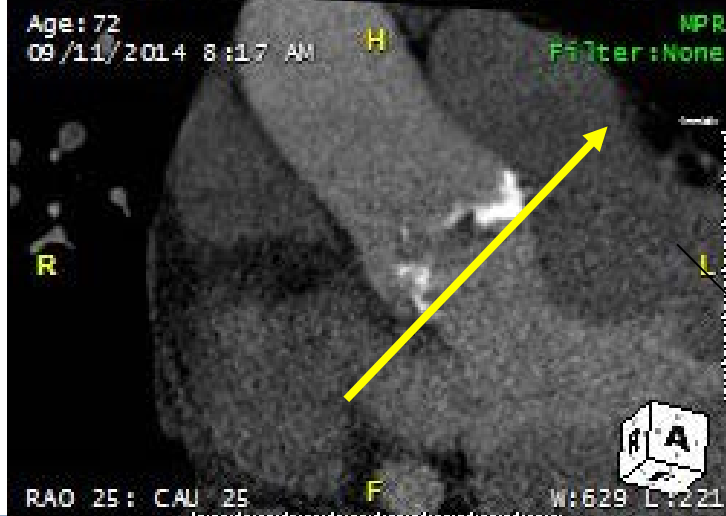
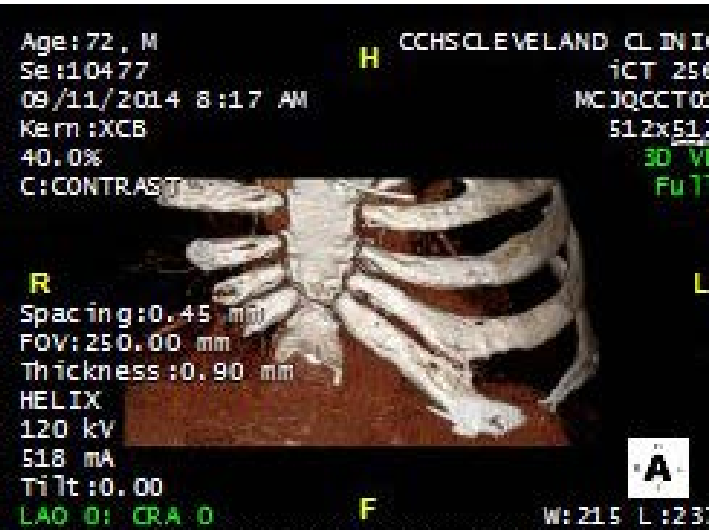
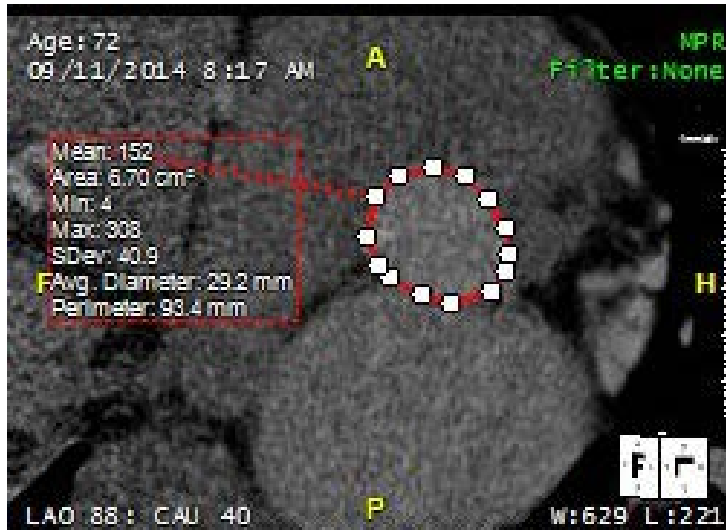
Angiography



