

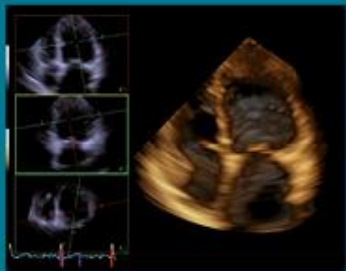
EuroValve

October 24-25, 2014

Challenging the guidelines Aortic regurgitation

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EuroValve

October 24-25, 2014

Faculty disclosure

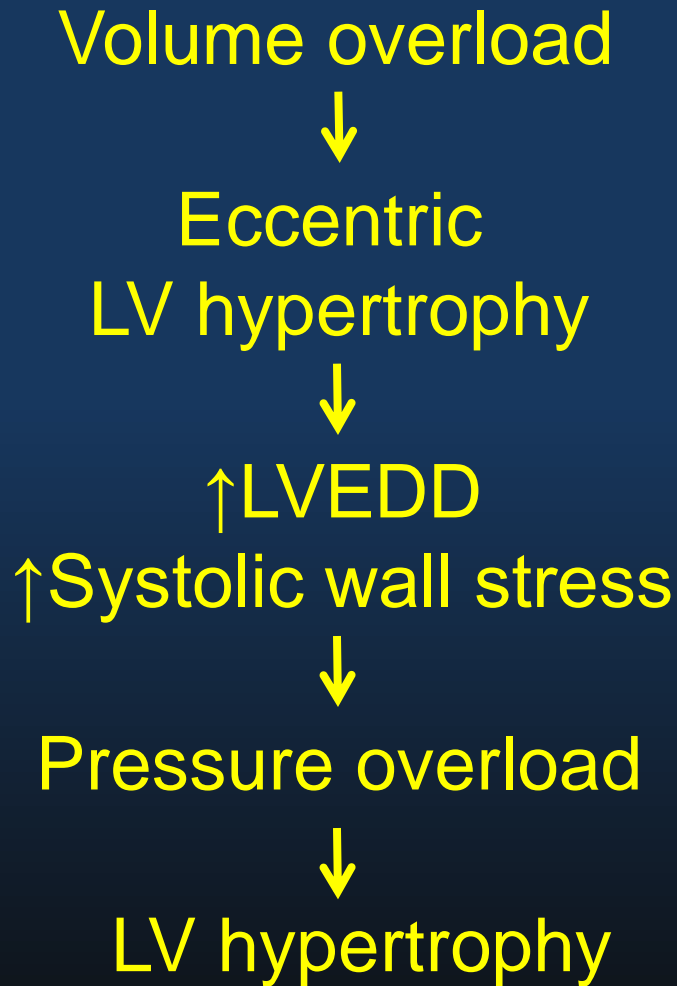
Victoria Delgado

I disclose the following financial relationships:

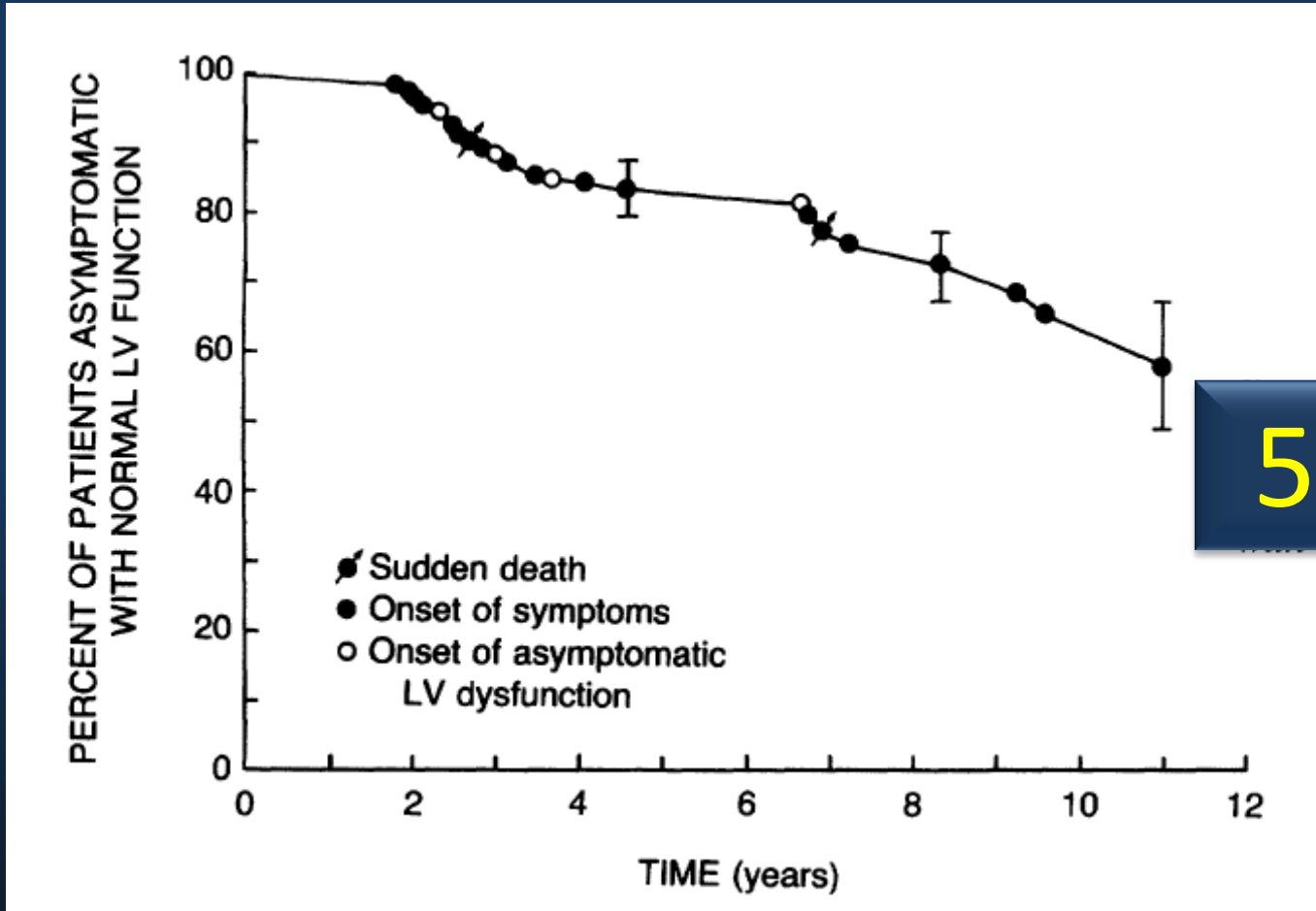
Paid speaker for Abbott Vascular



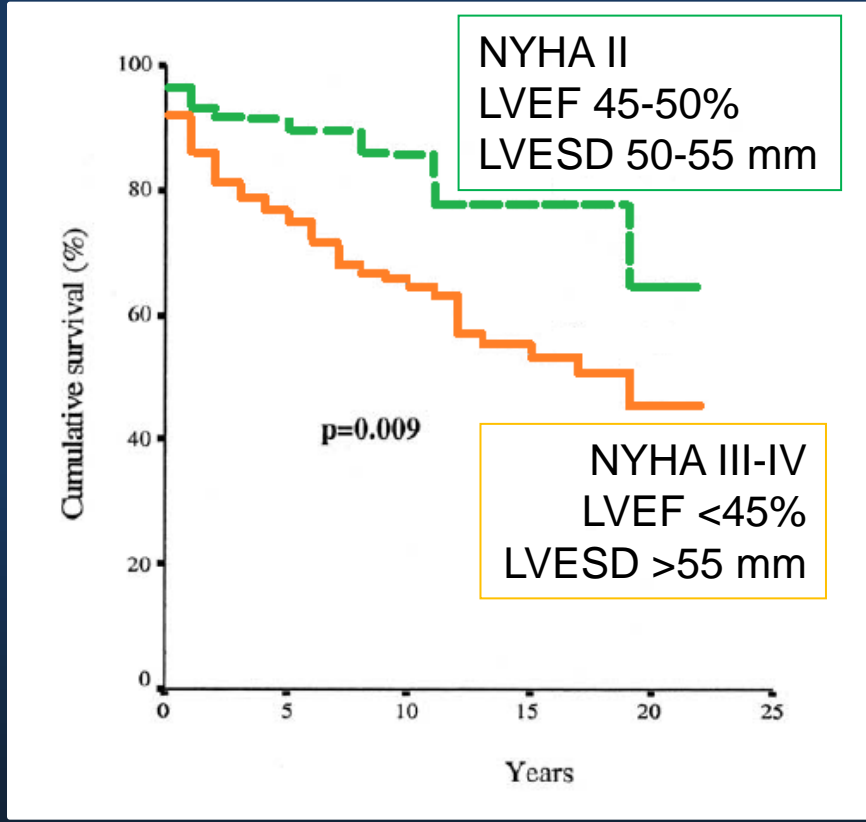
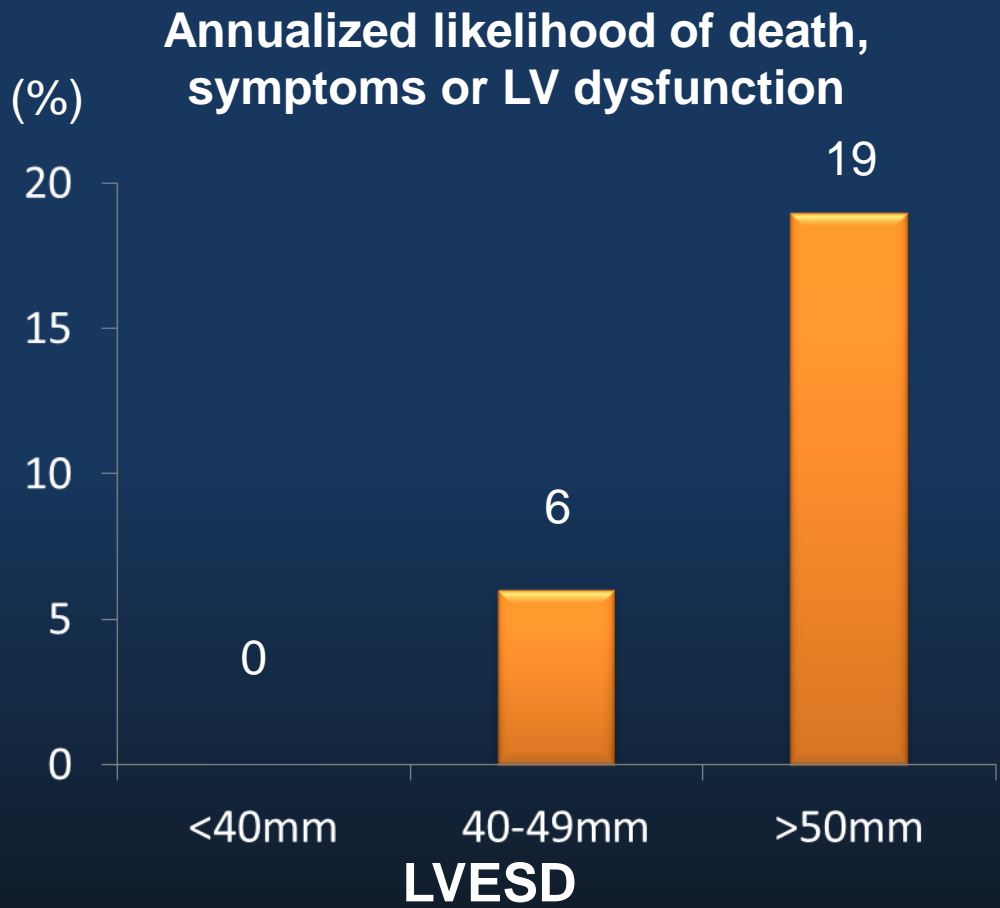
Aortic regurgitation



