How to access dyspnea using pleural ultrasound

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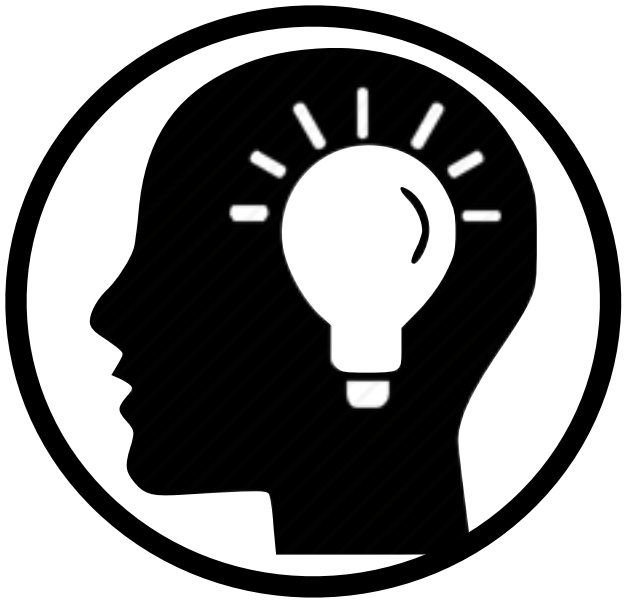
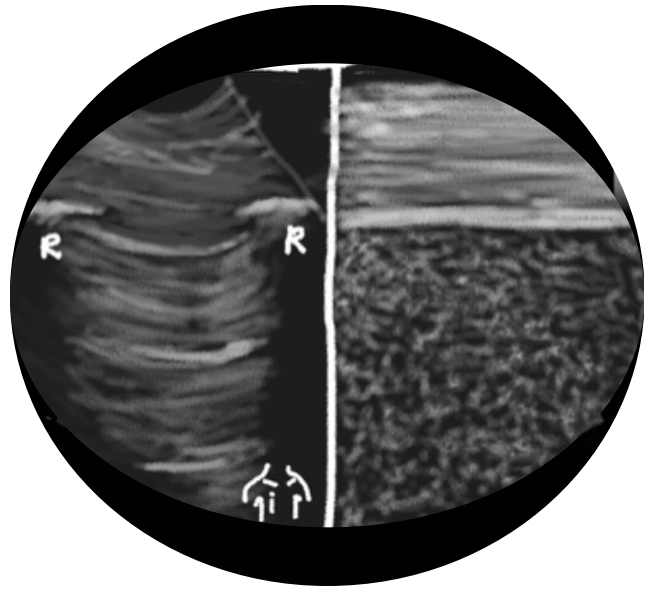
亞東醫院急診醫學部

急診醫學會超音波委員會委員

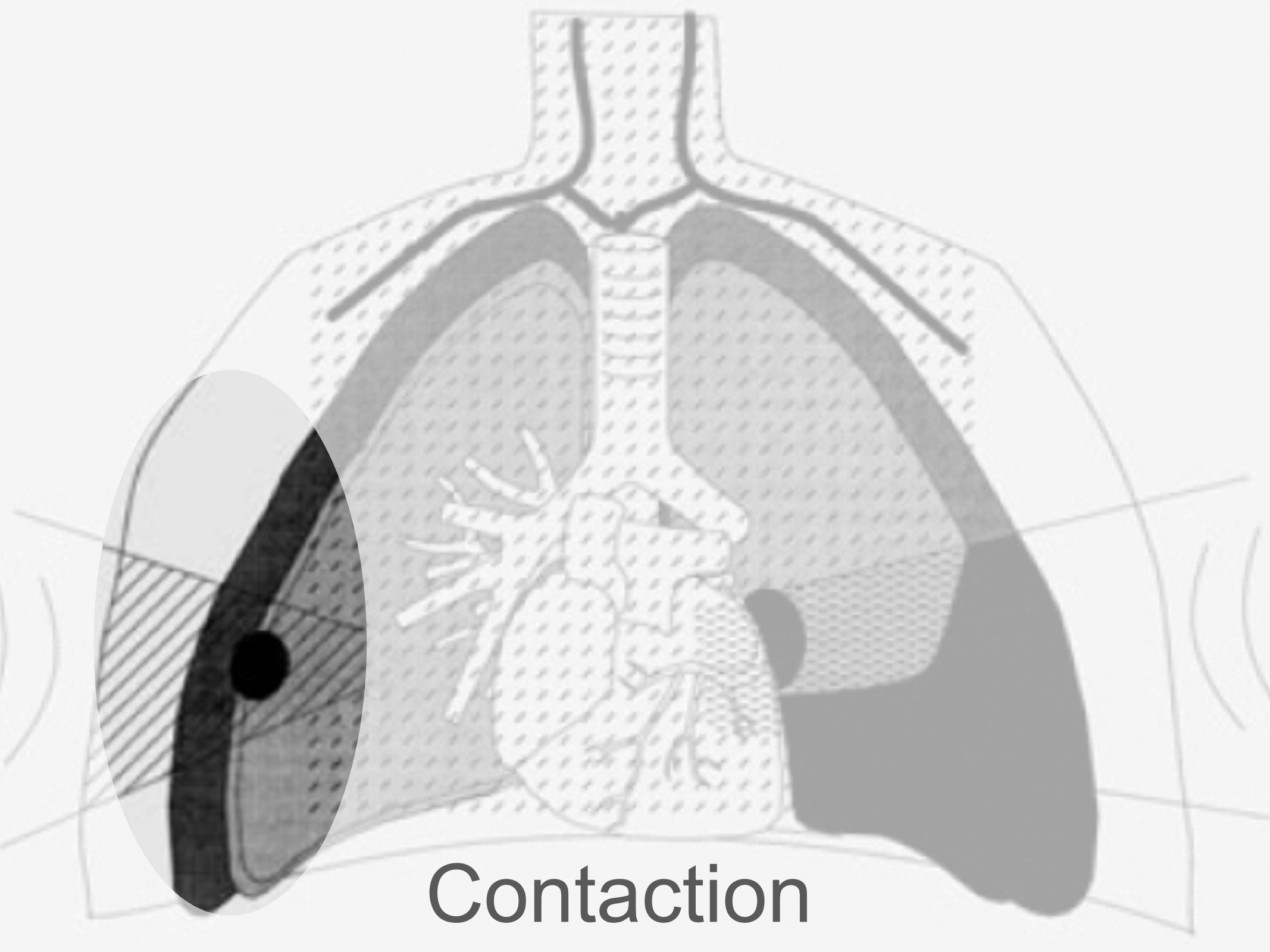
Lung ultrasound



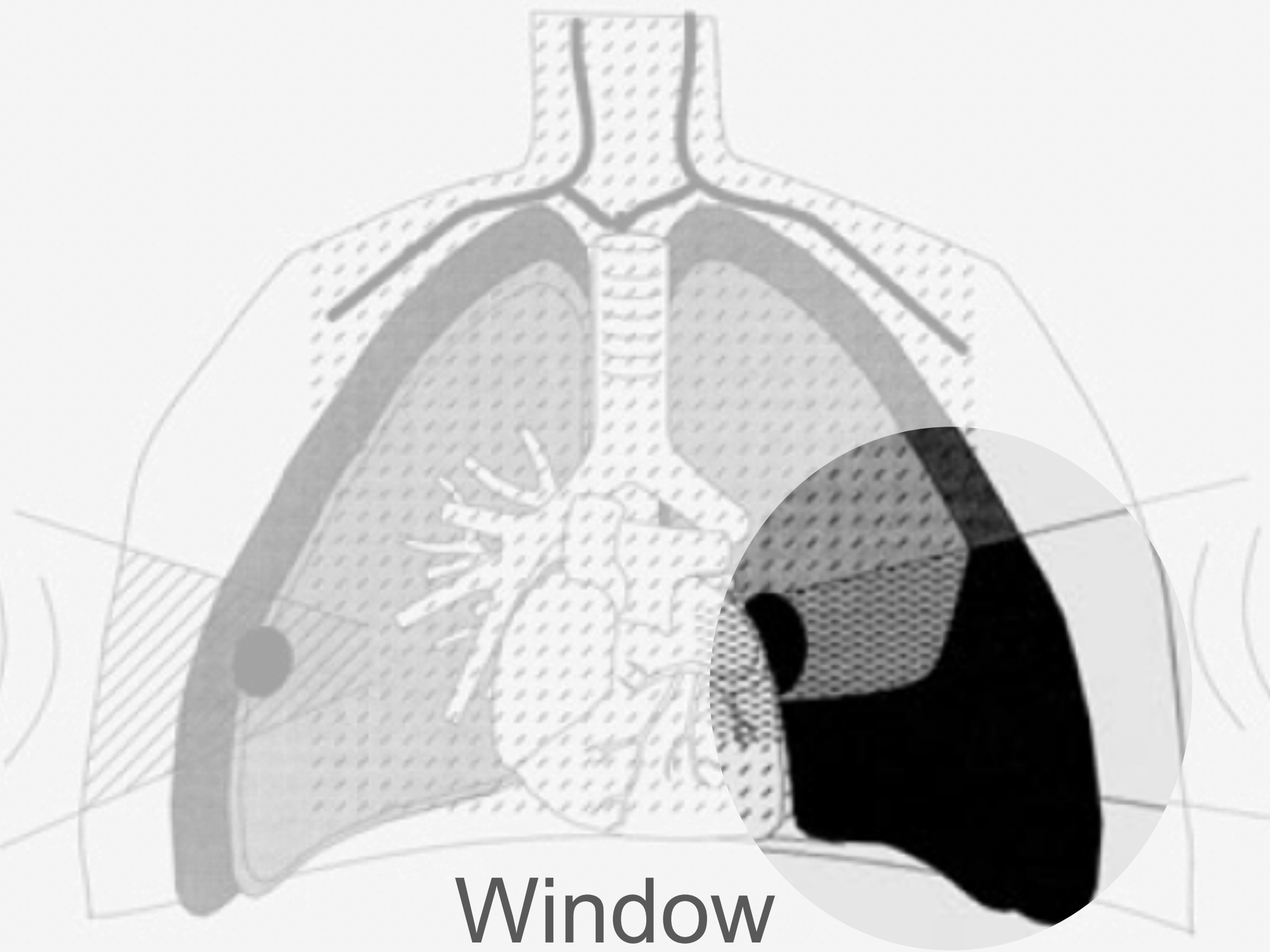


Lung ultrasound

( ) Could detect all lesion.



Contaction


Window

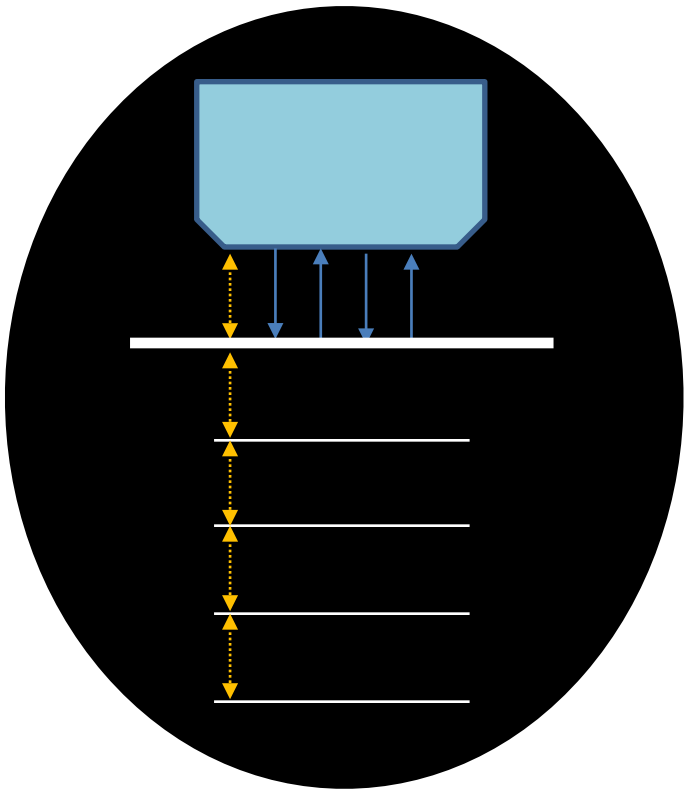
Lung ultrasound

(X) Could detect all lesion.

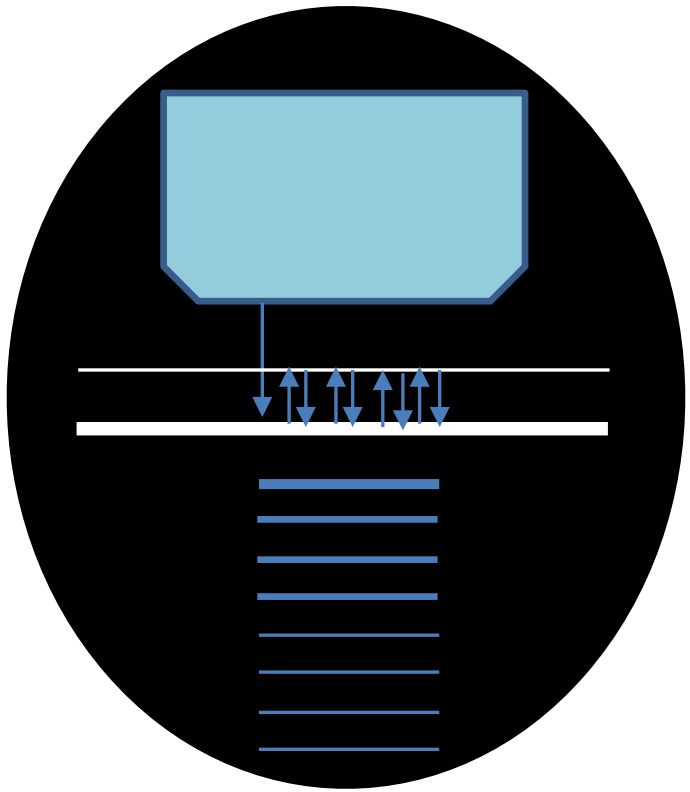
( ) Depends on artifact.

