



Implementing New Technology

PP16 Imaging Conference

Bicol Hospital, Legaspi City, Philippines

July 2016

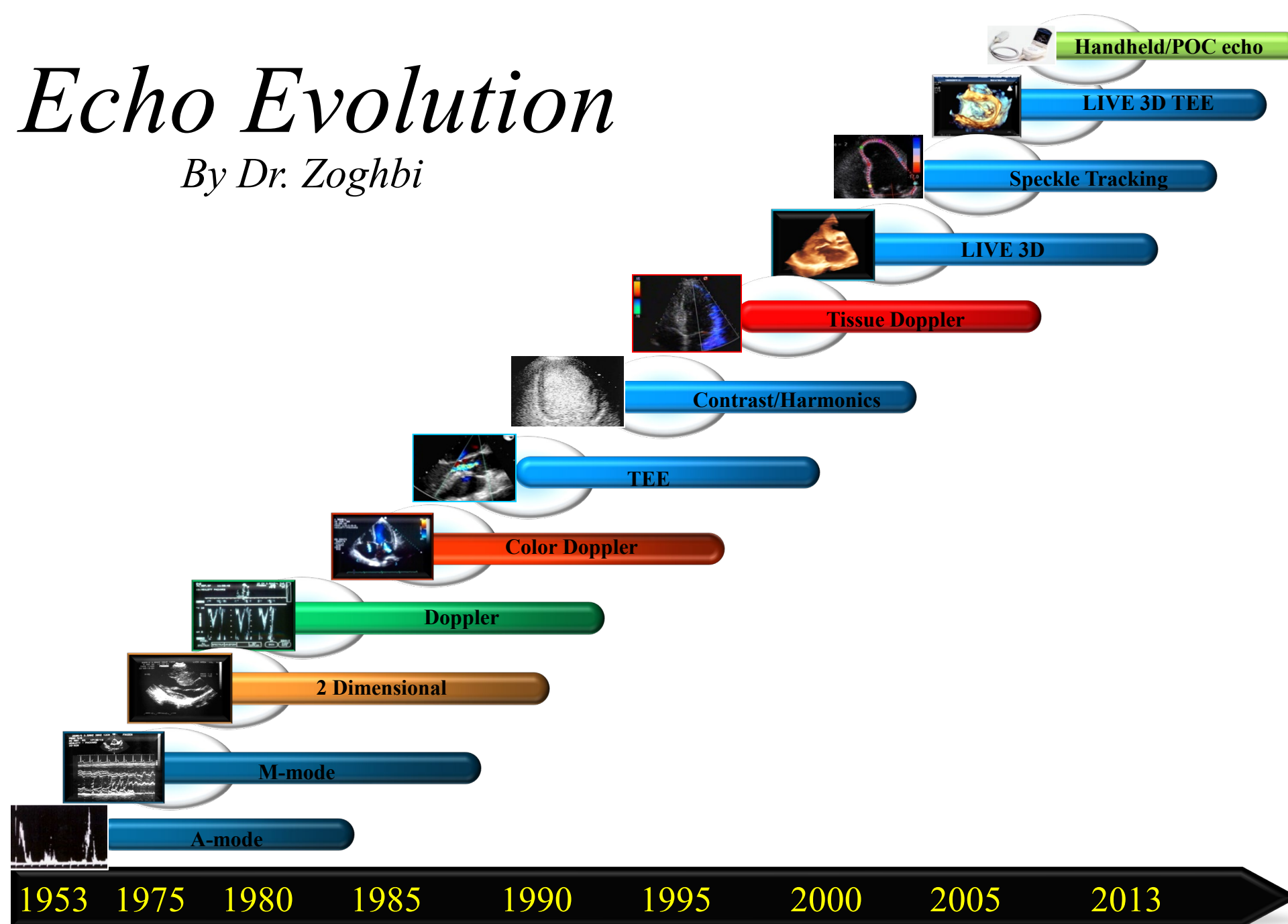
David Adams, ACS, RCS, RDCS, FASE

Duke University Medical Center

PACIFIC PARTNERSHIP 2016

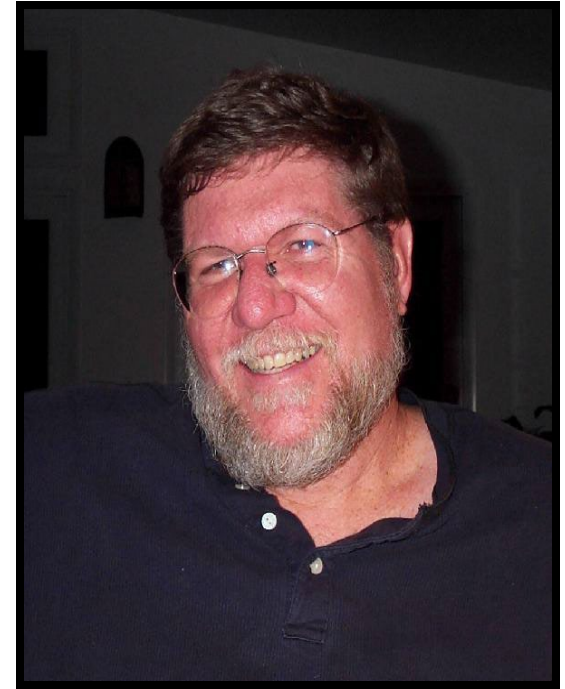
Echo Evolution

By Dr. Zoghbi





Scary Evolution





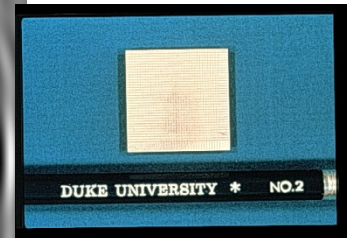
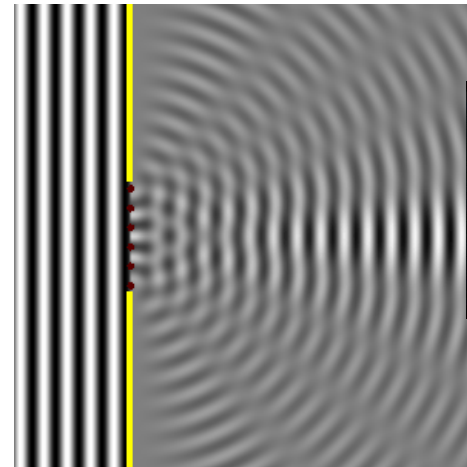
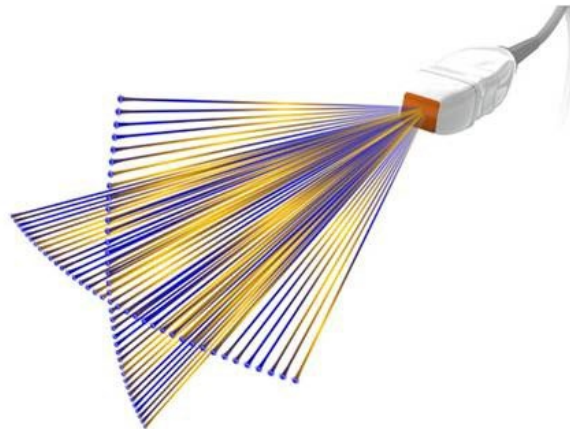
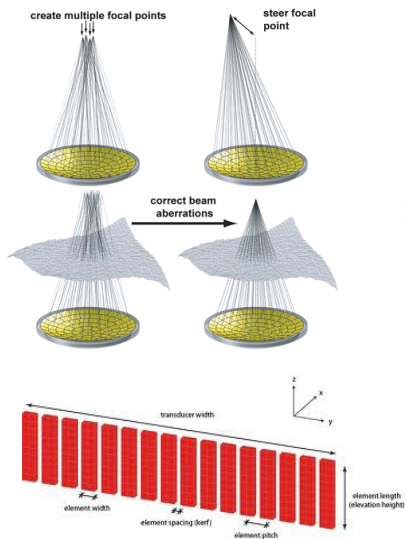
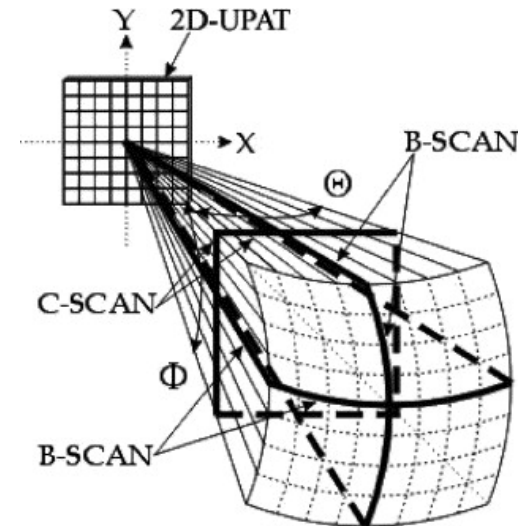
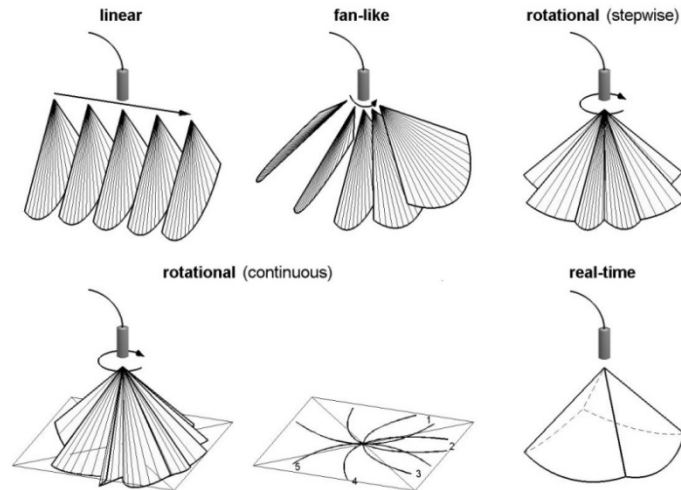
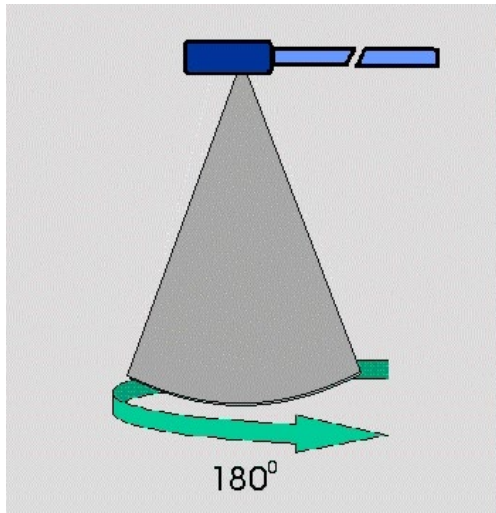
Echo Technology

New Technology
Requires New
Questions

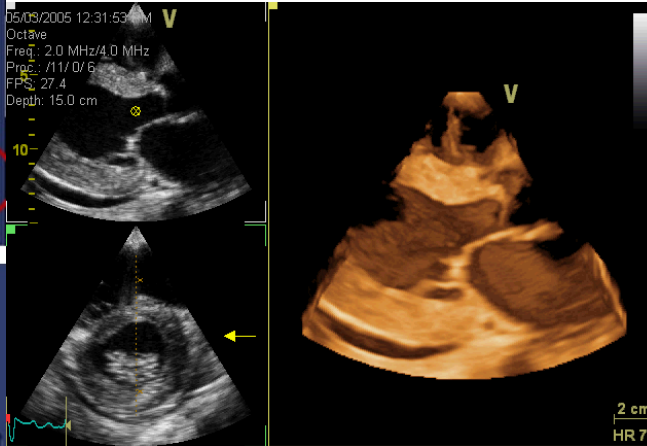


1st – What we are NOT Covering

~~Physics~~



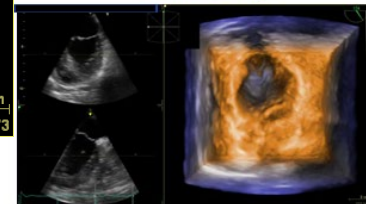
~~Knobology~~



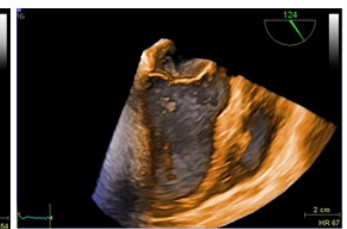
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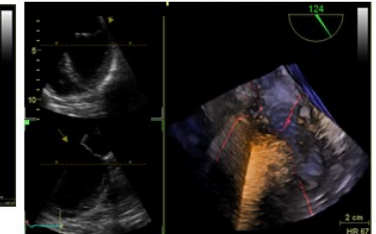
2ClickCrop



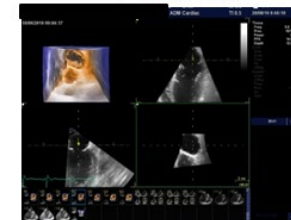
FlexiView



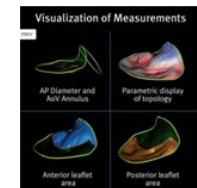
LaserLines



FlexiSlice



MV Assessment (EchoPAC)





More why than how!



Questions

- Who routinely does 3D?
- Who does strain imaging?



Question

- Why should you care?



The Goal of Echo?

