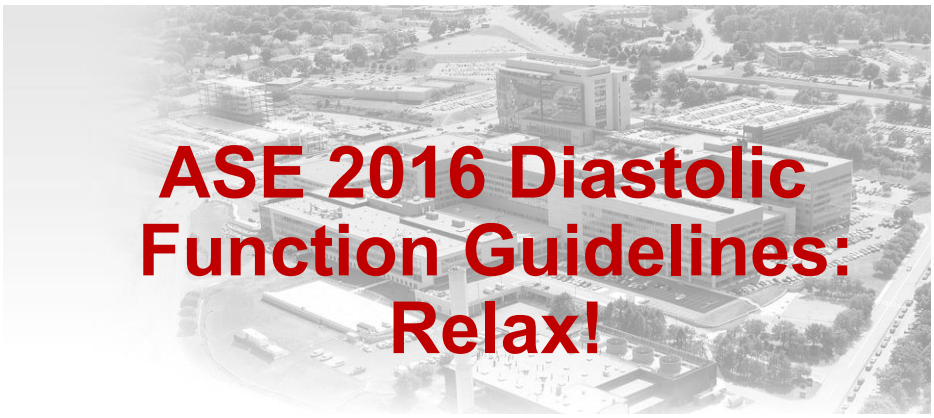
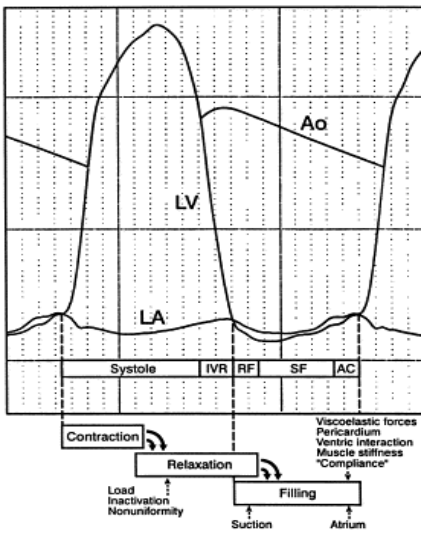


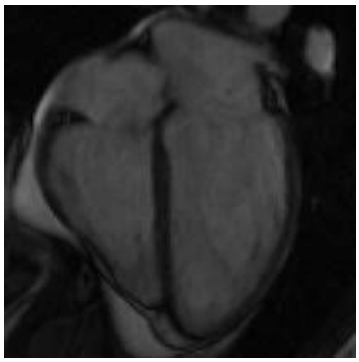
ASE 2016 Diastolic Function Guidelines: Relax!

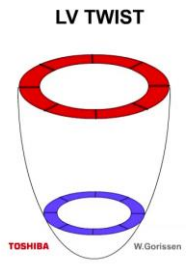
Gerard P. Aurigemma MD

No Relevant Disclosures

University of Massachusetts Medical School
UMASS







Usual reactions to discussions of diastolic dysfunction

2016 Diastology Guidelines Update Objectives

- 2009 ASE/EACVI guidelines were too complex to grade DF and estimate LV filling pressures
- Based on too many parameters and a lot of discrepancies
- Primary goal of 2016 update is to simplify
  - –increase feasibility of use of the guidelines in clinical practice

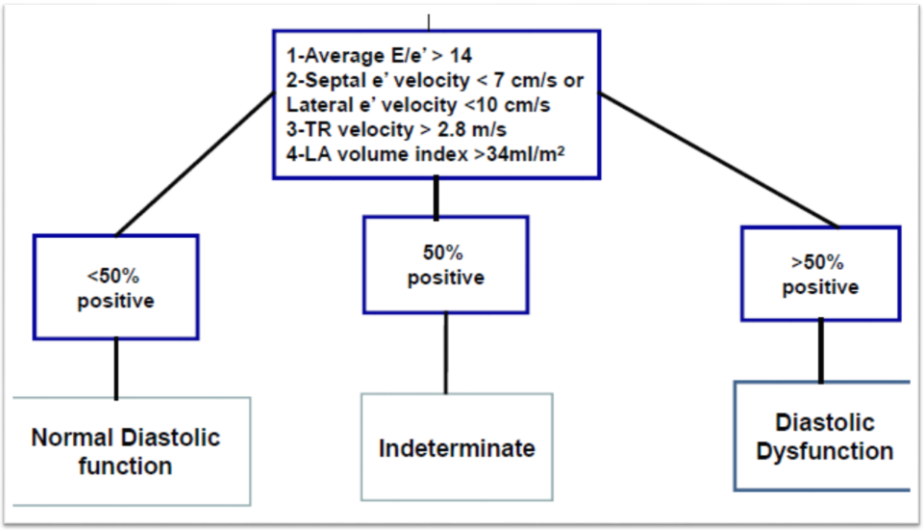
Cleveland Clinic

Slide courtesy Dr. Alan Klein

TR velocity,

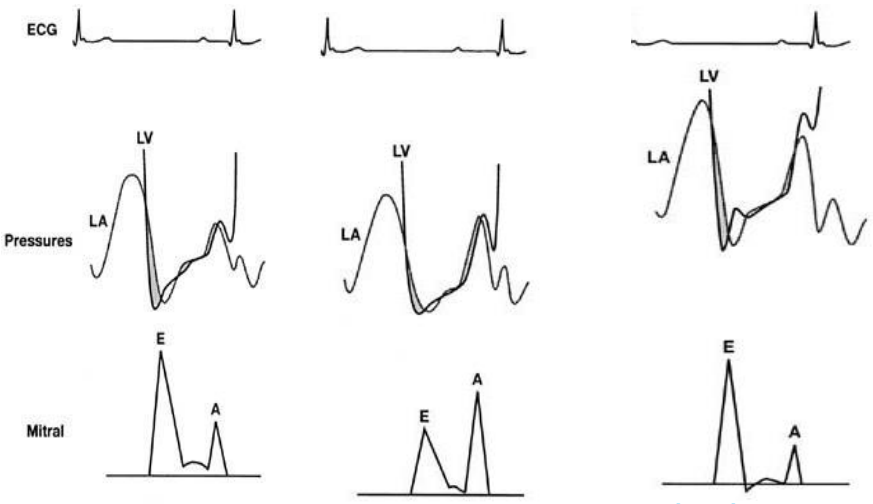
LA size

5



6

We must have the 4 major diastole parameters!



