



Lung ultrasound : SEMEIOTICS and TECHNIQUE

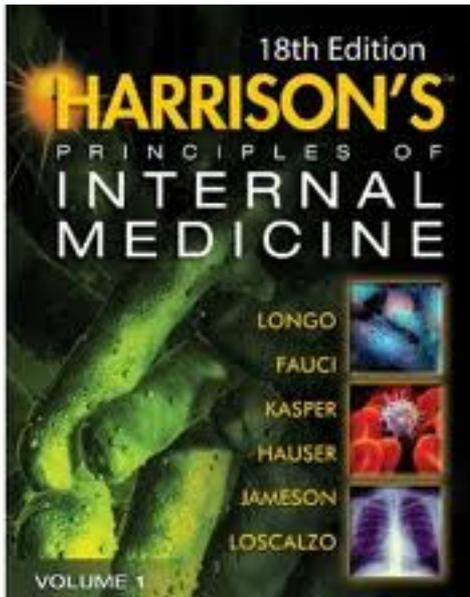
Luna Gargani

Cardiology Department
Institute of Clinical Physiology
National Council of Research, Pisa, Italy



Gent, 22nd November 2014

Air is foe to ultrasound



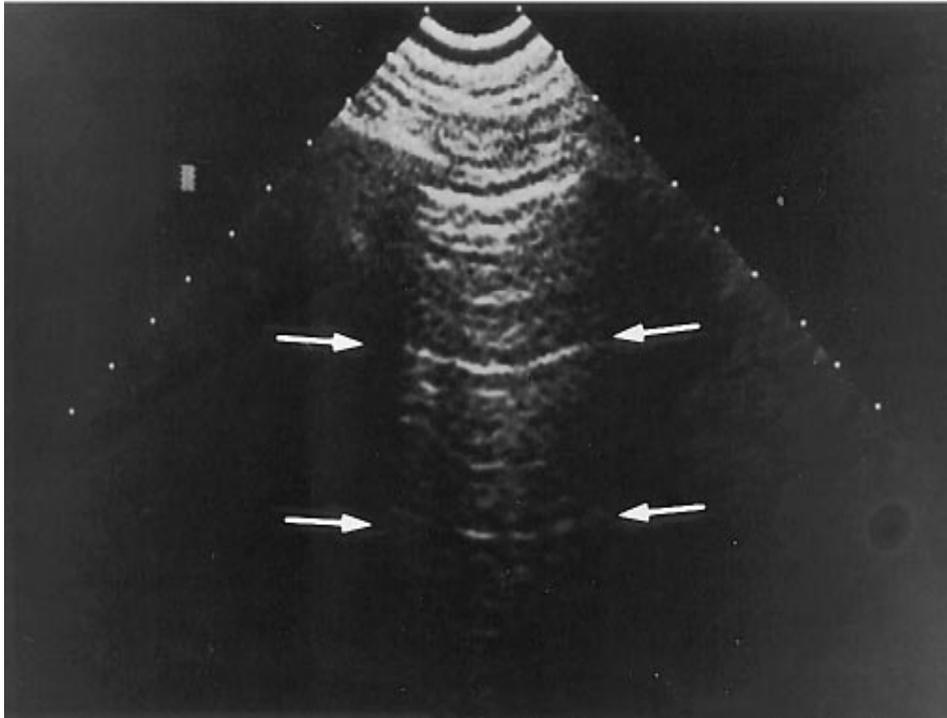
18th edition, 2011

«Because ultrasound energy
is rapidly dissipated in air,
**ultrasound imaging is not useful
for evaluation of the pulmonary parenchyma.»**

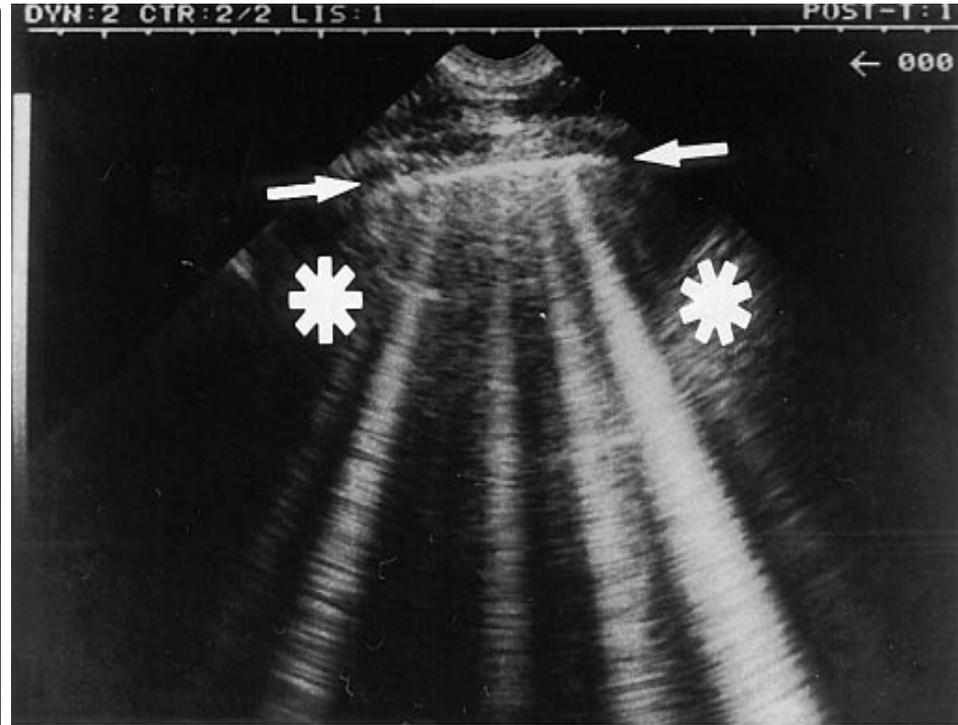
The Comet-tail Artifact

An Ultrasound Sign of Alveolar-Interstitial Syndrome

DANIEL LICHTENSTEIN, GILBERT MÉZIÈRE, PHILIPPE BIDERMAN, AGNÈS GEPNER, and OLIVIER BARRÉ



Normal subject

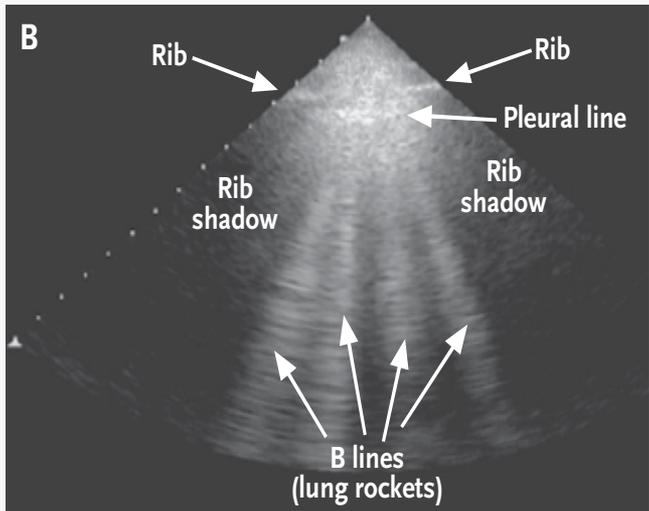
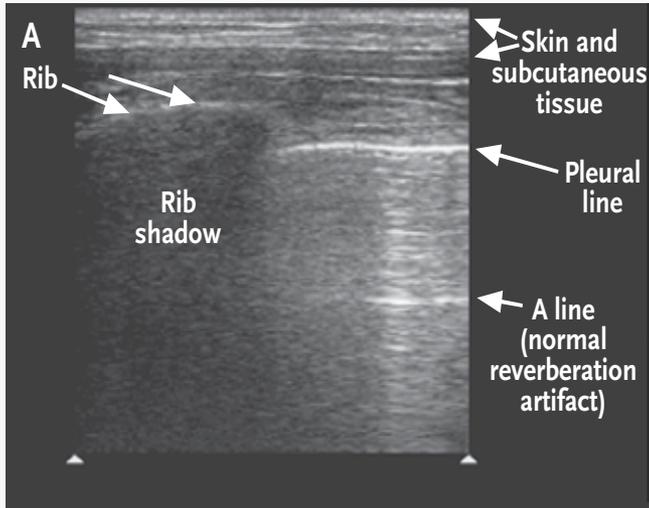


Acute pulmonary edema

CURRENT CONCEPTS

Point-of-Care Ultrasonography

Recently, lung ultrasound has emerged as a new sonographic technique to evaluate many pulmonary conditions.