- ~~• Gives you a job~~
- ~~• Makes money for the lab~~
- ~~• Makes money for IAC~~
- ~~• To make a diagnosis~~
- To get the pt to therapy



Today's Talk

- Speckle Strain



Echo Technology

My Interpretation



“It takes a strong
man to make a
tender chicken”

Frank Perdue



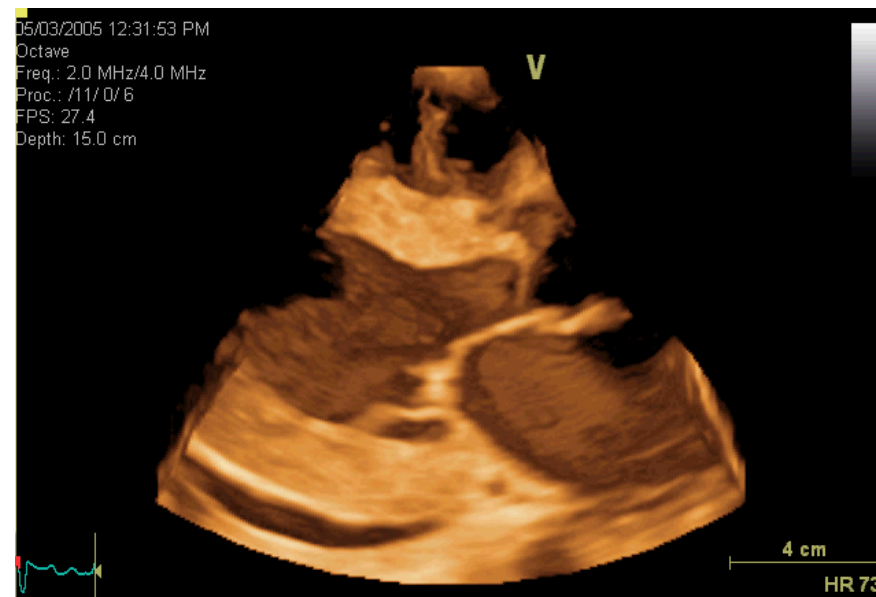
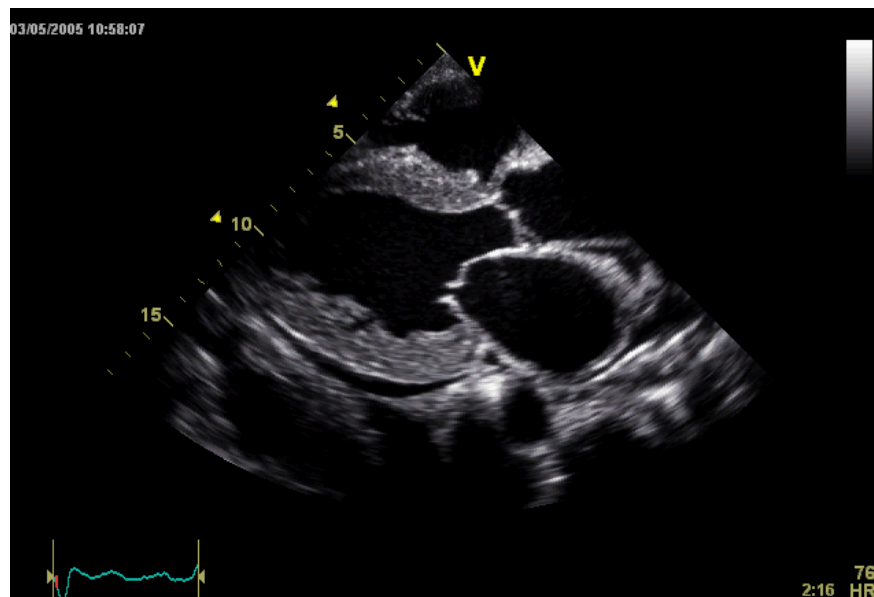
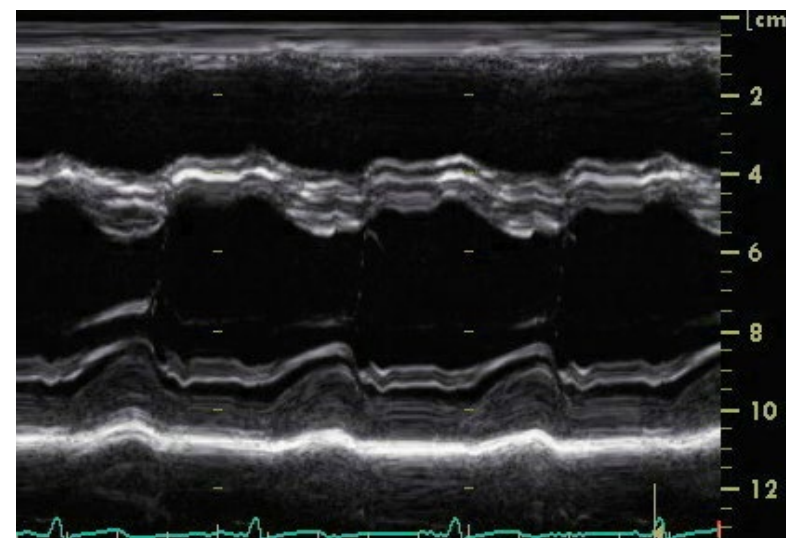
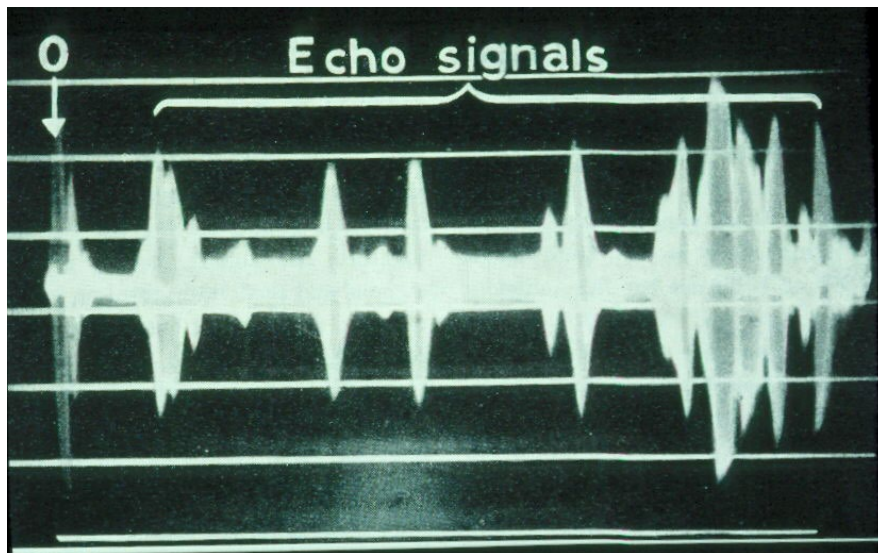
“It takes an aroused
man to make a
chicken affectionate”

Spanish translation



History of Echo

- One Slide





Questions for any New Technology

- Does it help you get thru the day?
- It is reproducible?
- Is it the same across Vendors?
 - EF is
 - Longitudinal strain is (kind of)
 - Others not

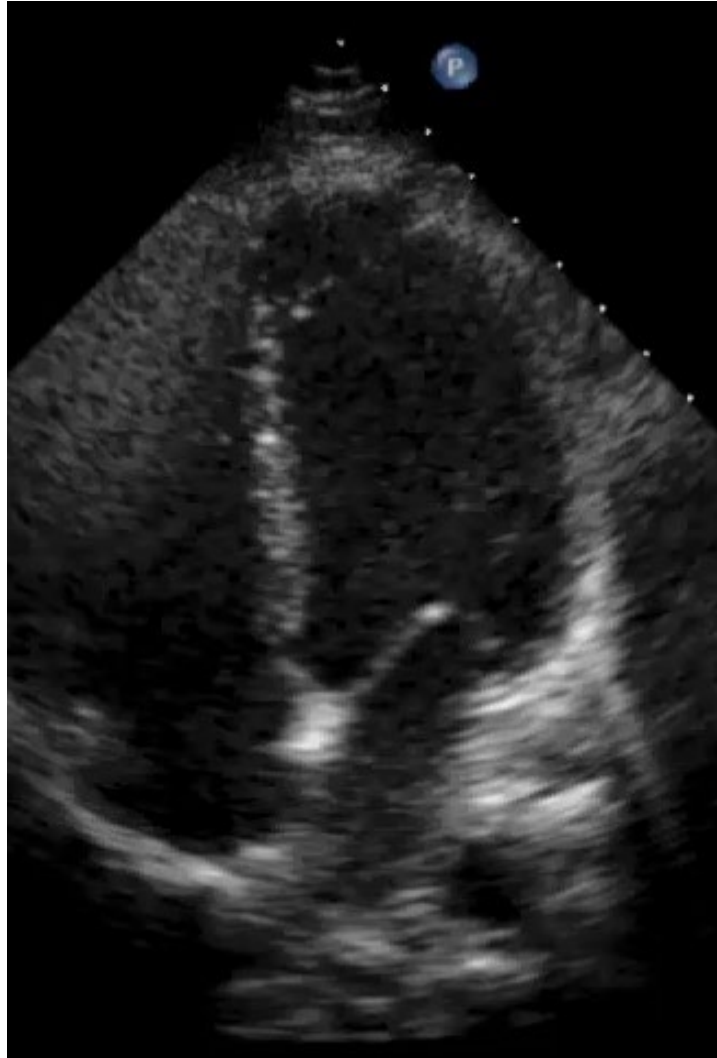


Strain Case

- 32 y/o F
- Breast CA dx 2012
- Older Sister dx'd 2010
- Started on chemotherapy –
adriamycin
- Concern = cardiotoxicity

