Element 52.00

Pellerin

Ventricular Assessment of Size, Shape, and Function in ECH Disorders

The 20th Echo in Context Video Teleconference
The pulse and the beat. ECG and Echo
Saturday, 26th February 2005

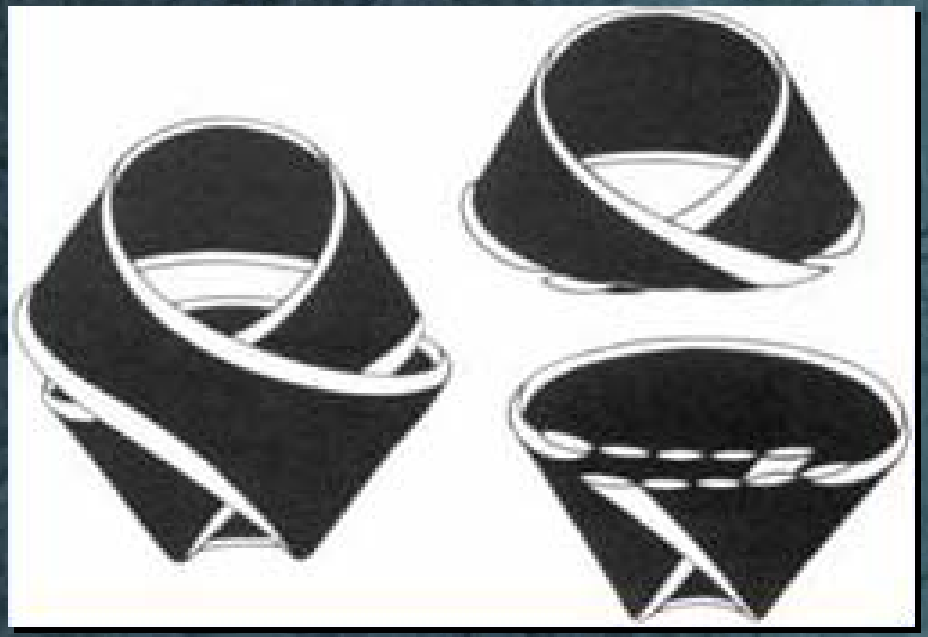
Dr. Denis Pellerin MD, PhD

- Ventricular assessment of size, shape, and function has important
  prognosis and therapeutic implications

- Ventricular volume predicts mortality better than ejection fraction
  Simpson's rule in 2D (biplane), in 3D (LVESD)
  Ventricular mass

- Ventricular geometry is a surrogate for myocardial fibers orientation
  Adaptive mechanism to maximize pump efficiency (remodeling)
  Changes in radial, longitudinal and circumferential motion
  Ratio of WT to cavity dimension, Sphericity index

2 Cineloops Ap 4ch in Control and DCM



Streeter DD 1979

Normal

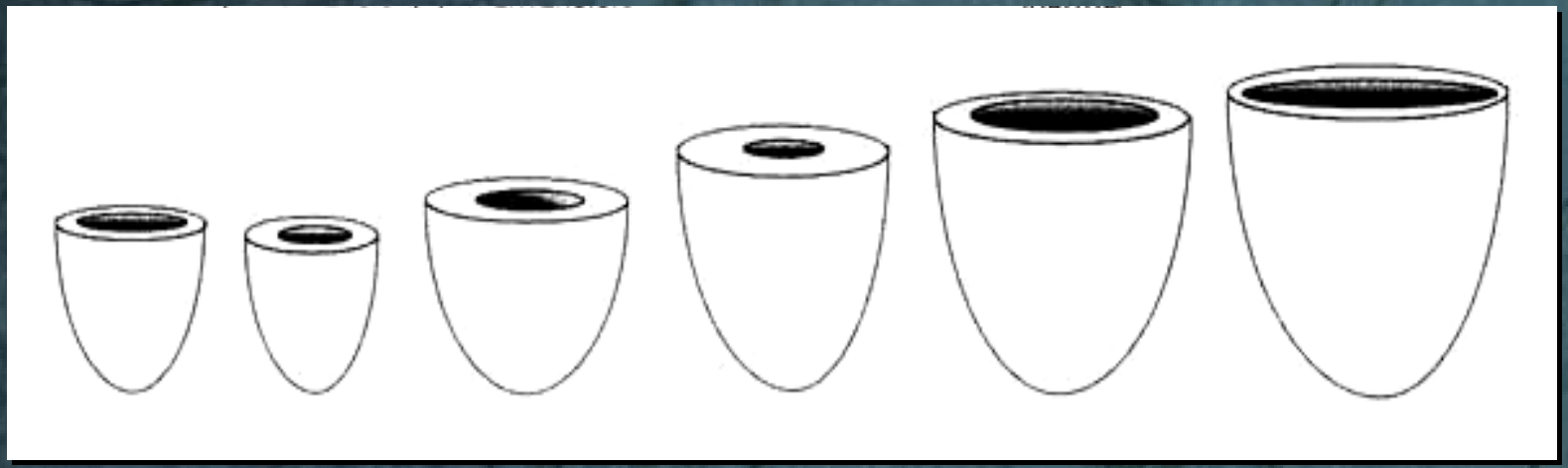
Concentric Remodeling (Hypertension)