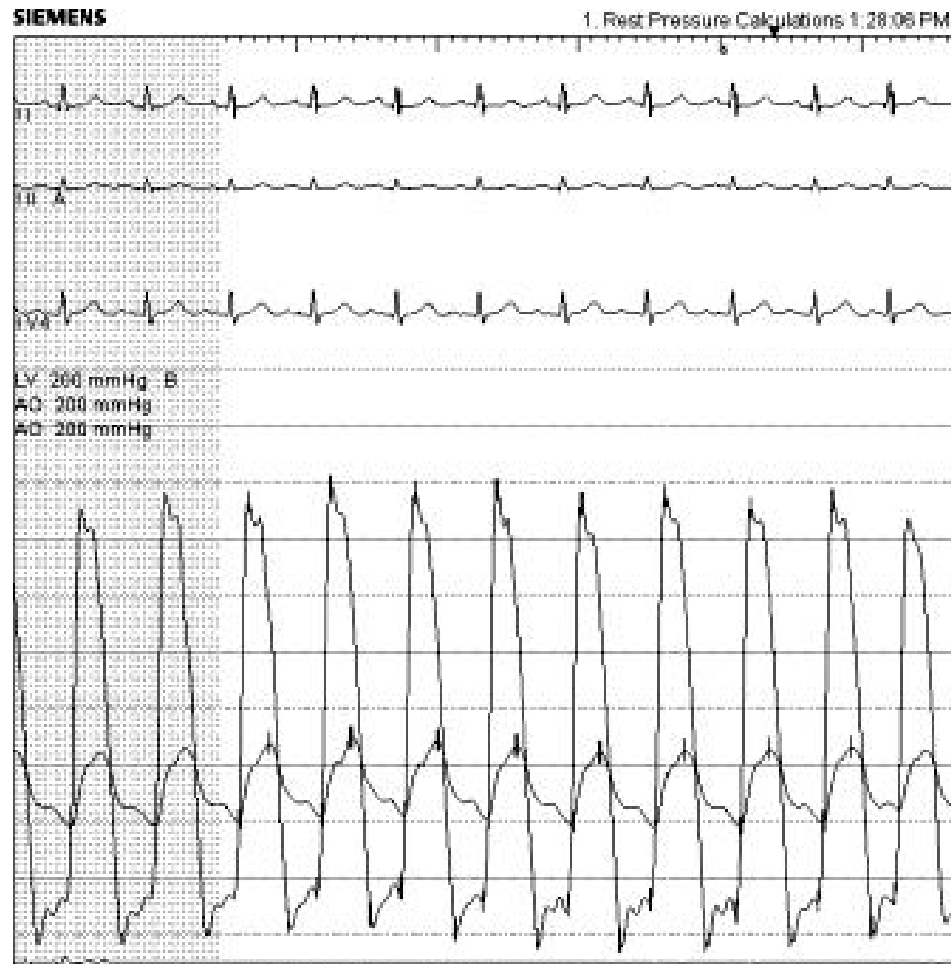
Data Synthesis

- TEE
 - 20.9 to 23.7 mm
- CT
 - Short axis : 20 to 21 mm
 - Long axis : 26 to 27 mm
 - Mean: 23 to 24 mm
 - Perimeter: 71 mm
 - Area: 423 mm²
- Angio
 - Coronal : 22.5 mm
 - Sagittal : 20.5 mm
 - Mean: 21.5 mm
- Balloon
 - 23 mm tight fit

Patient with very large annulus



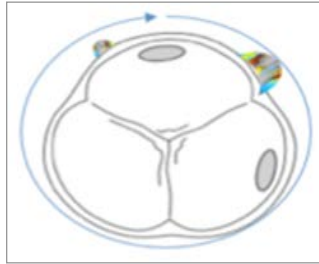
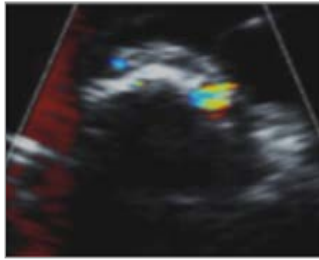
Role of “Feeling” - Pressure



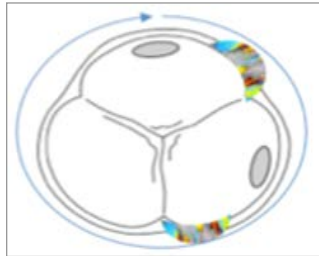
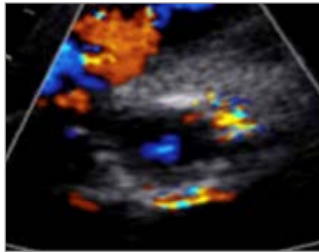
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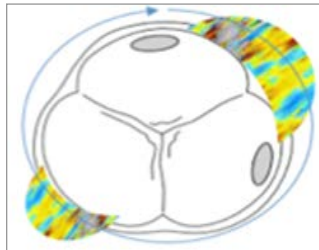
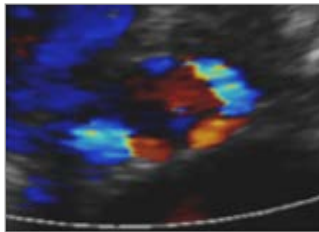
PARTNER Grading Criteria for Paravalvular AR



