Comparison of LV Mass as Derived by Echocardiography and Cardiac CT as a Function of Age

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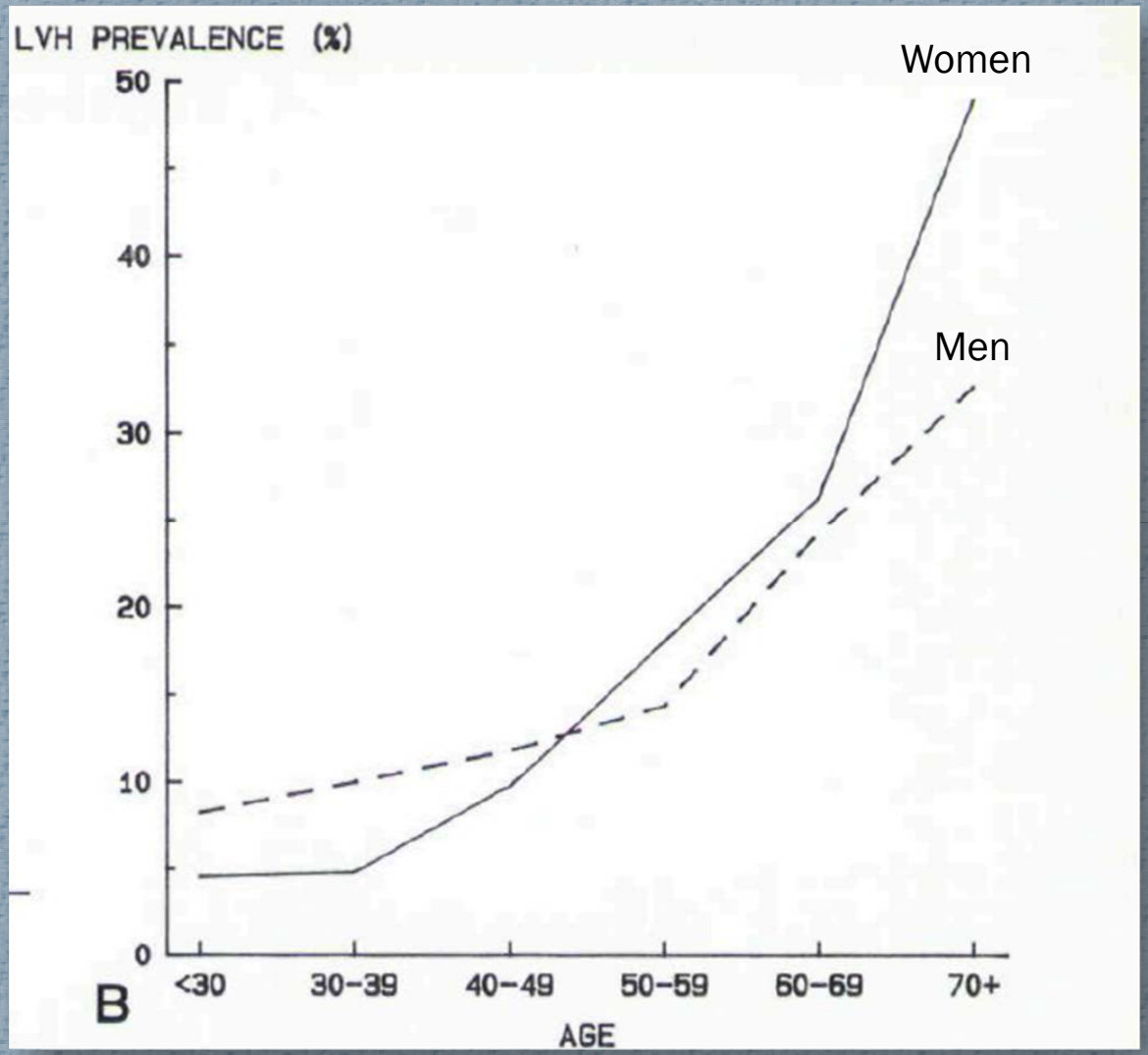
Conflict of interest

- None

Increased LV mass as measured by echocardiography is an independent risk factor for increased cardiovascular and cerebrovascular events, including excess mortality.

Prevalence of LVH as a function of Age: Echo



Levy et al. The Framingham Heart Study.
Annals of Internal Medicine.
1988

Women

Age	Normal	Mild LVH	Moderate LVH	Severe LVH
<20	86.8	10.5	2.6	0
(N=38)				
20-29	81.4	9.9	3.9	4.8
(N=413)				
30-39	74.7	9.6	6.6	9.1
(N=560)				
40-49	67.2	11	7.3	14.4
(N=572)				
50-59	63.6	13	7.7	15.7
(N=1264)				
60-69	56.8	14.6	11.3	17.2
(N=1092)				
70-79	54	14.7	10.6	20.7
(N=1139)				
80-89	50	12.7	11.6	25.7
(N=739)				
90 +	53	11.3	6.1	29.6
(N=115)				

