Diastolic Heart Function: Applying the New Guidelines 
Case Studies

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Relation with Industry

- None relevant
ASE/EACVI GUIDELINES AND STANDARDS

Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging

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How To Determine if Diastolic Dysfunction is Present?

- Known CV disease as CAD
- Pathologic LVH
- Hypertensive CV Disease
- LV systolic Dysfunction as noted by depressed LV EF
- Established clinical diagnosis of HFpEF
- Reduced LV global longitudinal strain, TD mitral annulus s’ velocity and MAPSE
- Specific Doppler signals (Prominent Ar in PV, L wave...)

Mitral Inflow “L” Velocity
Pulmonary Vein Ar Velocity in a Patient with HFrEF

What to Do if Clinical and 2D Findings Are Not Indicative of Cardiac Disease?
Criteria for Diagnosis of LV Diastolic Dysfunction

2D and Echo Doppler Findings in a 31 Year Old Male referred with a “Murmur” Diagnosis

- LA maximum volume index = 29 ml/m²
- TR jet peak velocity = 2.4 m/s
- LV EF = 65% (BP = 120/80 mmHg, HR = 60/min)
How would you Assess LV Diastolic Function

A-Normal
B-Grade I diastolic dysfunction
C-Grade II diastolic dysfunction
D-Grade III diastolic dysfunction
E-Cannot be determined
Case 1

- 63 year old male with recurrent dyspnea on daily activity, orthopnea and bilateral ankle swelling
- Gradual onset, and progressive course
- Has DM on oral medications and insulin
- Hypertension for > 10 years
- Chronic renal disease, serum creatinine = 2.5 mg/dL
- BP = 160/85 mmHg, HR = 64/min
Apical Views

MR by Color Doppler
Mitral Inflow and Annulus TD Velocities

Septal $E/e' = 160/6 = 26$

Lateral $E/e' = 160/8 = 20$

TR Jet by CW Doppler

Peak TR Velocity = 3.6 m/s
How would you Assess LV Diastolic Function

A-Normal
B-Grade I diastolic dysfunction
C-Grade II diastolic dysfunction
D-Grade III diastolic dysfunction
E-Cannot be determined

Summary

- Clinical data consistent with cardiac disease
- E/A ratio >0.8 and <2
- Average E/e’ = 20
- LA enlarged > 34 mL/m²
- TR 3.6 m/s
How would you Assess LV Diastolic Function

A-Normal
B-Grade I diastolic dysfunction
C-Grade II diastolic dysfunction
D-Grade III diastolic dysfunction
E-Cannot be determined
Case II

- 66 year old woman with history of previous MI presents with recurrent episodes of dyspnea with daily activities
- Onset of dyspnea 6 months ago, with a progressive course
- Has history of HTN, diabetes mellitus, and hypercholesterolemia
- No history of pulmonary disease
- BP = 116/68 mmHg, HR =60/min

Parasternal Long axis View
Apical Views

Mitral and Pulmonary Venous Flow
How would you Assess LV Diastolic Function

A-Normal
B-Grade I diastolic dysfunction
C-Grade II diastolic dysfunction
D-Grade III diastolic dysfunction
E-Cannot be determined

Summary

➢ Clinical data consistent with cardiac disease
➢ LV EF depressed
➢ E/A ratio $> 2$
➢ Pulmonary vein S/D ratio $< 1$
➢ LA enlarged $> 34$ mL/m$^2$
How would you Assess LV Diastolic Function

A- Normal
B- Grade I diastolic dysfunction
C- Grade II diastolic dysfunction
D- Grade III diastolic dysfunction
E- Cannot be determined
TD Sample Volume Location is Important

Cannot Use E/e’ To Estimate LV Filling Pressure In Diseases of The Mitral Valve

- Significant MV annular calcifications
- Mitral stenosis
- Significant mitral regurgitation
- Prosthetic mitral valve
Doppler Echocardiography for the Estimation of LV Filling Pressure in Patients With Mitral Annular Calcification

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

Algorithm for LVFP in MAC

Initial Cohort (n = 50):
- Sensitivity: 81%
- Specificity: 100%
- PPV: 100%
- NPV: 67%

Total Cohort (n = 71):
- Sensitivity: 85%
- Specificity: 95%
- PPV: 97%
- NPV: 78%

Mitral E/A

< 0.8
0.8-1.8
> 1.8

Normal LVFP
- Initial: 8/9 (89%)
- Total: 12/13 (92%)

IVRT
- ≥ 80 ms
- < 80 ms

Normal LVFP
- 4/9 (44%)
- 9/14 (64%)

High LVFP
- 16/16 (100%)
- 23/24 (96%)

High LVFP
75 yo with dyspnea: Is LV Filling Pressure Elevated?

Mitral Inflow

Tissue Doppler

\[ E = 130 \text{ cm/s} \]
\[ e' = 7 \text{ cm/s} \]
\[ \frac{E}{e'} = \frac{130}{7} = 19 \]

IVRT

TR Jet

\[ \text{IVRT} = 90 \text{ ms} \]
\[ \text{PASP} = 30 \text{ mmHg} \]

LV filling pressure is Normal.
What is Needed to Apply Guidelines Correctly

- Clinical findings collected and considered
- 2D/Doppler signals: good quality & accurately analyzed
- Recognize special situations & limitations of Doppler:
  - Special situations: A Fib, MAC, extremes of HR, high output
  - Cannot apply Doppler parameters (E/e’) in significant MR, MS, Prosthetic MV