Circumference = 6"
AR = 0.1+0.35 = 0.45"
Ratio = 8%
Severity = Mild (< 10%)



Circumference = 6"
AR = 0.5+0.5 = 1.0"
Ratio = 17%
Severity = Moderate (10 – 20%)
(Trans AR also present)

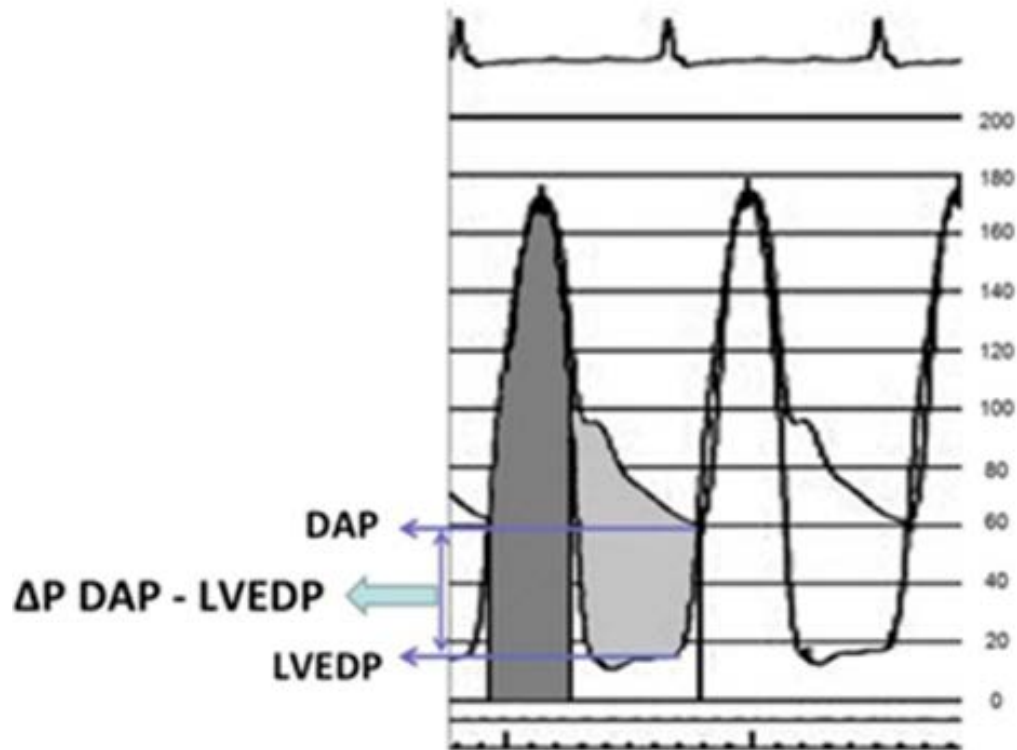


Circumference = 6"
AR = 0.6+1.1 = 1.7"
Ratio = 28%
Severity = Severe (> 20%)

