Transthoracic Echocardiogram (TTE)

Purpose

This document provides Ultrasound staff with a best practice guideline to assist them in conducting an adult echocardiogram.

Site Applicability

This imaging guideline is applicable to all Ultrasound departments within Lower Mainland Medical Imaging (LMMI) across Fraser Health, Providence Health Care, Provincial Health Services Authority and Vancouver Coastal Health.

Practice Level

This imaging guideline is applicable to echocardiographers, cardiologists, and radiologists in all Echocardiography and Ultrasound departments in LMMI.

Exceptions

Deviations to these guidelines are permitted to accurately assess the extent and severity of the abnormality based on the pathology present. The technical imaging characteristics of individual patients can preclude certain views and measurements.

Need to Know

- A requisition with an authorized individual's [1] name and billing number and containing demographic and clinical information is mandatory.
- A 1-5 MHz (or higher) sector array transducer is used for gray scale assessment, color and spectral Doppler analysis.
- Document, evaluate, characterize, and measure all abnormal findings. If any structure is not well visualized, note on the echocardiographer's worksheet. When appropriate, the images and report must include localization and quantification of abnormal pathology.

Guidelines

- The patient is draped to minimize exposure and maintain privacy and dignity.

- <u>Imaging Guidelines</u>
  - Digital acquisition standards:
    - 2-beat clips for sinus rhythm
    - 3-4 beat clips for atrial fibrillation
    - Agitated saline: 7-10 beat capture (depending on machine used)
    - Adjust beat capture as needed for constriction and tamponade cases

[1] physician or nurse practitioner

- 2D/Doppler Evaluation of Cardiac Anatomy:
  - Identify and evaluate size, structure and function of cardiac chambers (LV, RV, LA, RA).
  - Identify and evaluate all four cardiac valves for normal function, stenosis and/or regurgitation (AV, MV, PV, TV).
  - Identify and evaluate the great vessels (aorta and pulmonary artery), pulmonary veins (if seen), inferior vena cava/hepatic veins.
  - Identify and evaluate the pericardium.
  - Focused loop of any valve with suspected > mild disease with and without color Doppler.

- Color Flow Doppler Imaging:
  - Set scale to approximately 60 cm/s for valve assessment
  - Set scale to 30-40 cm/s for:
    - pulmonary vein flow with the sample volume set at 3-4 mm
    - inter-atrial shunt assessment
    - hepatic vein

- Conventional Doppler:
  - Acquire tracings at sweep speeds that would demonstrate a minimum of 4-5 beats.
  - After acquiring the above tracing, increase the sweep speed to demonstrate only 2- 3 beats for analysis and ease of measuring.
  - Adjust the scale resulting in a waveform that encompasses two-thirds of the spectral display.
  - Use of a dedicated non-imaging Doppler transducer (Pedoff) must be used from multiple views for aortic stenosis velocity/TVI/mean and peak gradient (apical, suprasternal, right supraclavicular, right parasternal, etc.).
  - Also use the non-imaging Doppler transducer (Pedoff) when assessing any valve stenosis or regurgitation or whenever indicated.

- If views of the aortic arch are required, the suprasternal notch window is utilized.

- <u>Imaging Sequence</u>
  - Parasternal Long Axis:
    - 2D parasternal long axis at an increased depth to visualize extracardiac structures (i.e.: pleural effusion)
    - 2D parasternal long axis at appropriate depth (optimize for anterior/posteriorwall of atrium)
    - M-Mode LA/Aortic root AV
    - color flow Doppler of zoomed AV
    - 2D zoom of MV
    - color flow Doppler of zoomed MV
    - 2D longitudinal view of ascending aorta (be sure to use higher parasternal window to capture the ascending aorta)
    - 2D RV inflow view to include right atrium and TV

- RV inflow view with color Doppler through TV
- continuous wave (CW) Doppler demonstrating TV inflow and TR