Concentric Hypertrophy (Hypertension/ Aortic)

Hypertrophic Cardiomyopathy

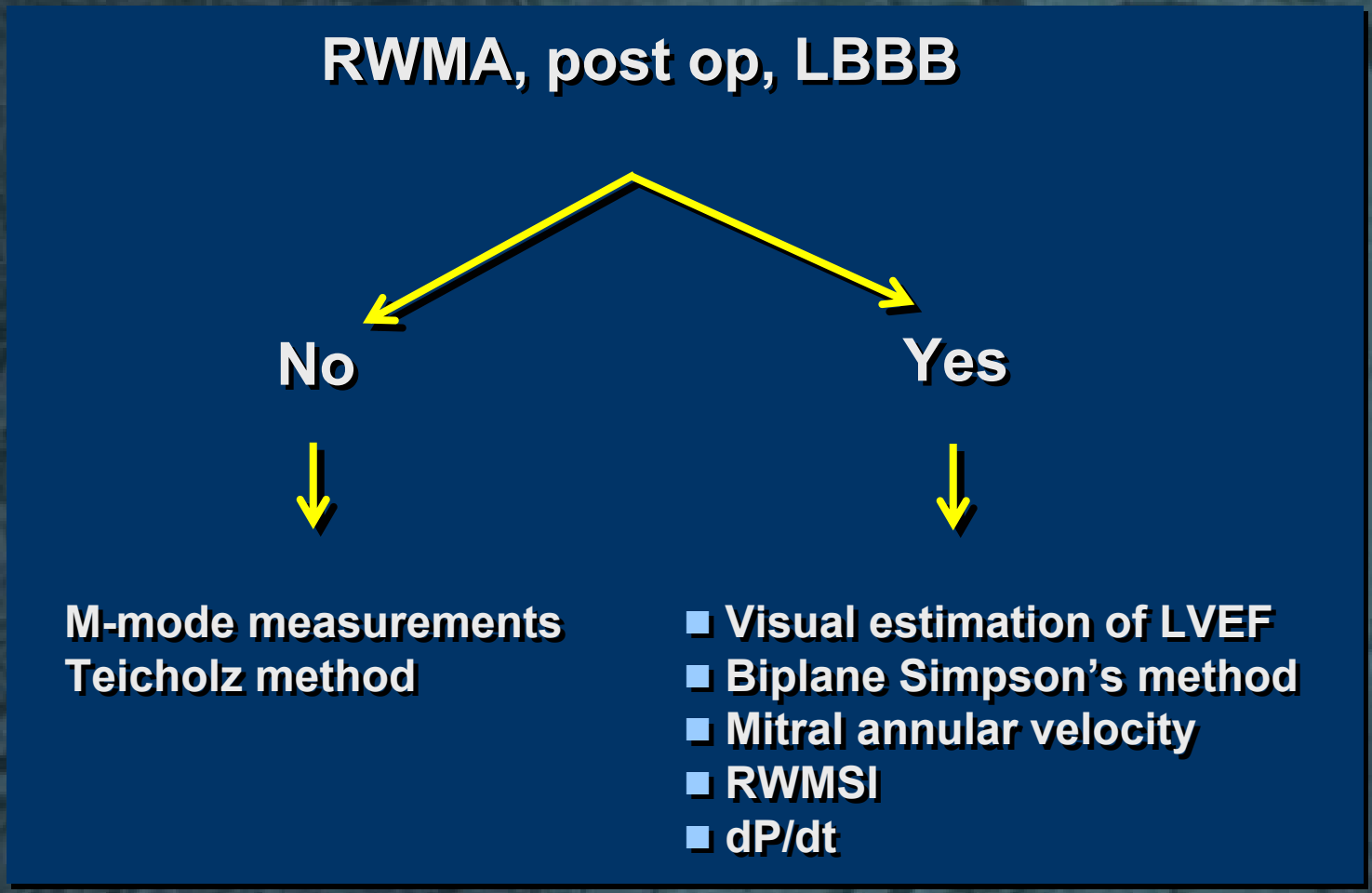
Eccentric Hypertrophy (Aortic/ Mitral Regurgitation)