HOW I DO IT ARTICLE

Open Access

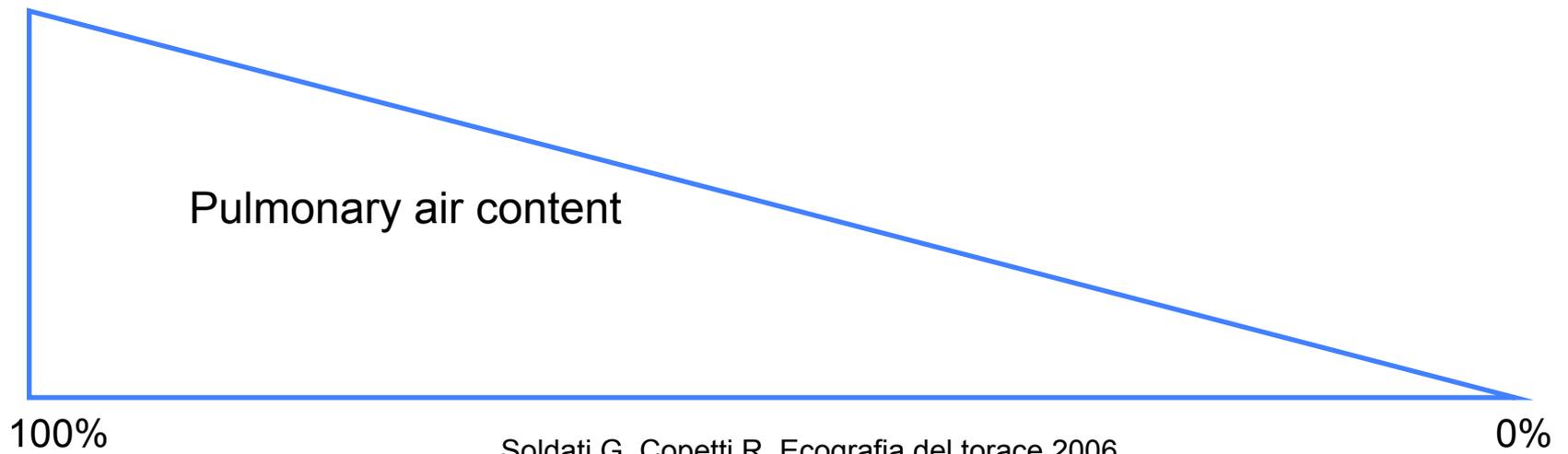
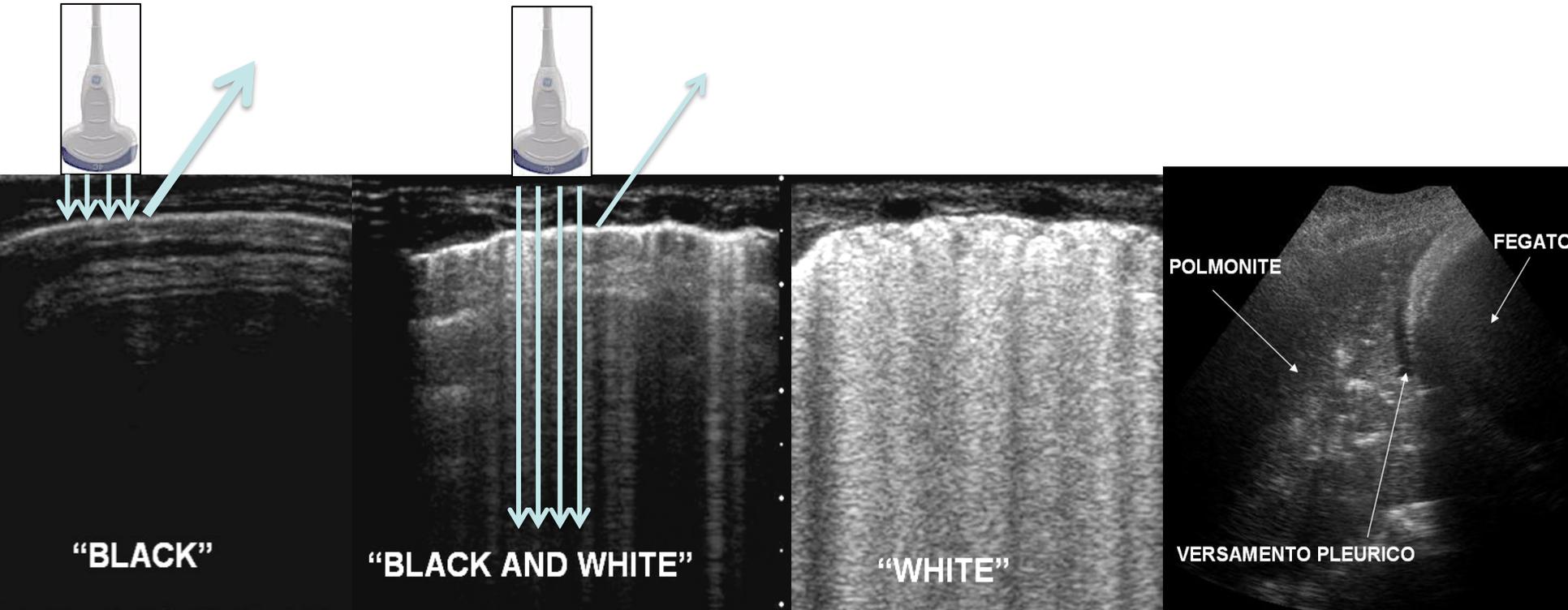
How I do it: Lung ultrasound

Luna Gargani^{1*} and Giovanni Volpicelli²

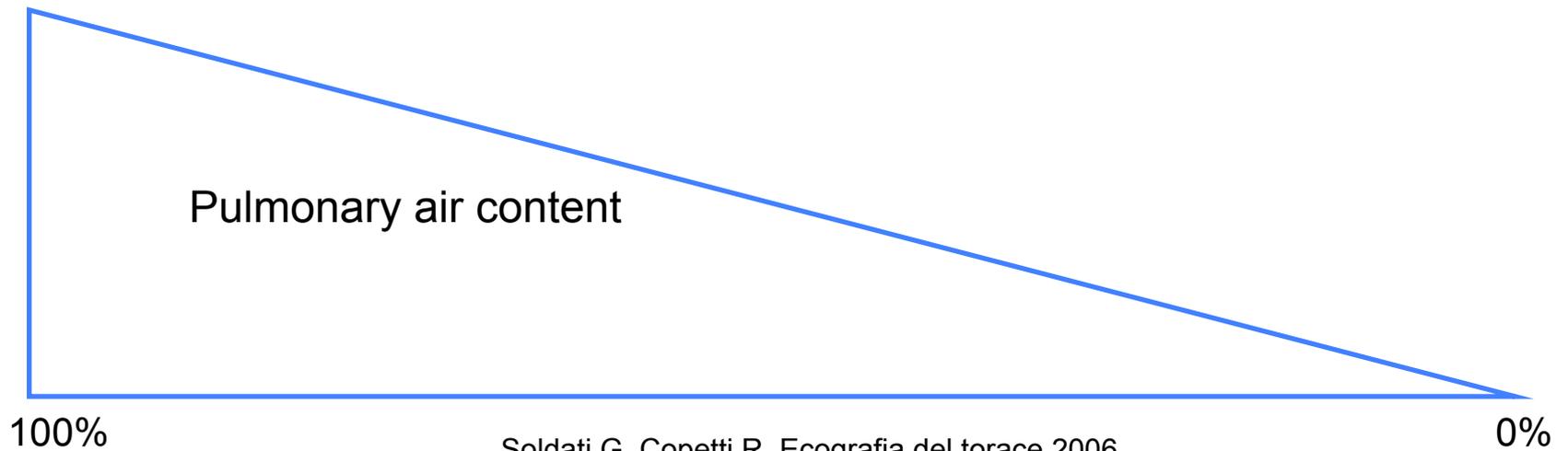
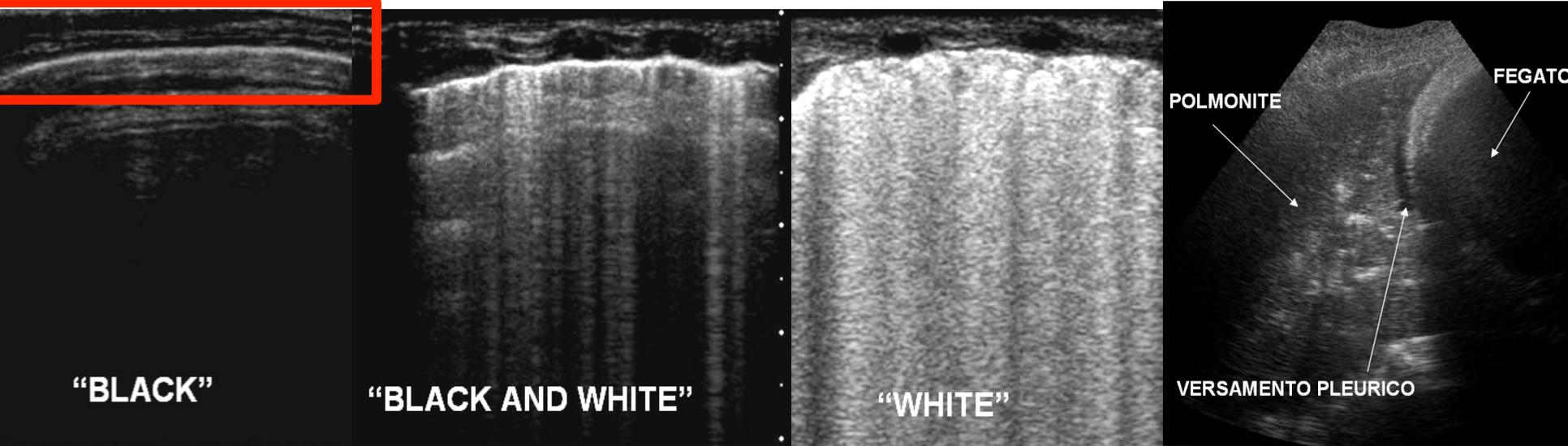
Abstract

In the last 15 years, a new imaging application of sonography has emerged in the clinical arena: lung ultrasound (LUS). From its traditional assessment of pleural effusions and masses, LUS has moved towards the revolutionary approach of imaging the pulmonary parenchyma, mainly as a point-of-care technique. Although limited by the

