Αδυναμίες στην εκτίμηση της διαστολικής λειτουργίας της αριστεράς κοιλίας

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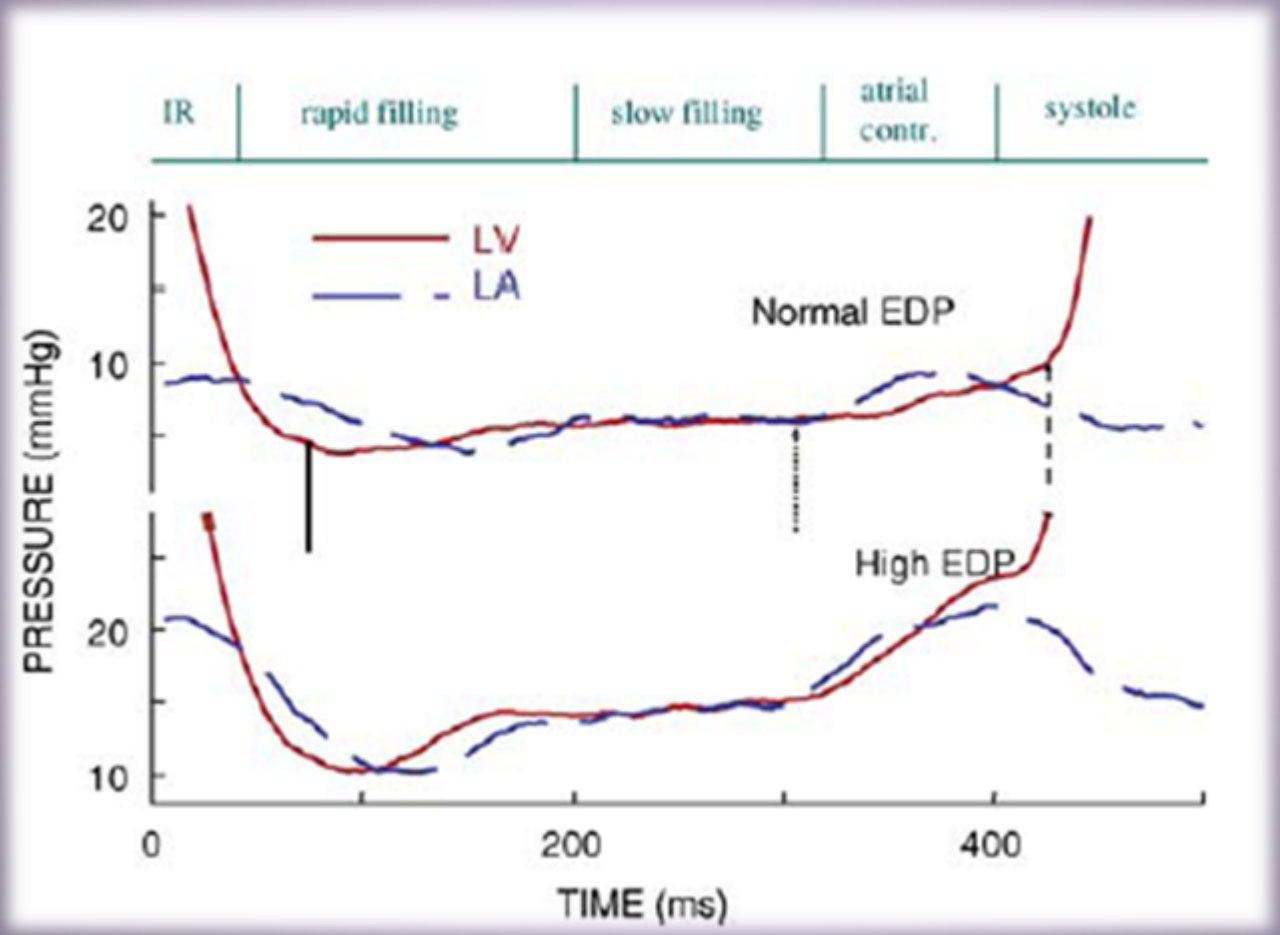
Evaluation of Left Ventricular Diastolic Function by Echocardiography



Echocardiography is the ***cornerstone*** for the assessment of left ventricular diastolic function in routine clinical practice