Dilated Cardiomyopathy

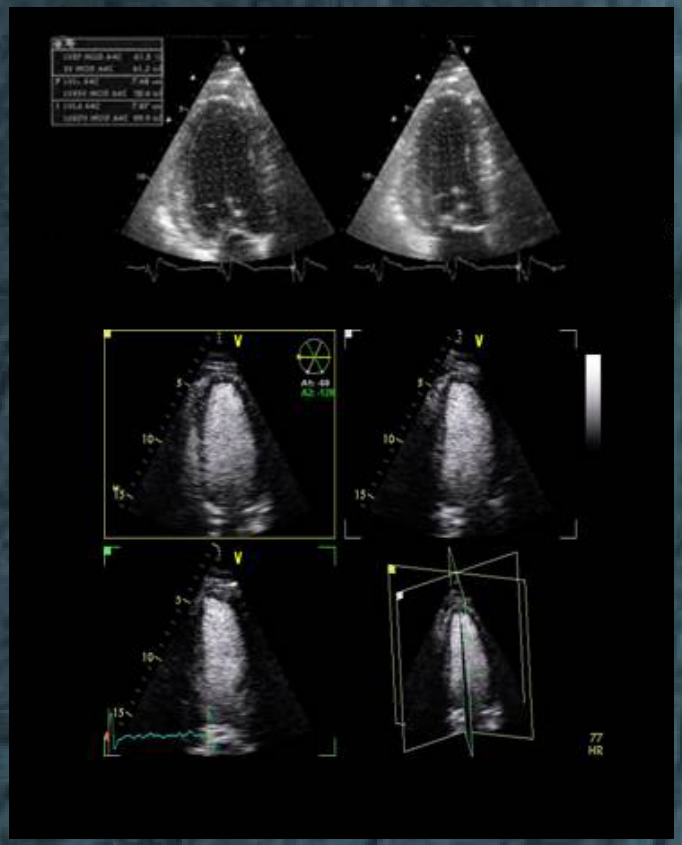


Aurigemma GP et al 2002

Assessment of Global LV Systolic Function



LV Volumes and Systolic Function



VENTRICULAR VOLUMES

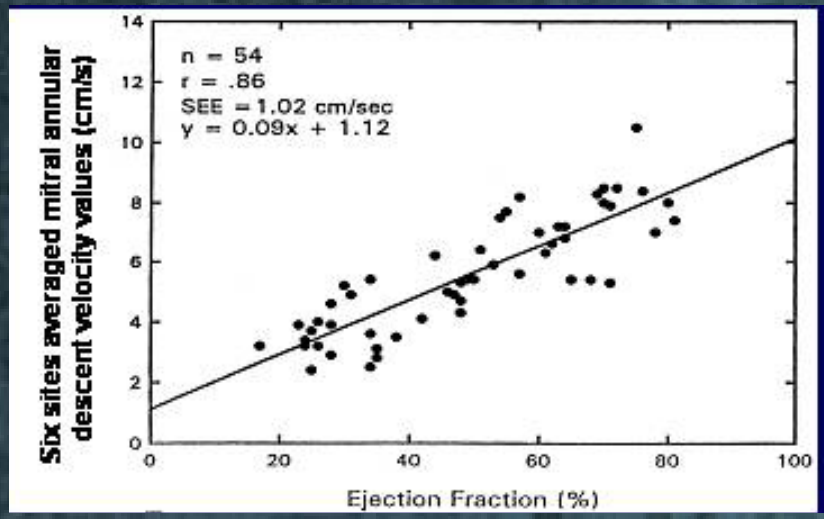
- Intra observer variability: 4 a 6%
- Inter observer variability:

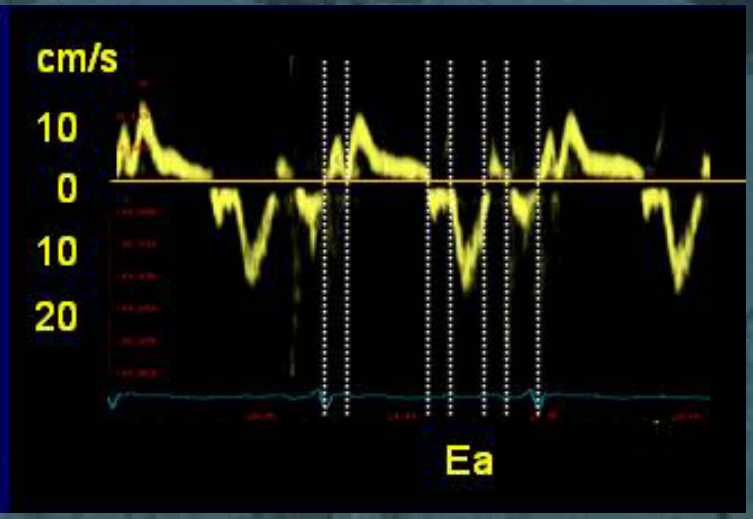
  8.5% EDV 16.5% ESV

- A variation of 15% for EDV
  25% for ESV
  10& for LVEF

is required before concluding on a significant change.