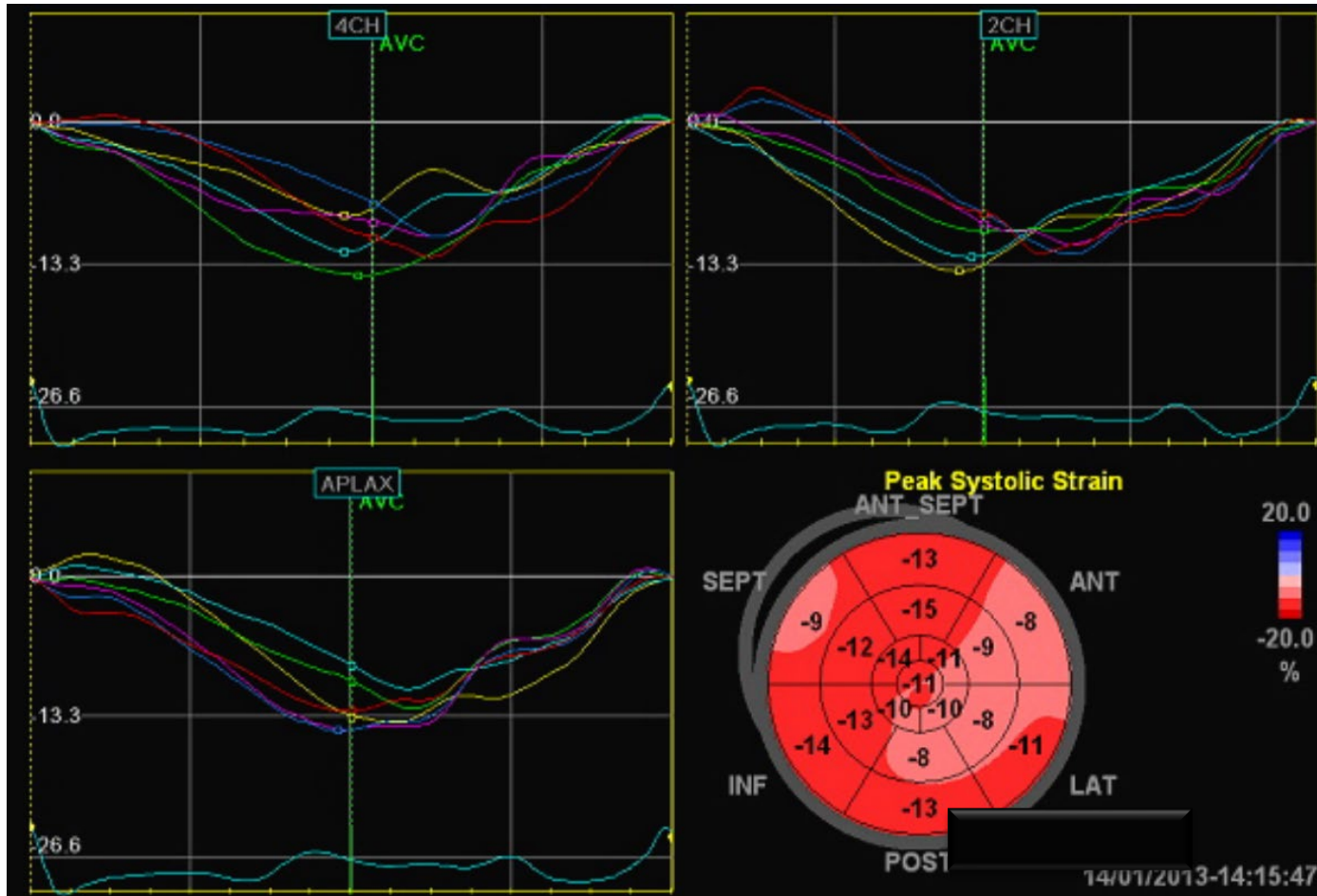


Chemo pt



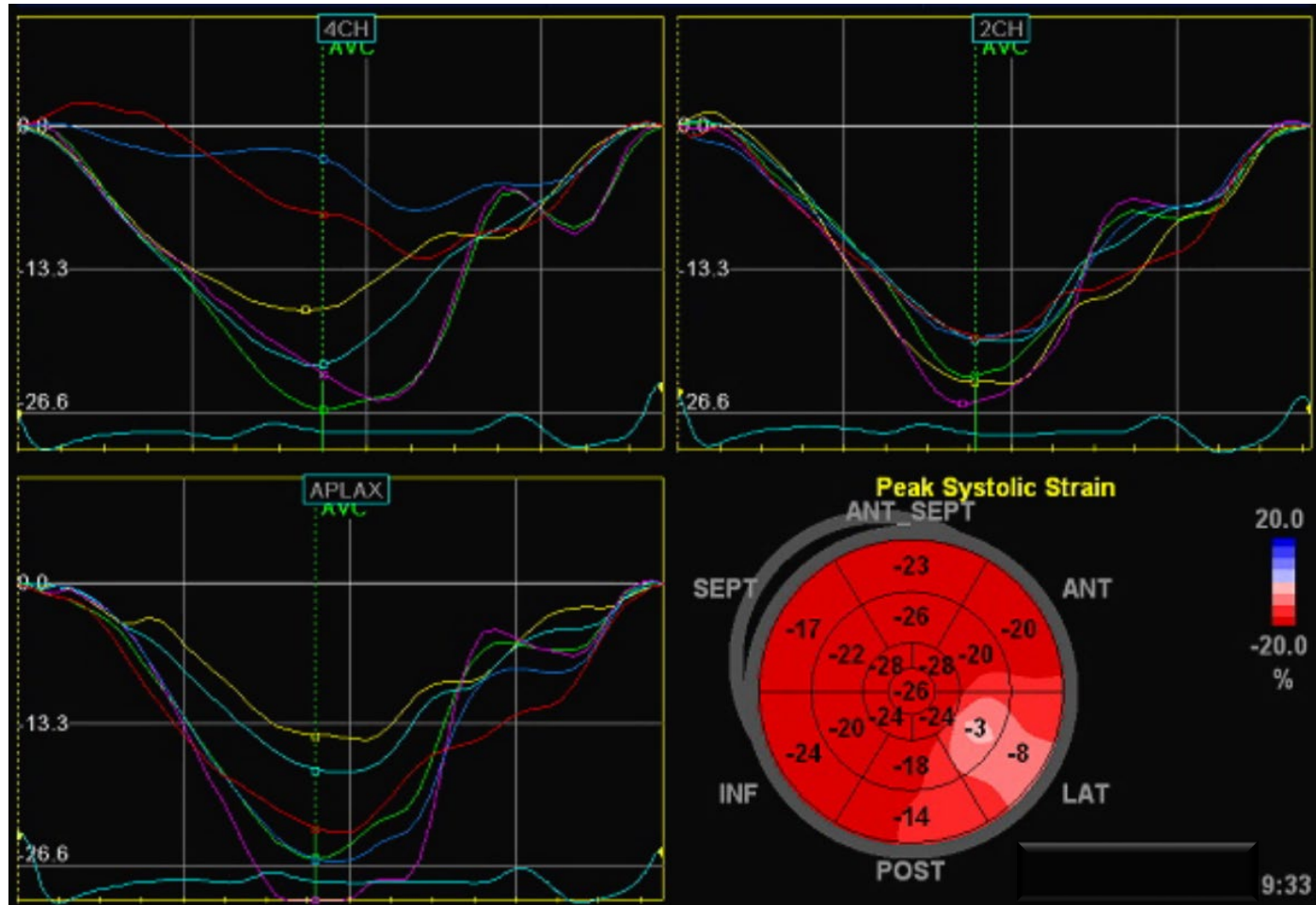


Strain #1 during chemo



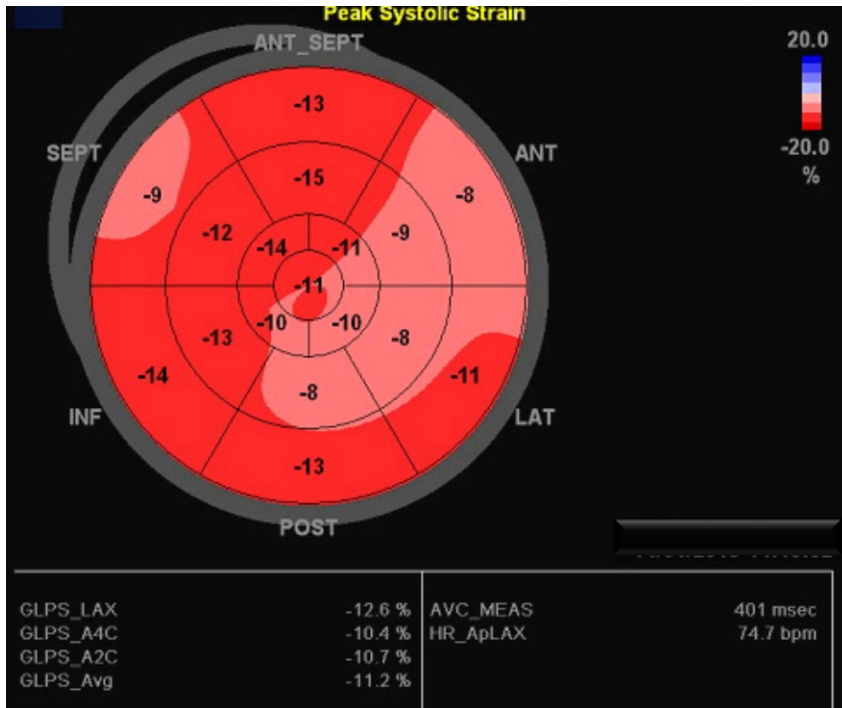


Strain #2 post change

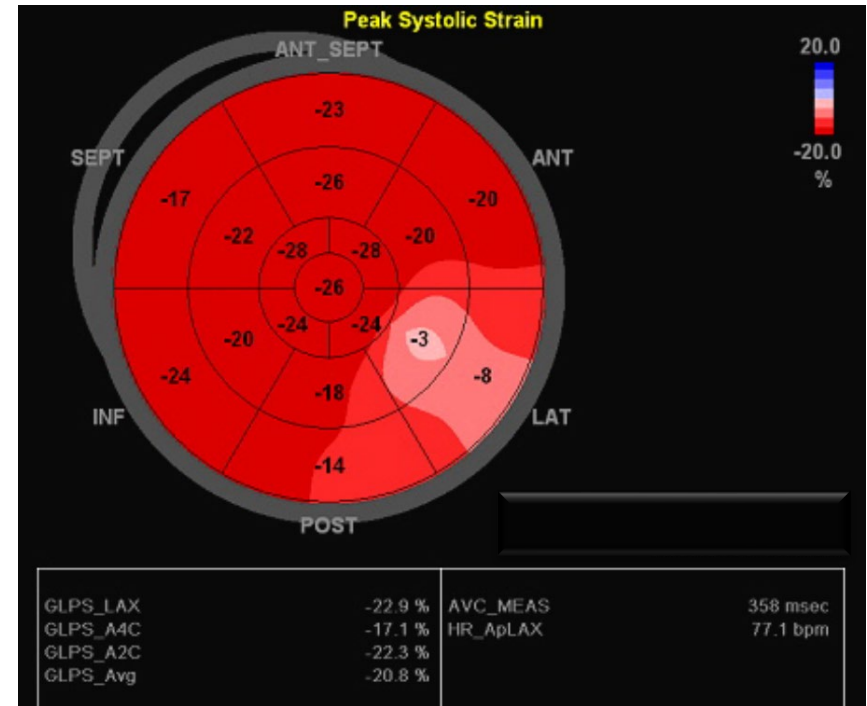




Chemo pt – Strain #1 vs 2



GS = -11%



GS = -20%

**We will come back
to this patient.**



Strain's Bottom Line

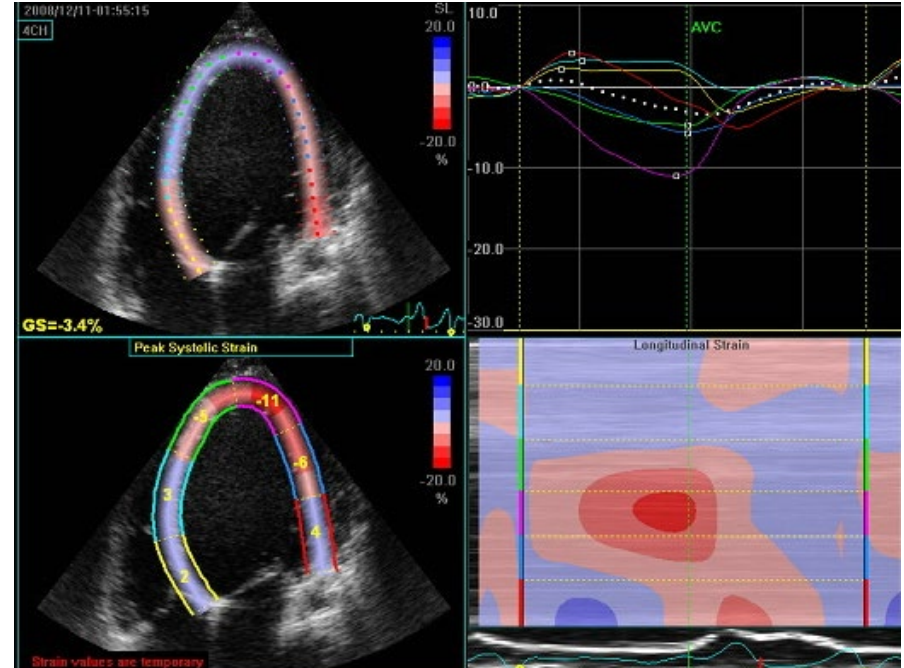
- Strain changes before EF changes
- Serial studies – tracking small changes over time



Strain – pattern recognition



Good



Bad



Strain

- Not for sissies
- Confusing
- Strains the brain
- My Goal – simplify
- Echo's goal – get the pt to therapy
- Strain is just another tool

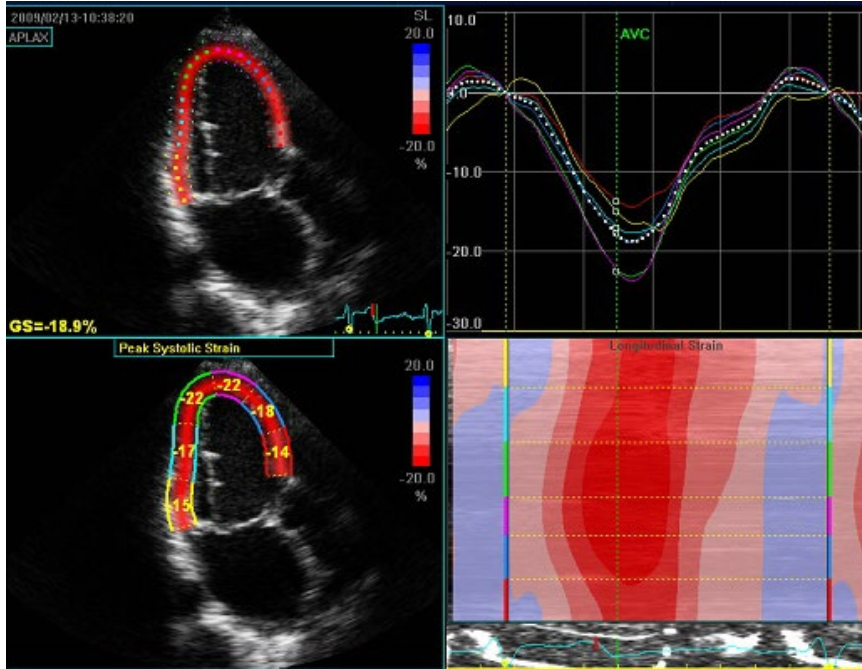


Some New Terms

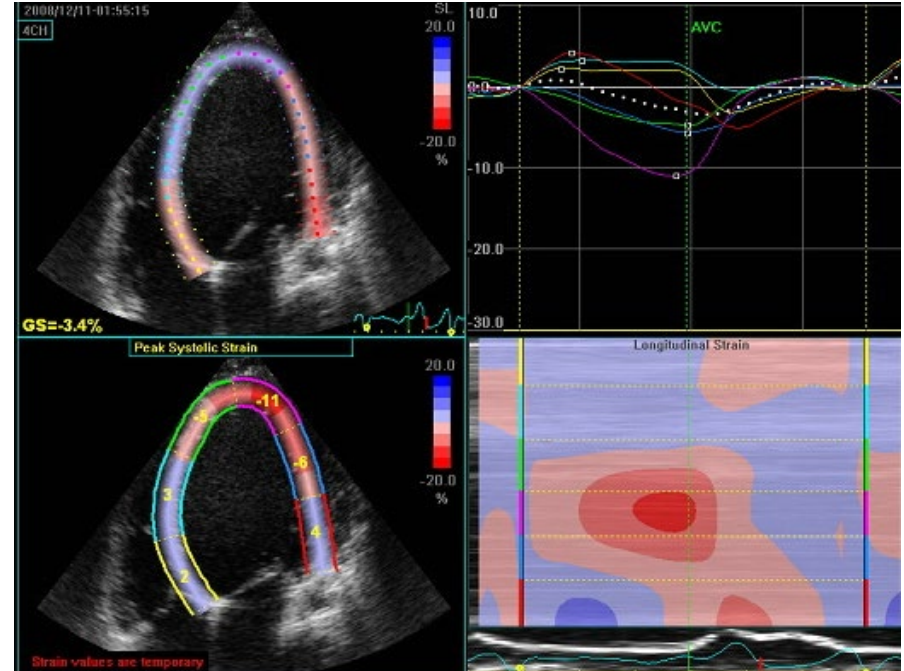
- Parametric imaging
 - Measuring things the eye can't see
 - Requires special software



Parametric displays



Good



Bad



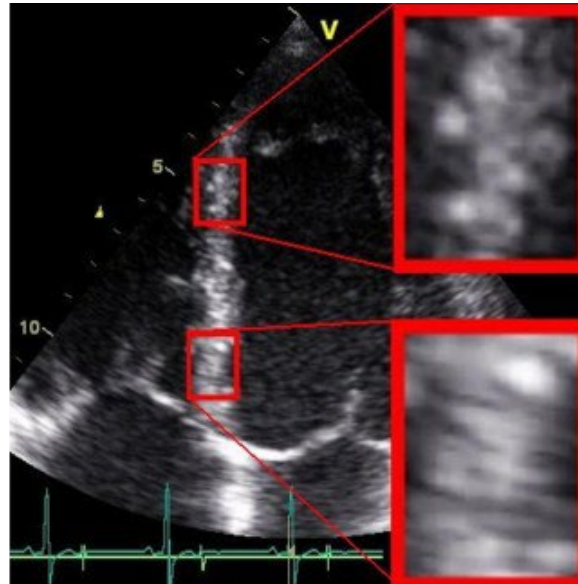
Some New Terms

- Parametric imaging
 - Measuring things the eye can't see
 - Requires special software
- Speckle



Speckle

- Acoustic signature within tissue
- Myocardium = lots of speckles
- A “kernel” is a defined area of speckle





Some New Terms

- Parametric imaging
 - Measuring things the eye can't see
 - Requires special software
- Speckle
- Speckle-Tracking (STE)



Speckle tracking

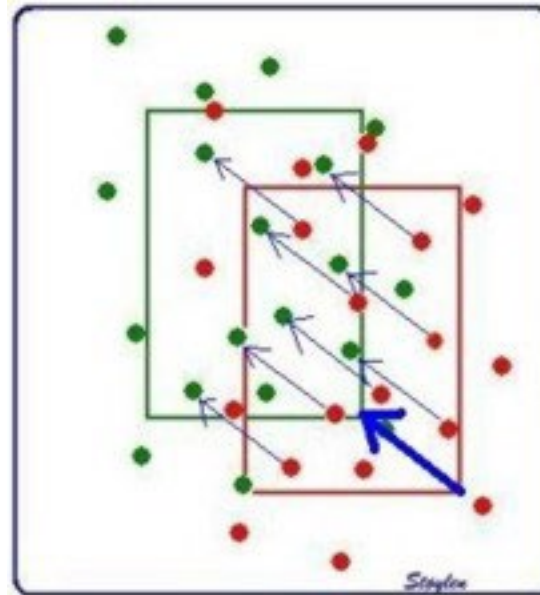
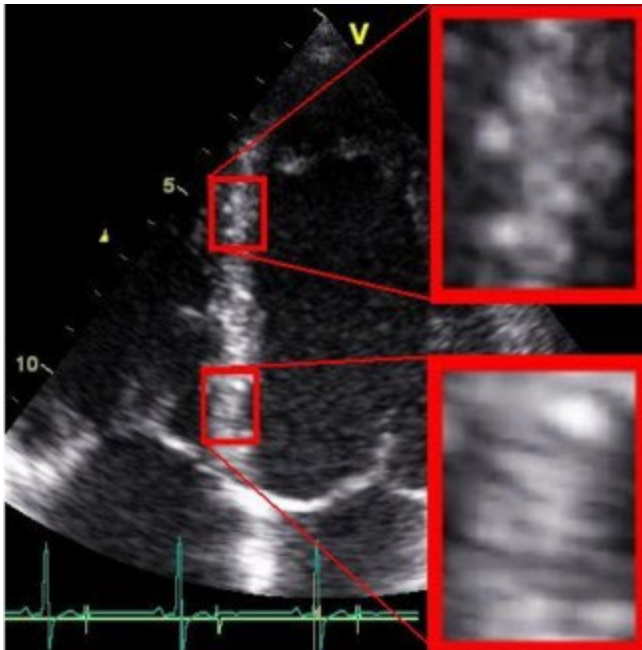
Variability of Global Left Ventricular Deformation Analysis Using Vendor Dependent and Independent Two-Dimensional Speckle-Tracking Software in Adults

Niels Risum, MD, Sophia Ali, MD, Niels T. Olsen, MD, PhD, Christian Jons, MD, PhD, Michel G. Khouri, MD, Trine K. Lauridsen, MD, Zainab Samad, MD, Eric J. Velazquez, MD, Peter Sogaard, MD, DMSc, and Joseph Kisslo, MD, *Durham, North Carolina; Gentofte, Denmark*



Speckle tracking

- Acoustic signature within tissue
- Myocardium = lots of speckles
- A “kernel” is a defined area of speckle





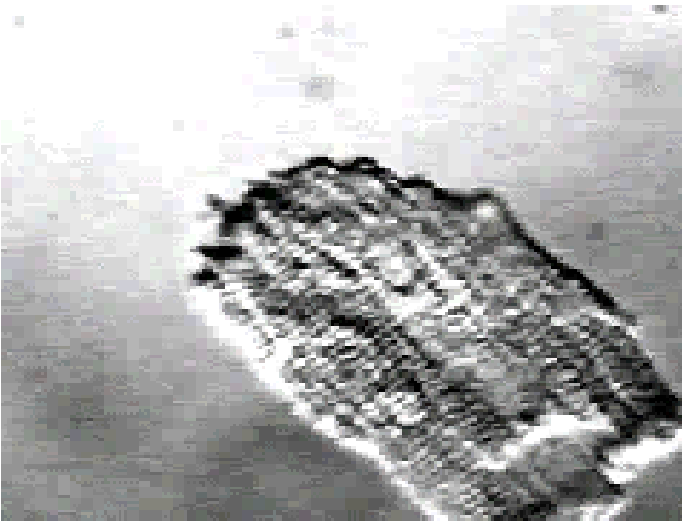
Strain software

- Identifies, tracks and displays speckle patterns (kernels) in the myocardium
- Why should you care (besides having a new toy)
- Helps clinically:
 - Chemo pts – more sensitive than EF
 - HCM / amyloid
 - CRT
 - CAD & Valvular Disease