Artifacts

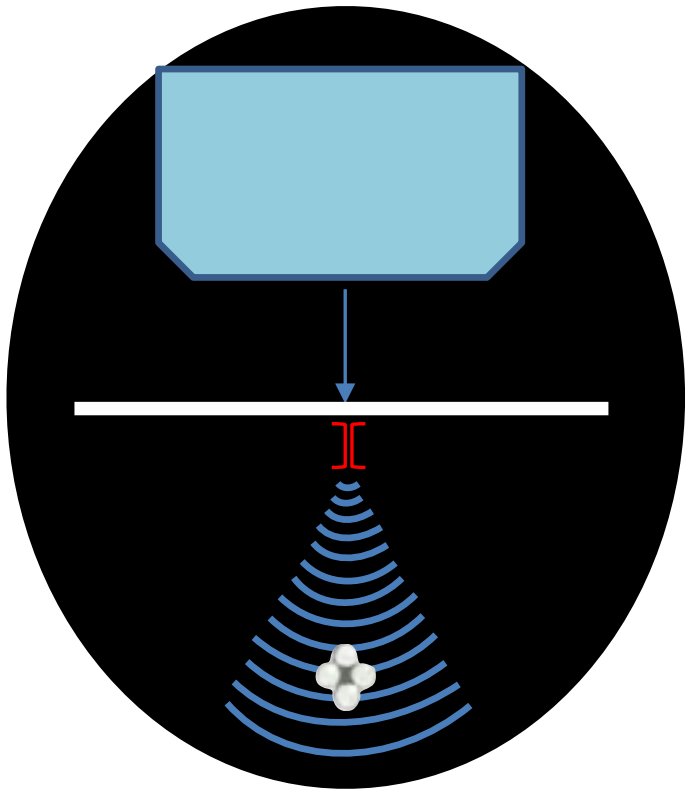
Repetition



Reverberation



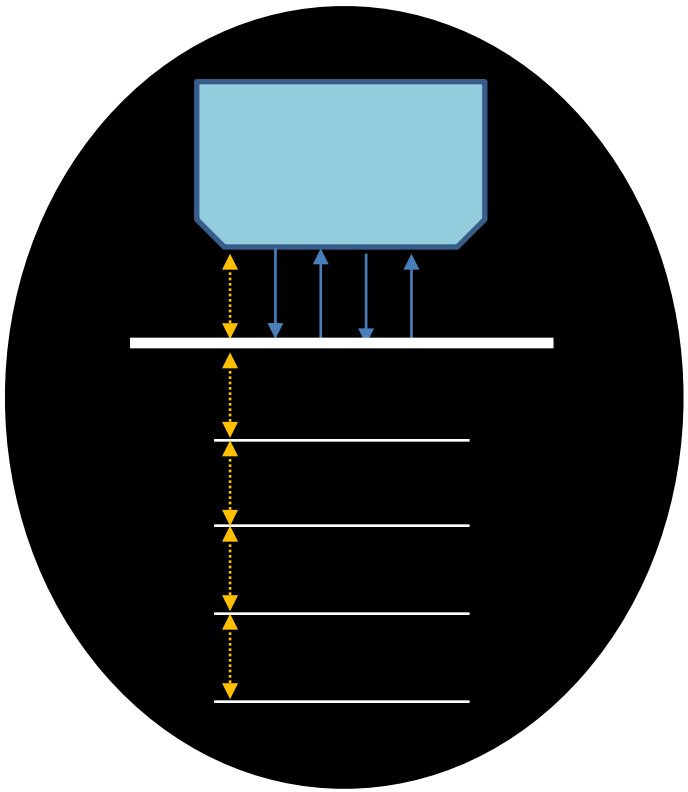
Ring-down



Dr Francis Lee

Artifacts

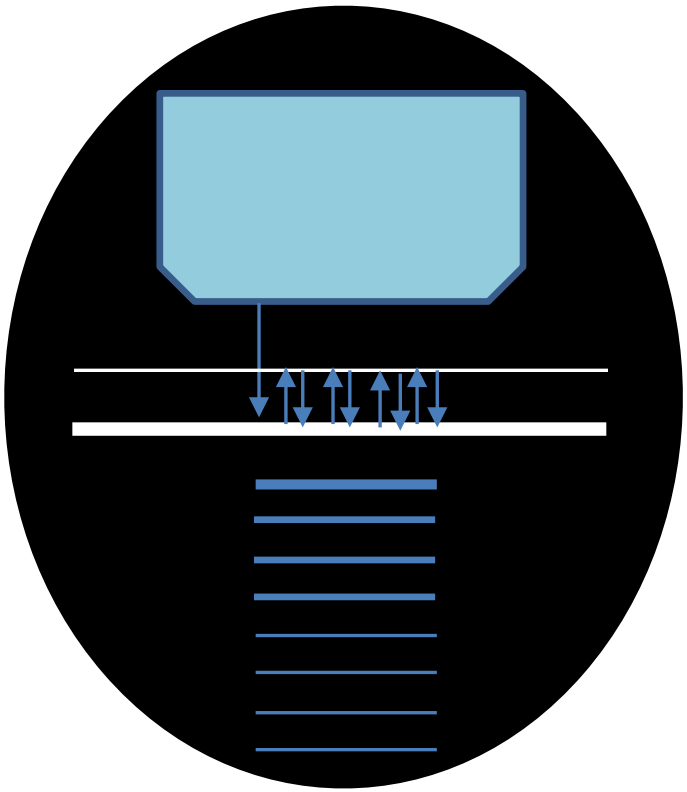
Repetition

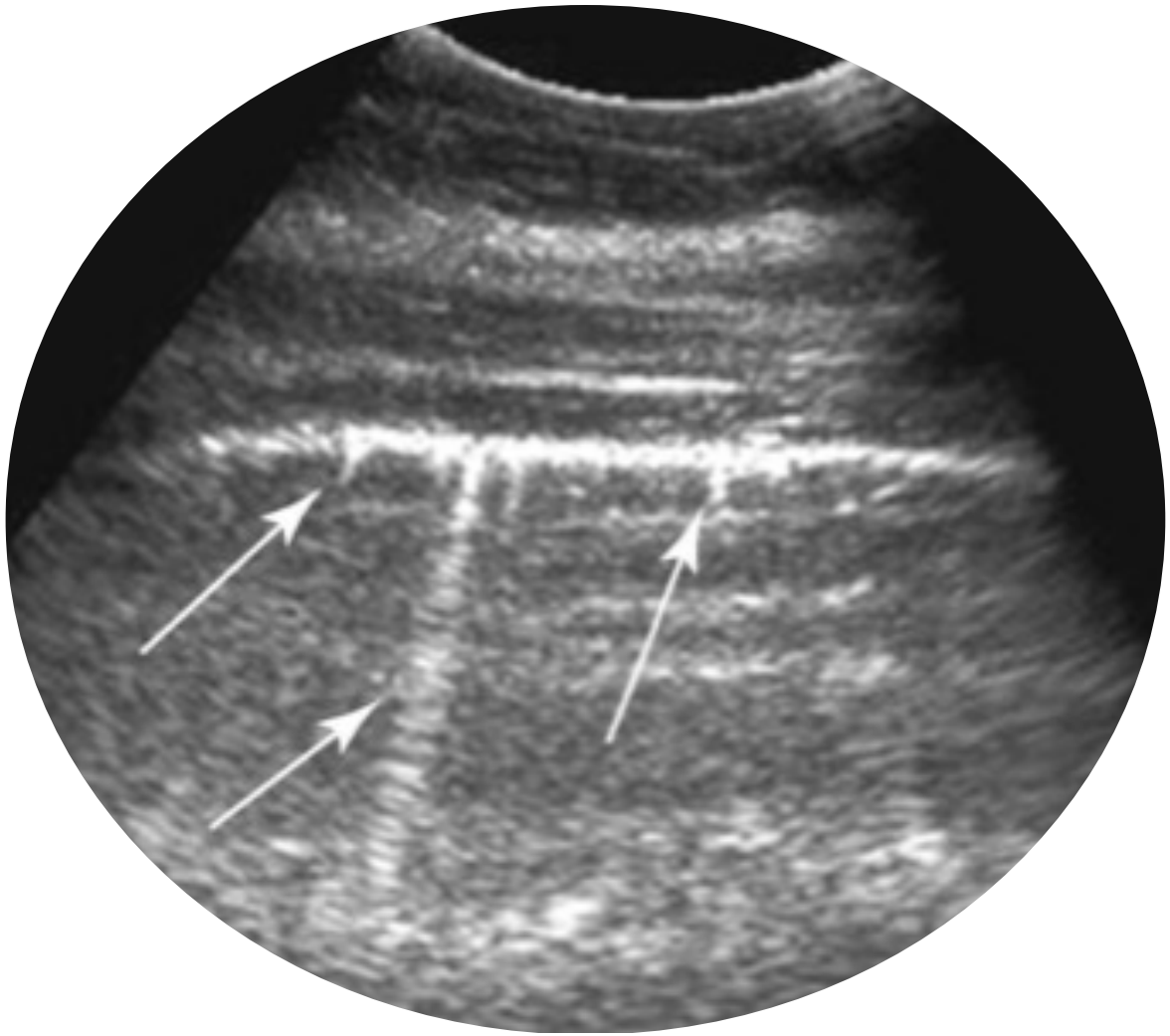


Dr Francis Lee

Artifacts

Reverberation

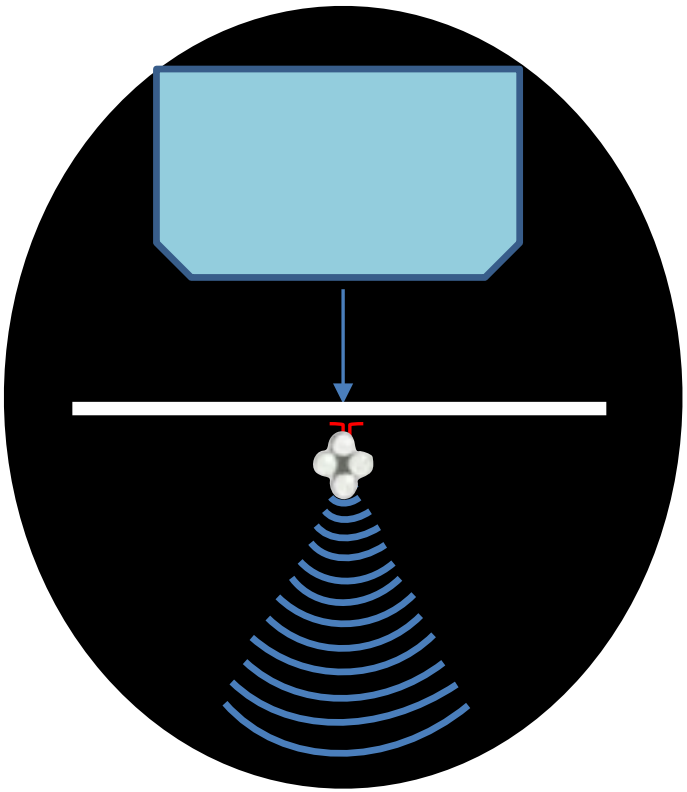


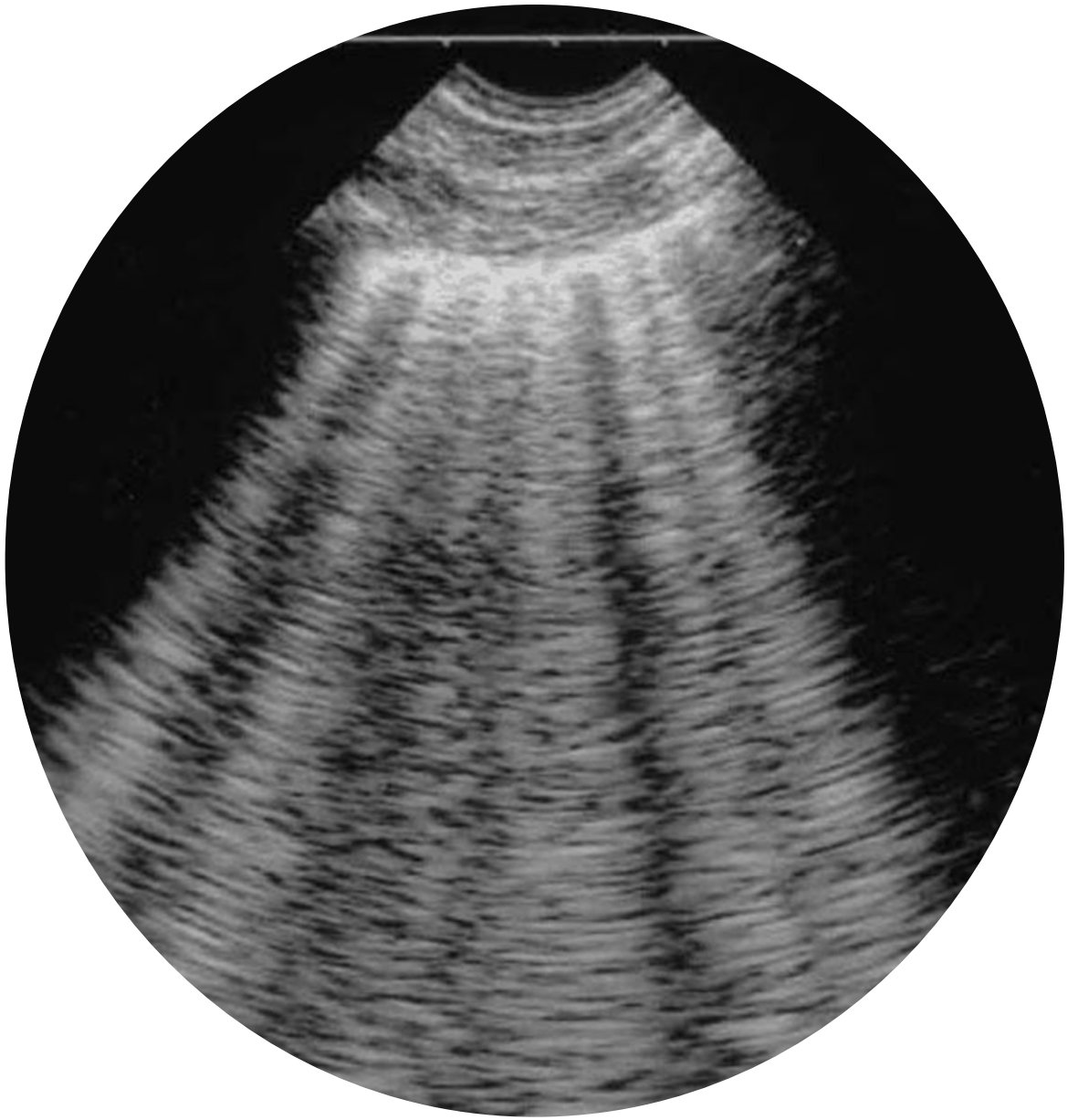


Dr Francis Lee

Artifacts

Ring-down





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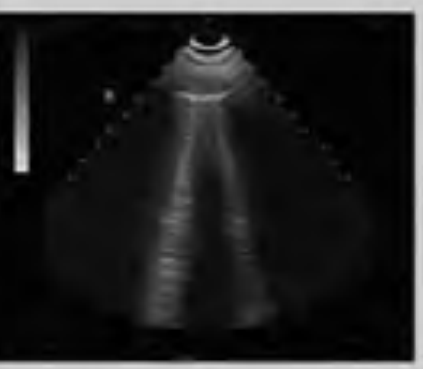
Lung ultrasound

(X) Could detect all lesion.

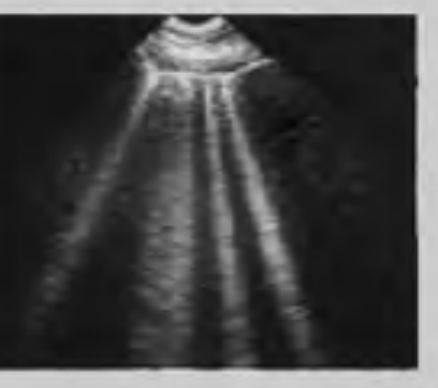
(O) Depends on artifact.

( ) More advance US machine is better

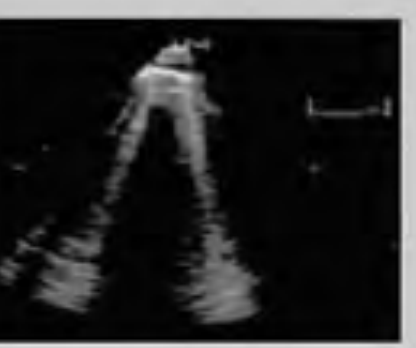
1982 (42 cm)

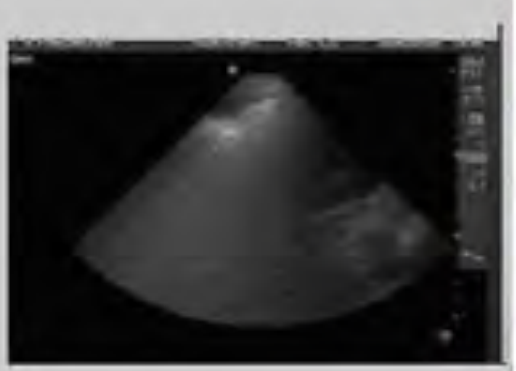



1992 (32 cm)




2002-2007 (48-70 cm)



Lung ultrasound

(X) Could detect all lesion.

(O) Depends on artifact.

(X) More advance US machine is better

( ) Is operator dependent

Interobserver agreement of penumonia

Kappa
0.30

Kappa
0.51

Kappa
0.93

Higher Kappa value, less operator dependent !

Lung ultrasound

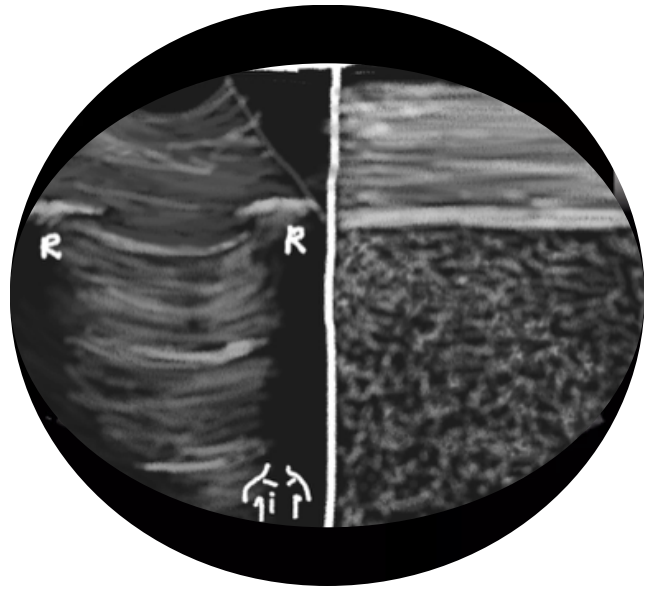
(X) Could detect all lesion.

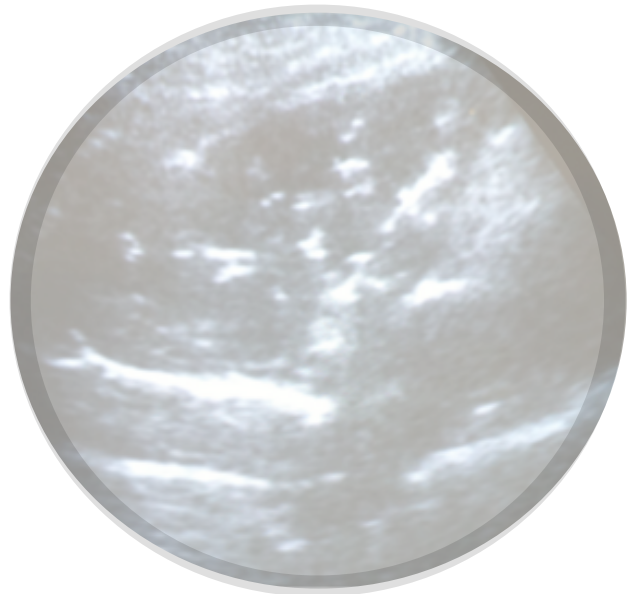
(O) Depends on artifact.

(X) More advance US machine is better

(X) Is operator dependent

Lung ultrasound





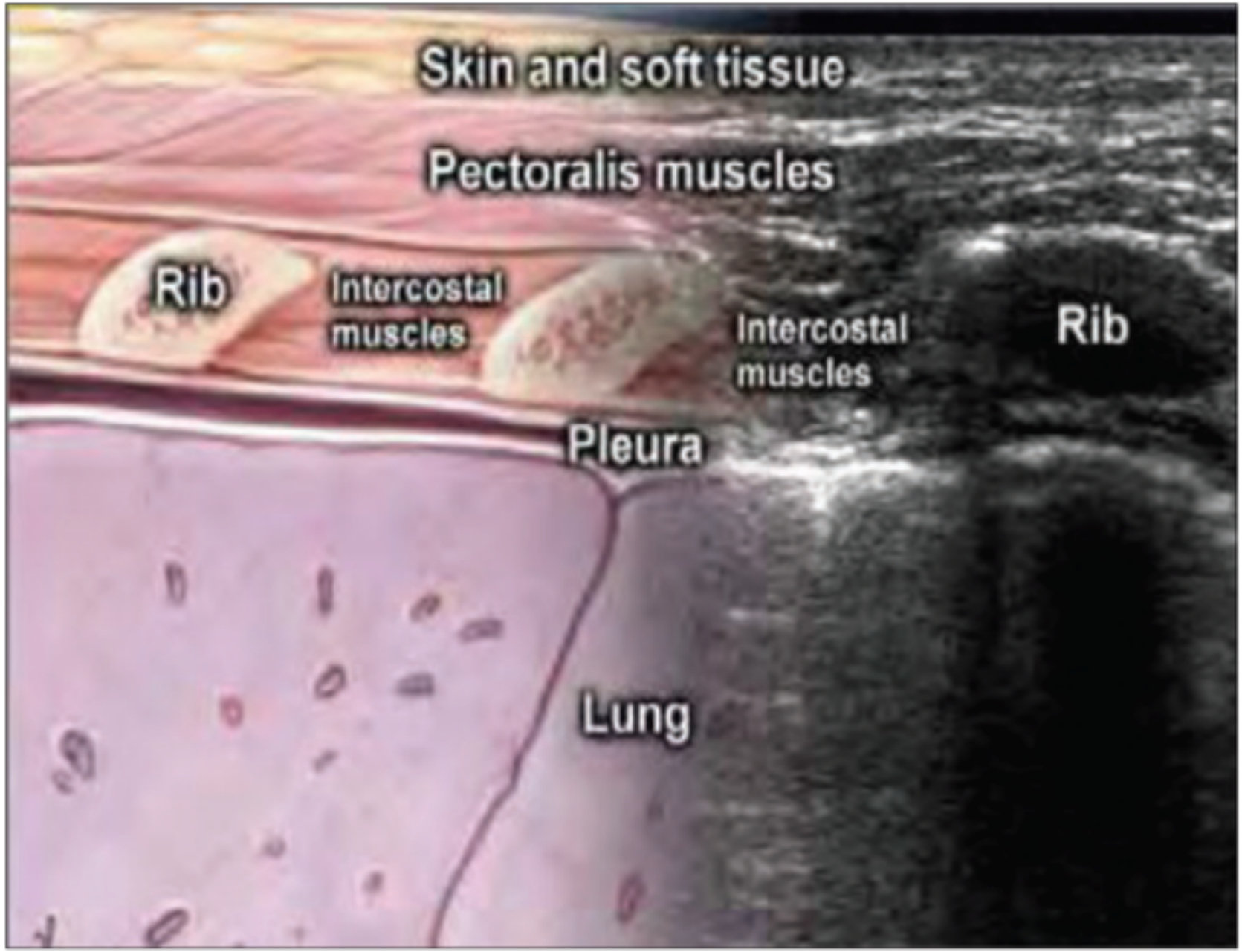


Figure 1: Anatomical drawing fused with corresponding ultrasoundimage demonstrating the superficial chest wall structures. (www.philips.com/CCEMeducation)

Static

- Pleural line
- A-line
- Comet tail sign/B line

Dynamic

- Lung sliding
- Lung pulse

Lung sliding

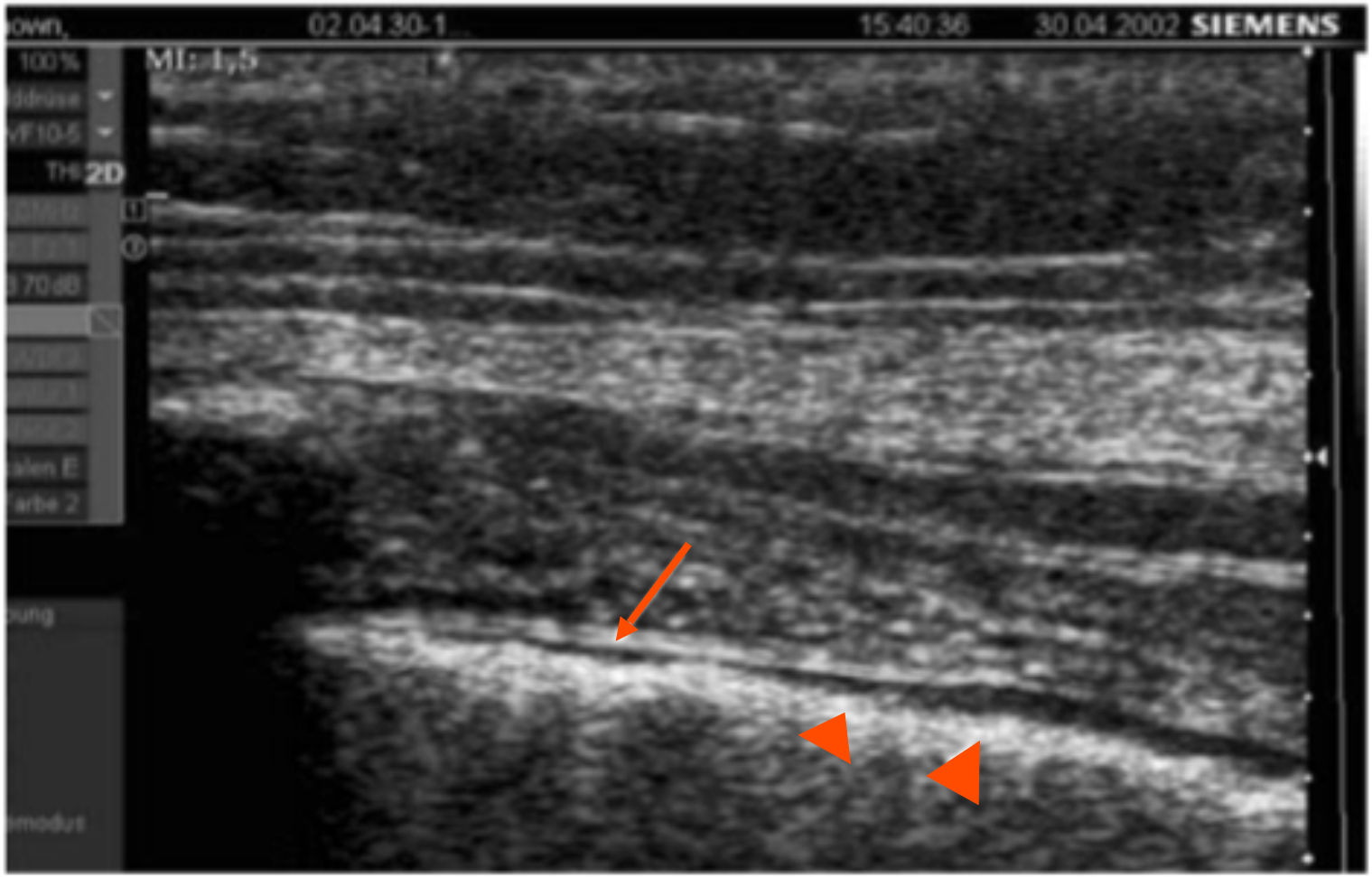


Fig. 3.3 Clearly recognizable double contour in the area of the parietal pleura (*arrow*), corresponding with the actual parietal pleura and endothoracic fascia. Note the disproportionally thick visceral pleura (*arrowheads*) due to artifact