Normal

Impaired Relaxation

Mean LA pressure not elevated

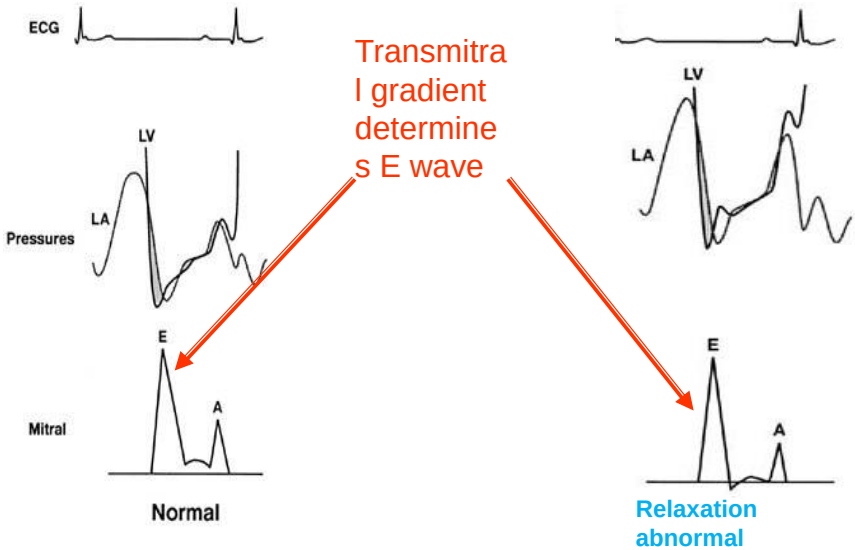
Prevalent in aging

Relaxation abnormal

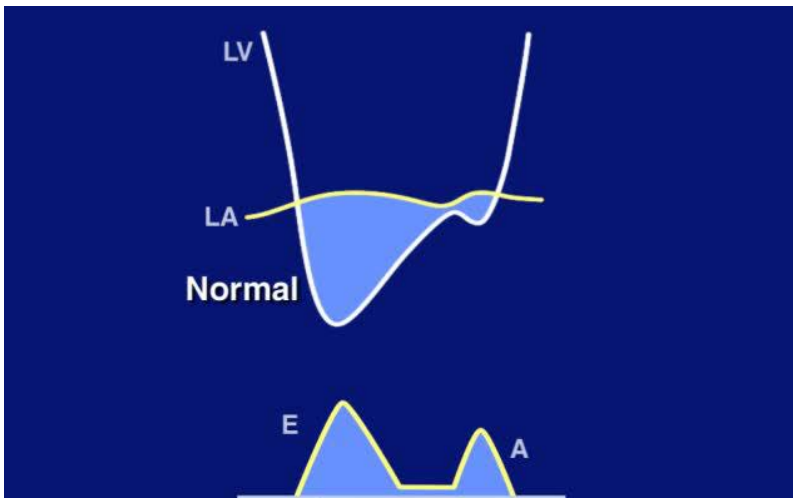
Compliance abnormal

Filling pressures elevated

Oh et al JASE 1997

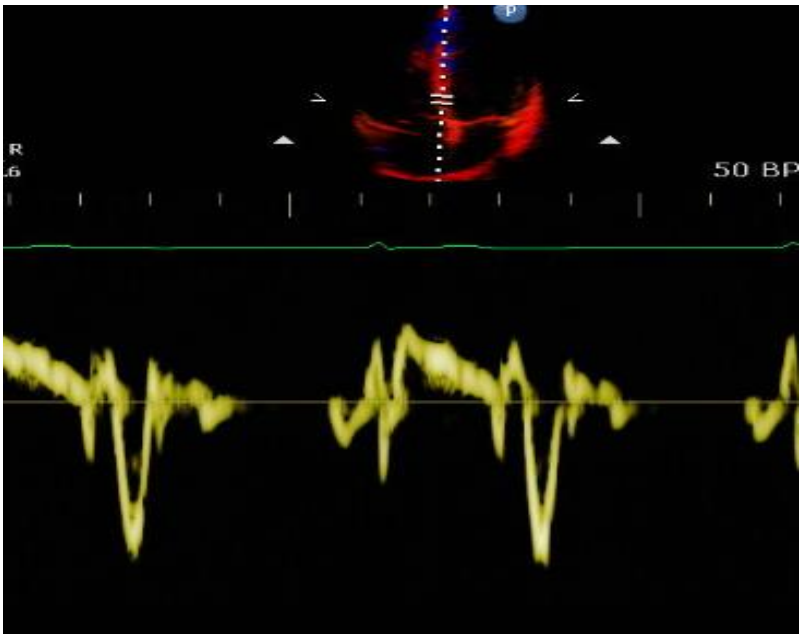


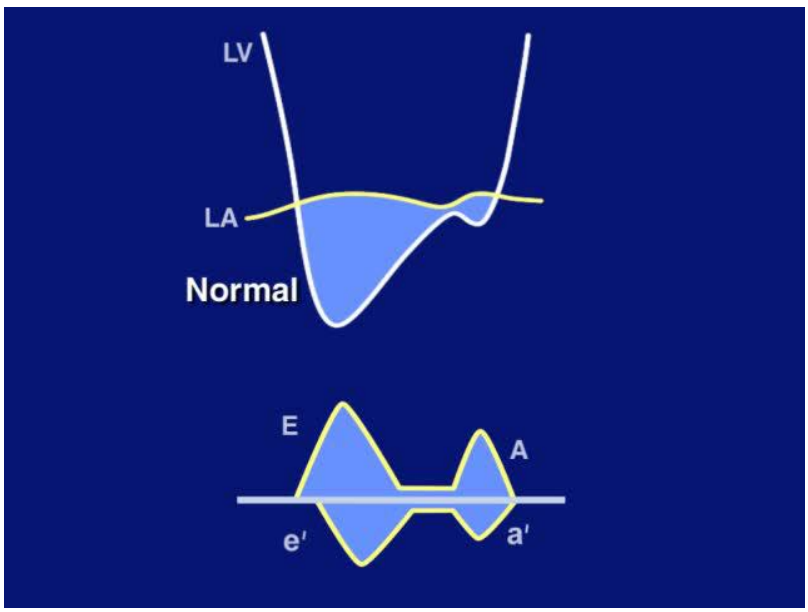
Oh et al JASE 1997



Animation from Steve Lester, Mayo Clinic

10





Animation from Steve Lester, Mayo Clinic

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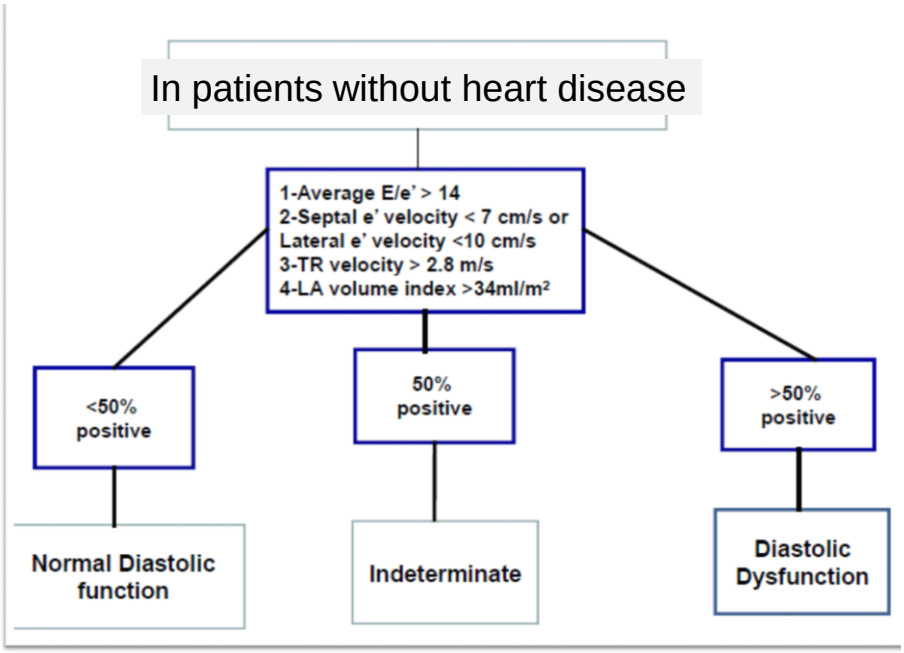
Table 4 LV relaxation, filling pressures and 2D and Doppler findings according to LV diastolic function