Aortic regurgitation: natural history

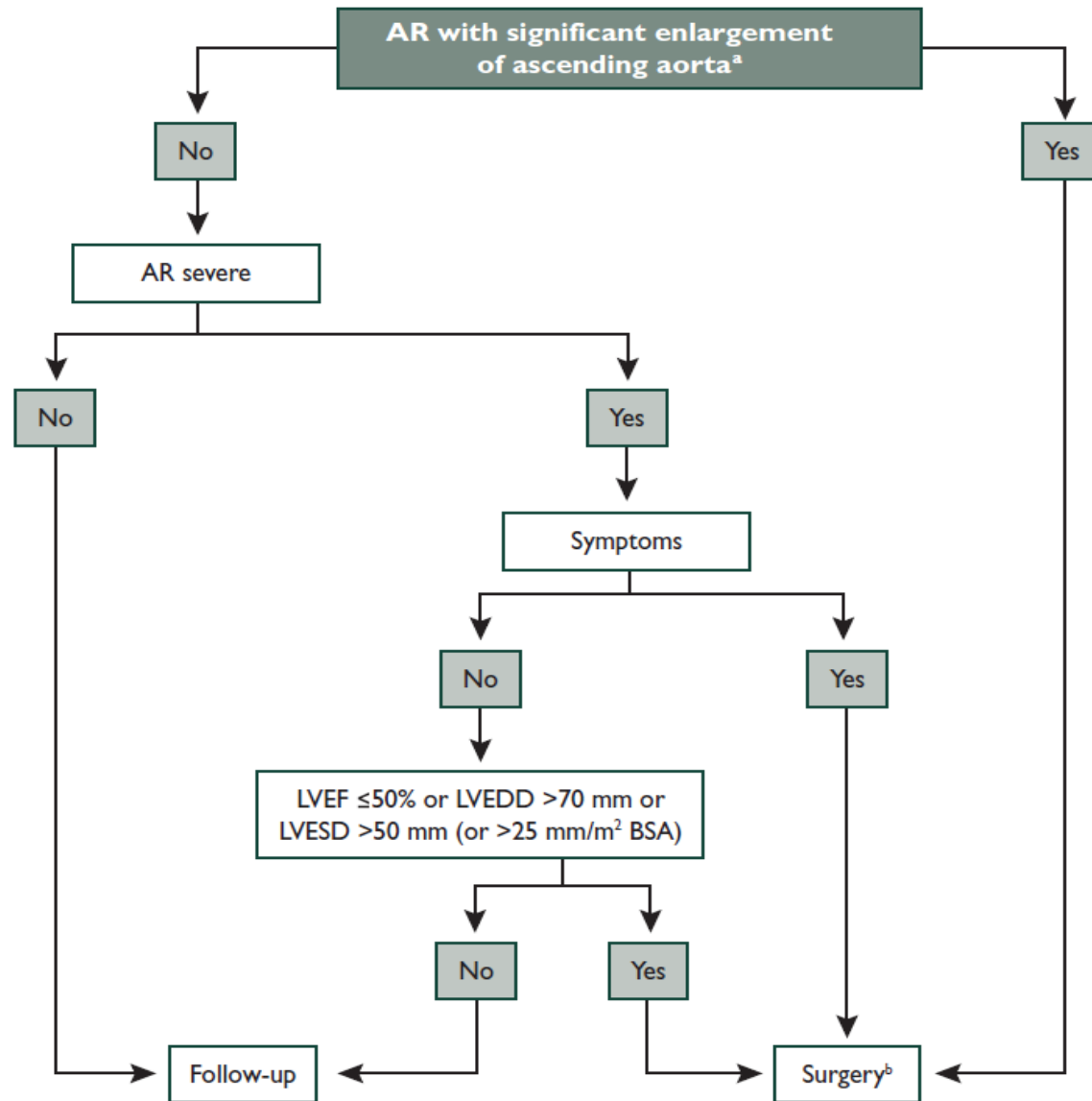


Aortic regurgitation: determinants of events



Bonow et al. Circ 1991; Tornos et al. JACC 2006

	Class ^a	Level ^b
A. Indications for surgery in severe aortic regurgitation		
Surgery is indicated in symptomatic patients.	I	B
Surgery is indicated in asymptomatic patients with resting LVEF ≤50%.	I	B
Surgery is indicated in patients undergoing CABG or surgery of ascending aorta, or on another valve.	I	C
Surgery should be considered in asymptomatic patients with resting EF >50% with severe LV dilatation: LVEDD >70 mm, or LVESD >50 mm or LVESD >25 mm/m ² BSA. ^d	IIa	C
B. Indications for surgery in aortic root disease (whatever the severity of AR)		
Surgery is indicated in patients who have aortic root disease with maximal ascending aortic diameter ^e ≥50 mm for patients with Marfan syndrome.	I	C
Surgery should be considered in patients who have aortic root disease with maximal ascending aortic diameter: ≥45 mm for patients with Marfan syndrome with risk factors ^f ≥50 mm for patients with bicuspid valve with risk factors ^g ≥55 mm for other patients	IIa	C



AR = aortic regurgitation; BSA = body surface area; LVEDD = left ventricular end-diastolic diameter; LVEF = left ventricular ejection fraction; LVESD = left ventricular end-systolic diameter.

^aSee Table 8 for definition.

^bSurgery must also be considered if significant changes in LV or aortic size occur during follow-up.

AHA/ACC Guideline

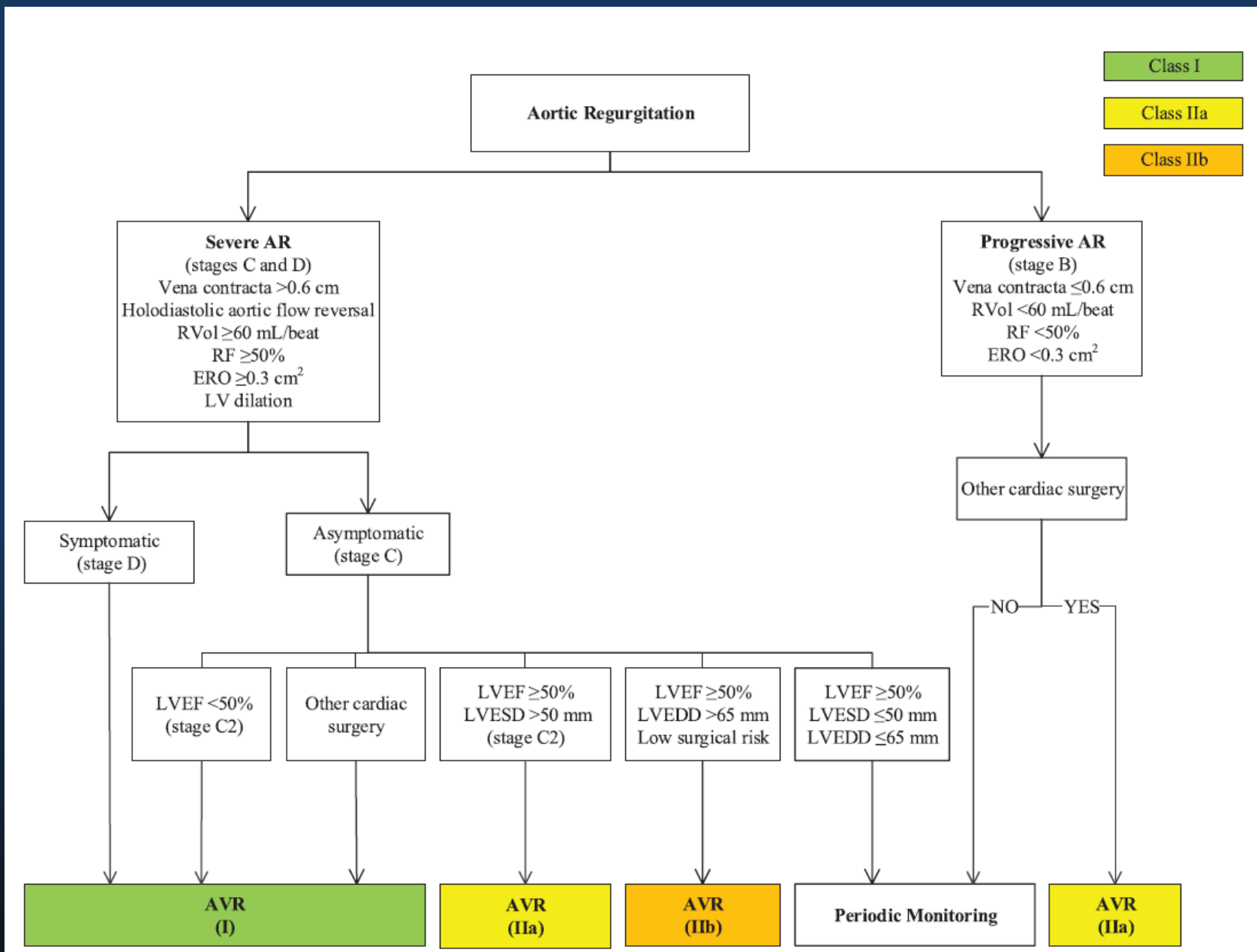
2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

C	Asymptomatic severe AR	<ul style="list-style-type: none"> • Calcific aortic valve disease • Bicuspid valve (or other congenital abnormality) • Dilated aortic sinuses or ascending aorta • Rheumatic valve changes • IE with abnormal leaflet closure or perforation 	<ul style="list-style-type: none"> • Severe AR: <ul style="list-style-type: none"> ○ Jet width $\geq 65\%$ of LVOT; ○ Vena contracta >0.6 cm; ○ Holodiastolic flow reversal in the proximal abdominal aorta ○ RVol ≥ 60 mL/beat; ○ RF $\geq 50\%$; ○ ERO ≥ 0.3 cm²; ○ Angiography grade 3+ to 4+; ○ In addition, diagnosis of chronic severe AR requires evidence of LV dilation 	<p>C1: Normal LVEF ($\geq 50\%$) and mild-to-moderate LV dilation (LVESD ≤ 50 mm)</p> <p>C2: Abnormal LV systolic function with depressed LVEF ($<50\%$) or severe LV dilatation (LVESD >50 mm or indexed LVESD >25 mm/m²)</p>	<ul style="list-style-type: none"> • None; exercise testing is reasonable to confirm symptom status
D	Symptomatic severe AR	<ul style="list-style-type: none"> • Calcific valve disease • Bicuspid valve (or other congenital abnormality) • Dilated aortic sinuses or ascending aorta • Rheumatic valve changes • Previous IE with abnormal leaflet closure or perforation 	<ul style="list-style-type: none"> • Severe AR: <ul style="list-style-type: none"> ○ Doppler jet width $\geq 65\%$ of LVOT; ○ Vena contracta >0.6 cm, ○ Holodiastolic flow reversal in the proximal abdominal aorta, ○ RVol ≥ 60 mL/beat; ○ RF $\geq 50\%$; ○ ERO ≥ 0.3 cm²; ○ Angiography grade 3+ to 4+; ○ In addition, diagnosis of chronic severe AR requires evidence of LV dilation 	<ul style="list-style-type: none"> • Symptomatic severe AR may occur with normal systolic function (LVEF $\geq 50\%$), mild-to-moderate LV dysfunction (LVEF 40%–50%), or severe LV dysfunction (LVEF $<40\%$); • Moderate-to-severe LV dilation is present. 	<ul style="list-style-type: none"> • Exertional dyspnea or angina or more severe HF symptoms