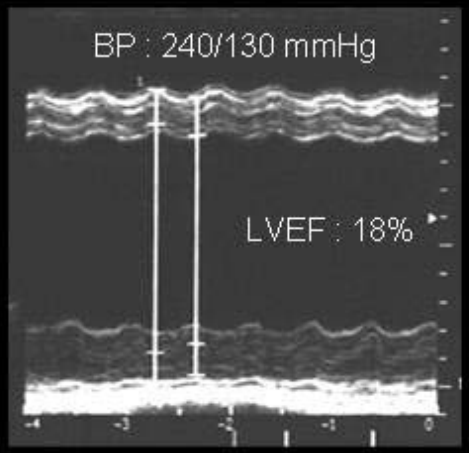
Mitral Annular Velocity



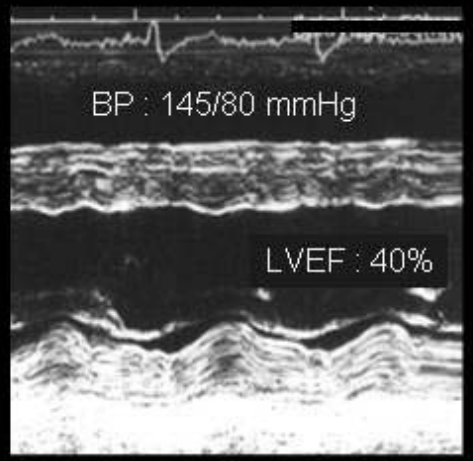


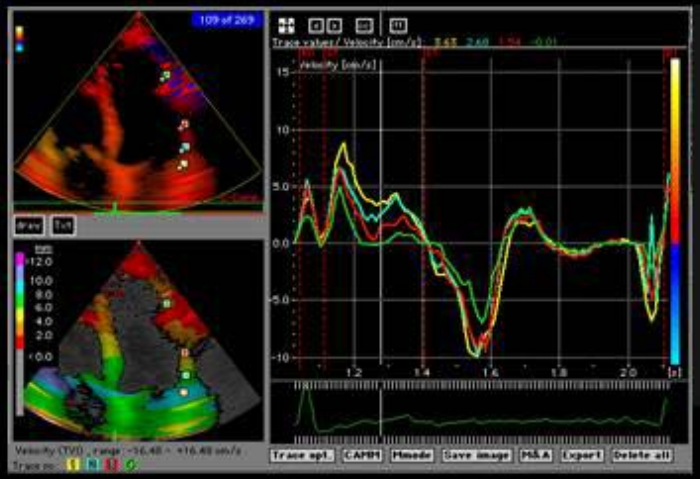
- Velocity assessment is not dependent on endocardial definition
  Conventional echo 77%, DTI measurements 100% (Alam JASE 2000)
- MAV > 5.4 cm/s was 88% sensitive and 97% specific for LVEF > 50%
- Limitations: prosthetic MV or annulus, mitral annular calcifications

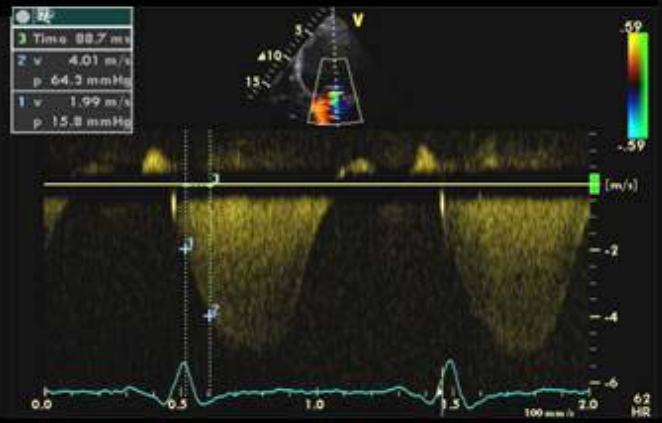
Gulati VK et al. Am J Cardiol 1996; 77:979-984



