



*Clinica Cardiologica
Università degli Studi di Padova
Direttore: Prof. Sabino Iliceto*

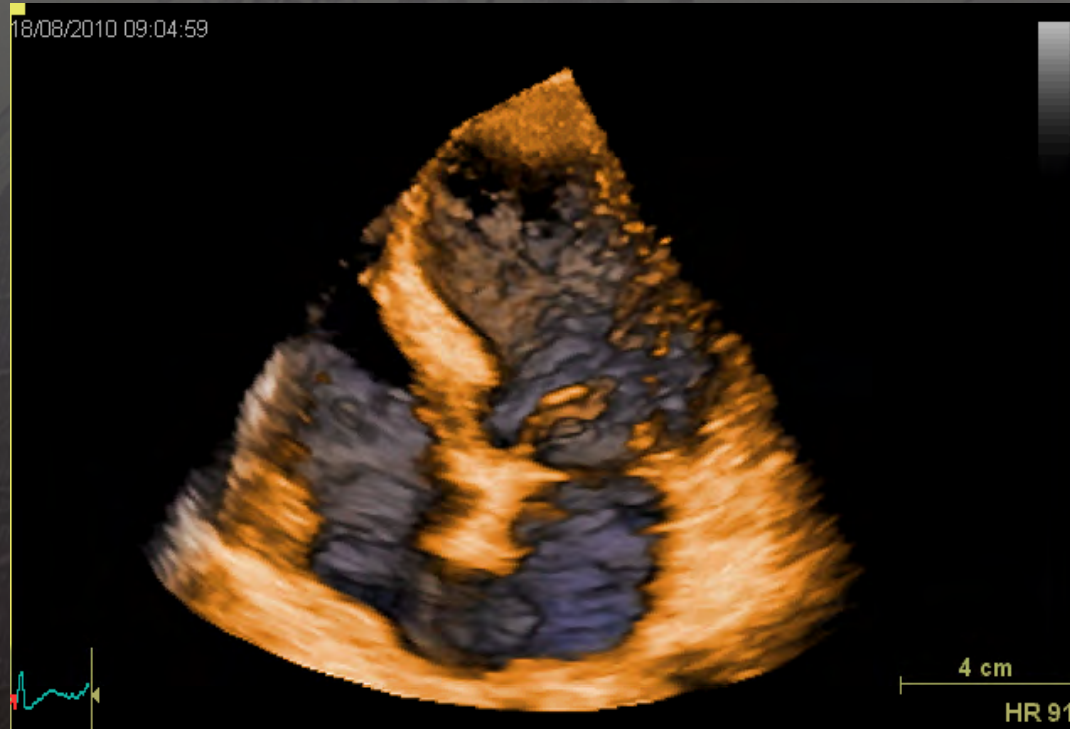
VALVULAR HEART DISEASE: WHAT DO WE LEARN FROM 3D ECHOCARDIOGRAPHY?

Luigi P. Badano**, MD, FESC

****Dr. Badano has received honoraries and research grants from GE Healthcare, Sorin cardio S.p.A., Actelion, Edwards Lifesciences**

***No off-label use of device**

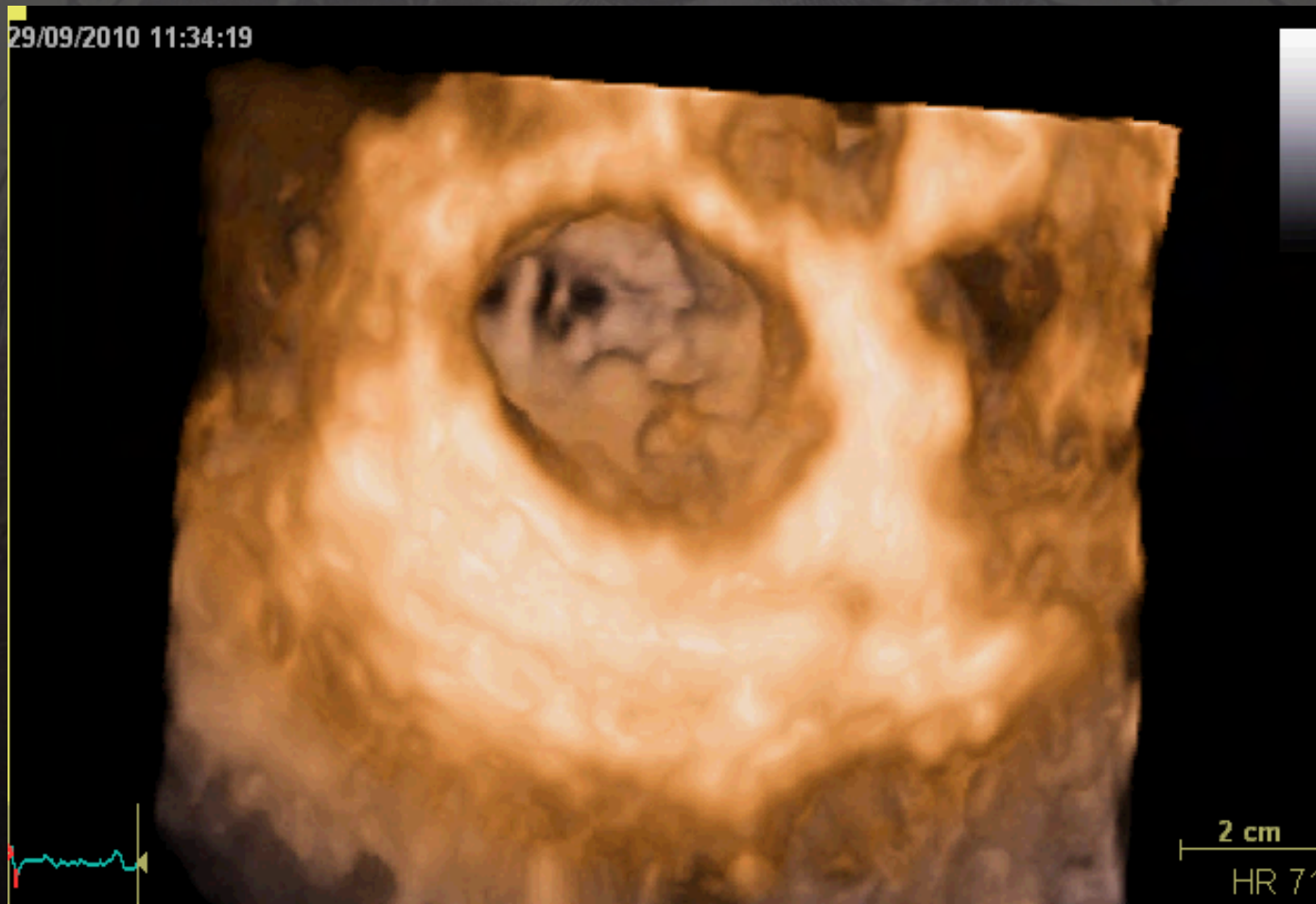
3D ECHO IN HEART VALVE DISEASES



- LV Geometry and Function (competitive with CMR)
- RV Geometry and Function (not previously possible with 2D)
- LA and RA Geometry and Function
- Valve morphology and spatial relationships
 - unique views
 - unprecedented quantitation possibilities
- Advanced quantification

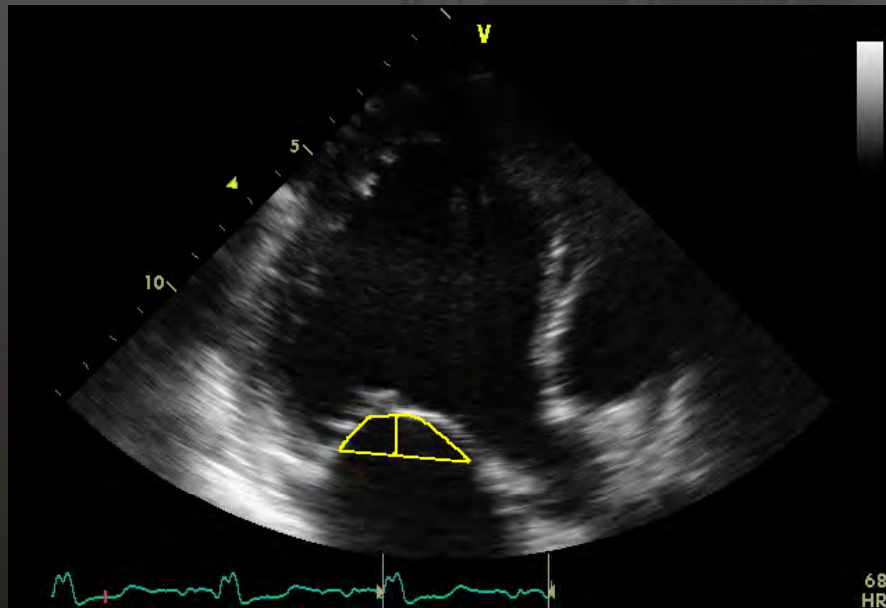
3D ECHO IN HEART VALVE DISEASES

Detailed mitral valve anatomy

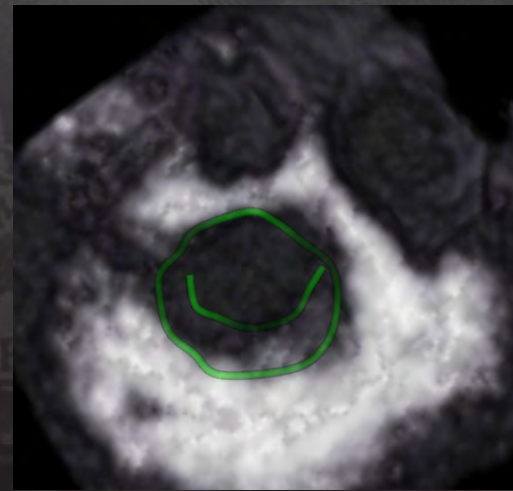


3D ECHO IN HEART VALVE DISEASES

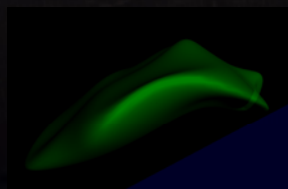
Not just fancy images! Functional Mitral Regurgitation