VARC II Recommendations

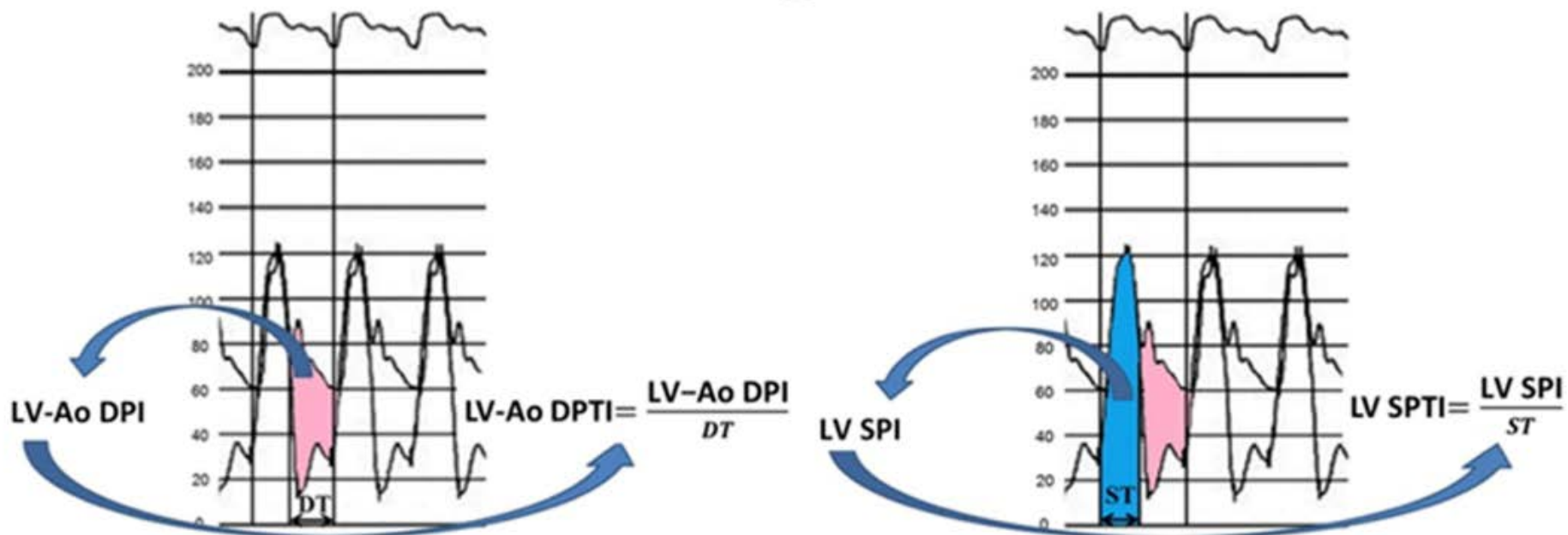
	Mild	Moderate	Severe
Semiquantitative parameters			
Diastolic flow reversal in the descending aorta—pulsed wave	Absent or brief early diastolic	Intermediate	Prominent, holodiastolic
Circumferential extent of prosthetic valve paravalvular regurgitation (%)	<10	10–29	≥30
Quantitative parameters			
Regurgitant volume (ml/beat)	<30	30–59	≥60
Regurgitant fraction (%)	<30	30–49	≥50
Effective regurgitant orifice area (cm ²)	0.10	0.10–0.29	≥0.30

