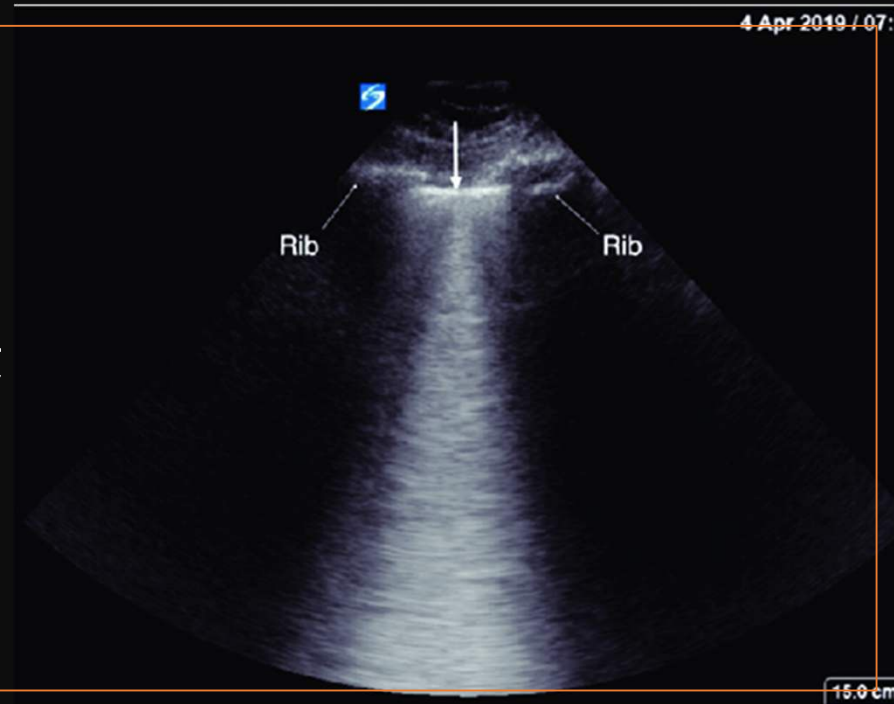


Application of Ultrasound for Respiratory Therapist

Mindy Conklin MRT RRT RRT-ACCS



Disclosures

- Monaghan Medical
- VAPOTHERM

OBJECTIVES

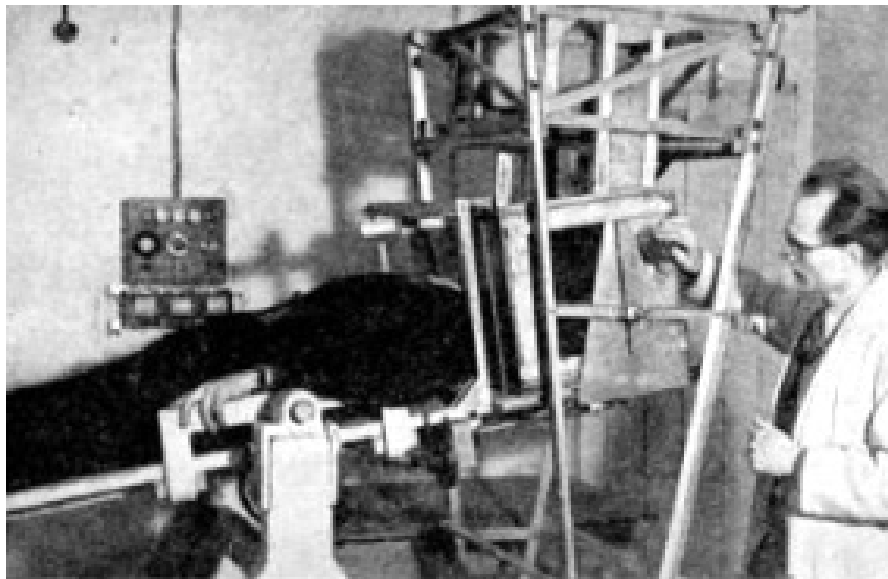
1. To provide an overview of point-of-care ultrasound technology
2. To describe the diagnostic capabilities of point-of-care ultrasound in critical care
3. To highlight the current applications of point-of-care ultrasound in respiratory therapy

The Evolution of Ultrasound

In 1942, Dr. Karl Dussik became a pioneer diagnostic US.



<https://www.ob-ultrasound.net/dussikbio.html>



Dussik and his ultrasonic apparatus in 1946



In 1951, Dr. John Wild built the first contact ultrasound scanner

<https://www.ob-ultrasound.net/jjwildbio.html>

The evolution of Point-of-care ultrasound

In early 2000s, point-of-care ultrasound (POCUS) arrived in the clinical setting



<https://www.diagnosticimaging.com/view/the-evolution-of-point-of-care-ultrasound> add text

Point-of-Care Ultrasound



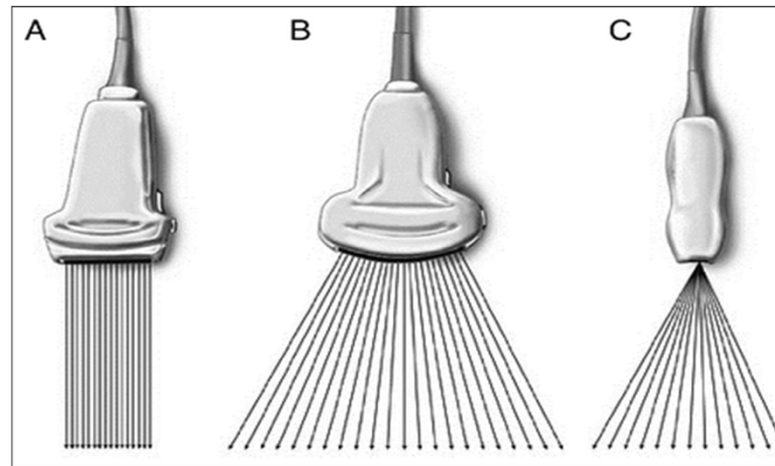
<https://rc.rcjournal.com/content/64/2/217>