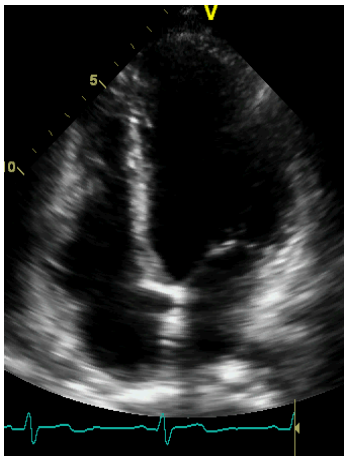
	Normal	Grade I	Grade II	Grade III
LV relaxation	Normal	Impaired	Impaired	Impaired
LAP	Normal	Low or normal	Elevated	Elevated
Mitral E/A ratio	≥0.8	≤0.8	>0.8 to <2	>2
Average E/e′ ratio	<10	<10	10–14	>14
Peak TR velocity (m/sec)	<2.8	<2.8	>2.8	>2.8
LA volume index	Normal	Normal or increased	Increased	Increased

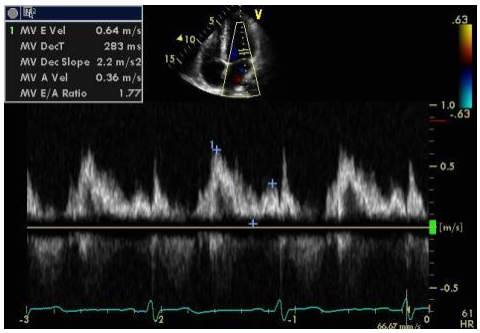
13

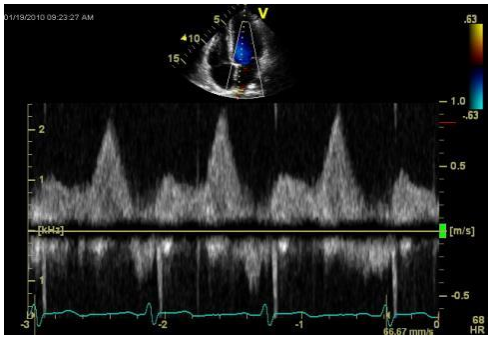


Nagueh JASE 2016

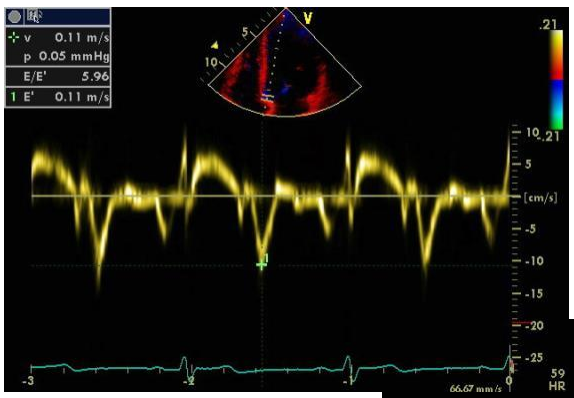
14

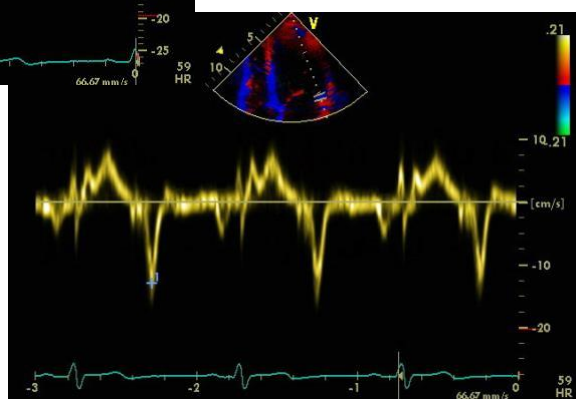






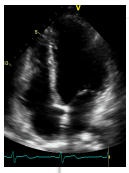
46 year old woman palpitations

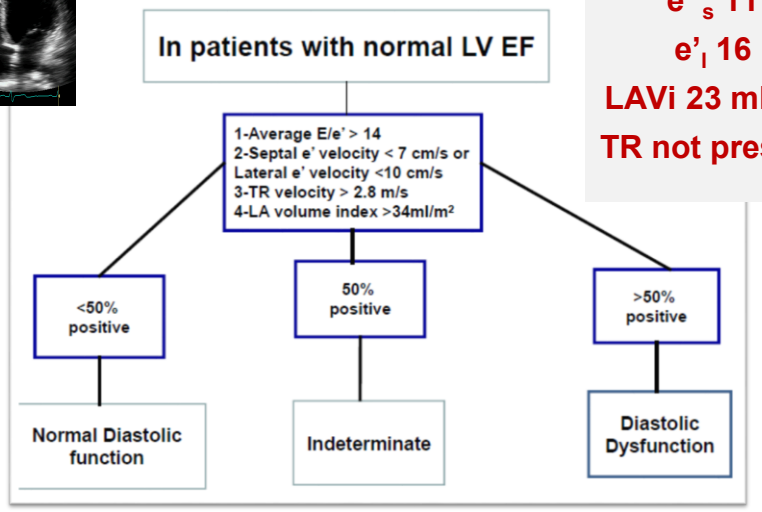




What are the filling pressures ?