Pressure Measurement



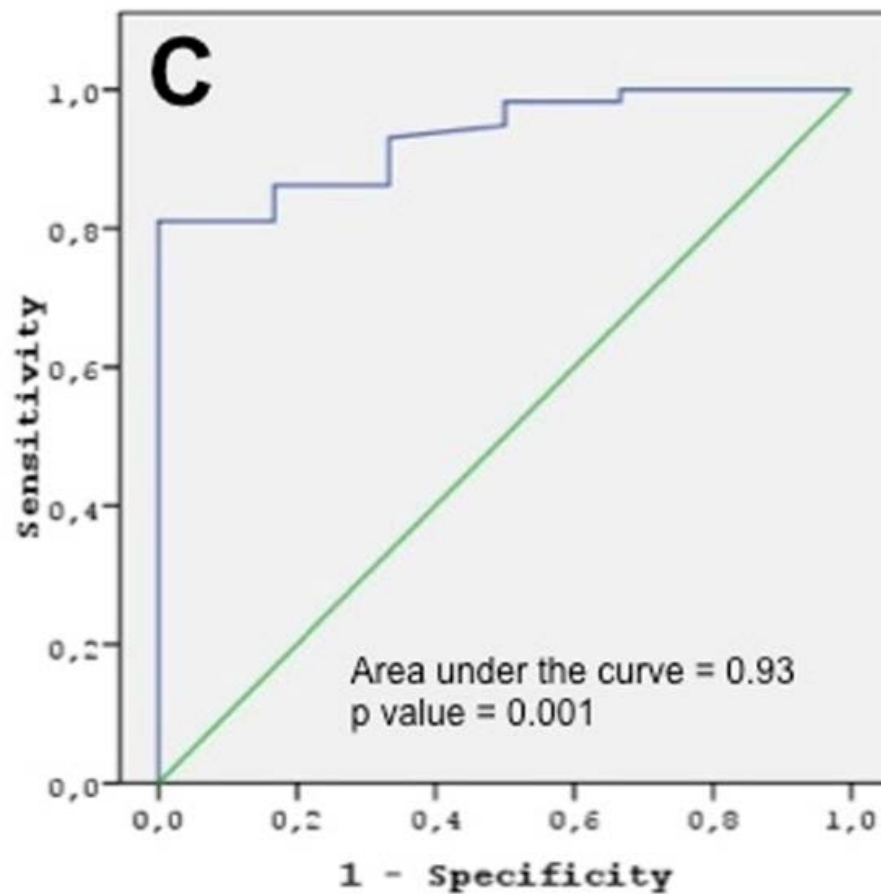
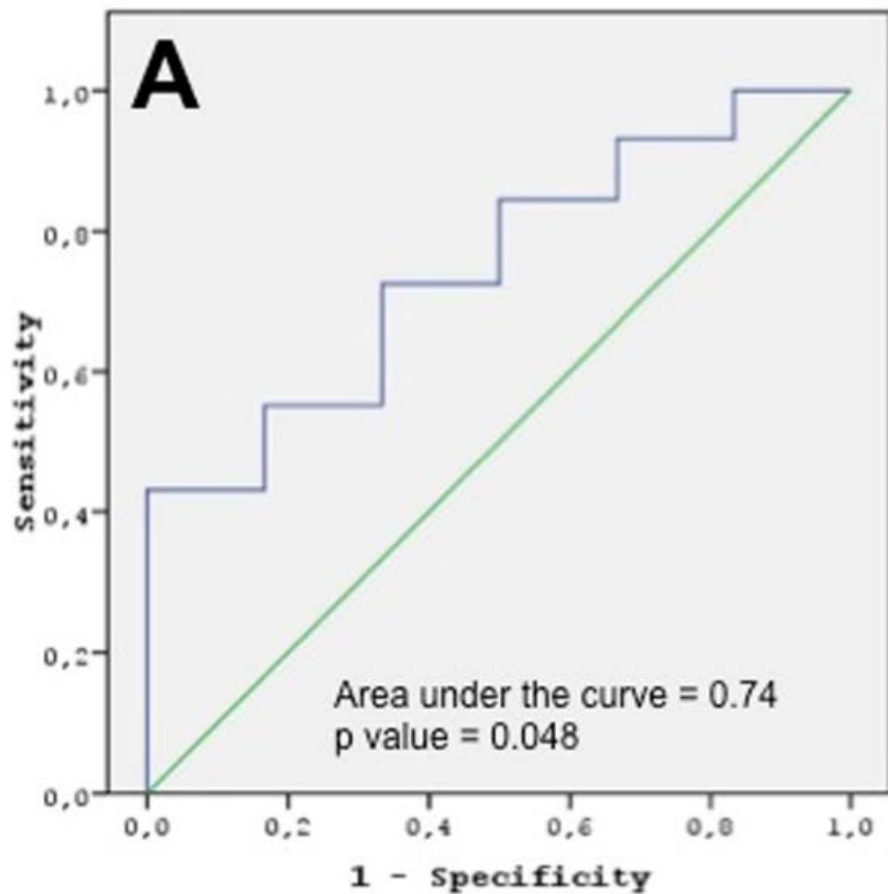
$$\text{AR Index} = \frac{\Delta P \text{ DAP} - \text{LVEDP}}{\text{SBP}} \times 100$$