Strain

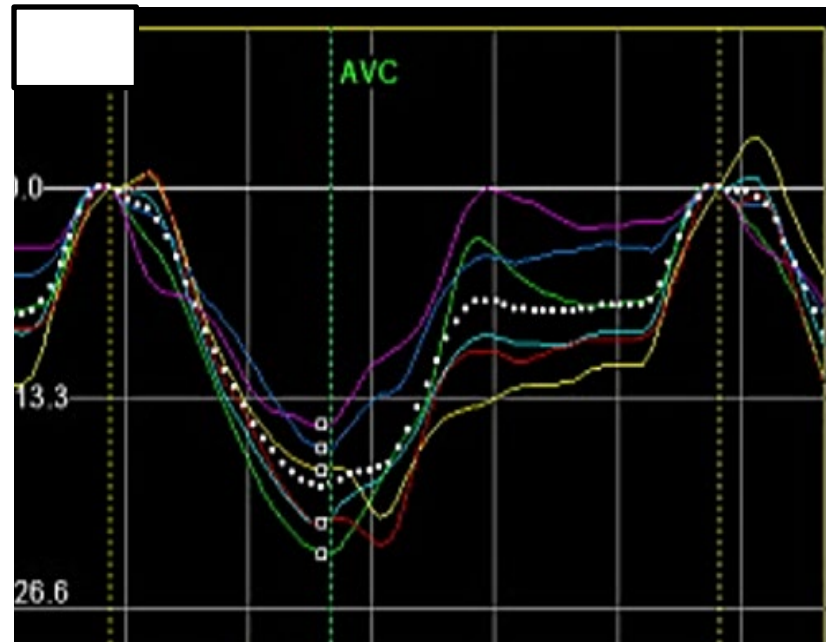
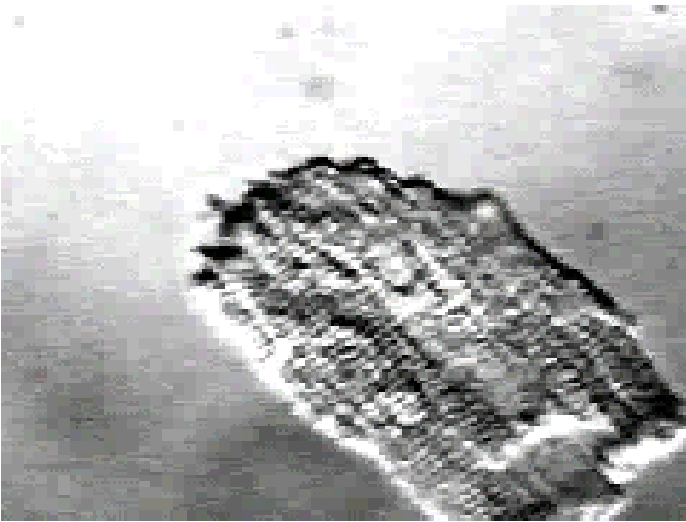
- Deformation dealing with shape and volume change
- Distance between speckle kernels changes





Strain

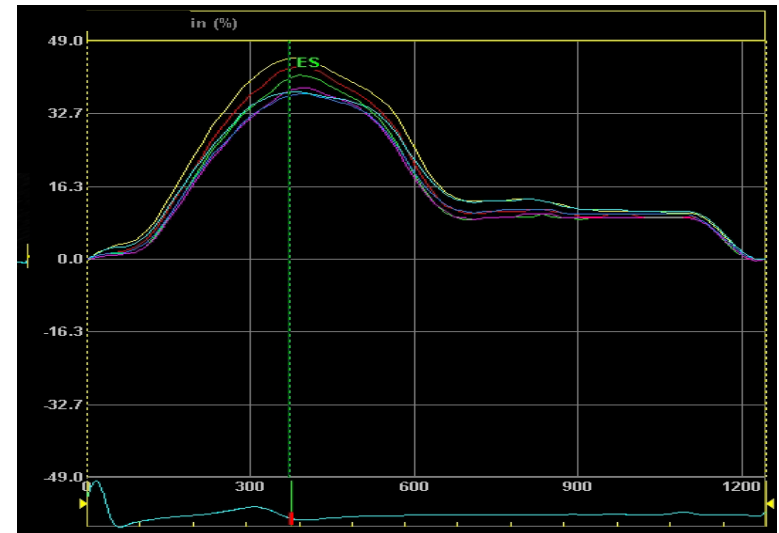
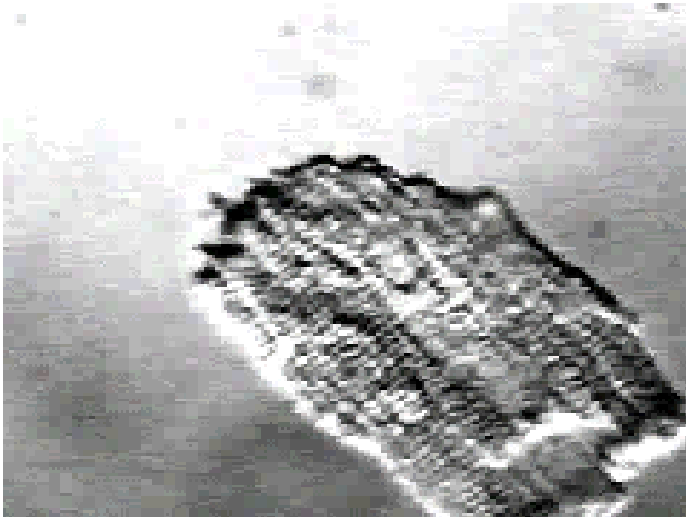
- During contraction (systole) in the long axis speckle gets closer (negative) – longitudinal strain





Strain

- During contraction (systole) in the long axis speckle gets closer (negative)
- In the short axis the speckle moves away (positive) – radial strain

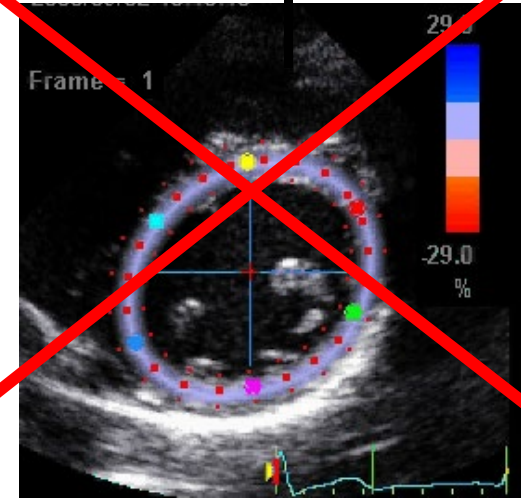
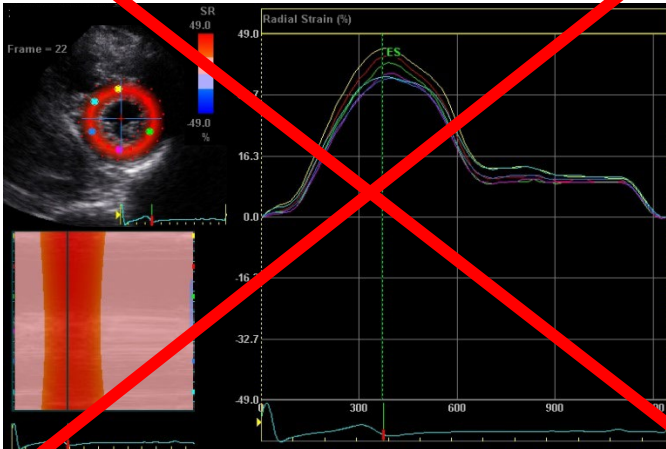




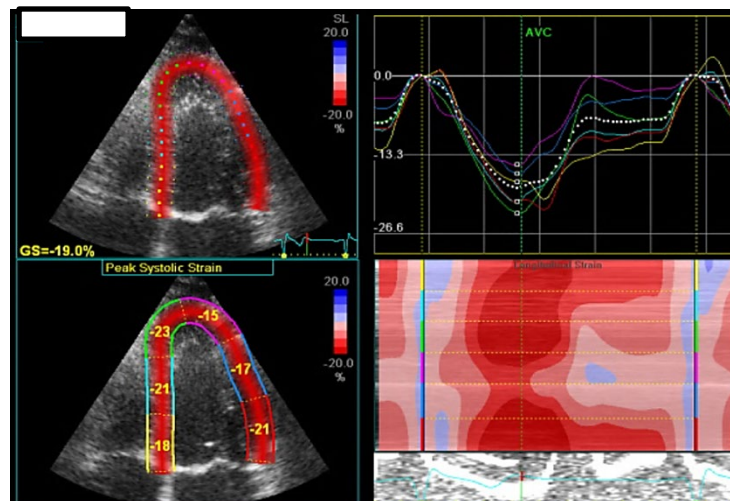
3 Types of Strain

Radial

Circumferential



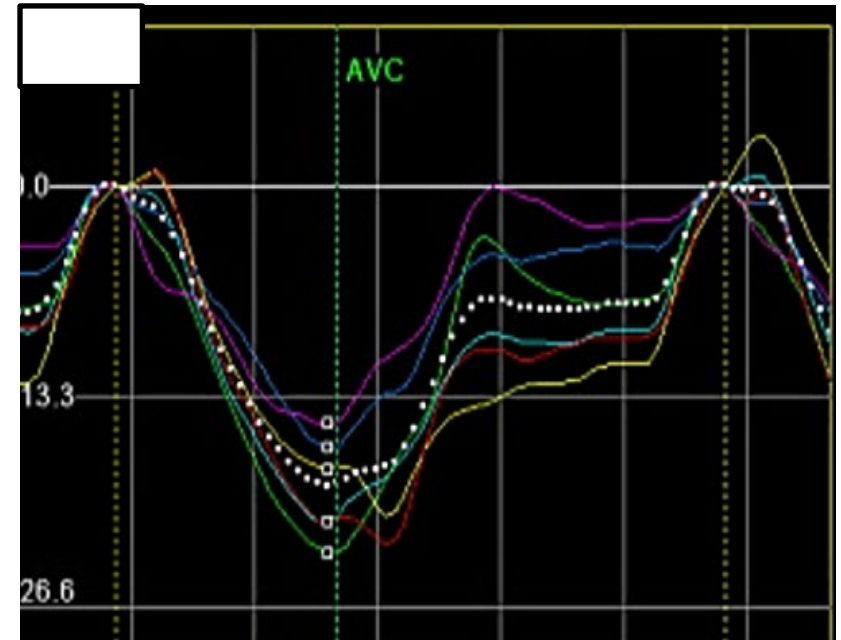
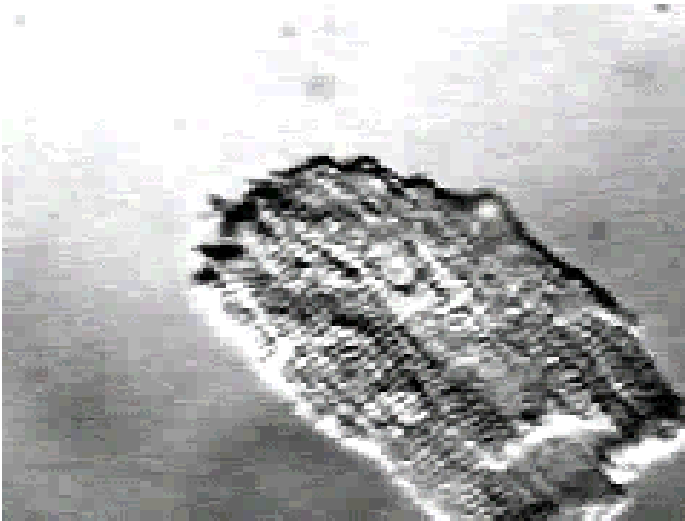
Longitudinal





Longitudinal Strain

- Negative
- Unitless (percentage)
- Normal (-19 or 20%)



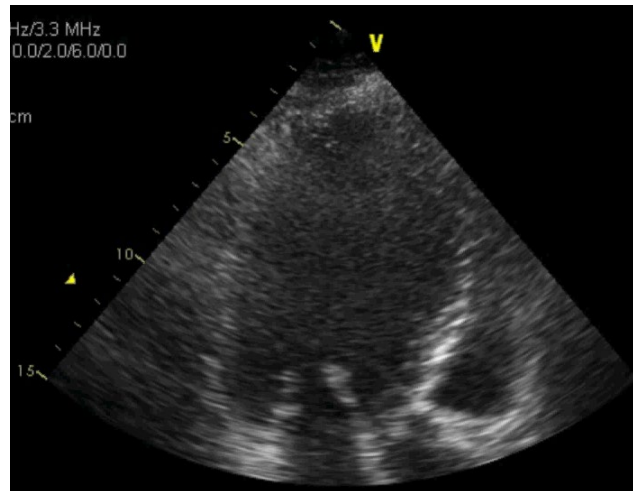
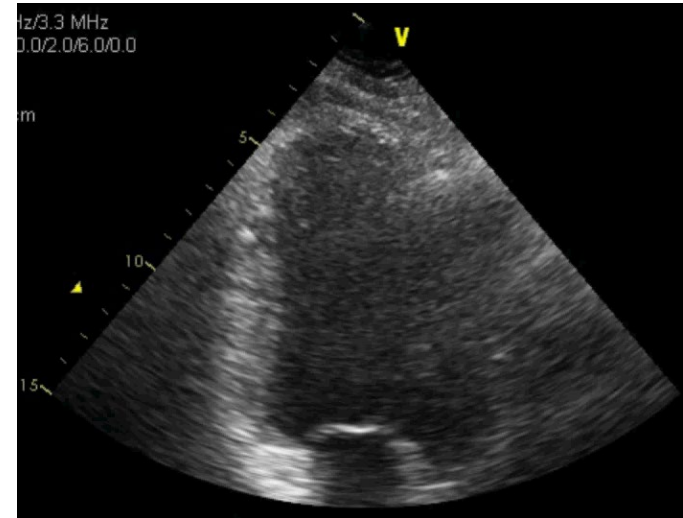
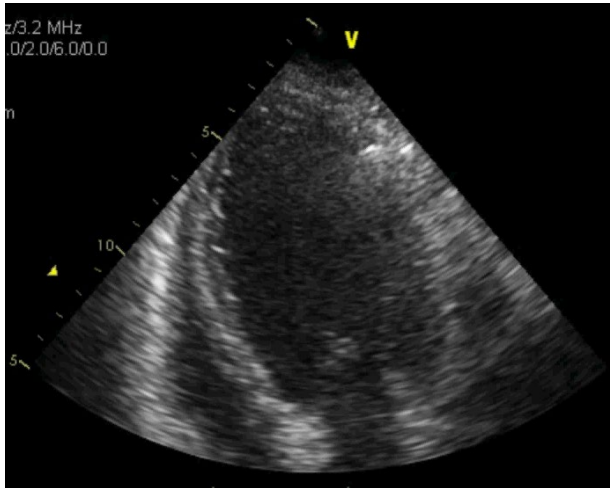