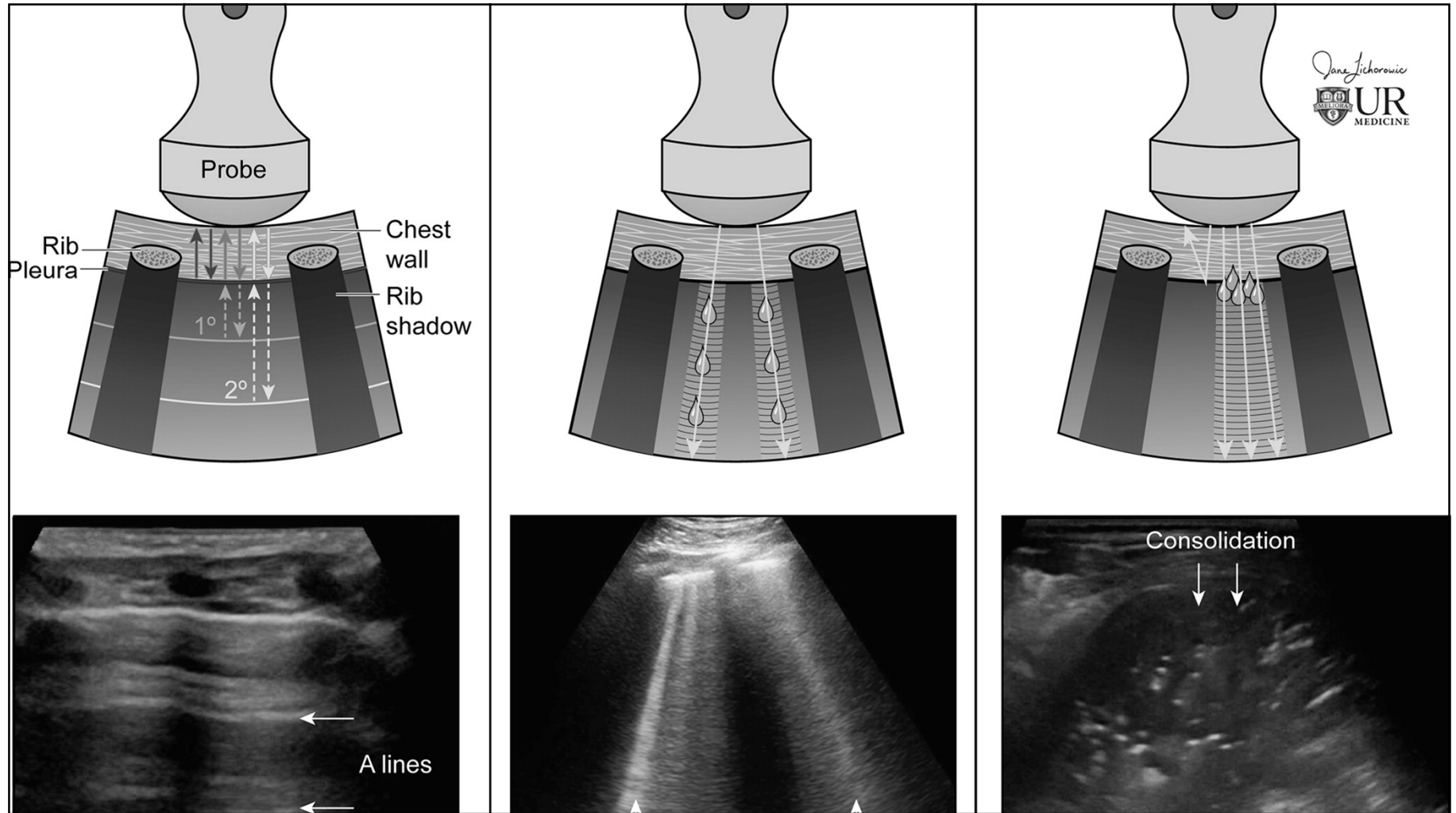


Gevscan.com

Lung Ultrasound probes



<https://rc.rcjournal.com/content/64/2/217>

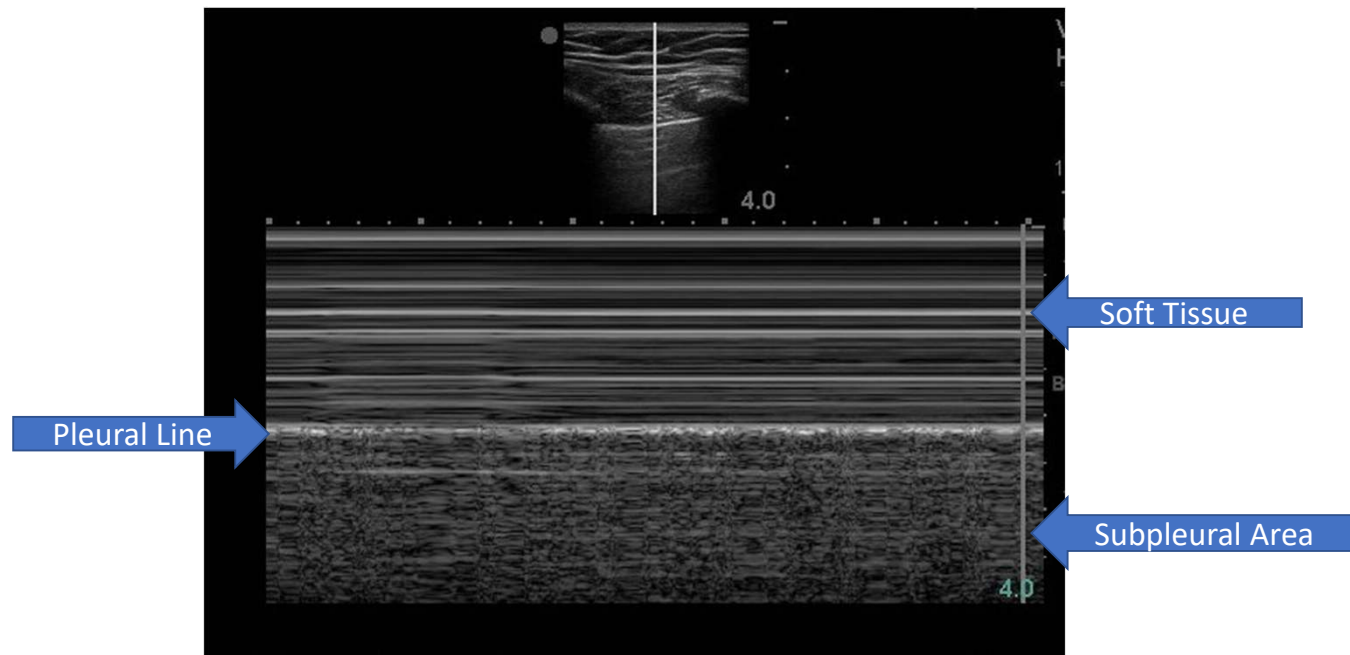


Modes of Ultrasound

M-Mode

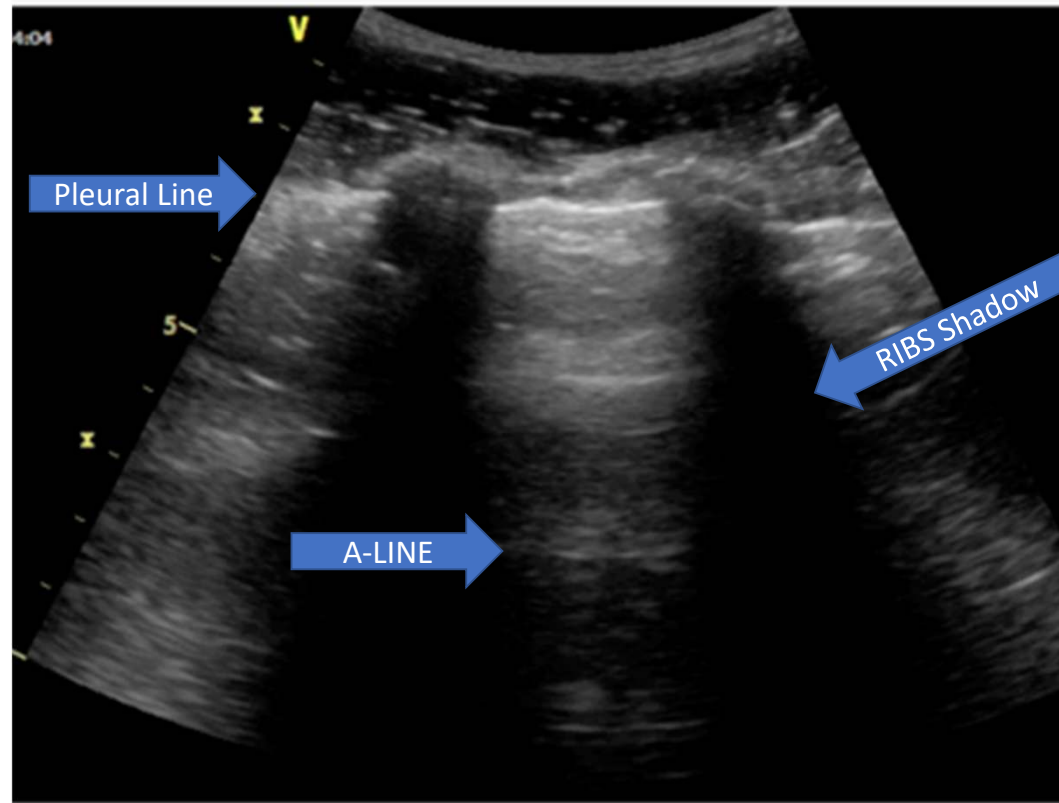
B-Mode

M-Mode

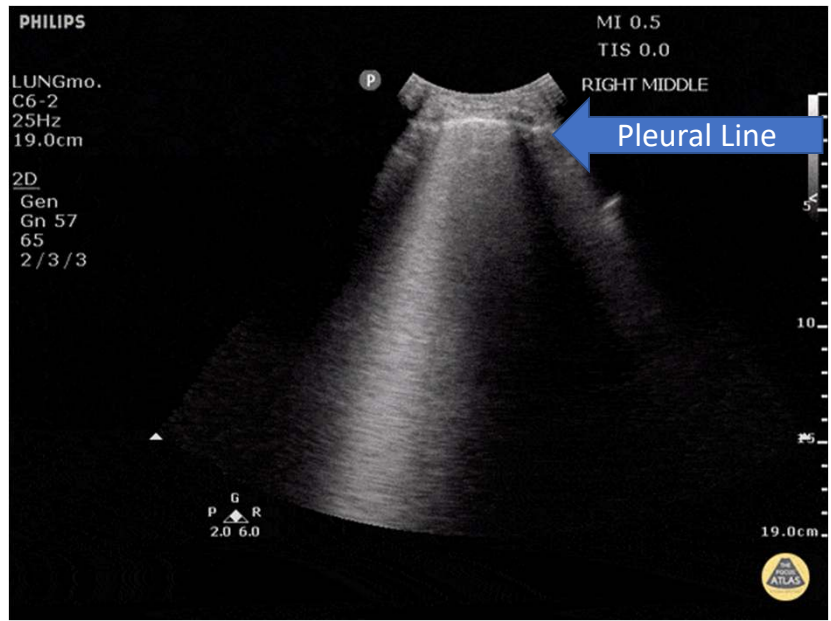


Adhikari, Srikar & Stolz, Lori & Amini, Richard & Blaivas, Michael. (2014). Impact of point-of-care ultrasound on quality of care in clinical practice. Reports in Medical Imaging. 7. 81. 10.2147/RMI.S40095.

B-MODE

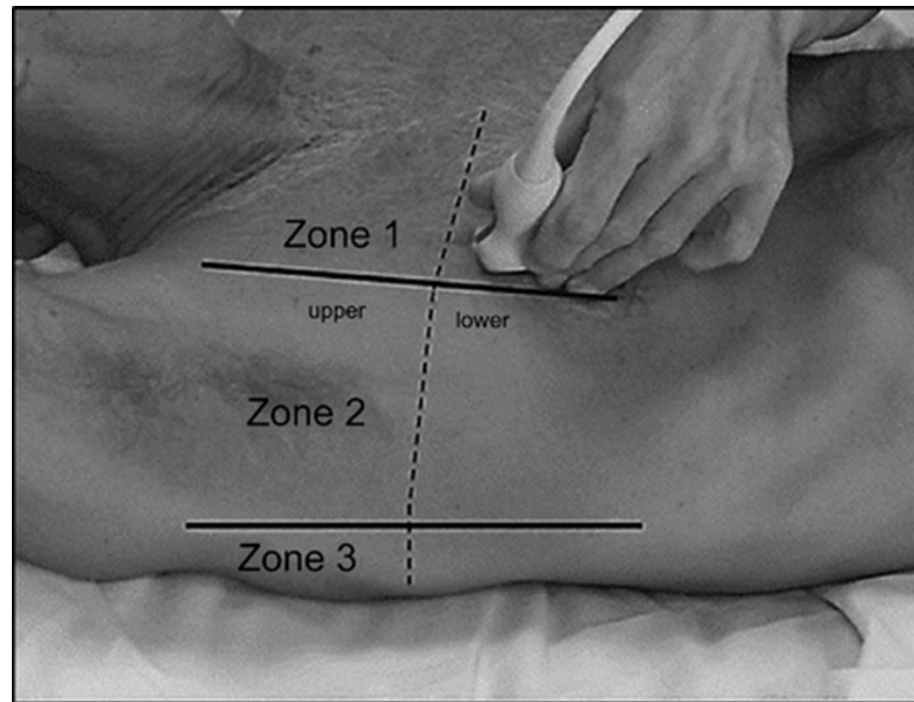


Adhikari, Srikar & Stolz, Lori & Amini, Richard & Blaivas, Michael. (2014). Impact of point-of-care ultrasound on quality of care in clinical practice. Reports in Medical Imaging. 7. 81. 10.2147/RMI.S40095.



<https://www.icmteaching.com/ultrasound/lung%20ultrasound/intro/>

Application of LUS



Lichtenstein D, Curr Opin Crit Care 2014;20:315-322



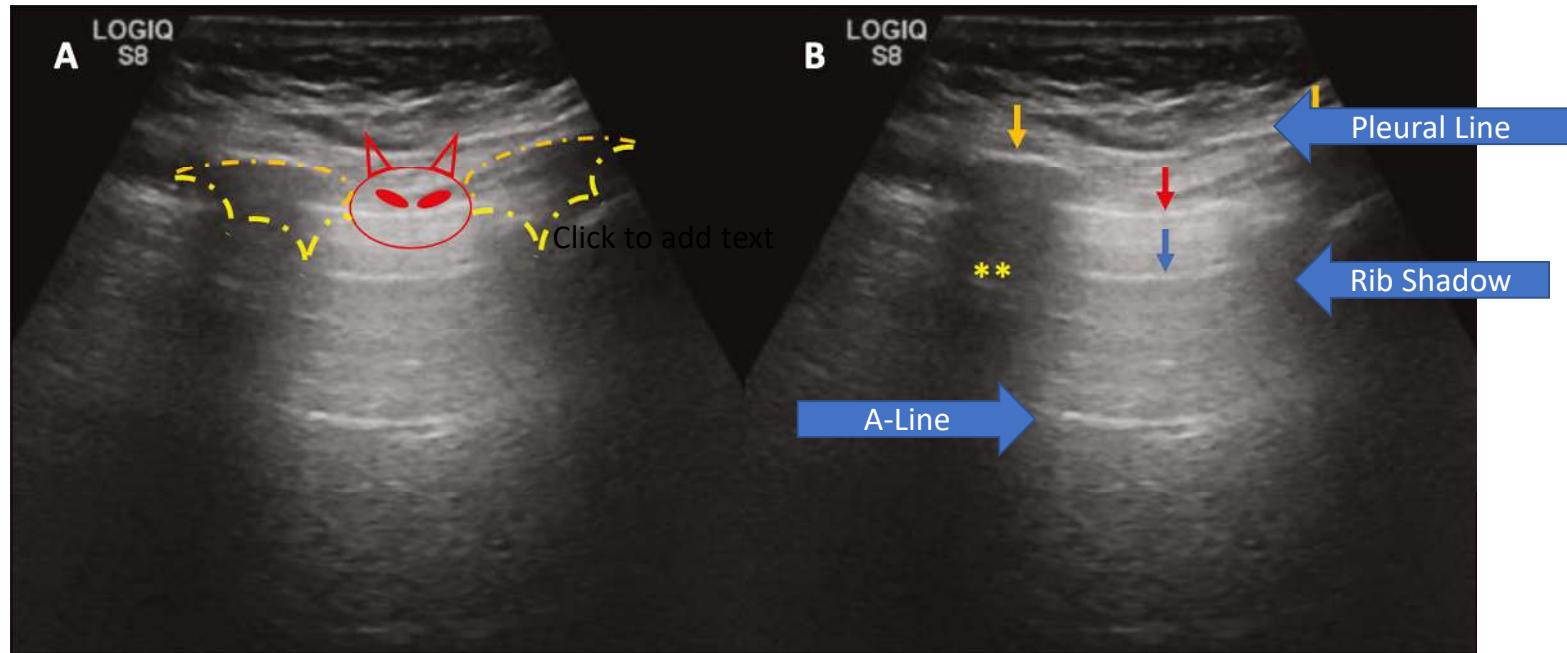
Lichtenstein D, Curr Opin Crir Care 2014;20:315-322