Men

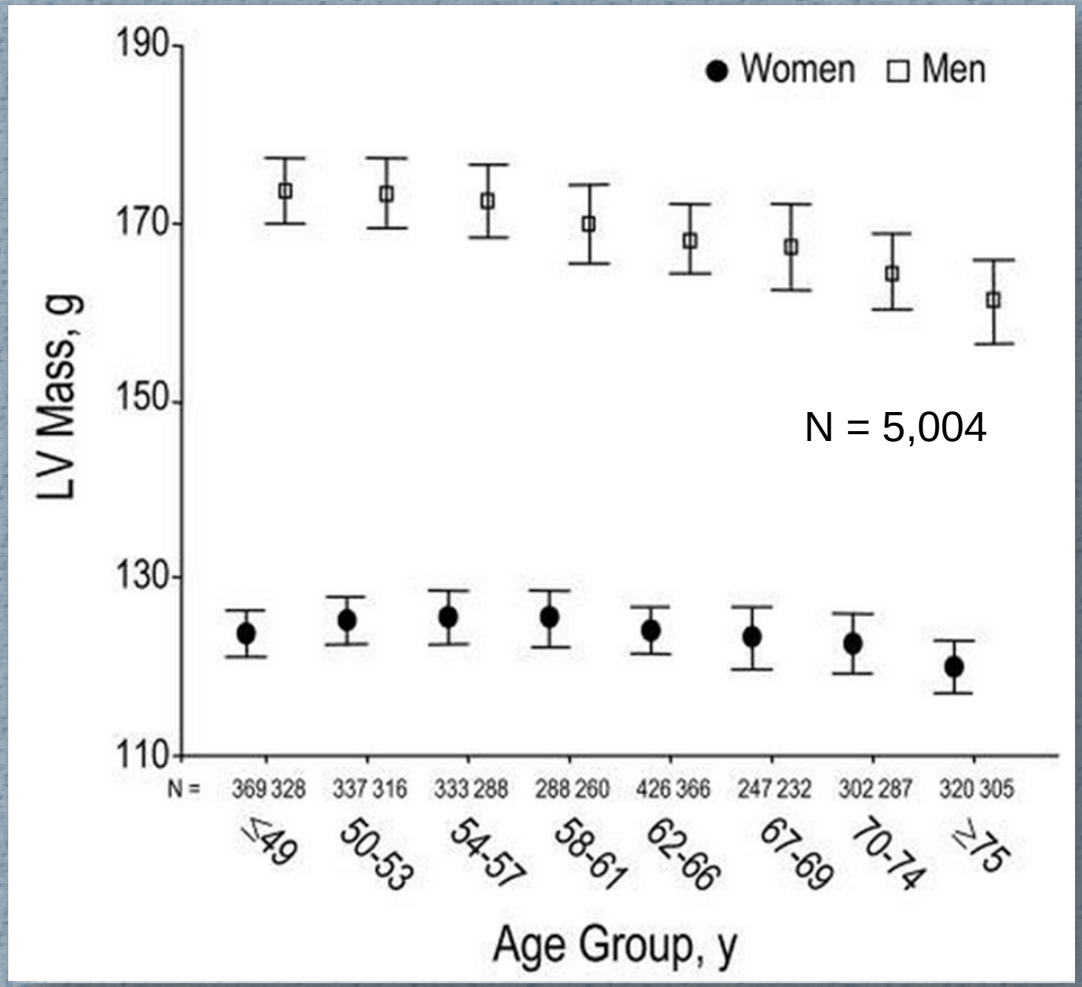
Age	Normal	Mild LVH	Moderate LVH	Severe LVH
<20	94.3	5.7	0	0
(N=35)				
20-29	87.7	4.7	2.4	5.2
(N=211)				
30-39	77.9	6.7	4.7	10.7
(N=401)				
40-49	69.3	8.7	7.5	14.4
(N=756)				
50-59	69.1	10.8	8.2	11.9
(N=1116)				
60-69	66	13.3	9	11.7
(N=1164)				
70-79	62.6	13.3	8.4	15.8
(N=1054)				
80-89	61.7	12.1	10.6	15.6
(N=531)				
90 +	55.8	14	16.3	14
(N=43)				

Zwas et al. 2007

MRI and CT assessments of LV Mass are considered more precise and reliable than echocardiographic assessments of LV mass:

- improved endocardial definition
- mass calculation does not utilize geometric assumptions regarding ventricular shape

MRI studies have not demonstrated a similar increase in LV Mass with age



These studies do demonstrate an increased mass: volume ratio with aging.

Poor prognosis was only seen with very severely increased LV mass.

Cheng et al. Circ Cardiovasc Imaging. 2009

Purpose of study

- To evaluate the correlation between LV mass measurement on echocardiographic and CT studies as a function of age
- To elucidate the discrepancy seen between cardiac imaging modalities

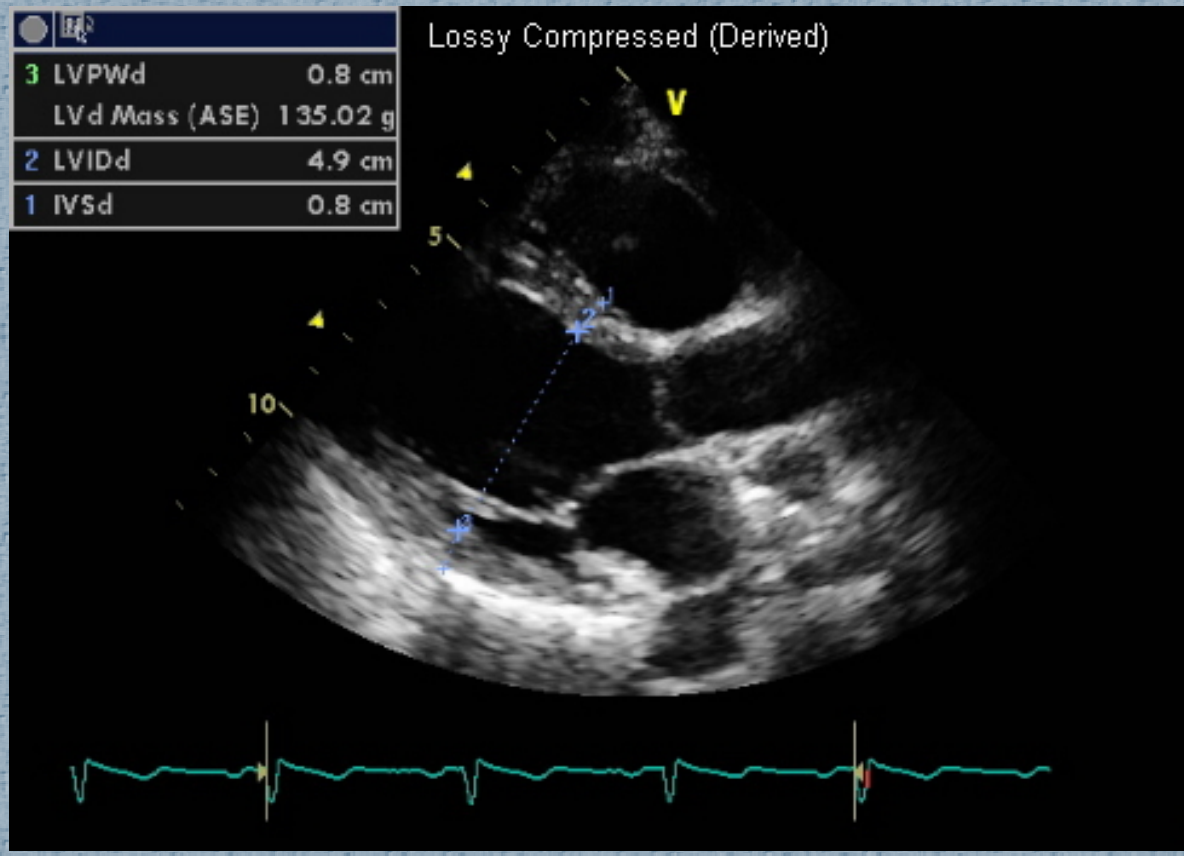
Methods and study design

- Same-subject modality comparison study
- Candidates: patients age 18 and up who underwent a cardiac gated-CT scan and echocardiography for clinical indications within 6 months of each other between January 2010 and January 2013 were included.
- Exclusion criteria: imaging that didn't allow for necessary calculations