Impaired LV diastolic function/ filling pressures

two-dimensional (2D) parameters

LV volumes,

LV mass,

Ejection fraction (EF),

and left atrial (LA) volumes

and Doppler parameters

mitral inflow,

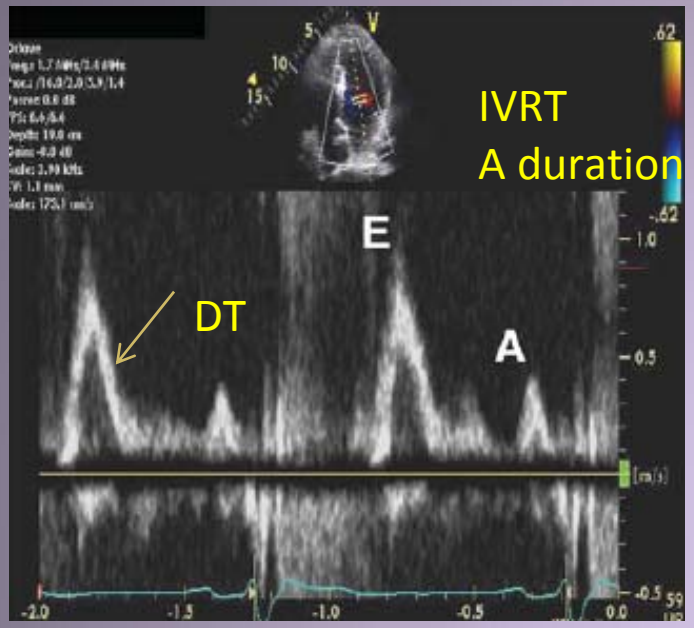
pulmonary venous flow,

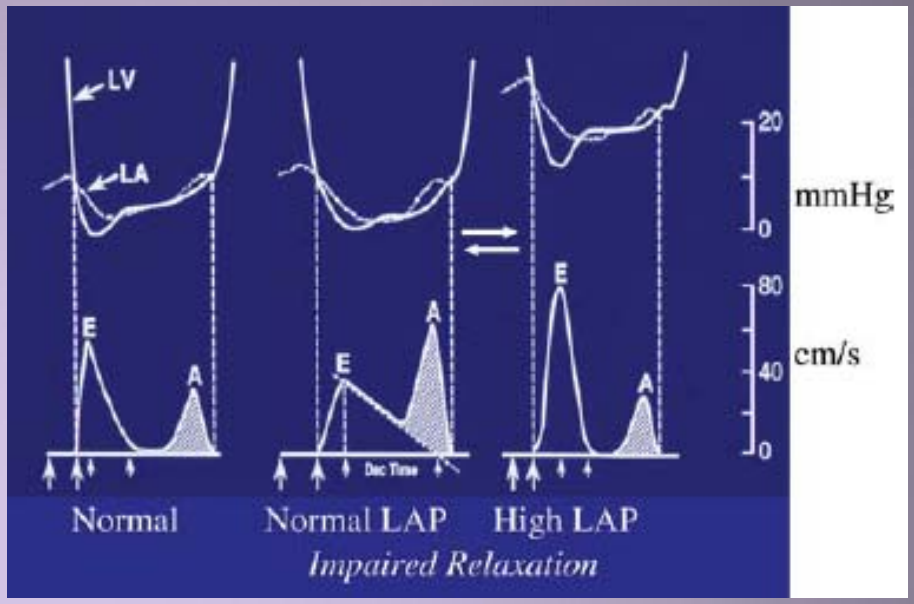
color M-mode flow propagation velocity (Vp),

and tissue Doppler (TD) mitral annulus velocities.

No one parameter clearly defines diastolic dysfunction and predicts elevated filling pressure

Mitral Inflow





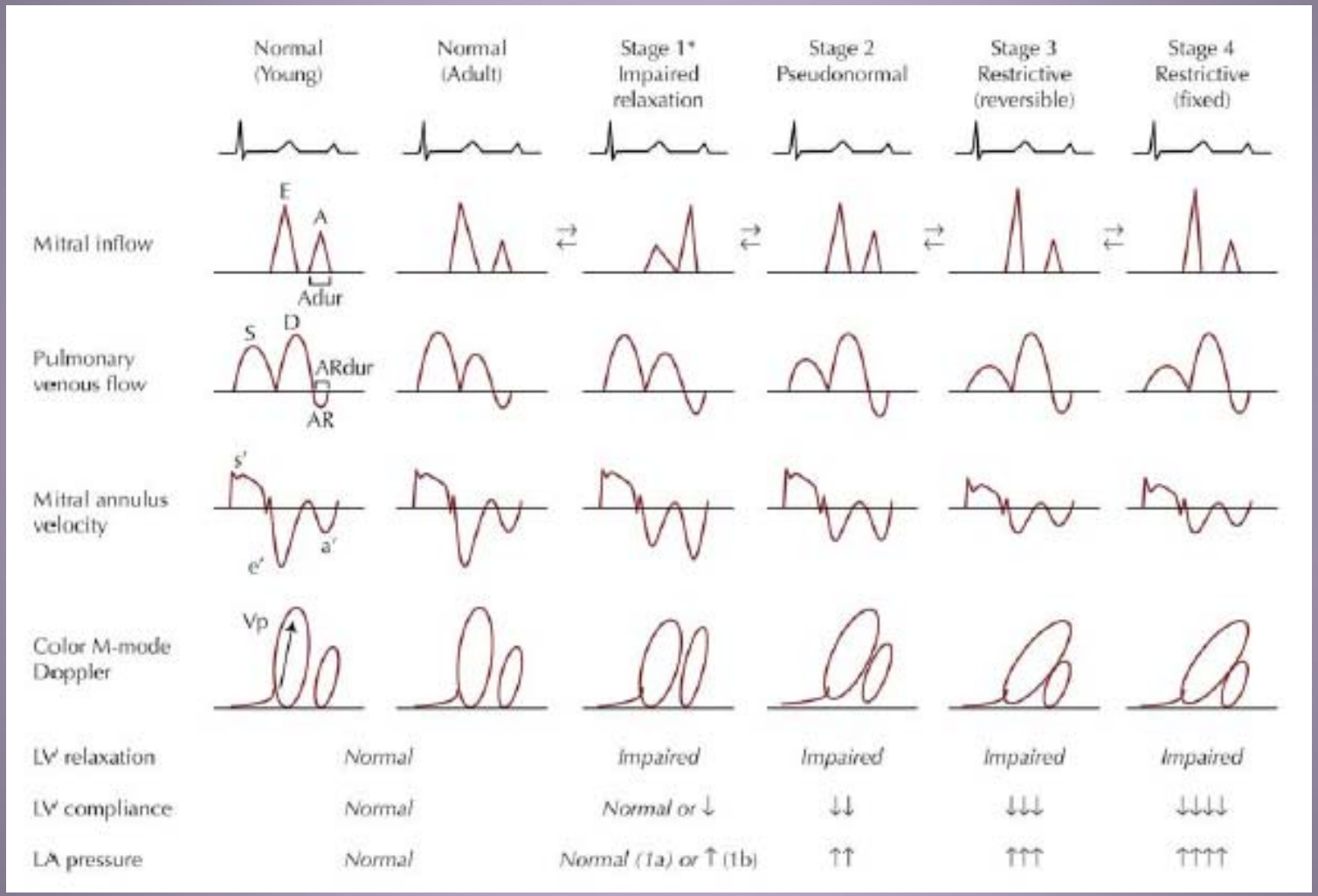
Dependent on **age and heart rate**.