BLUE-Protocol application of LUS in the critically ill

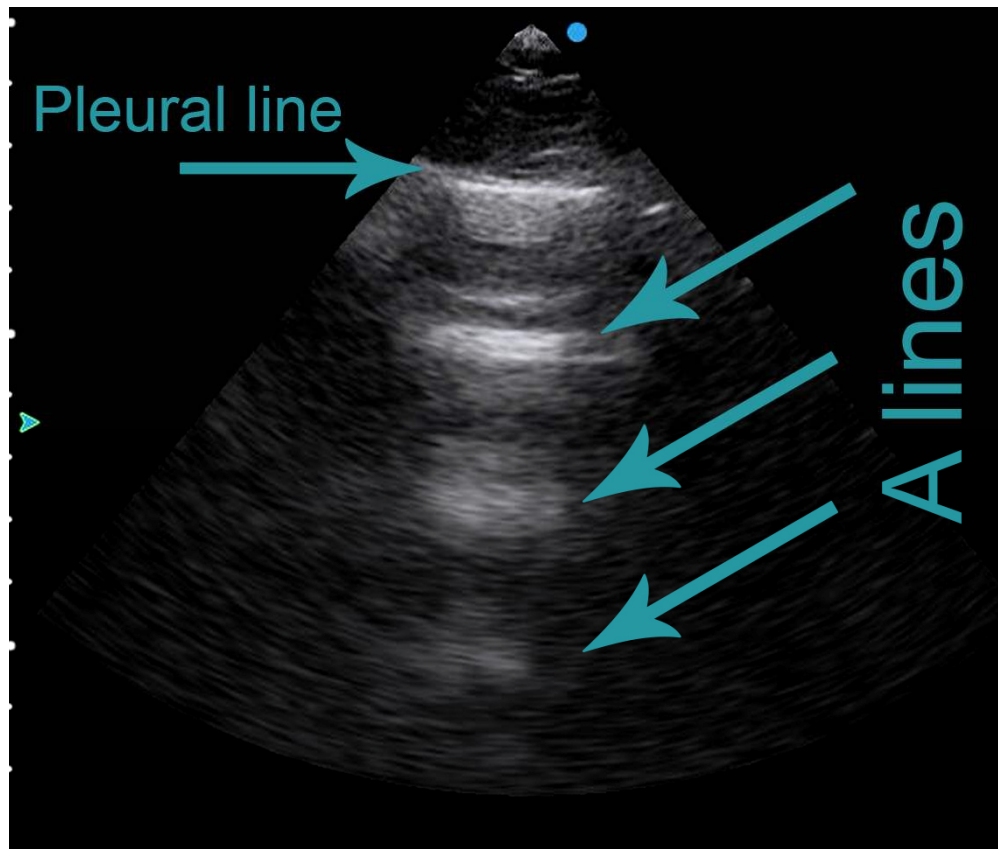
1. Bat sign
2. Seashore sign
3. A-lines
4. Quad sign
5. Sinusoid sign
6. Shred sign
7. Tissue-like sign
8. Lung Rockets
9. Stratosphere sign aka Barcode sign
10. Lung Point

<https://criticalcare.cooperhealth.org/fellows/wp-content/uploads/sites/4/2019/07/bluefallsprotocol.pdf>

Bat Sign



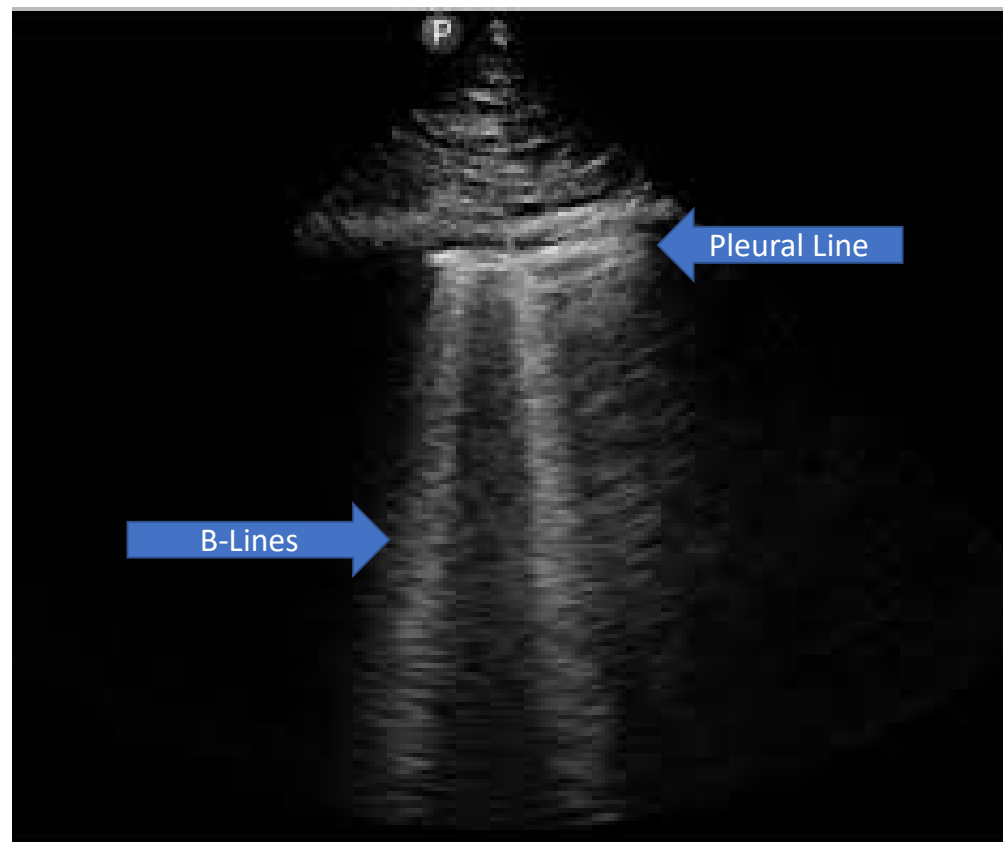
<https://www.scielo.br/j/rb/a/ZH5v8qZBZgdYBD6FBPJZ8Dg/?lang=en#>



A-Lines

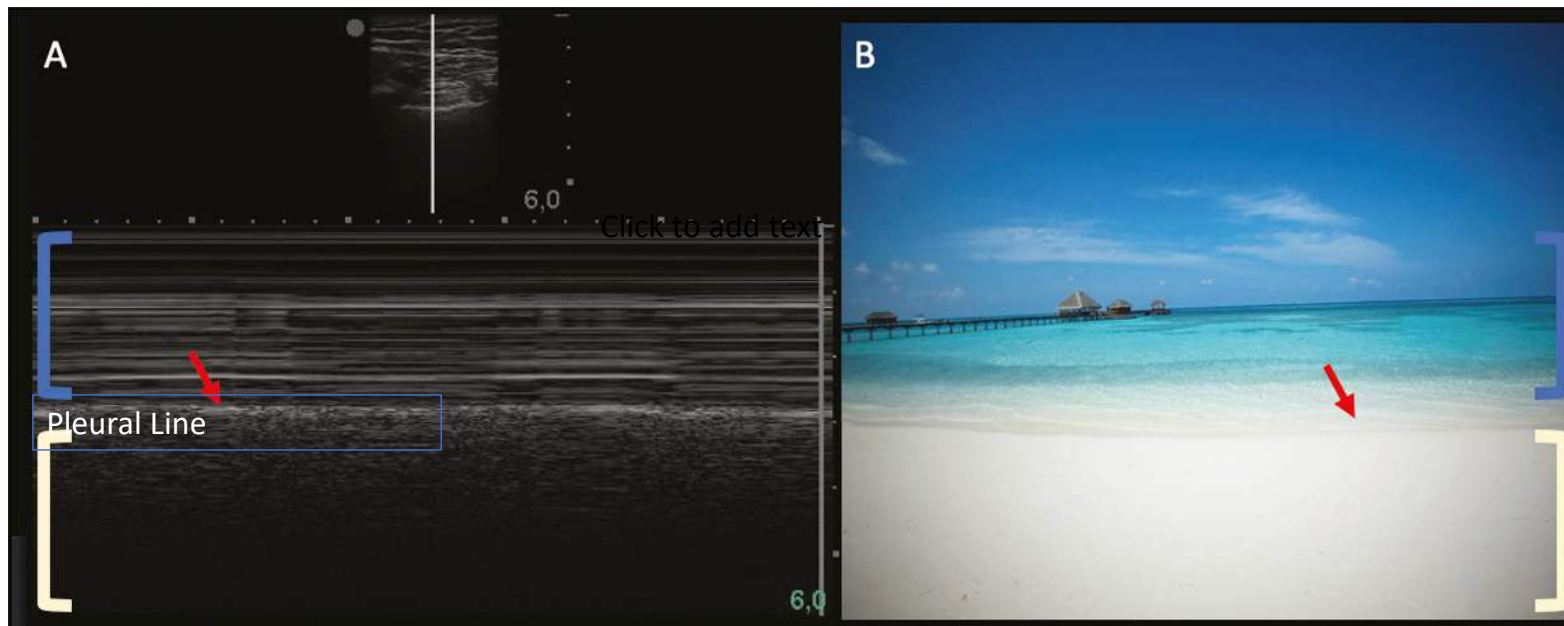
<https://rc.rcjournal.com/content/64/2/217>