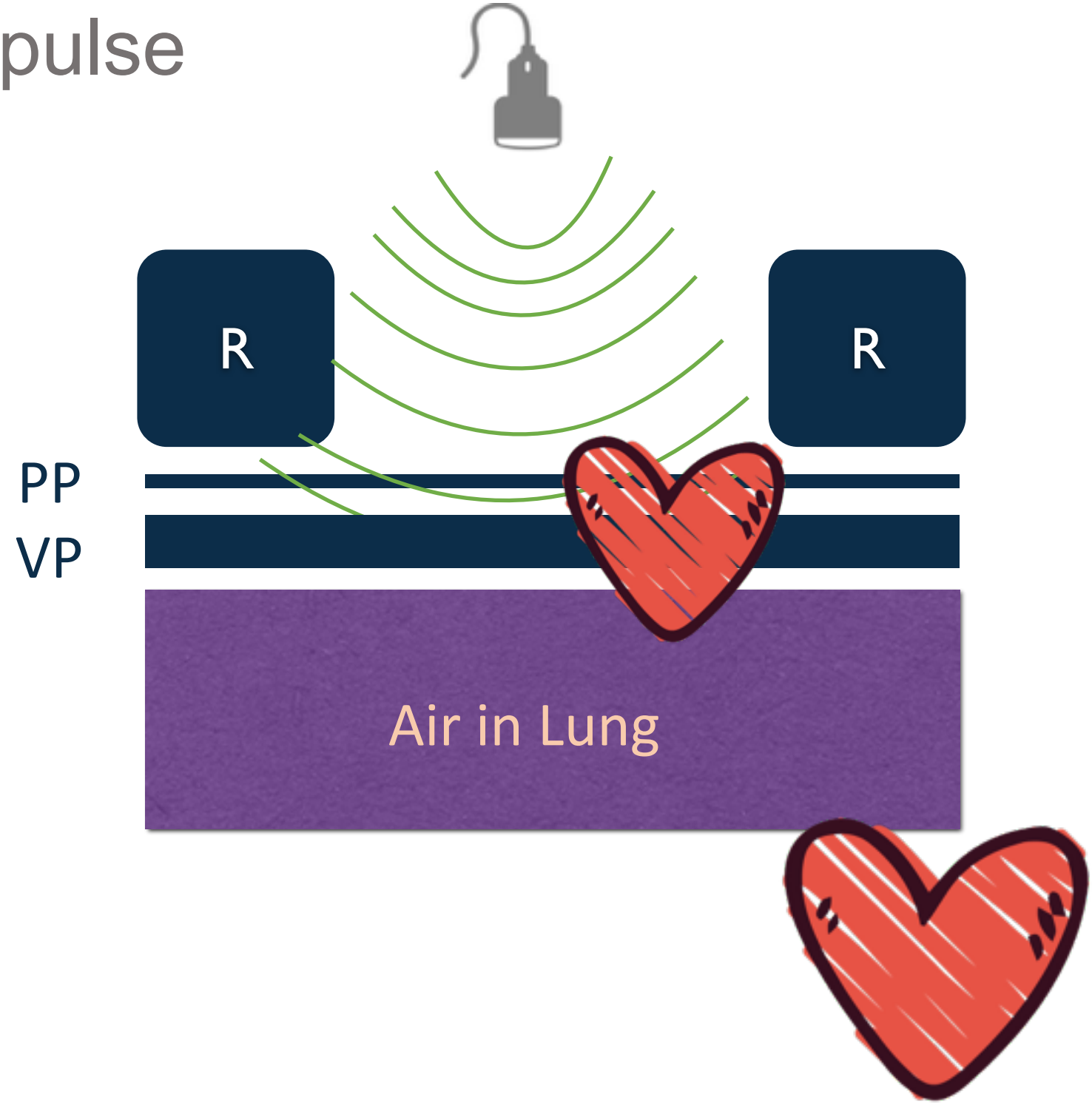
Rib Plerual Rib

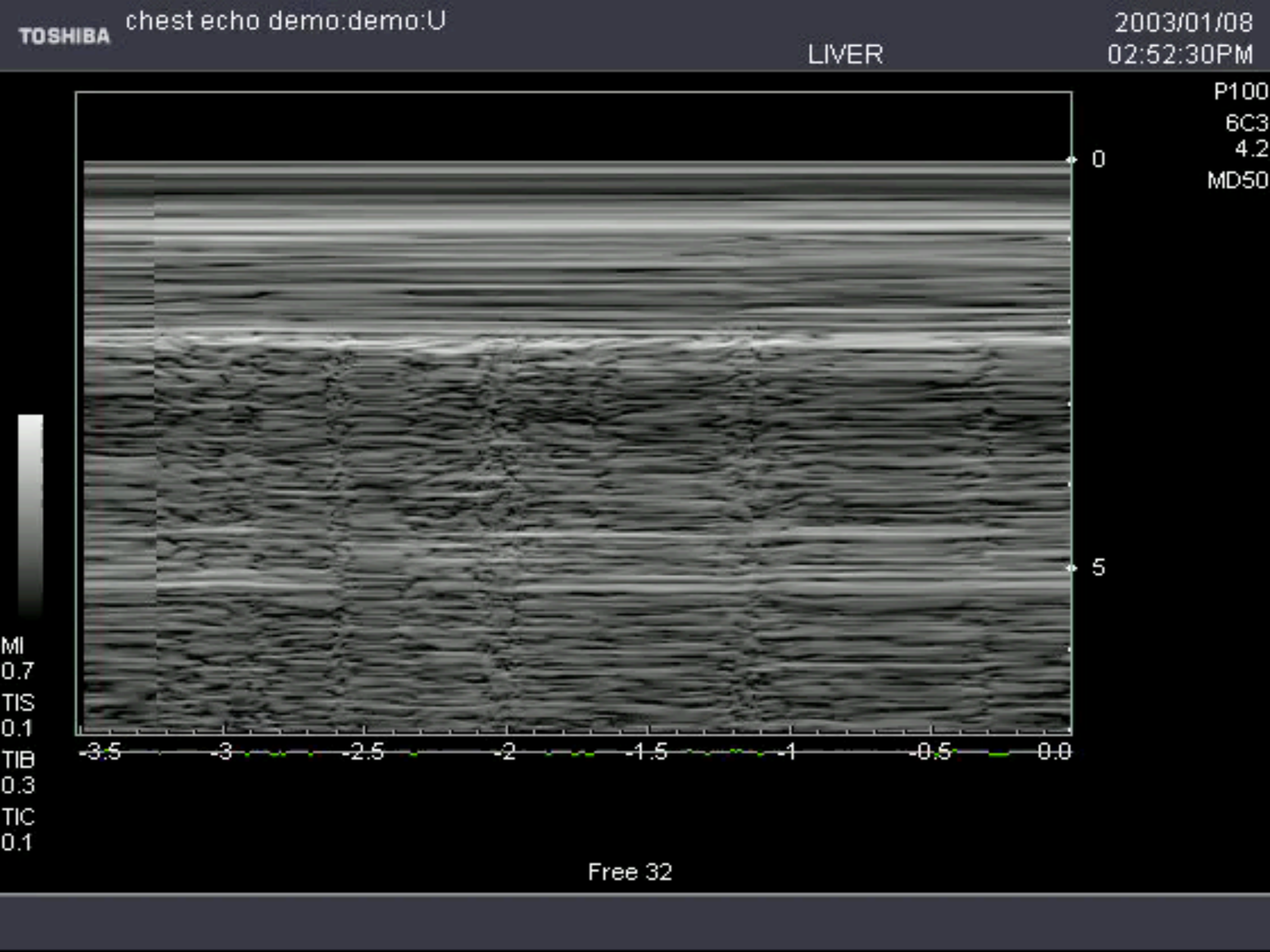
A

A

A

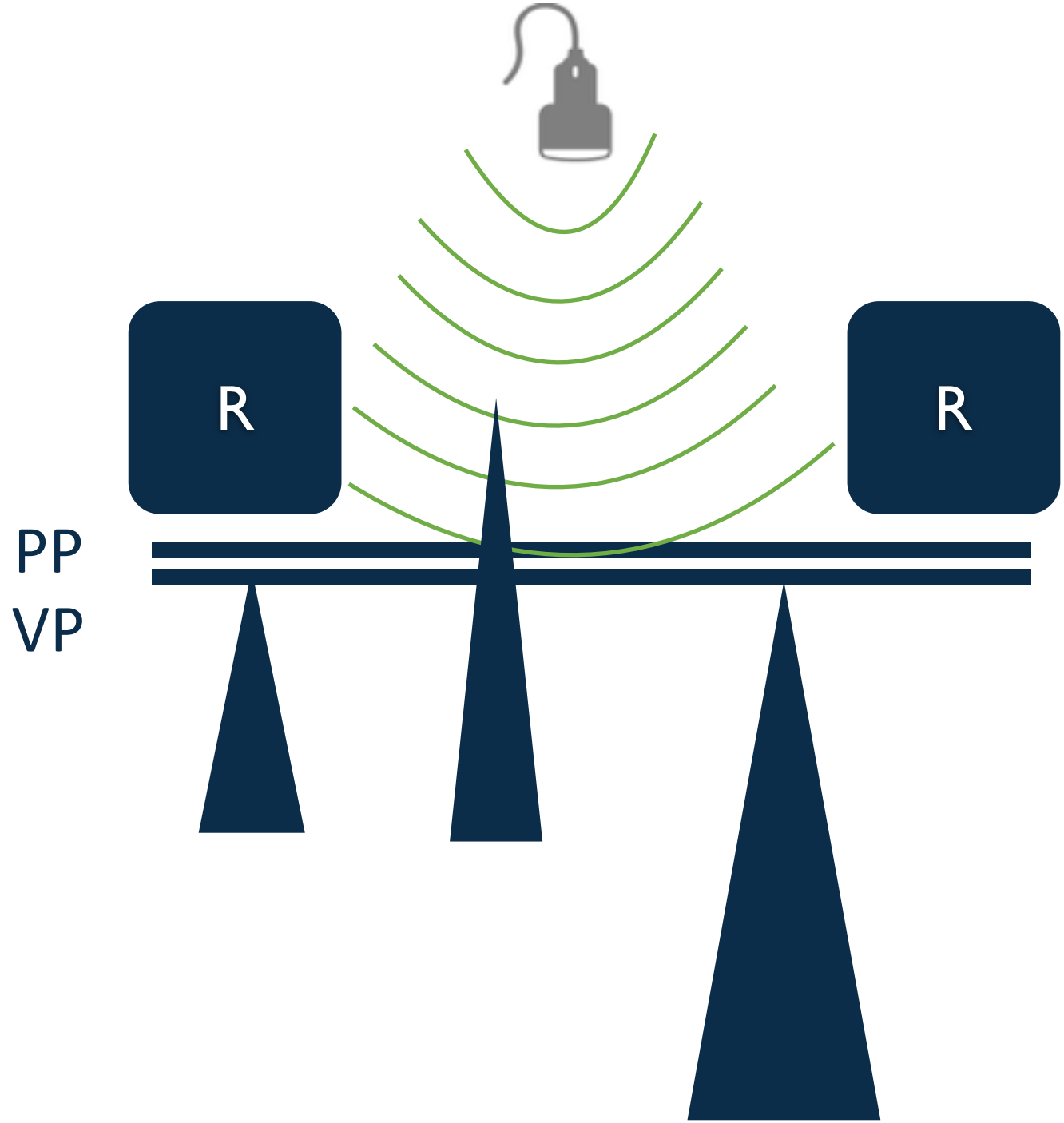
Lung pulse

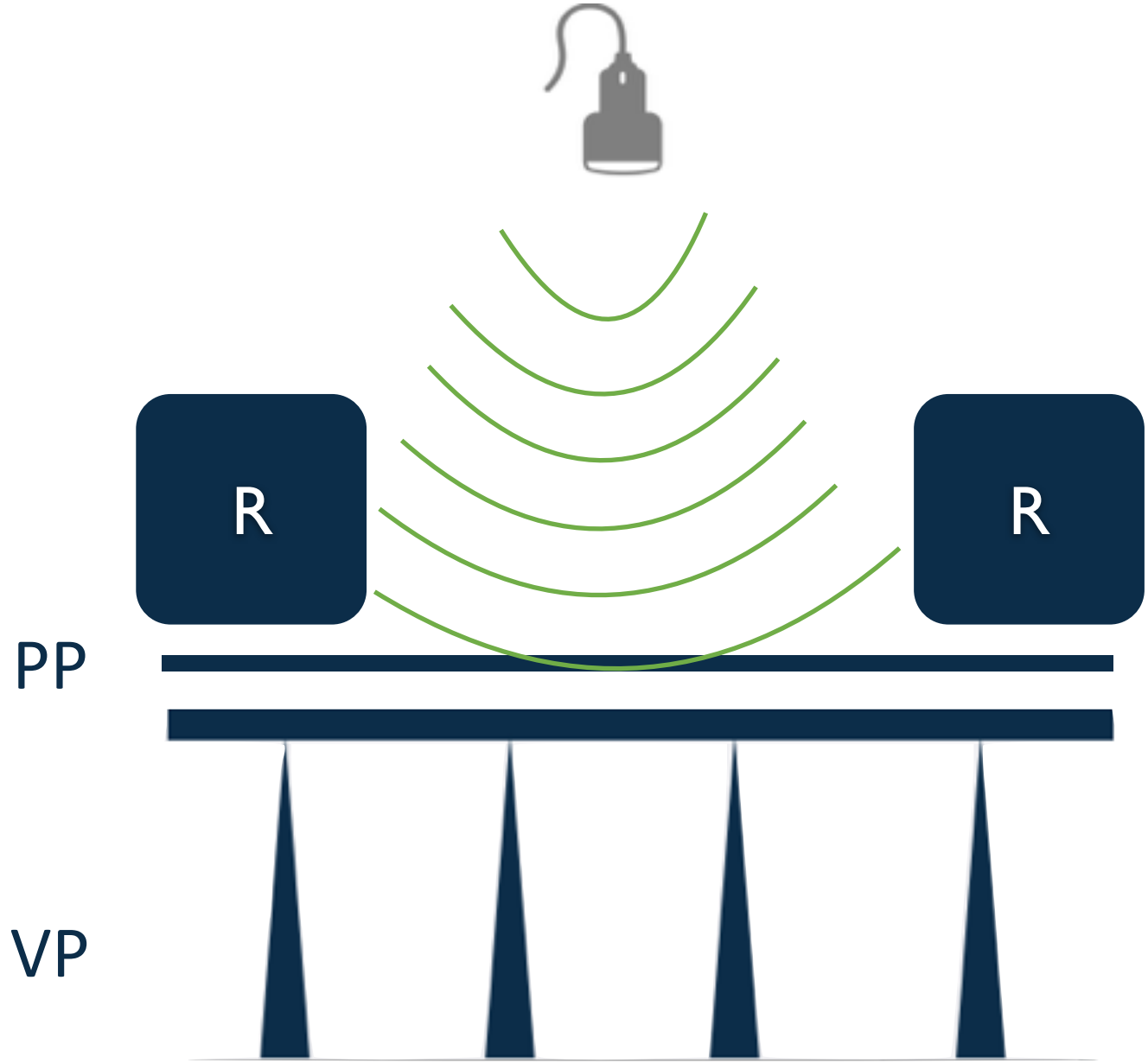



TOSHIBA
chest echo demo:demo:U
LIVER
2003/01/08
02:52:30PM
P100
6C3
4.2
MD50
0
5
MI
0.7
TIS
0.1
TIB
0.3
TIC
0.1
-3.5
-3
-2.5
-2
-1.5
-1
-0.5
0.0
Free 32

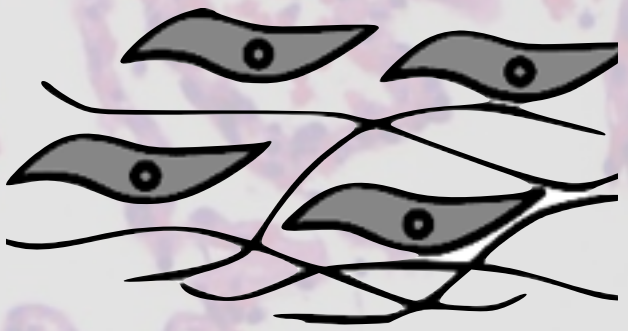
Lung ultrasound

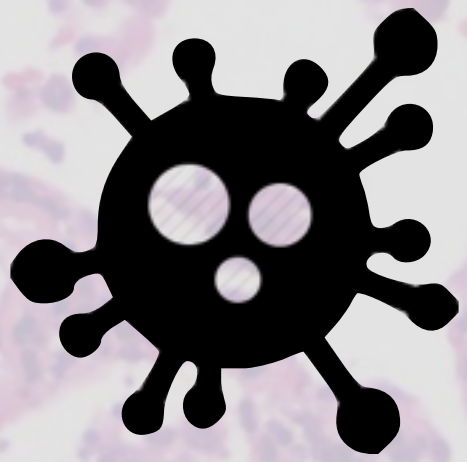
( ) Wedge vertical lines are always B line


R
R
PP
VP


R
R
PP
VP

B line
Interstitial syndrome





Normal lung

- Basal lung
- 25% of healthy people
- <3 per intercostal space

Image acquisition

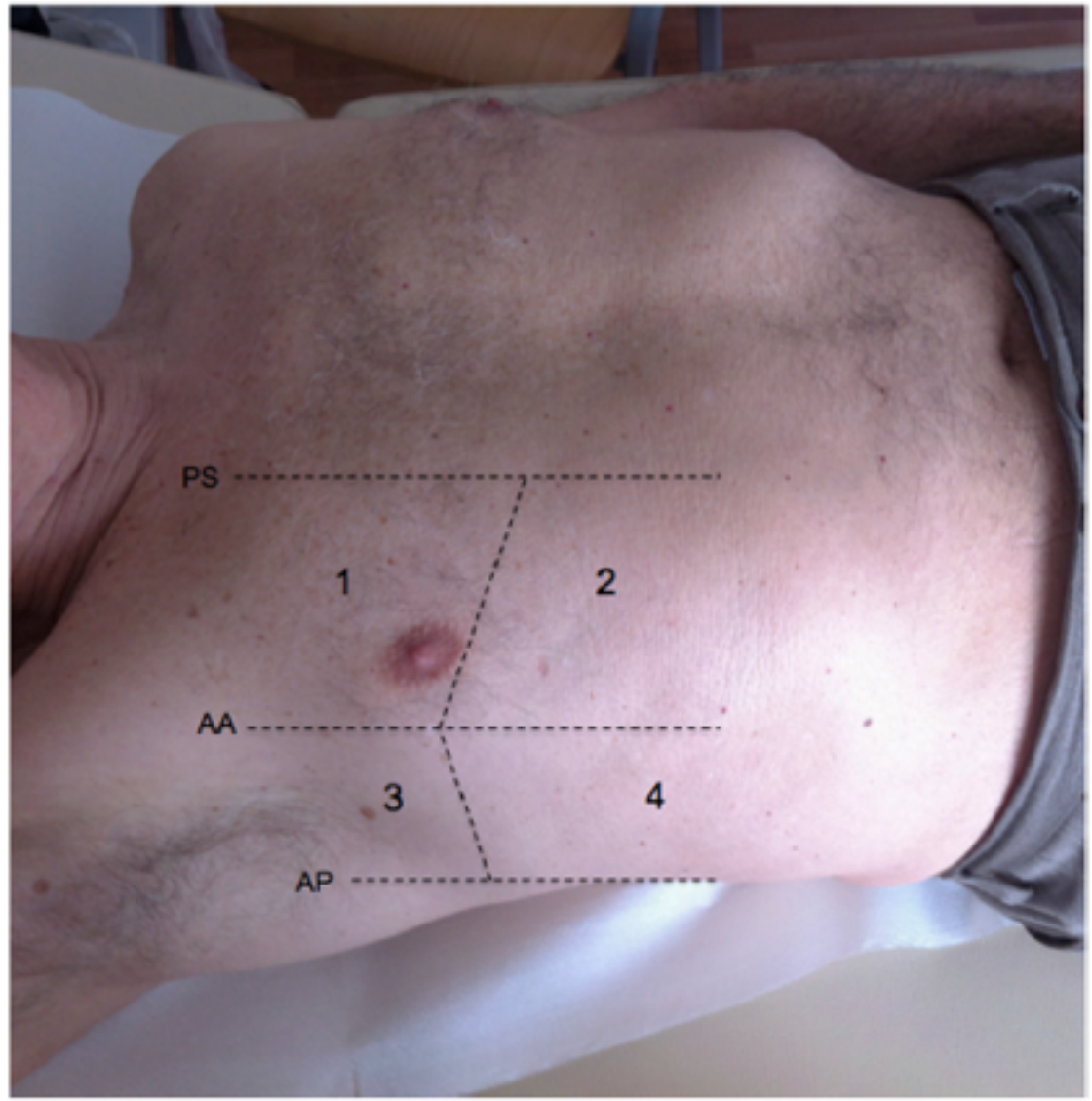


Figure 6 Eight-zone scanning scheme of the antero-lateral chest (according to Volpicelli G et al. See ref. [15]).