AHA/ACC Guideline

2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

Recommendations	COR	LOE
AVR is indicated for symptomatic patients with severe AR regardless of LV systolic function (stage D)	I	B
AVR is indicated for asymptomatic patients with chronic severe AR and LV systolic dysfunction (LVEF <50%) (stage C2)	I	B
AVR is indicated for patients with severe AR (stage C or D) while undergoing cardiac surgery for other indications	I	C
AVR is reasonable for asymptomatic patients with severe AR with normal LV systolic function (LVEF ≥50%) but with severe LV dilation (LVESD >50 mm, stage C2)	IIa	B
AVR is reasonable in patients with moderate AR (stage B) who are undergoing other cardiac surgery	IIa	C
AVR may be considered for asymptomatic patients with severe AR and normal LV systolic function (LVEF ≥50%, stage C1) but with progressive severe LV dilation (LVEDD >65 mm) if surgical risk is low*	IIb	C



Aortic regurgitation
quantification

LV function
assessment

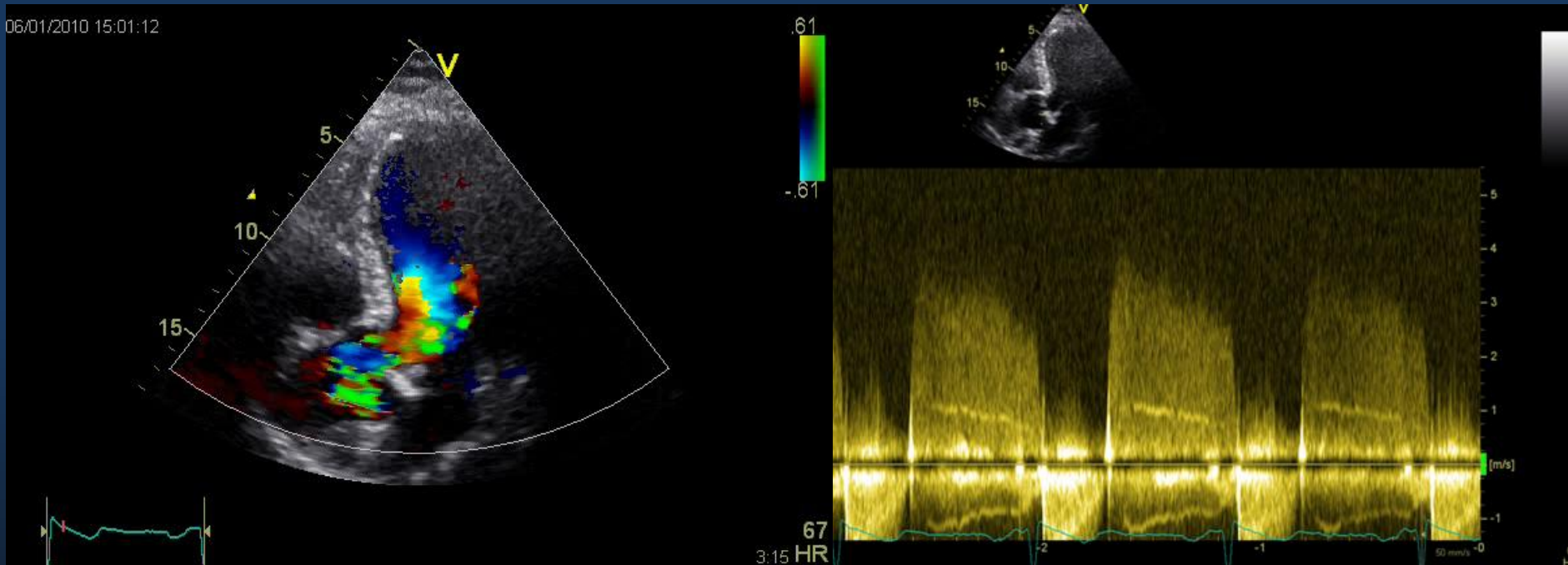
Jet deceleration rate – CW
PHT < 200 ms

LVEF (?)

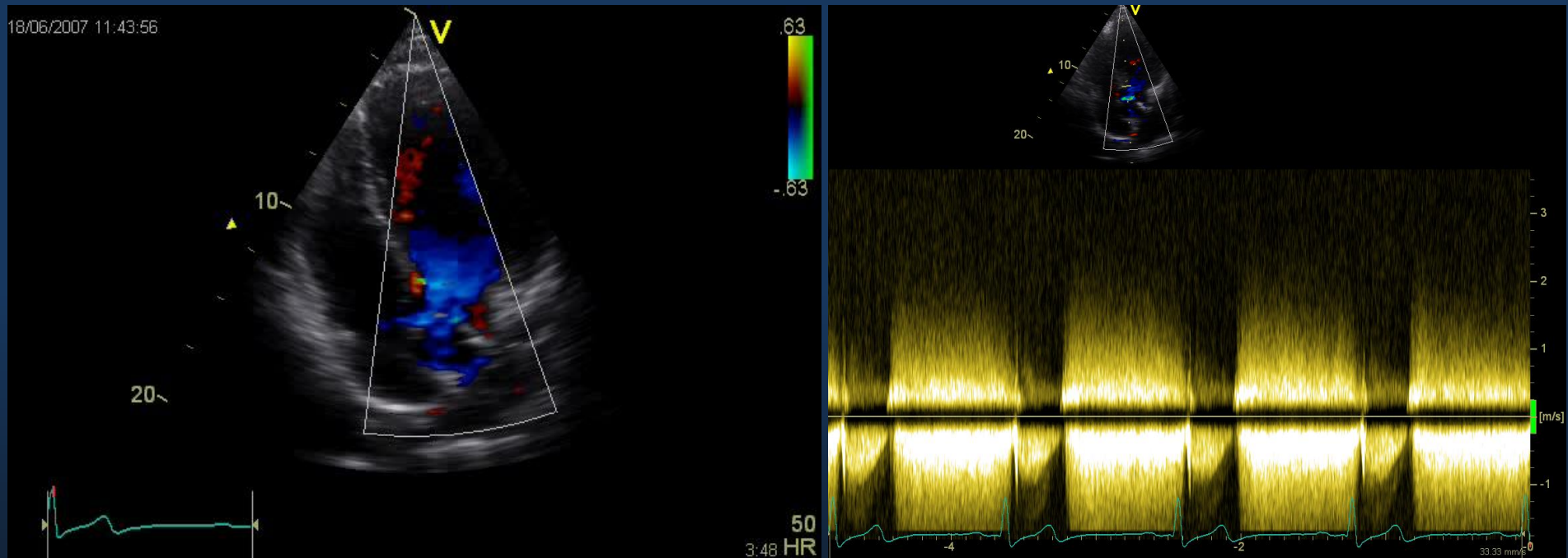
Vena contracta ≥ 0.6 cm
EROA ≥ 0.3 cm²
RVol ≥ 60 ml/beat

Myocardial contractility
 Δ LVEF- Δ ESS index
Myocardial strain/SR

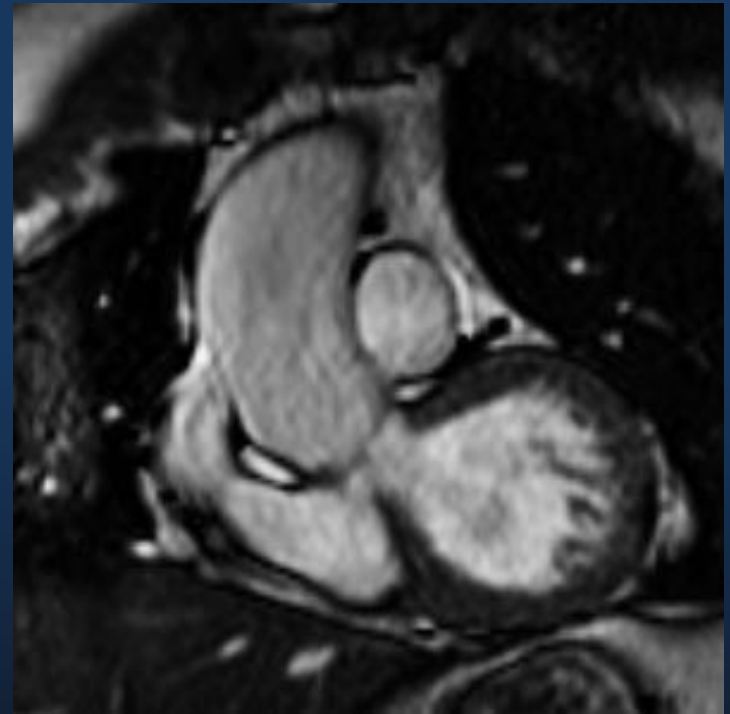
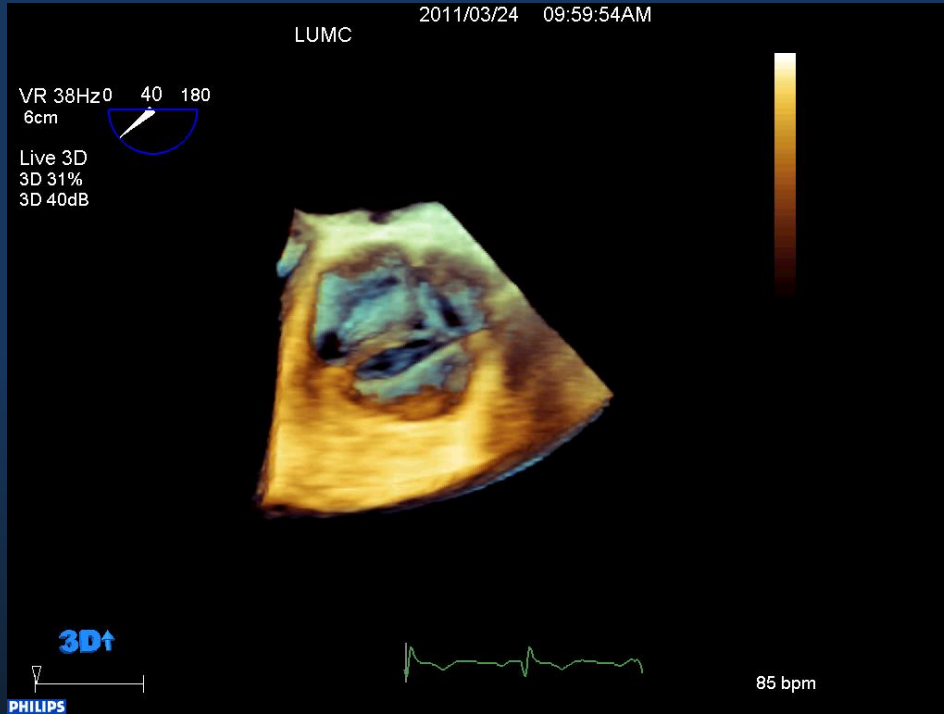
AR quantification