Lung ultrasound



Lung ultrasound

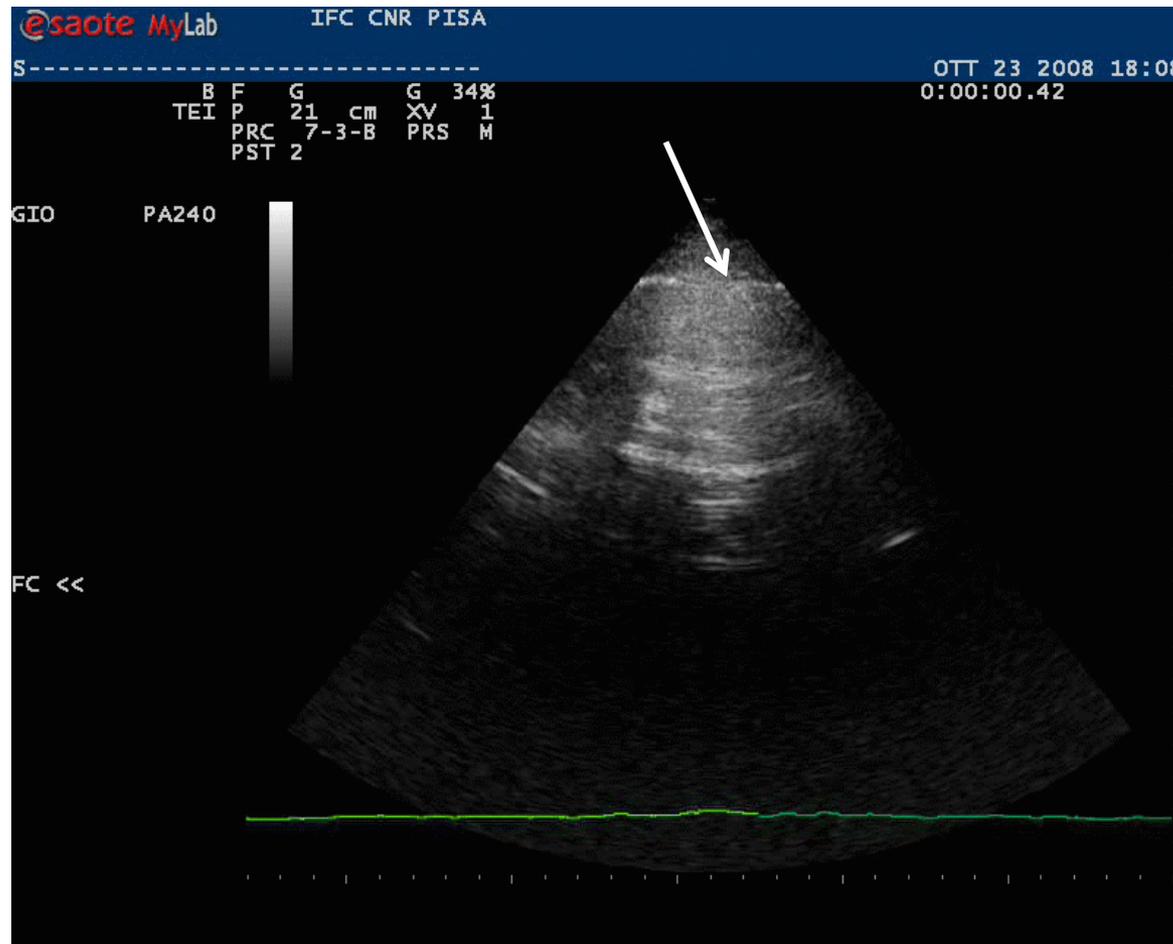


Semeiotics

- Lung sliding
- Lung point
- A-lines
- B-lines
- Consolidations
- Pleural effusion

Lung sliding

It is the depiction of a regular rhythmic movement synchronized with respiration, that occurs between the parietal and visceral pleura.



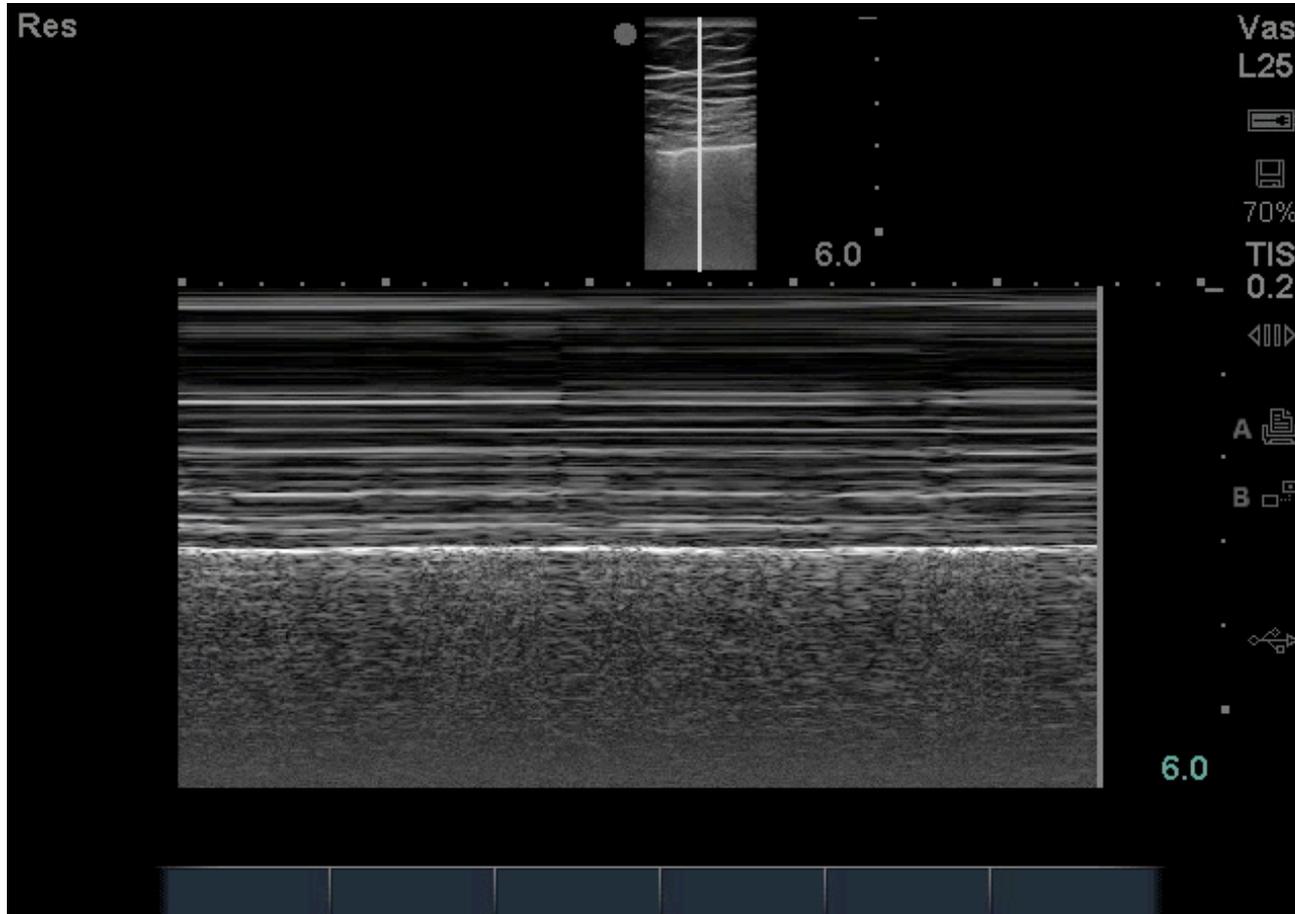
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Michael Blaivas
Daniel A. Lichtenstein
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Enrico Storti
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International Liaison Committee on Lung Ultrasound
(ILC-LUS) for the International
Consensus Conference on Lung Ultrasound (ICC-LUS)**