Inaccurate in patients with **normal EF, and hypertrophic cardiomyopathy.**

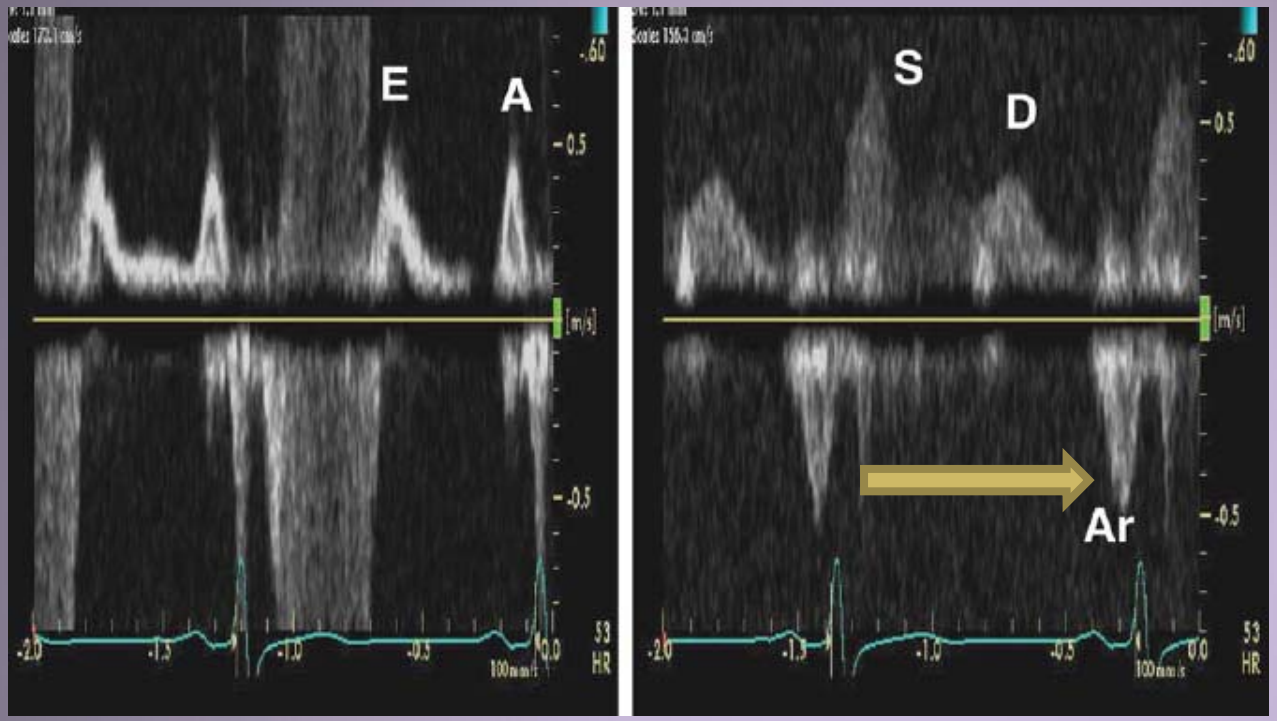
Limitations occur in patients with **heart block, atrial flutter, mitral valve disease, and heart transplants.**

ACC Curr J Rev 2001, ***10:45–49***

The Valsalva maneuver



Pulmonary Venous Flow



Peak systolic velocity (S)

Peak diastolic velocity (D)

S/D ratio <1

Systolic filling fraction

Peak Ar velocity >35cm/s

Duration Ar

Ar-A> 30ms

difficulty in obtaining high-quality recordings

age, heart rate, and respiratory effort affect pulmonary vein velocities.

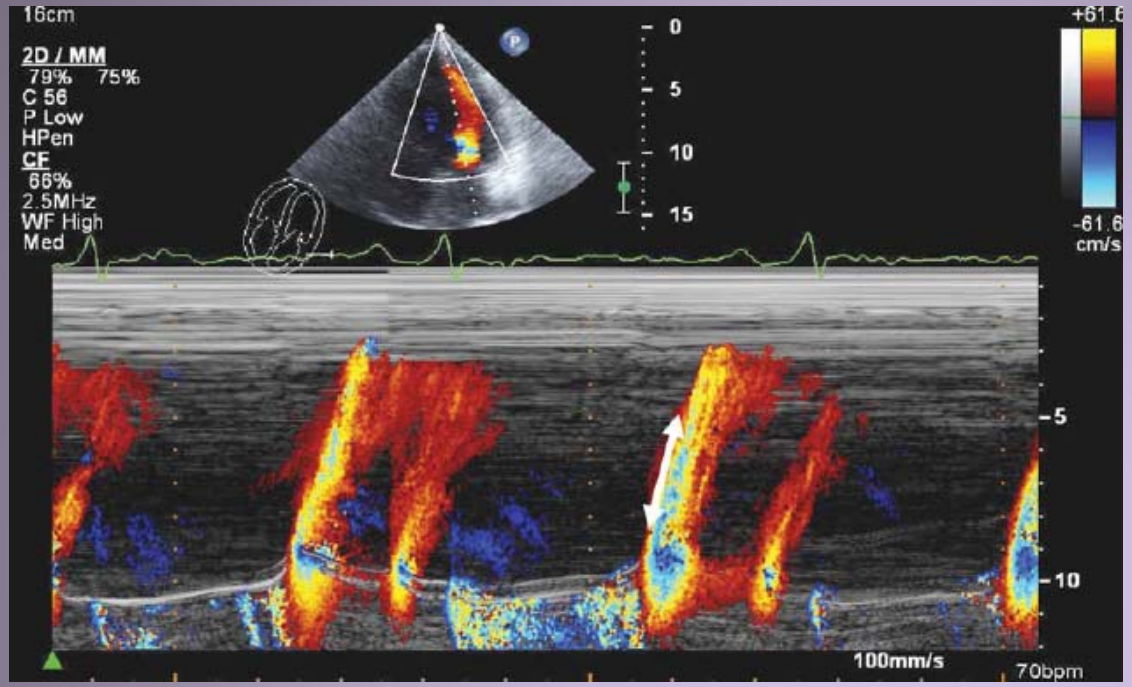
S/D can be inaccurate in patients with normal EF, and hypertrophic cardiomyopathy.

J Am Coll Cardiol 1997, ***30:1819–1826***

Ar-A duration is the **only age independent** indication of LVEDP increase

(sinus tachycardia, 1st AV block, atrial fibrillation)

Early Diastolic Flow Propagation Velocity



•Vp >50 cm/s is considered normal.