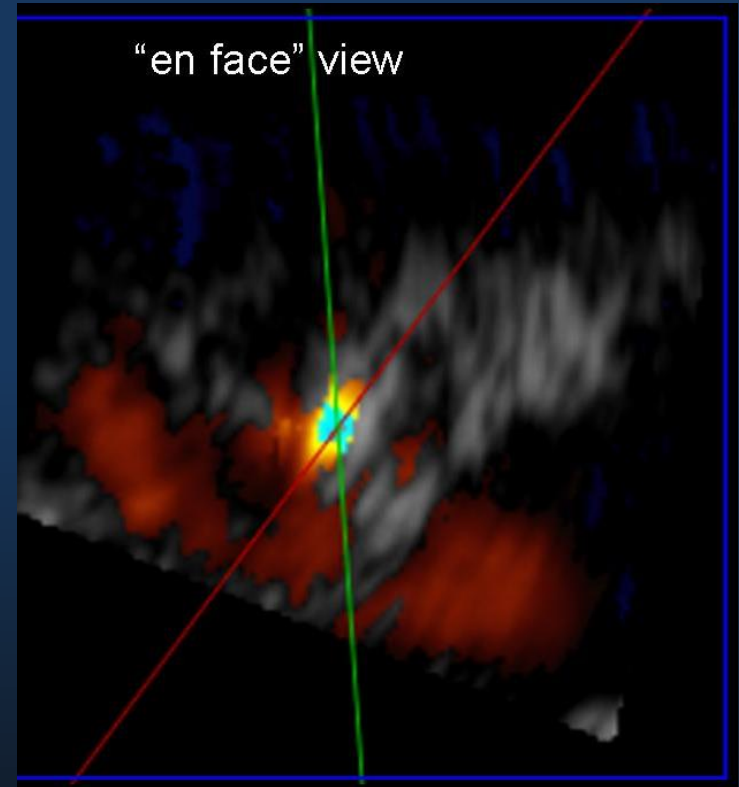
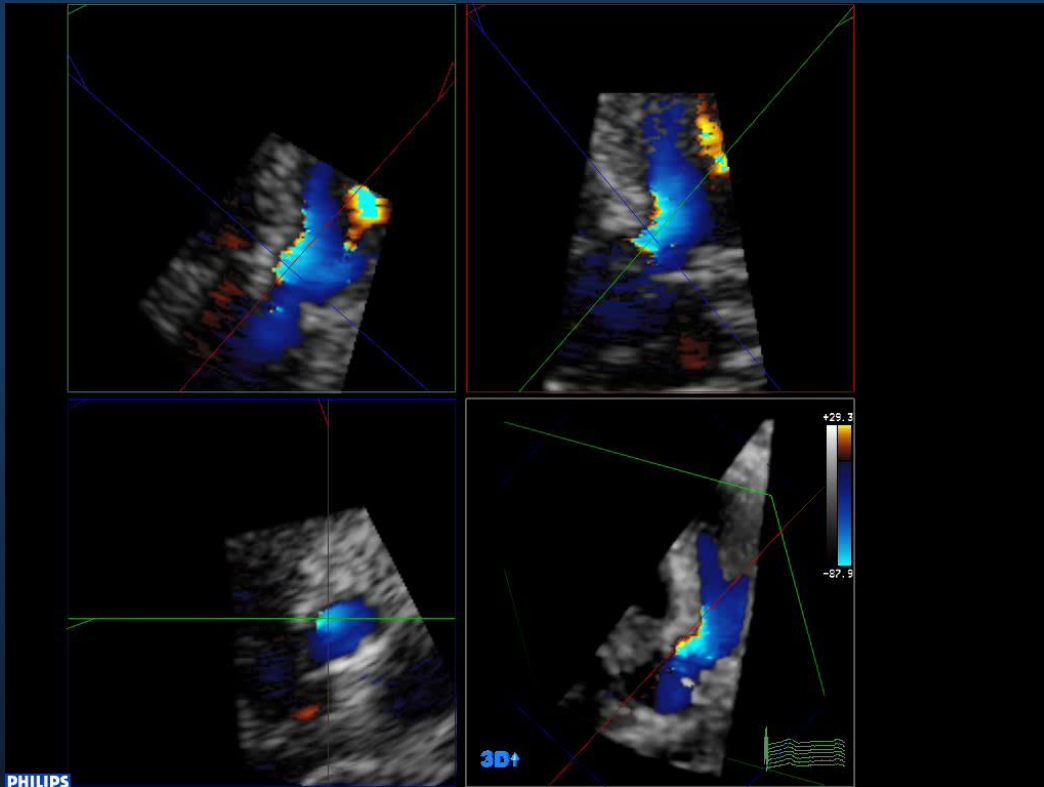
AR quantification