Loading Conditions

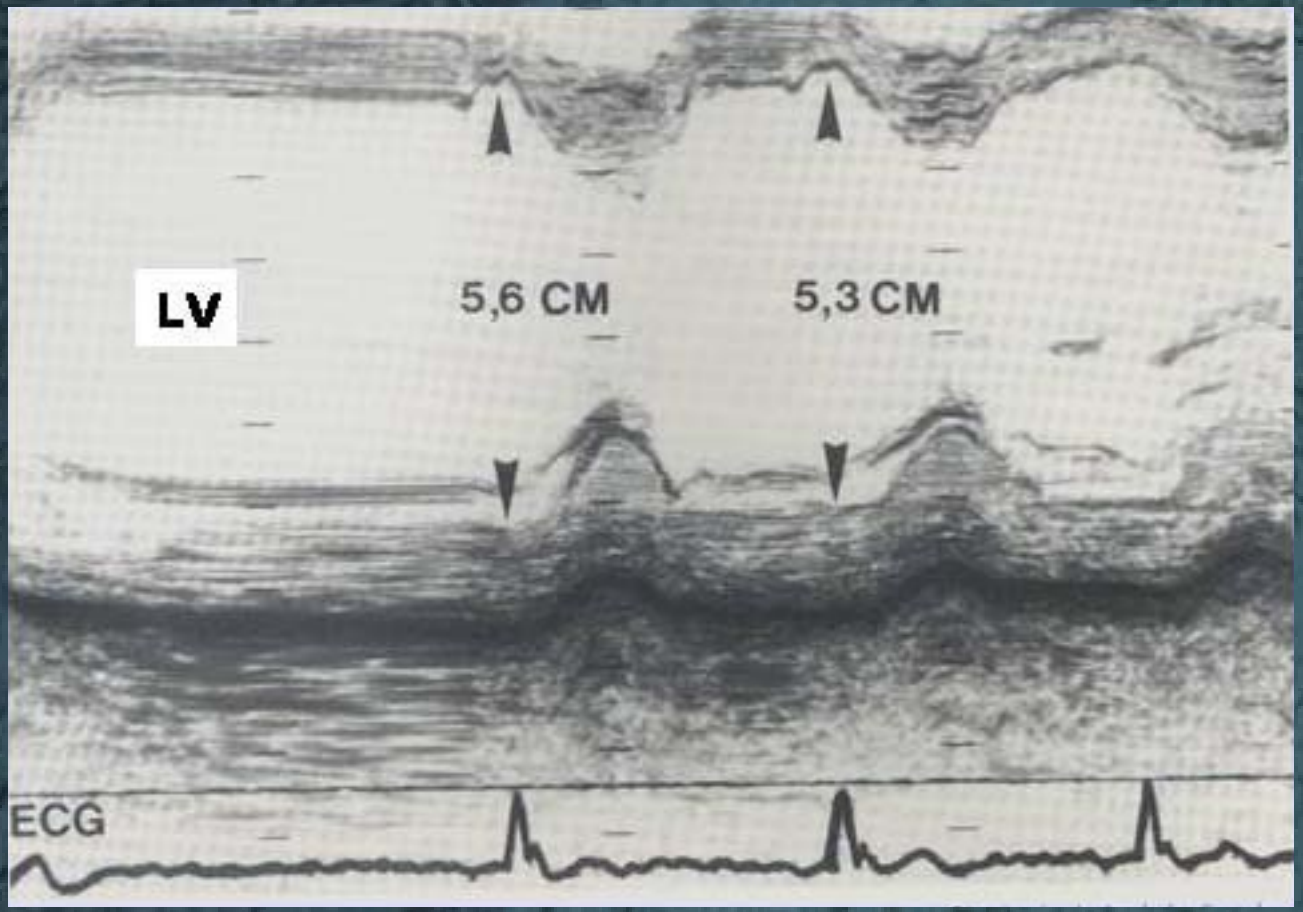






dP/dt = (64.3 – 15.8) / 0.0887 = 546 mmHg/s
Normal value > 1000 mmHg/s

Atrial Fibrillation



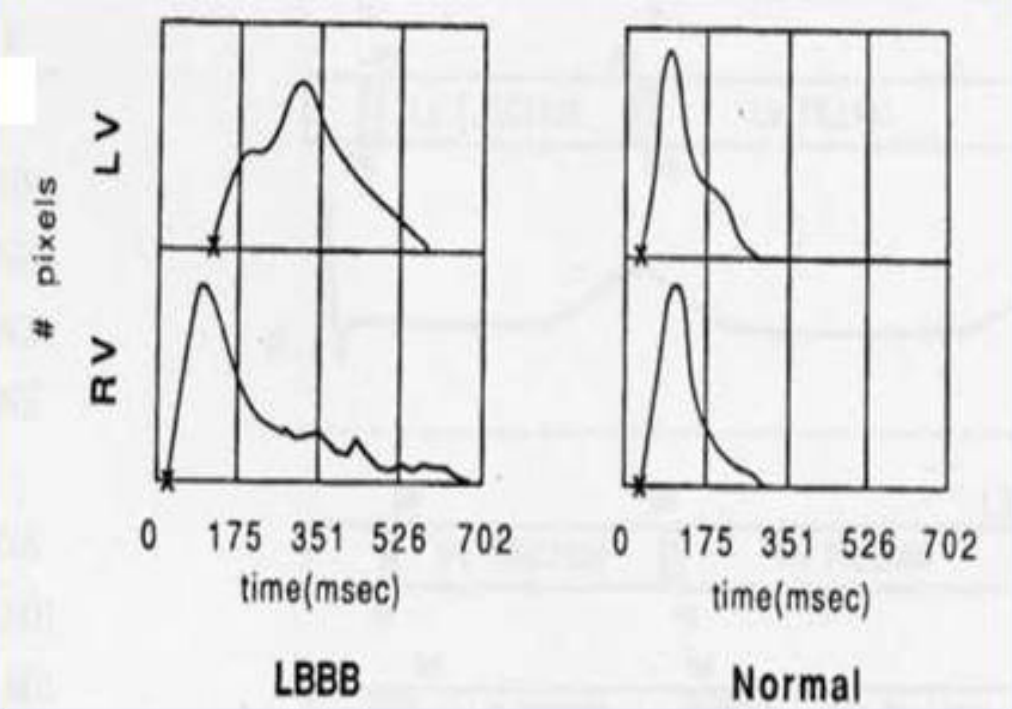
Perrenoud JJ 1989

Assessment of Regional LV Systolic Function

- SEMI QUANTITATIVE ANALYSIS
  - Conventional 2D echo
  - LV cavity contrast opacification in 2D
- QUANTITATIVE ANALYSIS
  - Myocardial velocity and deformation Imaging
  - Color kinesis + LVO
  - 3D echo (+ LVO)
- At rest and during stress