Pressure Measurement



$$\text{TIAR Index} = \frac{\text{LV-Ao DPTI}}{\text{LV SPTI}} \times 100$$

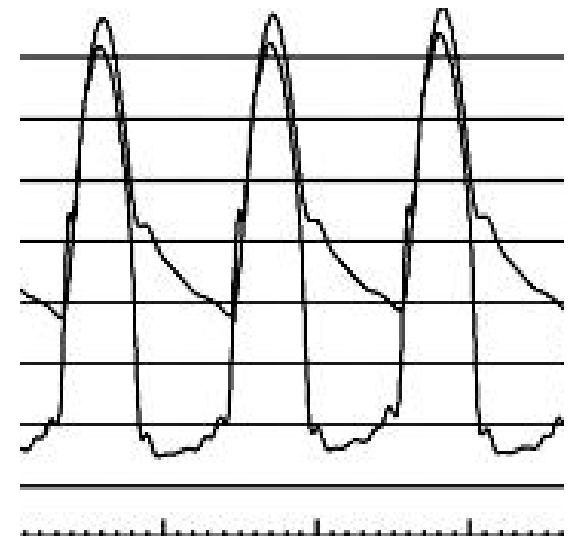
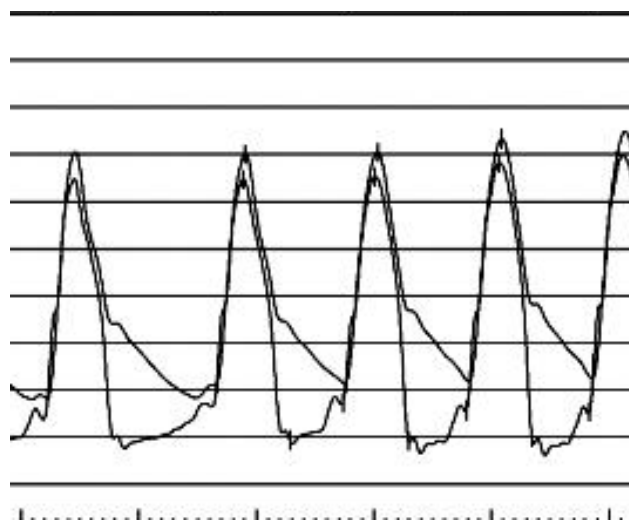
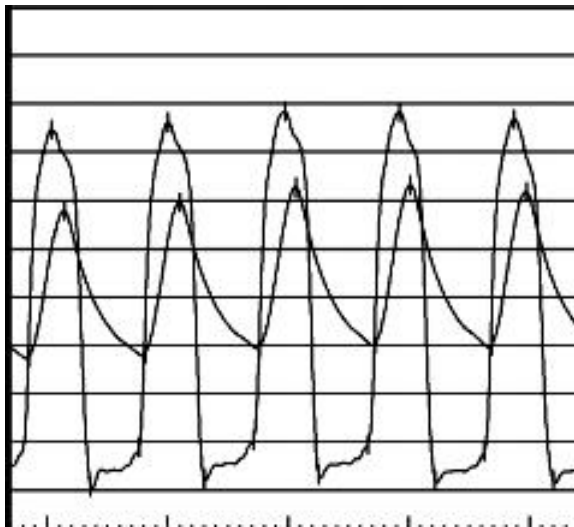
Performance



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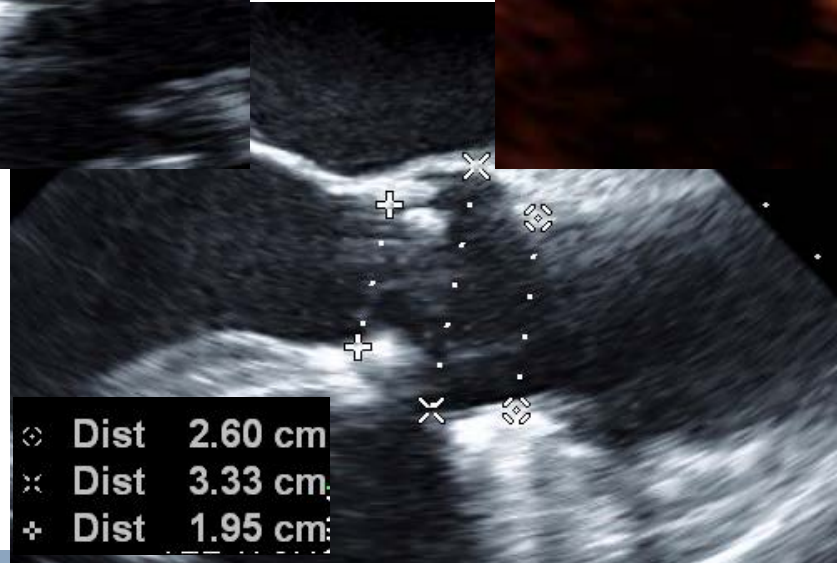
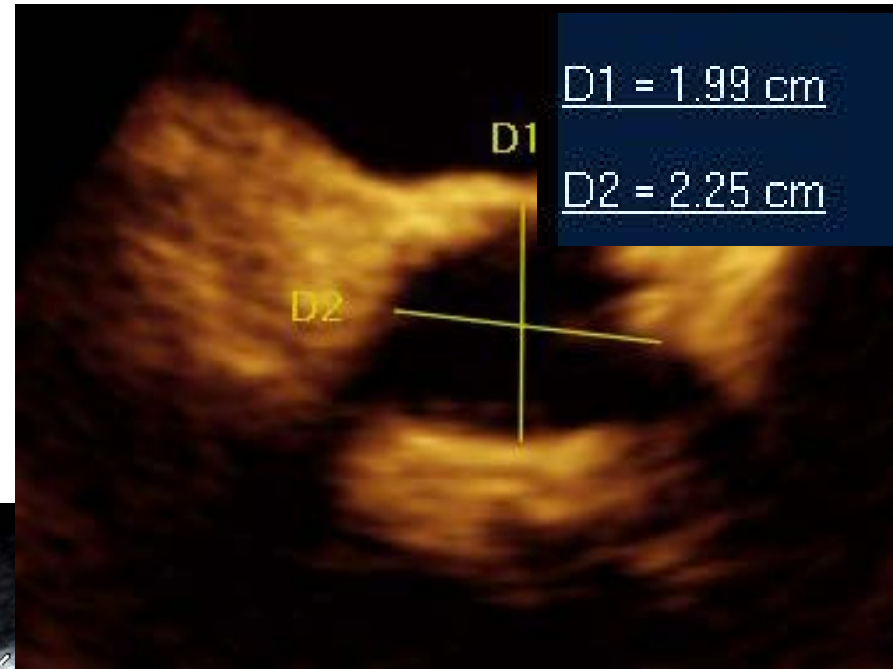
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Hemodynamics