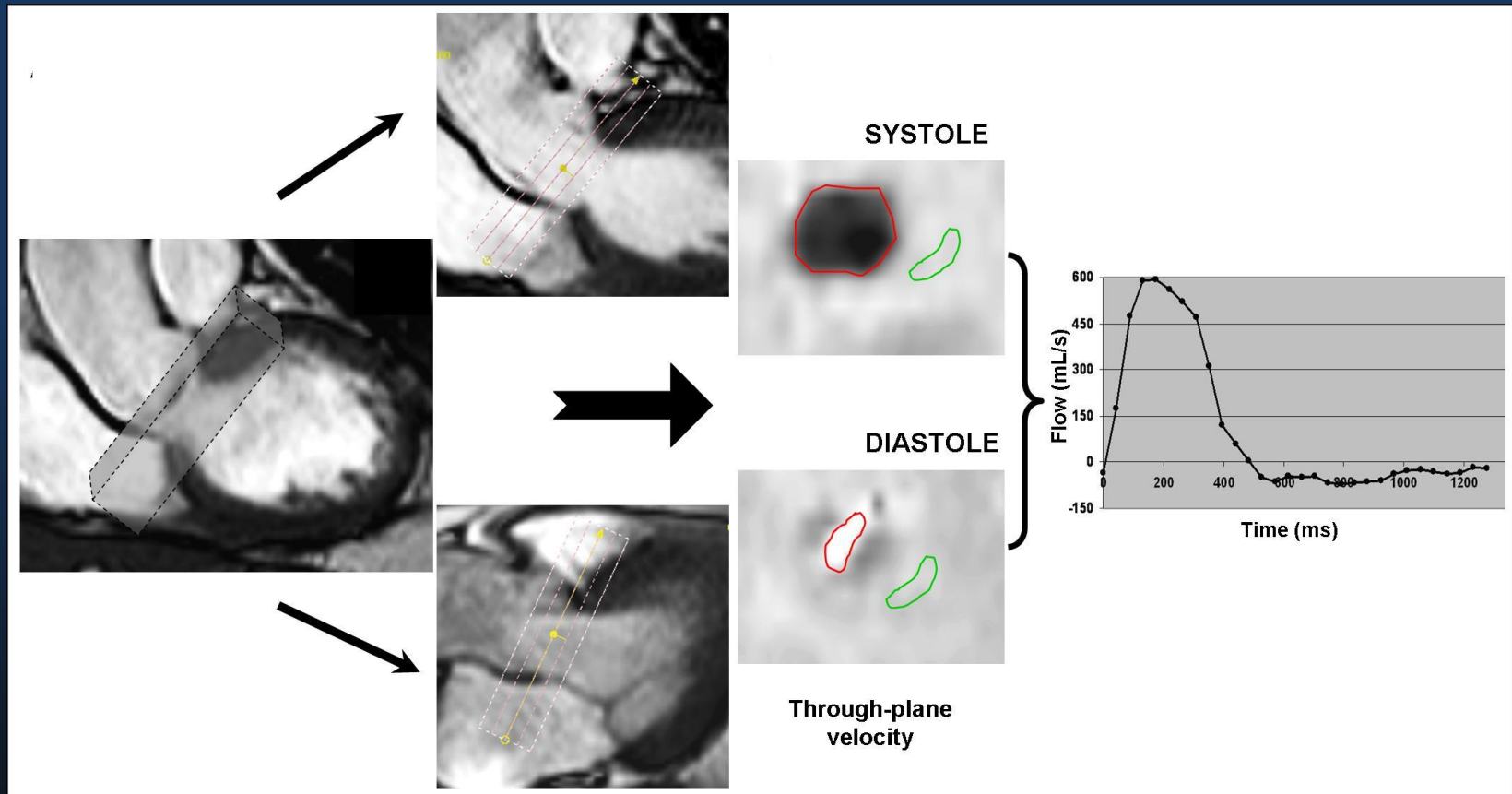
3-dimensional imaging



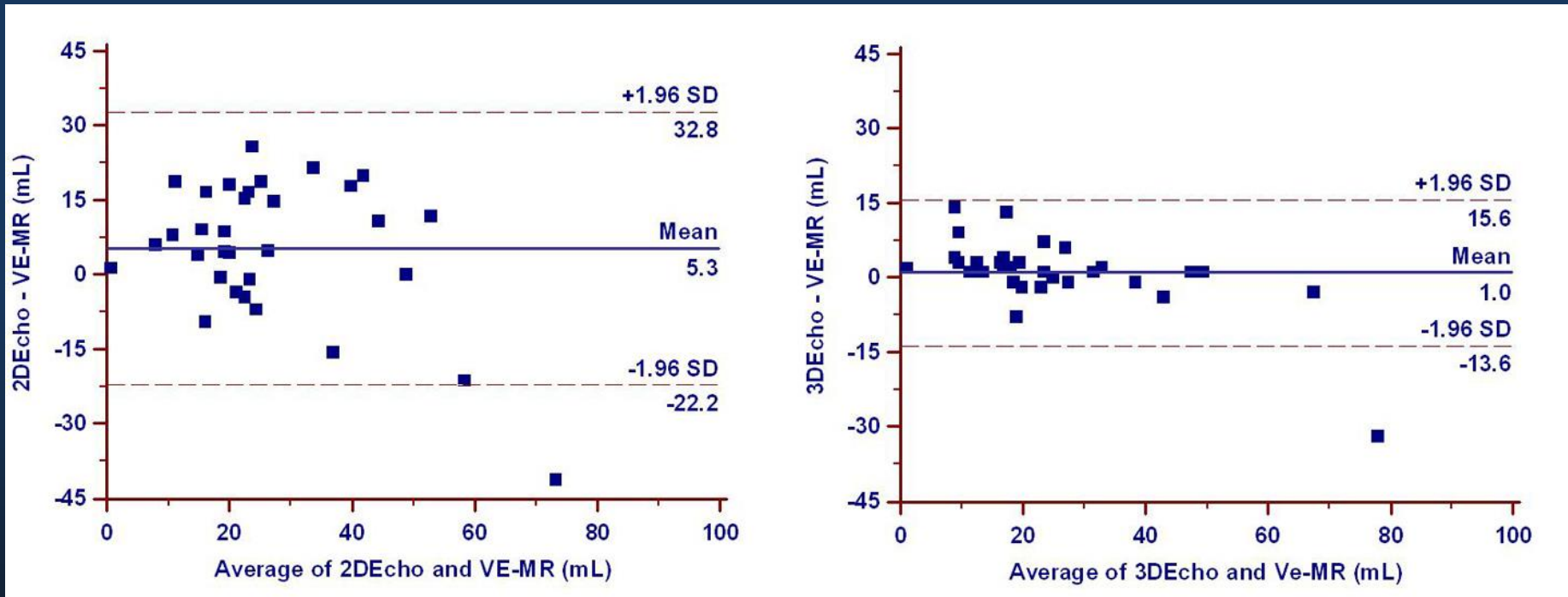
RT3DE vs. 3D velocity encoded MRI



RT3DE vs. 3D velocity encoded MRI

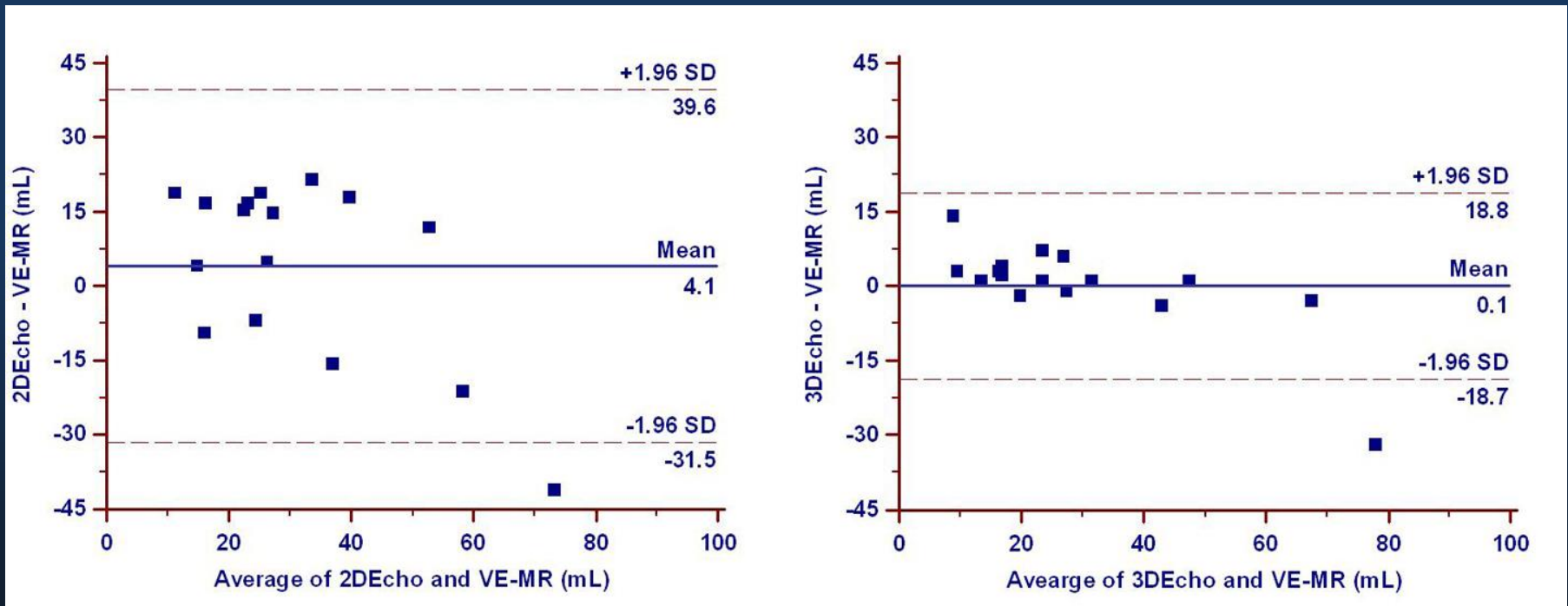


RT3DE vs. 3D velocity encoded MRI

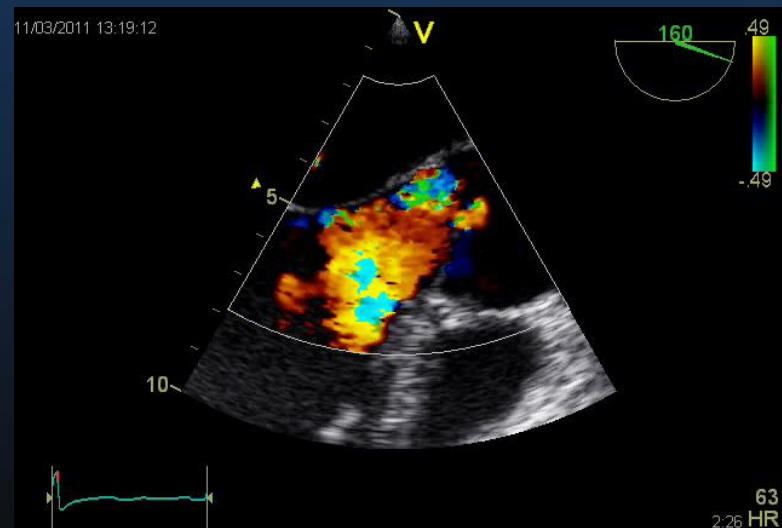
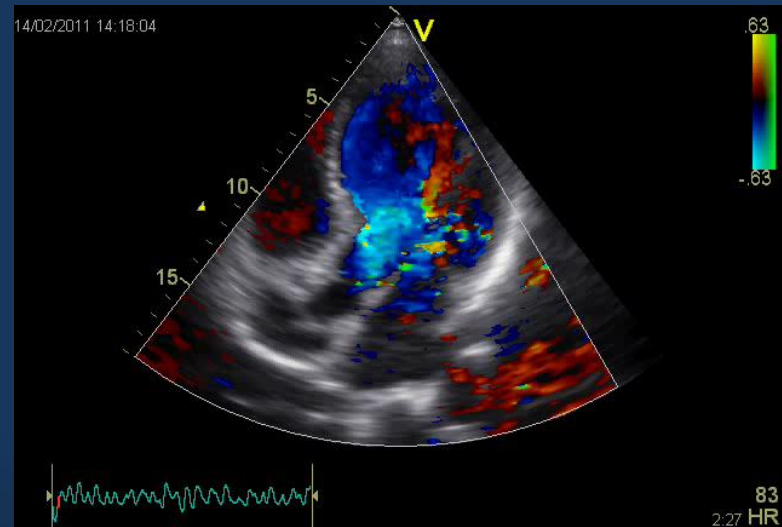
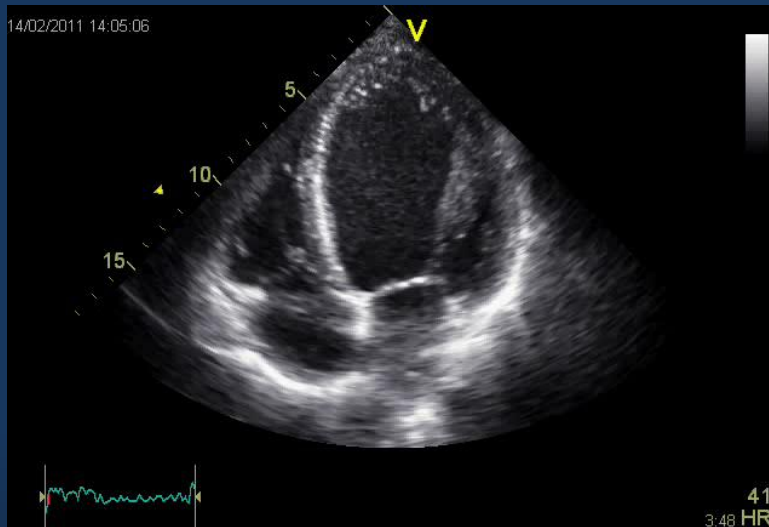


RT3DE vs. 3D velocity encoded MRI

Eccentric regurgitant jets

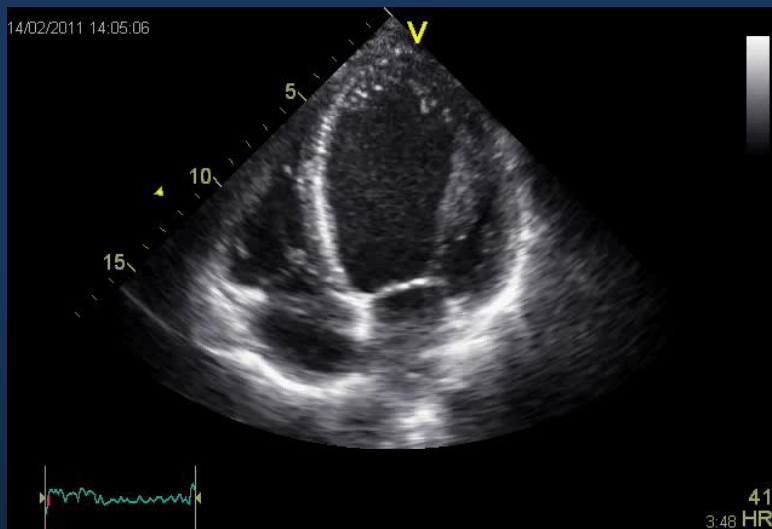


LV function assessment

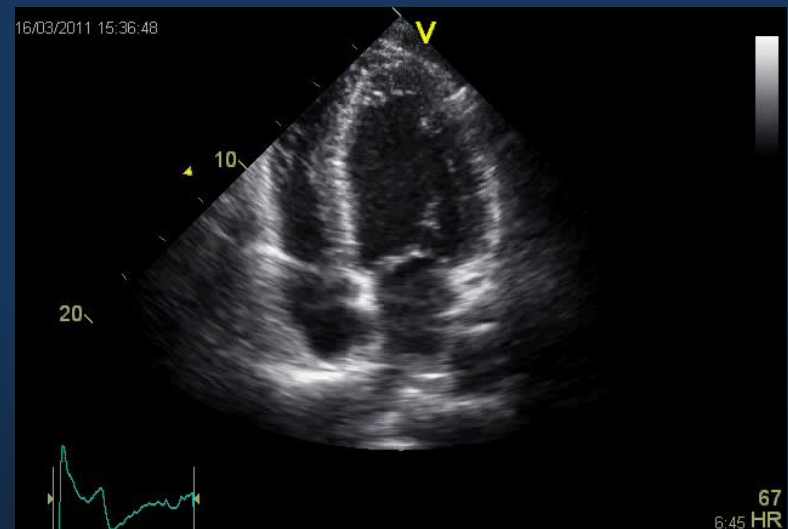


61 year old patient
No CAD
Dyspnea NYHA II
LVEF 57%
LVESD 42 mm
LVEDD 66 mm

LV function assessment



Pre-op



Follow-up

How to predict LV dysfunction after aortic valve replacement?