Tenting Area = 1.4 cm²
Coaptation Depth = 1.0 cm



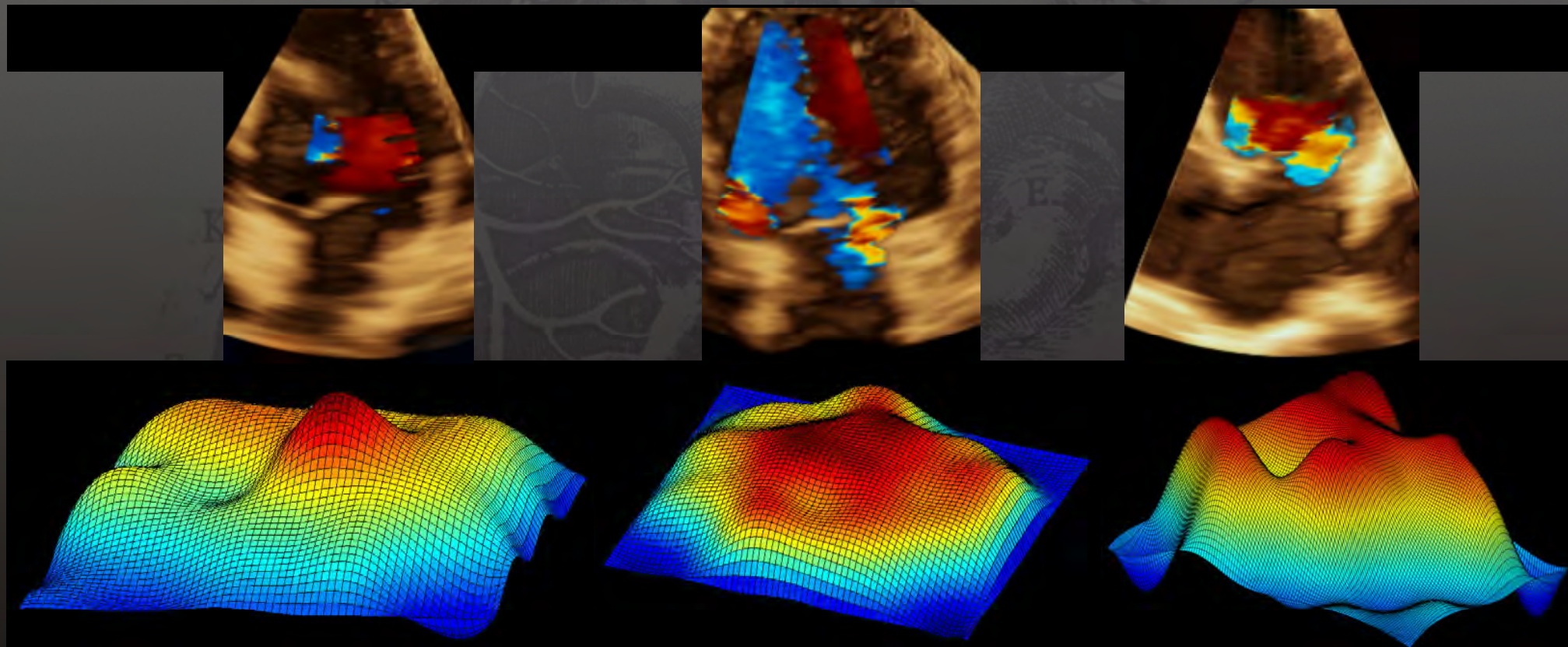
Automatic Measurements	
AP Diameter:	4.5 cm
AL-PM Diameter:	4.9 cm
Sphericity Index:	0.9
Commissural Diameter:	4.7 cm
Non-planar Angle:	143.0°
Anterior Annulus Length:	6.4 cm
Posterior Annulus Length:	8.8 cm
Annulus Circumference:	15.2 cm
Annulus Area (2D):	16.4 cm ²
CL Length (2D):	5.1 cm
CL Length:	5.6 cm



Tenting Volume = 6 ml

3D ECHO IN HEART VALVE DISEASES

Quantitation of Mitral Regurgitation



Mild MR

PISA/ERO 3.6 cm²/0.19 cm²

VC/ERO 0.19 cm²

Moderate MR

PISA/ERO 5.44 cm²/0.26 cm²

VC/ERO 0.27 cm²

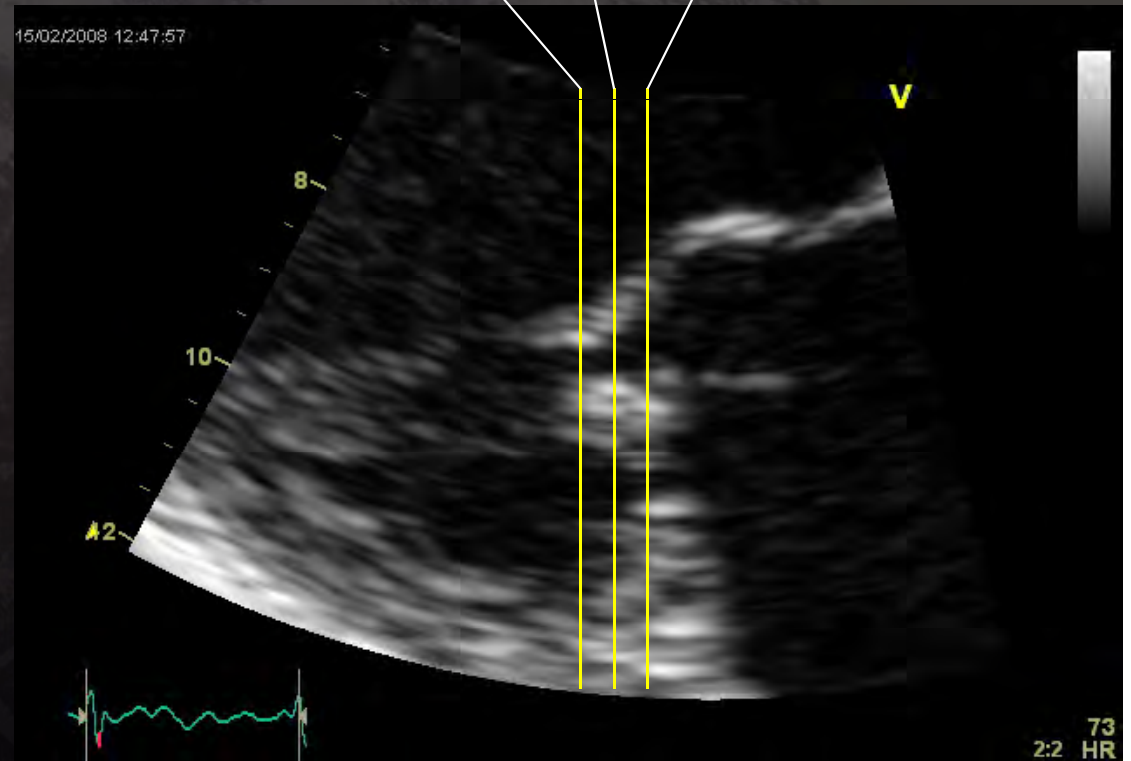
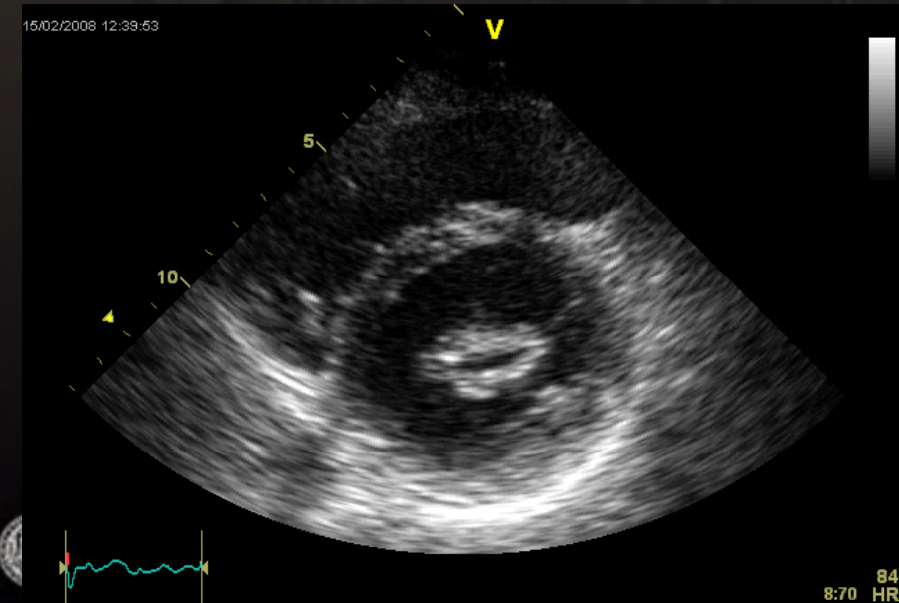
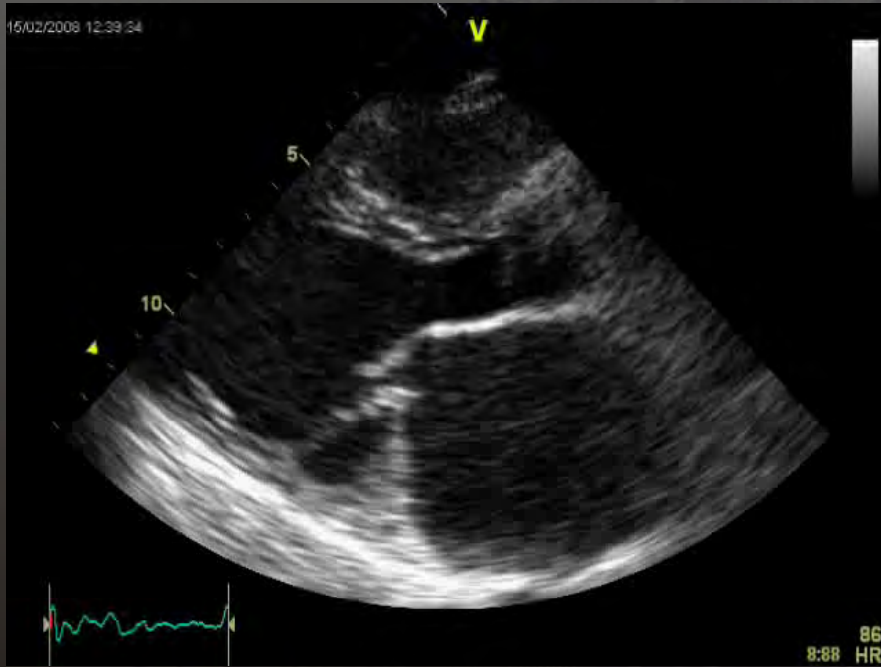
Severe MR