1. Normal
2. High
3. Low





E/A 1.8
e'_s 11
e'_l 16
LAVi 23 ml/M2
TR not present

Nagueh JASE 2016

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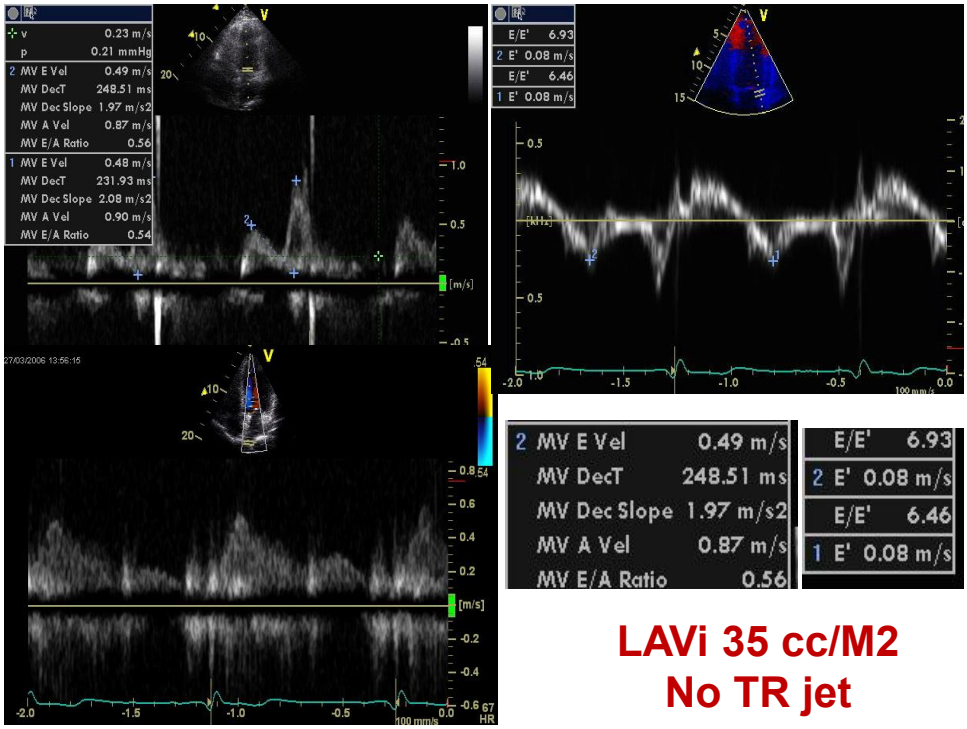
SM

66 year old

Retired police officer

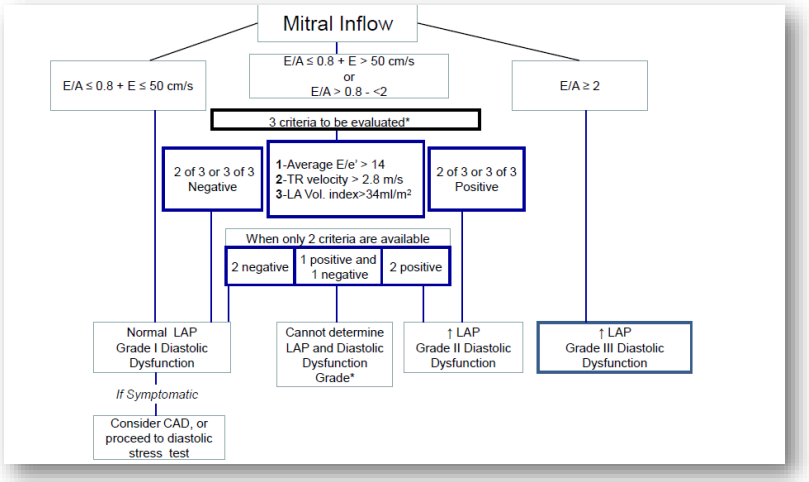
poorly controlled hypertension

Feels just fine, thanks



LAVi 35 cc/M2
No TR jet

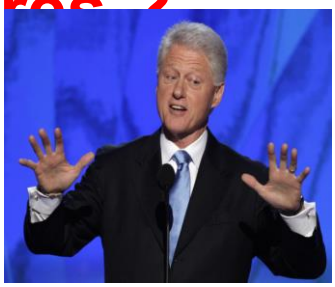
E/A 0.5 + E 49 cm/s
LAVi 35 ml/M2
TR not present



Nagueh JASE 2016

22

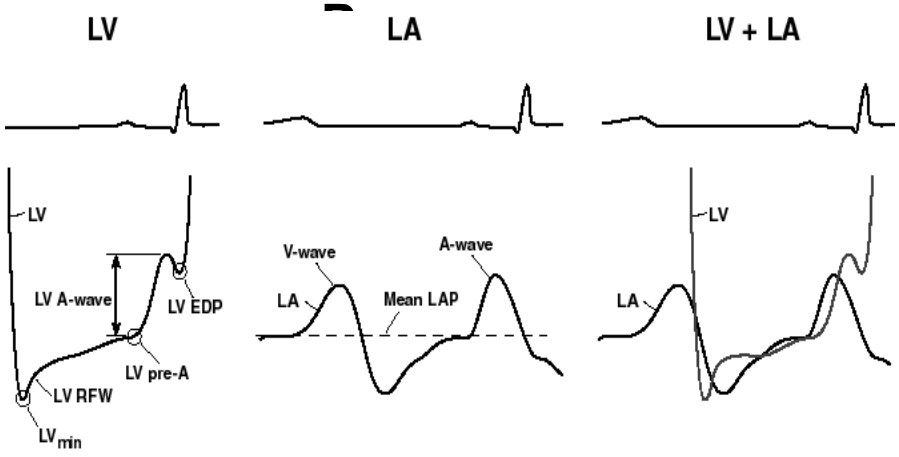
What are the filling pressures ?



