Normal TTE Examination, Doppler Echocardiography and Normal Antegrade Flow Patterns

Pravin Patil, MD FACC FASE
Associate Professor of Medicine
Director, Cardiovascular Disease Training Program
Lewis Katz School of Medicine at Temple University

Disclosures

✓ No relevant financial disclosures
Normal Echocardiography

Why do we need to review this?

✓ Recognize pathology when it exists

✓ ASCeXAM
  – Standardized image acquisition
  – Image optimization
  – Anatomic identification
  – Chamber quantification
  – “Less known” normal structures
  – AUC/Indications/Contraindications

Appropriate Use

✓ Appropriate Use Criteria for Echocardiography
Standardized Image Acquisition

Parasternal Long Axis

- 3rd-4th Intercostal space
- Index marker to R shoulder
- Two depths
  - Cardiac: 12-16 cm
  - Effusion: 20-24 cm
Parasternal Long Axis

Down One Interspace
Up One Interspace

Depth Matters...

12 cm Depth

20 cm Depth

LPE
Effusions Everywhere..
Off-Axis Measurements

On-Axis Measurements
ASE/AHA 17 Segment Model

Parasternal Short Axis

- Rotate 90° from PLAX to the left shoulder
- Tilt transducer down the left flank to pan heart
- Depth 12-16 cm
Short Axis LV

Parasternal

Subcostal

MV

TVAo

LV

Cardiac POCUS!

Subcostal Saves the Day!
Apical 4 Chamber

- Transducer on apical impulse
- Tilt the transducer to pan the heart and visualize 4 chambers
- Index marker to the axilla
- Depth: 14-18 cm

Apical Four Chamber
Apical 4 Chamber

Off-Axis

On-Axis

Slide Laterally
ASE/AHA 17 Segment Model

Normal?

- Apical Foreshortening
- Poor Endocardial Border Definition
Contrast for LV Opacification

✓ Commercial Contrast
  – Improve endocardial border definition
  – Eliminate foreshortening
  – Evaluate for mural thrombi
  – Restore diagnostic quality

ASCeXAM Focus

✓ How do you fix this image?
  – Recognize off-axis views
  – Imaging from wrong interspace
  – Foreshorten cardiac structure
  – Contrast use and optimization

✓ Anatomical identification
✓ Myocardial segment identification
✓ Extracardiac findings recognition
✓ Common Artifacts
Normal Antegrade Doppler

SVC Doppler
Pulmonary Vein Doppler

Mitral Inflow Doppler
IVRT

Lateral Annulus Tissue Doppler
ASCeXAM Focus

✓ Recognize normal antegrade color flow and spectral Doppler patterns
✓ Distinguish artifact from pathologic flow
✓ Optimize the acquisition of Doppler echocardiography

Normal Cardiac Structures
Persistent Venous Valves

Chiari Network
- No known function
- Not present in every patient
- Netlike structure that is a highly mobile remnant of sinus venosus
- Usually arises from the vicinity of the IVC not attached to the septum

Eustachian Valve
- Directs IVC flow across fossa ovalis in fetus
- Present in every fetus
- Ridge of tissue - rarely mobile at all
- Arises from the IVC and runs to the fossa

Eustachian Valve
Chiari Network

RV Inflow  Apical Four  PSAX

Venous Valves

Subcostal
Crista Terminalis

- Normal structure
- Often confused for a right atrial mass
- Smooth myocardial ridge from RA-SVC junction along posterolateral RA wall
Coronary Sinus

Coronary Sinus
Moderator Band

Pericardial Sinuses

Mnemonic

Transverse Sinus

Oblique Sinus
Subcostal SAX Aortic Valve
Coronary Arteries

Left Main Coronary
Pulmonary Veins

Pulmonary Veins
Suprasternal Notch
Normal Anatomic Structures

- Right Heart
  - Persistent Venous Valve
  - Crista Terminalis
  - Coronary Sinus
  - Moderator Band

- Left Heart
  - Pericardial Sinuses
  - Pulmonary Veins
  - Coronary Arteries
  - Papillary Muscles
  - Suprasternal Notch

Thank You!