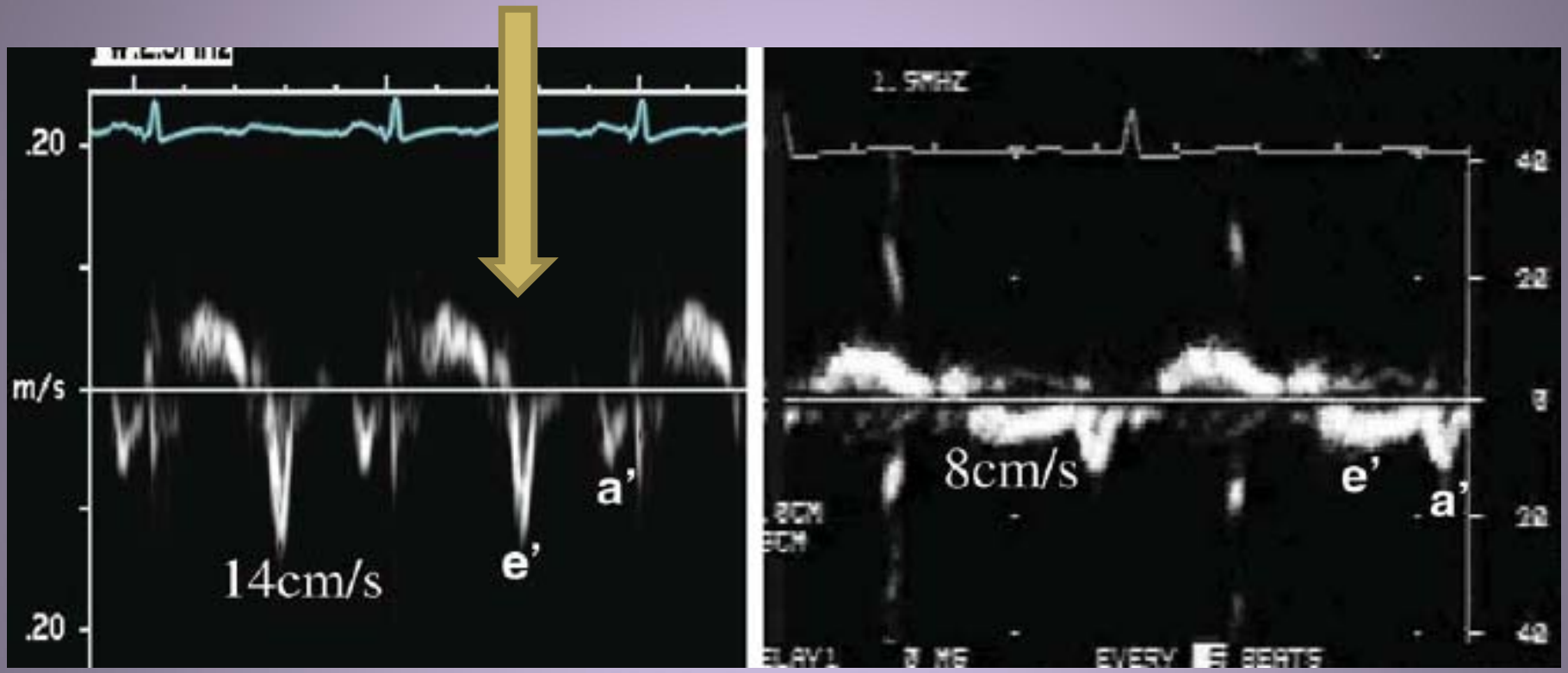
•E/Vp ratio 2.5 predicts PCWP >15 mm Hg with reasonable accuracy

•Patients with normal LV volumes and EFs but elevated filling pressures can have misleadingly normal Vp

J Am Coll Cardiol 1997, ***29:448–454.***

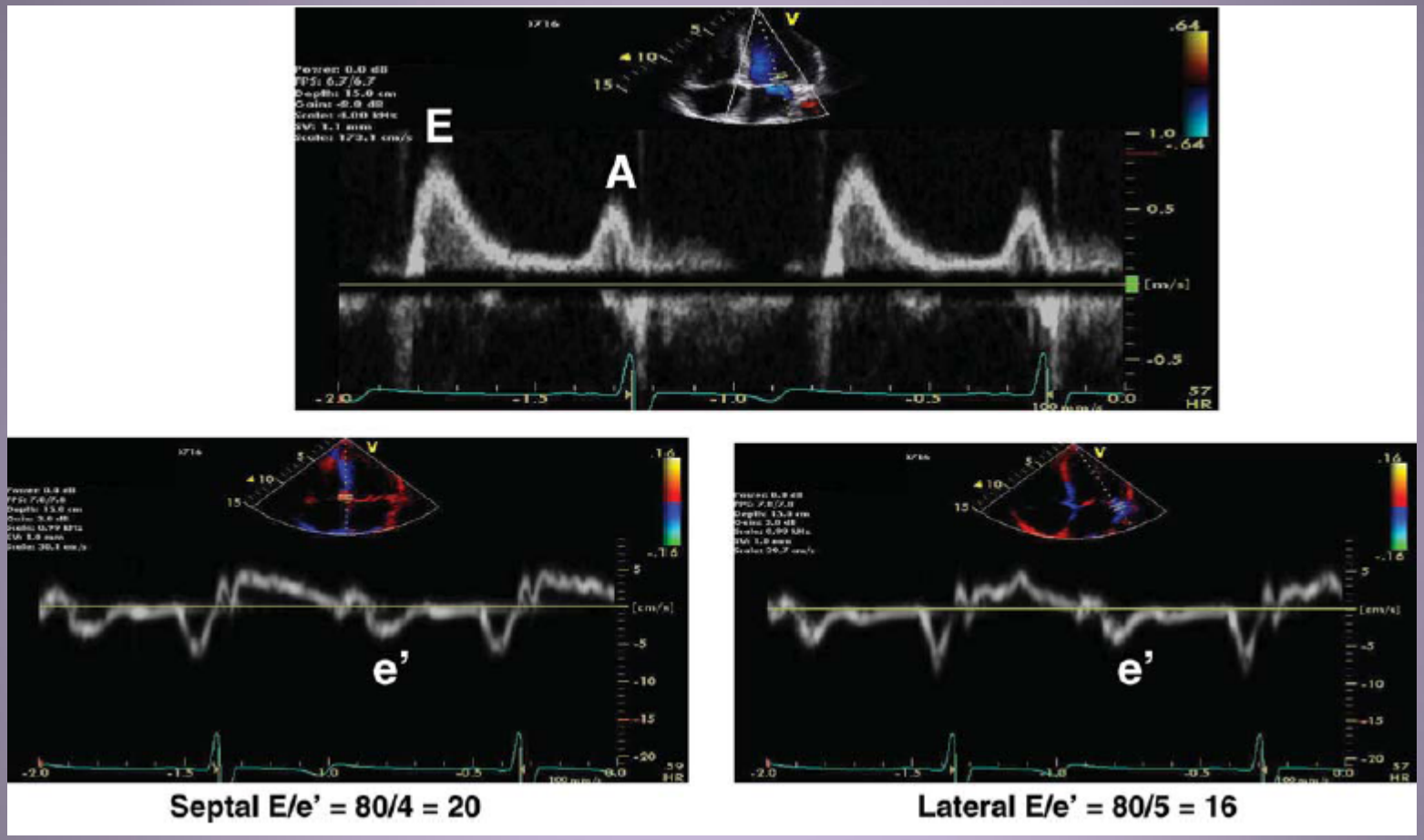
Tissue Doppler Annular Early and Late Diastolic Velocities