B-Lines



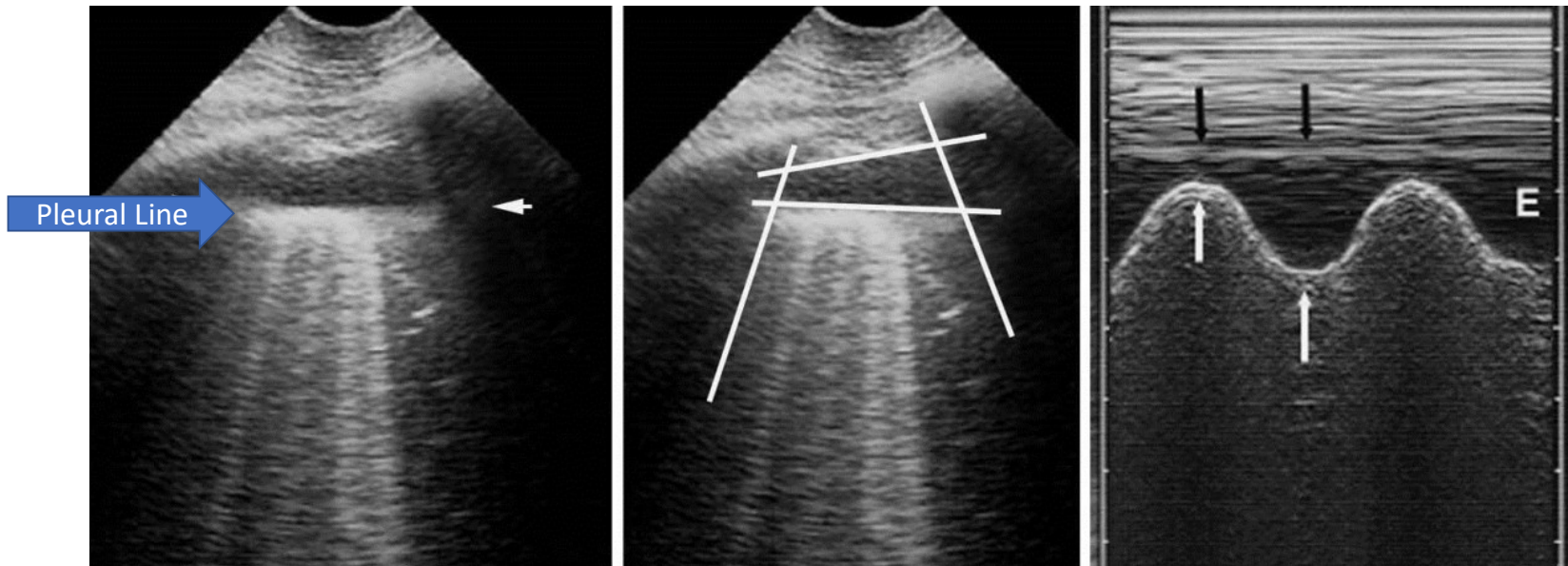


Seashore Sign



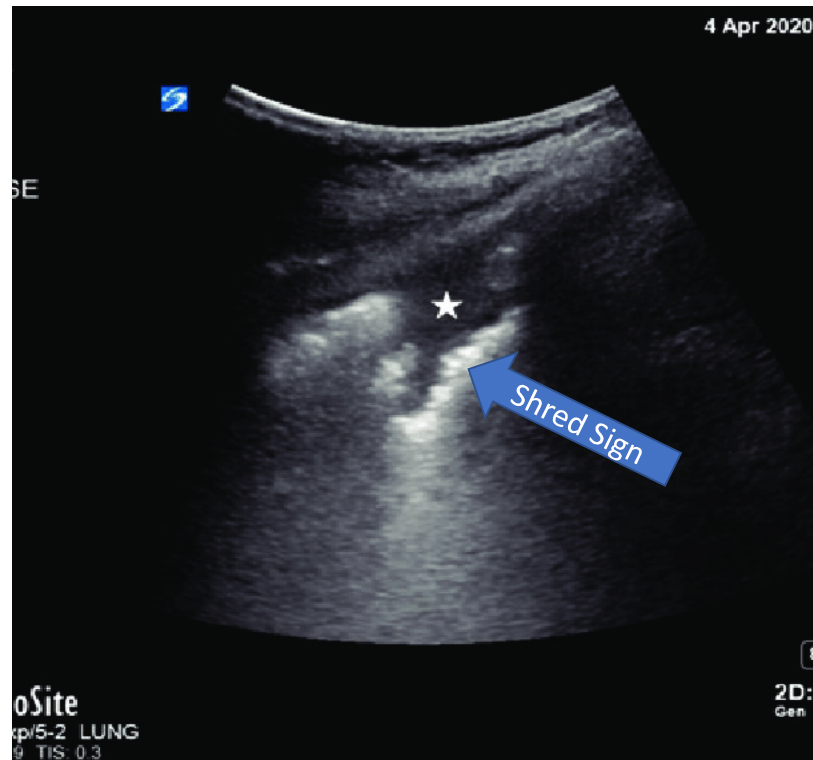
<https://www.scielo.br/j/rb/a/ZH5v8qZBZgdYBD6FBPJZ8Dg/?lang=en#>

Quad & Sinusoid sign

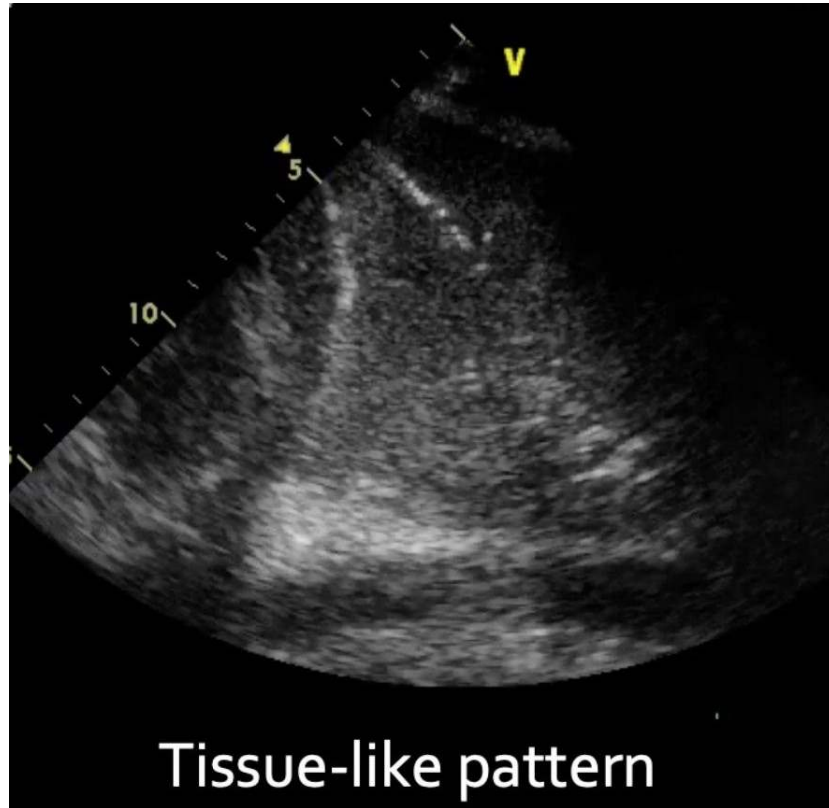


<https://rc.rcjournal.com/content/64/2/217>

Shred Sign

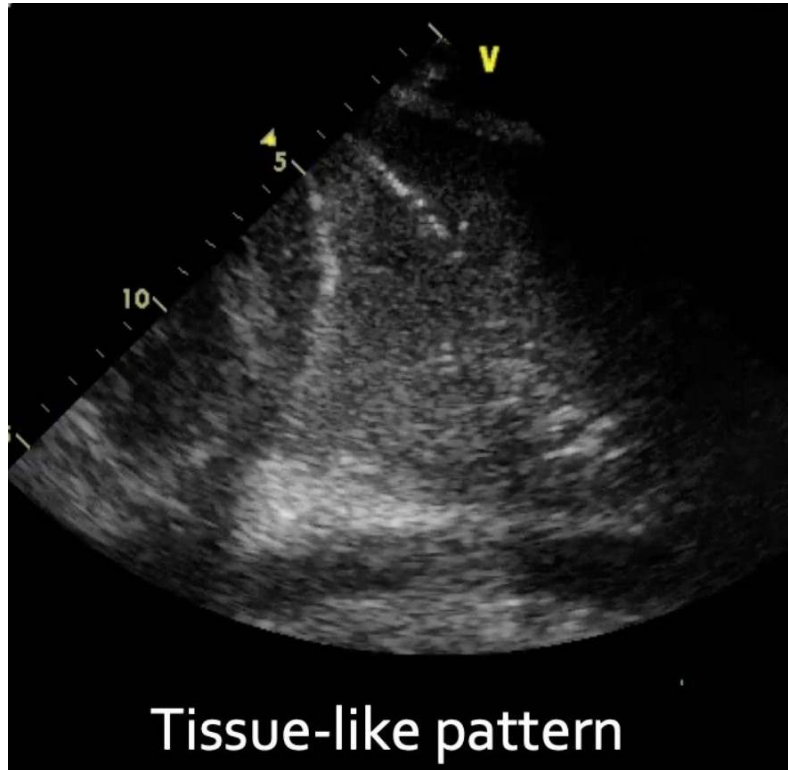


• <https://www.scielo.br/j/rb/a/ZH5v8qZBZgdYBD6FBPJZ8Dg/?lang=en#>

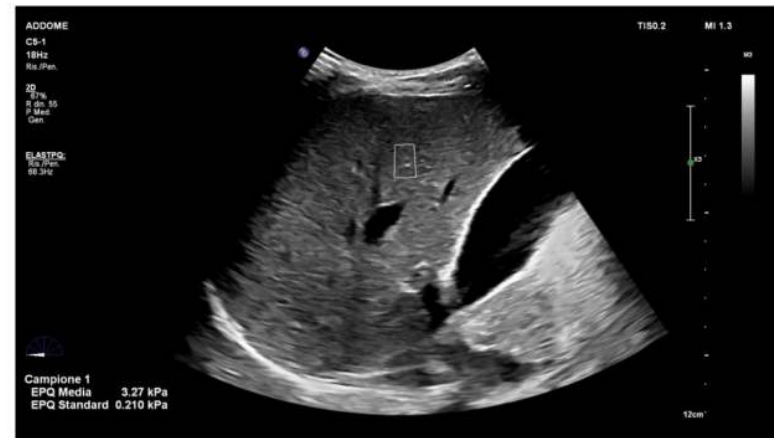


Tissue-like Sign

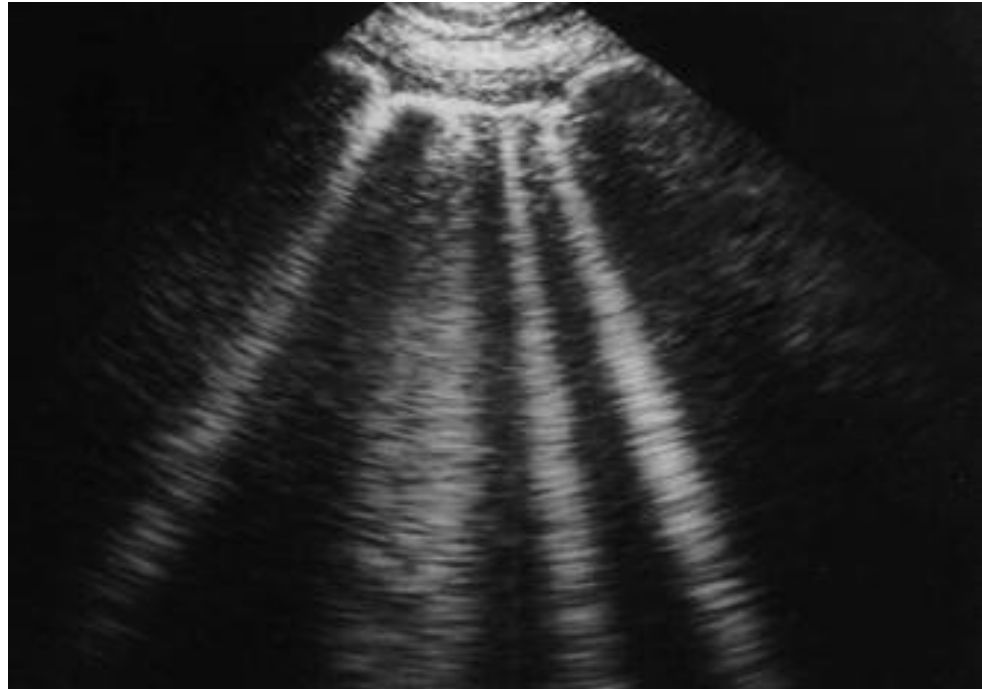
- <https://www.scielo.br/j/rb/a/ZH5v8qZBZgdYBD6FBPJZ8Dg/?lang=en#>