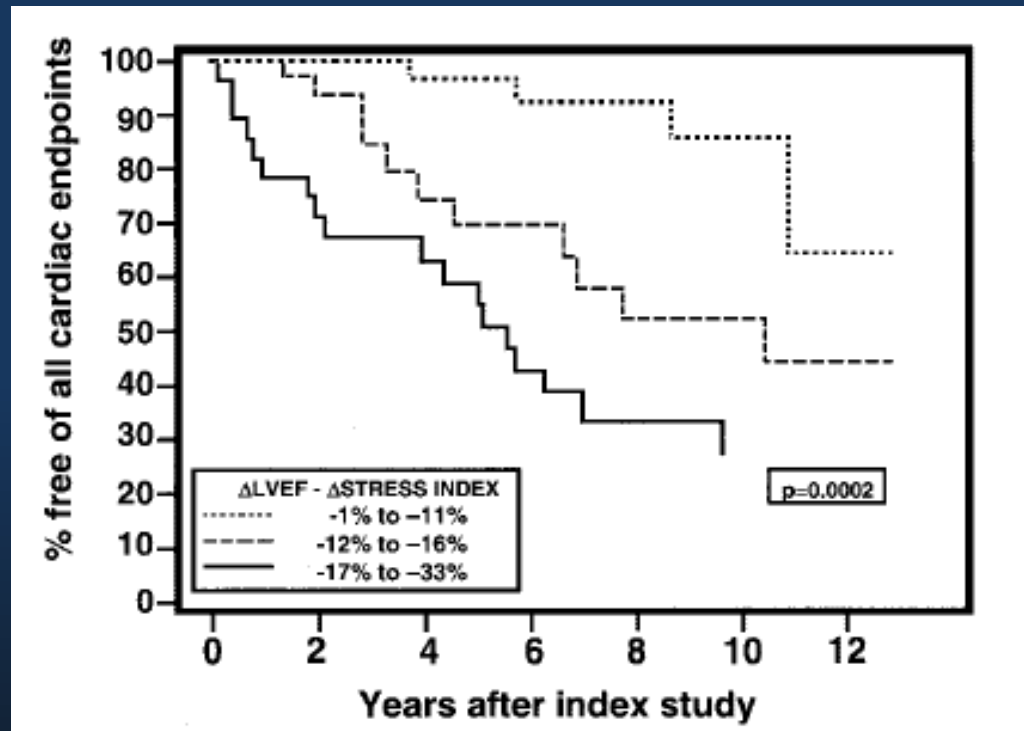
Indices of contractility

N = 104

Change in LVEF
corrected by change in
end-systolic wall stress
from rest to exercise


1st terciale \rightarrow 1.8%/y

3rd terciale \rightarrow 13.3%/y



Strain Rate

- **Strain** = amount of myocardial deformation

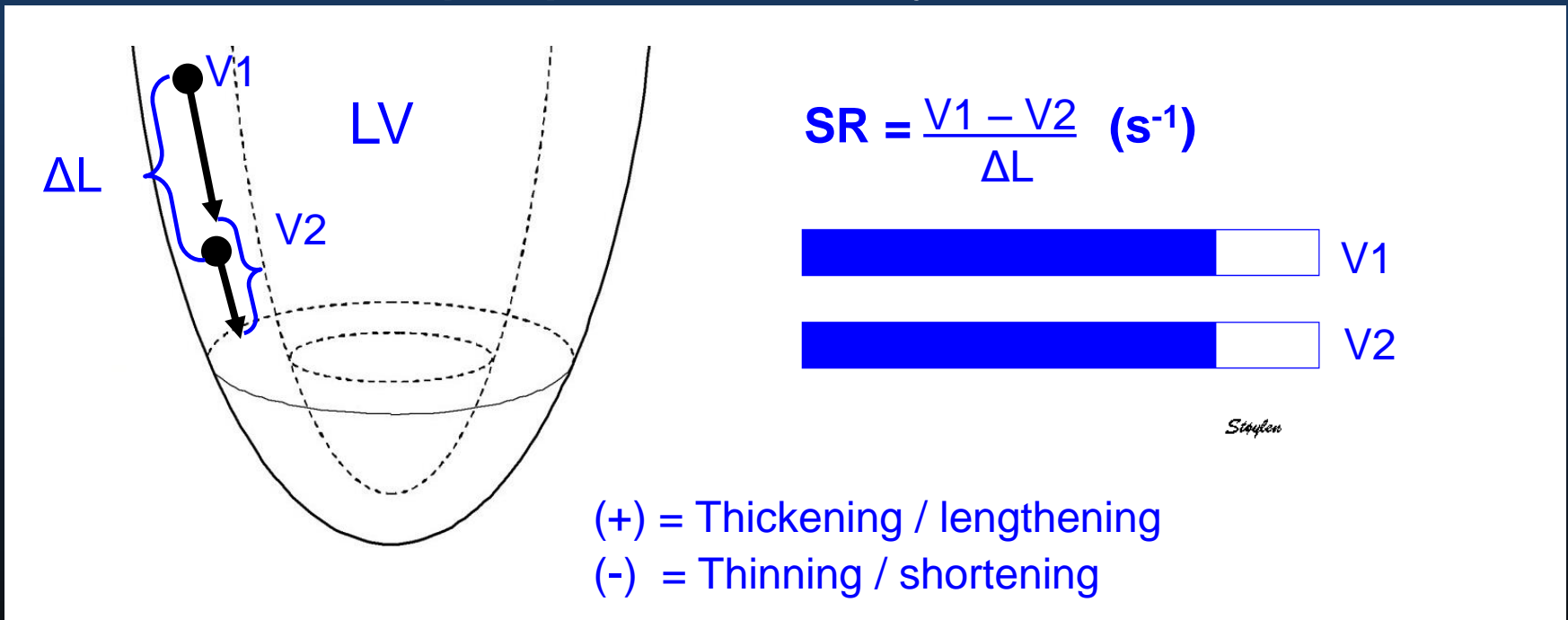


A diagram showing a horizontal bar of length L_0 (blue) and a shorter bar of length L (white). The difference in length is labeled ΔL .

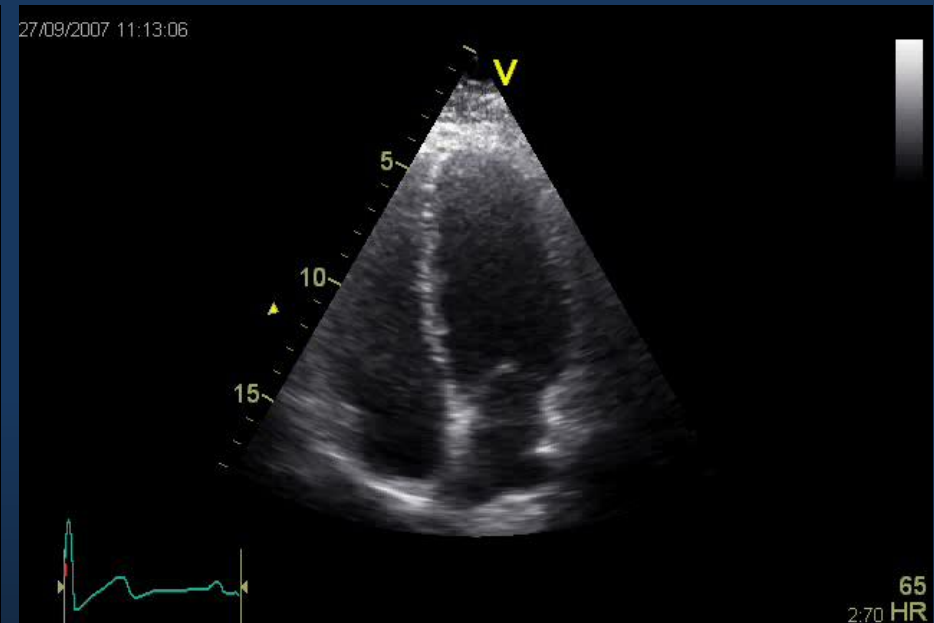
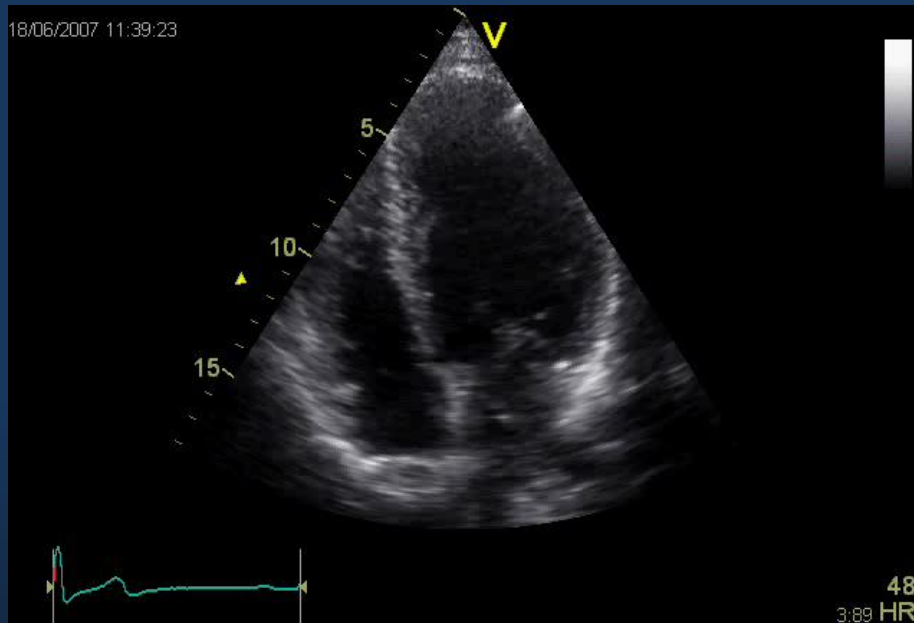
$$\epsilon = \frac{L - L_0}{L_0} = \frac{\Delta L}{L_0}$$