Less preload dependent



Normal values of DTI-derived velocities are influenced by age

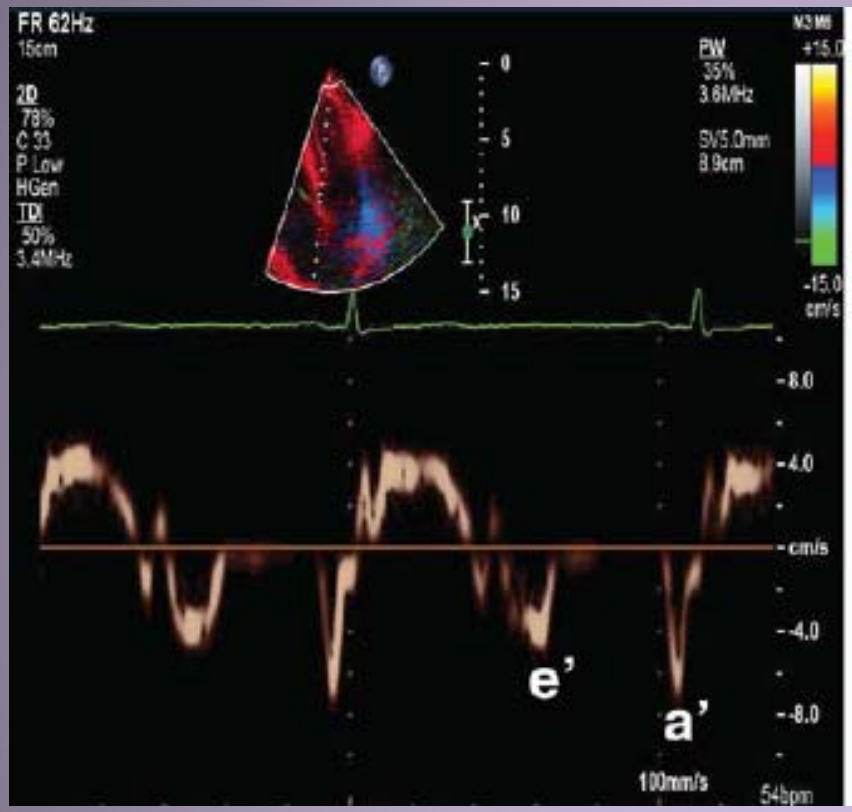
Tissue Doppler Annular Early and Late Diastolic Velocities

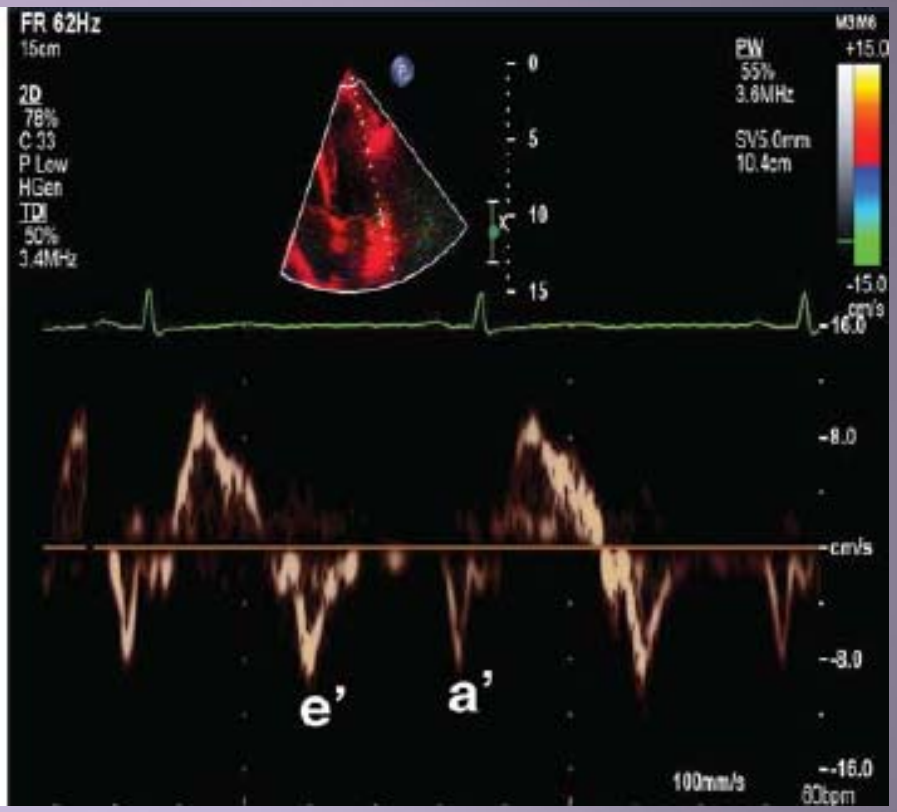


an average of the septal and lateral annular velocities, with an average **E/e′ ratio ≥ 13** being indicative of elevated LV filling pressures

J Am Soc Echocardiogr 2009, **22:107–133**

Tissue Doppler Annular Early and Late Diastolic Velocities





Tissue Doppler Annular Early and Late Diastolic Velocities

Technical limitations: location of the sample size,
gain, filter, minimal angulation
time interval measurements ⇔ variability
(IVRT/T E-e')

Clinical limitations:
annular calcification, surgical rings
mitral stenosis, prosthetic mitral valve
} e'reduced

primary MR } e' increased

acutely decompensated patients with advanced systolic heart failure, particularly in patients with large ventricular volumes, severely impaired cardiac output, with cardiac resynchronization therapy

Circulation 2009, ***119:62–70.***

in symptomatic patients with hypertrophic cardiomyopathy (New York Heart Association class III or IV)

Circulation 2007, ***116:2702–2708***

Global Diastolic Strain Rate

LV global strain rates during isovolumic relaxation (SRIVR) and early diastole correlate significantly with the time constant of LV relaxation