Getting started

- 2D Images Required:
 - Apical 4 chamber
 - Apical 2 chamber
 - Apical Long



Examples: 2D images



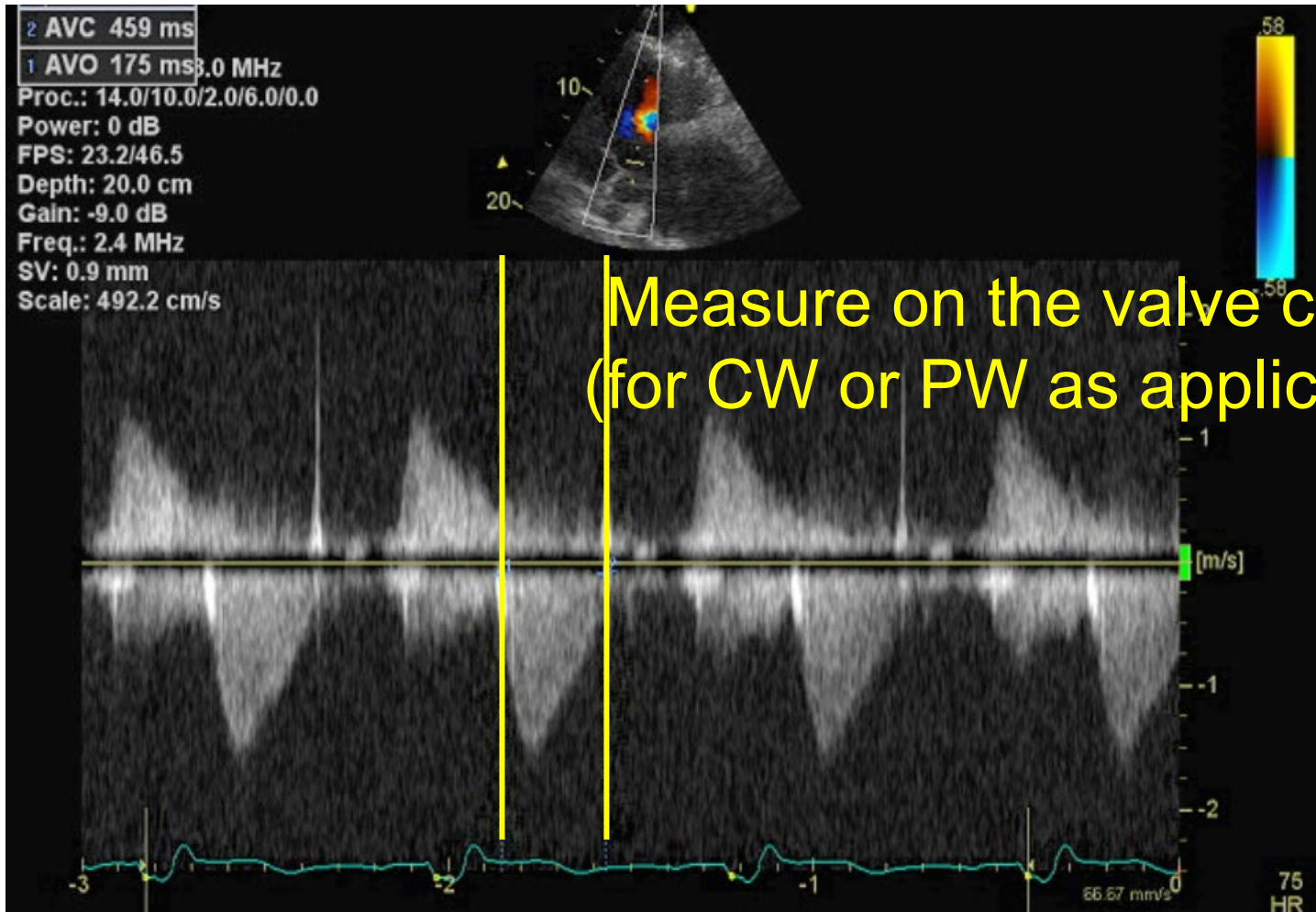


How to perform a Speckle-Tracking Strain Echocardiogram

- 2D Images Required:
 - Apical 4 chamber
 - Apical 2 chamber
 - Apical Long
- Doppler images Required (for AoV closure timing):
 - CW through AoV
 - PW of LVOT

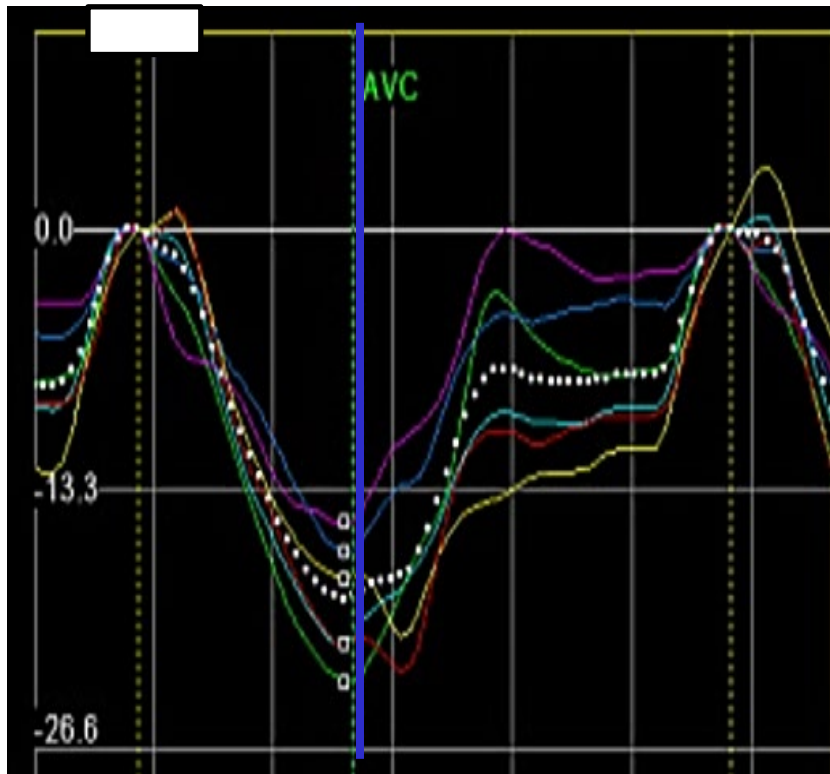


Example: Spectral Doppler





Why do we care about AoV closure?

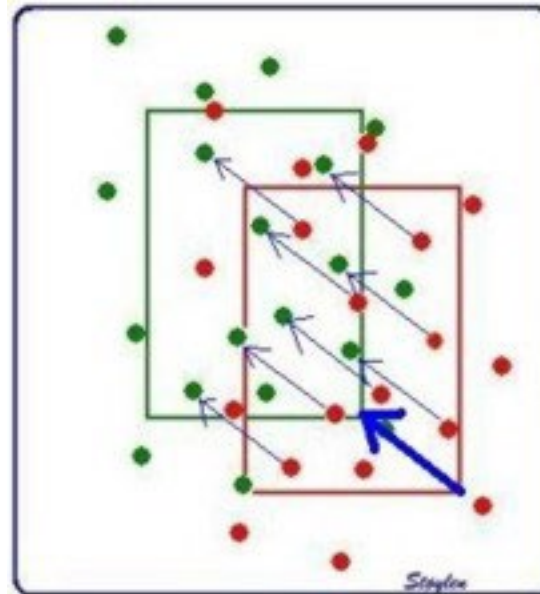
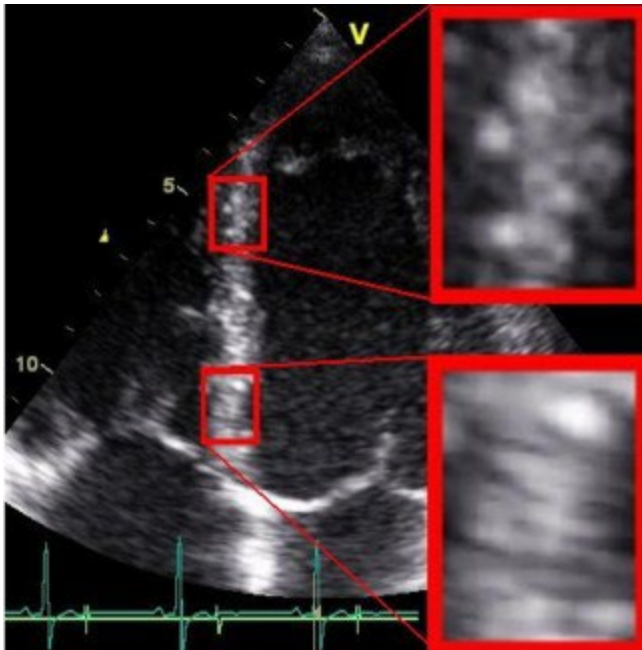


Contraction after
AoV closure is
wasted energy.



Why do we care about frame rate?

- Frame rate of 60-90Hz
- < 60 Hz kernels move too much
- > 90 Hz kernels don't move enough

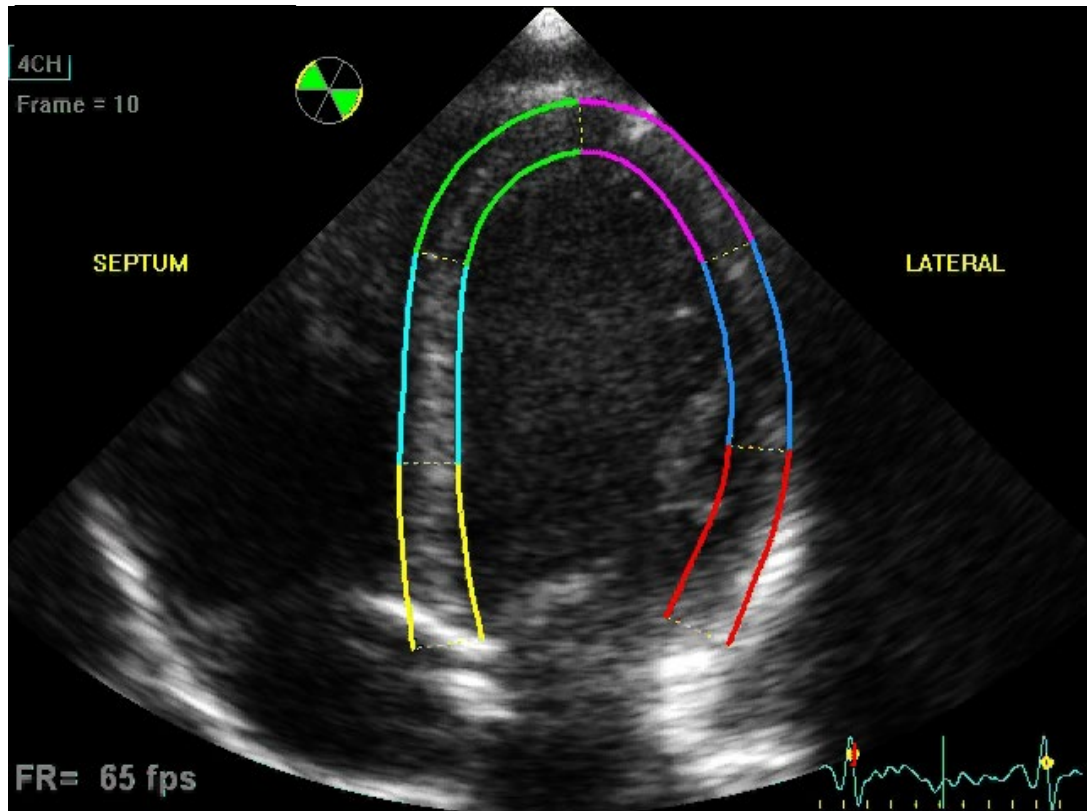


Analysis

- Check the waveforms!
- Do they make sense?
- What do they mean?
- What are the other things shown in the analysis?