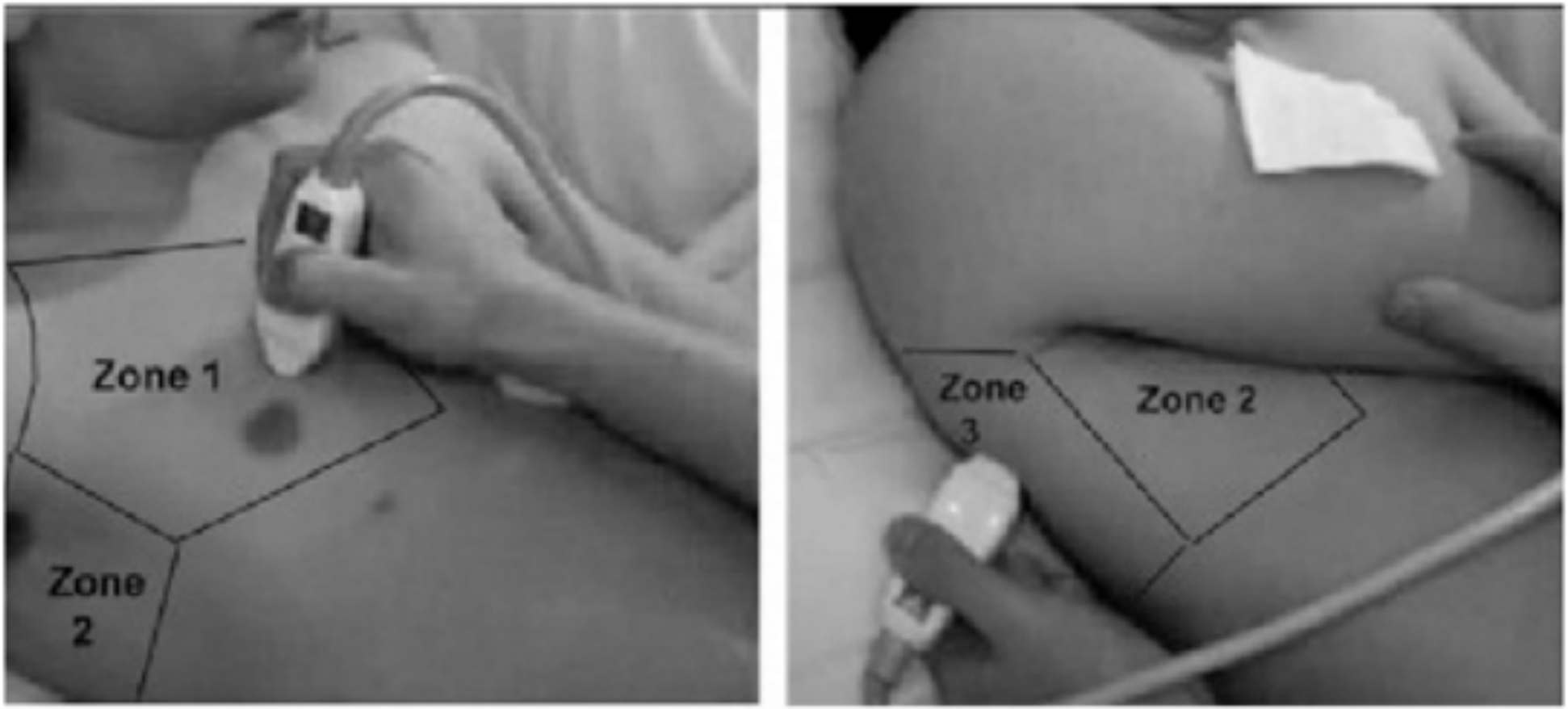
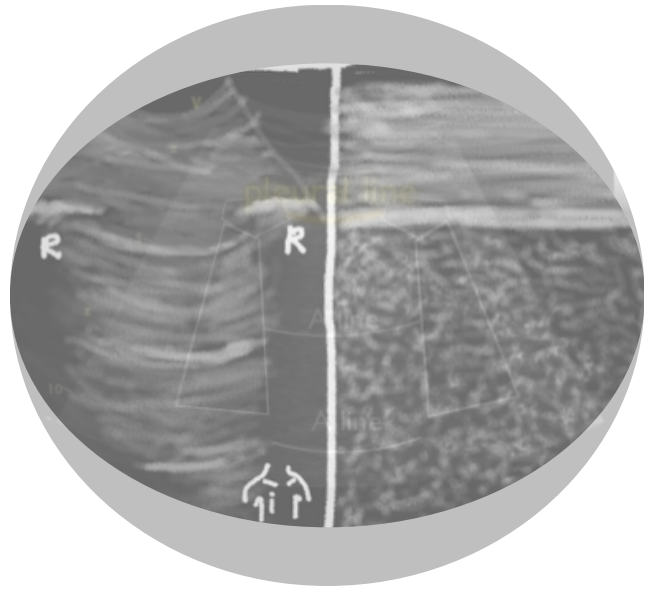
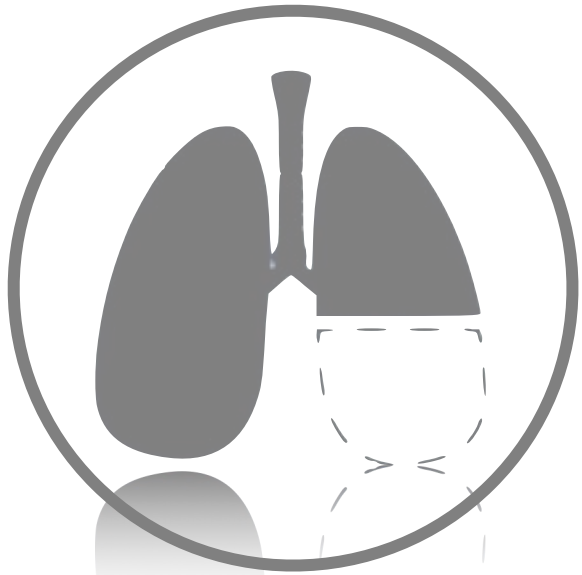


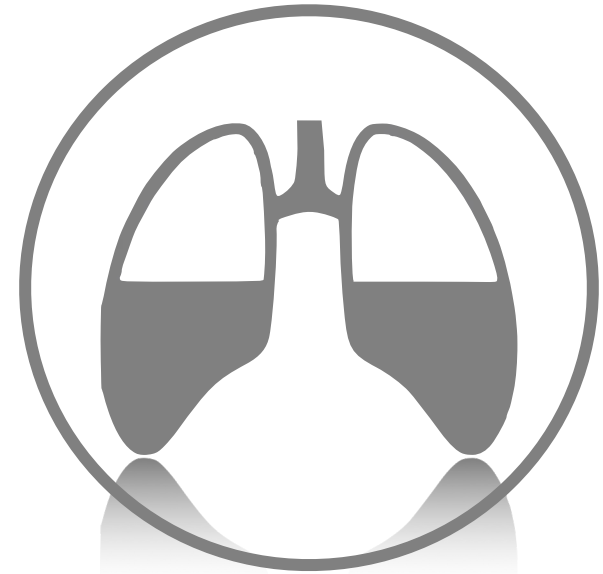
Figure A: Ultrasound of hemithorax, Lichtenstein et al.

Lung ultrasound



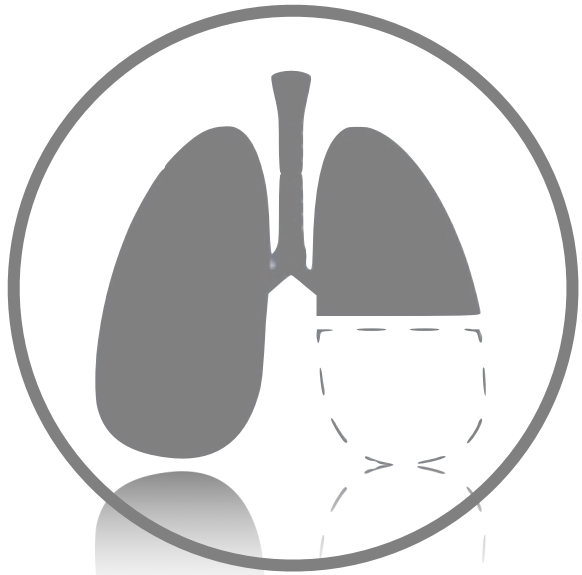


Pneumothorax



Pleural effusion

interstitial lung



Pneumothorax

Pleural effusion

Interstitial lung

Pneumothorax

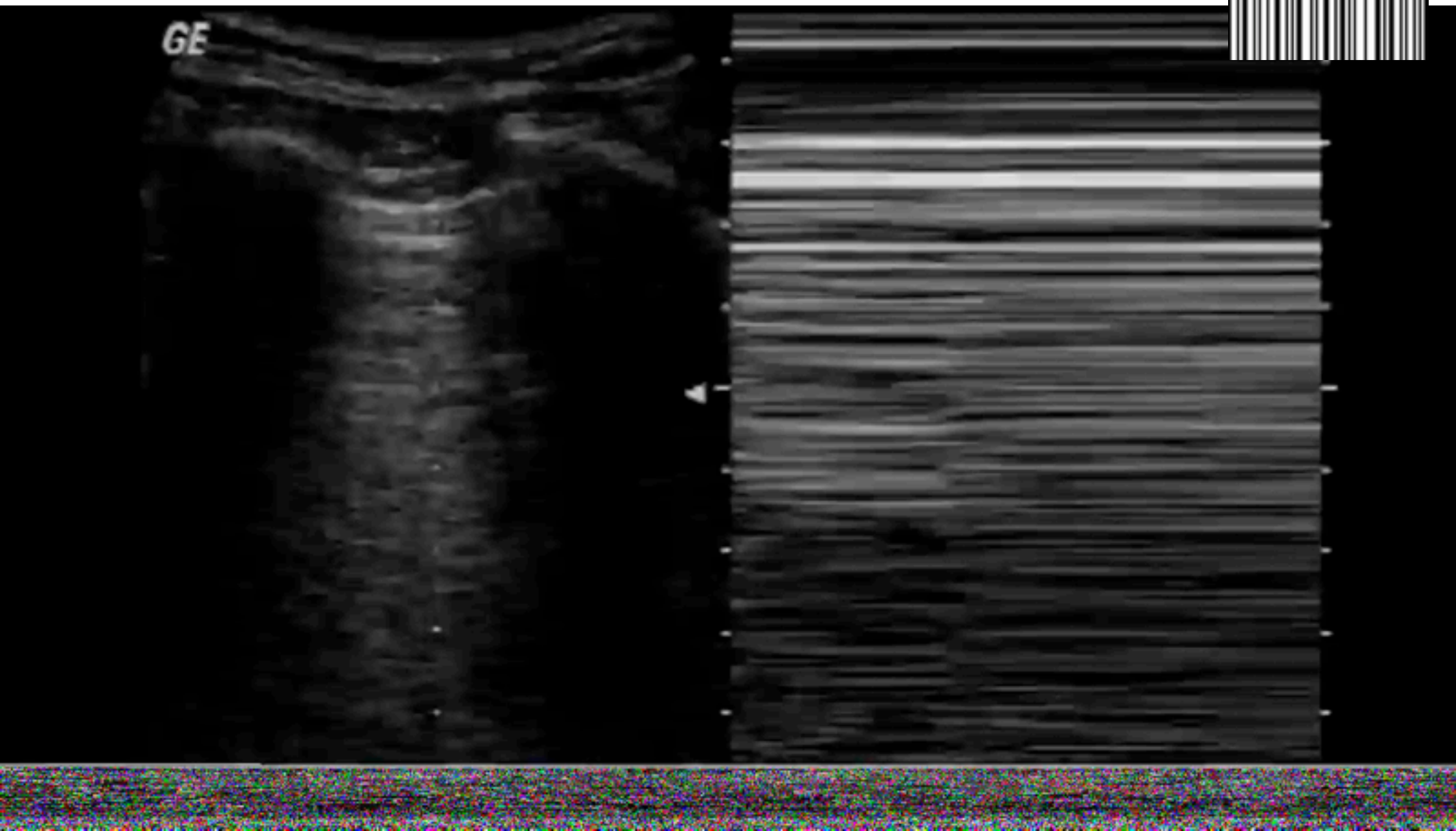
Signs indicate pneumothorax

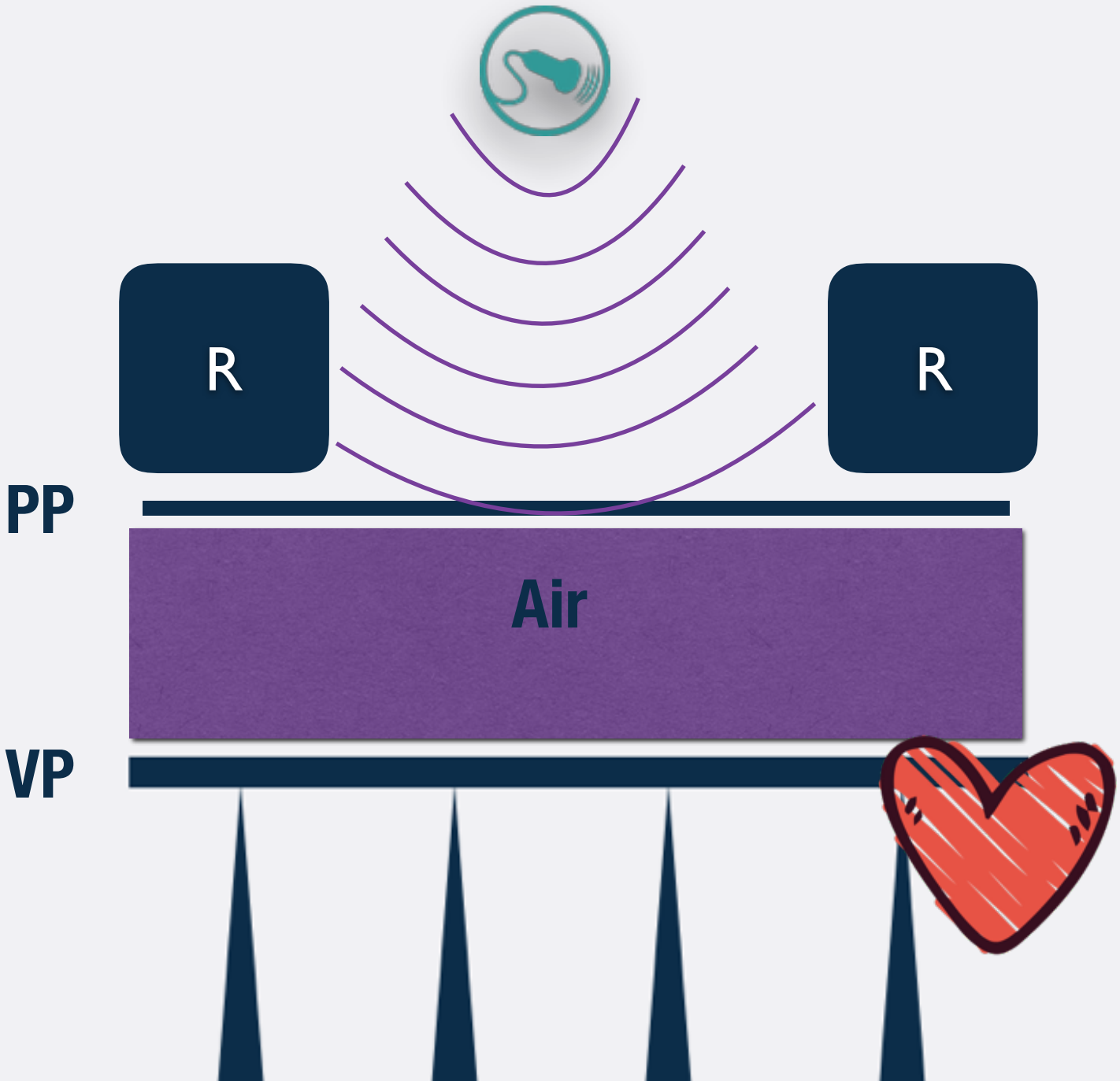
- Barcode sign in Non arrest patient
- Lung point