LV Untwisting Rate

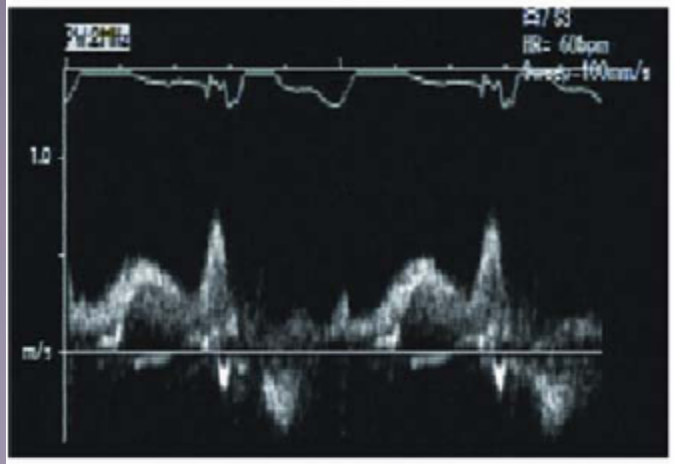
it is dependent on heart rate, preload and afterload, and LV relaxation

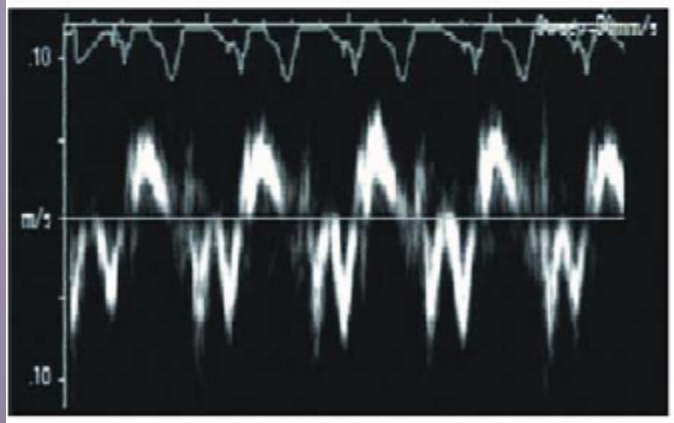
LV twist is reduced in diastolic dysfunction with impaired LV ejection fraction but not with preserved ejection fraction