Measurements

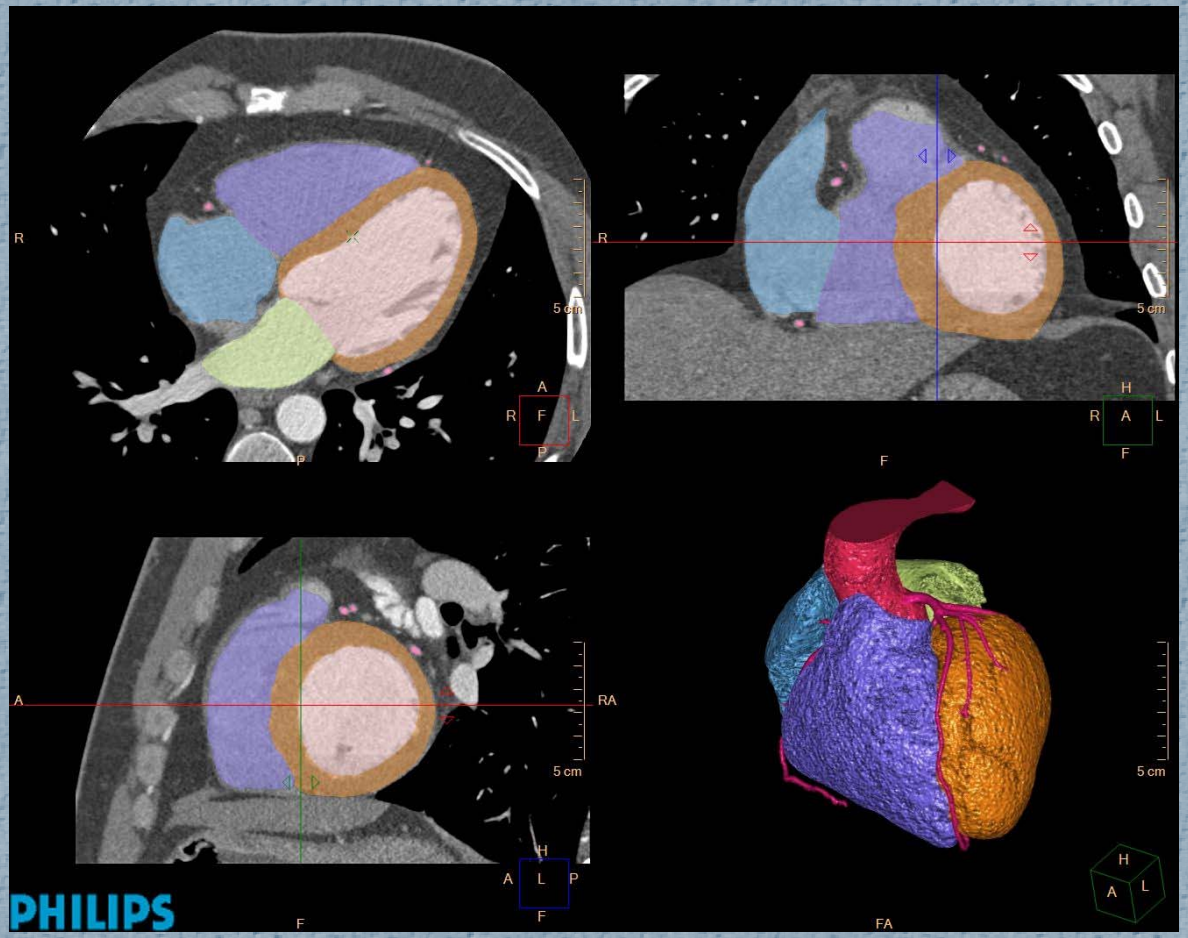
- Echo measurements
  - Performed according to ASE and EAE guidelines
  - Measurements included LV wall thicknesses, internal diameter, and all measurements necessary for LVM calculation for Truncated ellipsoid formula and Area-length formula.
  - Mid septal wall thickness
  - LV Mass was calculated according to the ASE formula:

$$0.8 \times \{1.04[(LVIDd + PWTd + SWTd)^3 - (LVIDd)^3]\} + 0.6\ g$$



Cardiac CT measurements

- Performed using step and shoot protocol on Philips 256-slice scanner.
- The Philips MxView LV/RV Analysis application software package was utilized, with manual correction of autosegmentation when necessary.