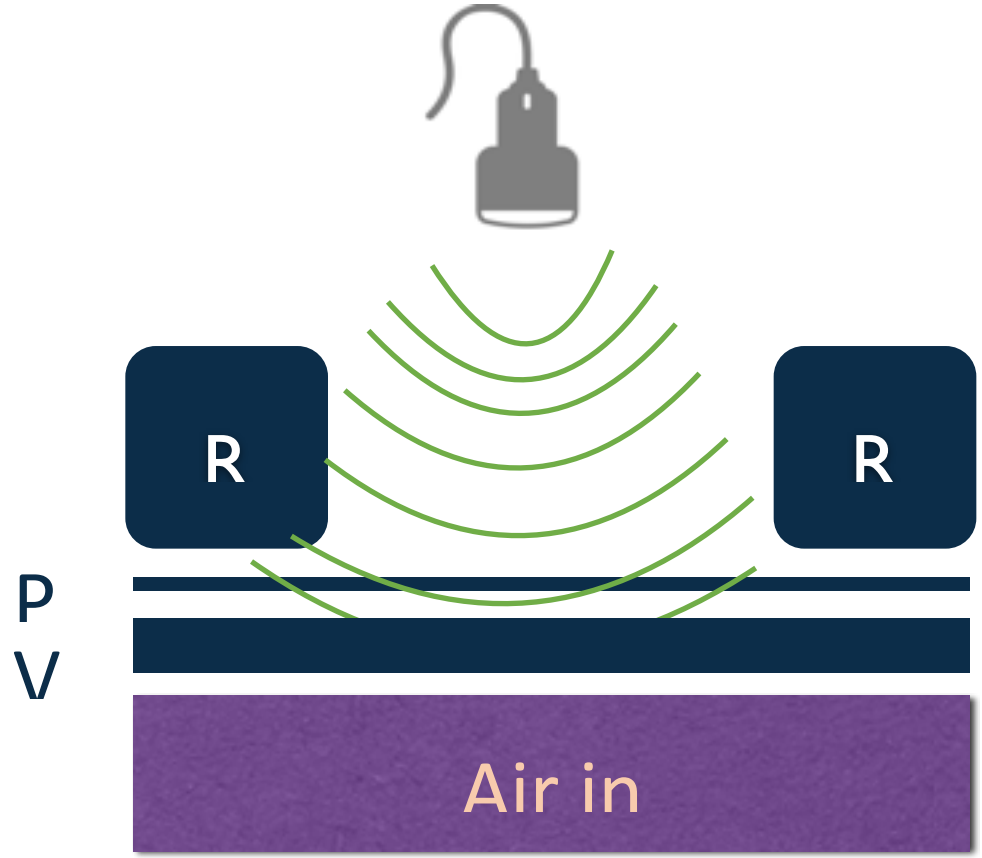
Signs exclude pneumothorax

- Lung sliding sign
- B-line, Comet tail sign
- Lung Pulse

Barcode sign

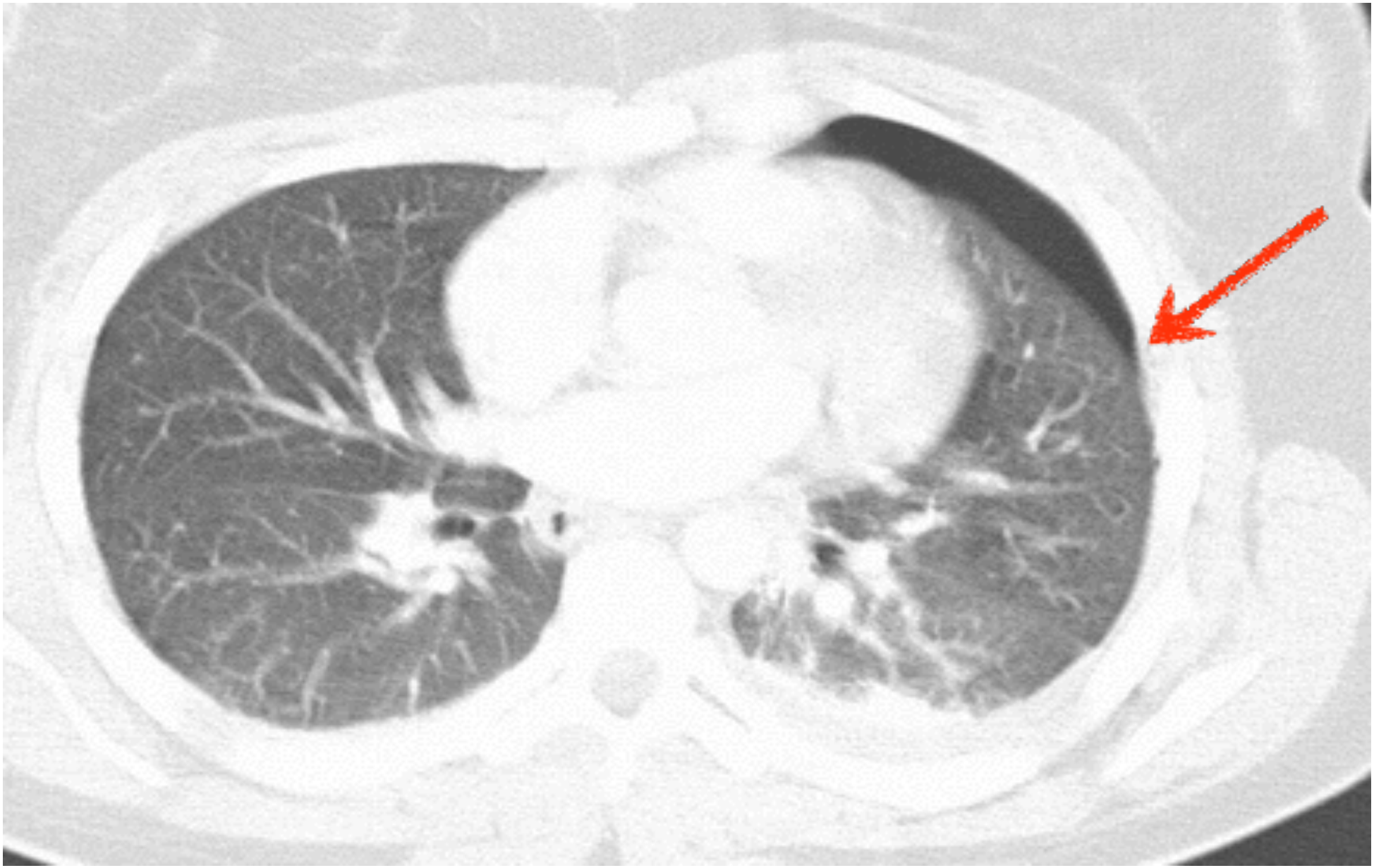


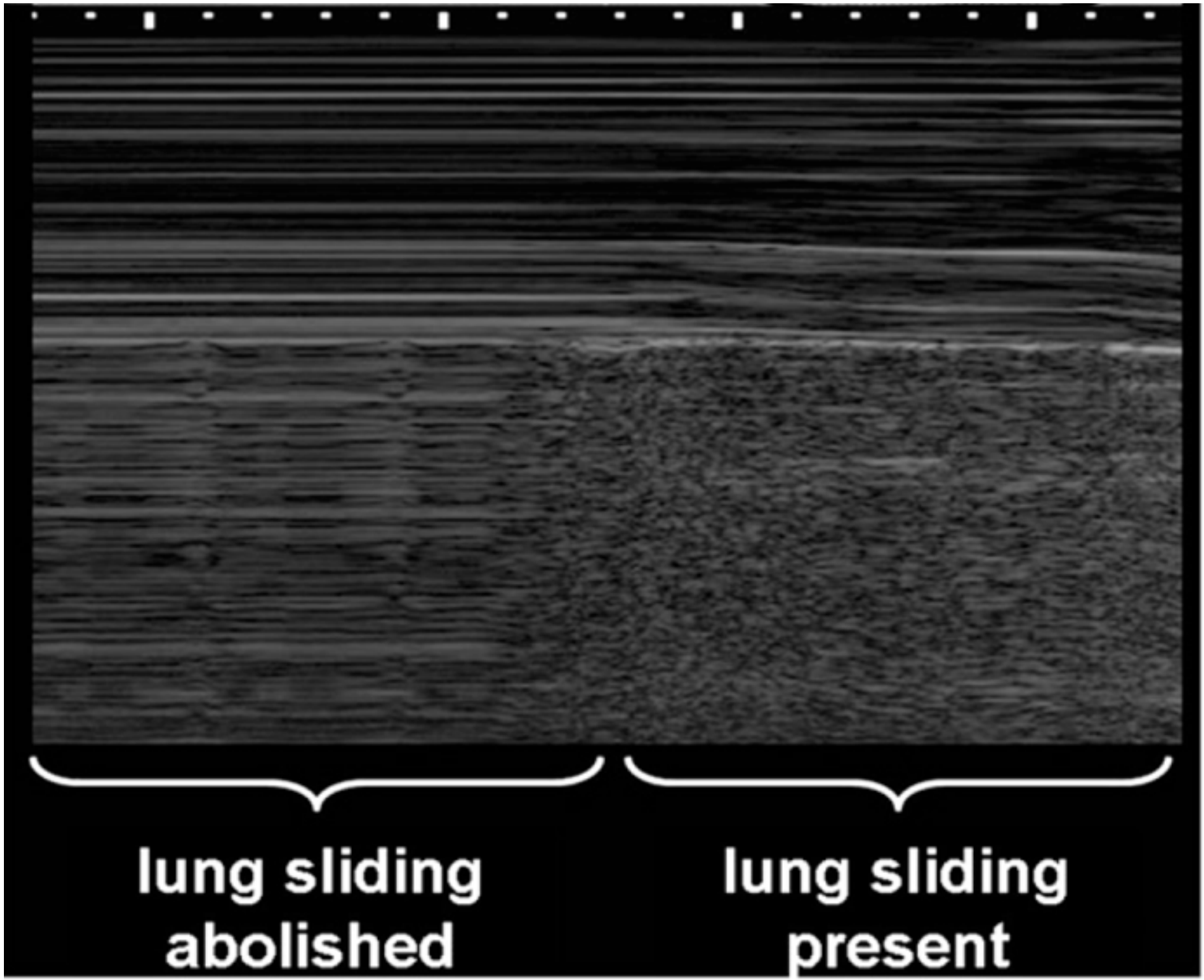

R
R
PP
Air
VP



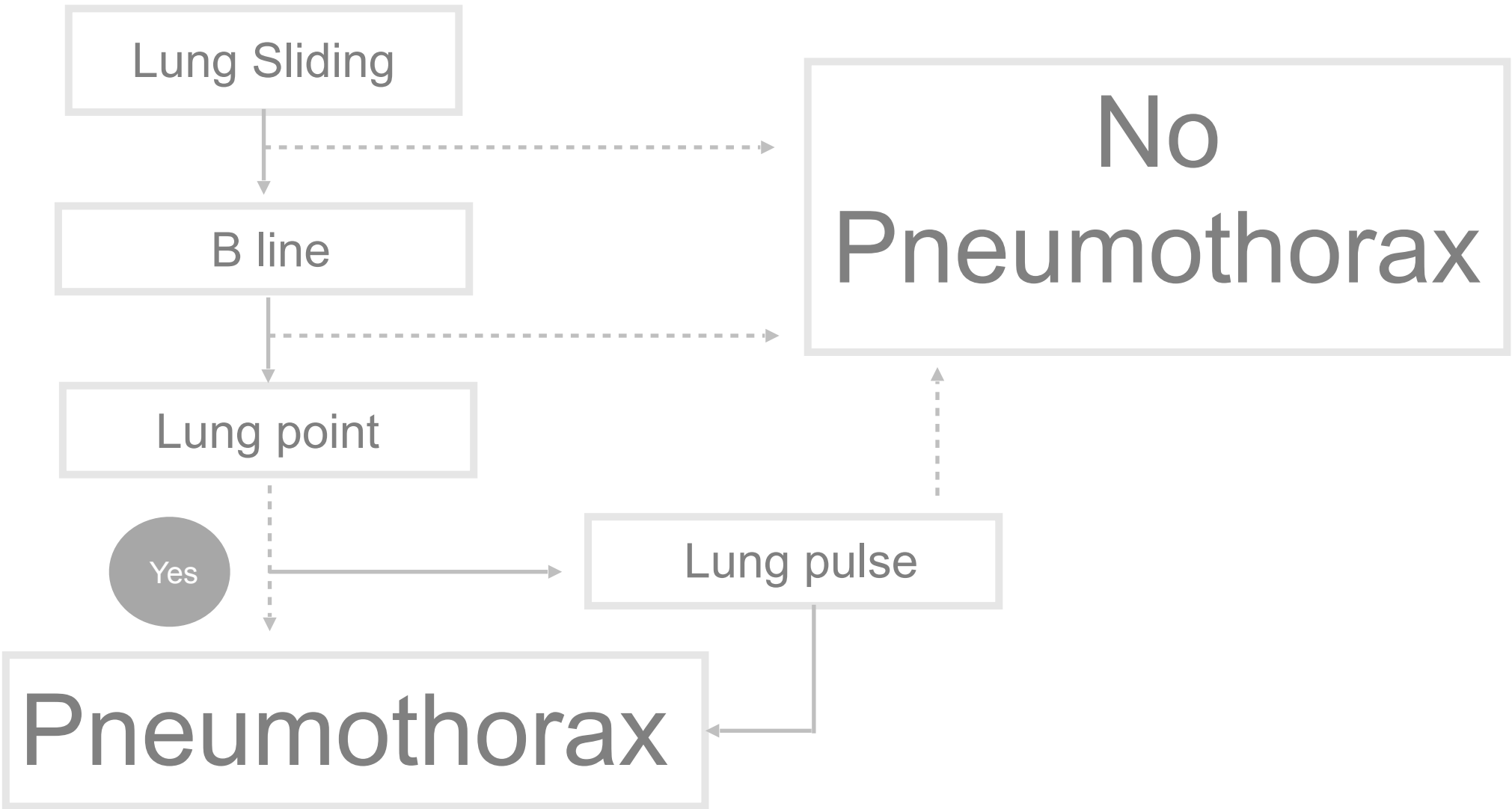
Adhesion

Lung point




lung sliding
abolished
lung sliding
present

Pneumothorax



Diagnosis of pneumothorax

or

CHEST

Original Research

PULMONARY PROCEDURES

Diagnosis of Pneumothorax by Radiography and Ultrasonography

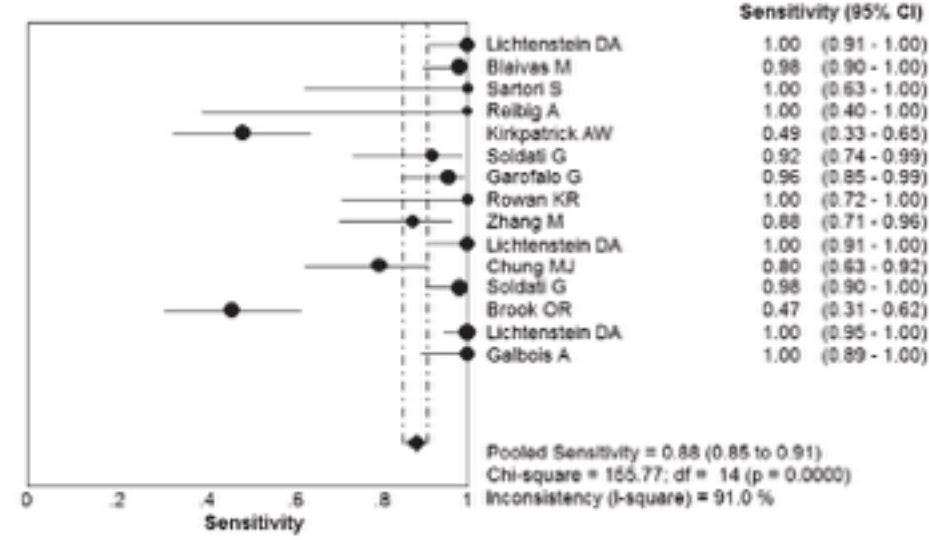
A Meta-analysis

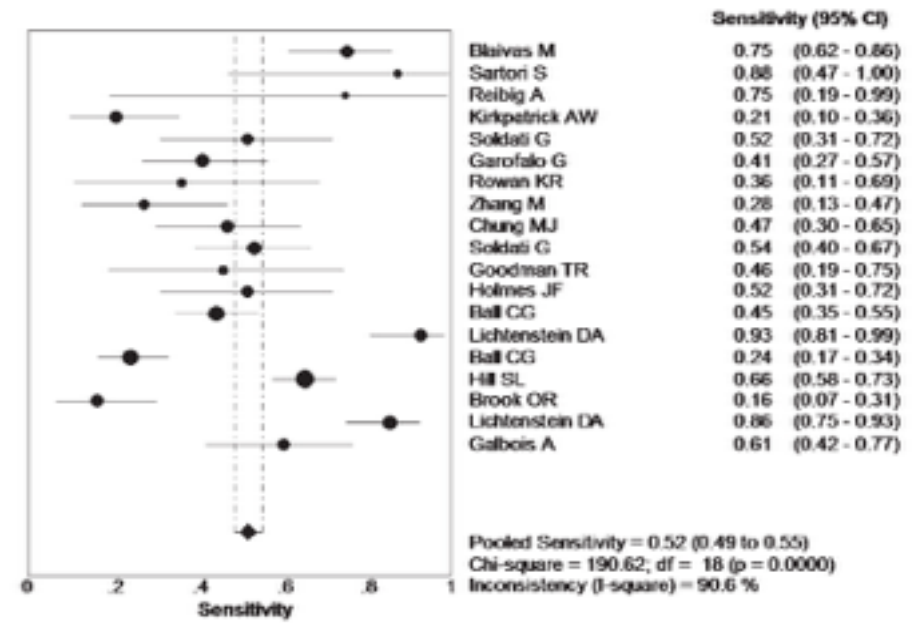
Wu Ding, MM; Yuehong Shen, MM; Jianxin Yang, MM; Xiaojun He, MM; and Mao Zhang, MD

- Original articles published in English up to October 2010
- 20 Original articles were found
- Diagnostic performance of Chest ultrasound vs A-P View for Pneumothorax.

Specificity

Sensitivity





Specificity

0.99

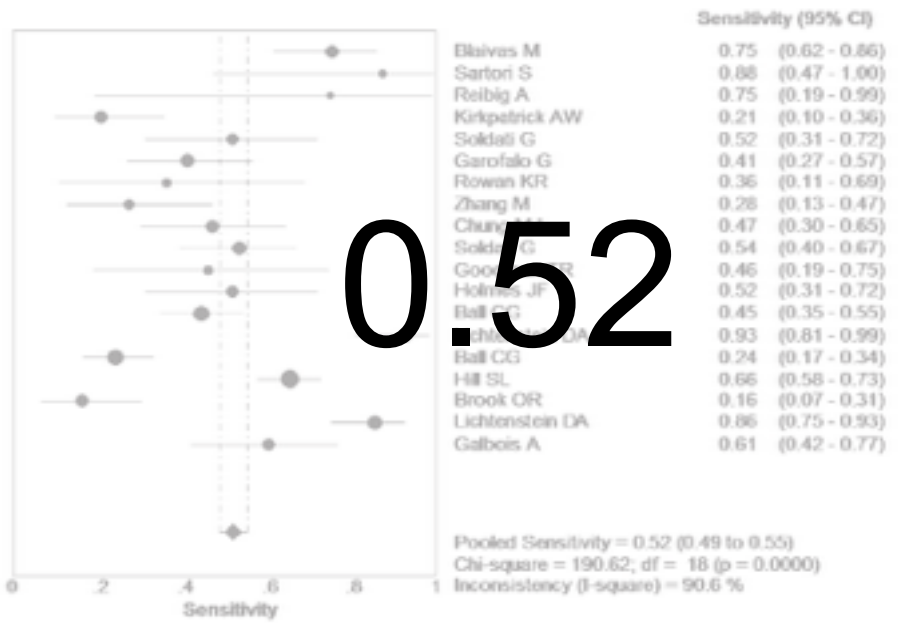
Sensitivity

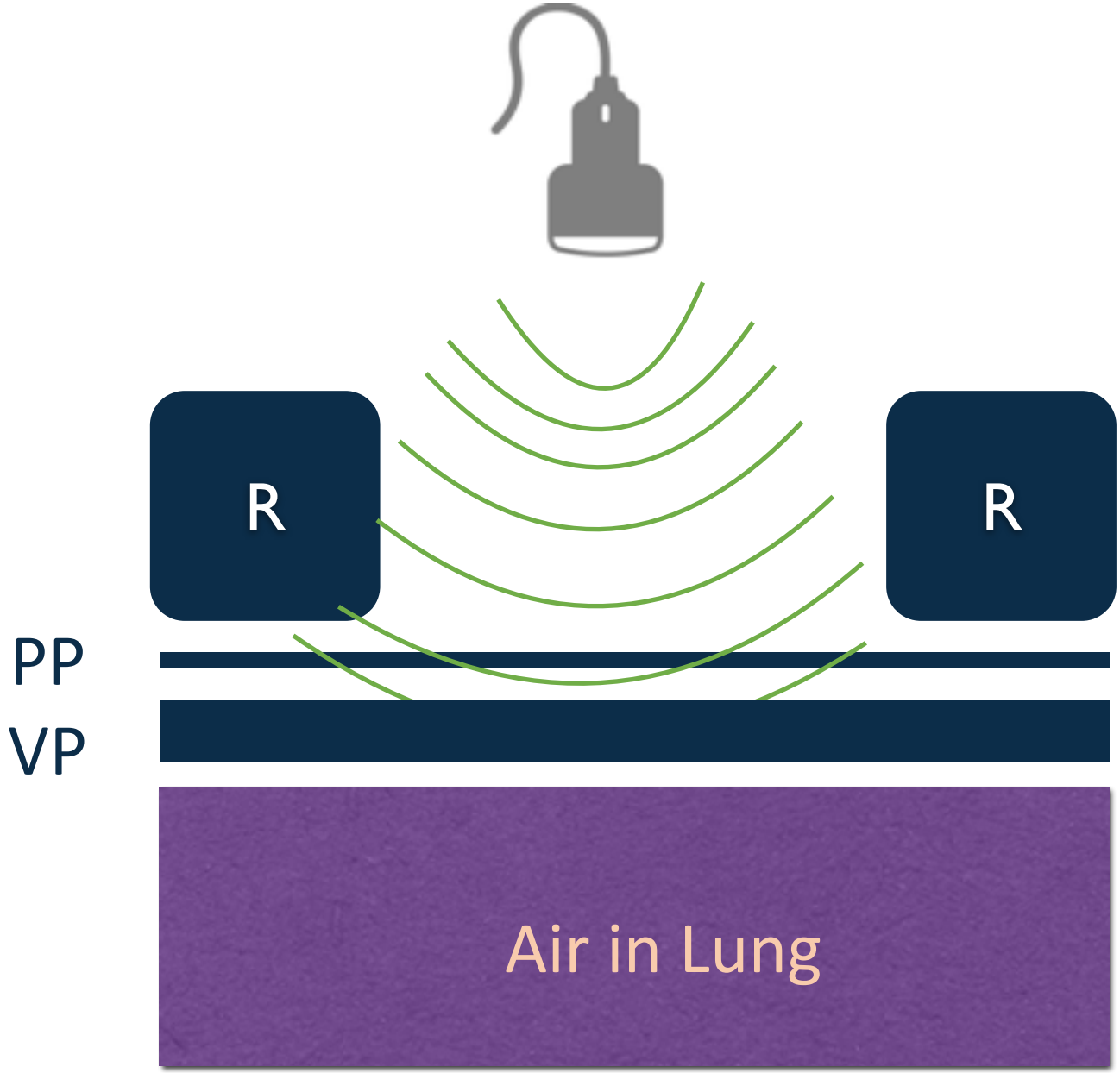
0.88

=

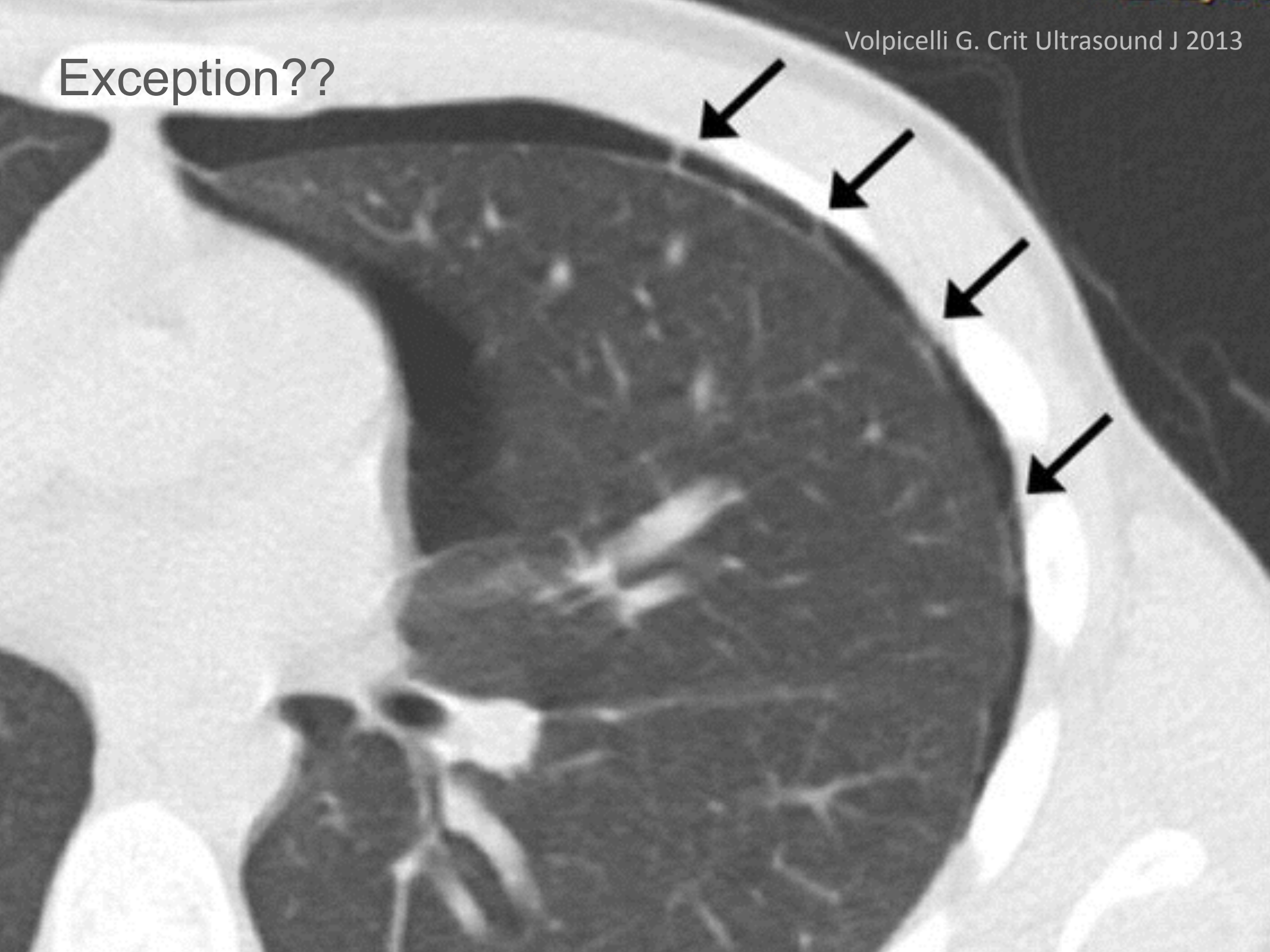
1.00

0.52




R
R
PP
VP
Air in Lung

Exception??