1. Normal
2. High
3. Low
4. What do you mean by "filling pressures?" (i.e. none of the above)

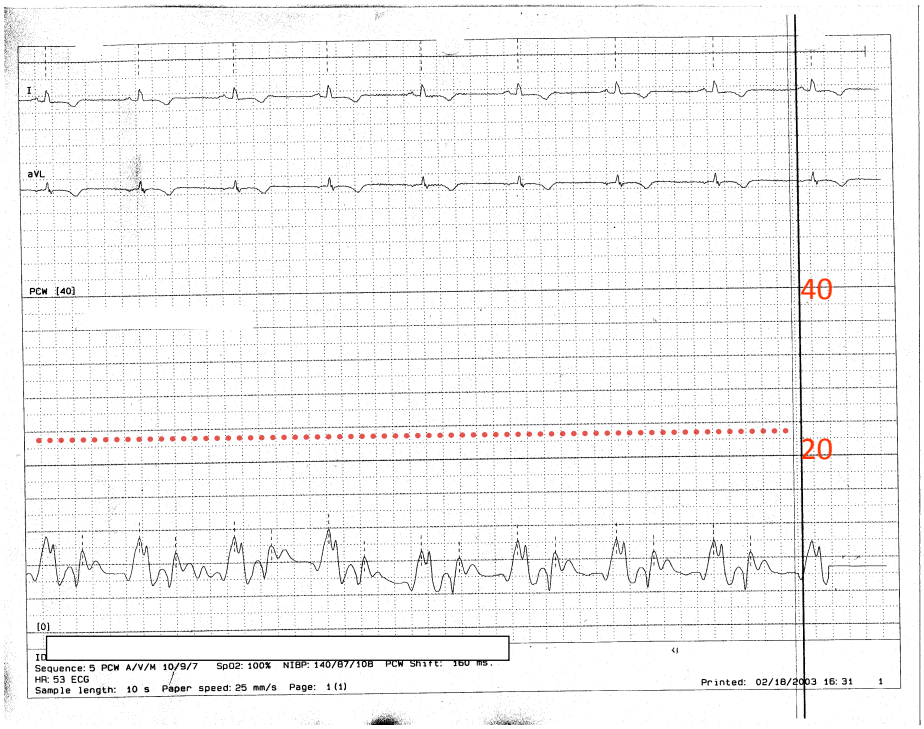
LV Filling Pressures

The Different LA and LV

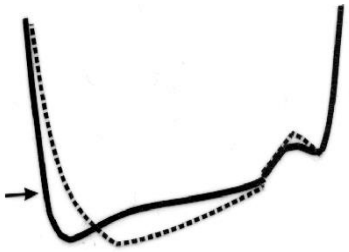


Courtesy: Chris Appleton, Mayo Clinic


I
aVL
LV [40]
20
[0]
HR: 58 LV LV dP/dt: 1743 dP/dt/P: 28
Sample length: 10 s Paper speed: 25 mm/s Page: 1 (1)
Printed: 02/18/2003 17:03 1


I
aVL
PCW [40]
40
20
[0]
Sequence: 5 PCW A/V/M 10/9/7 SpO2: 100% NIBP: 140/87/108 PCW Shift: 160 ms.
HR: 53 ECG
Sample length: 10 s Paper speed: 25 mm/s Page: 1 (1)
Printed: 02/18/2003 16:31 1

The atrial kick: an example of intelligent design



CONTROVERSIES IN CARDIOVASCULAR MEDICINE

Is echocardiographic evaluation of diastolic function useful in determining clinical care?

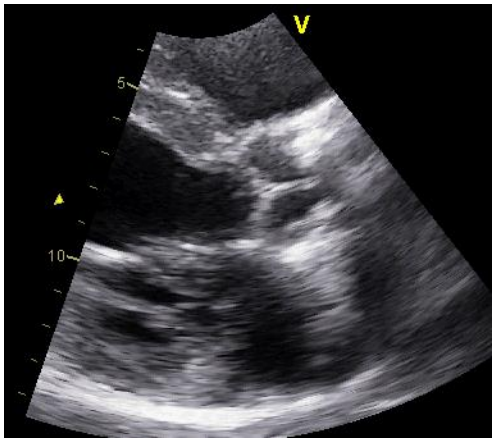
Echocardiographic Evaluation of Diastolic Function Can Be Used to Guide Clinical Care

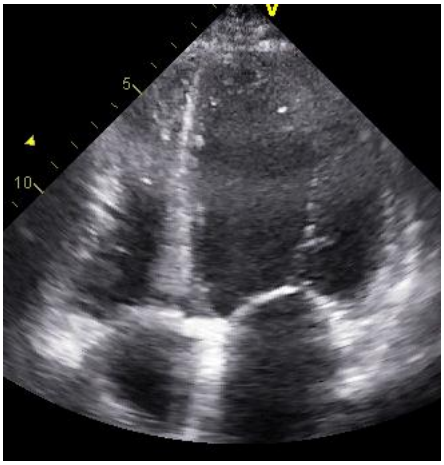
William C. Little, MD; Jae K. Oh, MD

In most patients with impaired relaxation pattern, the mean LA pressure is not elevated despite an increased LV end-diastolic pressure that is maintained by a vigorous atrial contraction.