International evidence-based recommendations for point-of-care lung ultrasound

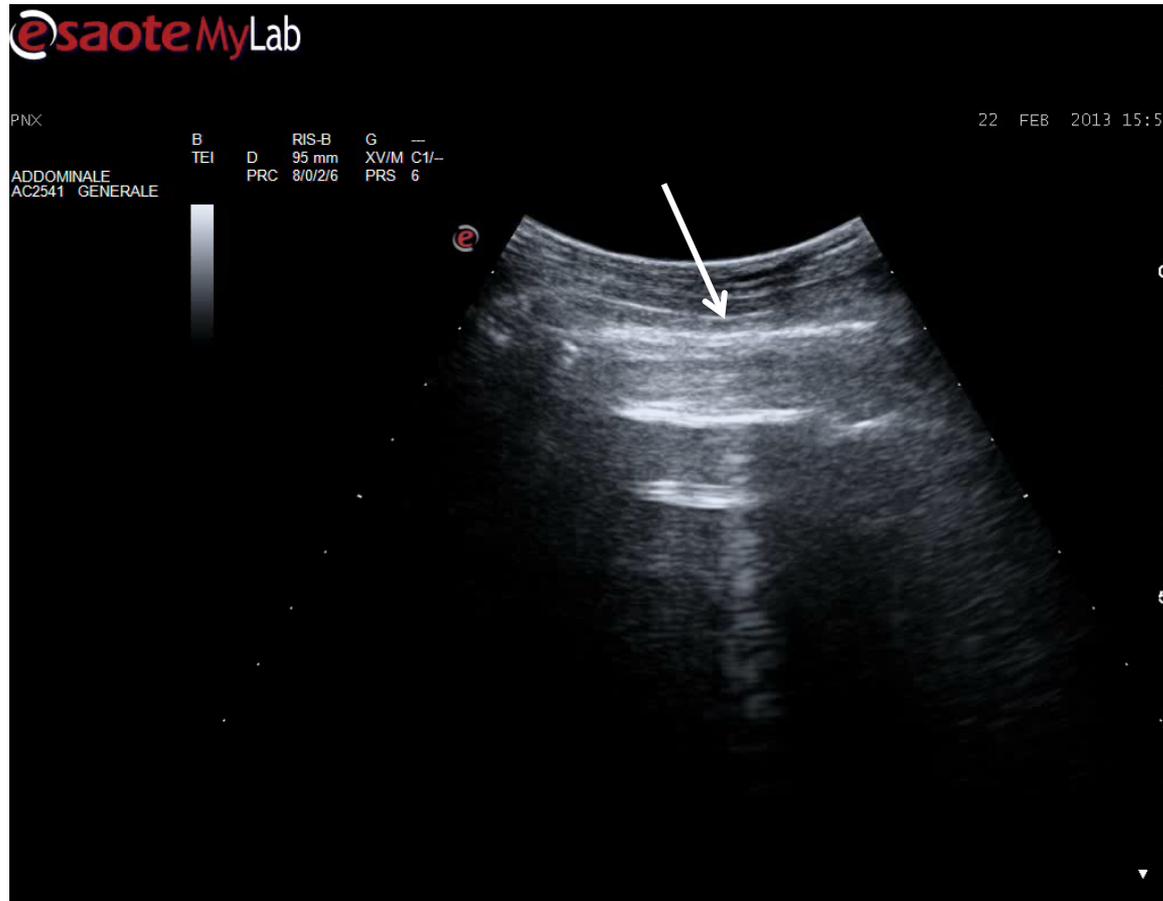


Lung sliding: M-mode

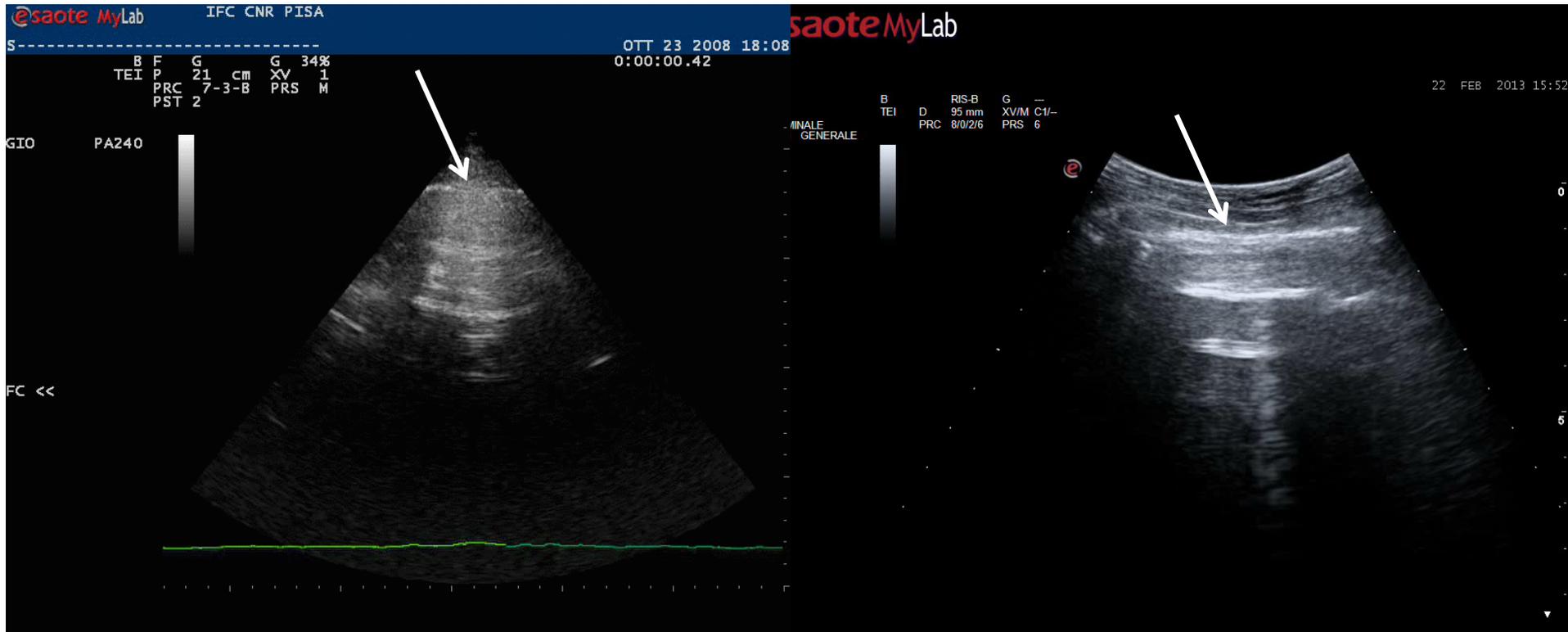
The seashore sign



Abolished lung sliding

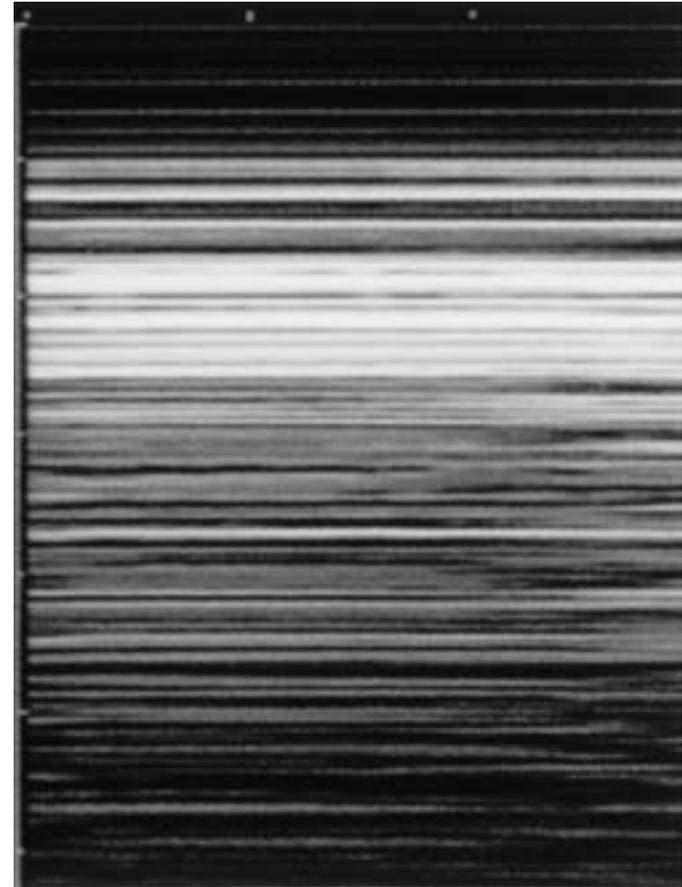
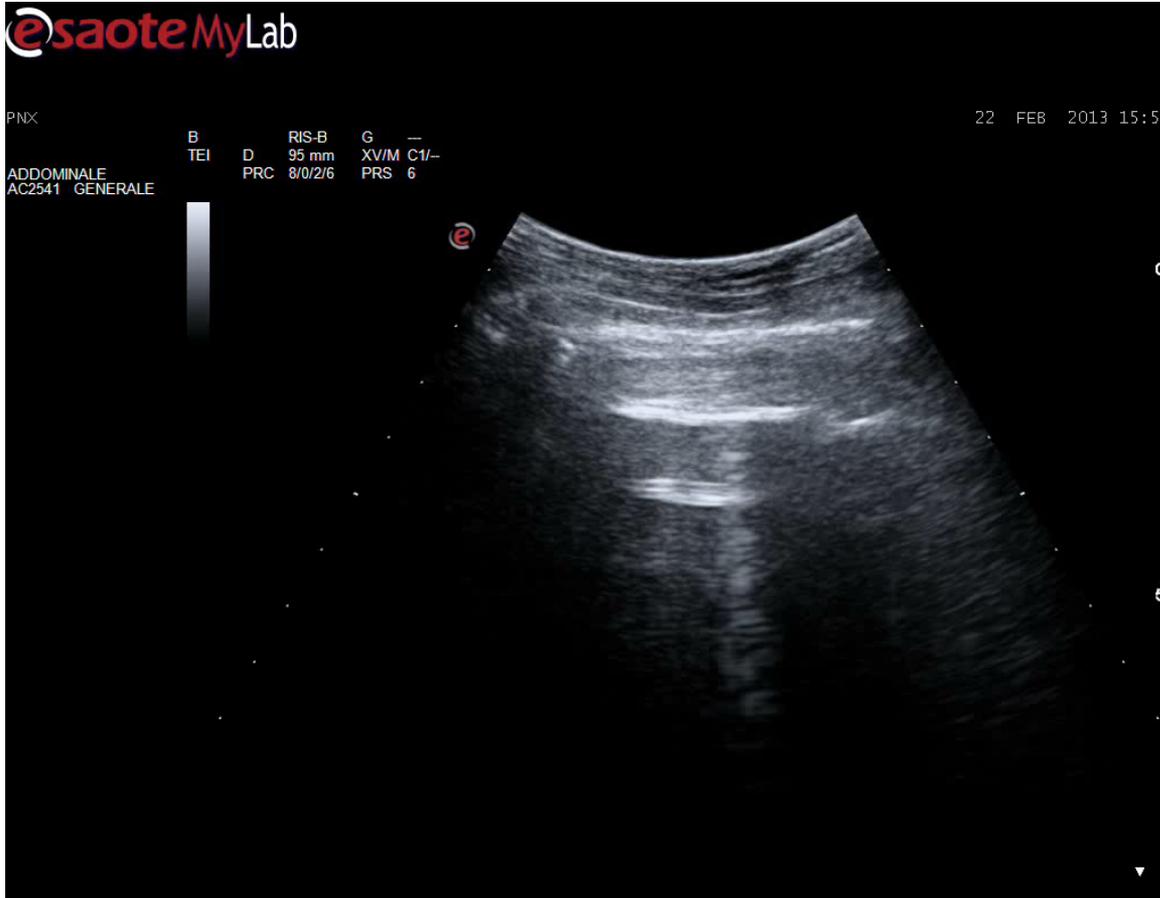