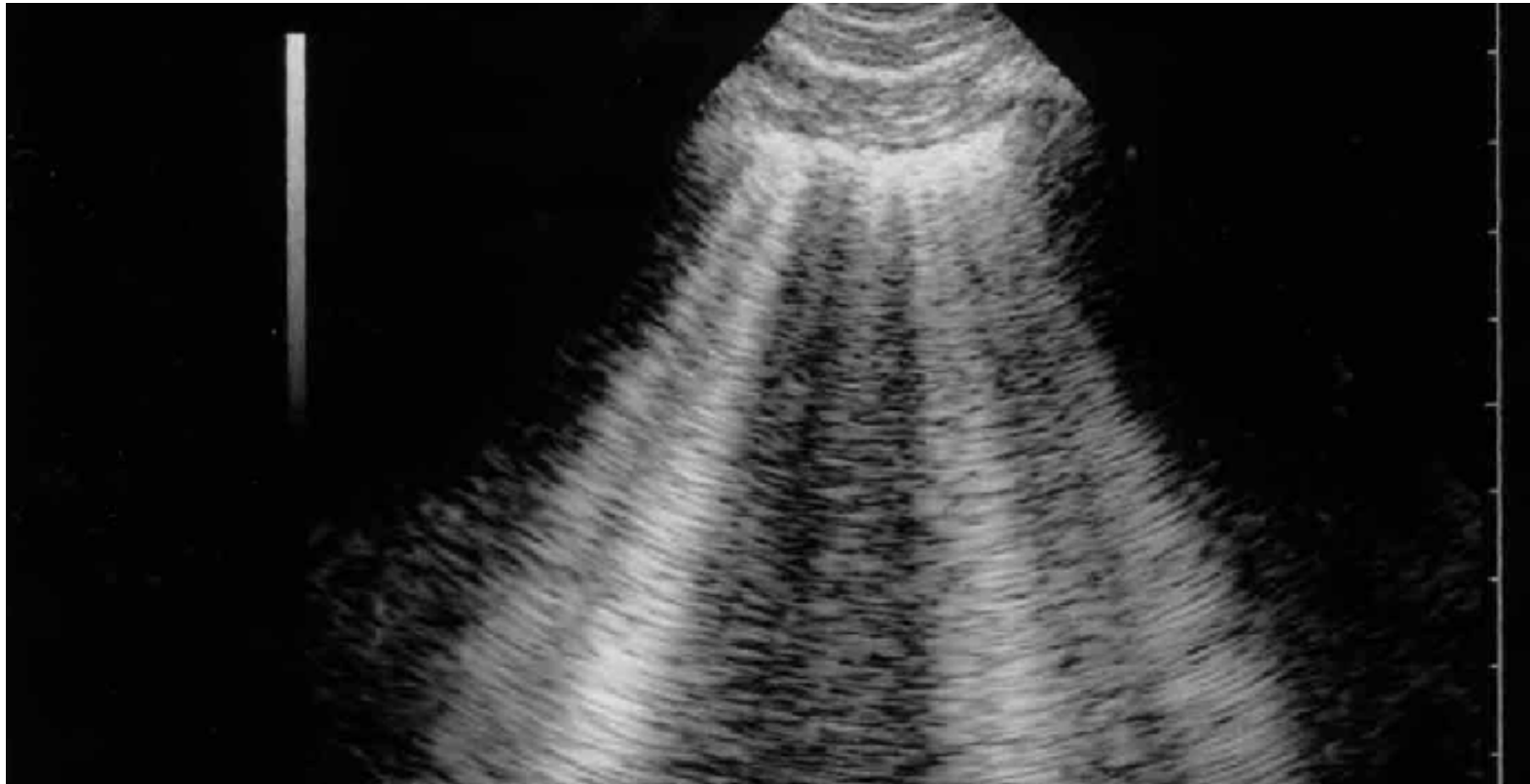
LIVER

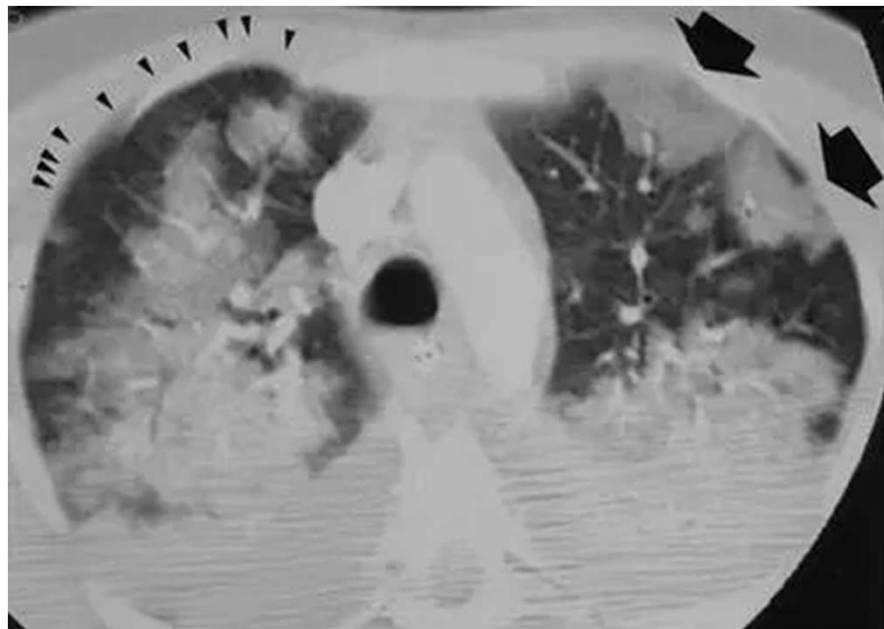


Lung Rockets

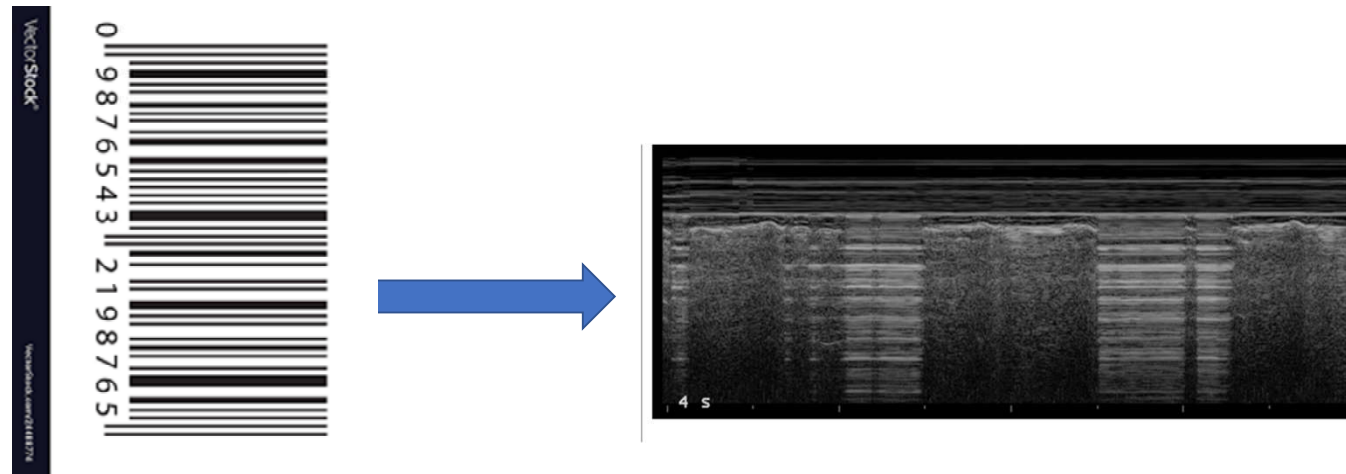


<https://www.scielo.br/jj/rb/a/ZH5v8qZBzgdYBD6FBPJZ8Dg/?lang=en#>



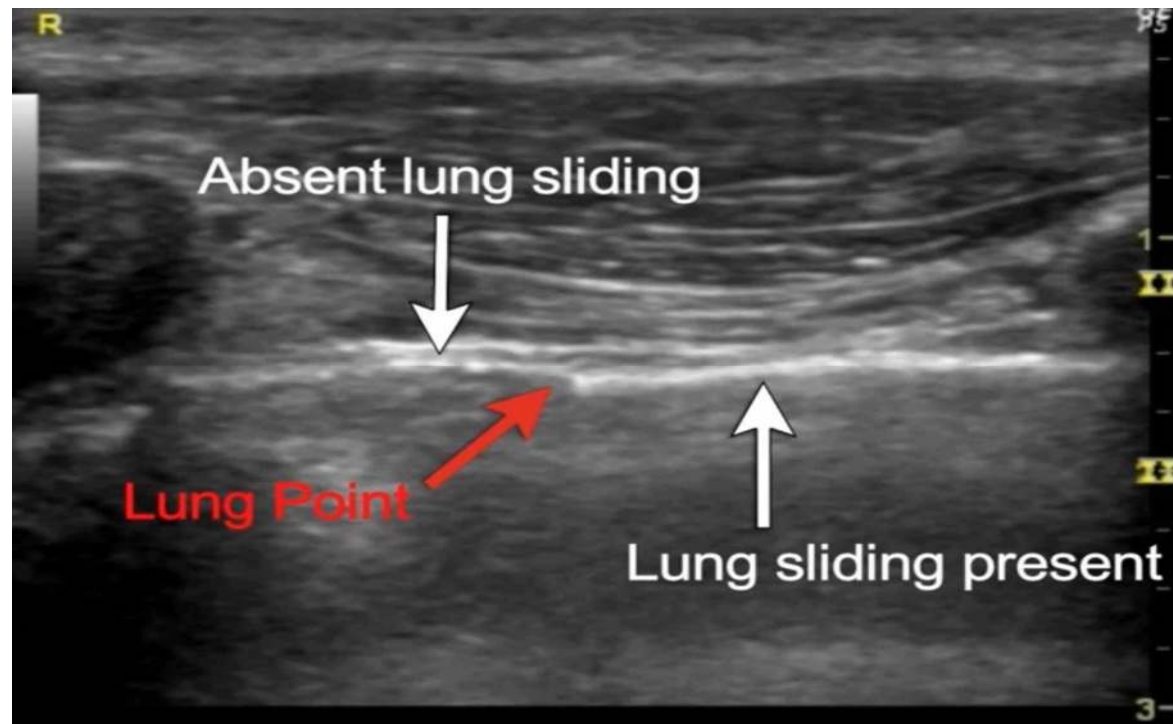


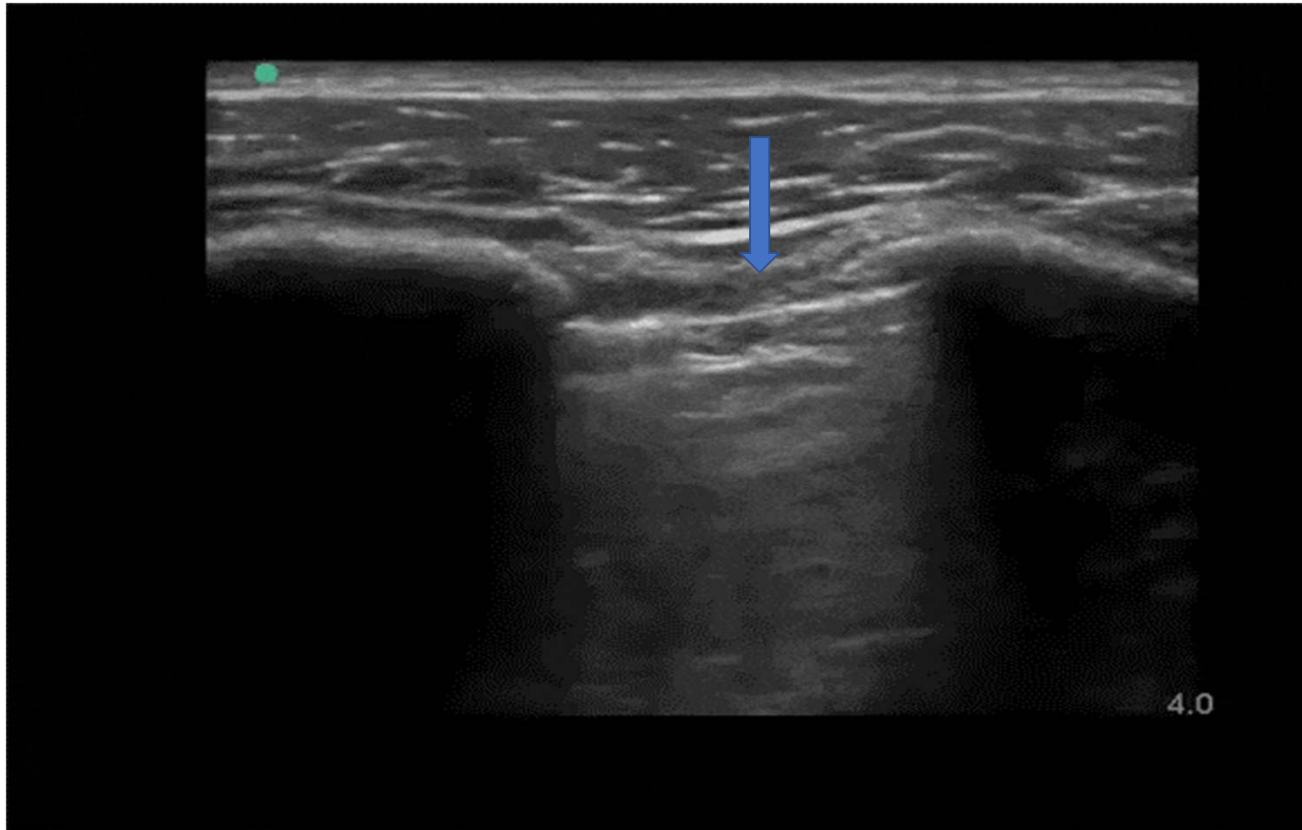
Barcode Sign



<https://www.mdedge.com/emergencymedicine/article/100752/imaging/emergency-ultrasound-pneumothorax-assessment>