Cineloop of a patient with CHF and narrow QRS complexes

Cineloop of a patient with CHF and LBBB



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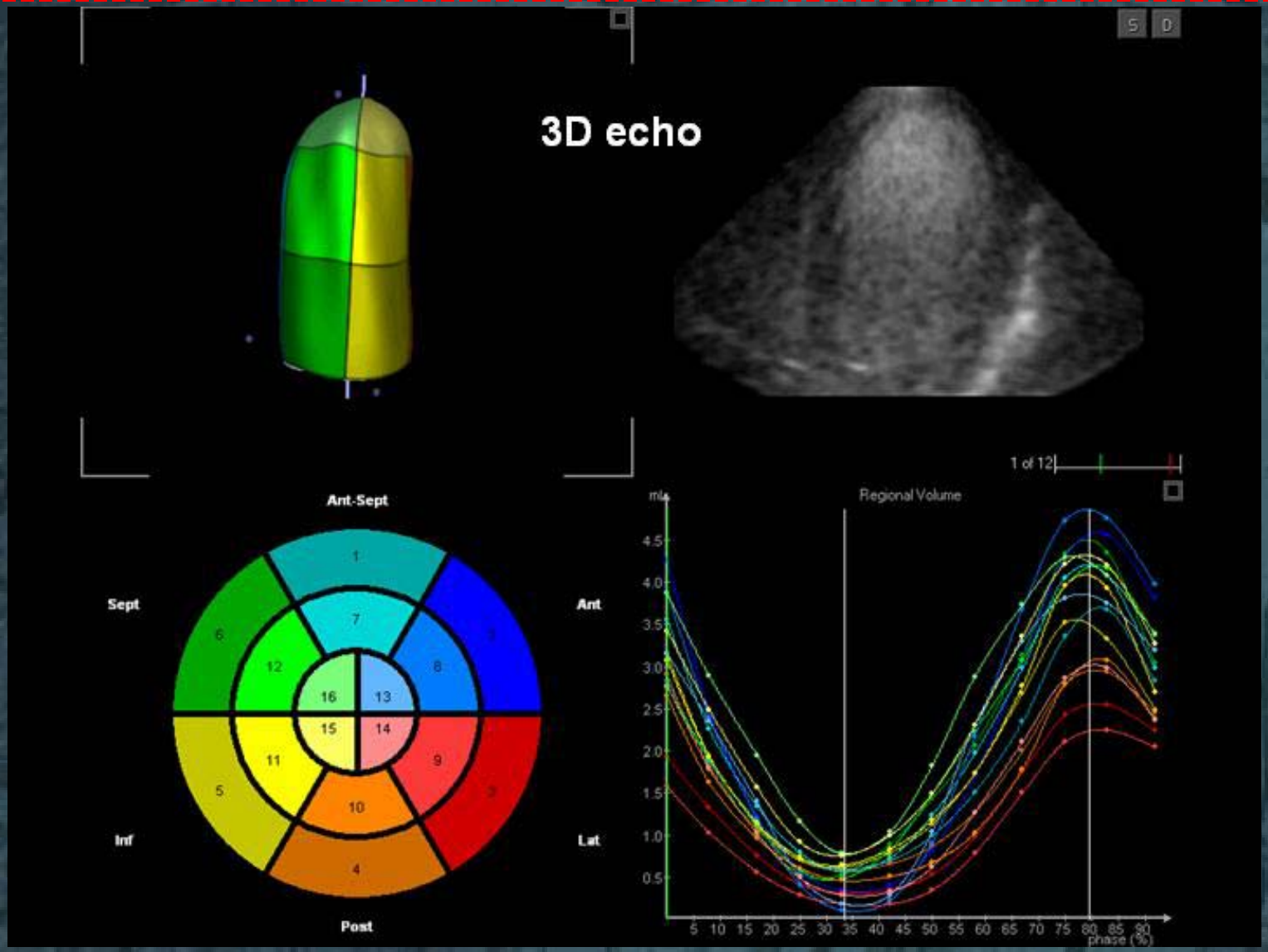
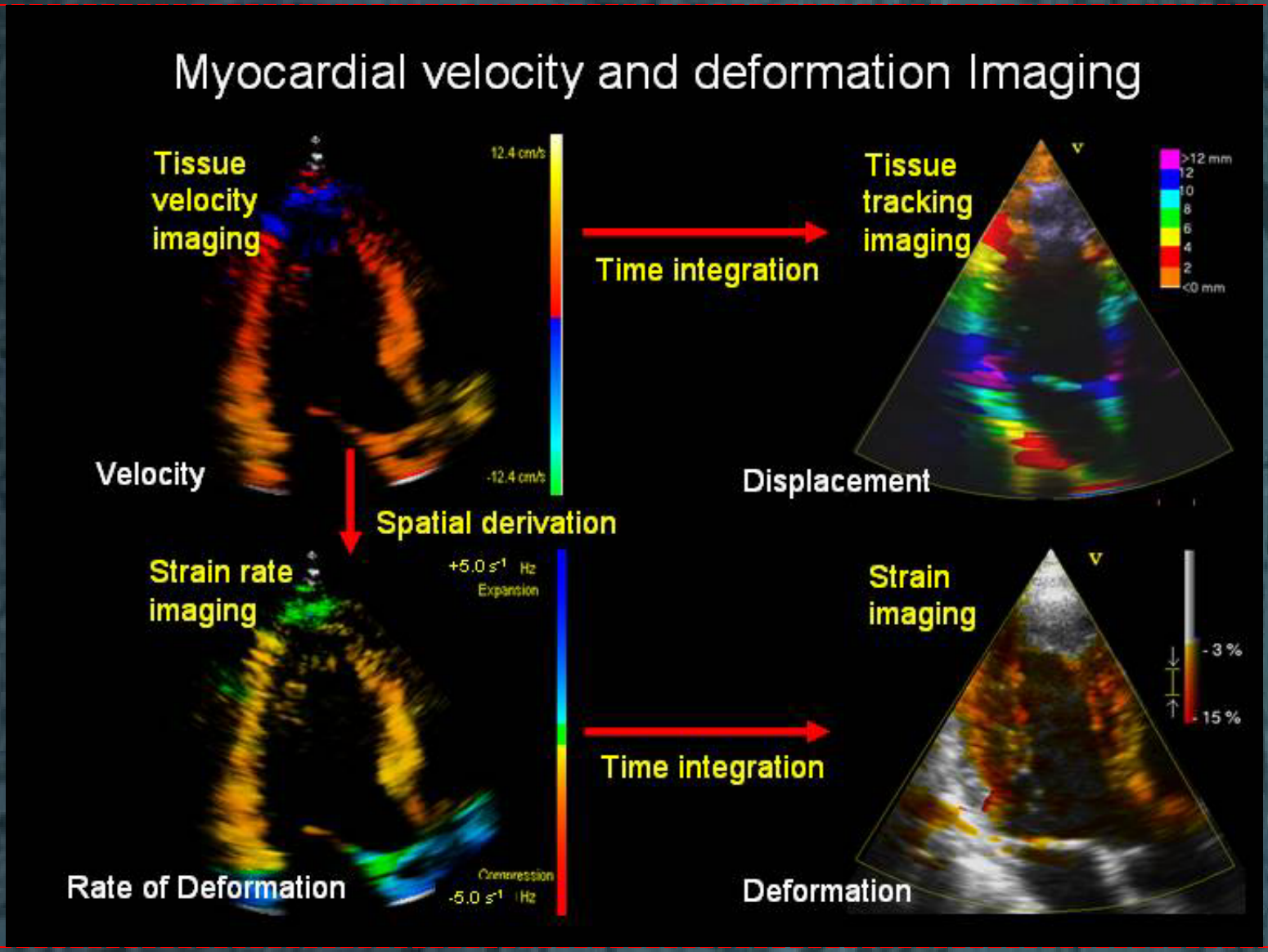
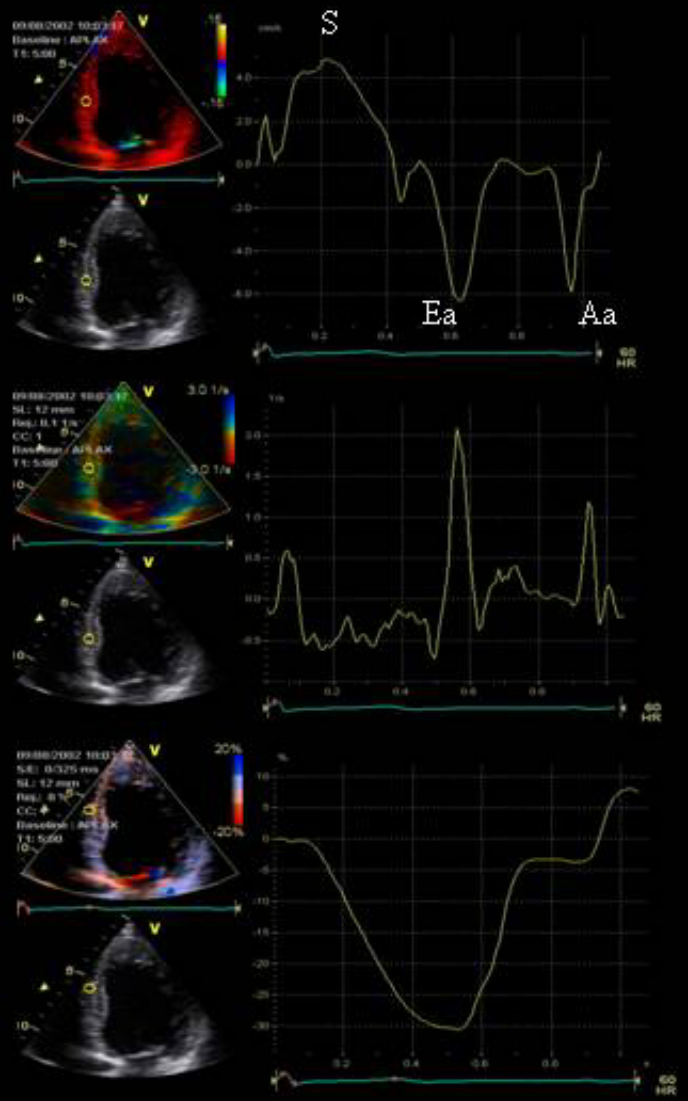
Delay between RV and LV activation 85 ms