Abolished lung sliding



Abolished lung sliding

The barcode sign



Lung sliding abolished: causes

- Pneumothorax
- Mainstem intubation
- High-frequency ventilation
- Massive atelectasis
- Pleural adhesences
- Severe fibrosis
- Cardiopulmonary arrest



Semeiotics

- Lung sliding

- Lung point

- A-lines

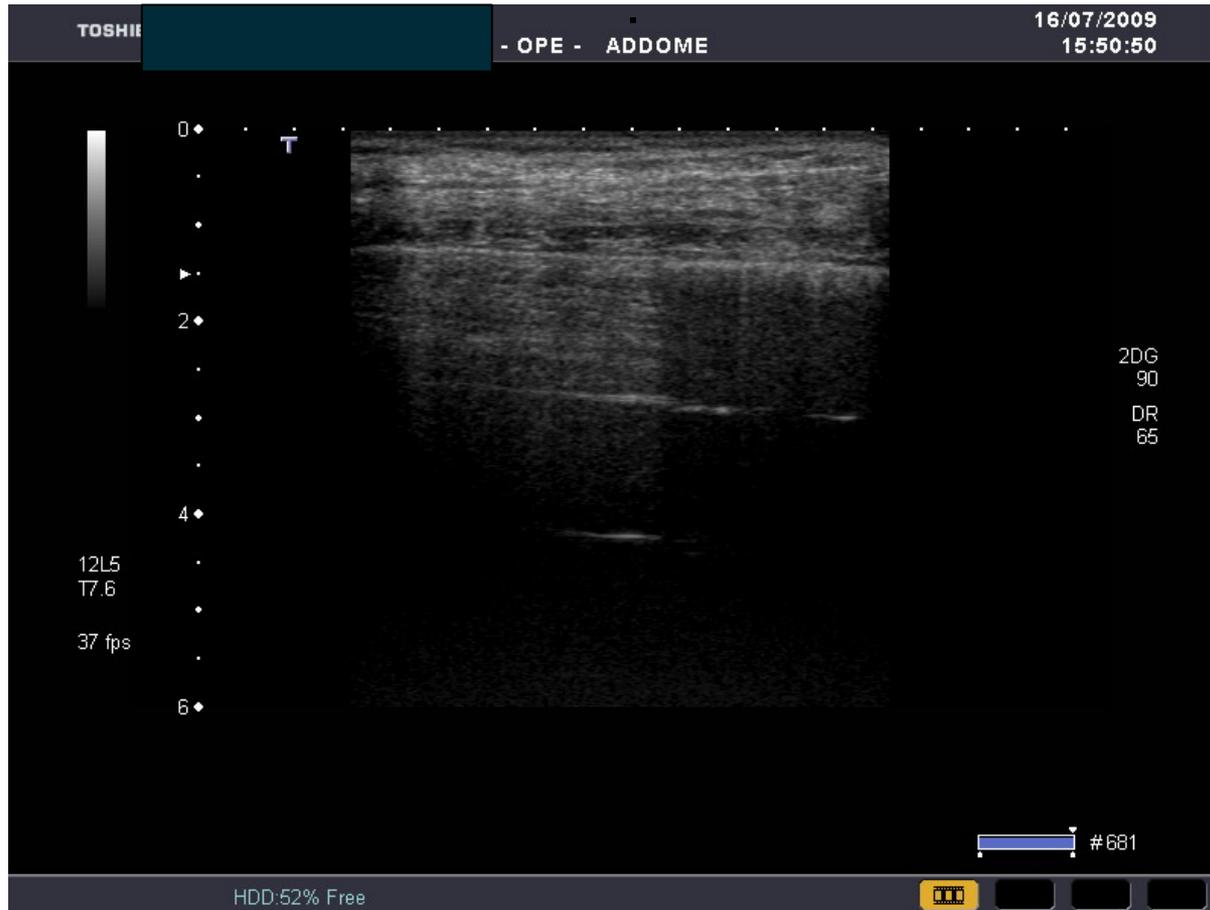
- B-lines

- Consolidations

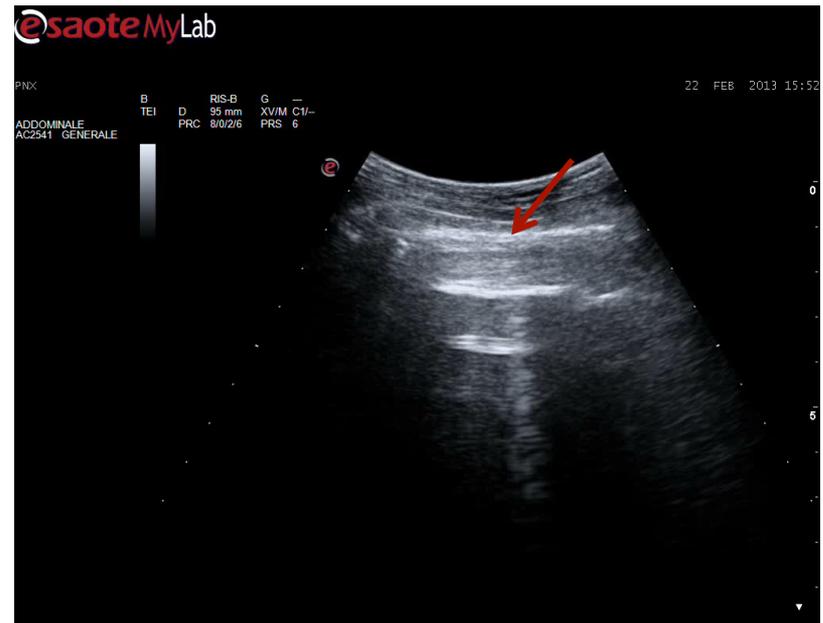
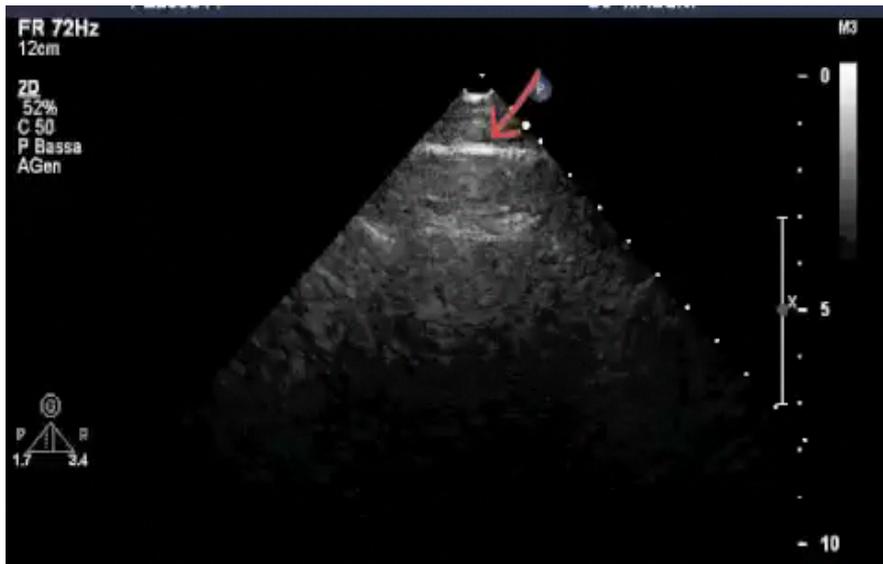
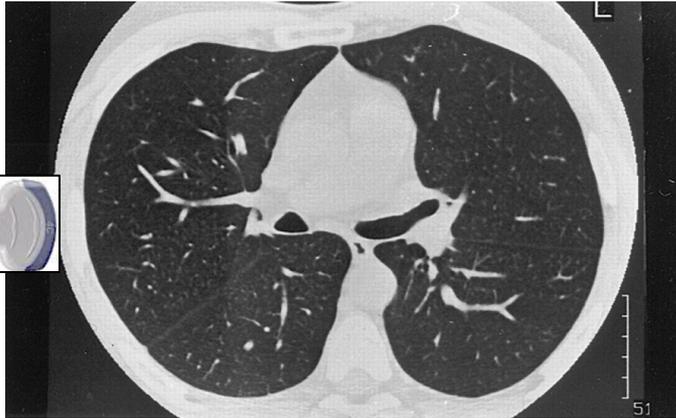
- Pleural effusion