Lung Point

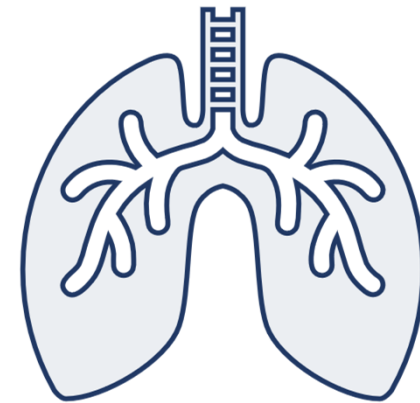




<https://www.grepmed.com/images/5705/lung-ultrasound-clinical-lungpoint-pulmonary>

Lung approach in the ICU

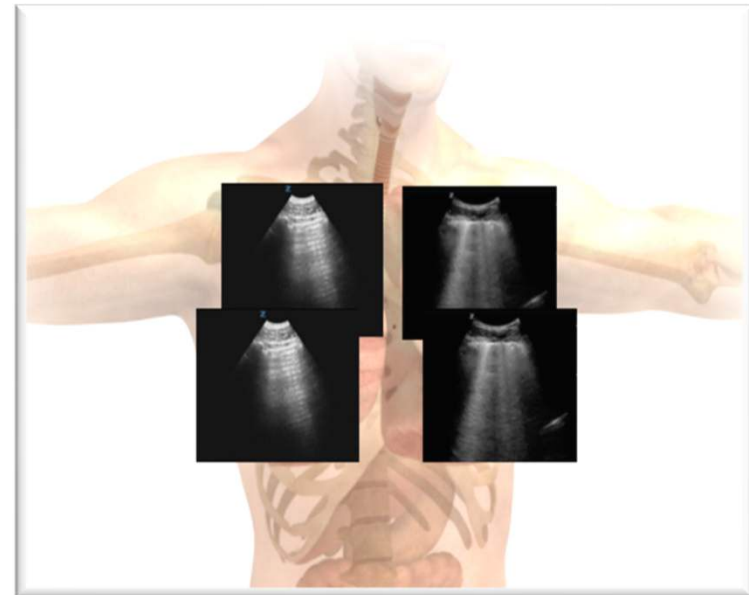
- Portable Chest X-ray: Not in real time
- CT Scan: Risk of transporting critical patients and limited availability, expensive
- Lung Ultrasound (LUS): Easily available, no ionizing radiation, low cost



[https://www.bjaed.org/article/S2058-5349\(17\)30109-9/fulltext#relatedArticles](https://www.bjaed.org/article/S2058-5349(17)30109-9/fulltext#relatedArticles)