Heart Fail Clin 2008, **4:315–324**

Diastolic Stress Test

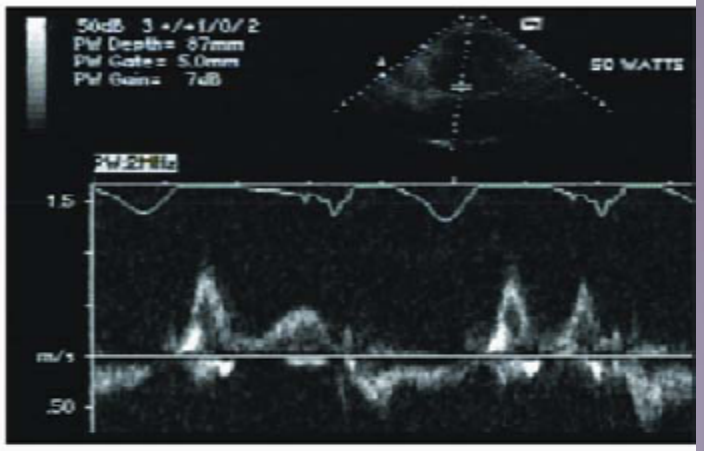
Baseline

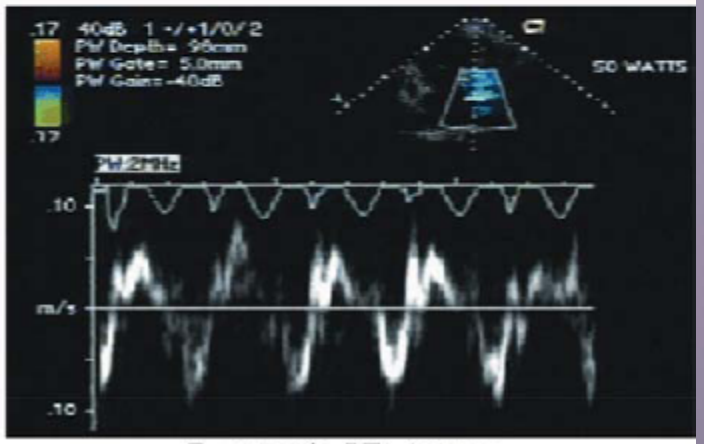




E= 50 cm/s, DT= 250 ms
e' = 7, E/e' = 7
TR = 2.4 m/s

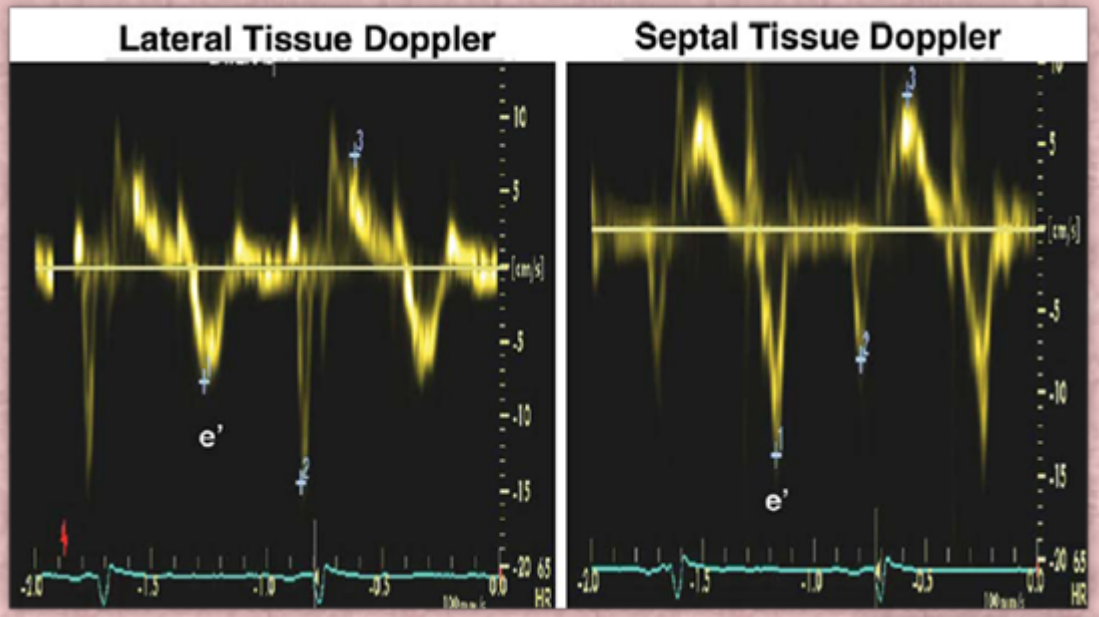
Supine Bike at 50 Watts





E= 85 cm/s, DT= 140 ms
e' = 8, E/e' = 11
TR = 3.8 m/s

Pericardial Diseases



Variable	Restriction	Constriction
Septal motion	Normal	Respiratory shift
Mitral E/A ratio	>1.5	>1.5
Mitral DT (ms)	<160	<160
Mitral inflow respiratory variation	Absent	Usually present
Hepatic vein Doppler	Inspiratory diastolic flow reversal	Expiratory diastolic flow reversal
Mitral septal annular é	Usually <7 cm/s	Usually >7 cm/s
Mitral lateral annular é	Higher than septal é	Lower than septal é
Ventricular septal strain	Reduced	Usually normal

Recommendations for the Assessment of LV Relaxation

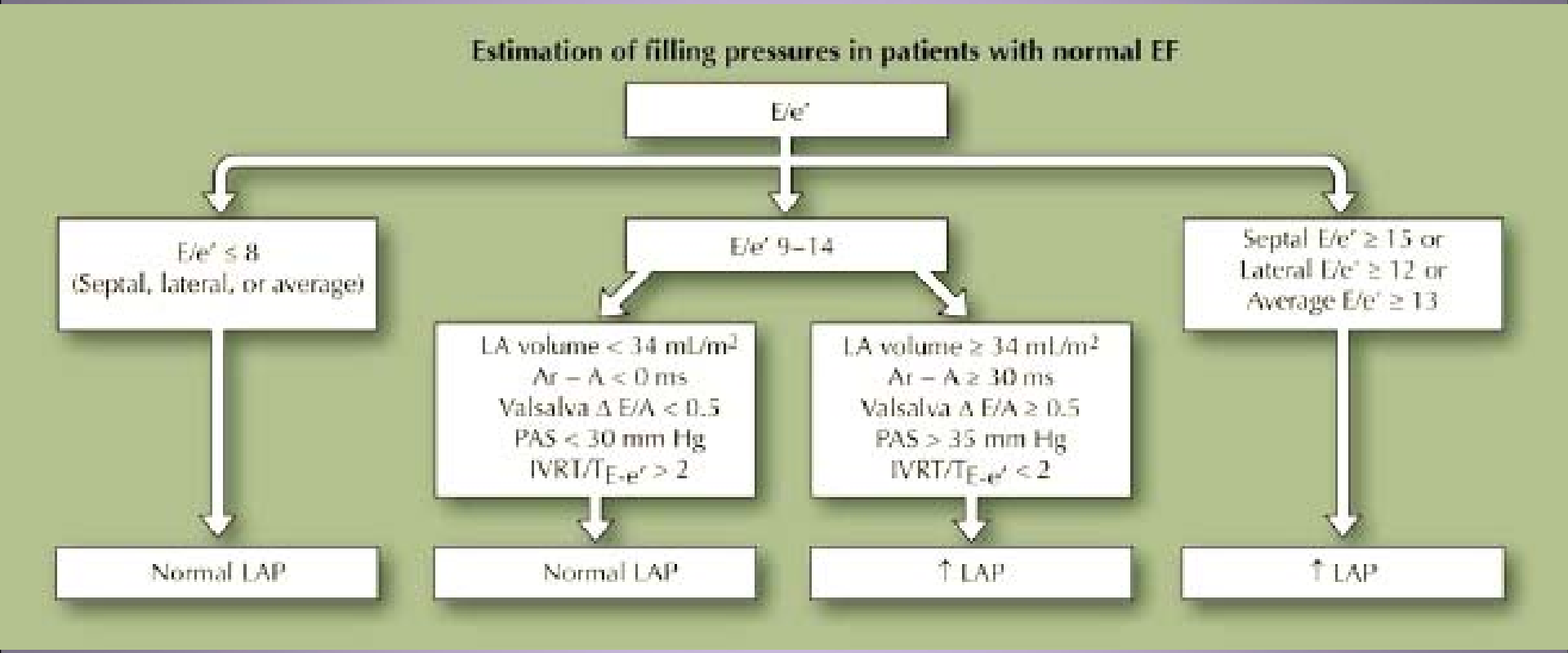
- Mitral inflow velocities and IVRT are not recommended as single measurements for that objective due to their load dependence.

- Vp can be applied in patients with depressed EF and dilated LV, though it has major limitations in patients with normal EF and volumes.