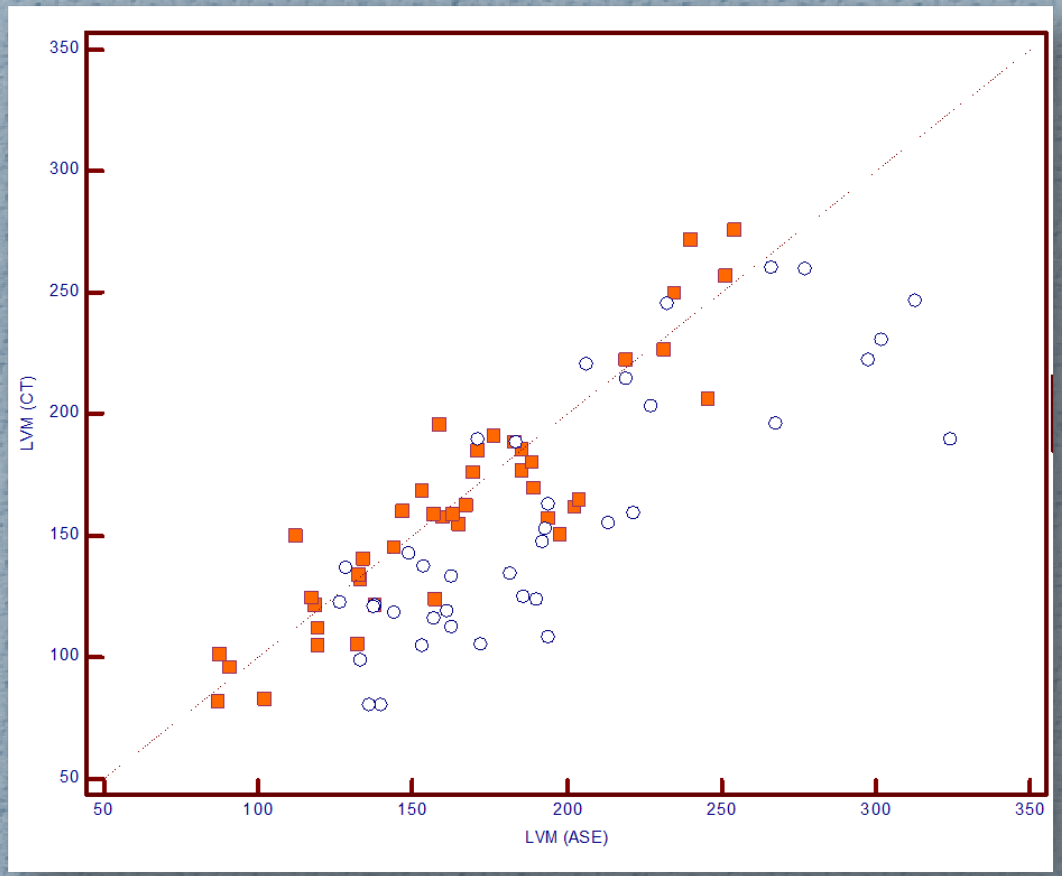


Results

- 81 patients (♂ 51 ♀ 30)
- 38 ≥ 65 years old (75±7, 65-90)
- 43 <65 years old (45±12, 18-64)