PISA/ERO 6.98 cm²/0.37 cm²

VC/ERO 0.40 cm²

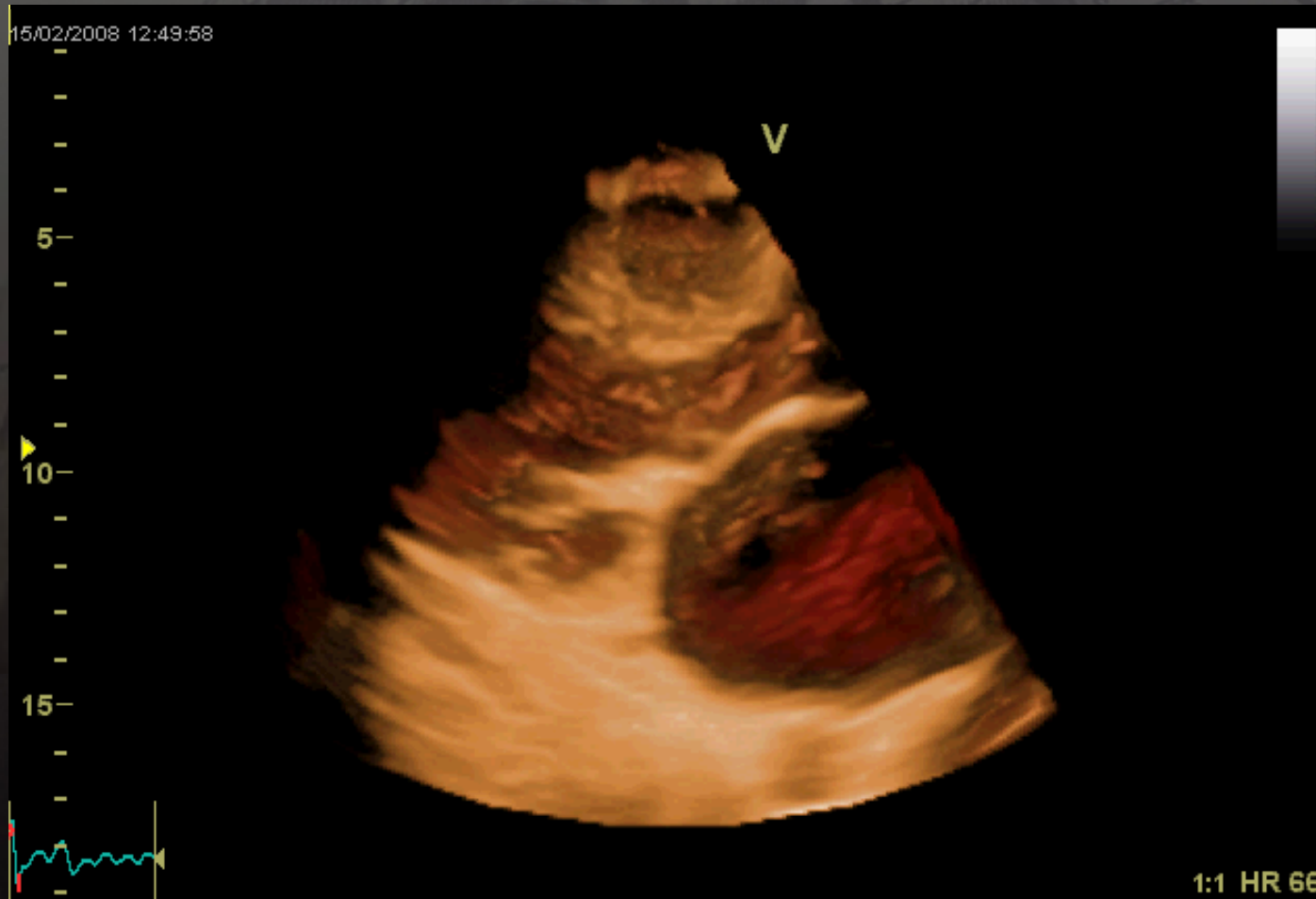
3D ECHO IN HEART VALVE DISEASES

Not just fancy images! Mitral Stenosis Quantitation



3D ECHO IN HEART VALVE DISEASES

Accurate Measurement of Mitral Valve Area



3D ECHO IN HEART VALVE DISEASES

Accurate Measurement of Mitral Valve area

Journal of the American College of Cardiology
© 2004 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 43, No. 11, 2004
ISSN 0735-1097/04/\$30.00
doi:10.1016/j.jacc.2004.01.046

Real-Time Three-Dimensional Echocardiography for Rheumatic Mitral Valve Stenosis Evaluation

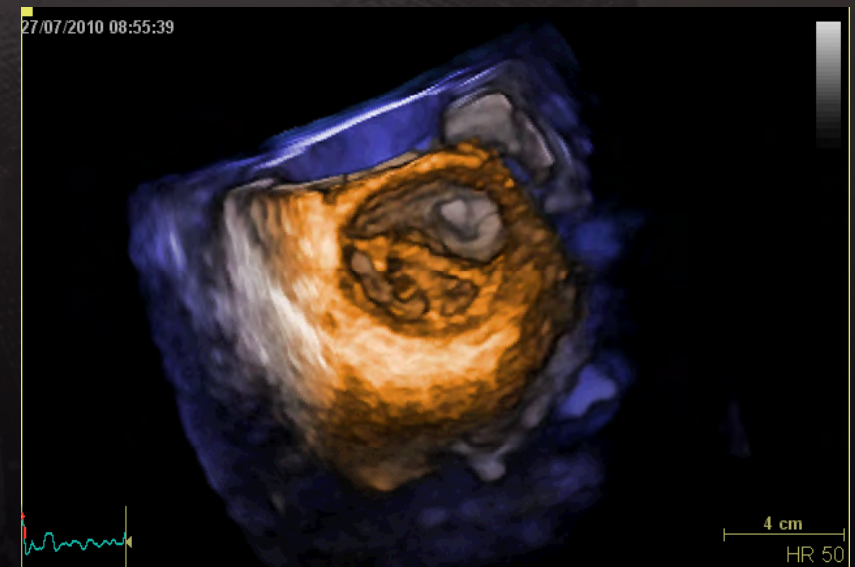
An Accurate and Novel Approach

José Zamorano, MD,* Pedro Cordeiro, MD,* Lissa Sugeng, MD,† Leopoldo Perez de Isla, MD,*
Lynn Weinert, MD,† Carlos Macaya, MD,* Enrique Rodríguez, MD,* Roberto M. Lang, MD†
Madrid, Spain; and Chicago, Illinois

Real time 3D is feasible, accurate, and highly reproducible for assessing Mitral valve area .

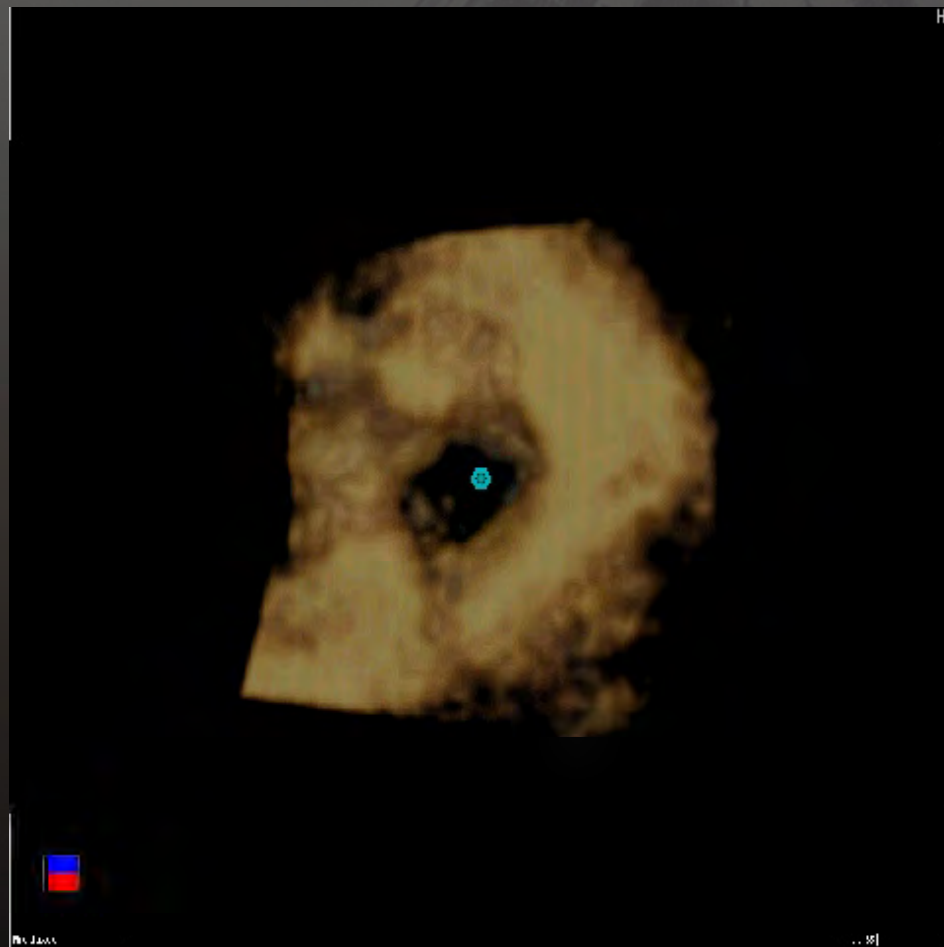
It has the best agreement with invasive technique.

More accurate than 2D area, PHT, or PISA.