Lung point

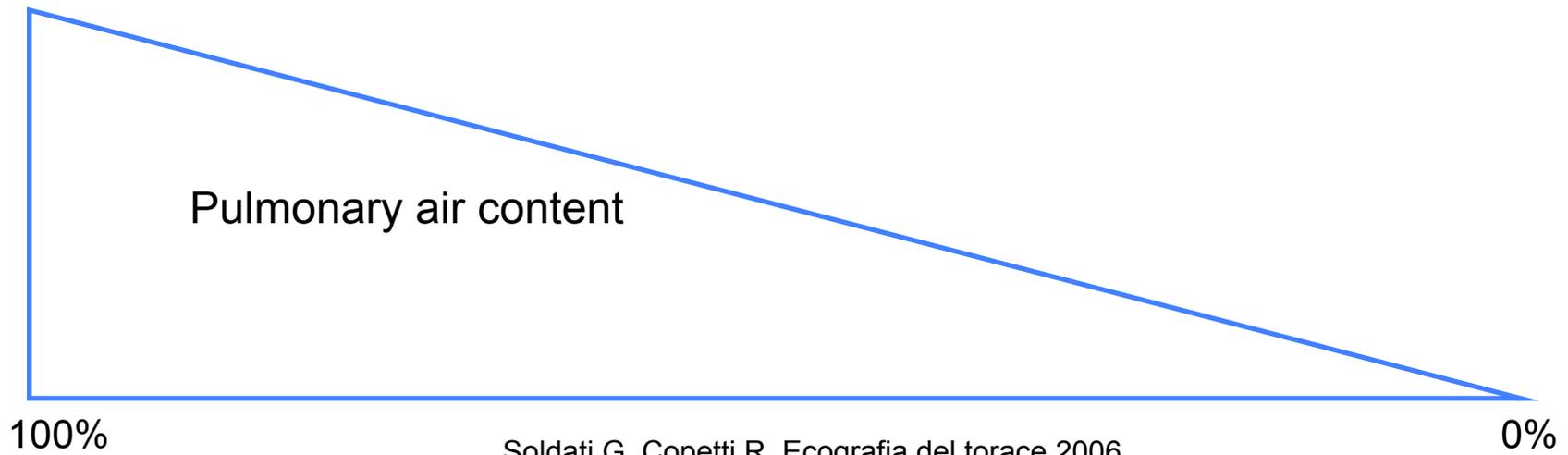
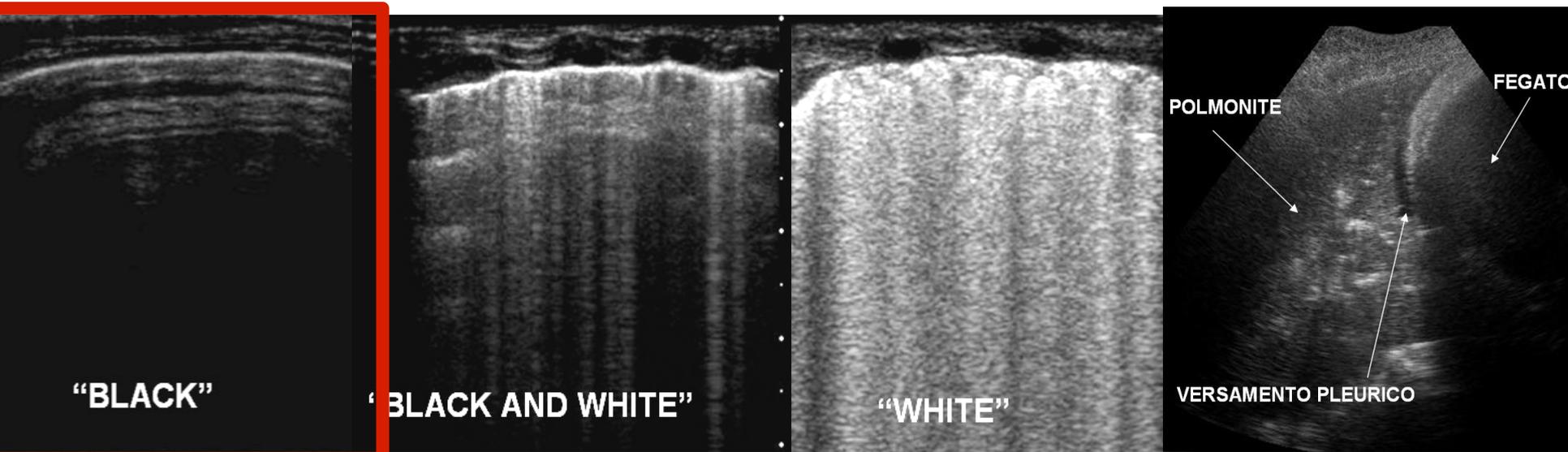
The physical location where abolished lung sliding transitions into an area of sliding, which represents the physical limit of pneumothorax as mapped on the chest wall



Pneumotorace



Lung ultrasound



Basic semiotics

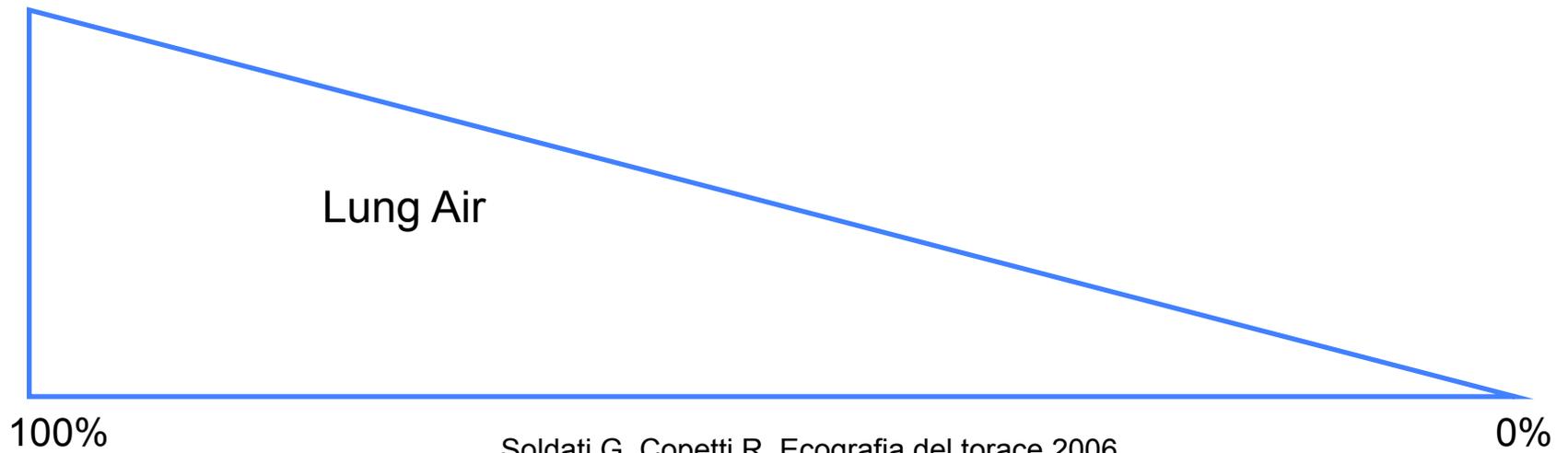
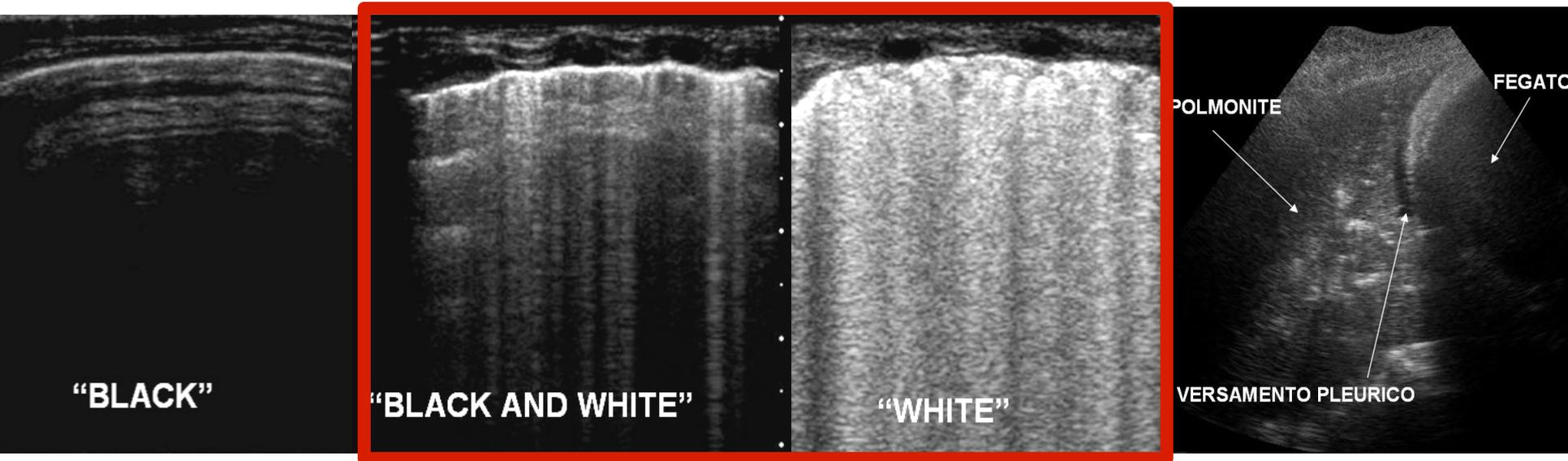
- Lung sliding
- Lung point
- A-lines
- B-lines
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A-lines