Comparison of LV Mass by Echo and CT

CT

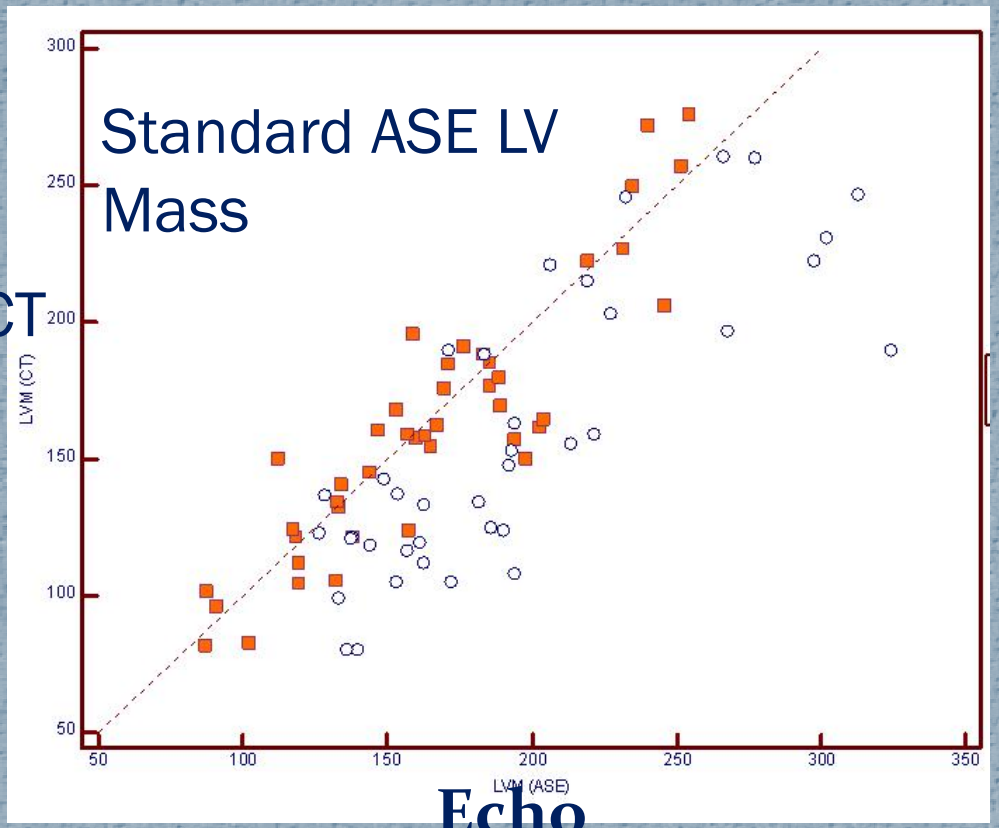


ECHO

Age <65
Age >65

R (total) = 0.8061
R (<65) = 0.9058
R (≥65) = 0.8163

Comparison of Echo CT correlation using standard vs. midwall measurements



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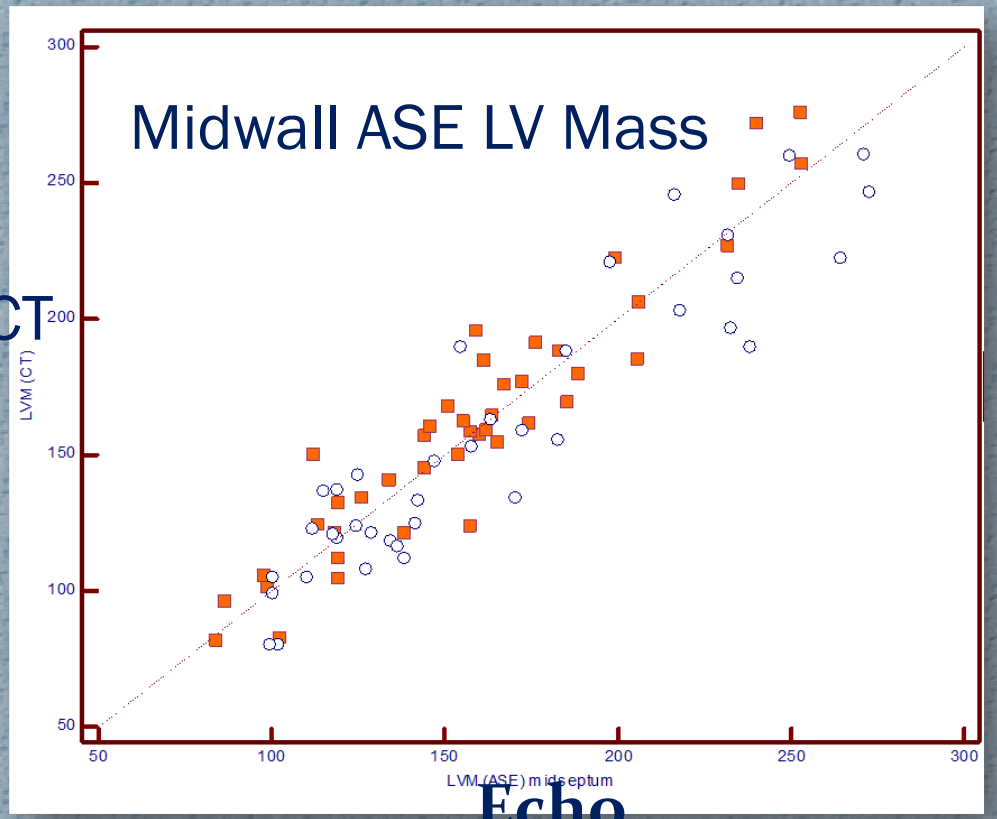
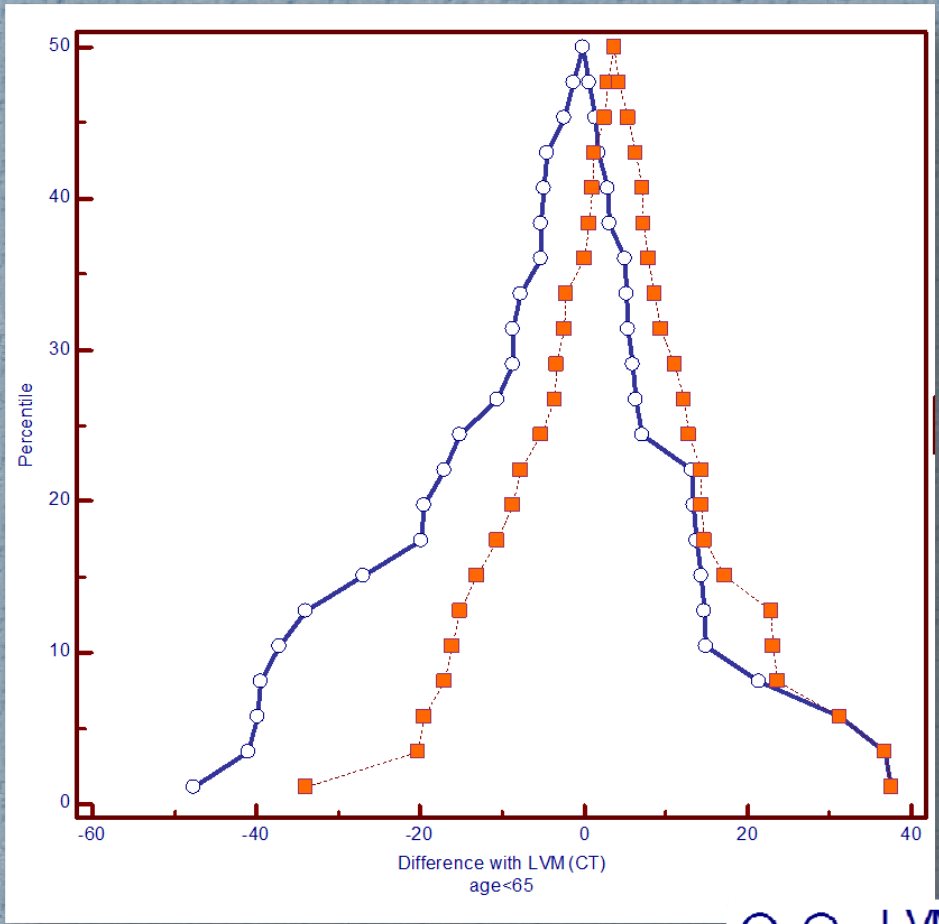


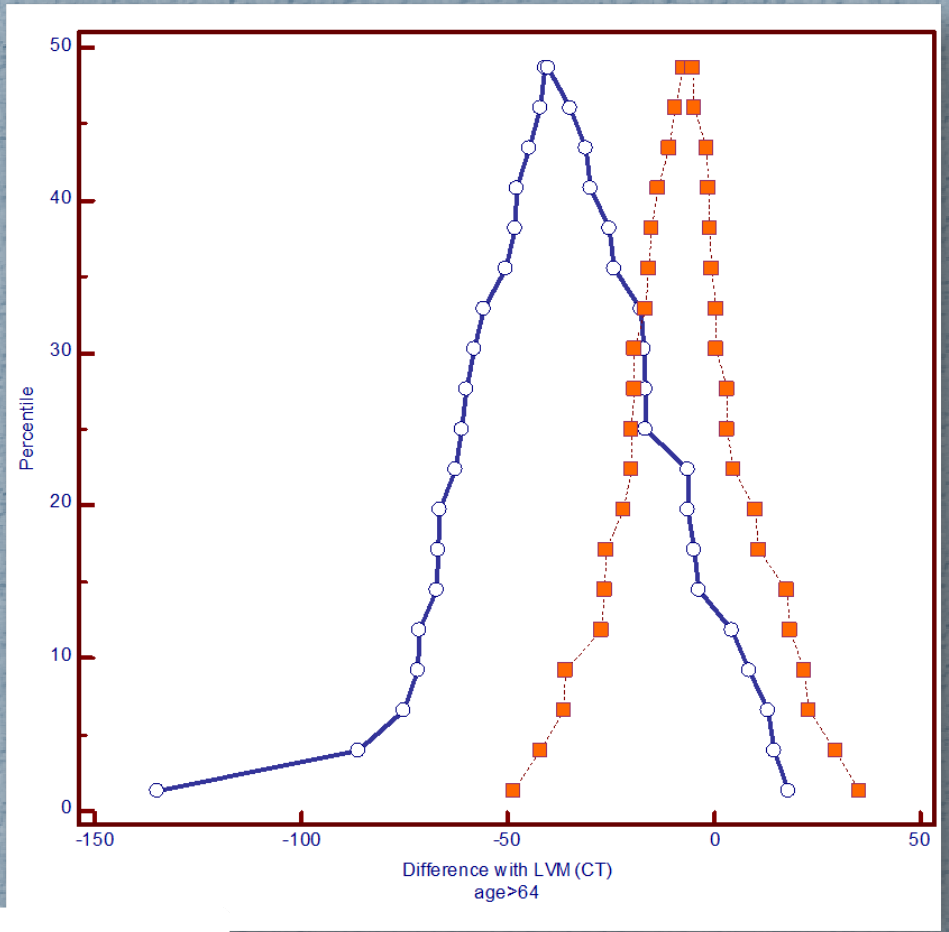
R (total) = 0.9311
R (<65) = 0.9477
R (≥65) = 0.9320

Age <65
Age >65

Mountain Plot: Difference Between Echo LV Mass calculated using standard or midwall measurement