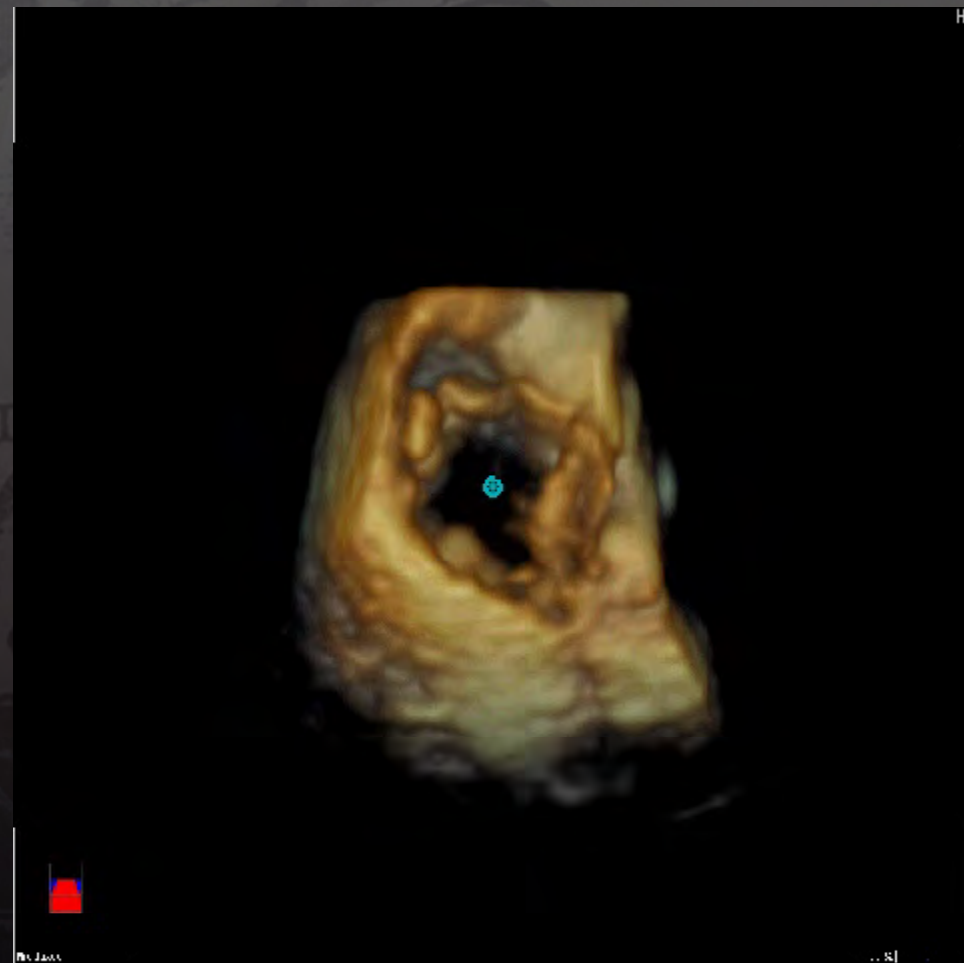


3D ECHO IN HEART VALVE DISEASES

The Normal Tricuspid Valve



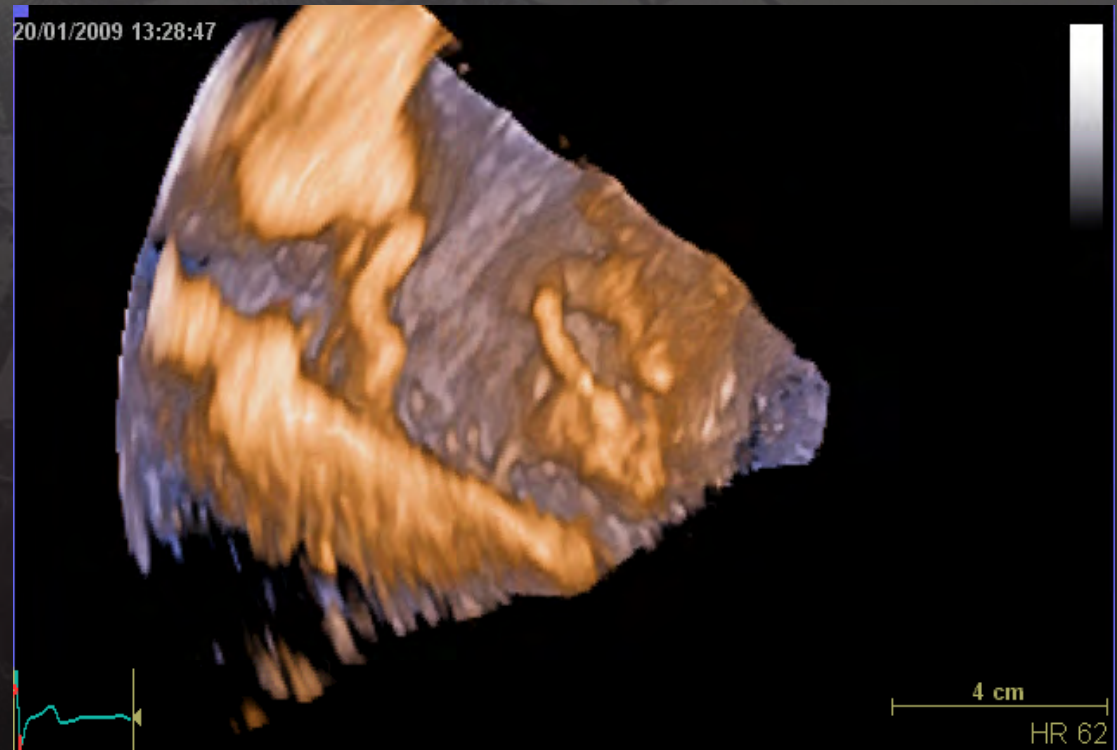
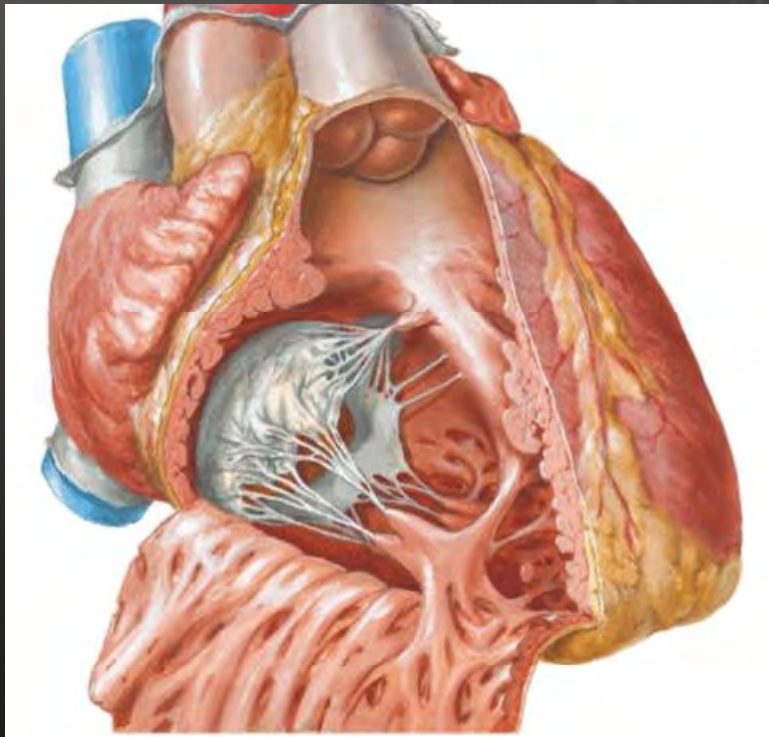
Atrial View



Ventricular View

3D ECHO IN HEART VALVE DISEASES

The Concept of Tricuspid Complex



3D ECHO IN HEART VALVE DISEASES

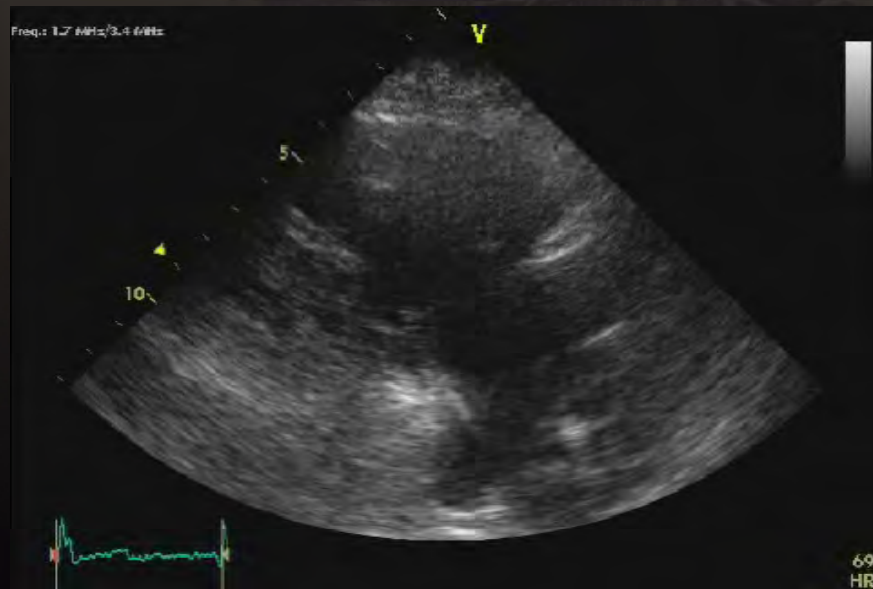
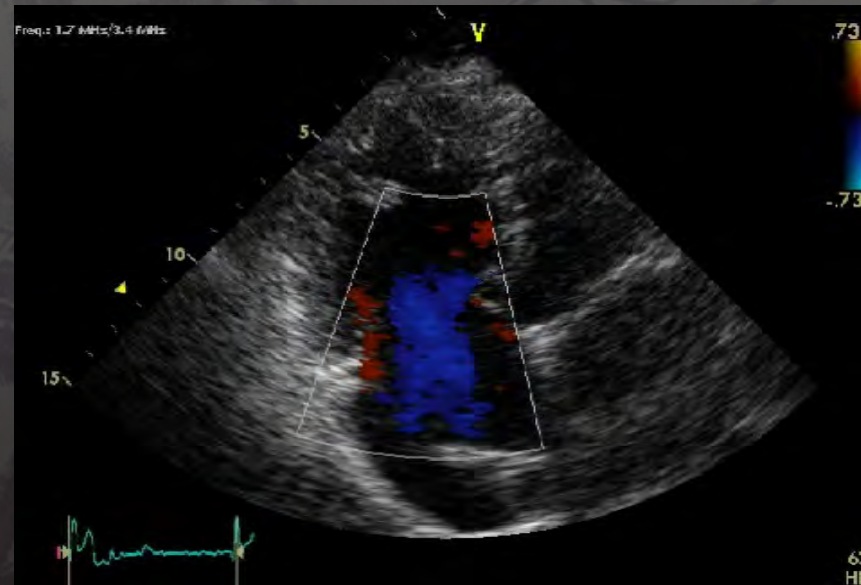
Clinical Case #1