- Parasternal Short Axis:
  - 2D imaging at the base of the heart to include the AV, TV, and PV
  - zoom 2D of AV cusps
  - color flow Doppler of zoomed AV cusps
  - 2D pulmonary valve/main pulmonary artery/branches
  - color flow Doppler PV for outflow and PR
  - PW Doppler RVOT
  - CW Doppler PV
  - color flow Doppler tricuspid valve demonstrating inflow and regurgitation
  - continuous wave (CW) Doppler demonstrating TR
  - short axis at the level of the MV (LV base)
  - short axis at the level of the MV demonstrating color flow Doppler
  - short axis at the level of the mid LV
  - short axis at the level of the LV apex

- Apical Window
  - 2D four chamber
  - 2D LV at decreased depth/zoomed to visualize endocardium (absolutely essential to do the zoomed view to employ Simpson's biplane method)
  - Apical four chamber optimizing the LA and MV (zoom or unzoom)
  - 2D five chamber
  - 2D long axis
  - 2D long axis LV at decreased depth/zoomed to visualize endocardium
  - 2D two chamber
  - 2D two chamber LV at decreased depth/zoomed to visualize endocardium
  - 2D two chamber view optimize LA and MV (zoom/unzoom)
  - two chamber with color flow Doppler MV/LA
  - LV long axis with color flow Doppler
  - AV/LVOT
  - MV/LA
  - four chamber with color flow Doppler across ventricular septum
  - four chamber with color flow Doppler across MV/LA
  - MV inflow color M-mode (optional)
  - MV inflow CW Doppler (must do CW before PW to capture the maximal E and A velocity)
  - MV inflow PW Doppler with the sample volume placed at the leaflet tips
  - PW Doppler MV inflow with the sample volume placed on the LA side (for mitral A wave duration)
  - pulmonary vein inflow PW Doppler
  - tissue Doppler medial and lateral mitral valve annulus and tricuspid valve annulus (RV assessment)
  - PW or CW IVRT

- PW Doppler LVOT
- CW Doppler AV (Use Pedoff probe as needed)
- transducer positioned over the RV apex demonstrating RV size and function (focused RV view – reduce the sector width to increase the frame rate)
- M-mode through RV tricuspid annulus for TAPSE (if RV function appears reduced)
- color Doppler through the TV and RA
- CW Doppler TR

- Subcostal Views:
  - 2D four chamber
  - 2D optimize atrial septum
  - Color flow Doppler atrial septum
  - 2D orthogonal view RV/LV mid-level
  - IVC long axis demonstrating respiratory changes (use longer loops)
  - 2D hepatic vein
  - color flow Doppler hepatic vein (PW as needed) – if clinically indicated

- Suprasternal View (SSN)
  - 2D Aortic arch/descending thoracic aorta
  - color flow Doppler Aortic arch/descending thoracic aorta
  - descending aorta CW and/or PW Doppler

- Right Supra-clavicular View (RSC) – OPTIONAL (as the case requires):
  - SVC color flow Doppler
  - PW Doppler SVC at slow sweep speed demonstrating respiratory cycle
  - The SVC is assessed using the appropriate technique[2].

- The transducer is cleaned and disinfected as per site specific process.

Related Documents

None.

References

None.

[2] sniffing or inspiration

Definitions

2D	- 2 dimensional
AV	- aortic valve
CW	- continuous wave
IVRT	- Isovolumic relaxation time
LA	- left atrium
LV	- left ventricle
LVOT	- left ventricular outflow tract
MR	- mitral regurgitation
MV	- mitral valve
PR	- pulmonary regurgitation
PV	- pulmonary valve
PW	- pulsed wave
RA	- right atrium
RPL	- Regional Practice Lead
RSC	- right supraclavicular
RV	- right ventricle
SSN	- suprasternal notch
SVC	- superior vena cava
TAPSE	- tricuspid annular plane systolic excursion
TR	- tricuspid regurgitation
TV	- tricuspid valve

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