Age < 65



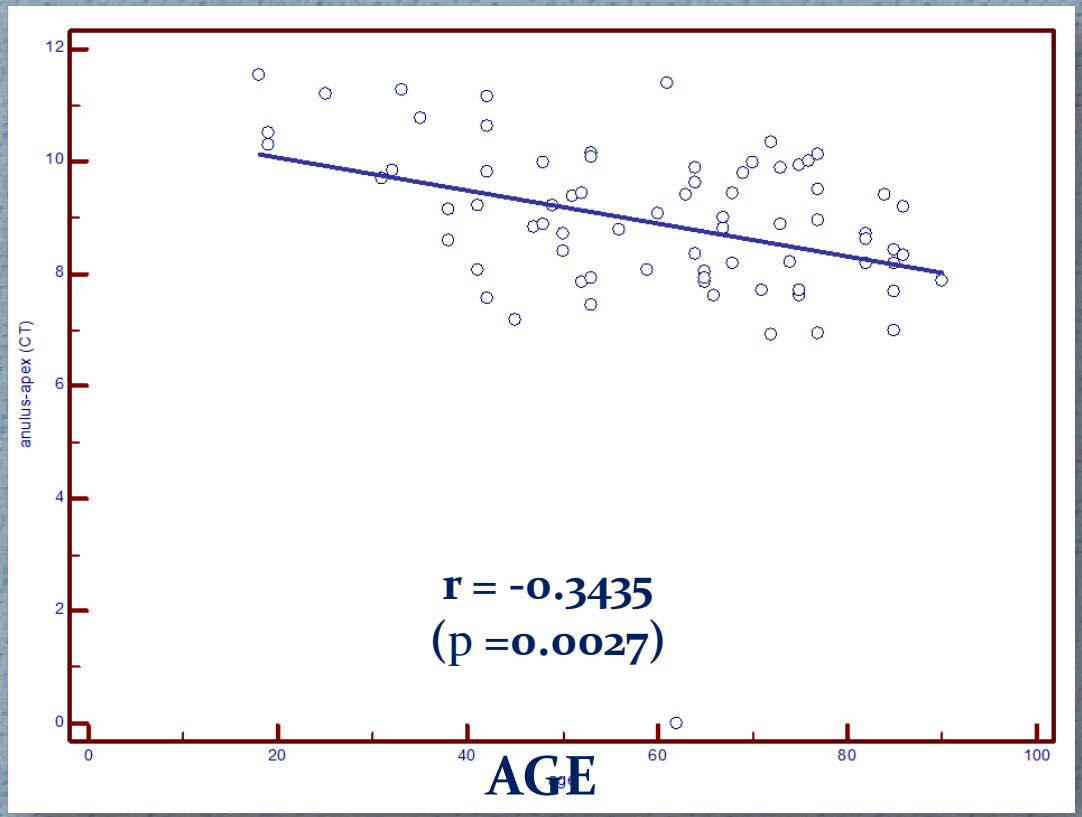
Age > 65

LVM (ASE)