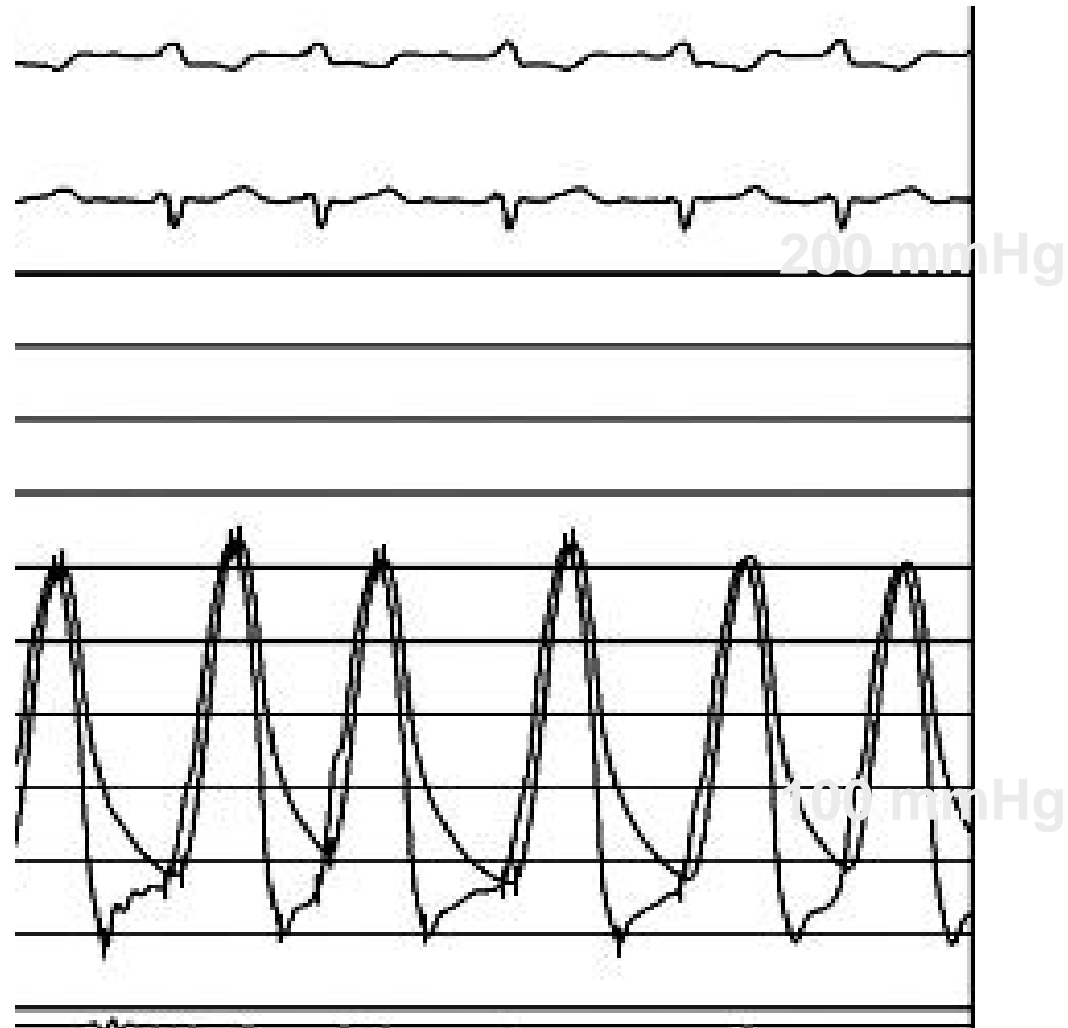


Patient Examples

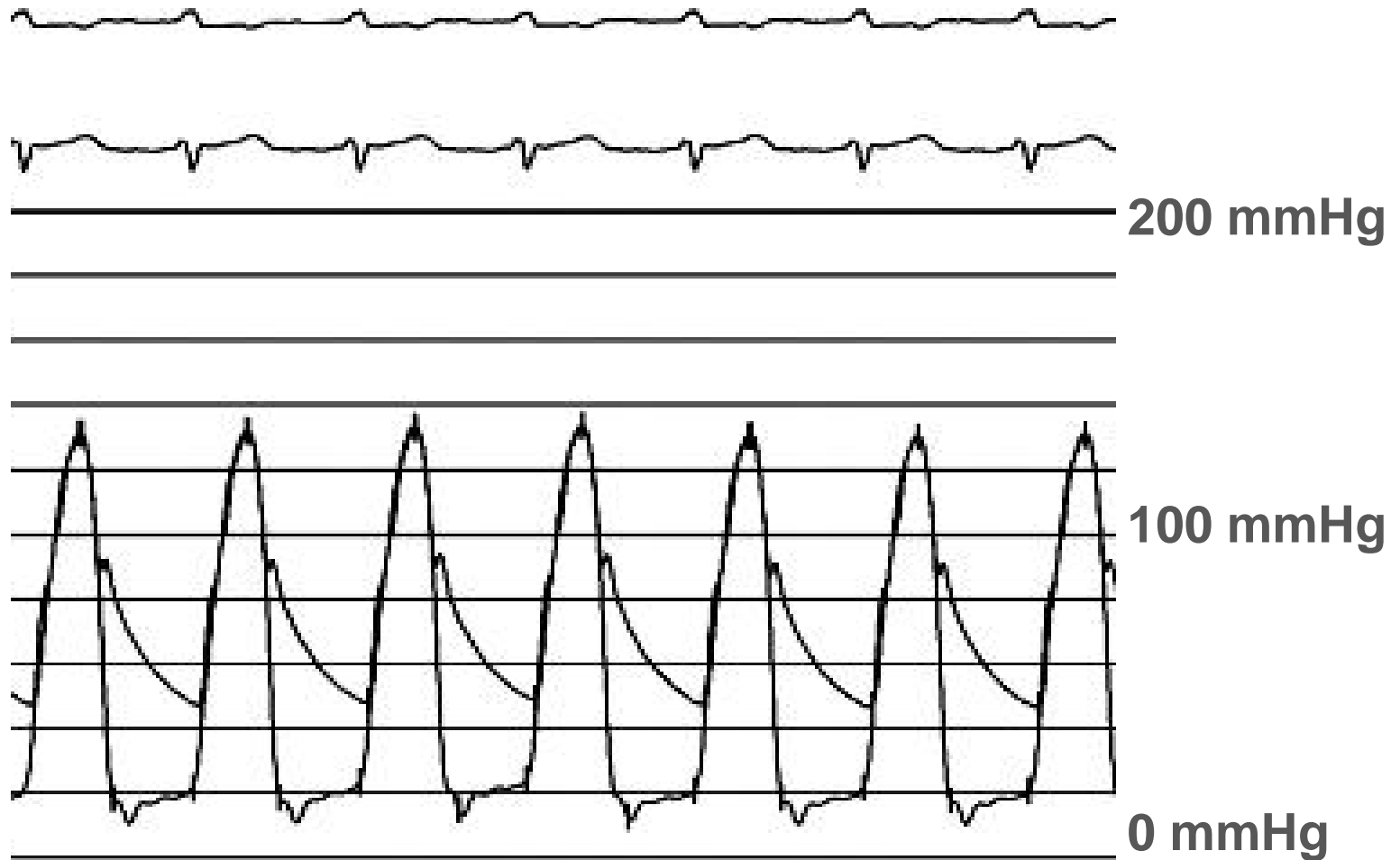
95 year old man, 5' 3" tall



Hemodynamics After Valve Deployment



Hemodynamics at Completion



Summary

- **Moderate to severe paravalvular AR is seen in about 10-15% of patients**
- **Annular size, calcification and position of the valve are the most important predictors**
- **More significant AR (?mild) is associated with worse short term and intermediate outcomes**
- **Postdilation, valve in valve or devices to close the leak can be used depending on the mechanism of AR**

Thank you for attention