Point-of-care US in the ICU

1. Diagnostic tool
2. Managing Ventilated patients
3. Monitoring
4. Line Access

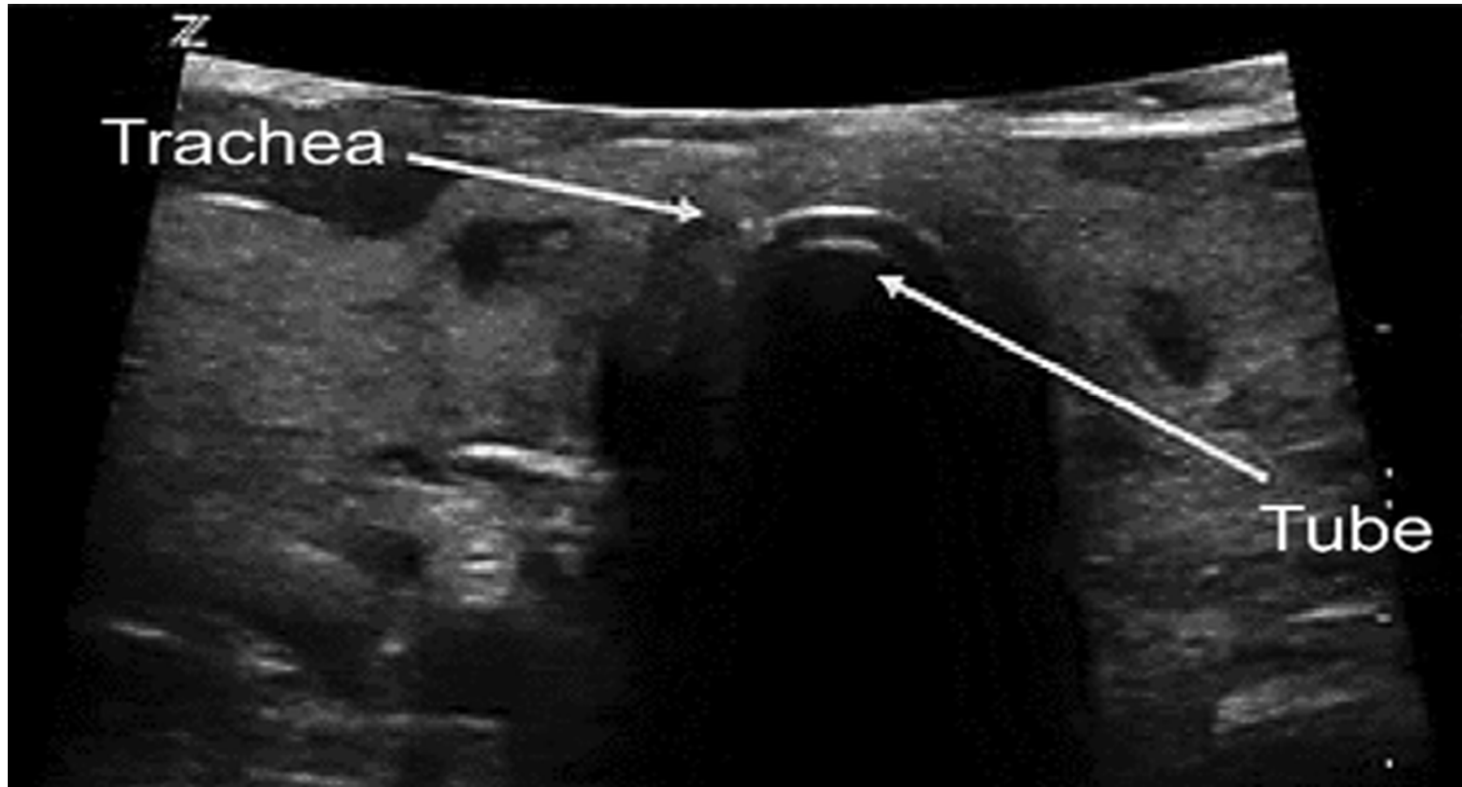


Airway Management Probe Placement

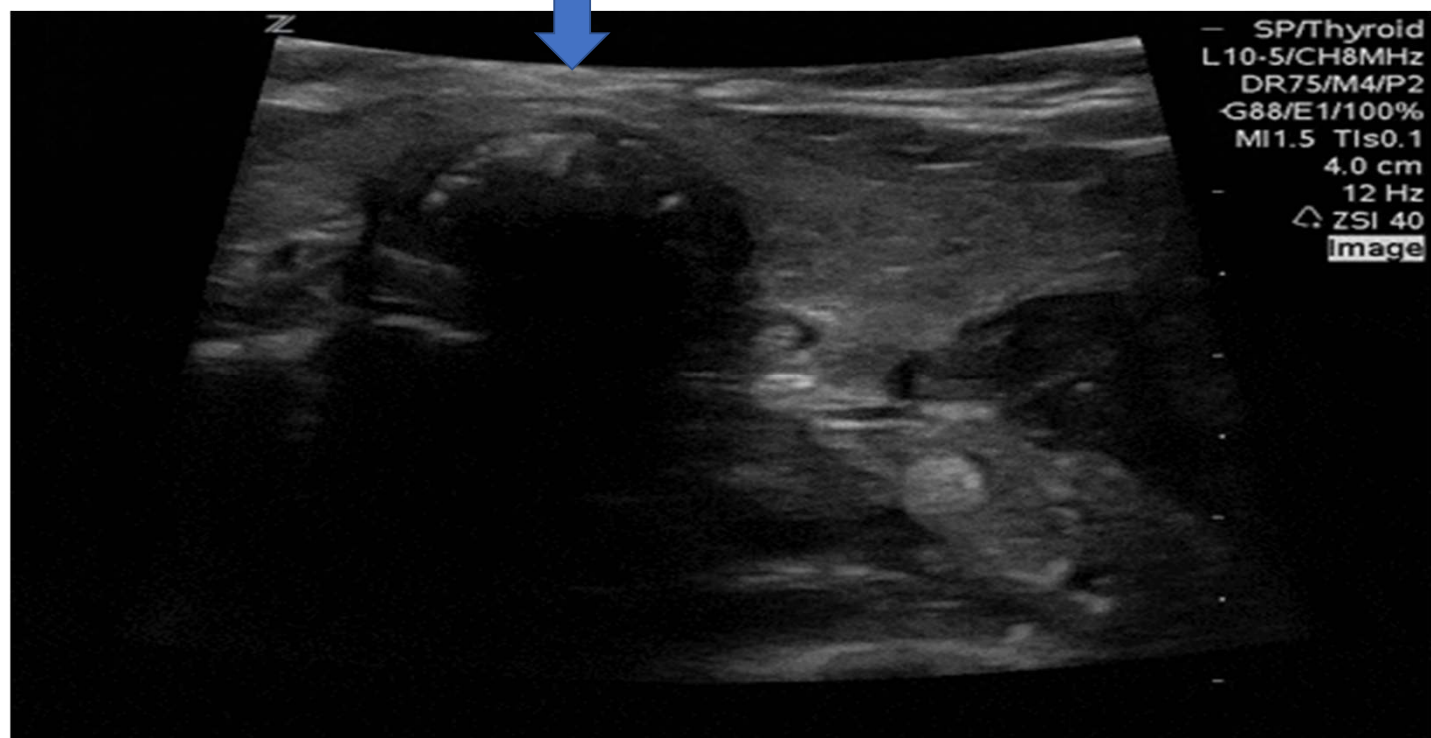


<https://rc.rcjournal.com/content/64/2/217>

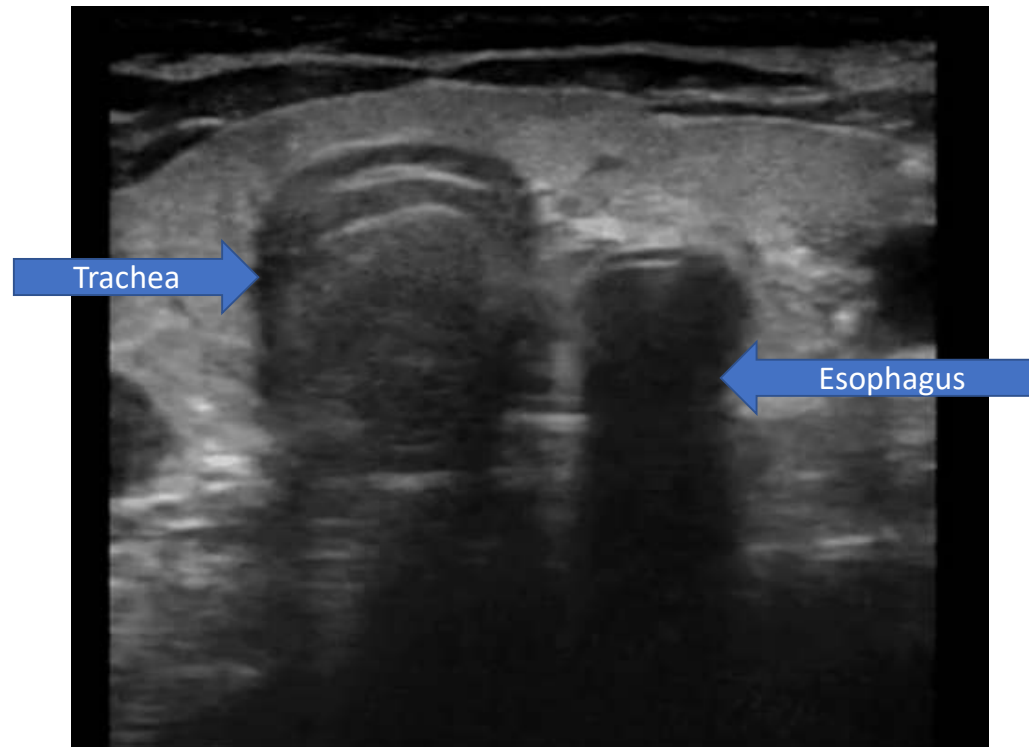
ETT Confirmation using US

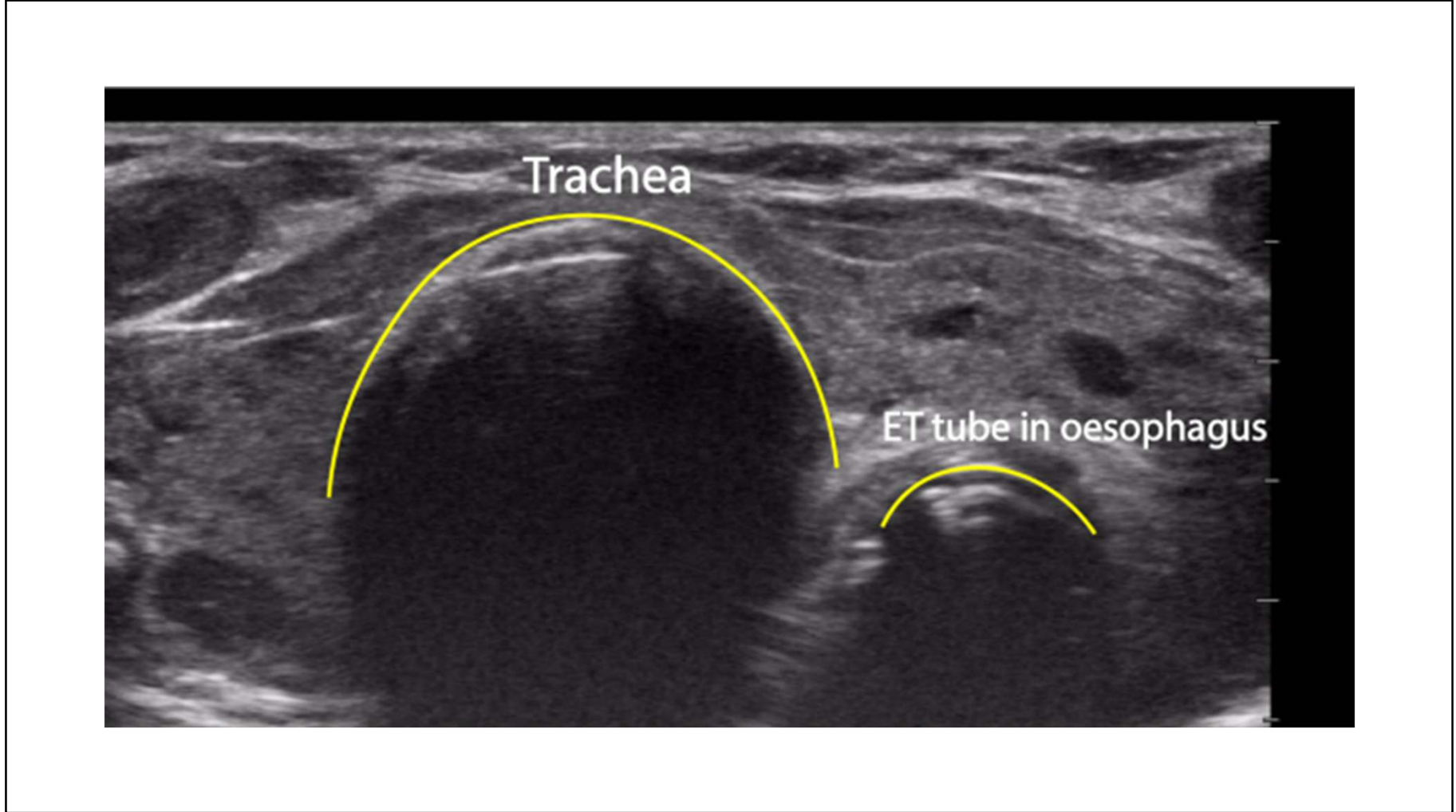


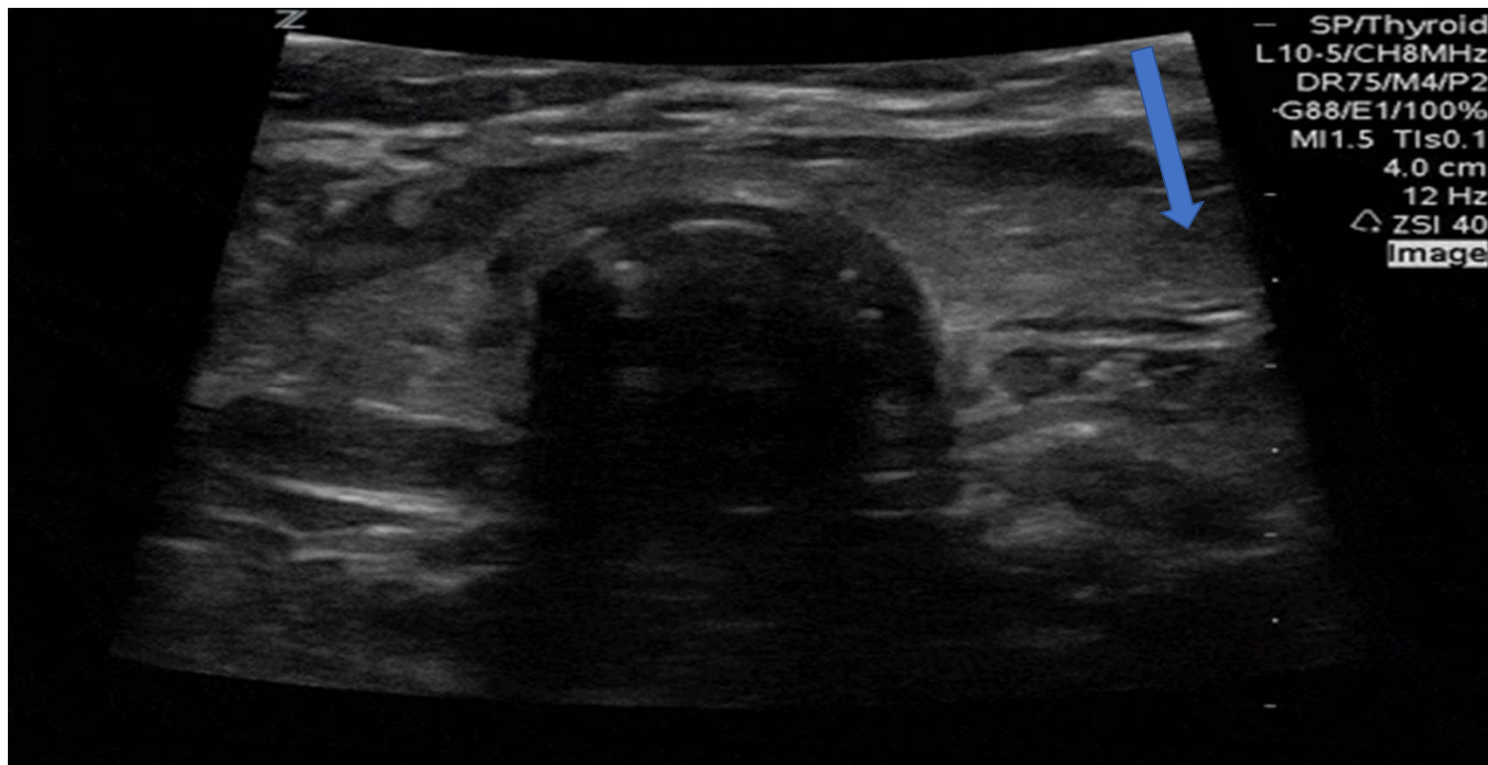
Trachea with proper tube placement



Esophageal intubation







• <https://www.kwaktalk.org/sono-sundays/2020/10/18/ett-confirmation>

Goose Sign



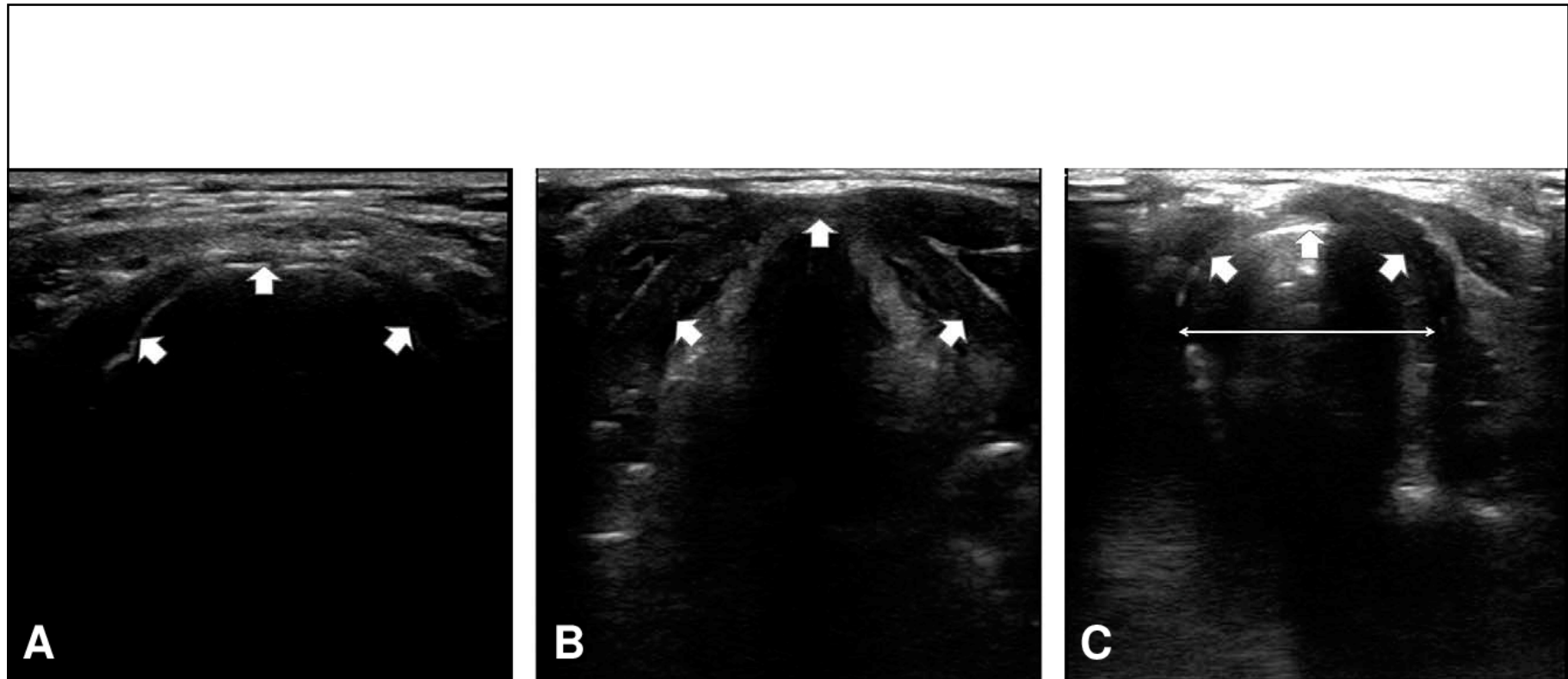


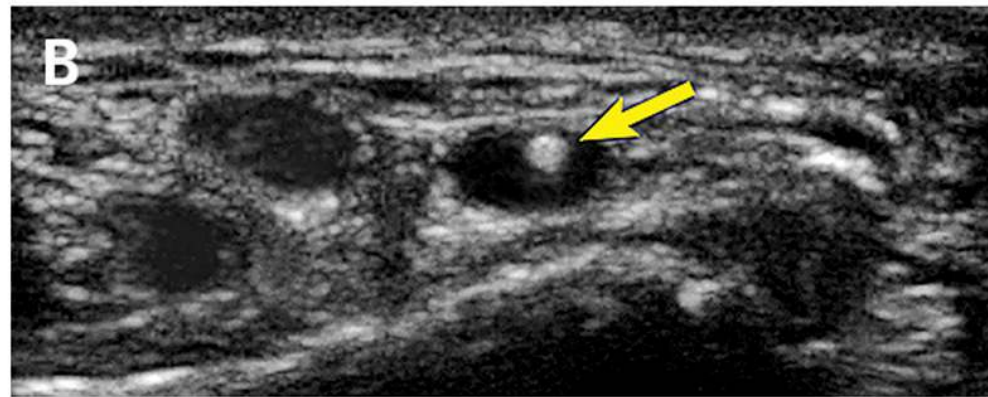
Fig. 1. Ultrasound images of the airway

Ultrasound-guided Line placement

A-Line

Central Line

A-Line