Steyler

- **Strain Rate (SR)** = rate of myocardial deformation

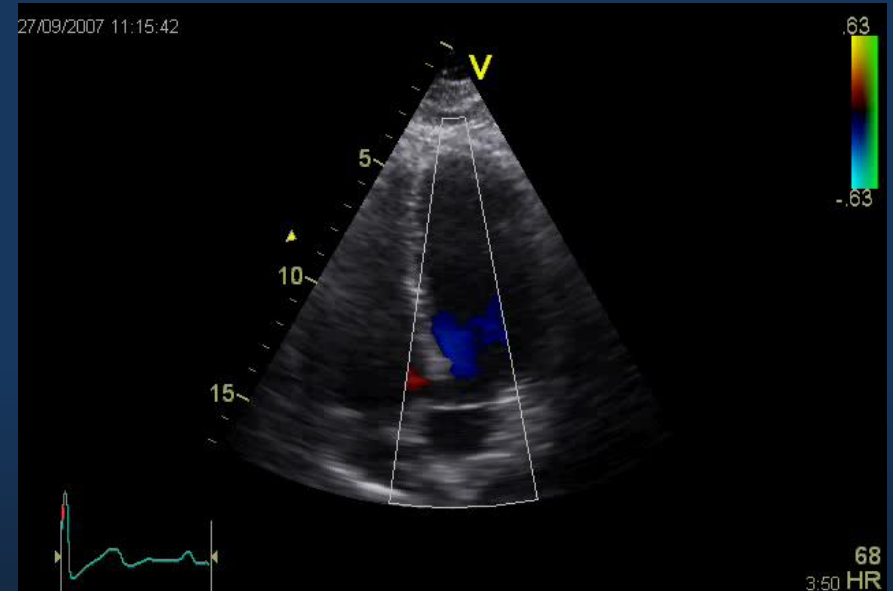
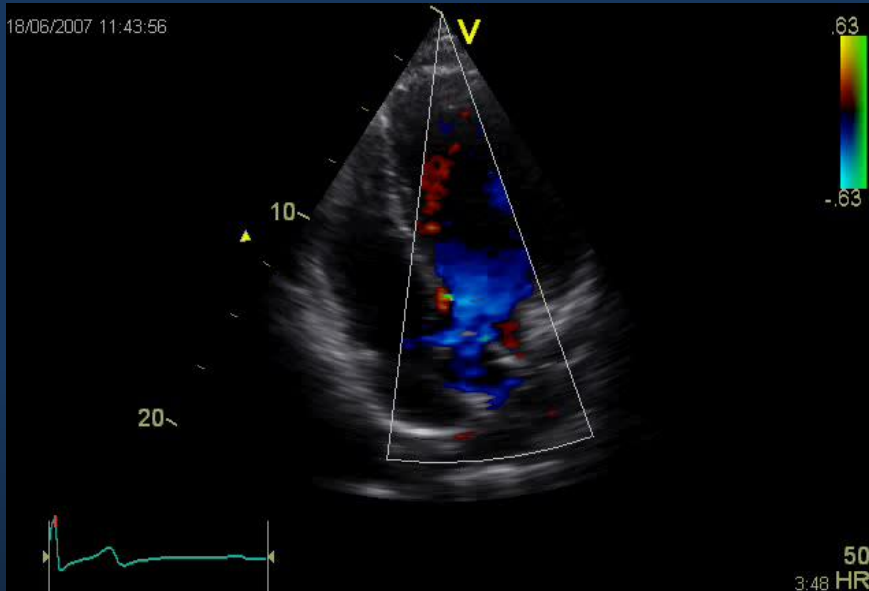


Comparable LVEF?



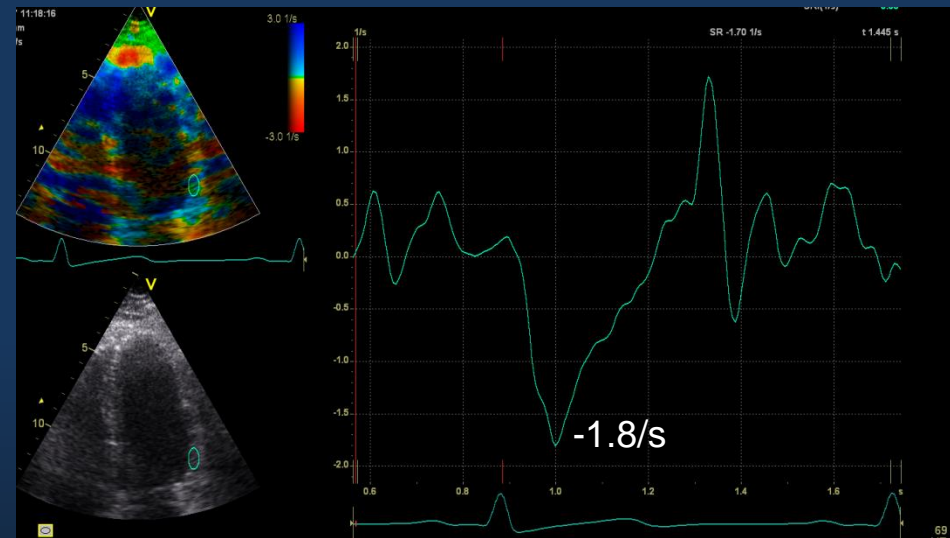
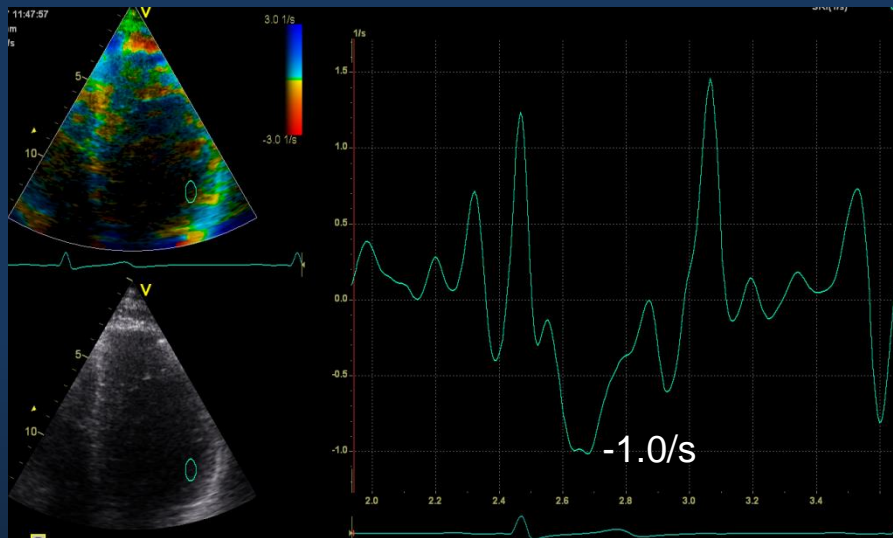
Comparable LV mechanics?

Comparable LVEF?

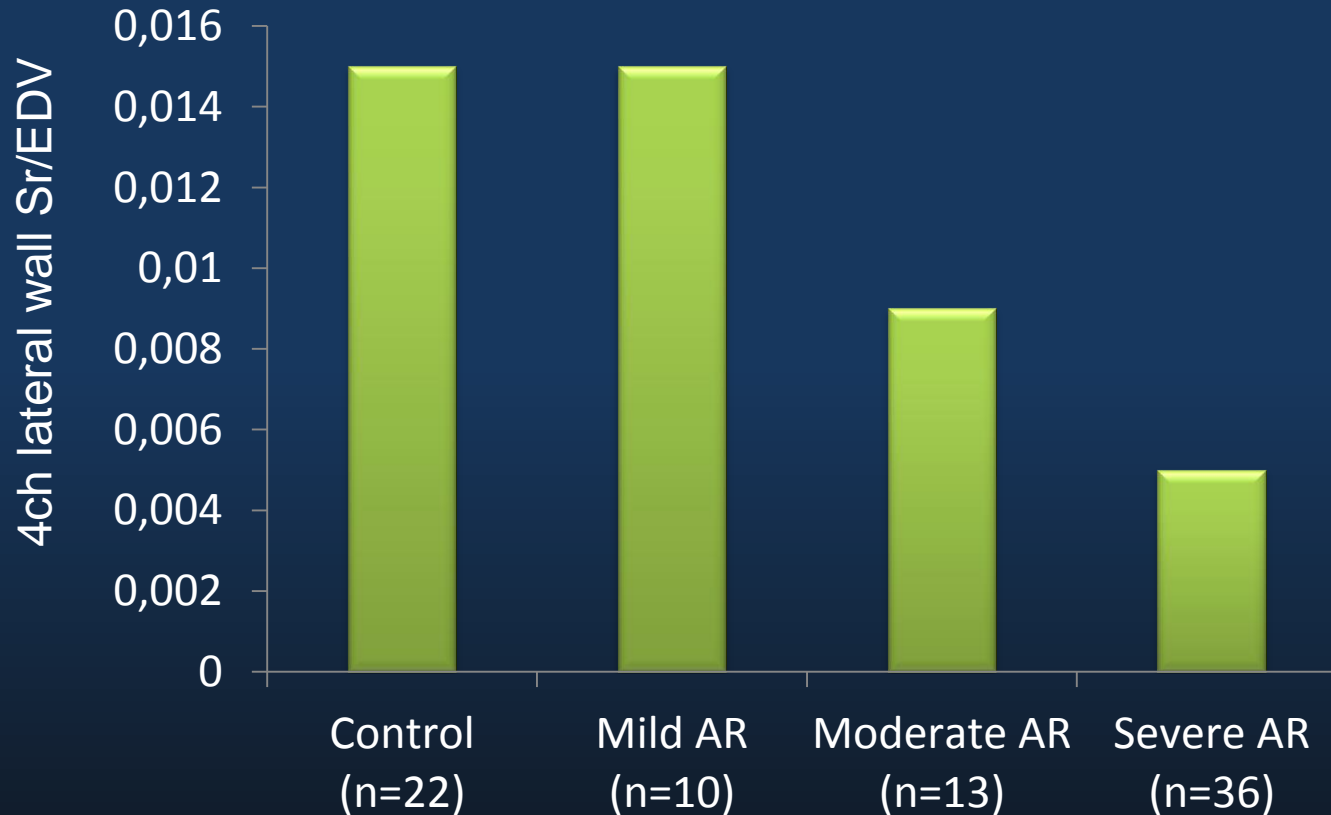


Comparable LV mechanics?