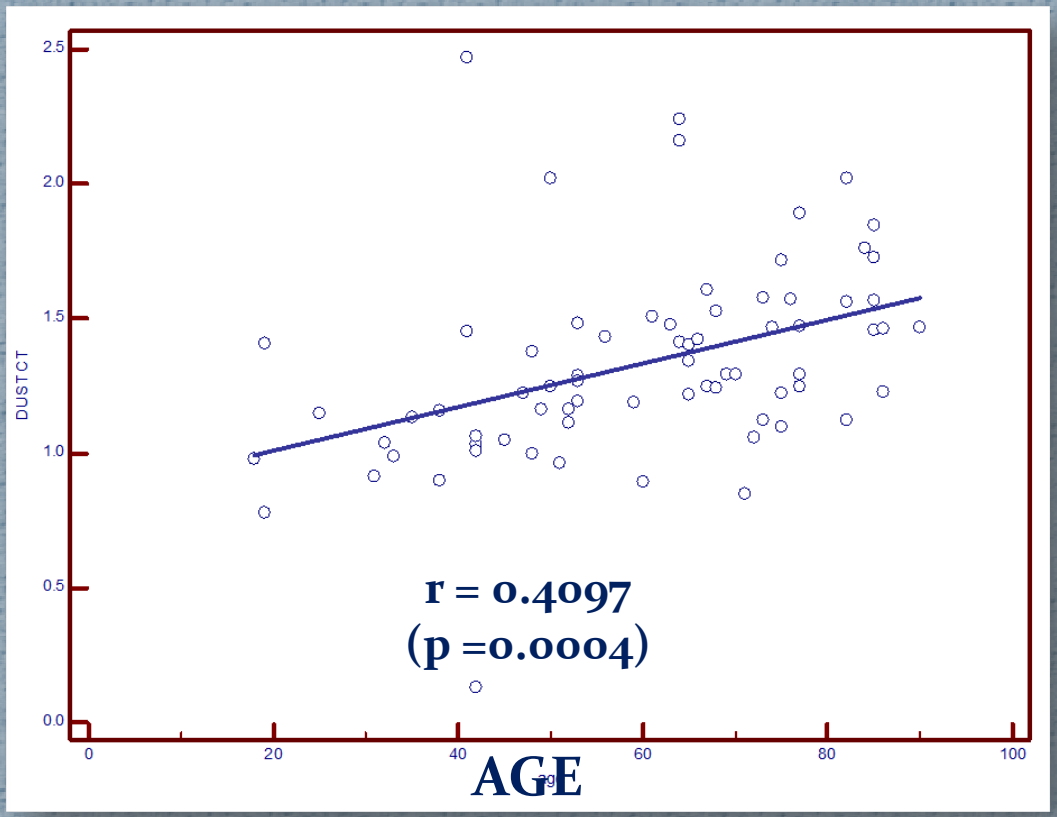
LVM (ASE) midseptum

LV Remodeling

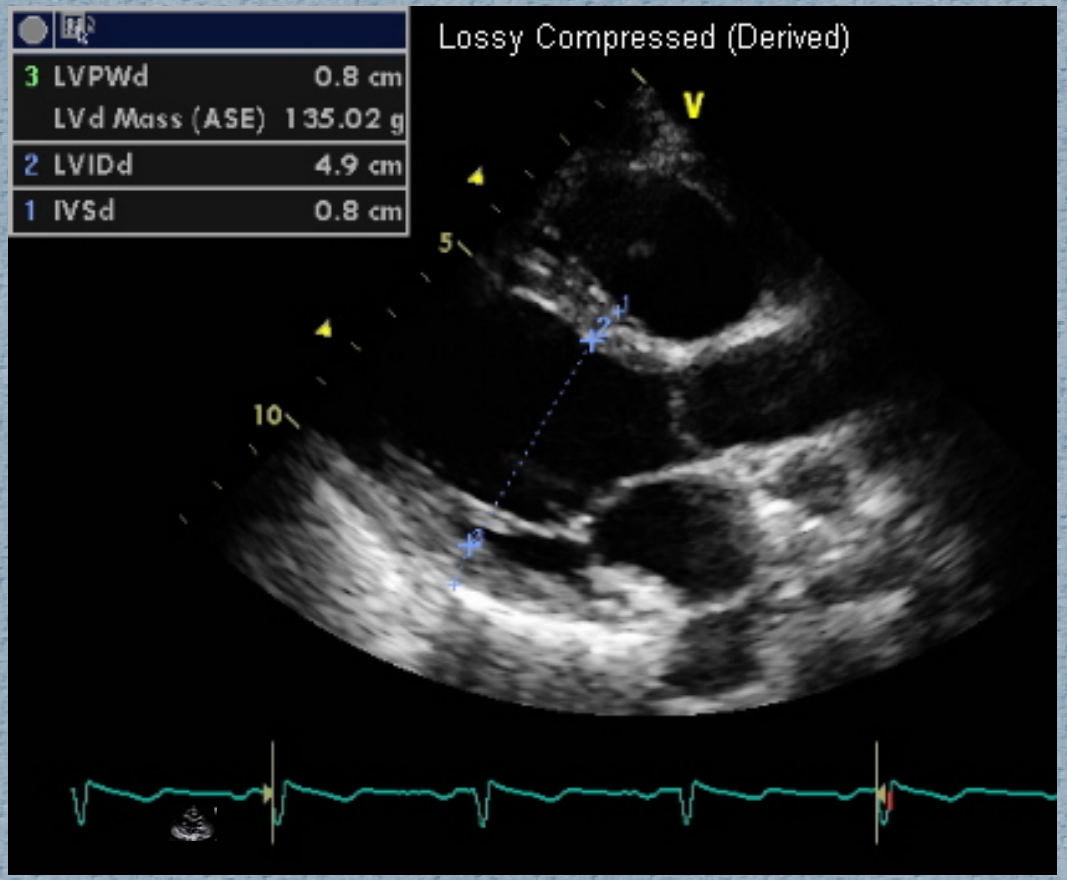
Age and Base-Apex distance



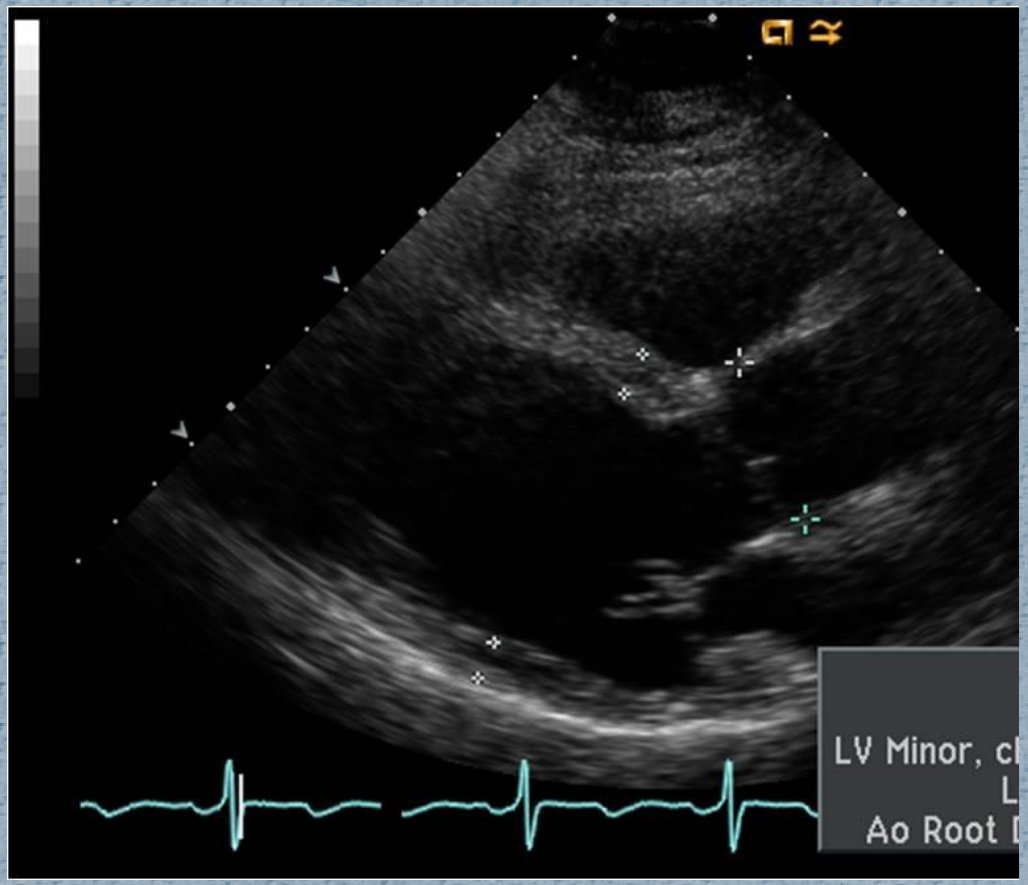
Age and Proximal: Midwall septal ratio



Remodeling with Aging



Young patient



Older patient

Conclusions

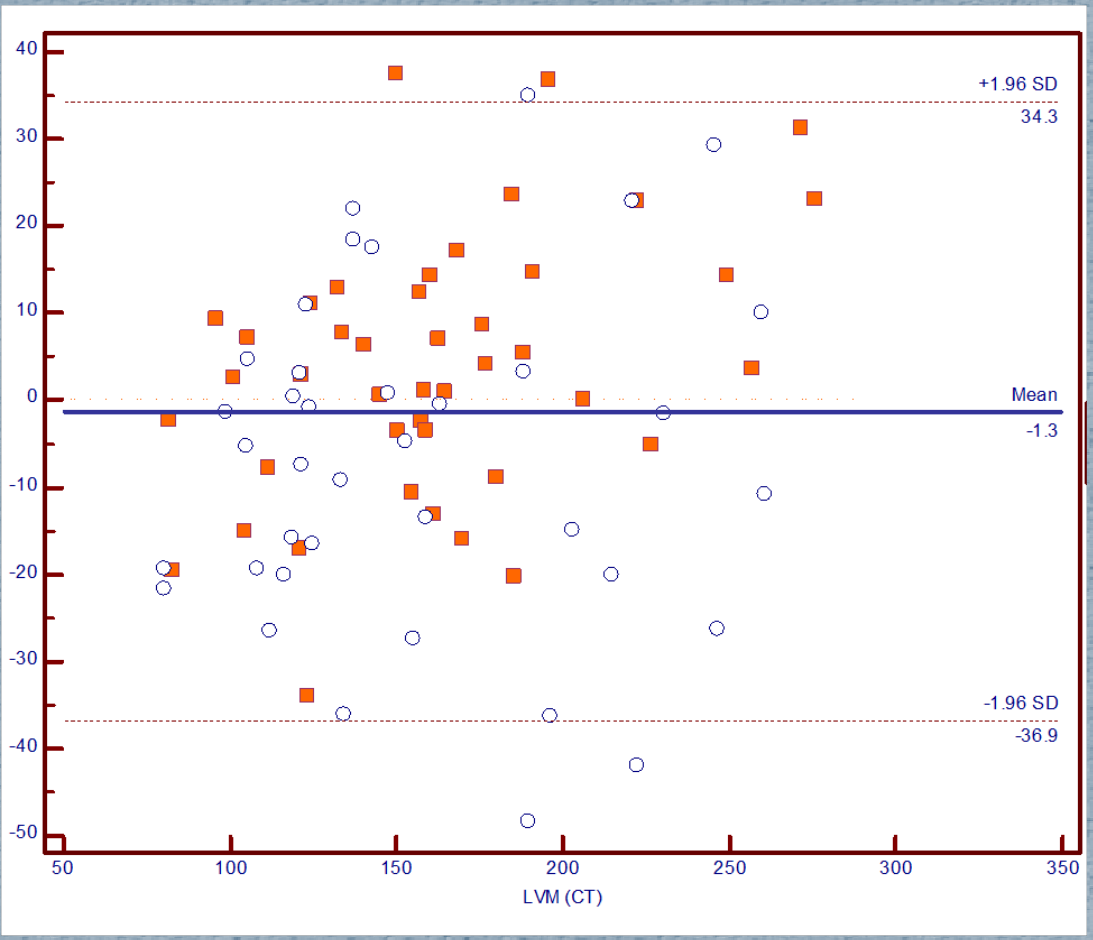
- LVM estimation using standard echocardiographic measurements may overestimate LVM in elderly patients due to LVM remodeling.