74-yr-old woman

Congestive HF

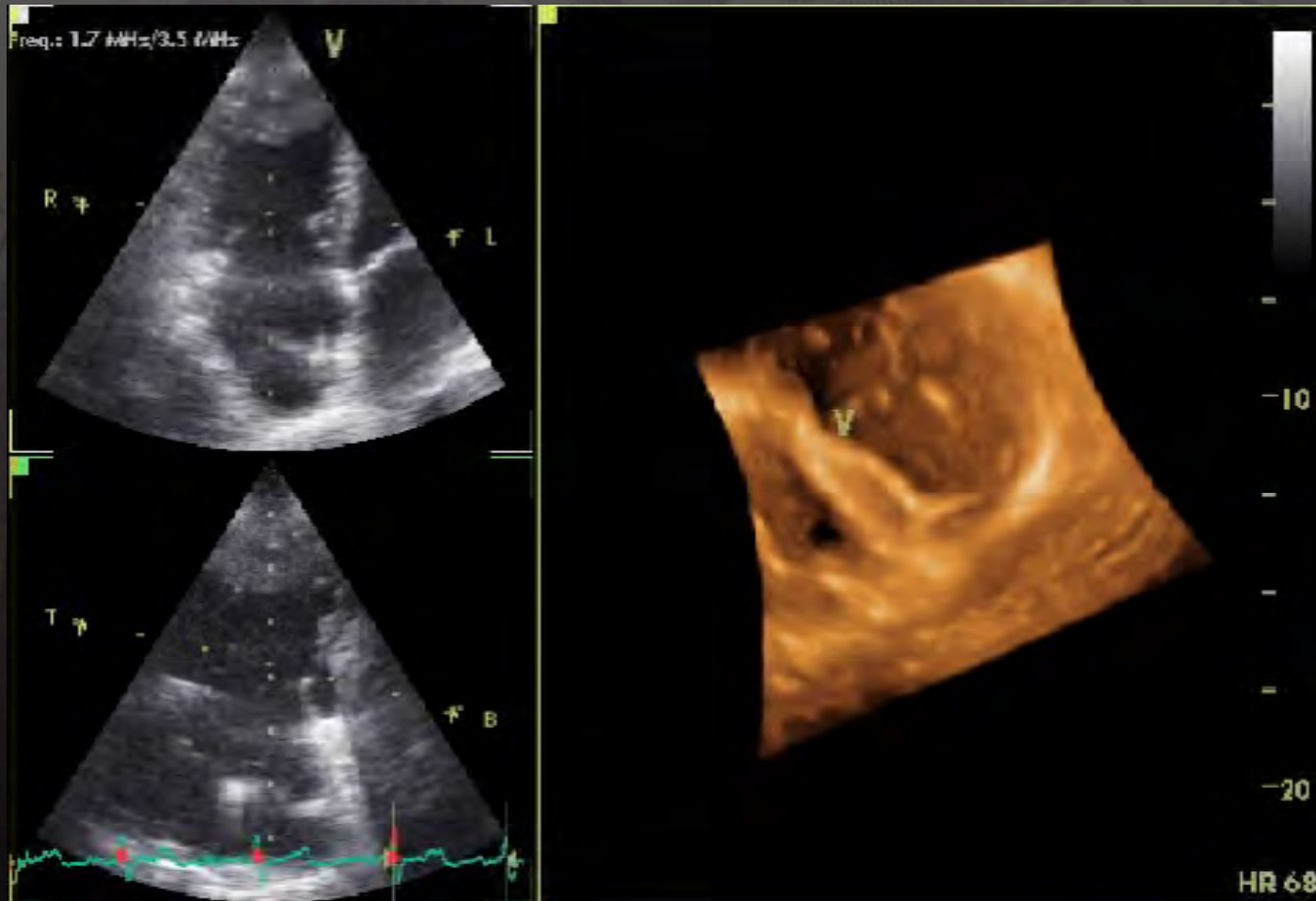
Previous DDD-R P.M implant

Symptomatic Sick Sinus
Syndrome



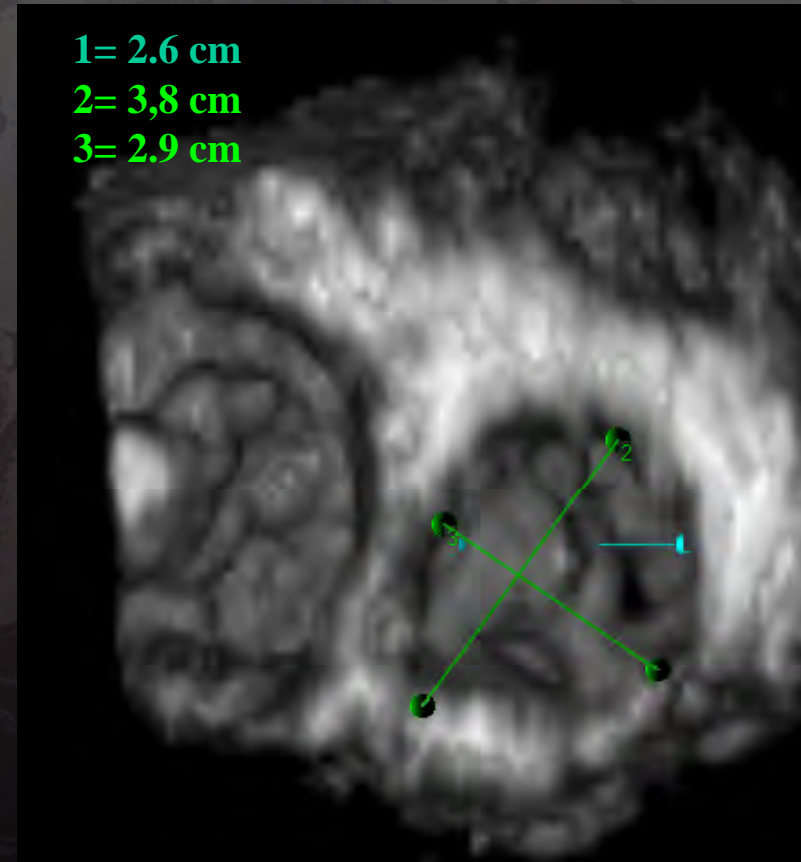
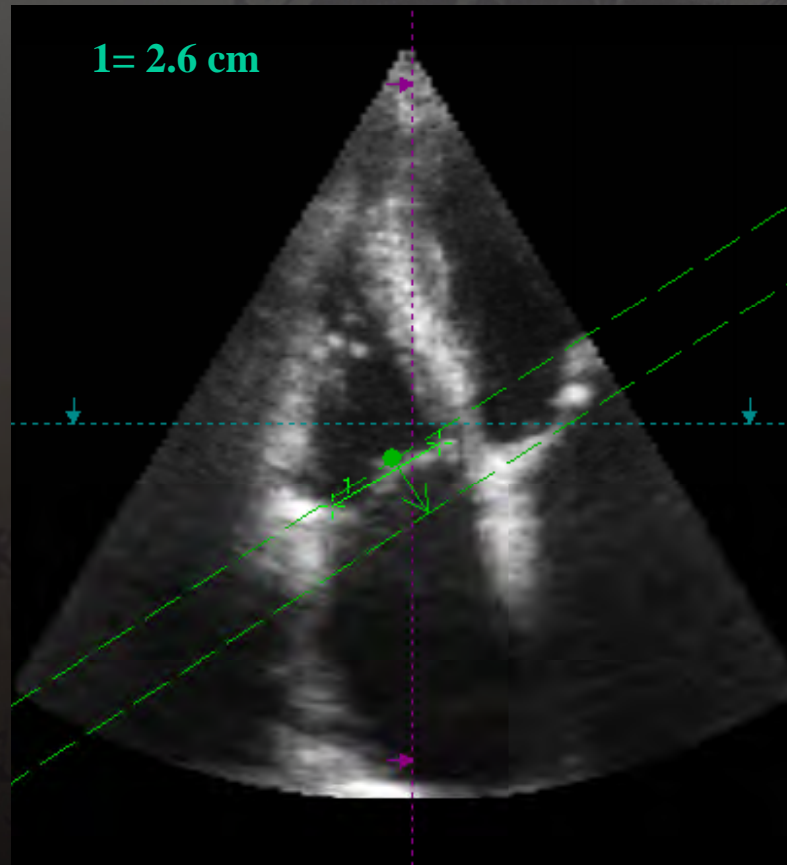
3D ECHO IN HEART VALVE DISEASES

Clinical Case #1



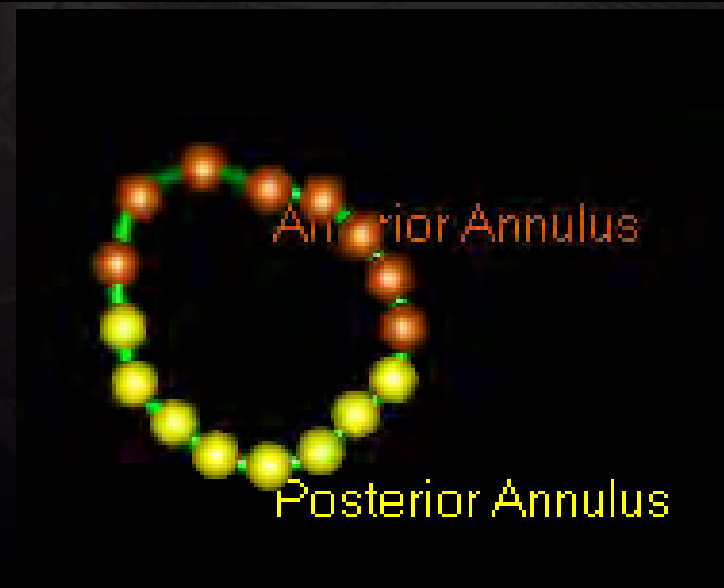
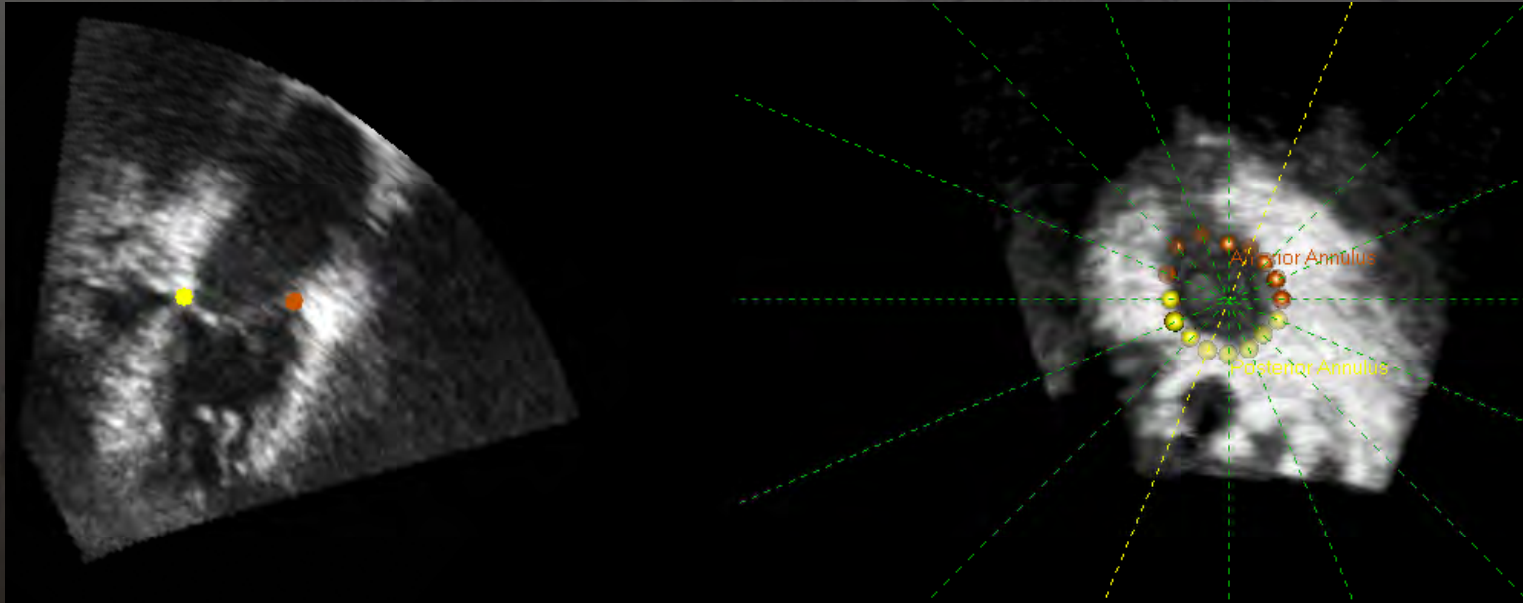
3D ECHO IN HEART VALVE DISEASES