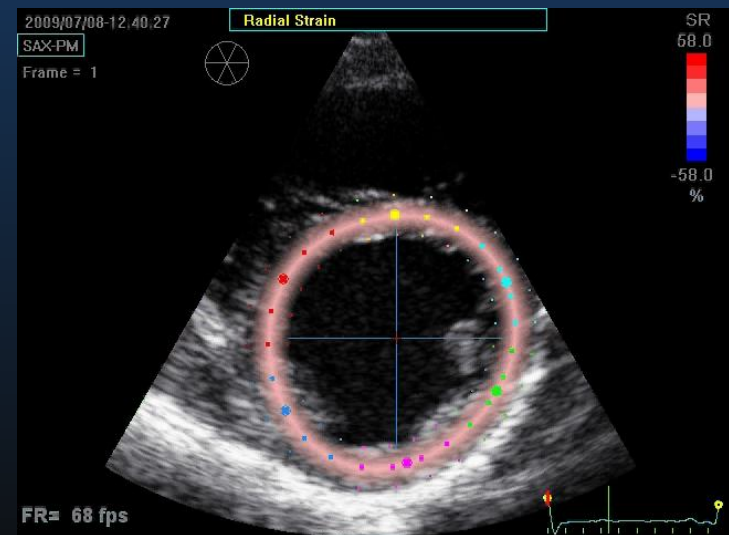
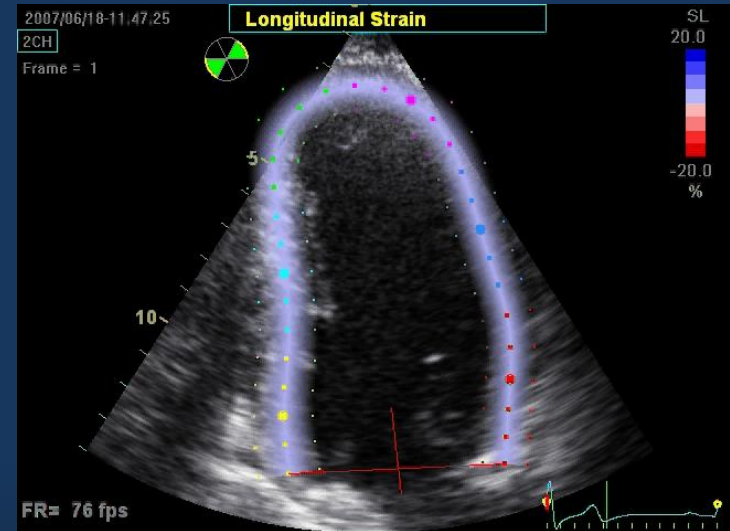
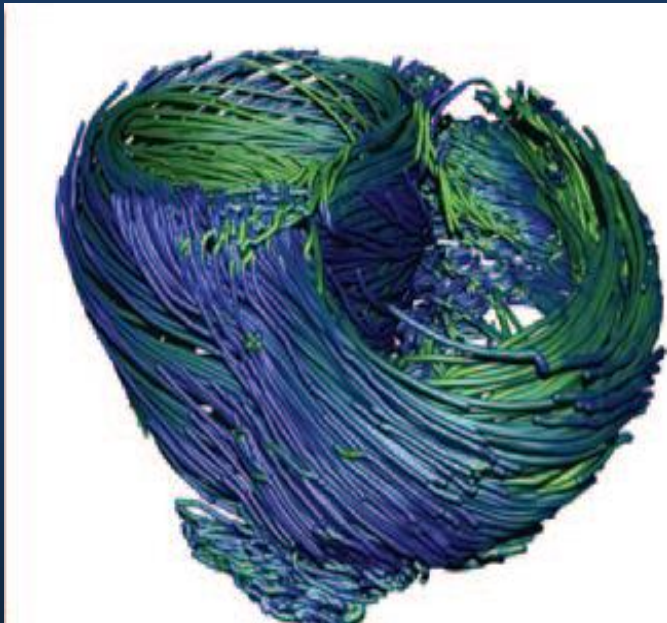
Tissue-Doppler derived strain Rate



Tissue-Doppler derived strain Rate

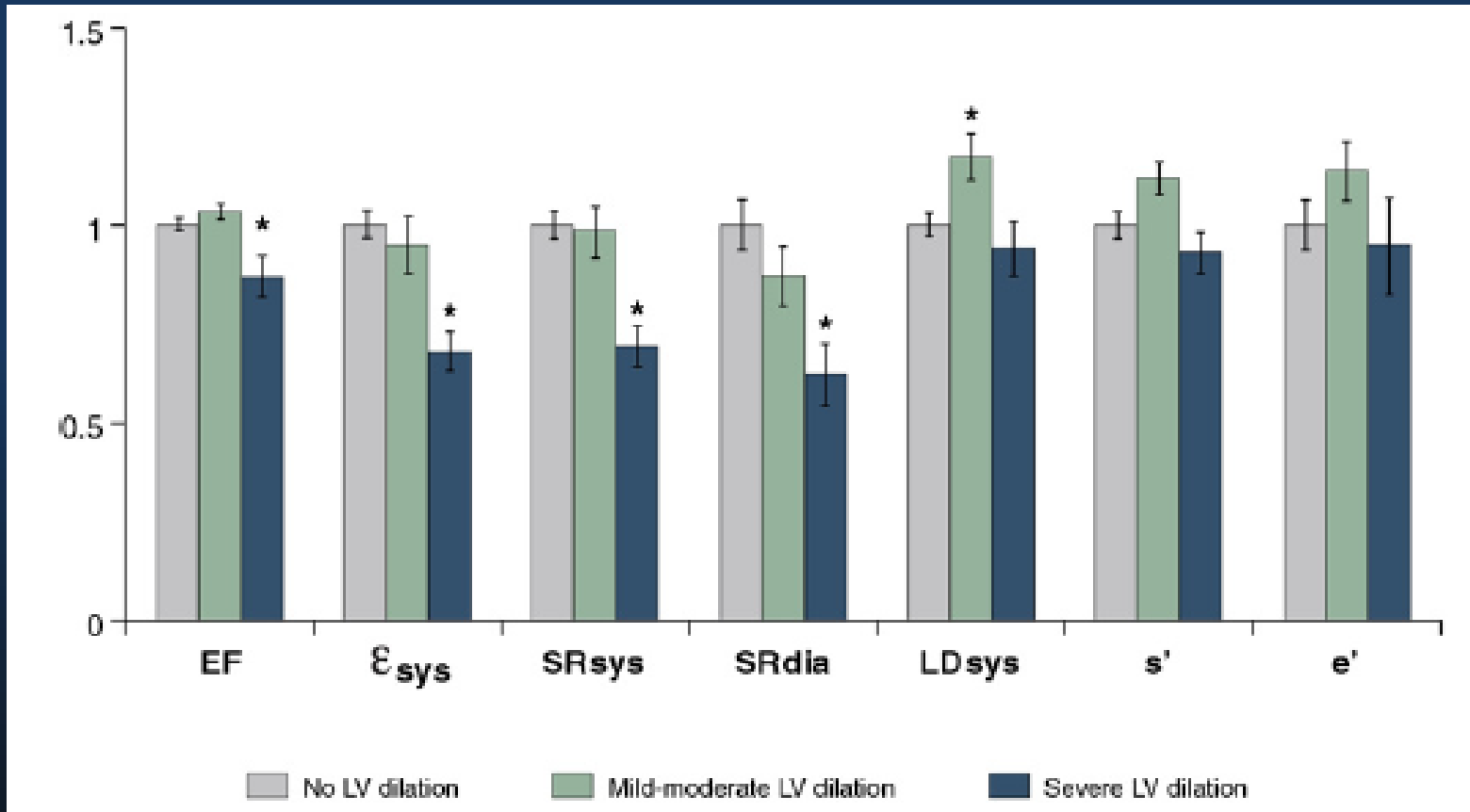


Speckle tracking imaging



Speckle tracking imaging

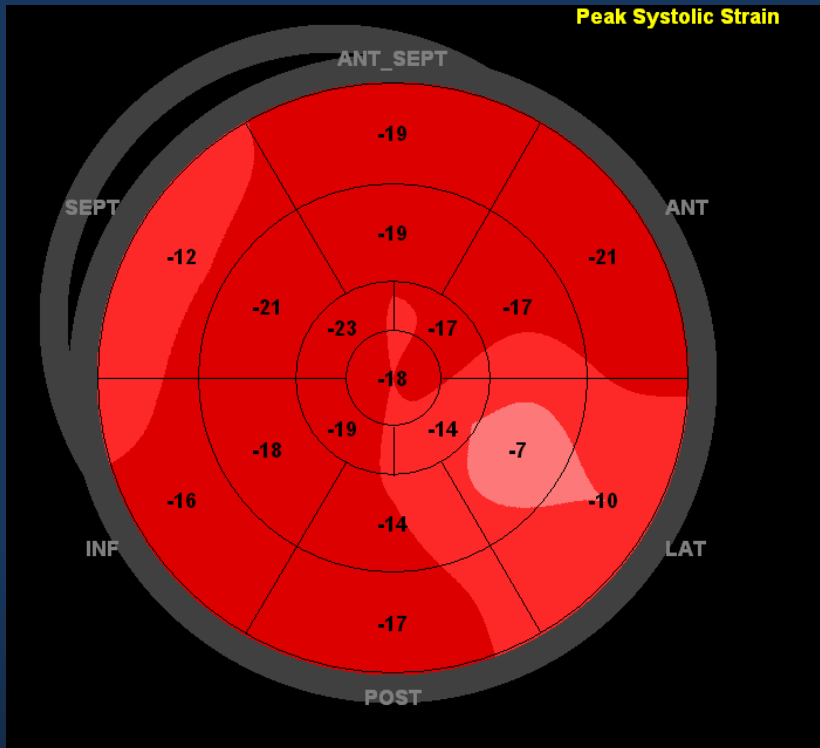
N = 64



Speckle tracking imaging

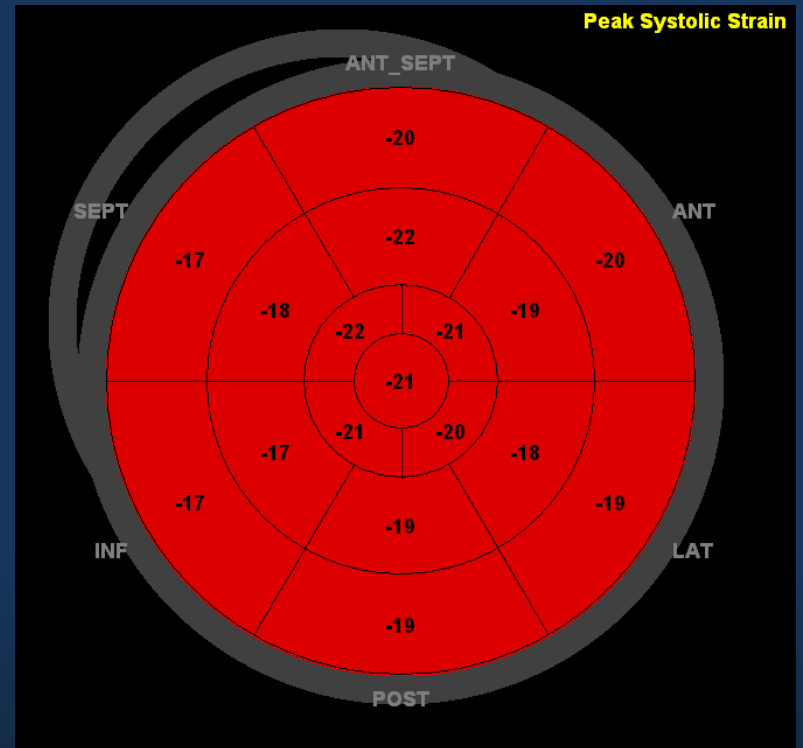
N = 64

Measurement	Progression of symptoms	Preserved LVEF after surgery
ϵ_{sys}	-18% (AUC 0.72; sens 88%, spec 60%)	-14% (AUC 0.77; sens 82%, spec 72%)
SR_{sys}	-1.1/s (AUC 0.76; sens 75%, spec 76%)	-1.0/s (AUC 0.77; sens 64%, spec 78%)



GLPS_LAX	-16.8 %	AVC_AUTO	
GLPS_A4C	-15.5 %	HR_ApLAX	
GLPS_A2C	-18.8 %		
GLPS_Avg	-17.0 %		

GLS = -17%



GLPS_LAX	-20.0 %	AVC_AUTO	
GLPS_A4C	-19.2 %	HR_ApLAX	
GLPS_A2C	-19.5 %		
GLPS_Avg	-19.6 %		

GLS = -19.6%

Conclusions

- Evaluation of severe aortic regurgitation patients:
 - Accurate quantification of the disease
 - ☞ 3D imaging modalities
 - Evaluation of other parameters of contractility
 - ☞ Tissue Doppler and speckle tracking strain imaging