- Horizontal reverberation of the pleural line
- Normal finding



Lung ultrasound

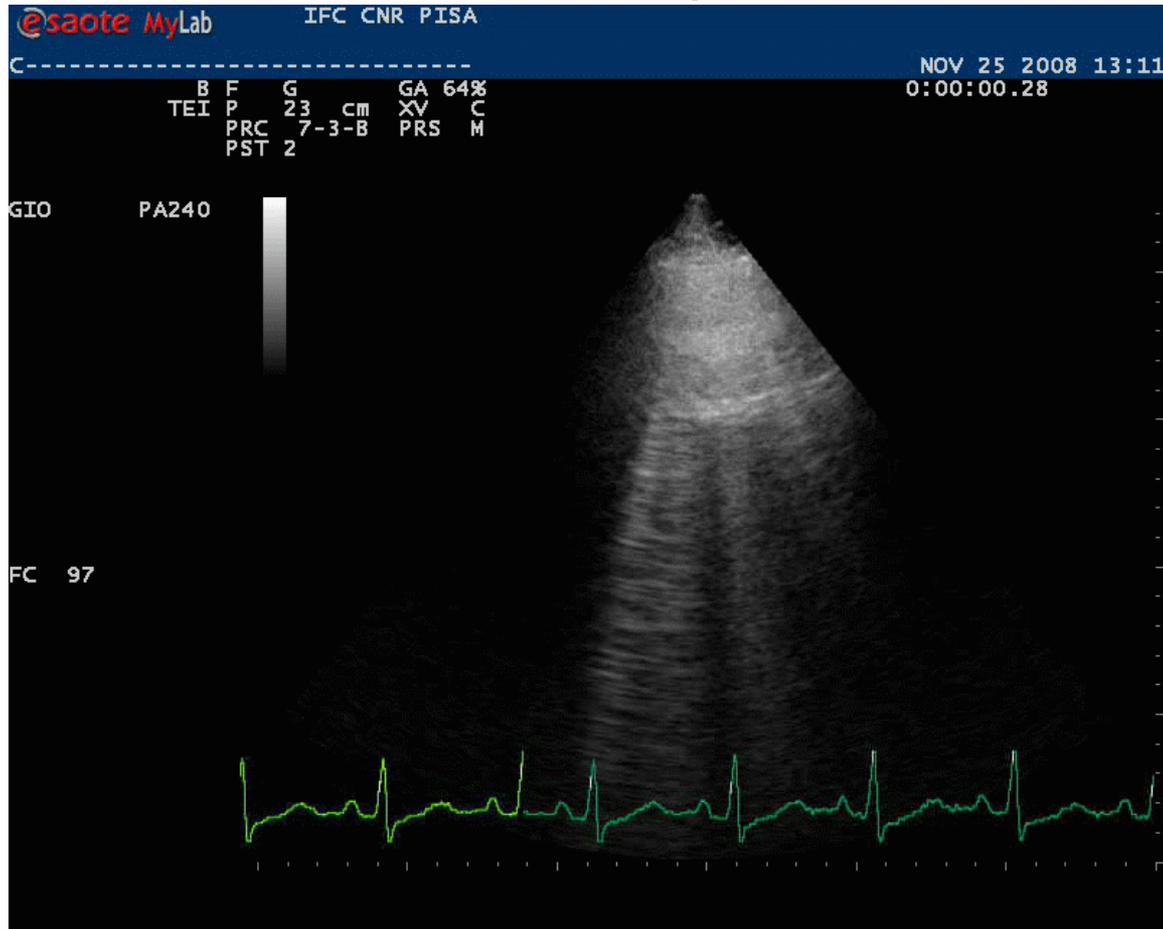


Basic semiotics

- Lung sliding
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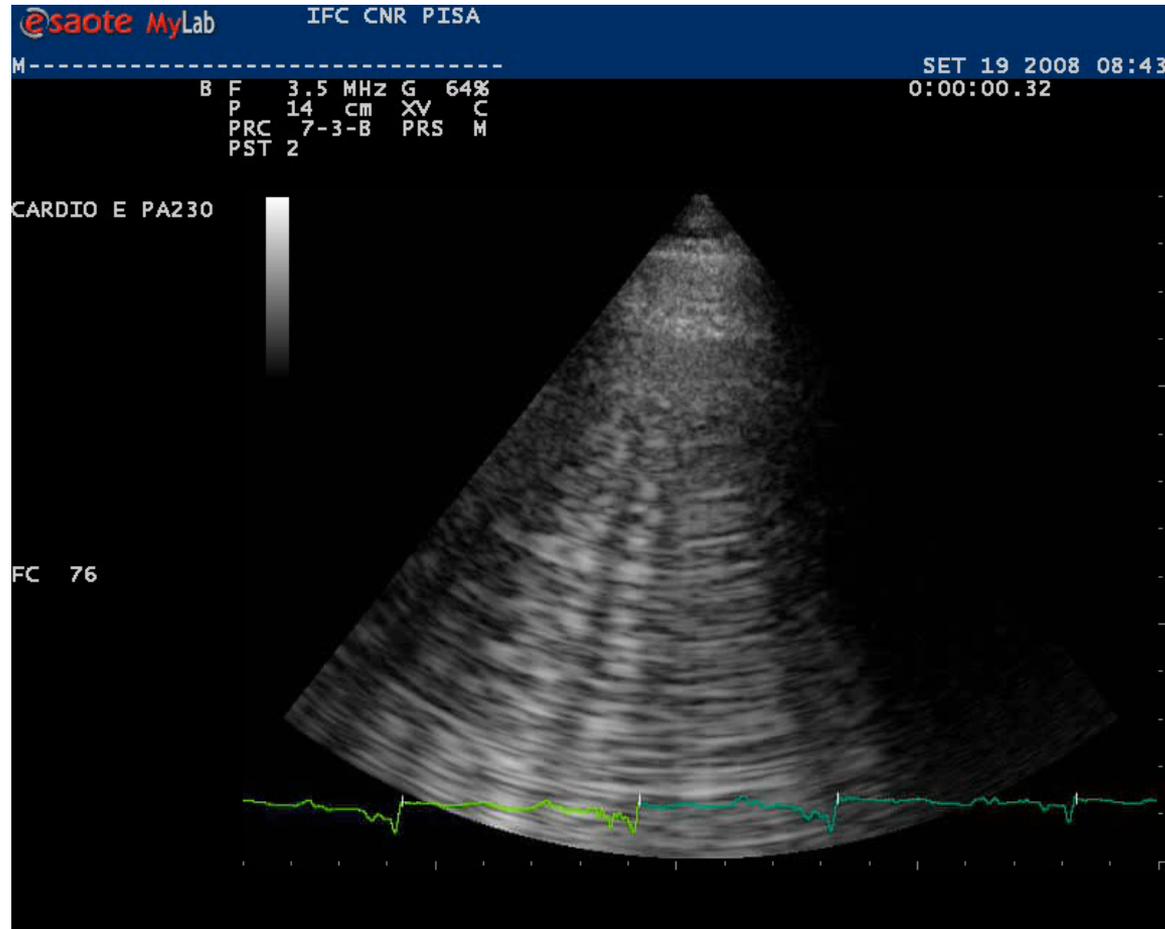
B-lines: definition

Discrete laser-like vertical hyperechoic reverberation artifacts, that arise from the pleural line.



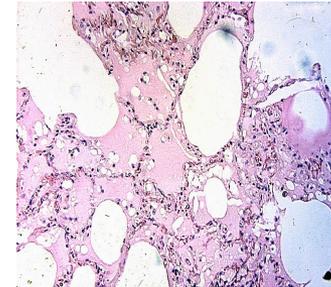
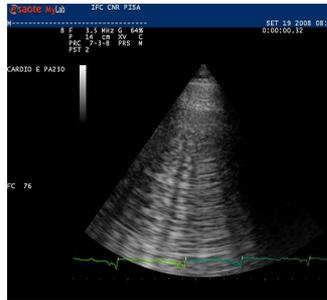
B-lines: definition

B-lines are the sonographic sign of the interstitial syndrome



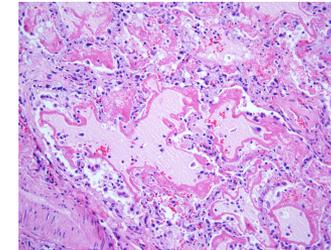
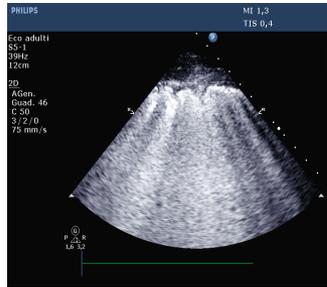
B-lines: a non-specific sign of interstitial syndrome

Cardiogenic pulmonary oedema



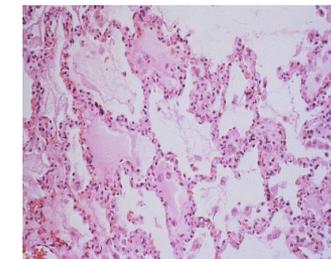
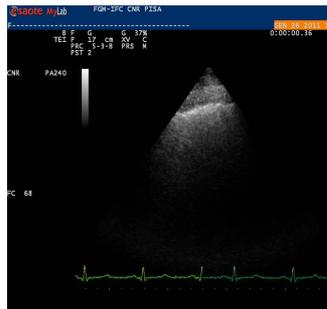
Transudate

