Classic M mode Echocardiography

ECHOCARDIOGRAPHY
BOARD REVIEW

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M-mode

• Refers to the motion that is derived from the time component.
• Also referred to as Time-motion mode (T-M mode)
• Higher sampling rate (1800/sec vs. 30/sec)
• Higher temporal resolution (diastolic fluttering of AV, B bump, AV notching).
Temporal Resolution

- Temporal resolution is determined by frame rate.
- Frame rate in turn is determined by imaging depth and number of pulses per frame.
- M-mode is only one line interrogation, therefore fewer pulses and high frame rate lead to better temporal resolution at the expense of somewhat poor spatial resolution.
M mode (Disadvantages)

- Relatively poor spatial resolution
- Single dimension (depth only)
- Non-perpendicular interrogation (always use 2D guidance)
- M-mode overestimates LV true dimension by 6-12 mm.
NORMALS
Some important points to remember for the Echo Boards

• Figure out what structure you are looking at first (make use of the 2D image above).
• Always look at the EKG to time abnormal motion in cardiac cycle and figure out the valve in question (mitral opens in diastole, aortic in systole).
• If multiple m modes are provided in the same case, then try to identify a unifying diagnosis.
• May get a normal m mode.
MV Prolapse
(posterior leaflet)
Severe Aortic Regurgitation

- Ao
- LA
- LV
- AVO
- MVC
Fine MV Fluttering in AR

Commonly seen with AR, but not a marker of severity.
Mitral valve fluttering/premature closure (not shown), and premature opening of Aortic valve in acute severe AI
• Thick calcified MV
• Reduced EF slope
• Anterior motion of the posterior leaflet in diastole
• Reduced MV opening in diastole
Mitral Stenosis
Normal MV

MS

Adapted from ASCE Review course 2007
M-mode through the aortic valve
M-Mode in HOCM

ASH / SAM

Mid-systolic AV Closure
Mid systolic AV closure, AV notching, thick septum, SAM (defines degree of LVOT obstruction)

**Dynamic LVOT Obstruction**
M-Mode LV  PSLAX
Paradoxical Septum

FIGURE 14-6. Paradoxical septal motion indicates severe right ventricular volume overload, due in this case to isolated severe TR. A, Diastole—the interventricular septum flattens toward the LV cavity. B, Systole—paradoxical bulging of the interventricular septum away from the LV cavity.
Inferior Vena Cava

**FIGURE 14-7.** A, Subcostal echocardiographic view: severe right-sided heart failure is indicated by an engorged inferior vena cava (IVC) and hepatic vein (*), ascites (a) surrounding the liver (L), and a dilated right atrium (RA). B, In the same patient, pulsed Doppler blood-flow velocity measurement in the hepatic vein demonstrates two significant flow reversals: diastolic “A wave” (A) indicating high RV end-diastolic pressure and a large systolic “S wave” (S) indicating severe tricuspid regurgitation. (Arrow, early diastolic forward flow [prominent y descent of severe TR].)
ASD with Large L to R Shunt

Note markedly dilated RV and “paradoxical” septal motion
Paradoxical septum in RV volume overload
M-Mode in Constrictive Pericarditis

Note the diastolic Septal “bounce”

Adapted from ASCE review 2007.
Markedly elevated RA pressure (> 20 mm Hg)

Note: 1. Dilated IVC
2. Lack of respiratory variation
Paradoxical septum/ Diastolic septal bounce/ High RAP in Constrictive pericarditis
Adapted from ASCE review 2007.
Adapted from ASCE review 2007.
M-Mode in Cardiac Tamponade

Diastolic RV Collapse
Cardiac Tamponade
Markers of LV Dysfunction

1. Dilatation
2. Akinesis, Dyskinesis, or Hypokinesis
3. Lack of thickening
4. Thinning
Markers of LV Dysfunction

A-C Shoulder ("B-Bump")

Feigenbaum, ECHOCARDIOGRAPHY
Increased EPSS, dilated cavity, B bump

LV Dysfunction with elevated LV EDP
Normal Pulmonic valve M-mode
Pulmonic Valve M-Mode
Pulmonary Hypertension or Supravalvular PS with flying W sign (notching of Pulmonary valve in systole with absent a wave)
Pulmonic Valve M-Mode

Normal PV

Feigenbaum, Echocardiography, 3rd ed.

Adapted from ASCE Review course 2007
Pulmonic Valve M-Mode in PS
Adapted from ASCE review 2007.
Pre-excitation of the inferolateral wall in WPW
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EXTRAS
(for review if time permits)
Degenerative Aortic Stenosis
Aortic valve with LVAD speed change
MV Prosthetic Dysfunction

Note that the MV opens late on the 3rd

Adapted from ASCE review 2007.
M-Mode of RA & LA Myxomas

Back cover of ECHOCARDIOGRAPHY
Feigenbaum, 3rd edition
M-Mode Contrast Echo (IV Saline Injection)

Tajik & Seward, 1977

Note that when the contrast appears in the RV, it appears in the MV orifice.
ASD or PFO
M-Mode Contrast Echo (IV Saline Injection)

Tajik & Seward, 1977

VSD with R to L shunt
Note that after contrast appears in the RV, it is seen in the LV, sparing the MV orifice.
M-Mode Contrast Echo

Tajik & Seward, 1977

Pulmonary AV Fistula
Note that after contrast appears in the RV, it is not seen in the LV until the 4th beat following.
Abnormal Septal Motion

C. Otto, MD
Textbook of Clinical Echocardiography