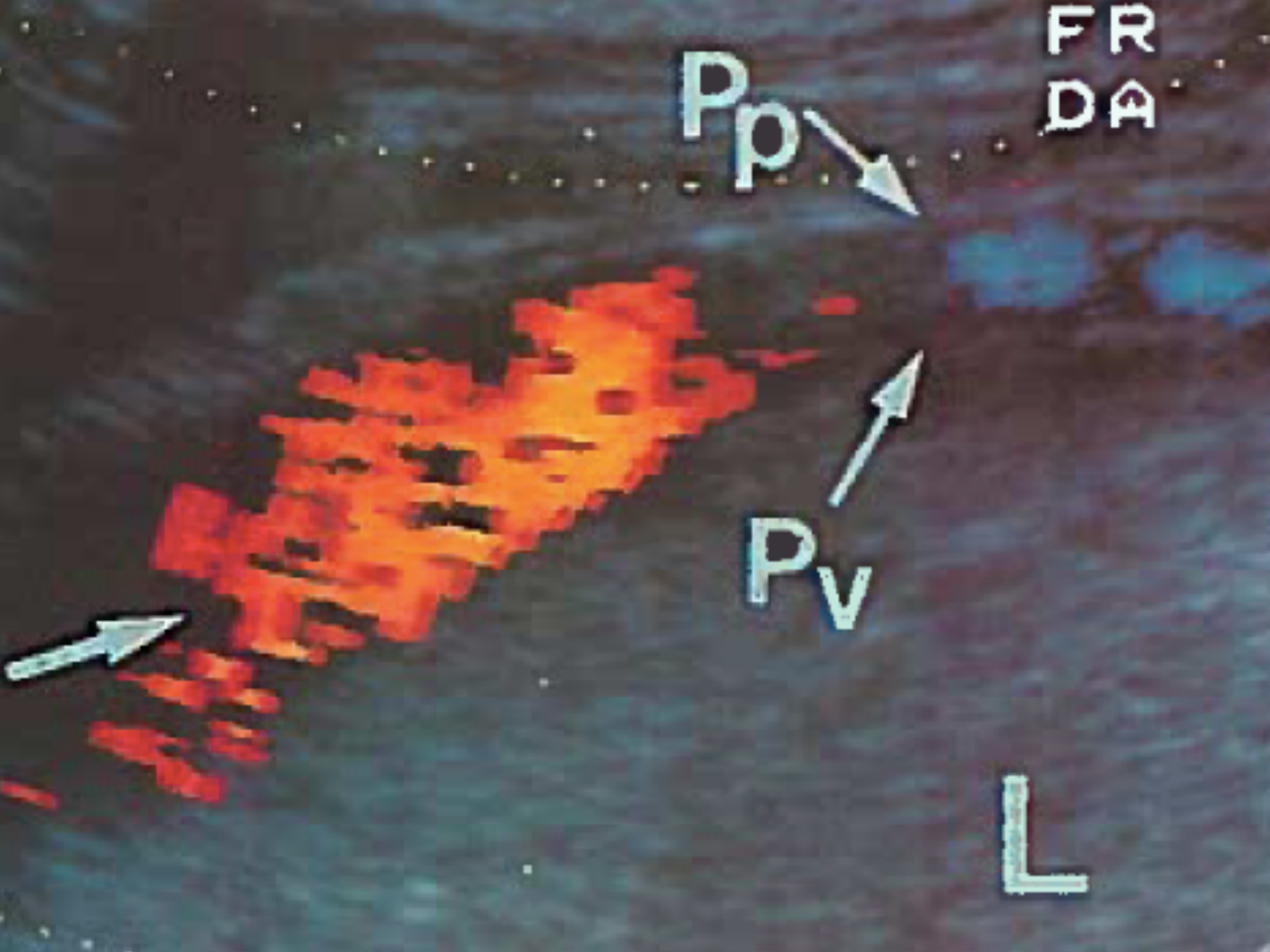
Volpicelli G. Crit Ultrasound J 2013

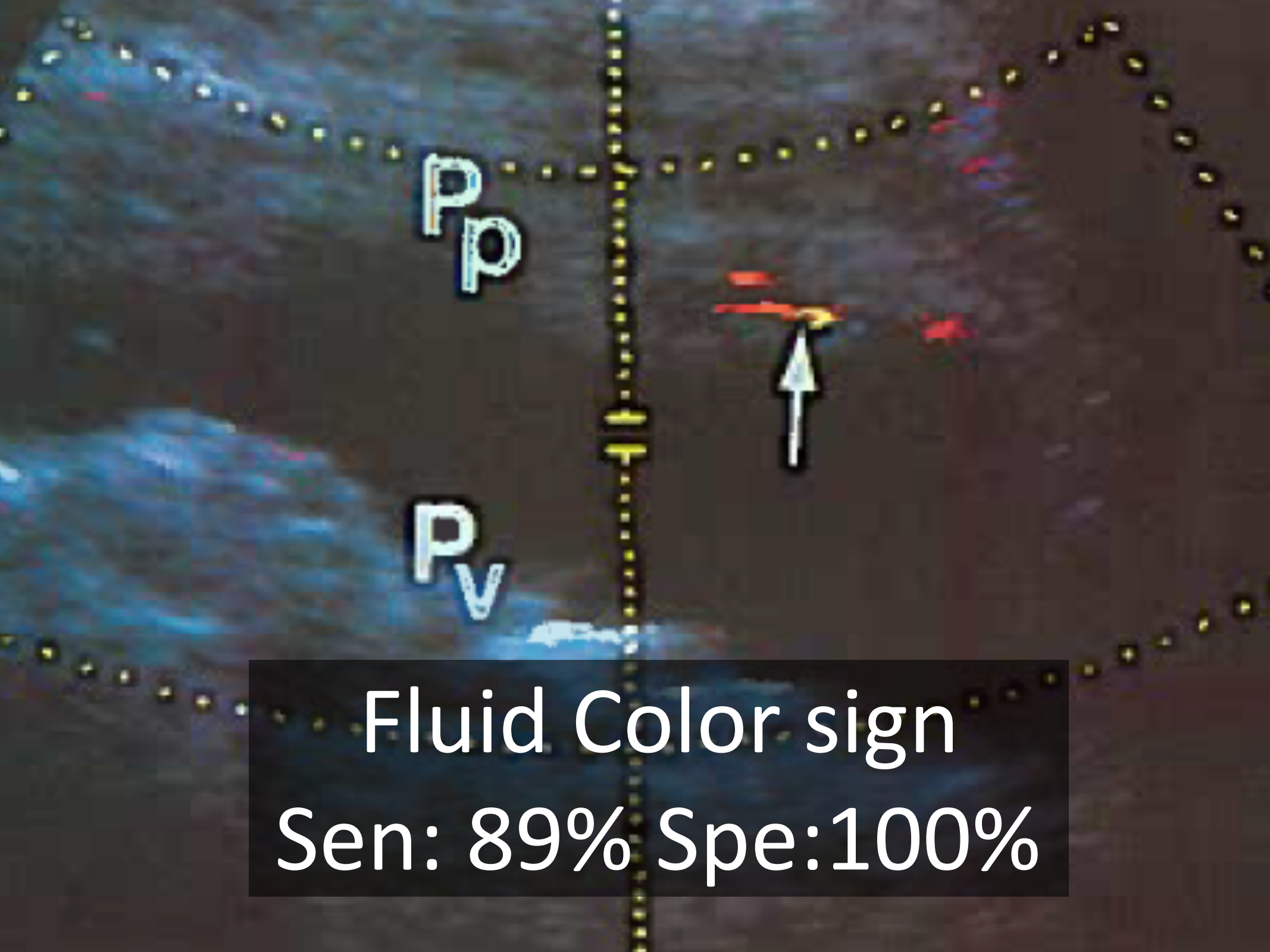
Pneumothorax

Pleural effusion

Pulmonary edema

Pneumonia

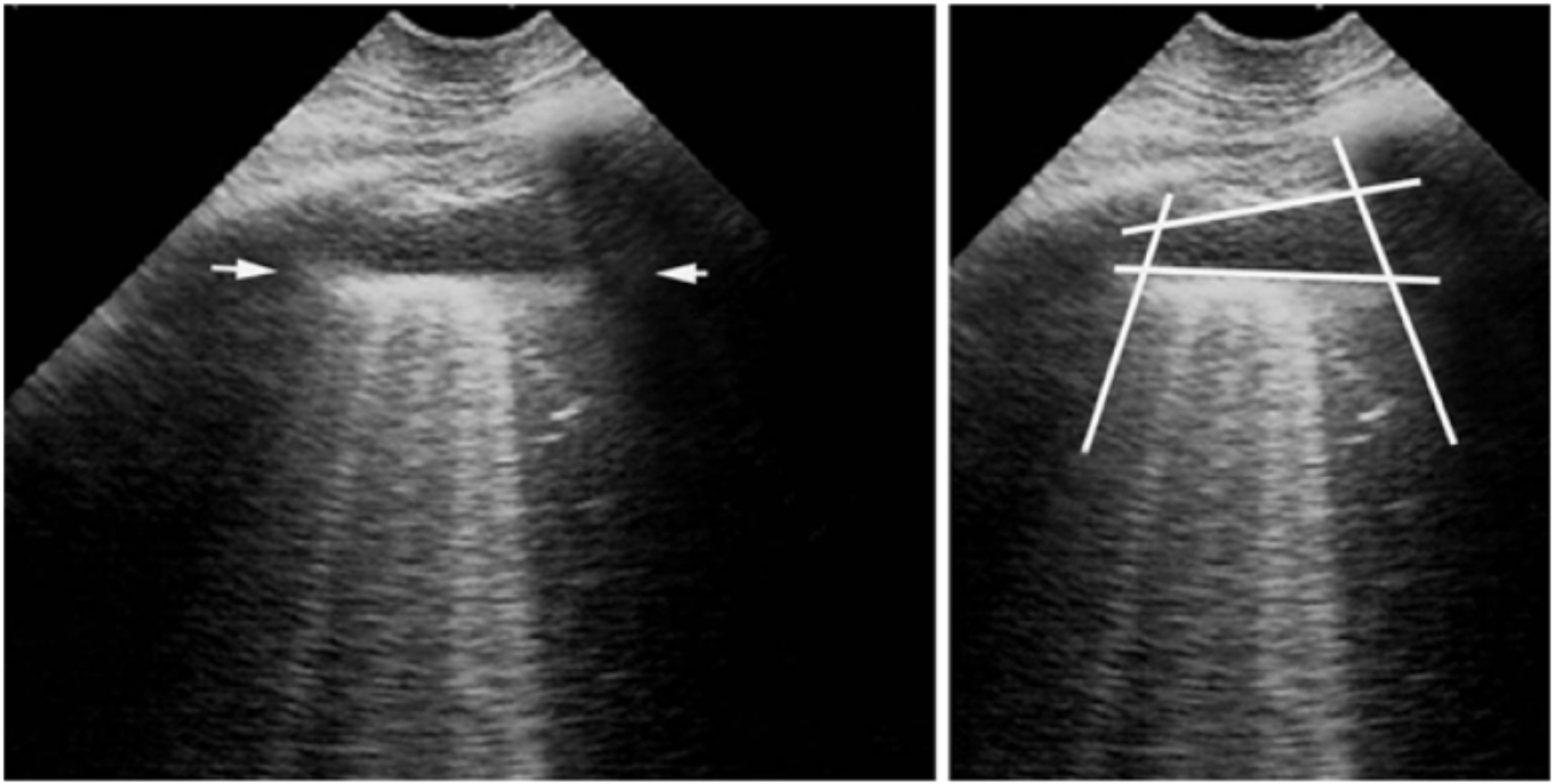

FR
DA
Pp
Pv
L



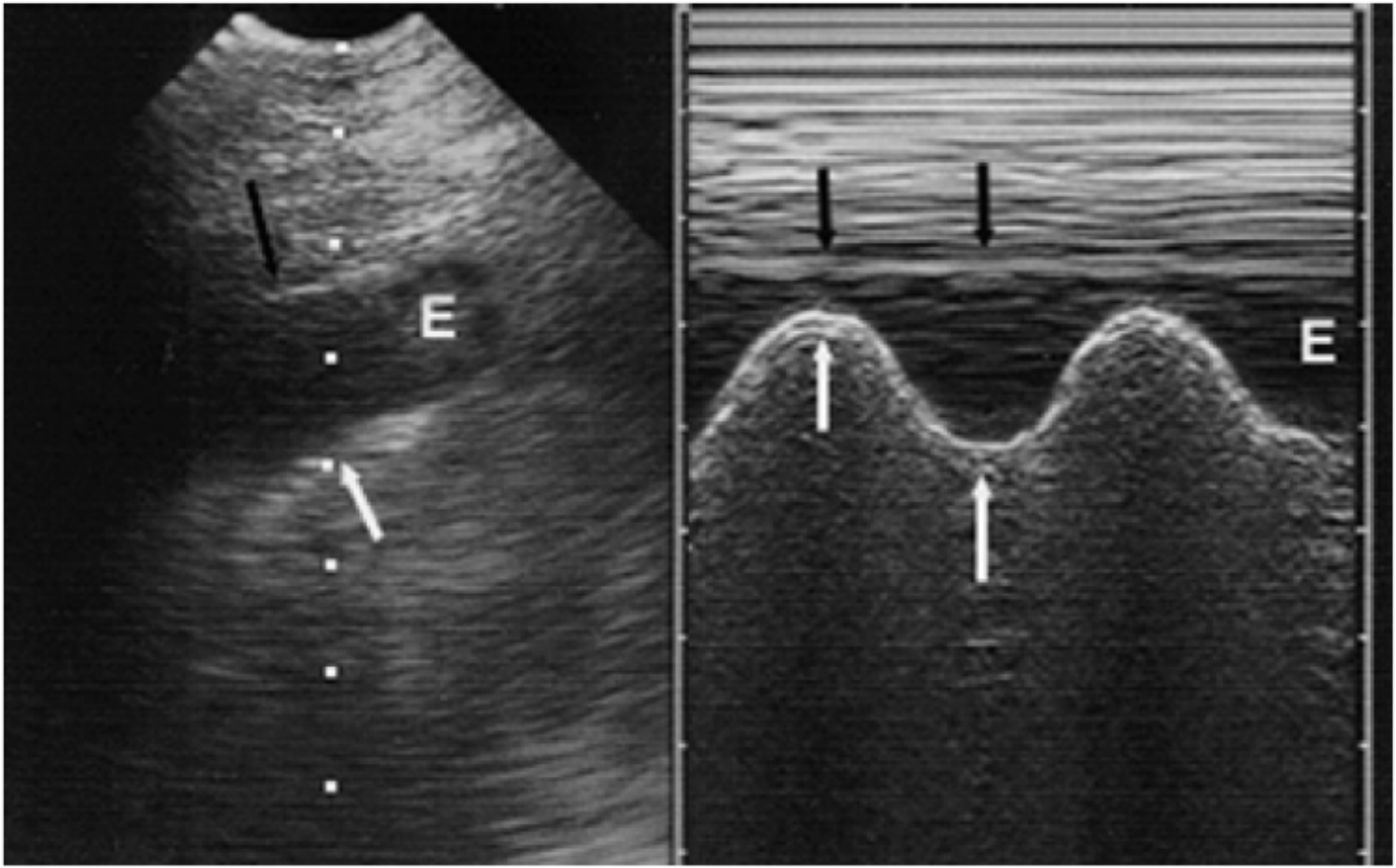
Fluid Color sign

Sen: 89% Spe:100%

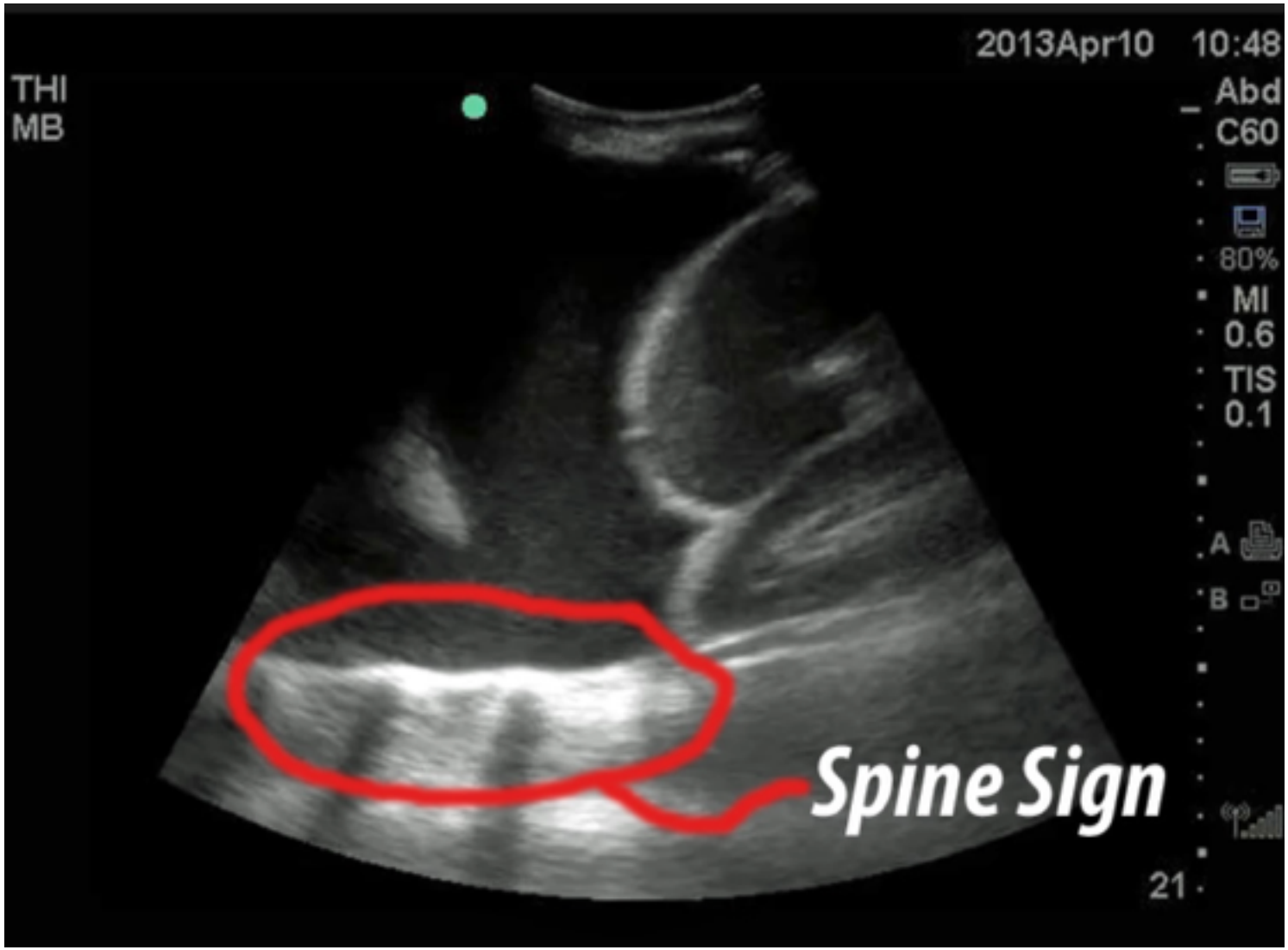
Quard sign



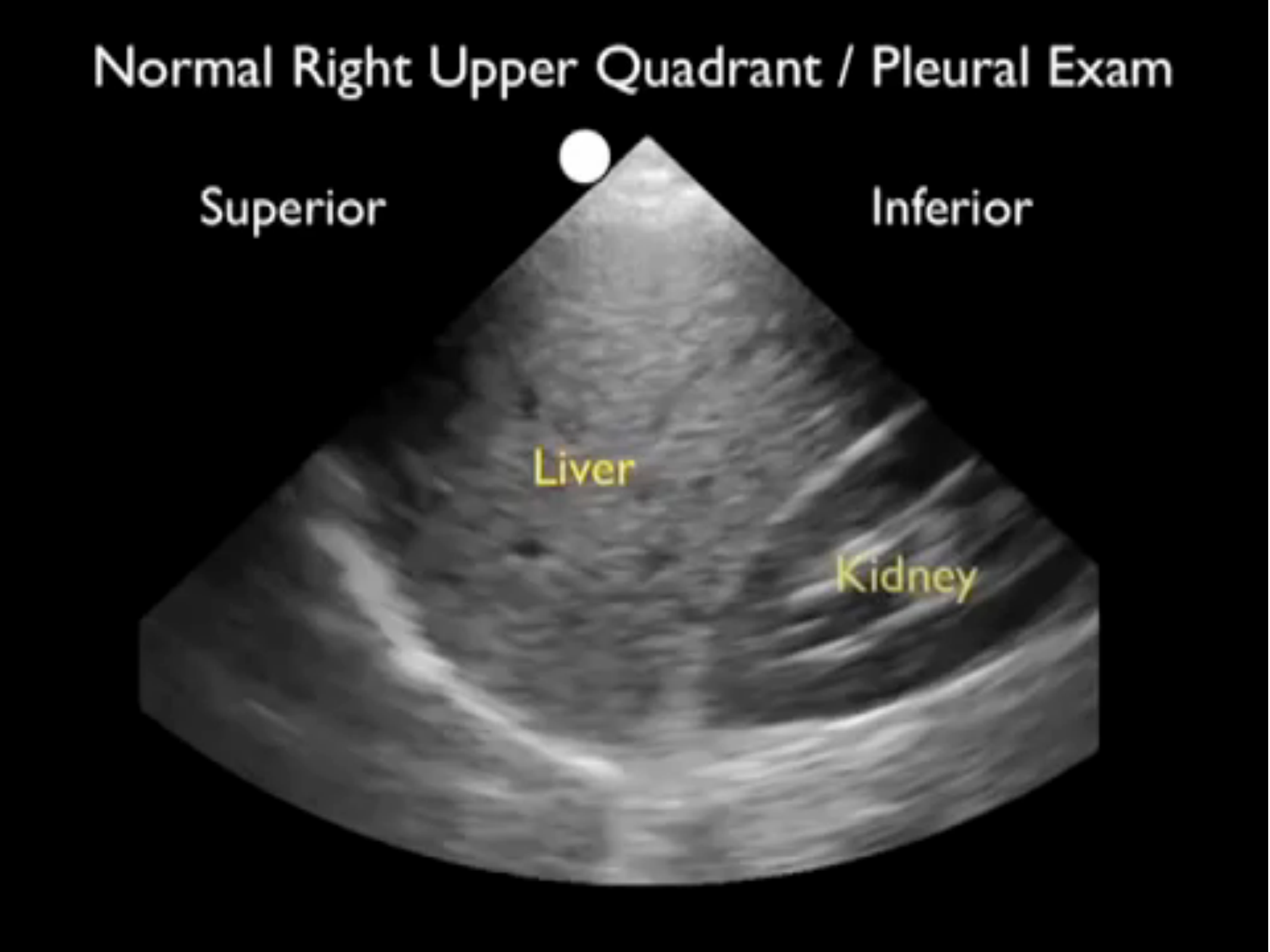
Sinusoid sign



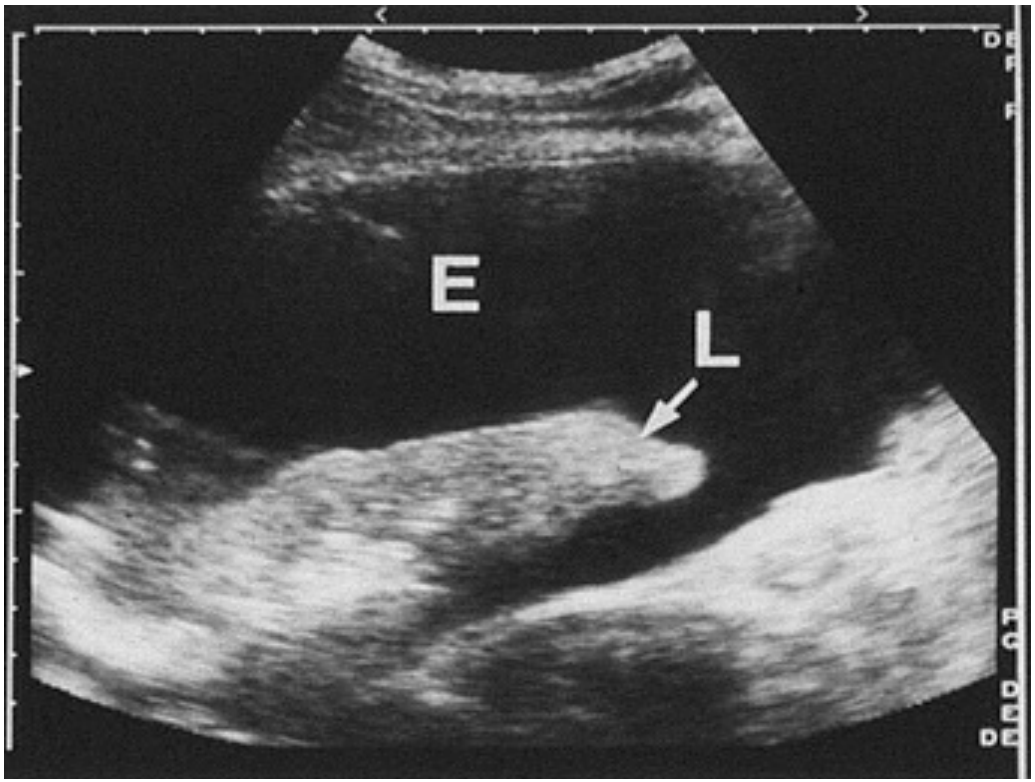
Continuous spine sign



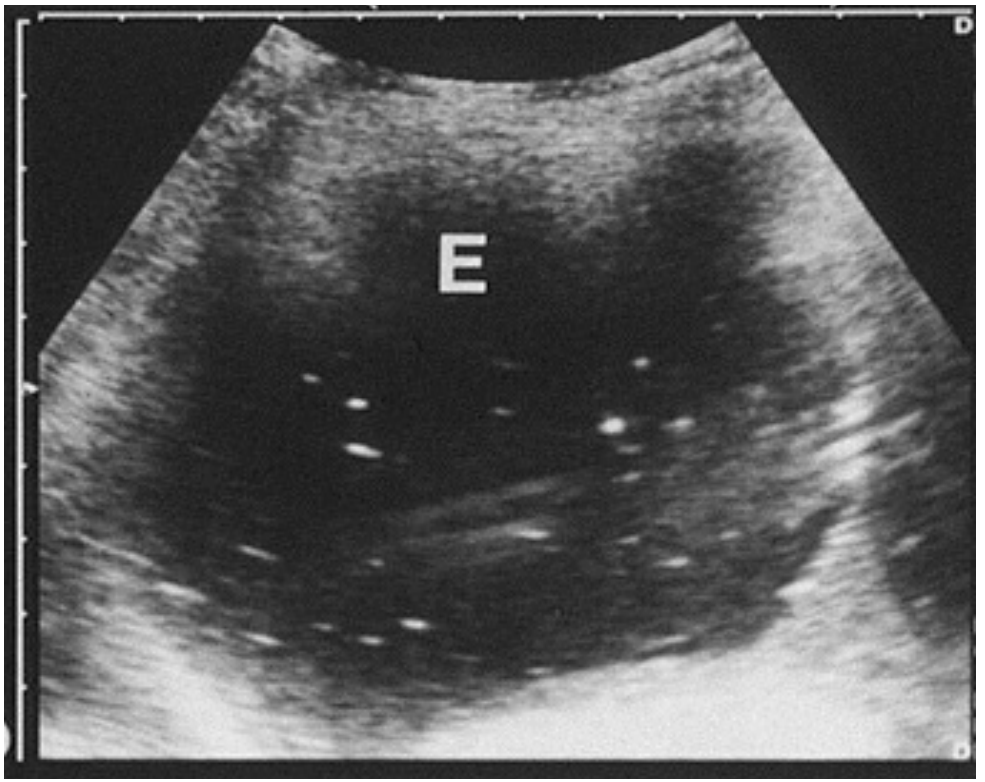
Normal Right Upper Quadrant / Pleural Exam