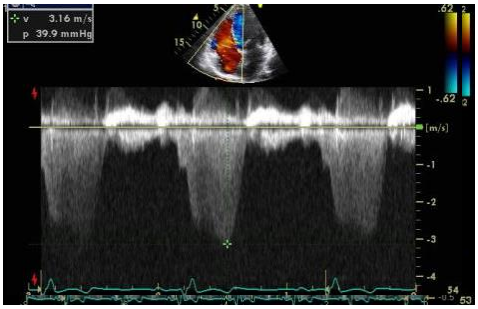
52 year old man

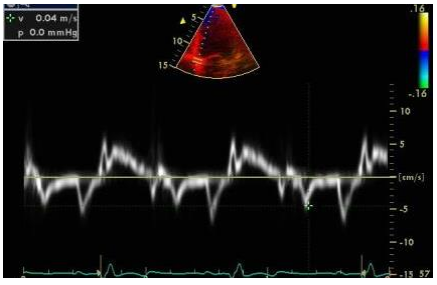
history of CAD admitted with HF

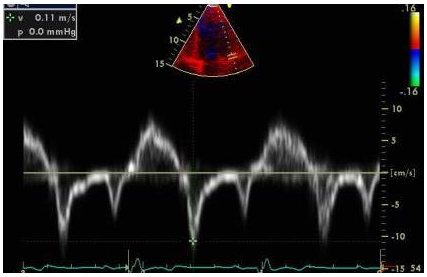




29





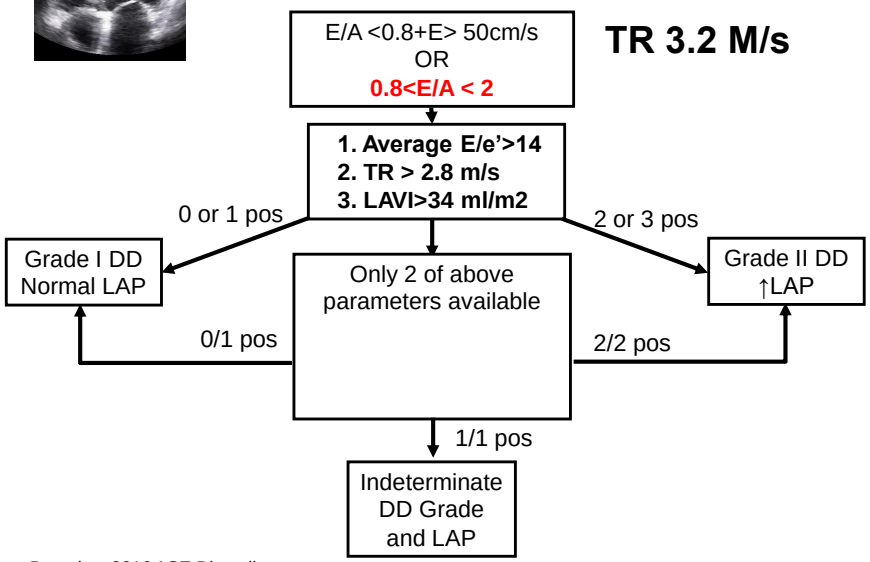


30

E/e' 15

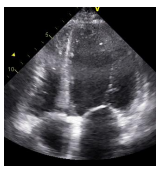
LAVi 33 ml/M2

TR 3.2 M/s



Based on 2016 ASE Diastolic Function Guidelines

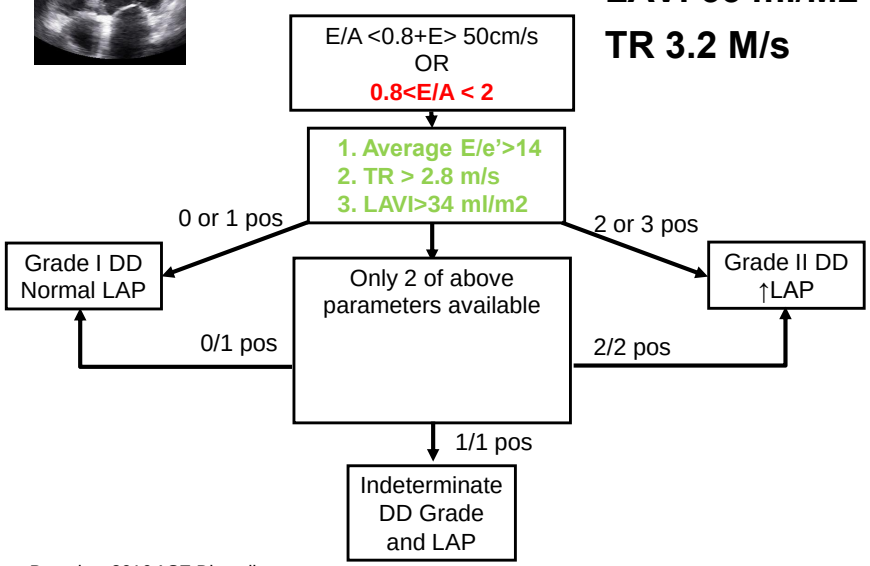
Created by Michael Salerno MD,PhD



E/e' 15

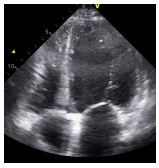
LAVi 33 ml/M2

TR 3.2 M/s



Based on 2016 ASE Diastolic Function Guidelines

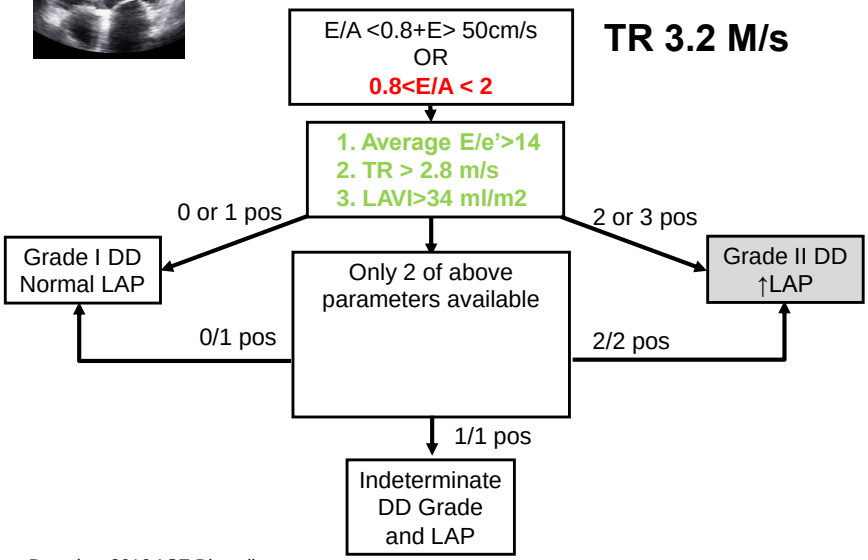
Created by Michael Salerno MD,PhD



E/e' 15

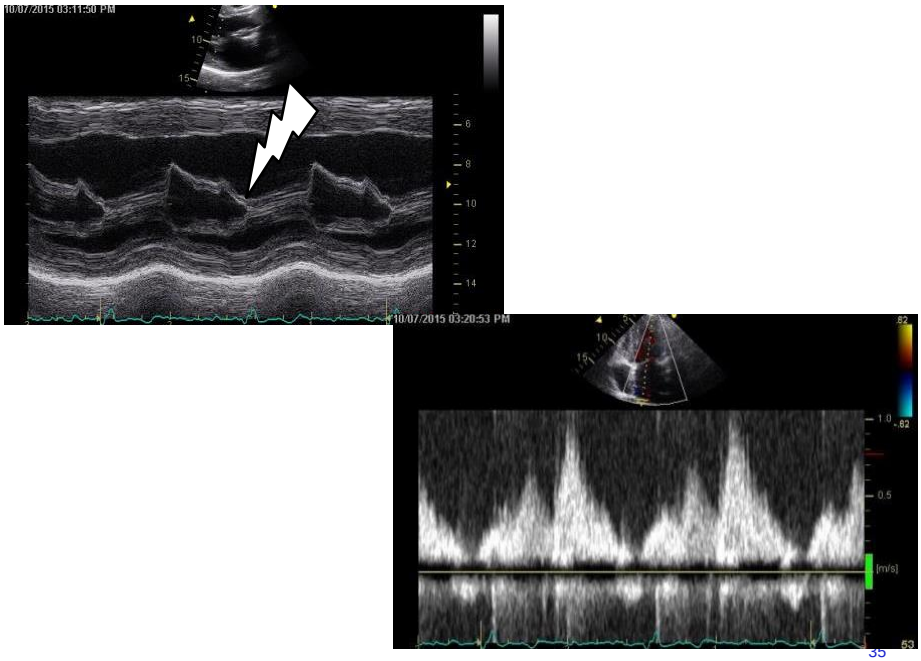
LAVi 33 ml/M2

TR 3.2 M/s



Based on 2016 ASE Diastolic Function Guidelines

Created by Michael Salerno MD,PhD



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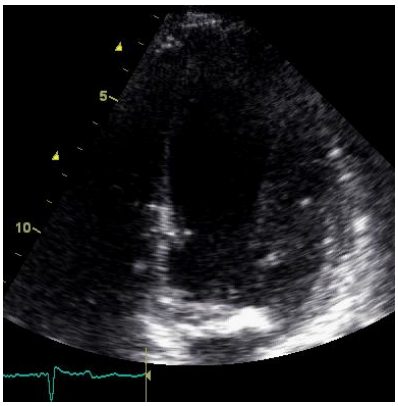
Diastolic Function in “Special” Populations

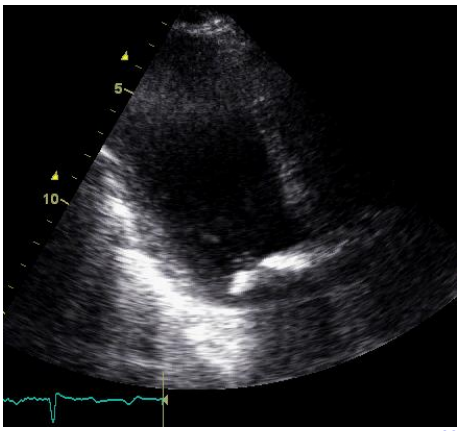
Table 6 Assessment of LV filling pressures in special populations

