Regional Ultrasound – Focused Echo

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Regional Ultrasound – Focussed Echo

Objectives

1. Understand the differences between echo and abdominal US
2. Understand the different views the heart can be looked at
3. Discuss important pathologies whilst doing focussed echo
4. Mention rarer things that might be of interest
Indications

• During
  – (Unexplained) hemodynamically unstable patient
  – Cardiac arrest
  – Major Trauma (FAST scan)

• To answer questions like…
  – is there a pericardial effusion?
  – roughly how good is the LV function?
  – what’s the estimated intravascular volume status?
Anatomy

- Images difficult to appreciate at the beginning
- The left ventricle (LV) is the thicker walled and the largest of the four chambers in the normal heart
- Cardiac apex is a distinctive landmark from which to orient the image
- LV “drains” into LVOT, AV and ascending aorta
- RV is adjacent to left liver lobe (“acoustic window”), IVC + hepatic veins visible there
Scanning techniques

- **Per convention, marker-dot should be on the right side of the monitor!!** (vs. left in Abdo-US! )
- Probes with small footprints (ribs!) ideal, hold them like a pen, use enough gel
- Ideally patient in left lateral decubitus position
- Structures closest to the transducer are displayed at the top of the image
- Transverse (short axis) and sagittal (long axis) planes used for standard heart imaging
- For long-axis-views, indicator on probe pointing to right shoulder, for short-axis-views to left!!
- Use cardiac settings on machine if possible
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The most important views

• Parasternal long axis view
• Parasternal short axis view
• Apical 4 (& 5) chamber view
• Subcostal/subxiphoid view (may be the easiest-to-obtain view in critically ill patients)
Parasternal long axis view

- Probe in ~3rd – 5th ICS left (parasternally)
- Probe indicator towards right shoulder
Parasternal short axis view

- Rotate probe from parasternal-long-axis-view position 90° clockwise, hence probe indicator aiming towards left shoulder

- Tilting the probe allows visualization of the LV from apex, papillary muscle-, mitral to aortic valve and RVOT level
Apical 4 (5) chamber view

- Rather “intuitive” view
- Probe at apex, indicator aiming at left shoulder
- Angling probe anteriorly reveals LVOT (“5th chamber”)
Subcostal/subxiphoid view

- may be the easiest-to-obtain view in critically ill patients
- used e.g. in FAST scans to quickly assess heart
- probe with enough pressure almost flat onto epigastrium, angled towards head
- uses liver as acoustic window
- right ventricle is immediately adjacent to the left liver lobe
- flexing knees helps relax abdominal wall!
IVC measurements

- Less than 50% collapse of IVC in inspiration probably equals CVP of ~10-15mmHg
- Good to get estimate of intravascular volume status quickly
- Rule of thumb:
  - IVC < 1cm – underfilled
  - IVC > 2cm – full
Important pathologies to recognize

• Pericardial effusion / tamponade
• Severely impaired LV function
  • Severe aortic stenosis
  • Severe mitral regurgitation
  • Dilated RV in massive PE
Pericardial effusion and tamponade

- e.g. in penetrating chest trauma (only ~50ml acutely sufficient to tamponade – vs. chronic effusions in eg. Breast/lung Ca!)
- black fluid collection encircling the heart
- Tamponade = effusion + diastolic RA/RV collapse
Case – 26y old chap with chest pain
Assessment of LV function

- Roughly estimated as absent (ie cardiac standstill)/poor/normal/hyperdynamic
- Chamber size large/small
- Useful in e.g. chest pain, SOB, hypotension

Hyperdynamic state – eg. blood-loss

Hypodynamic state – eg. Cardiogenic shock
Case

- 75y old gentleman
- Referred by A&E: collapse ?cause
- collapsed in hospital car park after cataract OP, fine now
- No preceding SOB/CP/palp
- ~3mth Hx of mild SOBOE
- No PMH, no Meds

- O/E: BP 180/70, P80, 96%, afeb
- Chest+CXR clear, ESM, abdo soft, neuro nad, ECG: SR,
Severe aortic stenosis

- Aortic valve area < 1 cm²
- peak gradient > 64 mmHg (>4m/s)
Severe aortic regurgitation

- Jet during diastole back into left ventricular outflow tract
- Flow color depending on view (short axis or 4-chamber)
Severe mitral stenosis

- "doming" of the leaflet opening during diastole in the long axis view
Valvular infections

- Is there a highly mobile tag of material attached to a portion of the valve?
Cardiomyopathy

- Various different forms – eg. hypertrophic, dilated etc.
- Due to viral, toxic/EtOH, post-partum, congenital or extensive multi-vessel coronary artery disease...
HOCM

- In most cases with asymmetrical septal hypertrophy (ASH)
- dynamic narrowing of the left ventricular outflow tract
- dynamic motion of the anterior mitral leaflet towards the interventricular septum during systole (SAM)
Ischaemia

- Hypo- or akinetic segments of myocardium according to affected vessel supplying this area
Summary

1. Emergency Echocardiography is a non-invasive, rapid, real-time method of providing critical information about the heart.
2. It’s a goal-directed examination, to answer defined clinical questions - eg. effusion, LV-function.
3. Focus on learning the standard views.
4. You should now be able to detect pericardial effusion and assess global cardiac function.