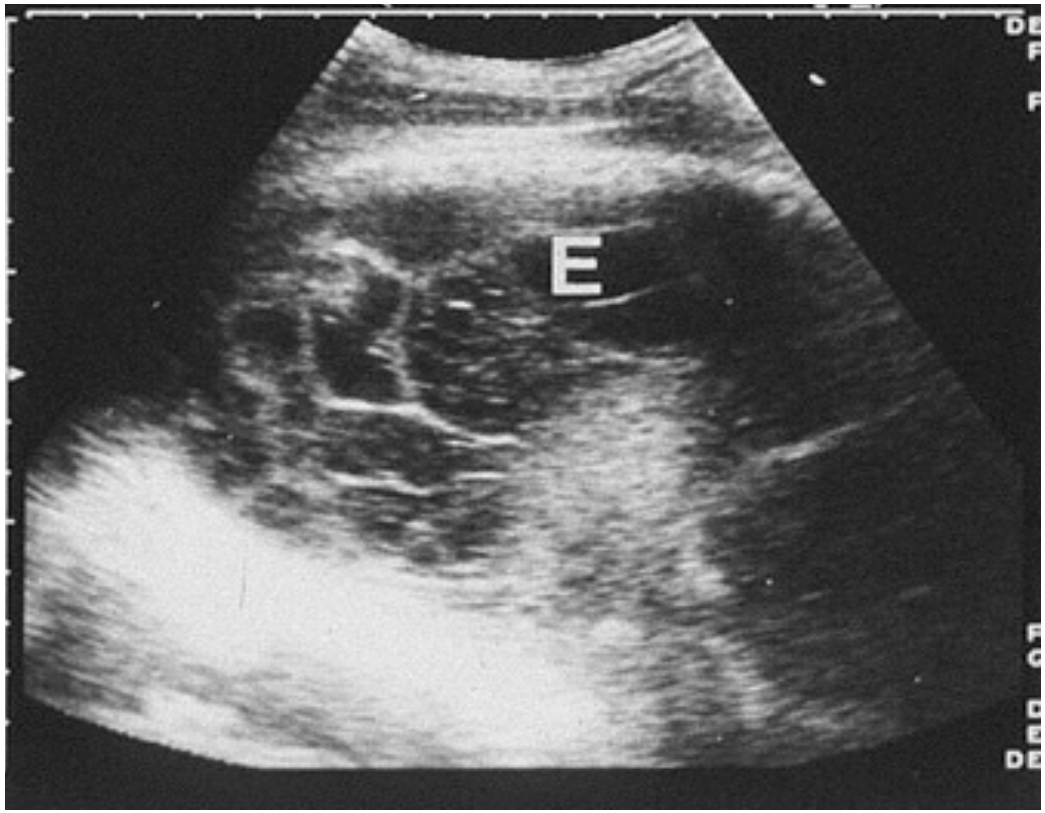
Echo picture of pleural effusion

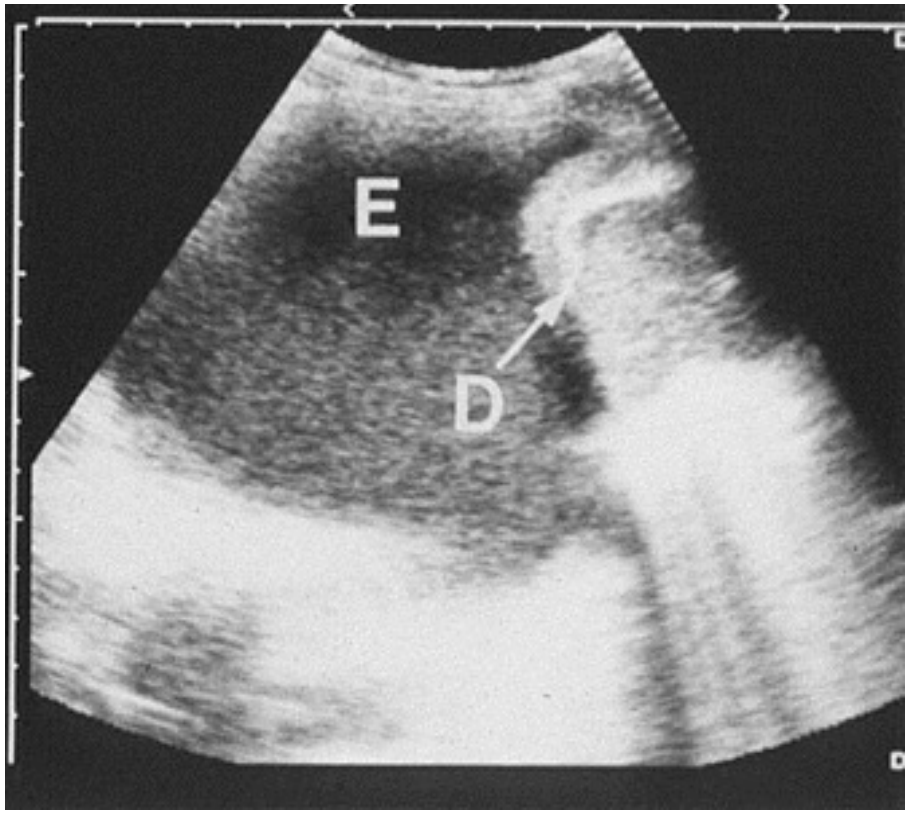


- Anechoic



- Complex but non-septated





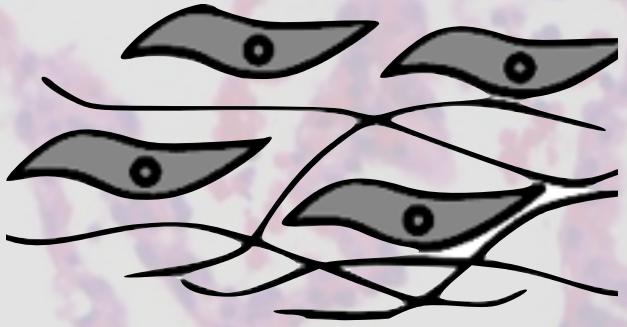
- Complex and septated

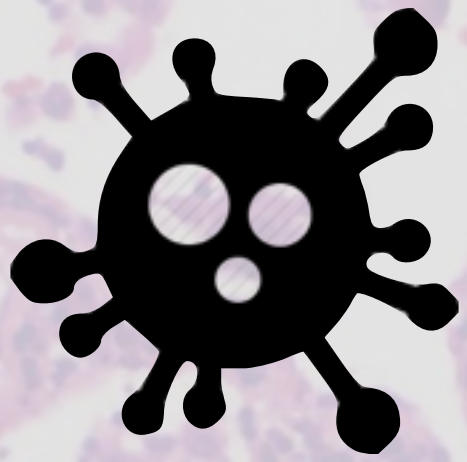
- echogenic

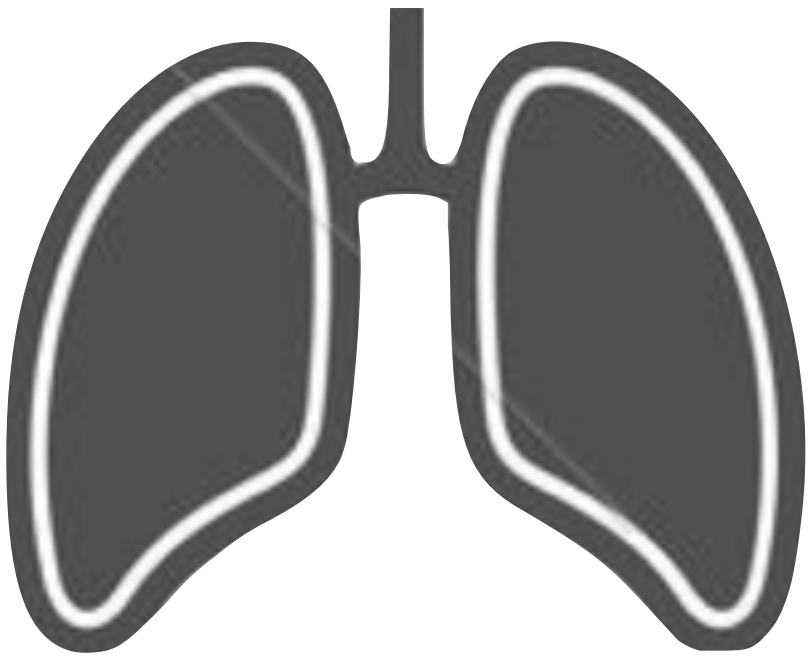
Pneumothorax

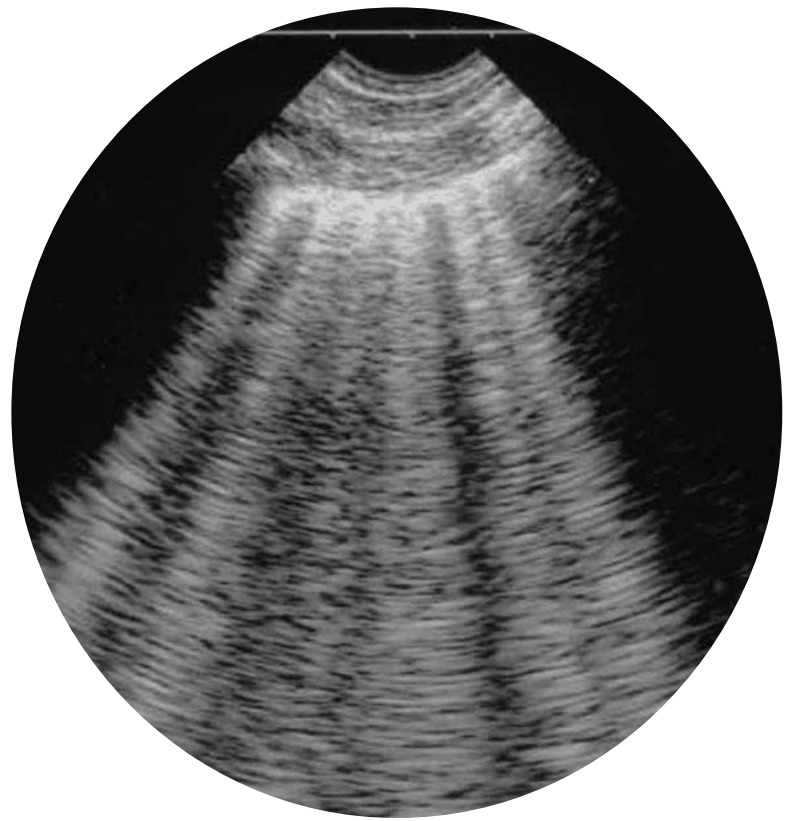
Pleural effusion

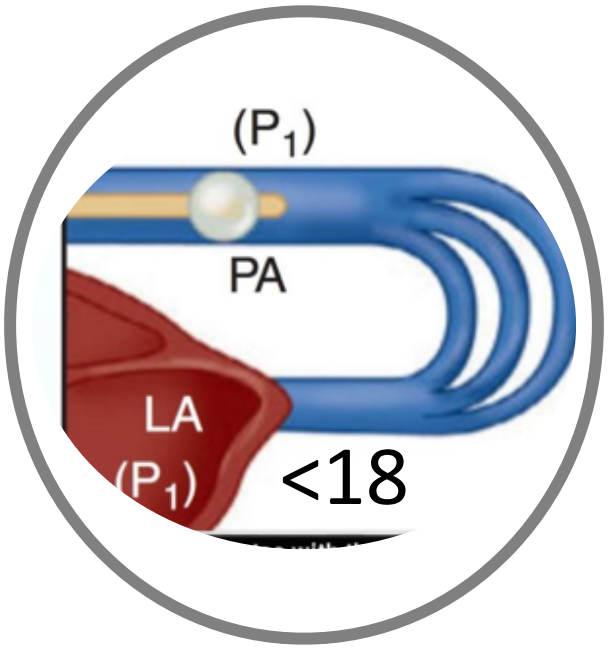
Interstitial lung





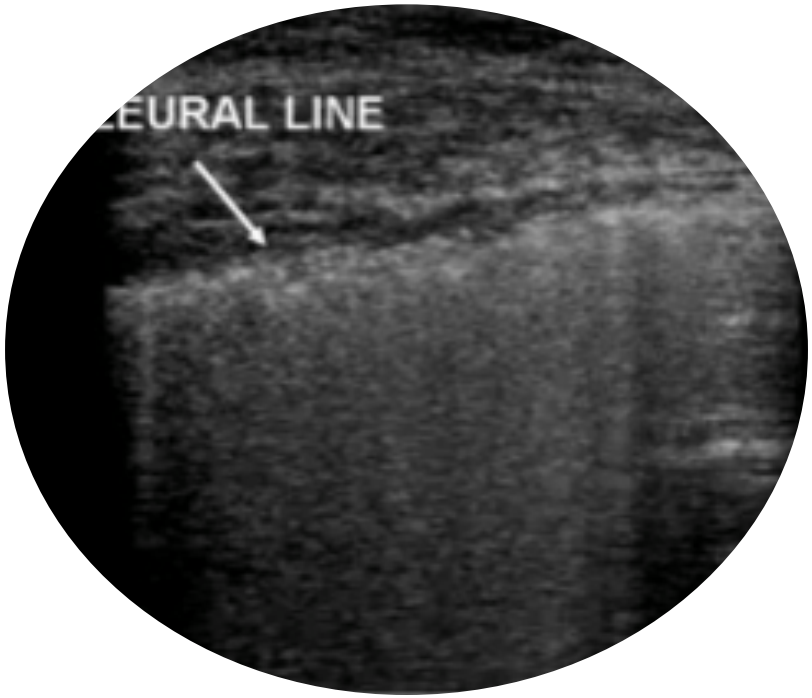


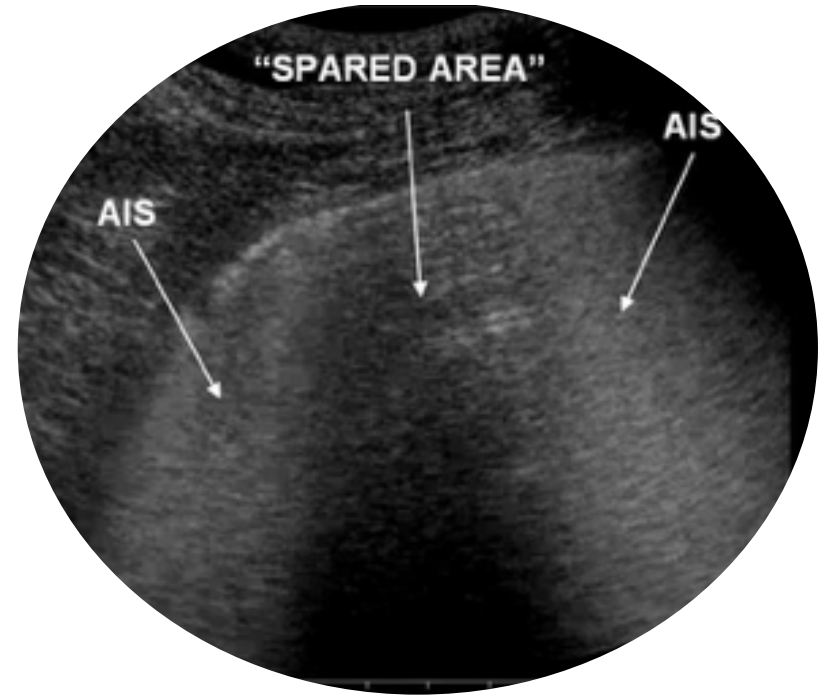


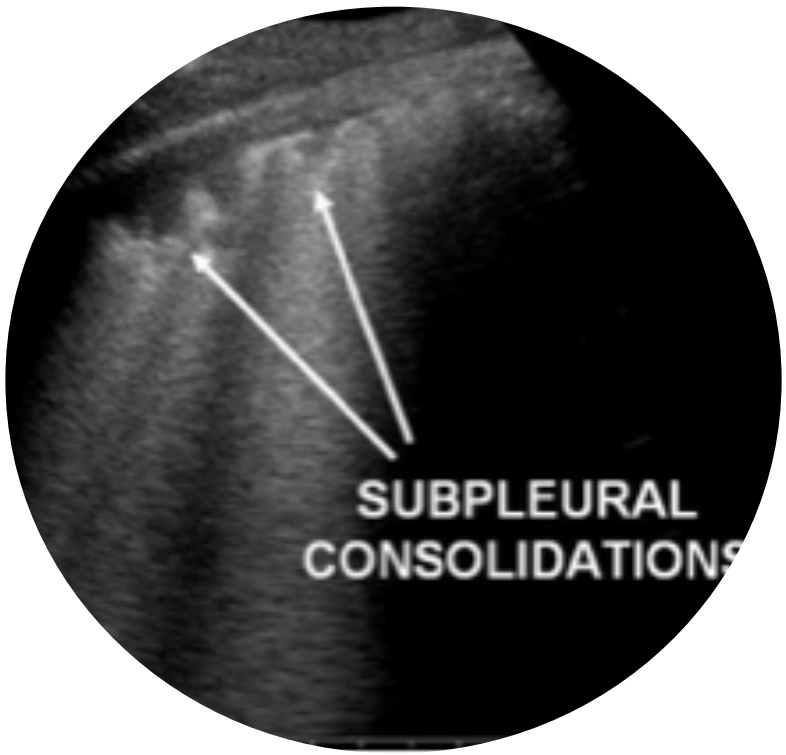

(P1)
PA
LA
(P1)
<18


NPV=100%

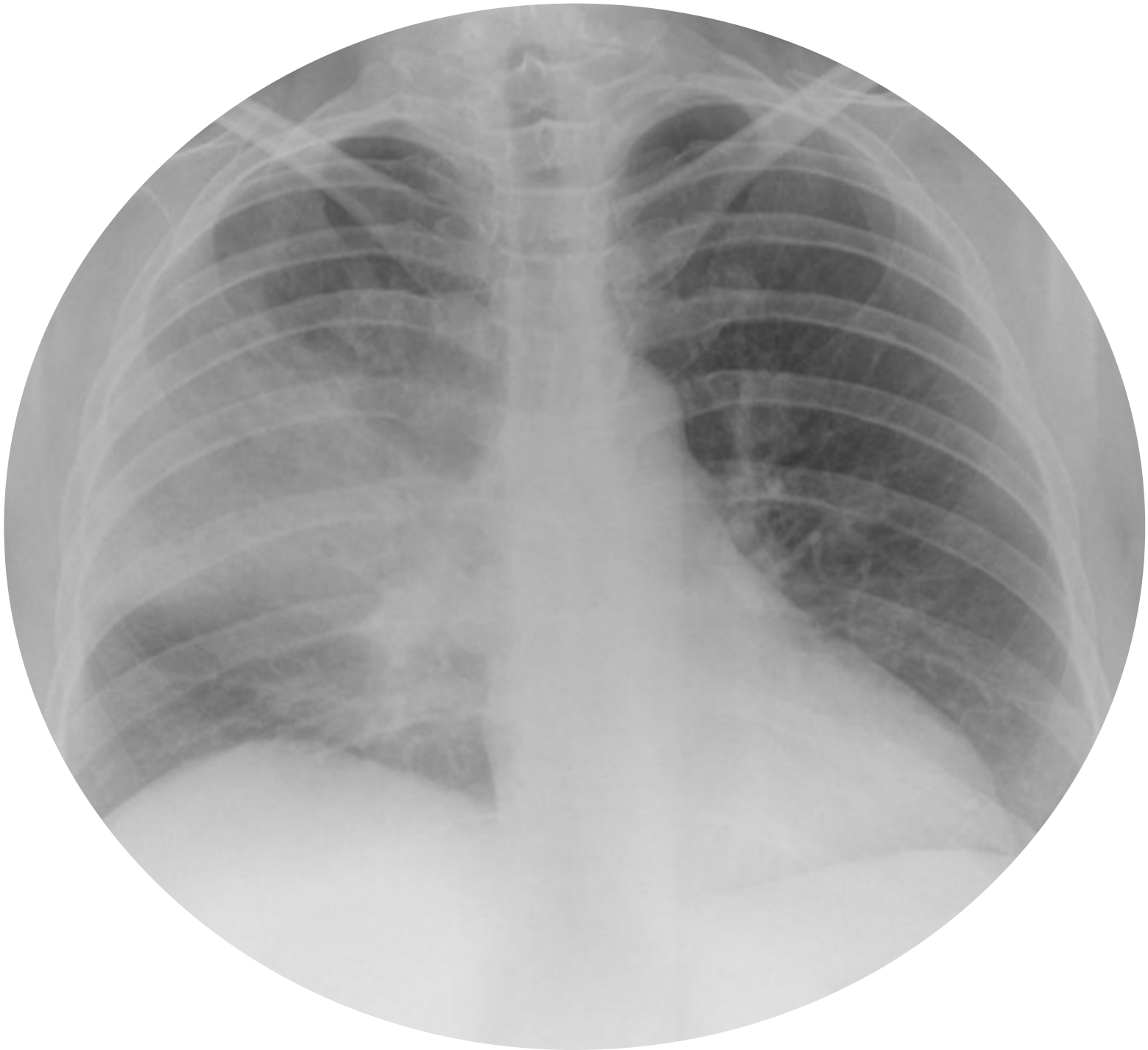
NON CARDIOGENIC LUNG EDEMA

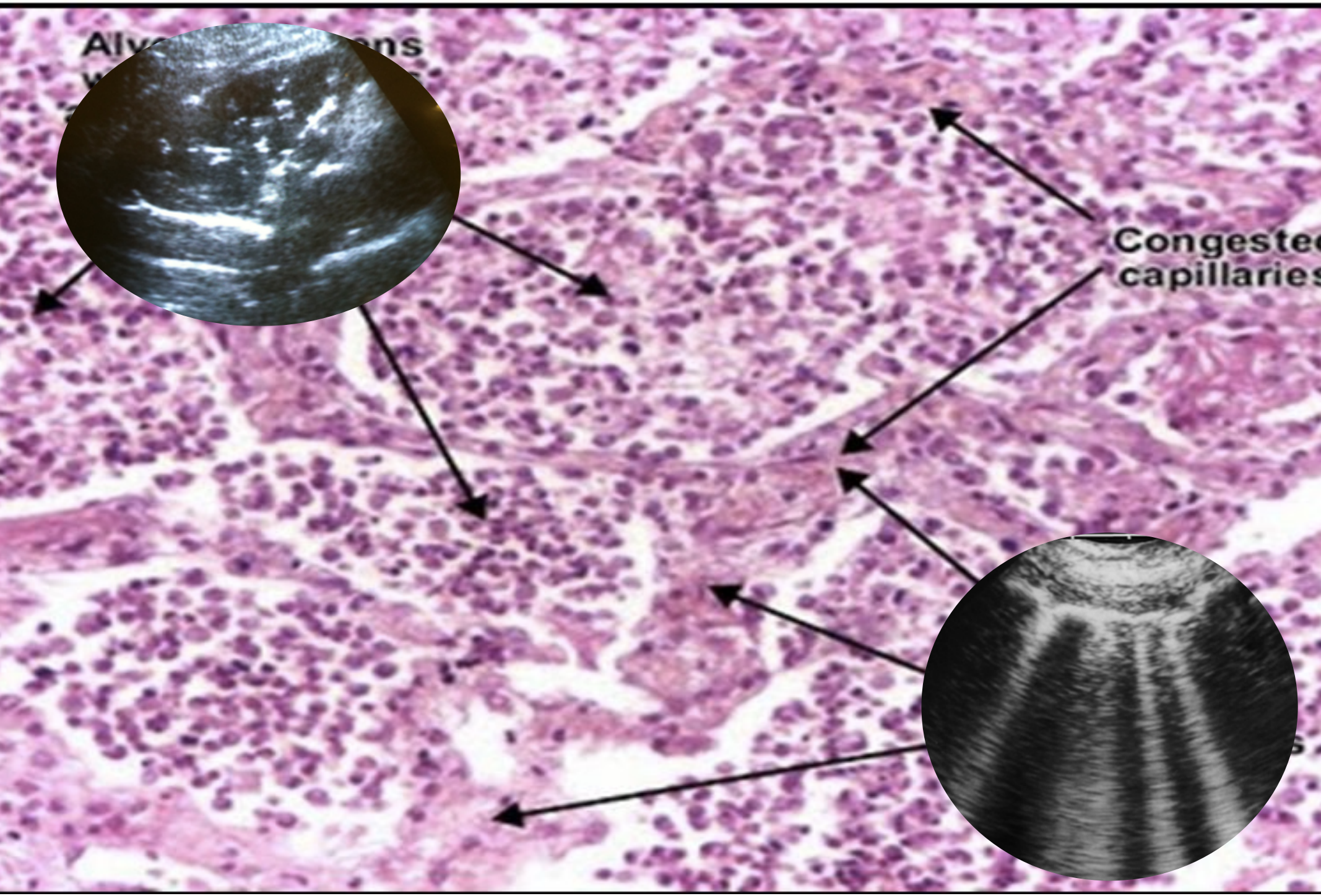

EURAL LINE

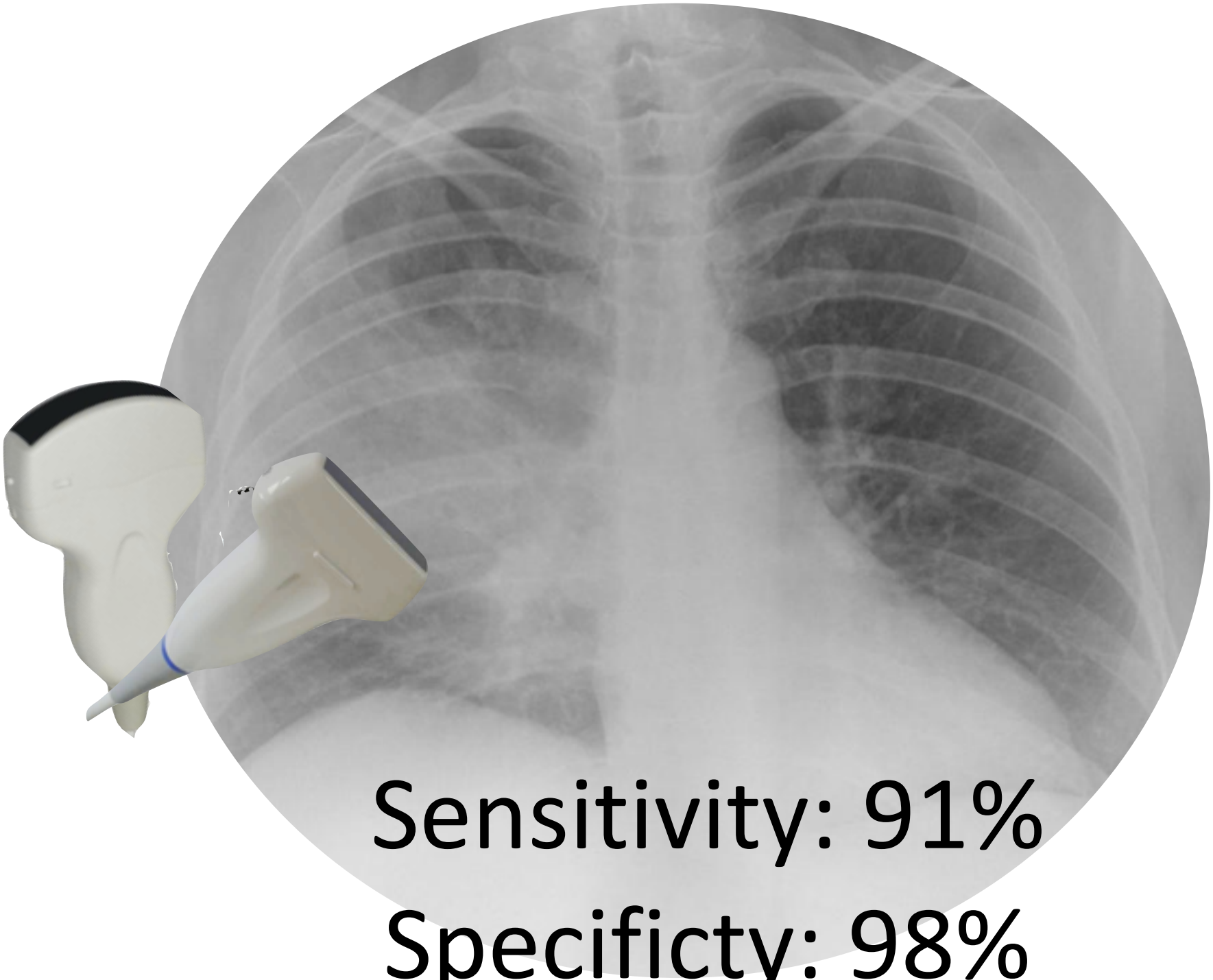

"SPARED AREA"
AIS
AIS

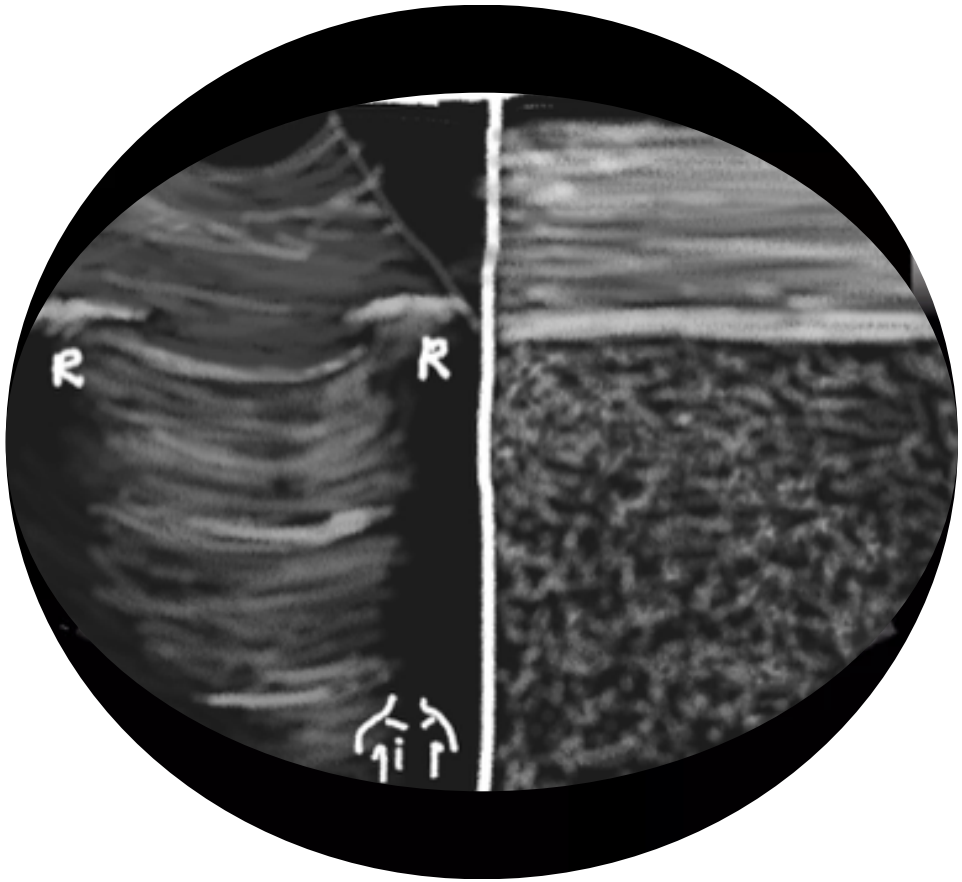

SUBPLEURAL
CONSOLIDATIONS

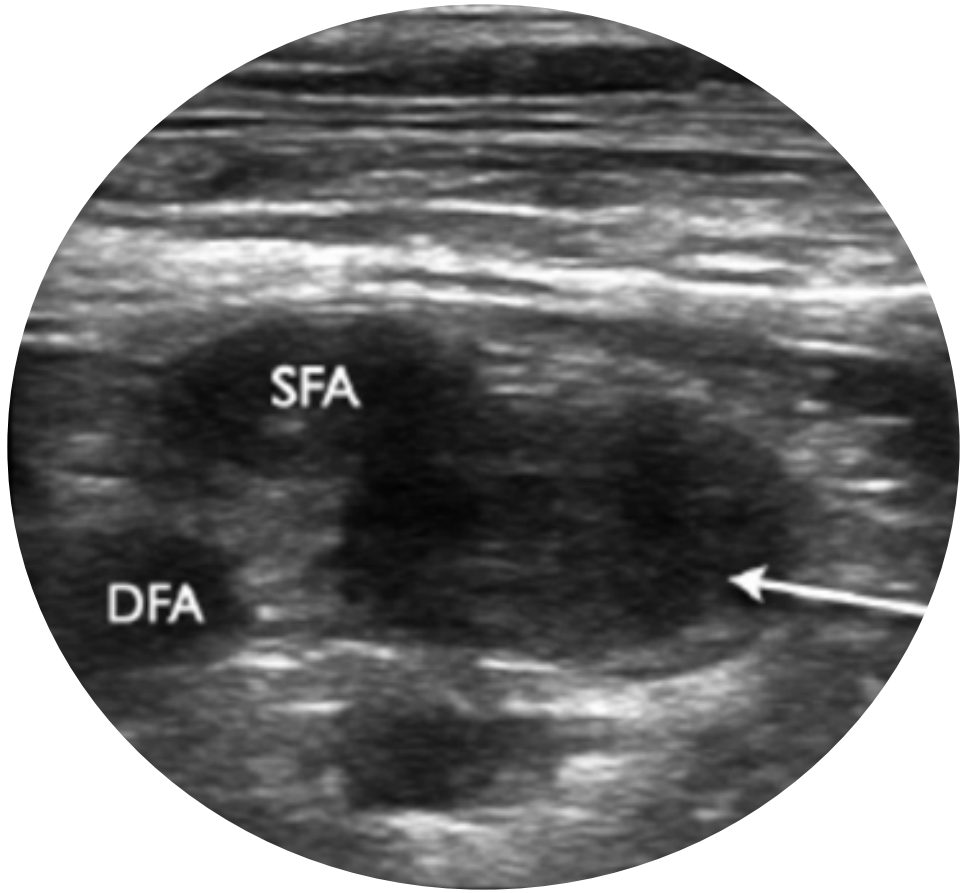