Grines CL et al. Circulation 1989


3D echo
S
D
Ant-Sept
Sept
Ant
Inf
Lat
Post
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
1 of 12
Regional Volume
ml
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
phase (%)


Myocardial velocity and deformation Imaging
Tissue velocity imaging
12.4 cm/s
-12.4 cm/s
Velocity
Time integration
Tissue tracking imaging
>12 mm
12
10
8
6
4
2
<0 mm
Displacement
Spatial derivation
Strain rate imaging
+5.0 s-1 Hz
Expansion
Compression
-5.0 s-1 Hz
Rate of Deformation
Time integration
Strain imaging
- 3 %
- 15 %
Deformation

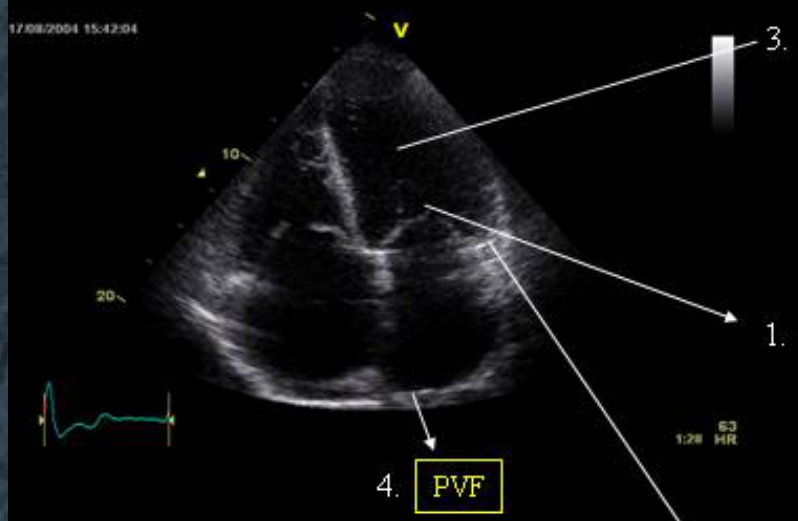


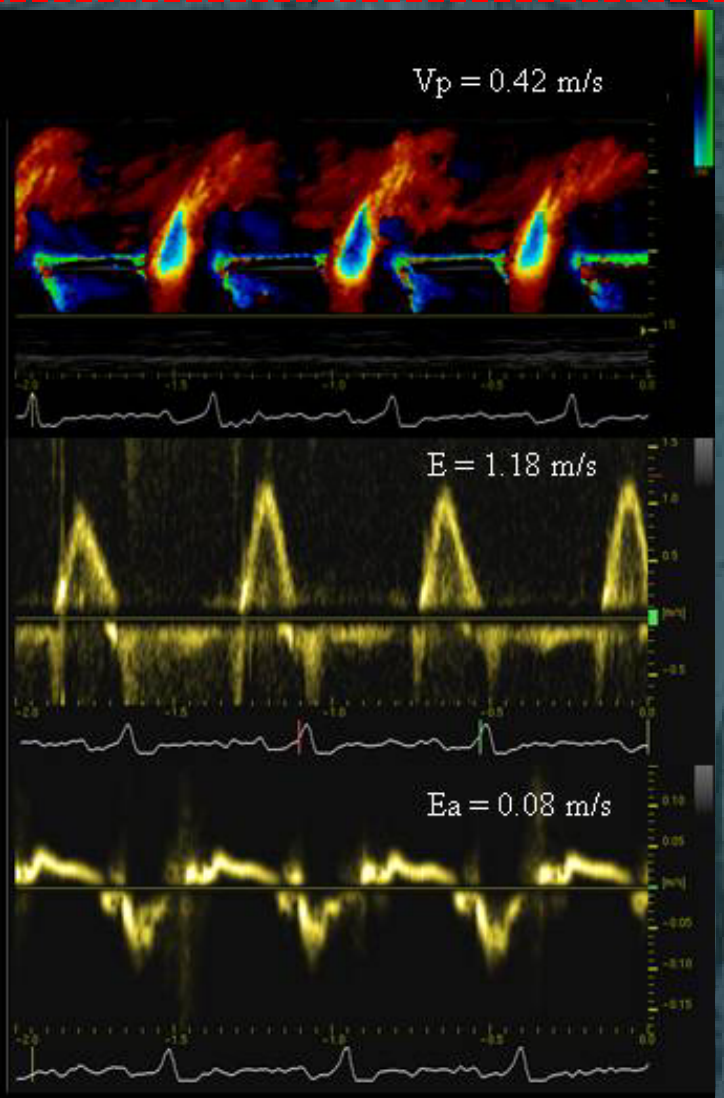
Tissue Doppler

Strain Rate

Strain

Assessment of LV diastolic function





E/Ea = 14.7 PCWP = 23mmHg

E/Vp = 2.8 PCWP = 19mmHg

CONCLUSION

- Ventricular assessment of size, shape and function has important prognosis and therapeutic implications
- Global and regional LV function: select your parameter (when poor endocardial definition or abnormal septal Motion)
- RWM analysis requires training
- Conventional analysis/Quantitative analysis

52.00 Pellerin 01