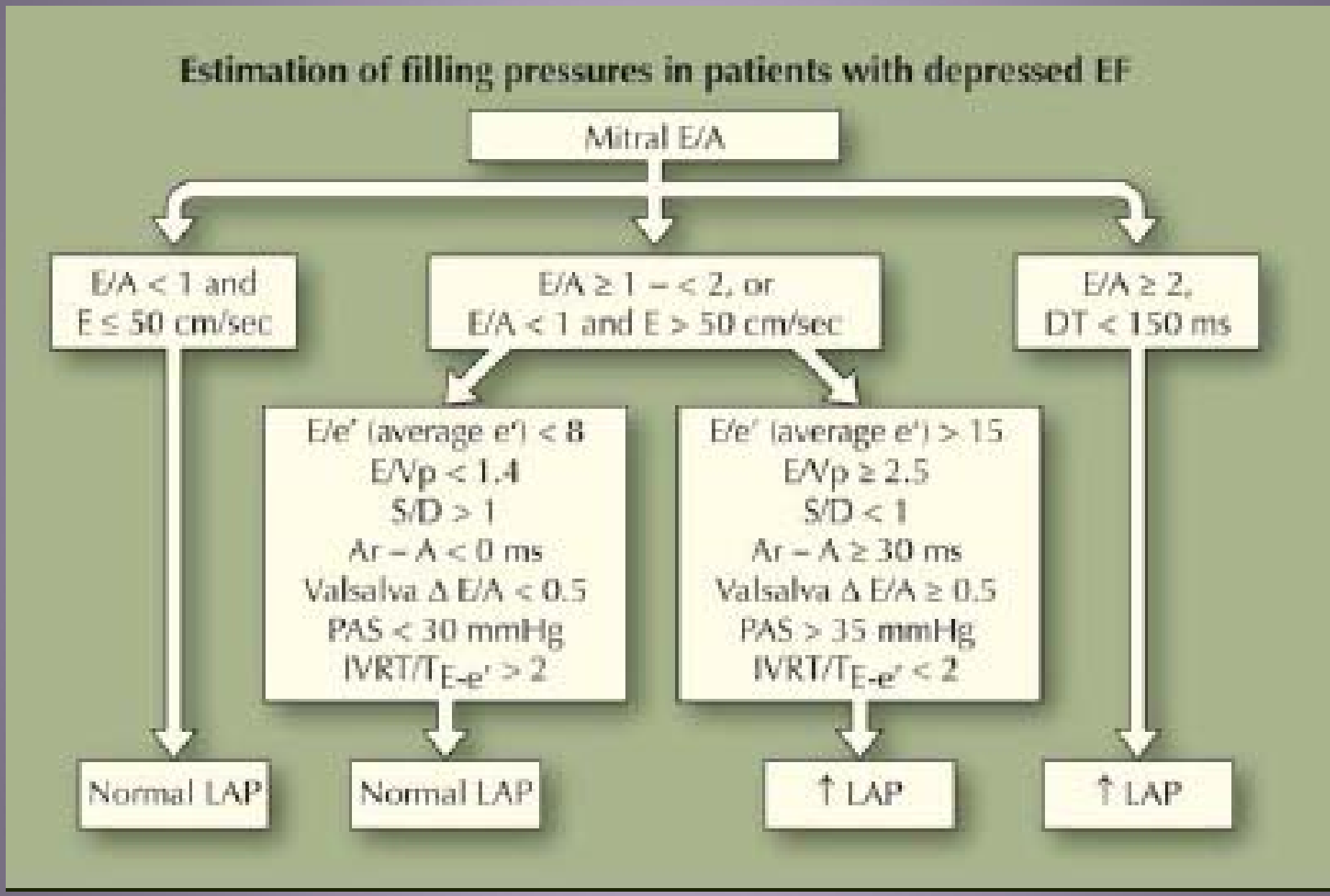
- Mitral annulus e′ velocity can be used as the initial approach for drawing conclusions about the status of LV relaxation in patients with normal EF.

A septal velocity less than 8 cm/sec, and a lateral velocity less than 8.5 cm/sec are diagnostic of abnormal LV relaxation in subjects younger than 60 years old.

- For research purposes, the aortic regurgitation and mitral regurgitation signals by CW Doppler may be used to derive noninvasive estimates and the time constant of LV relaxation



Current Heart Failure Reports 2009, 6:154–159



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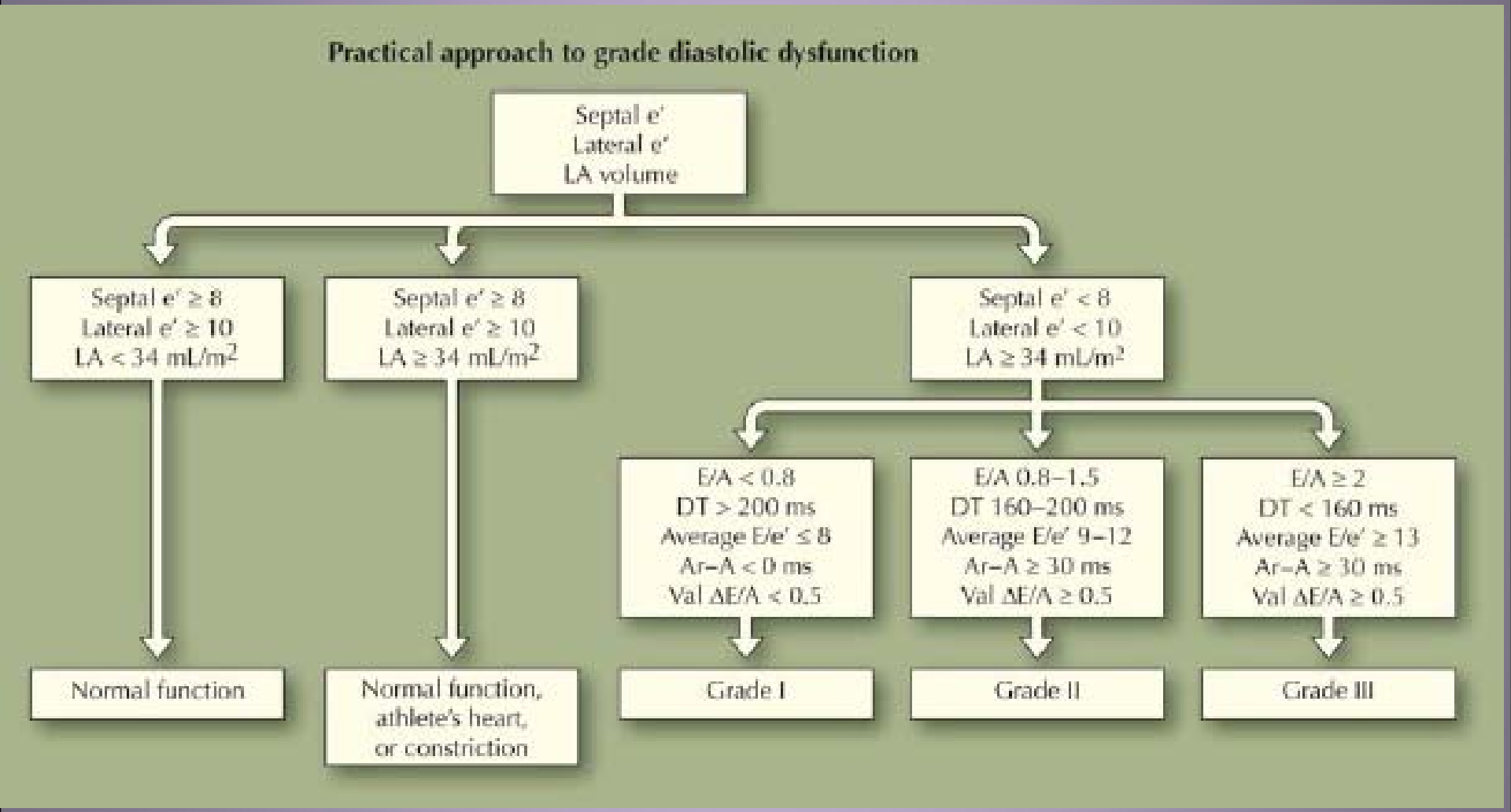

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