Tricuspid Annulus diameters



3D ECHO IN HEART VALVE DISEASES

Tricuspid Annulus Geometry

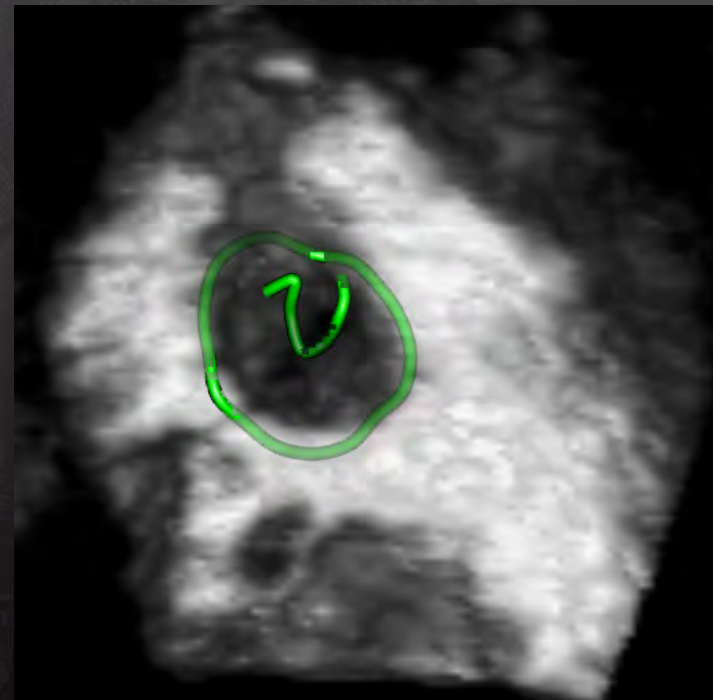


3D ECHO IN HEART VALVE DISEASES

Tricuspid Annulus Size

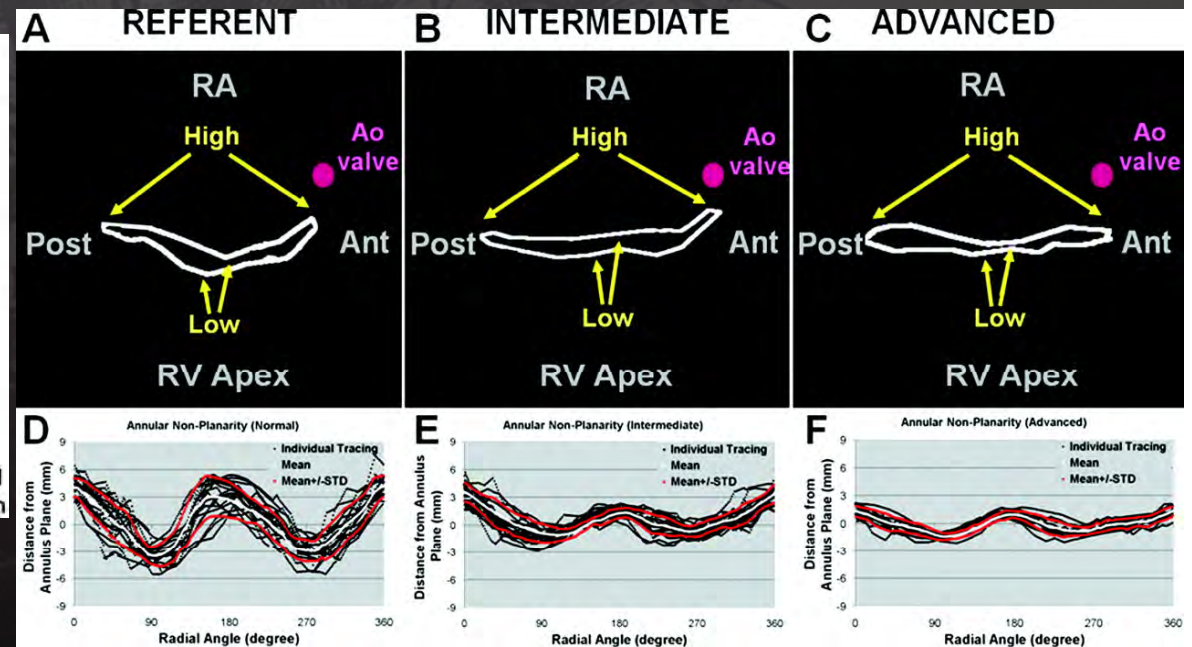
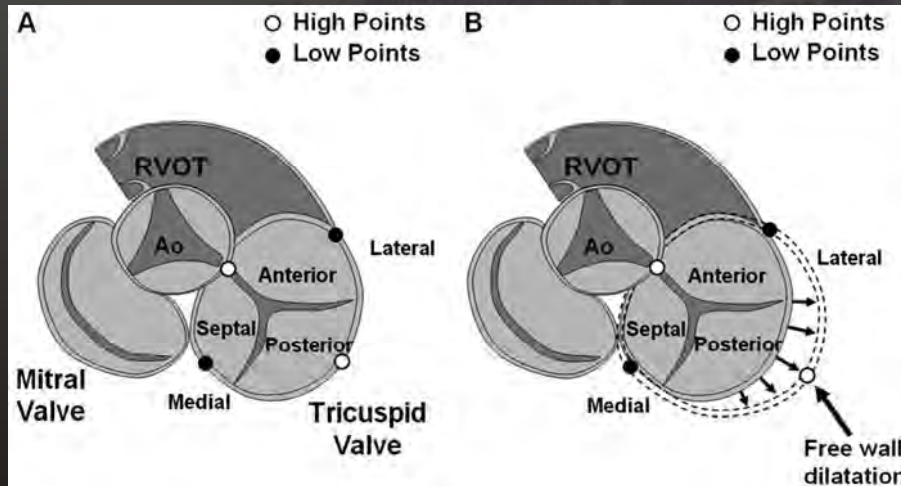
Automatic Measurements

AP Diameter:	3.1 cm
AL-PM Diameter:	3.1 cm
Sphericity Index:	1.0
Non-planar Angle:	173.7°
Annulus Circumference:	10.7 cm
Annulus Area (2D) :	8.3 cm ²



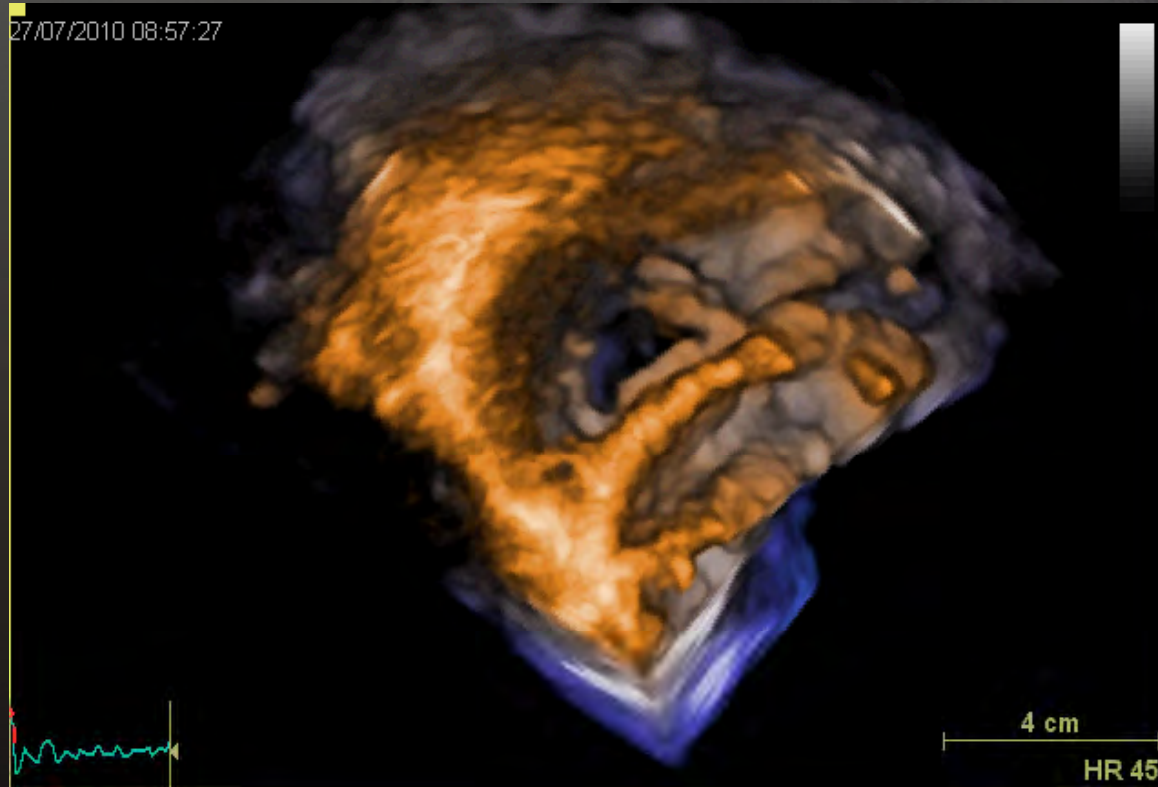
3D ECHO IN HEART VALVE DISEASES

Tricuspid Annulus Geometry



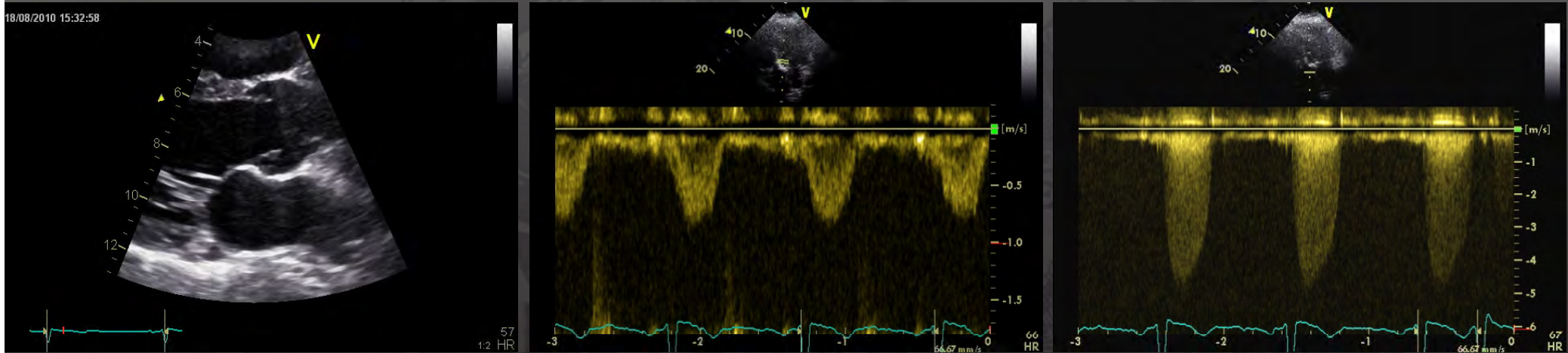
3D ECHO IN HEART VALVE DISEASES

Tricuspid Stenosis



3D ECHO IN HEART VALVE DISEASES

2D/Doppler Quantification of Aortic Stenosis



LVOT Diameter

LVOT VTI

Ao VTI

Assumptions:

- LV Outflow Tract is circular and constant in size throughout cardiac cycle;
- LVOT Doppler tracing recorded at the same place where LVOTD has been measured.

Threat:

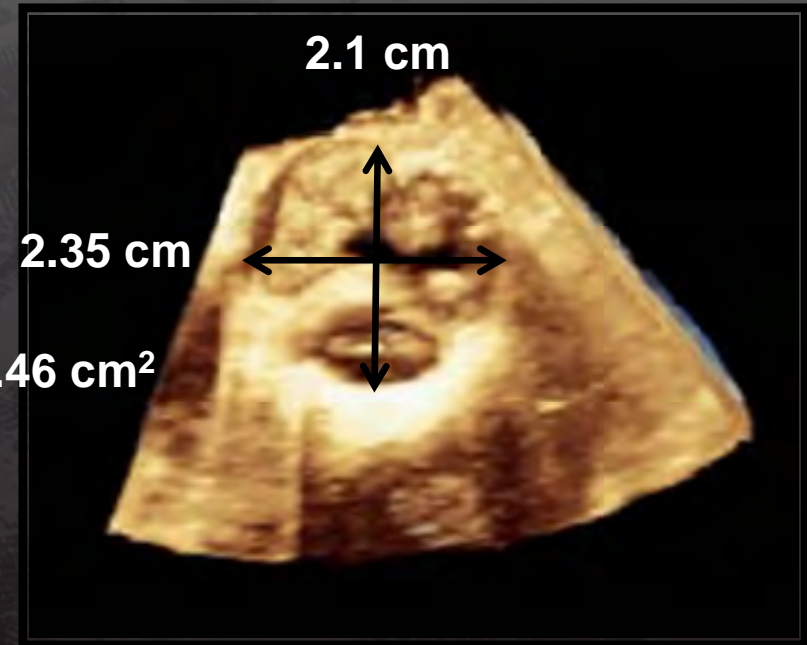
- Any 10% error in LVOTD measurement translates in 20% error in Ao EOA

