Ultrasound
Emergency cardiac sonography

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Emergency cardiac sonography

Focused Questions:

What is the Lung profile?

Pericardial fluid and tamponade physiology present?

Left and right ventricle function poor, normal, or hyperdynamic?

IVC variation and size?

Probe: Low frequency phased array
Introduction

How to see the heart and why does the intensivist want to see the heart

Pulmonary edema is a lung diagnosis (must integrate lung in emergent evaluation of heart)

RACE (Maclean)

FEER (Breitkreutz 2007)

FATE

FOCUS
Introduction

Measurements rarely made; visual medicine but can use M-mode for documentation purposes

Heart routes: Parasternal, apical, subxiphoid

Knowing all views important in critical care because very patient dependent as to which is optimal
Anatomy of the ultrasound views

Views better shown in bedside videos

Parasternal long
Anatomy of the ultrasound views

Views better shown in bedside videos

Parasternal short

RV
LV
Anatomy of the ultrasound views

Views better shown in bedside videos

Apical
**Contractility (systolic function)**

M mode left ventricular shortening fraction normally 28–38% in Parasternal short axis view at or slightly below mitral valve level = dimension in diastole – dimension in systole divided by diastolic dimension

Diastolic dysfunction hard to detect

LV contractility field large in subtleties, preload and afterload status, cardiac window positioning, operator experience

CHECK LUNG for B profile bilateral suggestive of pulmonary edema

Squeeze of the pump

Determination of global left ventricular function

LV walls: visual calculation of % change from diastole to systole

Ejection Fraction: Radionuclide imaging and visual determination roughly equivalent

Amico AF. Am Heart J. 1989
Squeeze of the pump

**Good/hyperdynamic contractility:** walls almost come together and almost obliterate ventricular cavity during systole

**Poor contractility:** walls move little and heart may be dilated

Anterior leaflet of mitral valve: in normal state will vigorously touch septum during ventricular filling (best in parasternal long view axis)

Vignon. Chest. 1994
Squeeze of the pump

Segmental wall motion abnormalities?
Squeeze of the pump
Segmental wall motion abnormalities?

Again, can **WE** do this?

EP's can...estimate of LV contractility

Identification of cardiogenic shock leads to earlier revascularization

Hyperdynamic in early sepsis, hypovolemia

Repeated evaluations, changes in **contractility over time**

BLUE profiles
hemodynamic pulmonary edema

**B profile** - bilateral anterior predominant B lines with lung sliding = **pulmonary edema**

WITHOUT lung sliding bilateral could be ARDS

**A/B-** unilateral B lines = aspiration or early pneumonia

**B line:** thickened interlobular septum --&gt; then alveolar fluid

Pressurized transudate, includes all interlobular septa up to anterior wall against gravity = lung rockets

Transudates are supposed to not impair lung dynamics and explains preserved lung sliding

Posterior can be physiologic and leaky states (sepsis)

Staub. Physiology Rev. 1974
Principles of lung ultrasound

B line

B7 lines

B3 lines

Birolleau Variant
Principles of lung ultrasound

B line video
Principles of lung ultrasound

B line video
Focused Questions:

What is the Lung profile? – Discussed elsewhere

Pericardial fluid and tamponade physiology present? – Discussed in Advanced Echo

Left and right ventricle function poor, normal, or hyperdynamic? RV discussed in Advanced

IVC variation and size? Discussed in reading