- Increased mass to volume ratio may result from shortening of the base-apical length and thickening of the proximal septum.
- Use of mid-wall measurements may correct this overestimation.

Conclusions

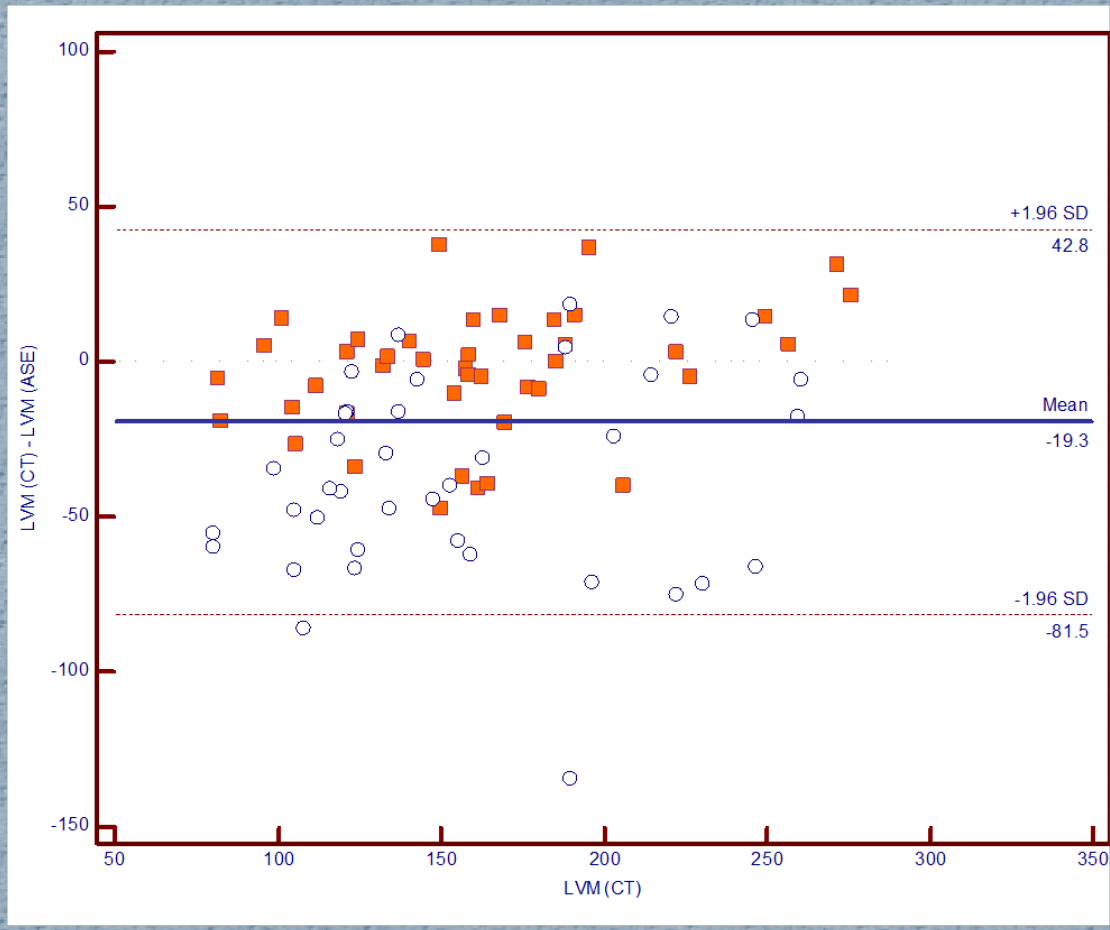
- Prognostic information derived from echocardiographic LV mass may reflect the extent of remodelling rather than a true increase in LV mass.
- Further research to better echocardiographically characterize LV remodelling may improve echocardiographic prognostication.


THANKS!

Bland-Altman Analysis



Standard



Midwall

Age <65

Age >65