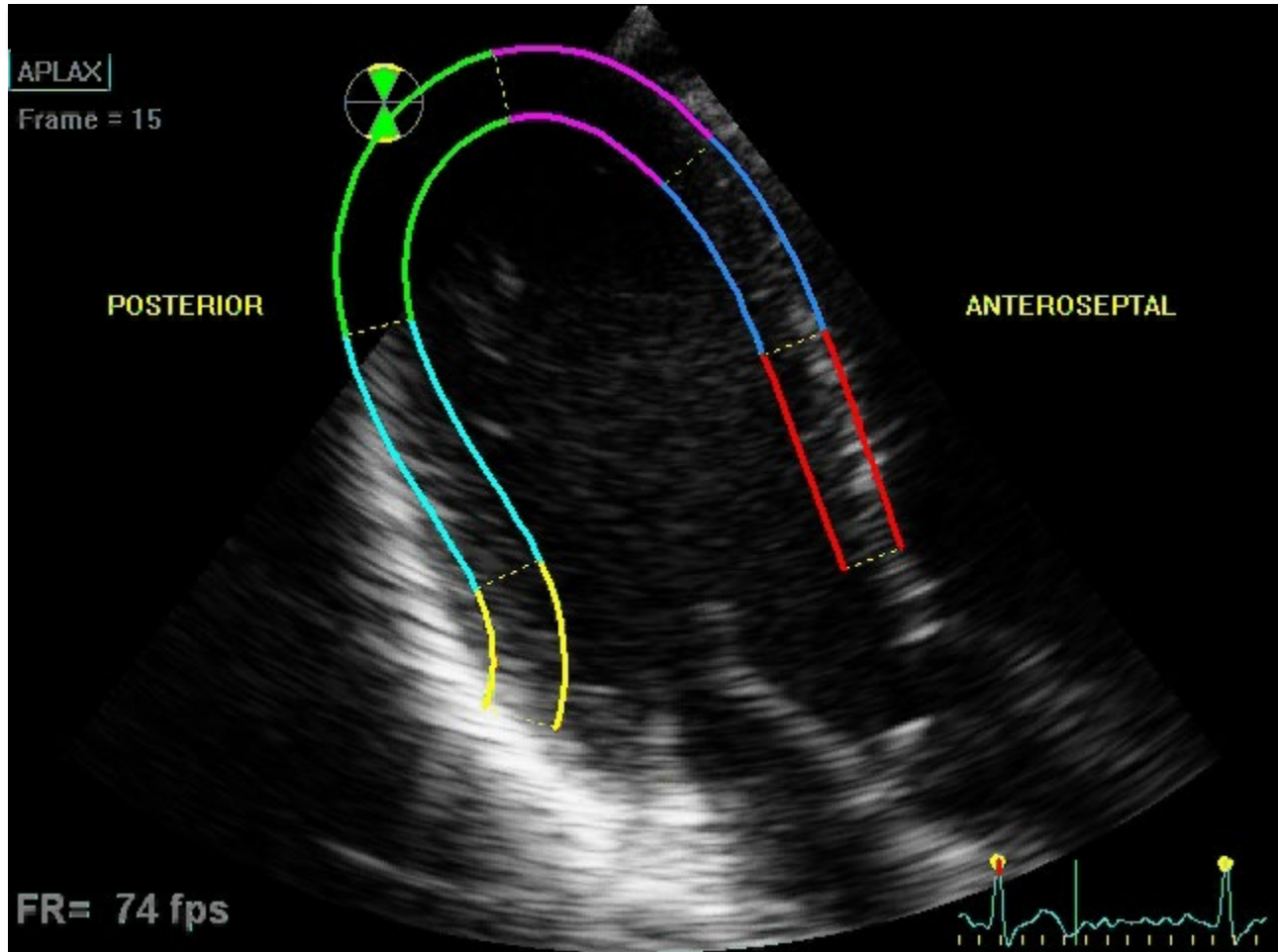


Good tracking

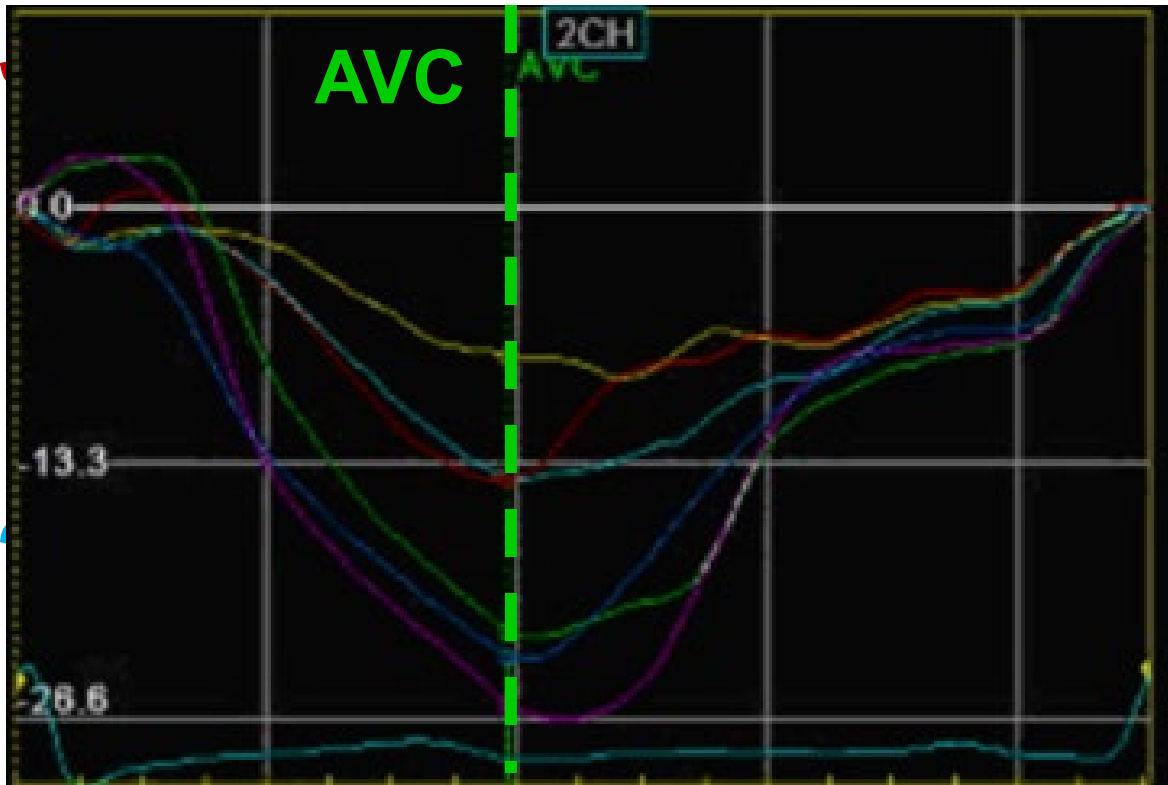




Bad tracking (stupid)



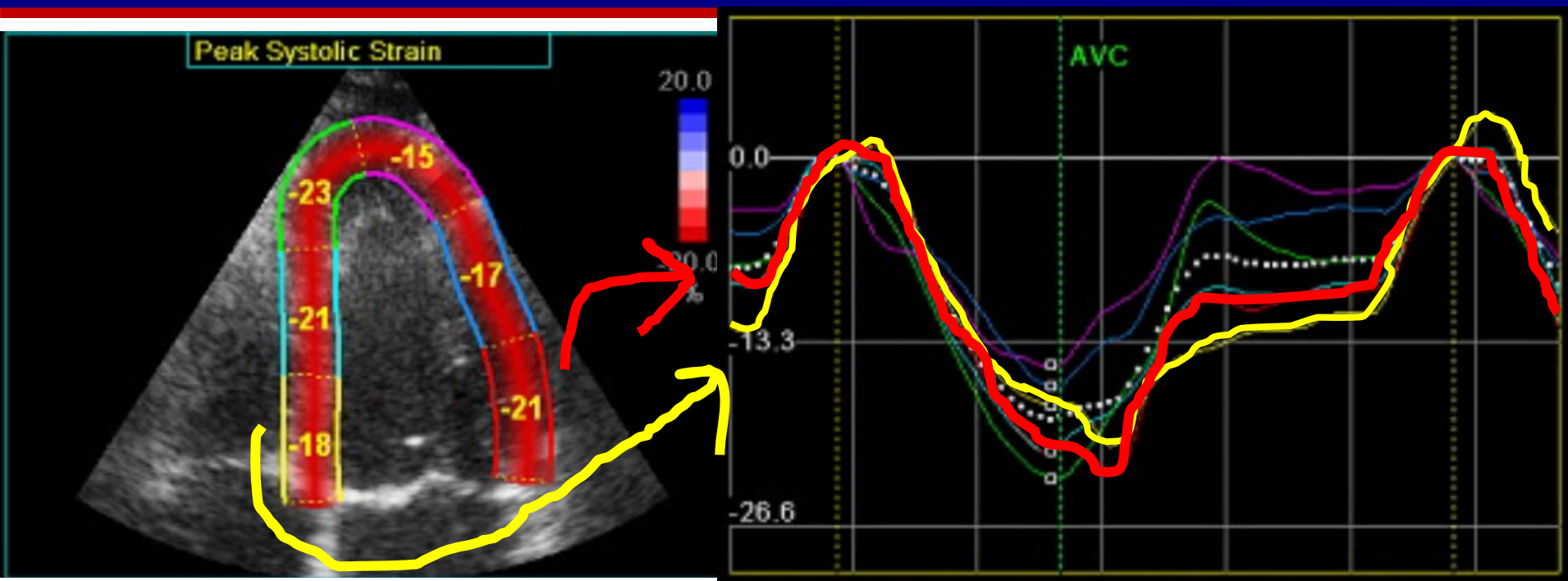
Waveforms



Waveforms trace the regional strain throughout the cardiac cycle



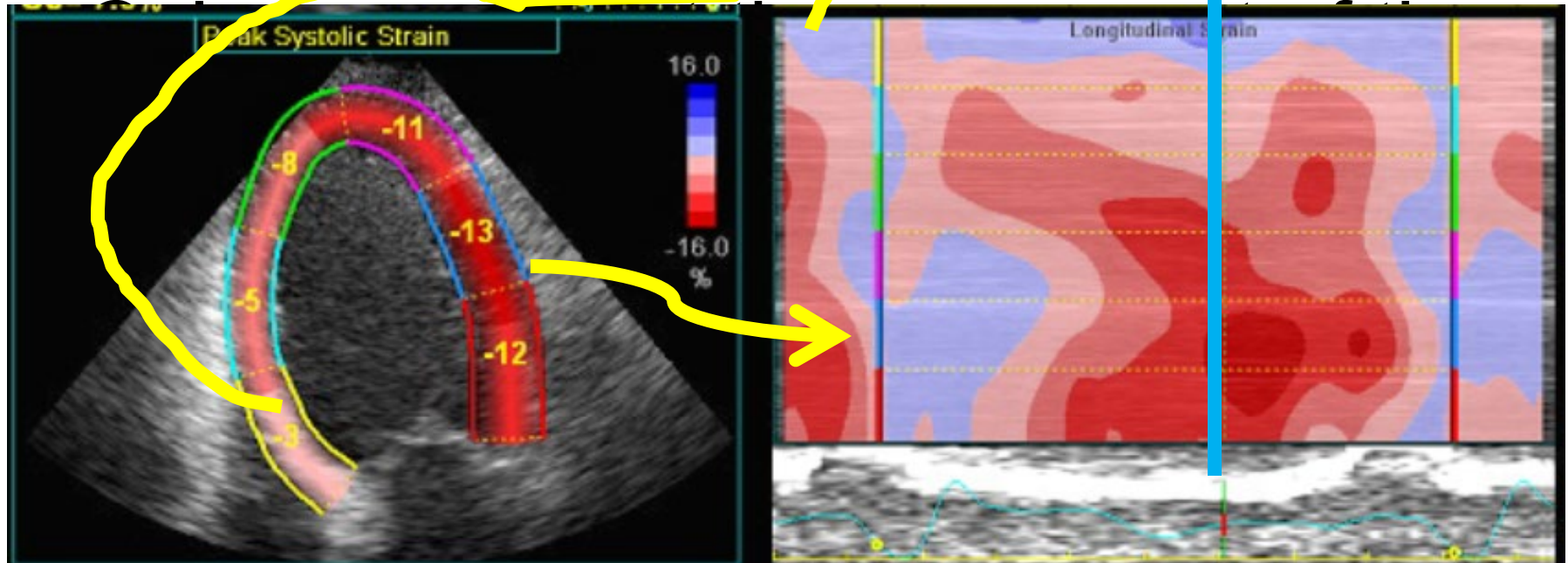
Waveforms & colors





Analysis continued: M-Mode

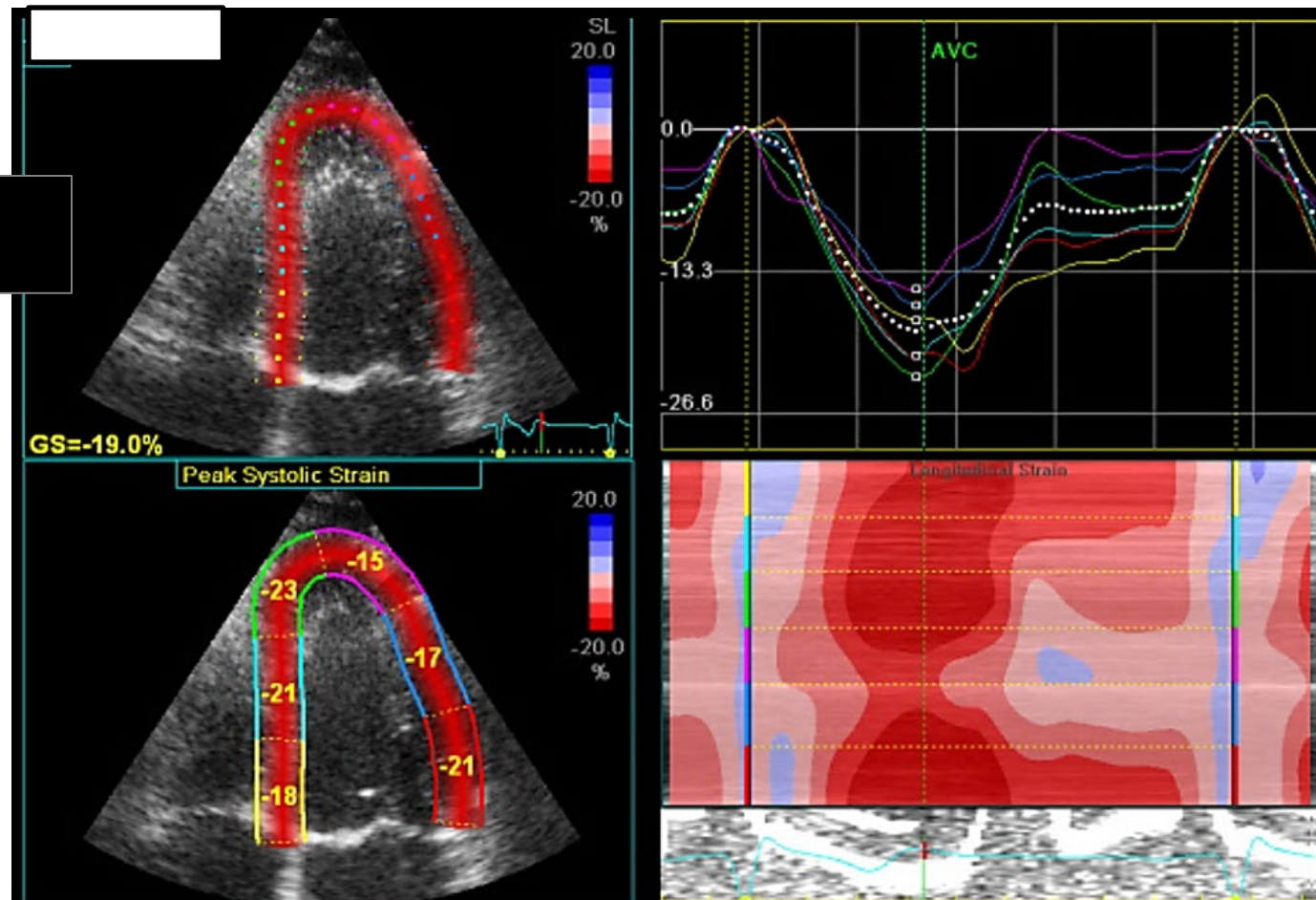
AVC





Normal LS?

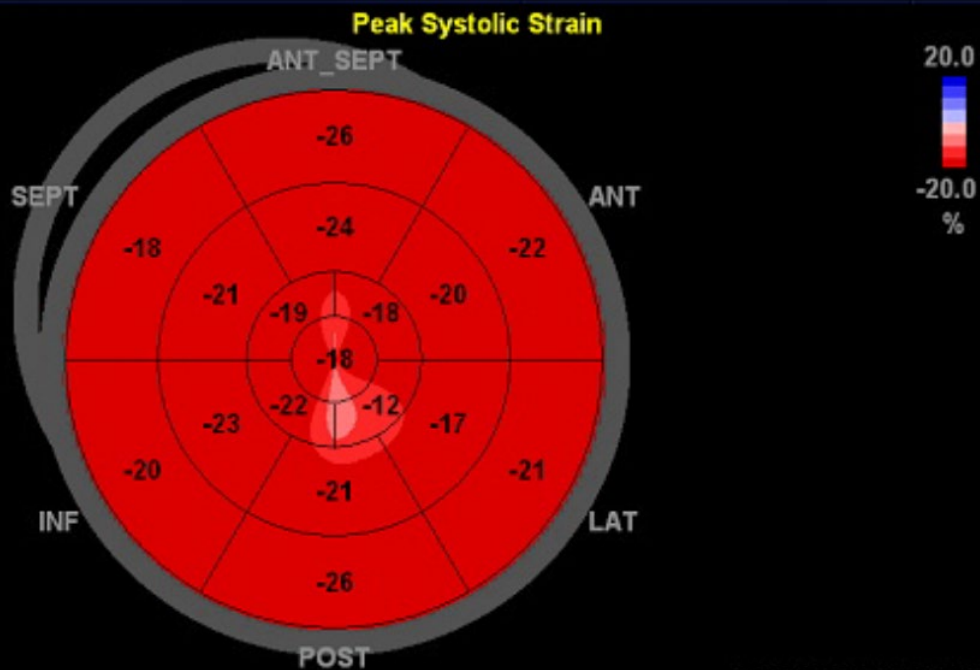
GS = -19%





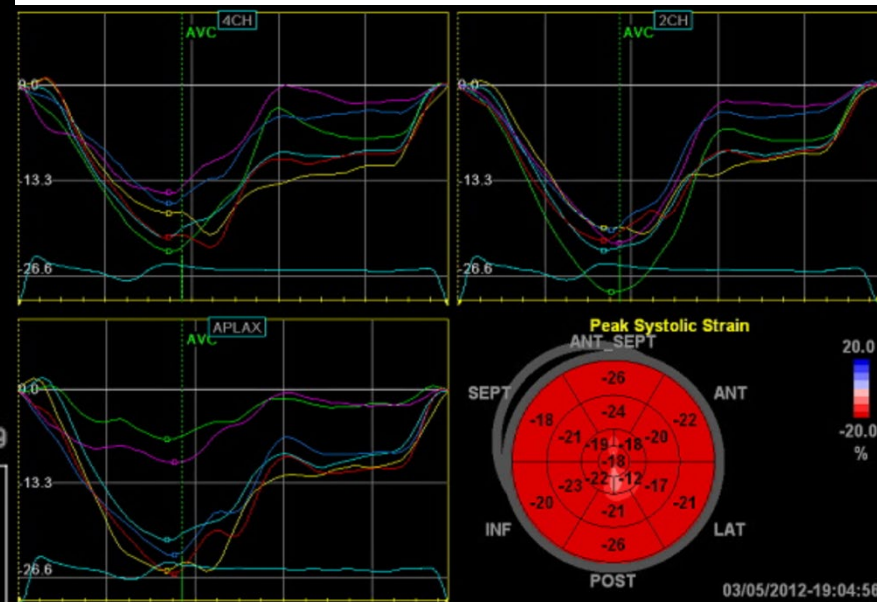
Example: End Products

Average Global Peak Longitudinal Strain:



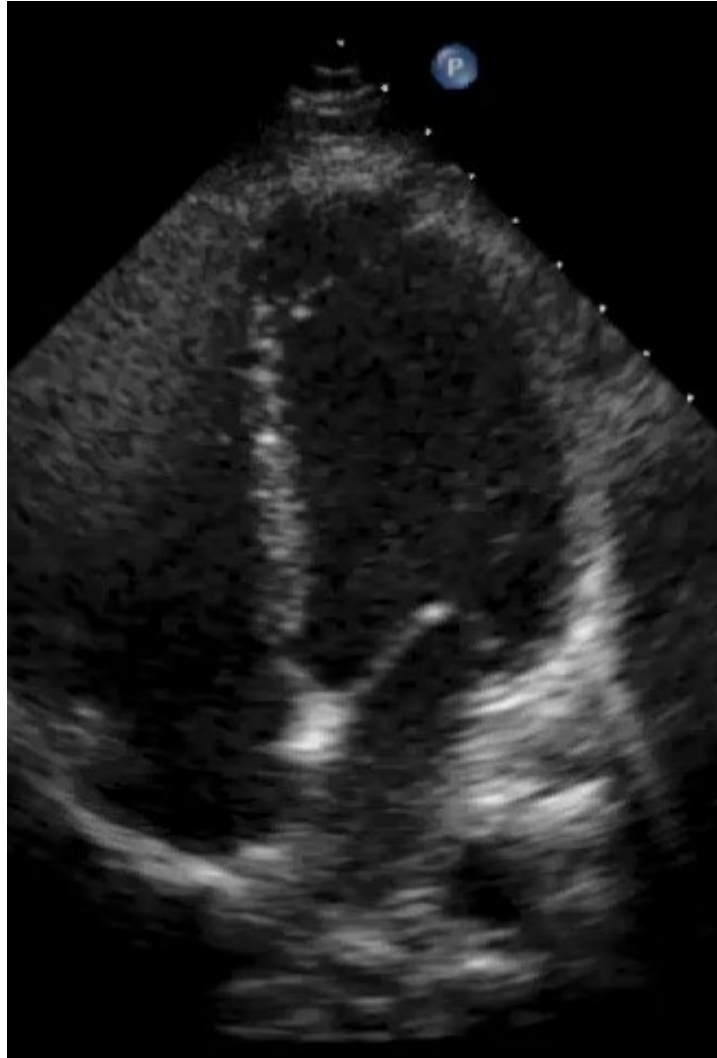
03/05/2012-19:05:09

GLPS_LAX	-19.1 %	AVC_MEAS	372 msec
GLPS_A4C	-19.0 %	HR_ApLAX	61.6 bpm
GLPS_A2C	-22.1 %		
GLPS_Avg	-20.1 %		



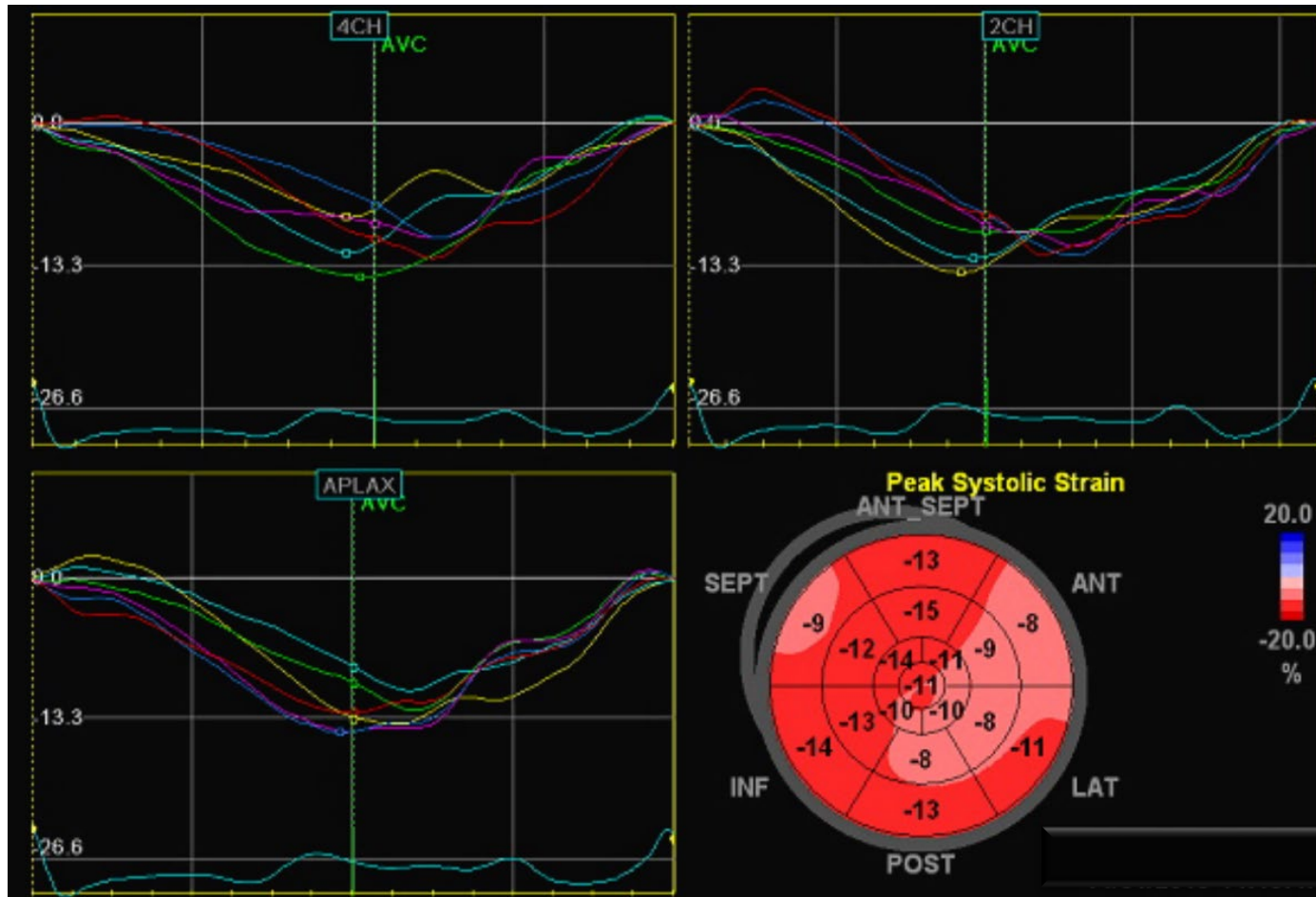


Chemo pt



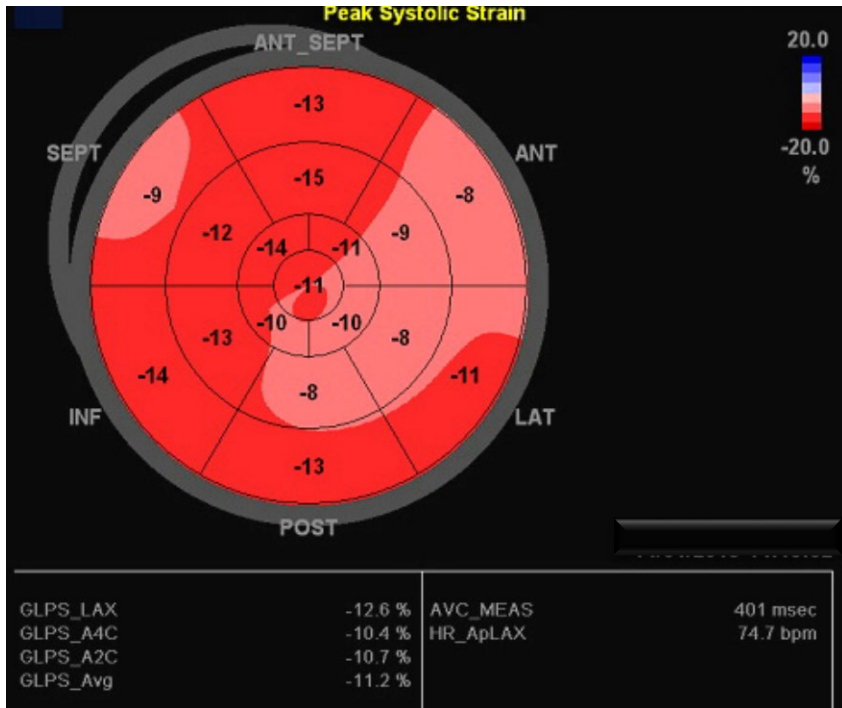


Chemo pt – Strain #1

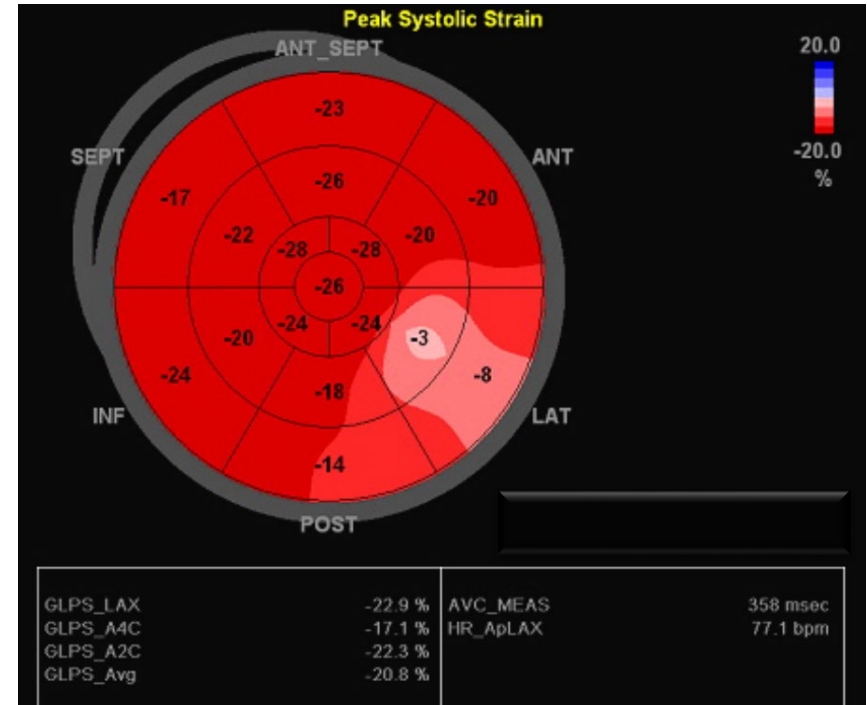




Chemo pt – Strain #1 vs 2



GS = -11%



GS = -20%

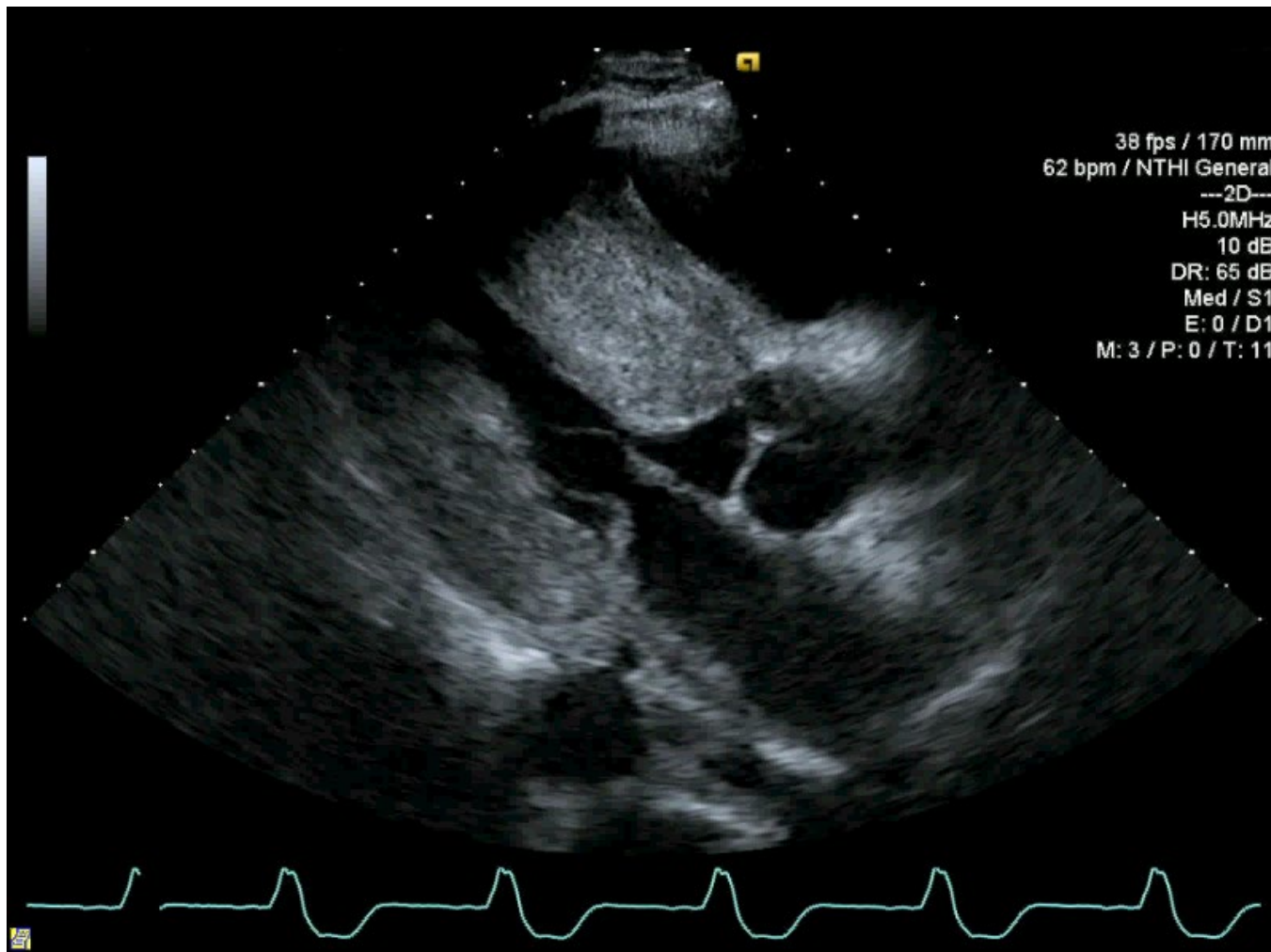


Clinical Balancing Act

- Strain improved but was chemo Rx effective?
- Not all cardiac toxicity is irreversible.
- Pick your poison?