3D ECHO IN HEART VALVE DISEASES

Limits of conventional 2D assessment of LVOT Area



LVOT D= 2.05 cm

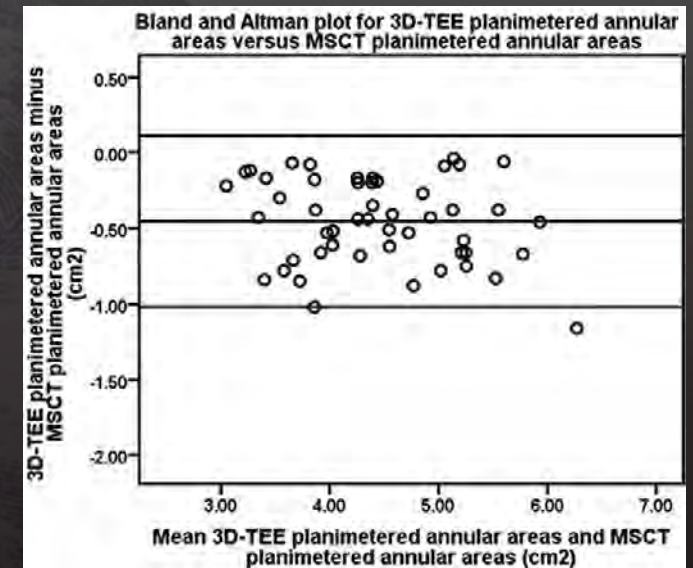
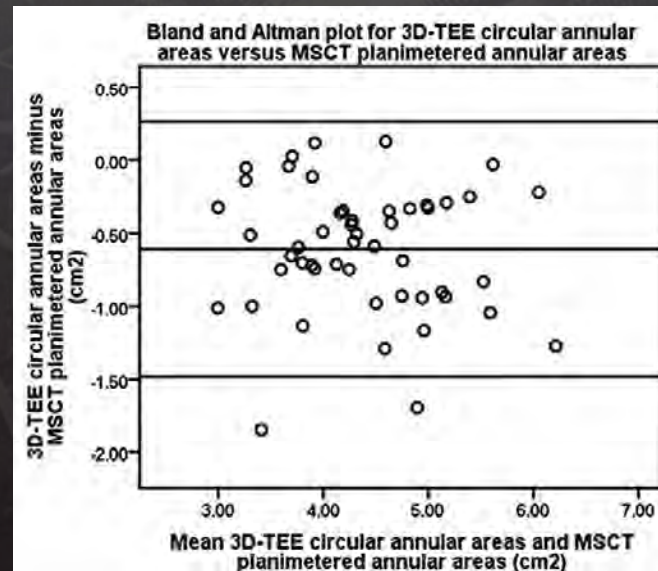
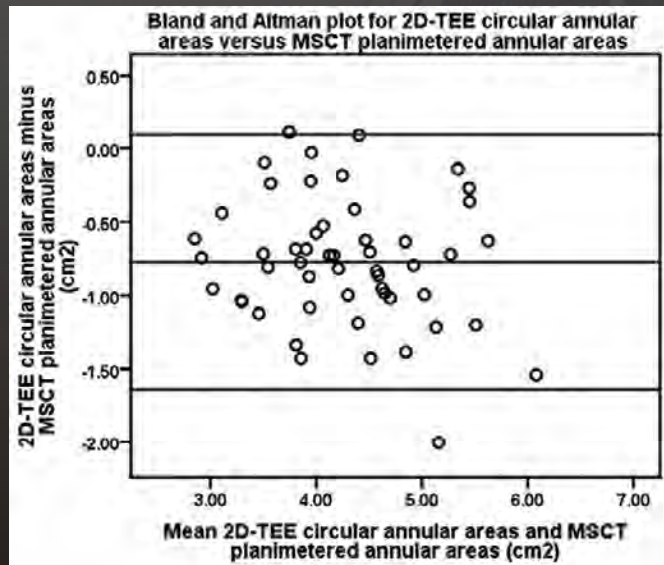


LVOT Area= 4.07 cm²



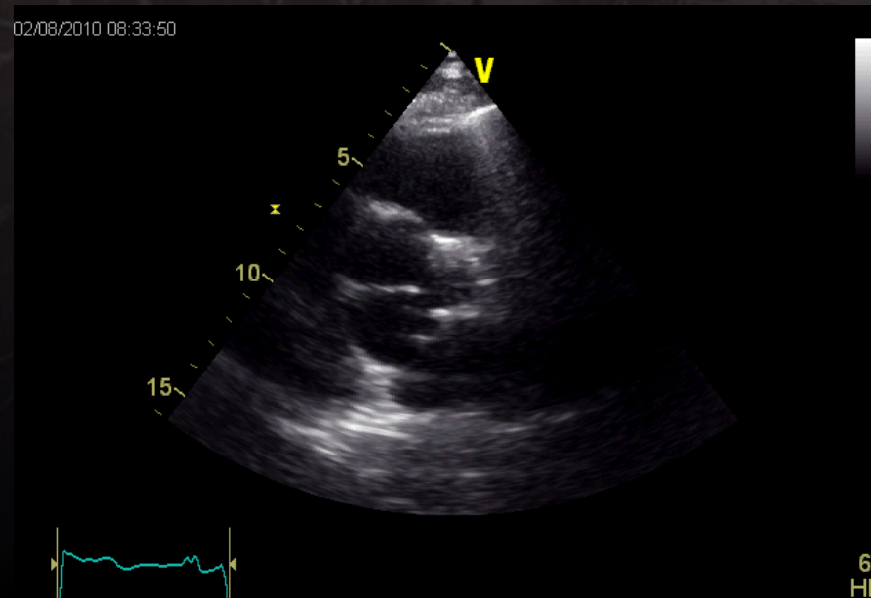
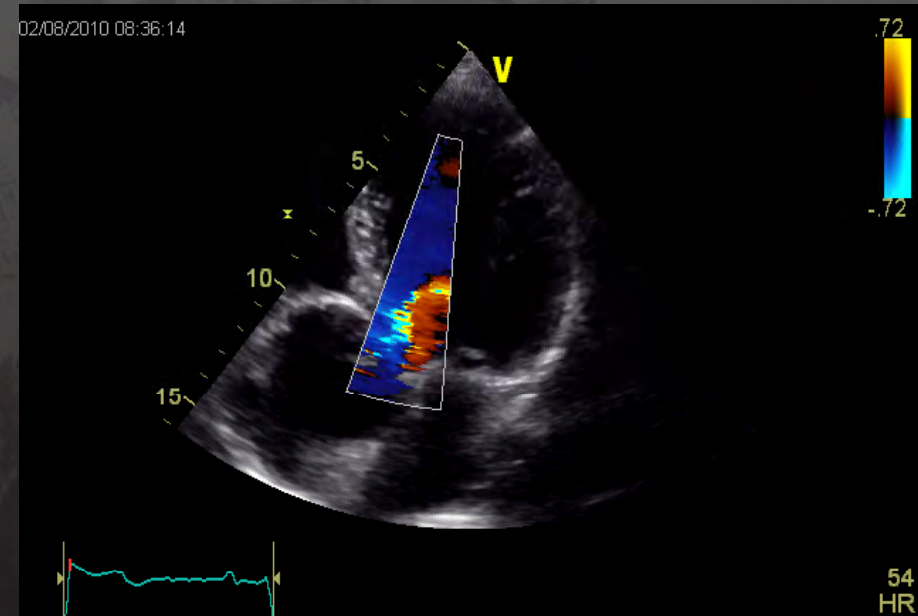
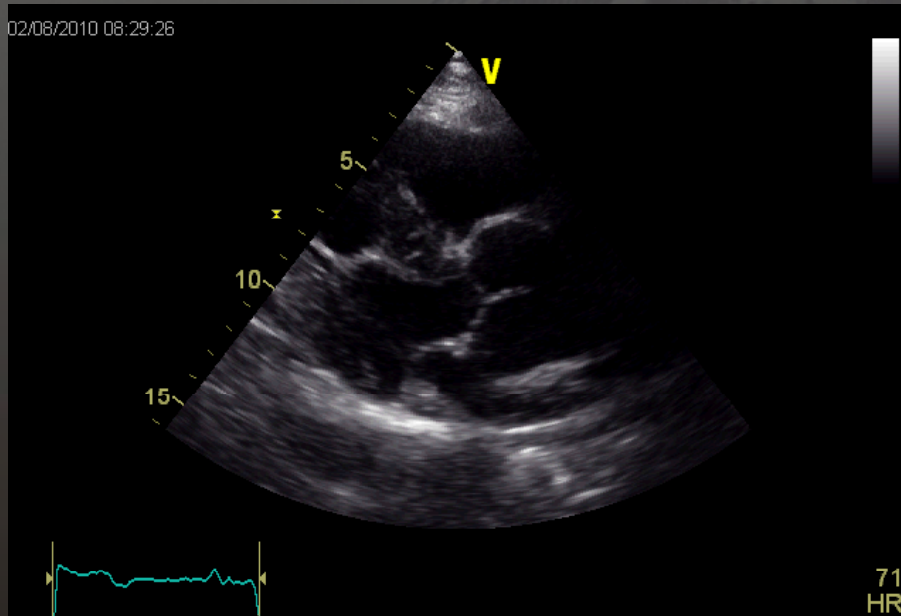
3D ECHO IN HEART VALVE DISEASES

