

Lung US Quick Sheet: Bob Gobbo and Orlando Acosta:

What is causing the Dyspnea: Pneumonia, CHF, Asthma, PTX

Air scatters US waves, Radiology colleagues do not perform these exams!

1998: Artifact in pts with Pulm Edema: B Lines in Edema, COPD group: A lines

2008: Blue Protocol: A and B lines and Lung sliding – took less than 3 minutes

Lung US accurate in Pulm edema, COPD, Pneumonia, PTX

2015: Peds 96% Sens and 98% Specificities for Pneumonia

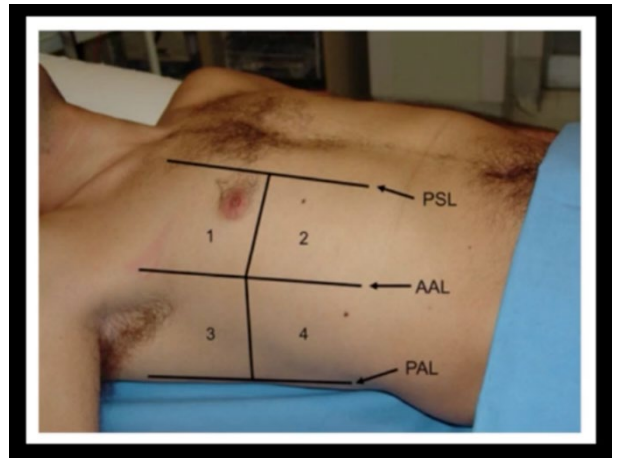
2015: Metanalysis: Chest CT vs US vs CXR: Lung US more sensitive than CXR

International Recs: Strong Evidence, Lung US Mo Better – Fast, Accurate and Reproducible

Technique: Rely on Artifact: Air Fluid and Effusions

Focused ?'s

- 1) Is there Lung Sliding – just beneath ribs and is there shimmering? Yes, No PTX. Can switch to M mode: Sandy Beach: Normal Bar Code: PTX
- 2) Are there A lines – reverberation of sound waves from lung tissue, reflected back to probe, bright horizontal lines+ aerated lungs
- 3) Are there B Lines – (flashlight paths) if fluid present, bright echo vertical lines (at least 3) artifact extends at least 18 cm, move back and forth with respiration, signify presence of edema. Theory of thickening interstitial edema (edema, infiltrate, infarct, fibrosis, contusions) not to be confused with comet tails
- 4) Is there consolidation present: Hepatization? When alveoli are filled with more fluid the lung structure appears to be a solid organ – like the liver
- 5) Is there an Effusion: Hypoechoic fluid in most dependent areas.



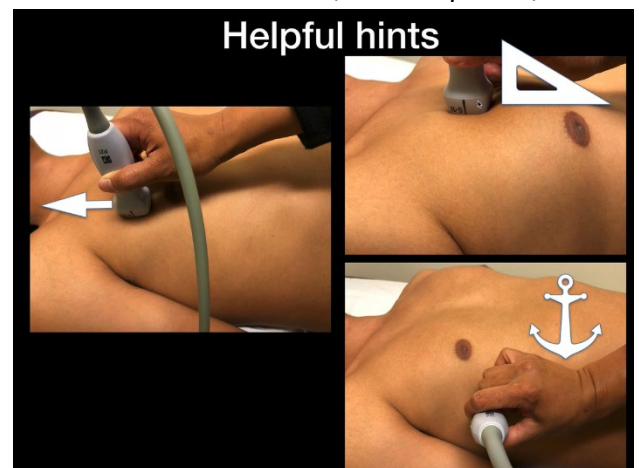
Technique: Home base: Scanning Pleural Line and MCL, @ D with marker towards head, rib and pleura, start with lower frequency probes to high frequency if needing to see pleura

Approach: Botticelli: See photo 8 zones, others up to 28 zones.

GUSI 5 IC spaces Anteriorly and Posteriorly at Costophrenic Angle

Helpful Hints:

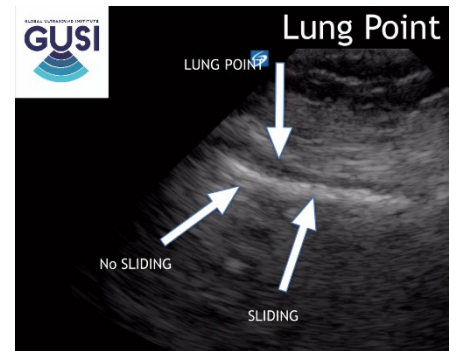
- Change angle of Probe as you slide:
- Probe Marker towards head
- Keep Probe at Right Angle to Pleura
- Anchor with hand, then slide
- Don't miss area above diaphragm.
- Left side move laterally due to heart



Pathology and Pitfalls: Lung US depends on Artifact. In Normal Lung one cannot see anything but the pleural and everything below pleural line is artifact (and should be air)

- 1) Pneumothorax: + Lung sliding at that IC space also B lines, comet tails = No PTX. Can use M Mode: Sandy Beach = Normal, Barcode = PTX

Lung Point: 100% Specific, 66% Sensitive. Created at point where PTX meets the Normal Lung and lung sliding



- 2) Interstitial Disease: > 3 B lines in sonographic field > 18 cm (edema, infiltrate, fibrosis).
 - a. In CHF: Fluid translocation, pleural line is thin and regular, B lines are Bilateral and incorp Cardiac Exam (Reduced EF, Plethoric IVC)
- 3) Pneumonia: Pleural is thick and consolidation as if a dog bit the pleural, and air bronchograms, hepatization.
- 4) Pleural Effusions: Hypoechoic fluid, spine sign(+) and mirror image (-). Like to hide in the Costophrenic angle, have patient sit up and scan form CVA

Pitfalls and Troubleshooting

- 1) Comet Tails vs. B Lines: B Lines go to bottom of screen and be at least 18 cm deep and use low freq probe.
- 2) Perpendicular Angle: Curvature of the Chest Wall requires changing the angle of the probe to give you a right angle to see the pleural crisply. Tilt probe accordingly to get the brightest capture of the pleural and be between the ribs.
- 3) Lung US findings more Sensitive than Specific
- 4) Reducing Tissue Harmonic Imaging (not an issue with the Butterfly)
- 5) Anchor on chest wall as you as you Slide to ICS
- 6) Mirror Artifact vs Hepatization: Mirror: See Liver on both sides of diaphragm, Hepatization of the Lung tissue: The consolidated lung is irregular appearing and air bronchograms and consolidated lung is above the diaphragm.
- 7) Ascites vs Pleural Ascites: Check the orientation and view the diaphragm. Are you in the abdominal cavity with a kidney?

COVID Lung 3 LUS Covid or Viral Pneumonia

- 1) B Lines – Waterfall
- 2) Pleural Line Abnormalities - Irregular
- 3) Sub Pleural Consolidations – dog bite

Ribbon of Gel – Take time in each zone towards diaphragm, pause, rock, fan, tilt to get better looks finding the “sweet spot”. Takes about 3 minutes total. Like rolling on Paint.