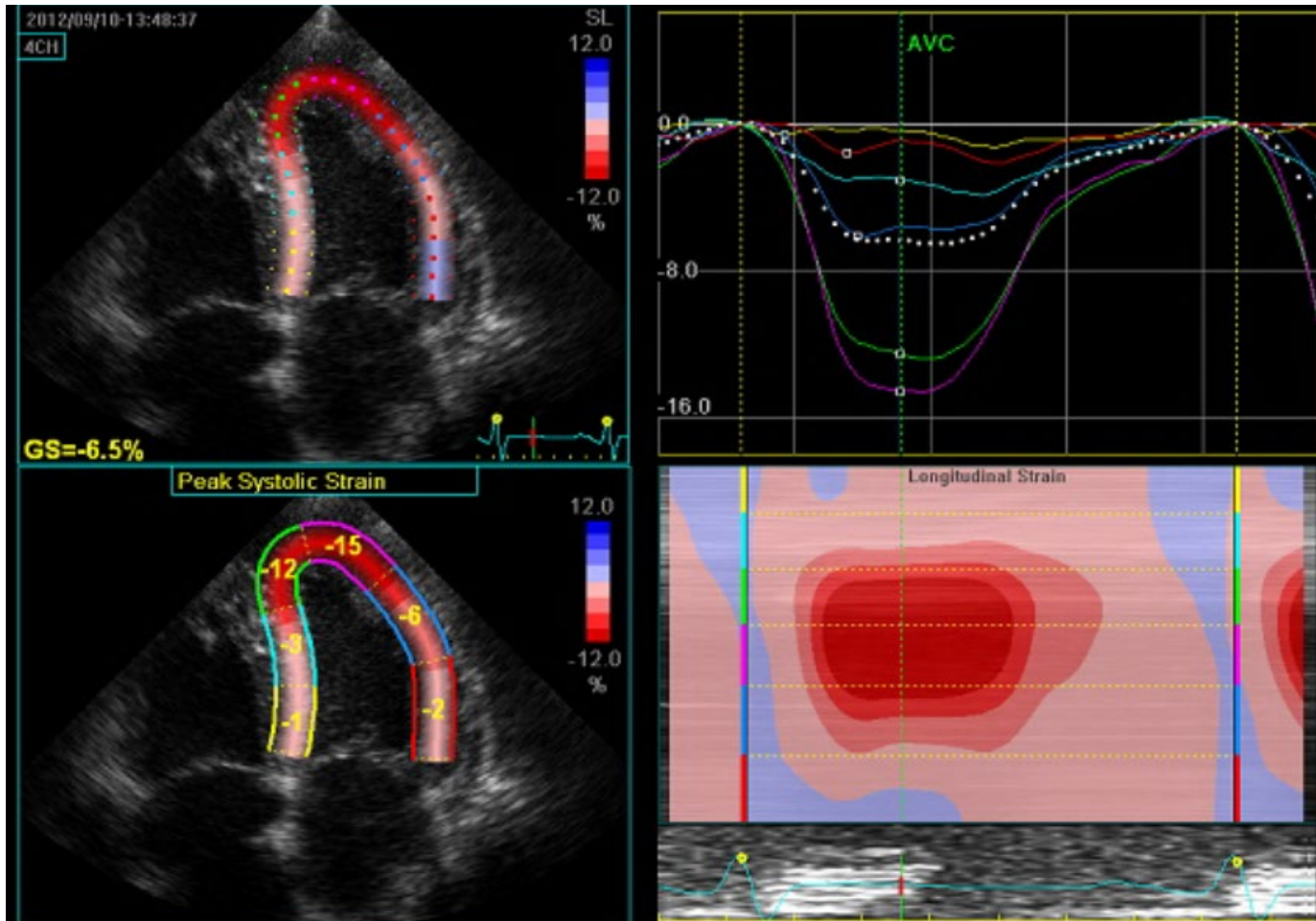


Amyloid pt?



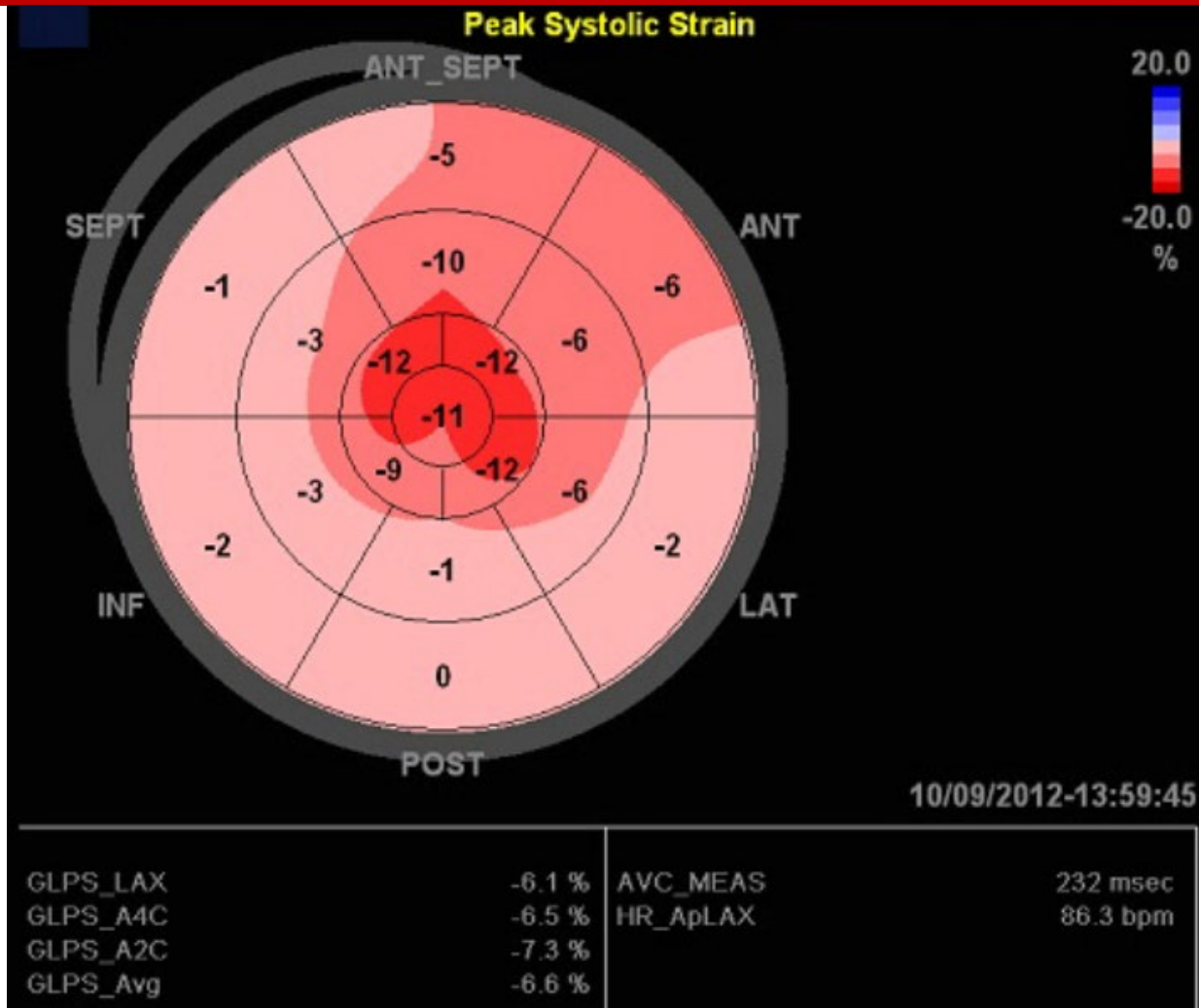


Amyloid pt - Strain





Amyloid pt - Strain





Other Strain Applications

- Cardiomyopathies (in general)
- Hypertrophic Cardiomyopathies (HCM)
- Athlete's Heart
- Sarcoidosis, Lupus
- Amyloidosis
- Myocardial Infarction
- Aortic Stenosis
- And the list is growing!

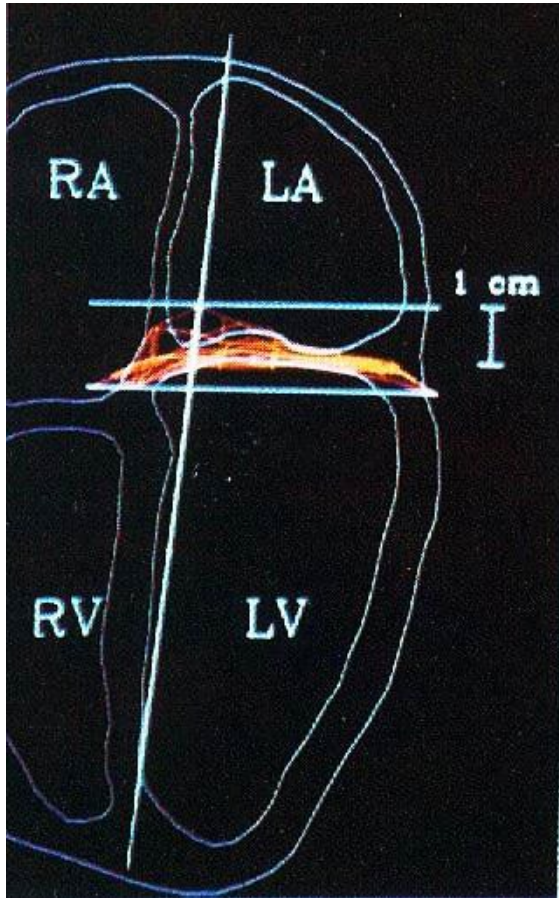


More Research

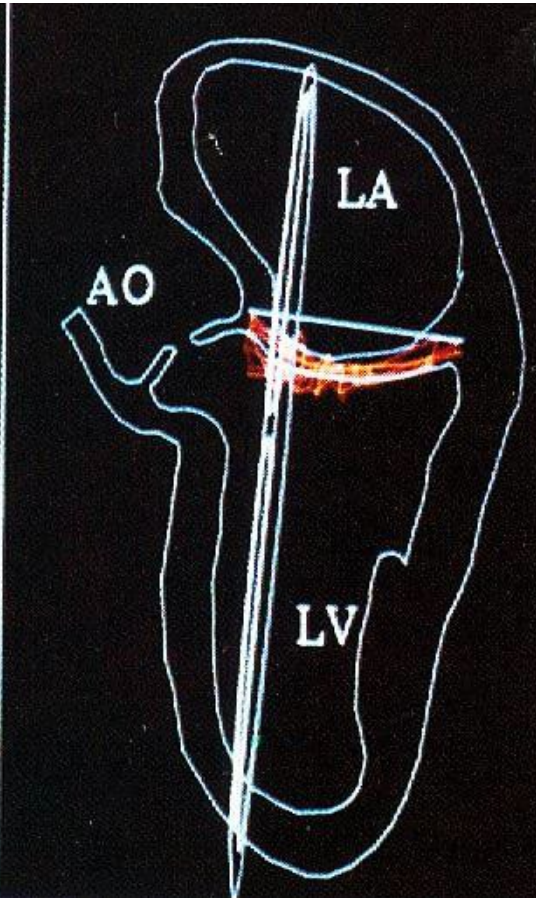




1989 MV Anatomy



4 Chamber

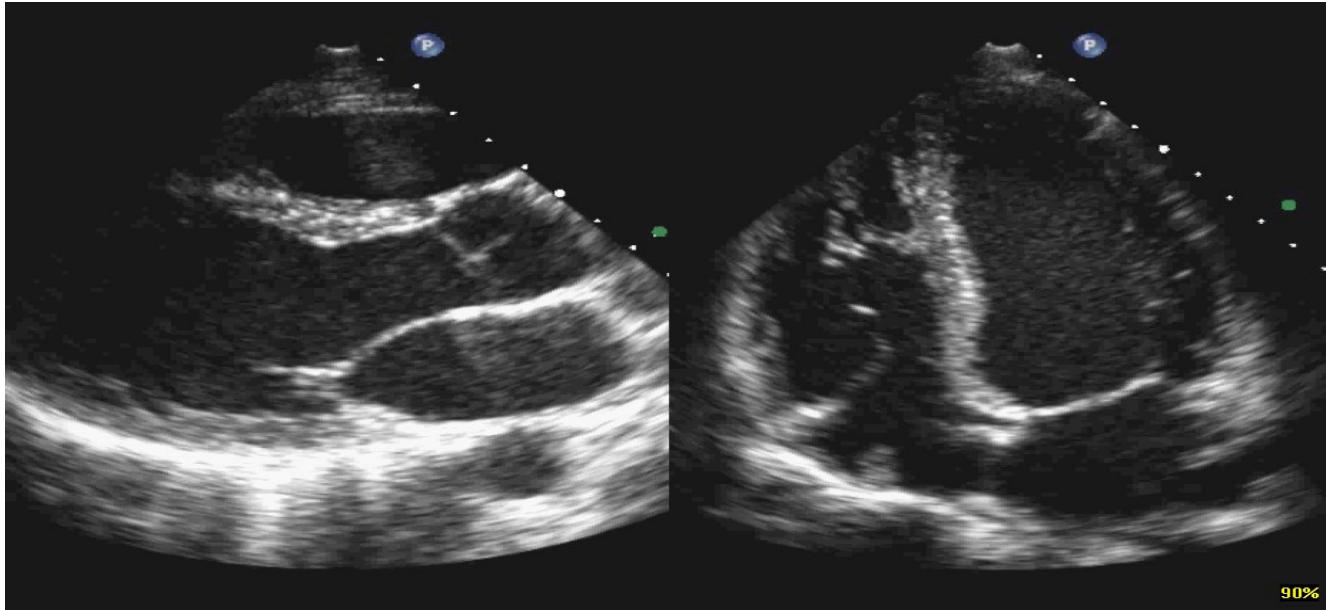


Long Axis

Dr. Bob Levine,
et al at MGH



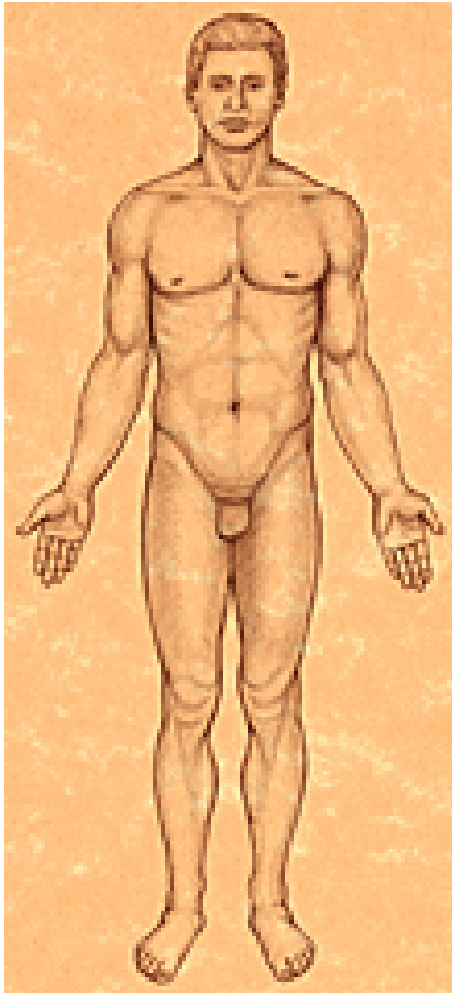
No MVP from Apical 4-Ch





Thanks to the Duke Echo Lab





The End

DUKE: Adams