Limits of conventional 2D assessment of LVOT Area



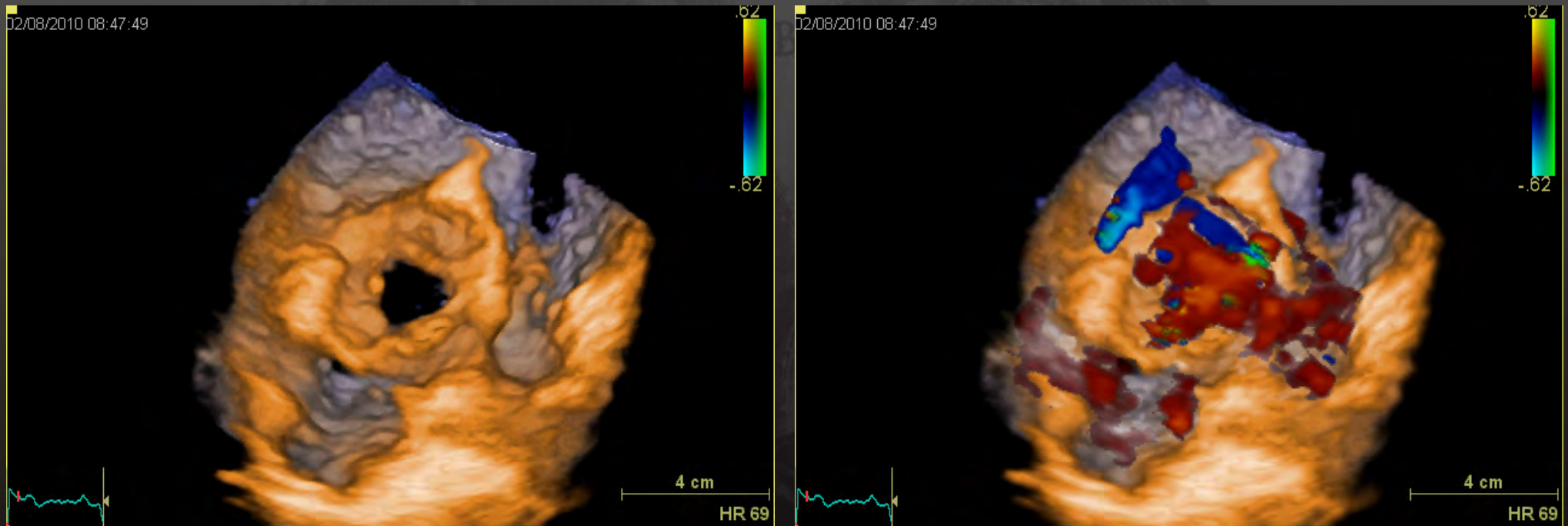
3D ECHO IN HEART VALVE DISEASES

Aortic Root Dilation: Clinical case



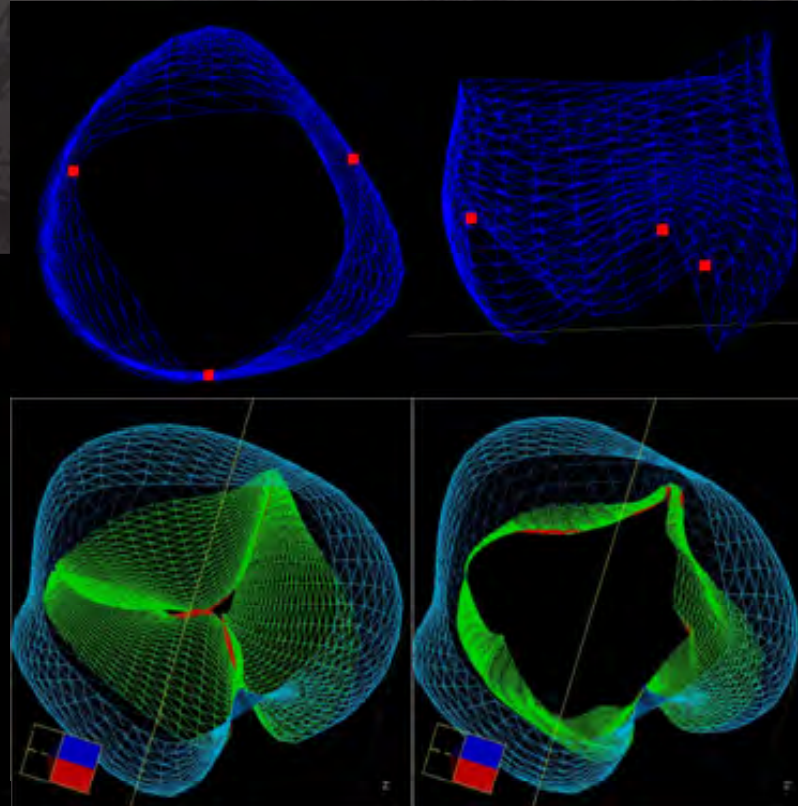
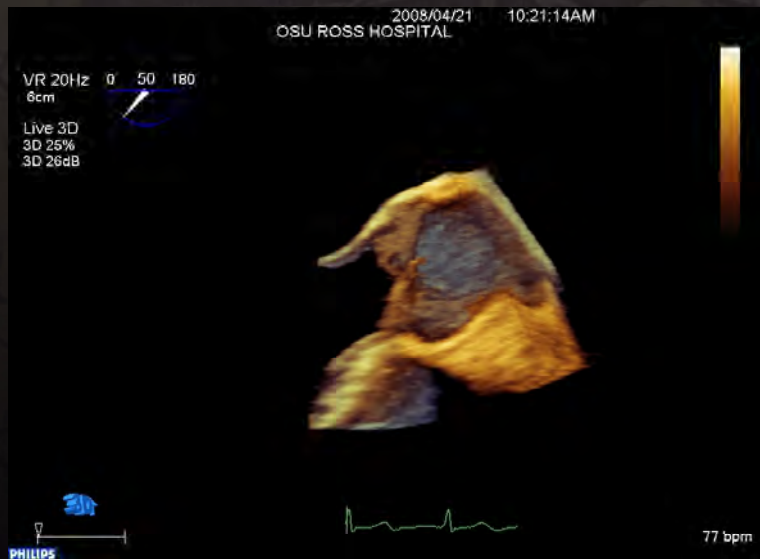
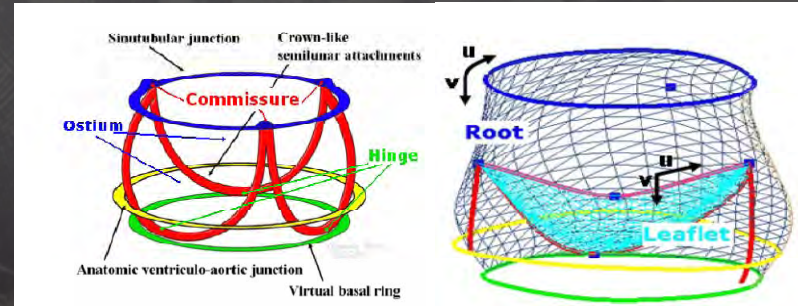
3D ECHO IN HEART VALVE DISEASES

Aortic Root Dilation: Clinical case



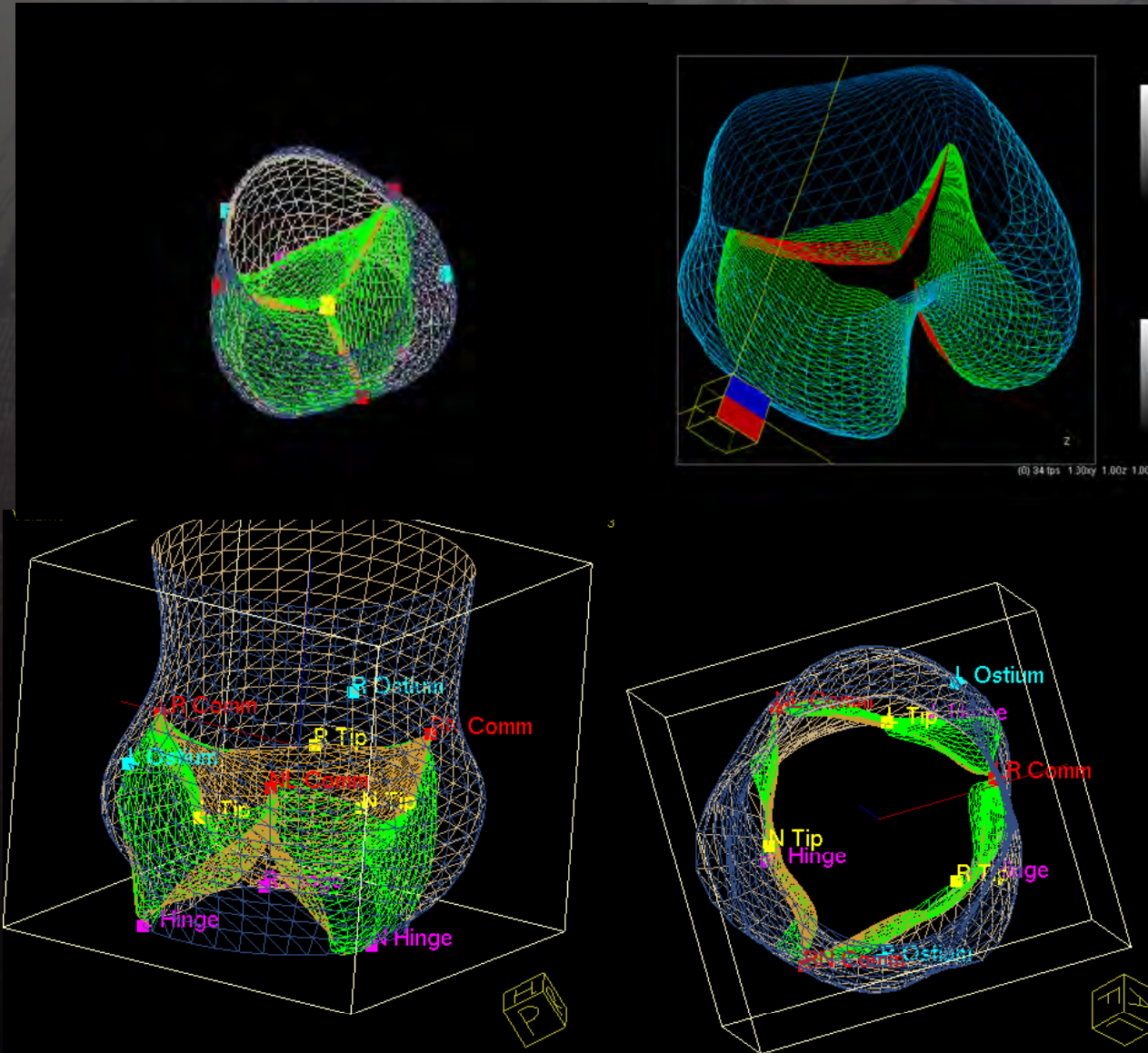
3D ECHO IN HEART VALVE DISEASES

Aortic Valve and Root Modeling



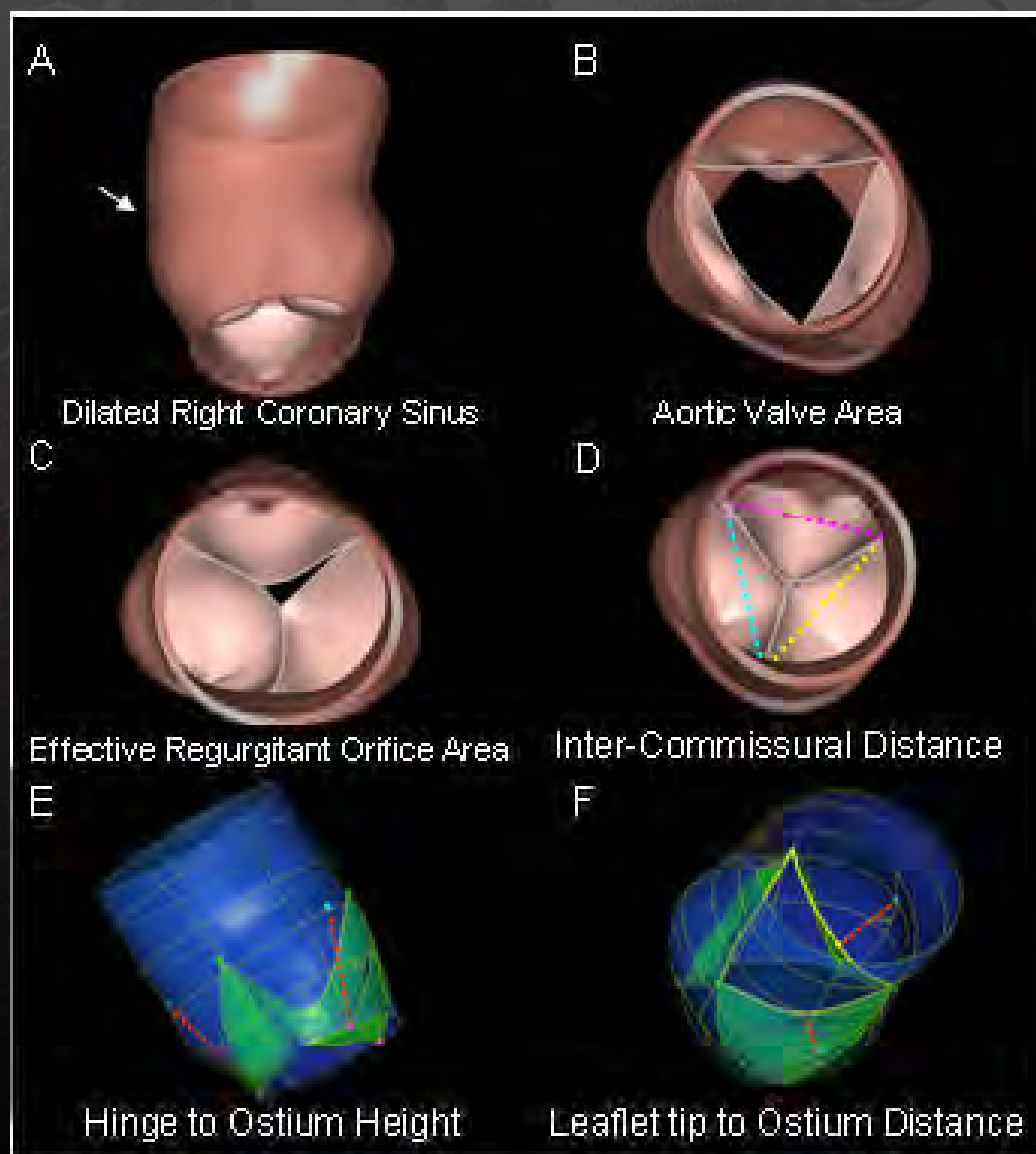
3D ECHO IN HEART VALVE DISEASES

Aortic Valve and Root Modeling



3D ECHO IN HEART VALVE DISEASES

Aortic Root Complex Quantitation



3D ECHO IN HEART VALVE DISEASES

Conclusions

- 3D echo has overcome the era a pure research tool and it is now ready for routine clinical use;
-
- 3D echo offers a unique opportunity to assess the pathology of heart valve diseases and provides unprecedented quantitative data about their severity
- Communication with cardiac surgeons has greatly improved by using 3D images and surgery can be accurately planned in advance



EUROECHO 2010



Join us in...

DENMARK
COPENHAGEN
8-11 December
2010