Disease	Echocardiographic measurements and cutoff values
AF[43,94-99]	Peak acceleration rate of mitral E velocity (≥1,900 cm/sec^2) IVRT (≤65 msec) DT of pulmonary venous diastolic velocity (≤220 msec) E/Vp ratio (≥1.4) Septal E/e′ ratio (≥11)
Sinus tachycardia[41,44]	Mitral inflow pattern with predominant early LV filling in patients with EFs <50% IVRT ≤70 msec is specific (79%) Pulmonary vein systolic filling fraction ≤40% is specific (88%) Average E/e′ >14 (this cutoff has highest specificity but low sensitivity) When E and A velocities are partially or completely fused, the presence of a compensatory period after premature beats often leads to separation of E and A velocities which can be used for assessment of diastolic function
HCM[100-106]	Average E/e′ (>14) Ar-A (≥30 msec) TR peak velocity (>2.8 m/sec) LA volume (>34 mL/m^2).
Restrictive cardiomyopathy[13,107-109]	DT (<140 msec) Mitral E/A (>2.5) IVRT (<50 msec has high specificity) Average E/e′ (>14)
Noncardiac pulmonary hypertension[32]	Lateral E/e′ can be applied to determine whether a cardiac etiology is the underlying reason for the increased pulmonary artery pressures When cardiac etiology is present, lateral E/e′ is >13, whereas in patients with pulmonary hypertension due to a noncardiac etiology, lateral E/e′ is <8
Mitral stenosis[110]	IVRT (<60 msec has high specificity) IVRT/$T_{E\text{-}e'}$ (<4.2) Mitral A velocity (>1.5 m/sec)
MR[110-112]	Ar-A (≥30 msec) IVRT (<60 msec has high specificity) IVRT/$T_{E\text{-}e'}$ (<5.6) may be applied for the prediction of LV filling pressures in patients with MR and normal EFs Average E/e′ (>14) may be considered only in patients with depressed EFs

A comprehensive approach is recommended in all of the above settings, which includes estimation of PASP using peak velocity of TR jet (>2.8 m/sec) and LA maximum volume index (>34 mL/m^2). Conclusions should not be based on single measurements. Specificity comments refer to predicting filling pressures > 15 mm Hg. Note that the role of LA maximum volume index to draw inferences on LAP is limited in athletes, patients with AF, and/or those with mitral valve disease.

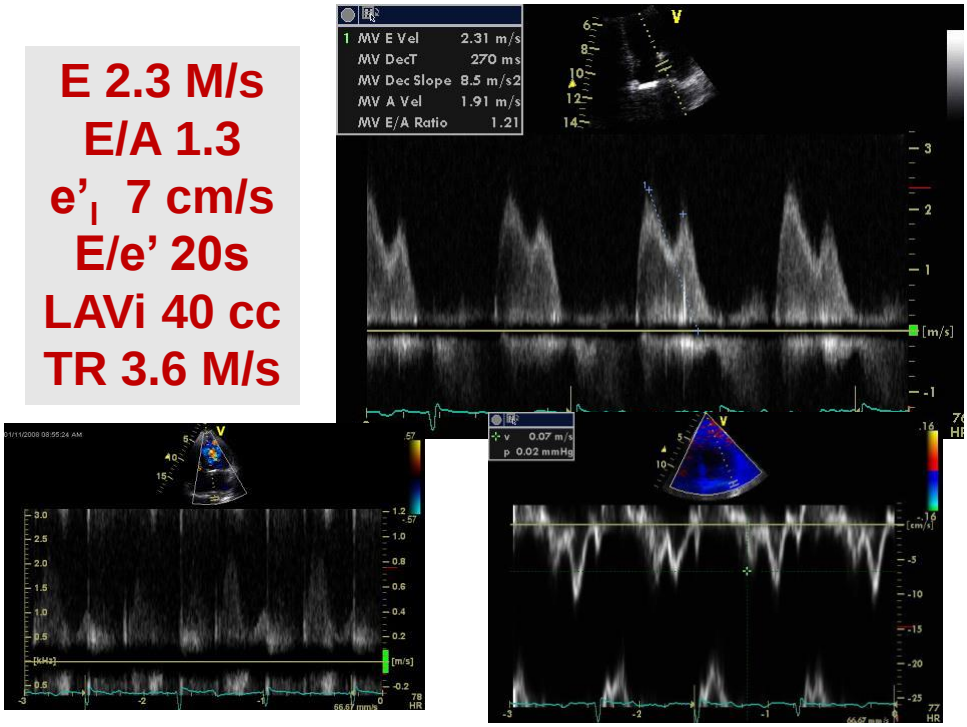


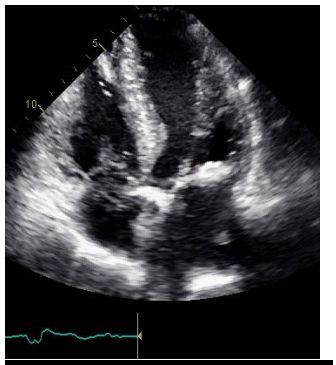
74 diabetic flash pulmonary edema

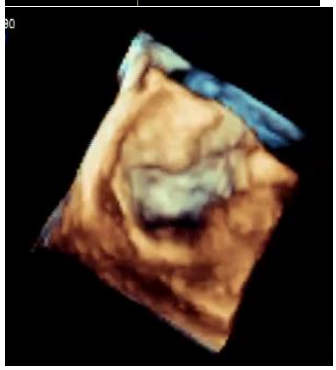


38

E 2.3 M/s
E/A 1.3
e'$_l$ 7 cm/s
E/e' 20s
LAVi 40 cc
TR 3.6 M/s







Doppler Echocardiography for the Estimation of LV Filling Pressure in Patients With Mitral Annular Calcification

Muaz M. Abudiab, MD, Lakshmi H. Chebrolu, MD, Robert C. Schutt, MD, Sherif F. Nagueh, MD, William A. Zoghbi, MD