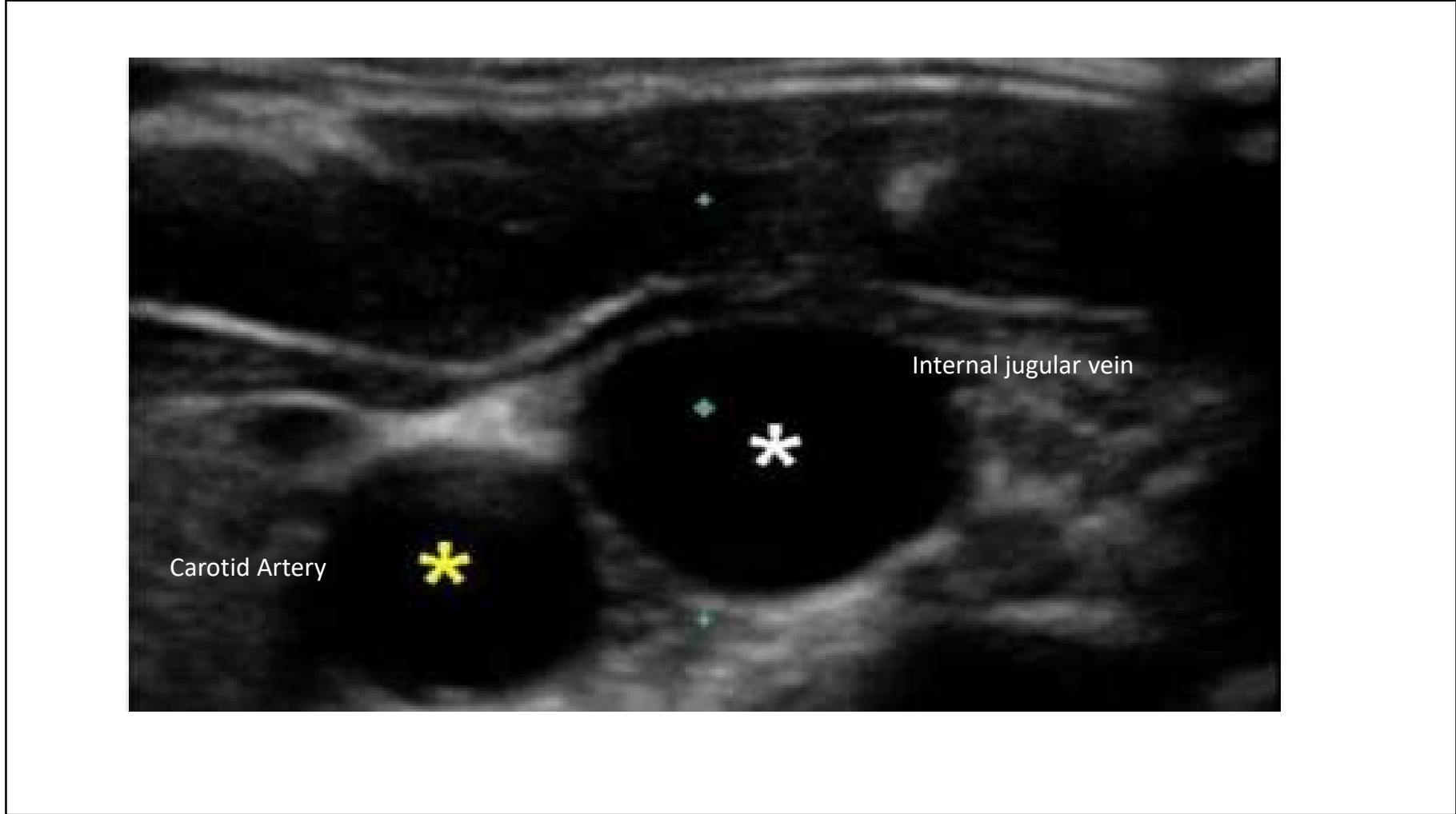


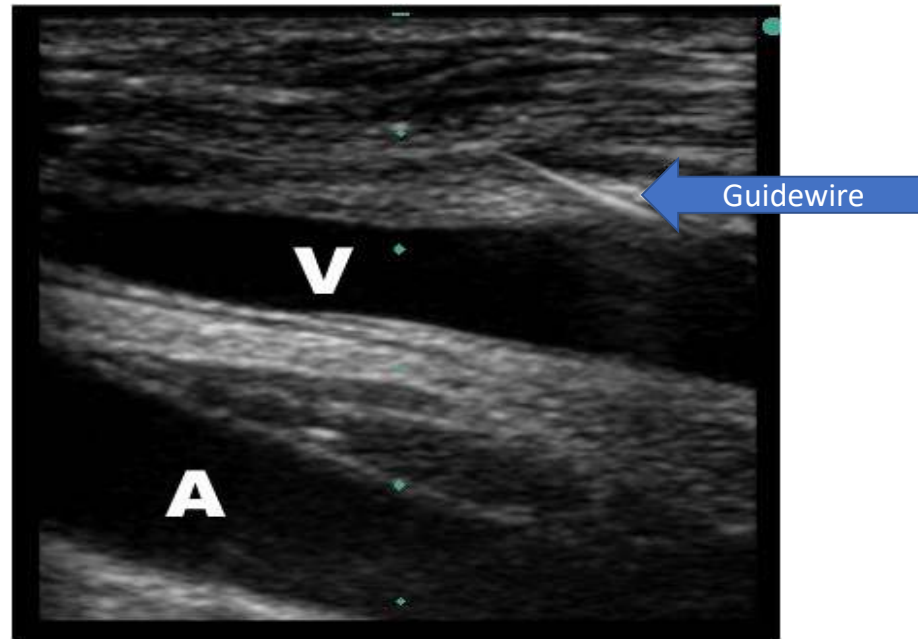
<https://www.nejm.org/doi/full/10.1056/NEJMvcm1213181>

Central Line



JJ Valdez MSRC; RRT-ACCS

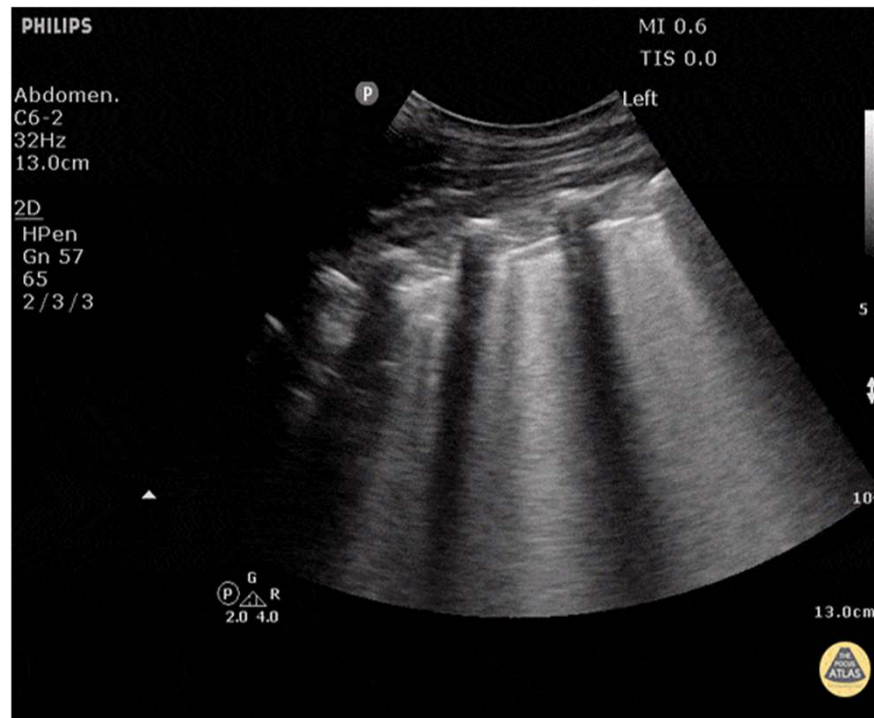




Quiz Time!

1. Where do ALL B-Lines arise from?

Pleural Line



2. In the **BLUE** protocol, what does **BLUE** stand for?

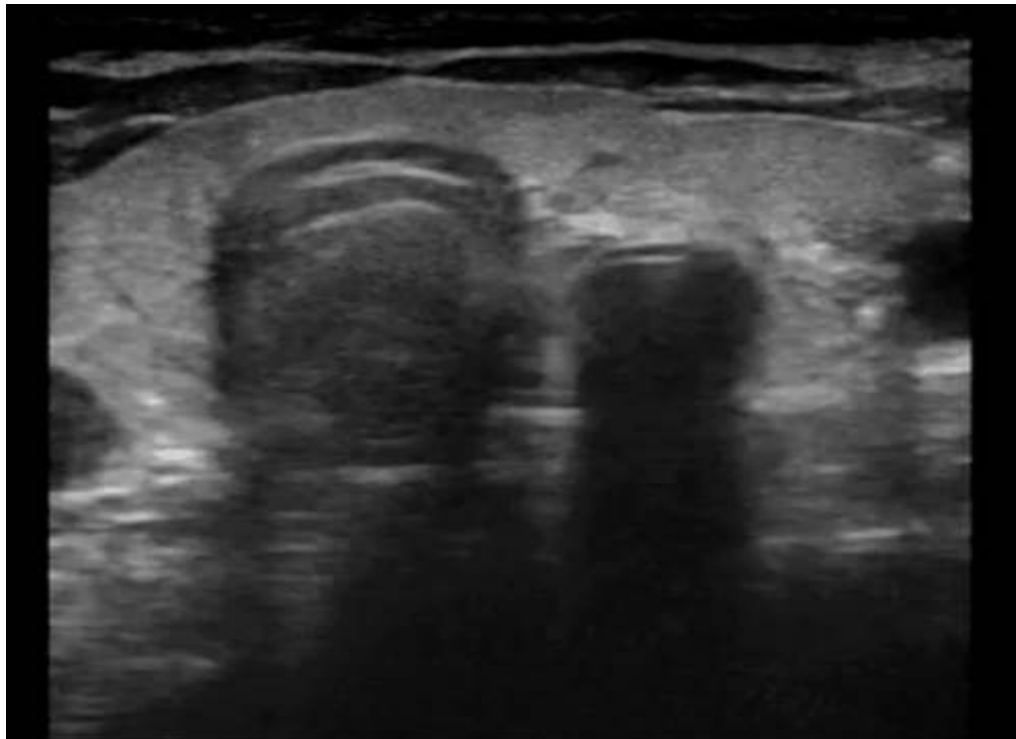
Bedside
Lung
Ultrasound in an
Emergency

3. How many lung signs are in the **BLUE** protocol?

- 1. Bat sign**
- 2. A-Line**
- 3. Seashore Sign**
- 4. Quad sign**
- 5. Sinusoid sign**
- 6. Shred sign**
- 7. Tissue-like sign**
- 8. Lung Rockets**
- 9. Barcode sign**
- 10. Lung Point**

5. What sign is seen when an esophageal intubation occurs?

Goose Sign



Questions?



Mindy.conklin@va.gov