absent lung sliding

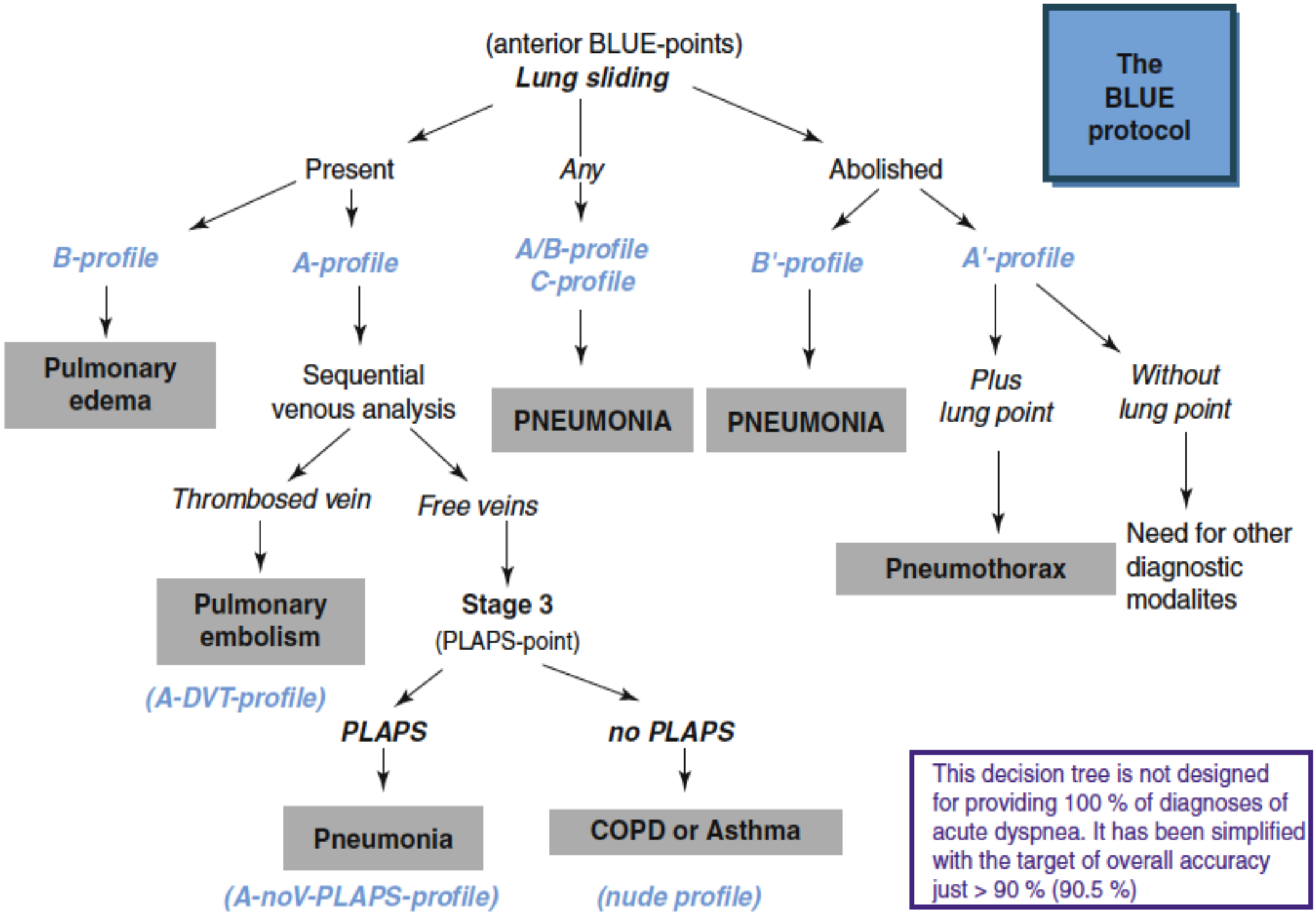



Congested
capillaries

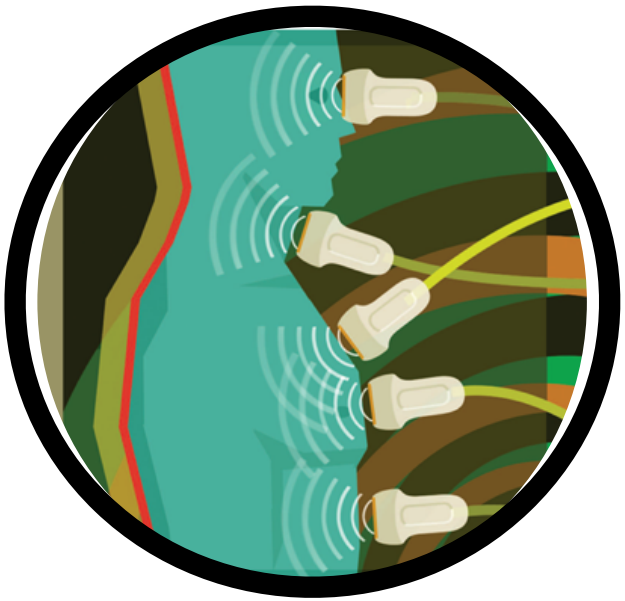

Sensitivity: 91%
Specificty: 98%


R
R


SFA
DFA


The BLUE protocol
(anterior BLUE-points)
Lung sliding
Present
Any
Abolished
B-profile
A-profile
A/B-profile
C-profile
B'-profile
A'-profile
Pulmonary edema
Sequential venous analysis
PNEUMONIA
PNEUMONIA
Plus lung point
Without lung point
Thrombosed vein
Free veins
Pneumothorax
Need for other diagnostic modalites
Pulmonary embolism
Stage 3
(PLAPS-point)
(A-DVT-profile)
PLAPS
no PLAPS
Pneumonia
COPD or Asthma
(A-noV-PLAPS-profile)
(nude profile)
This decision tree is not designed for providing 100 % of diagnoses of acute dyspnea. It has been simplified with the target of overall accuracy just > 90 % (90.5 %)

SUMMARY



Thanks for your attention

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Far East Memorial Hospital