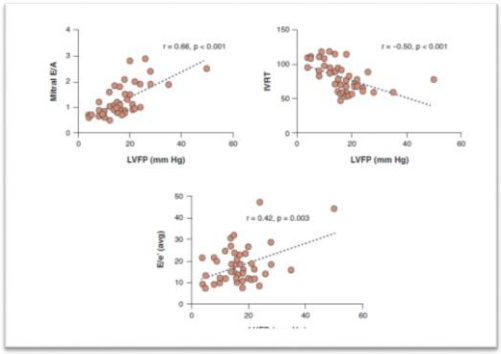


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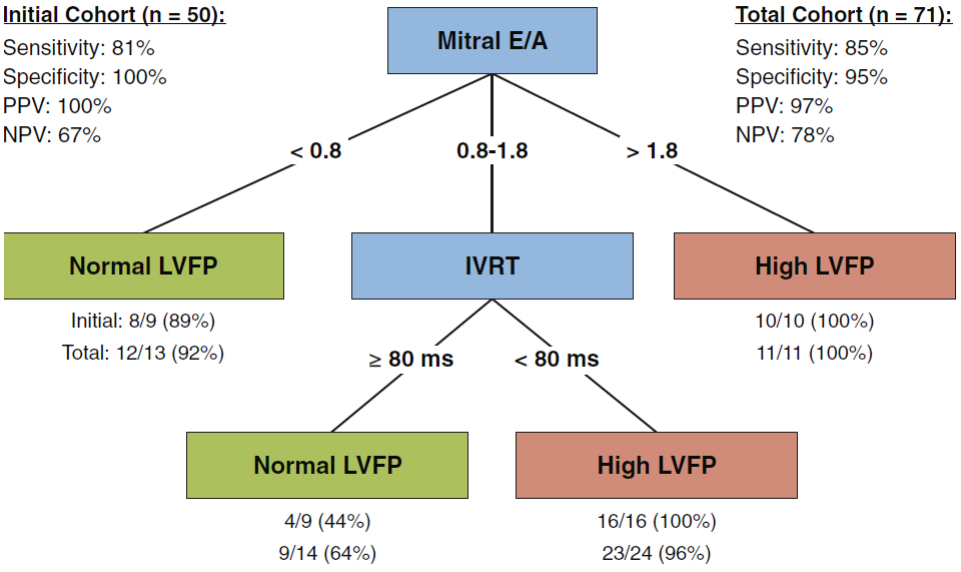
FIGURE 3 Proposed Clinical Algorithm for Estimation of Left Ventricular Filling Pressure in Subjects With Mitral Annular Calcification



42

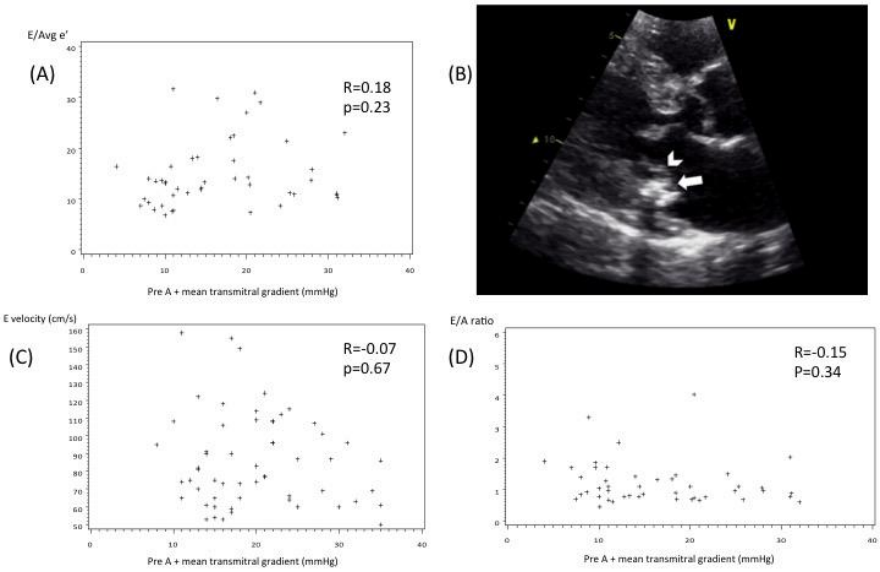


Figure 1: (A) Correlation between E/E' and LV pre A pressure plus transmitral gradient. (B) Parasternal long axis image showing heavy calcification of the posterior mitral annulus (arrow) involving the posterior leaflet (arrowhead). (C) Correlation between E velocity and LV pre A pressure plus transmitral gradient. (D) Correlation between E/A ratio and LV pre A pressure plus transmitral gradient.

Dickey, Ogunsua et al JASE (abstract)[43]

Diastolic Function in MV Disease

- **E wave reflects filling rate, not relaxation**
- **E wave is elevated because of**

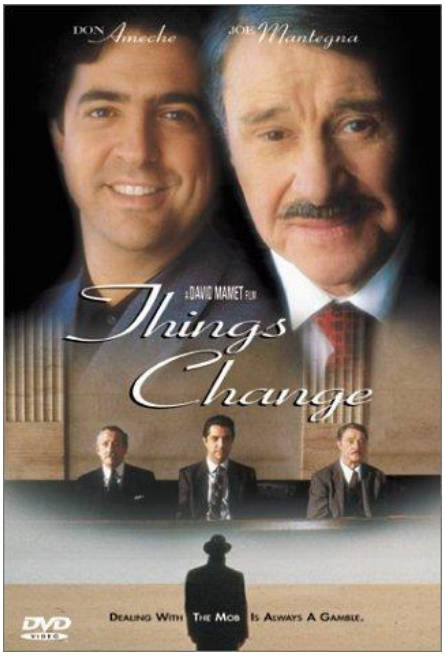
a. **high V wave**

b. **low end systolic pressure (preload effect)**

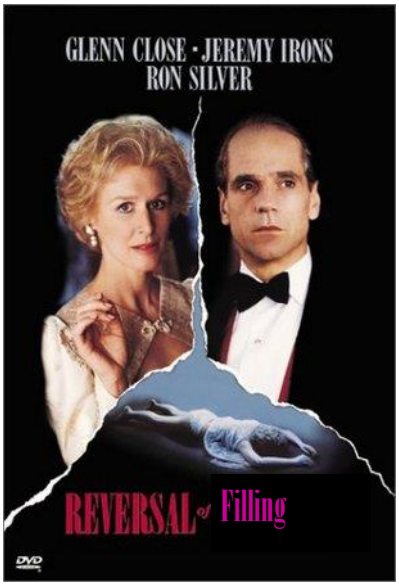
c. **high LA pressure**

- **E/e' works better in presence of myocardial disease, less well in MVP**
- **PV flow parameters PA pressure are useful**
- **Combination of E wave and IVRT holds promise in MAC**

[44]



45



The poignant story of how one man beat the odds and reversed advanced diastolic dysfunction !!!!

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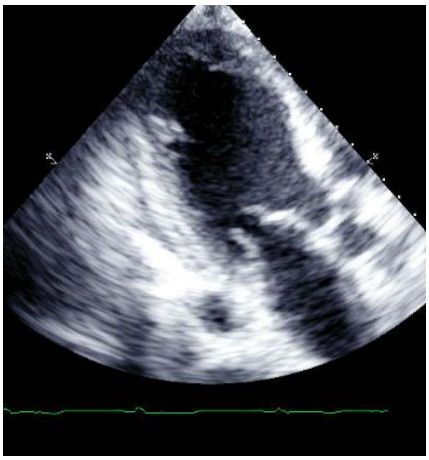


MV DS PL2t
MV E/A
2.19
78 BPM
79 BPM
cm/s
1.6MHz
WF 125Hz
SV4.0mm
16.5cm

48