Non-cardiogenic pulmonary oedema



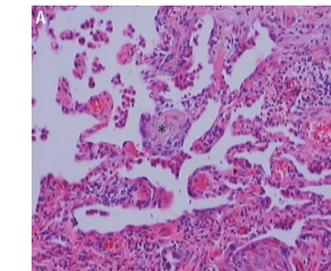
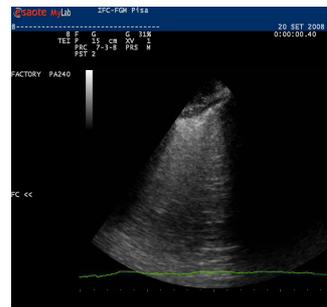
Exudate

Interstitial pneumonia



Exudate

Pulmonary fibrosis

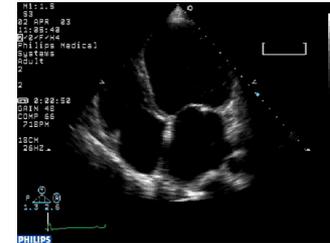


Collagen

B-lines: clinical applications

- Heart failure

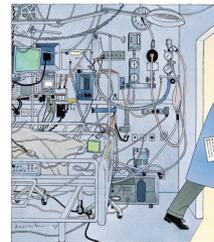
- Diagnosis
- Monitoring and therapy titration
- Prognosis



- Dialysis



- ALI/ARDS



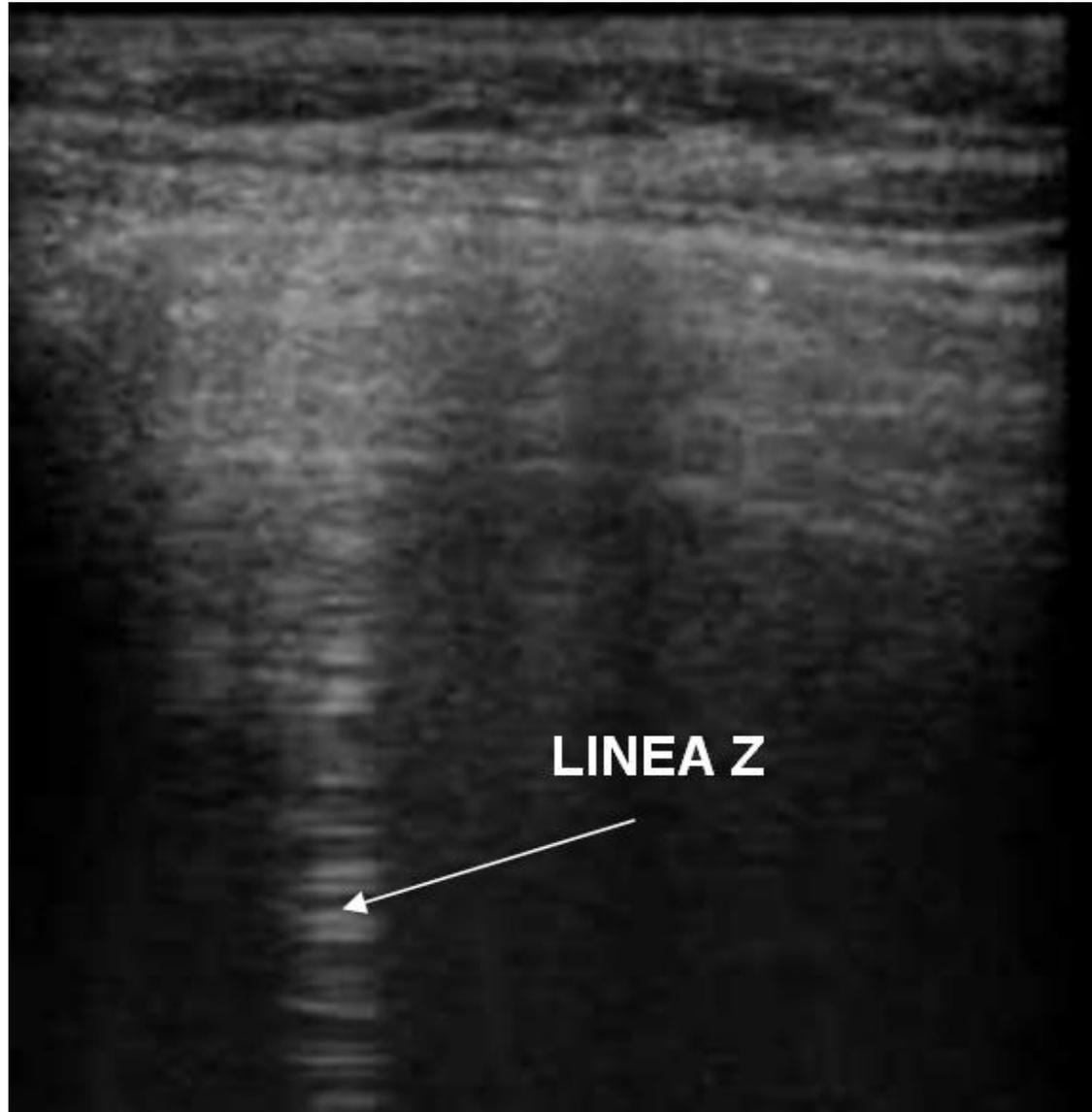
- Interstitial lung disease



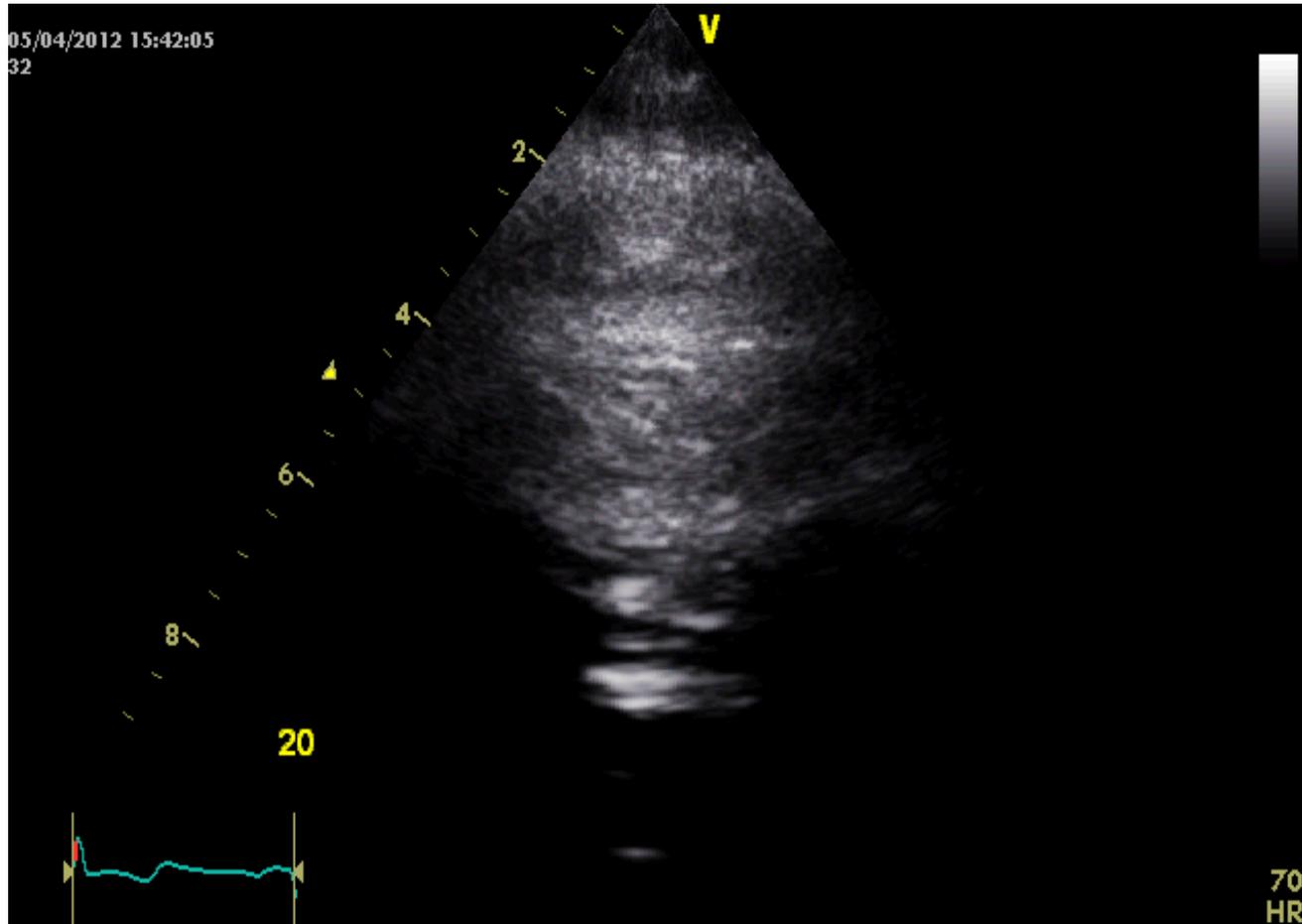
- Eclampsia, other



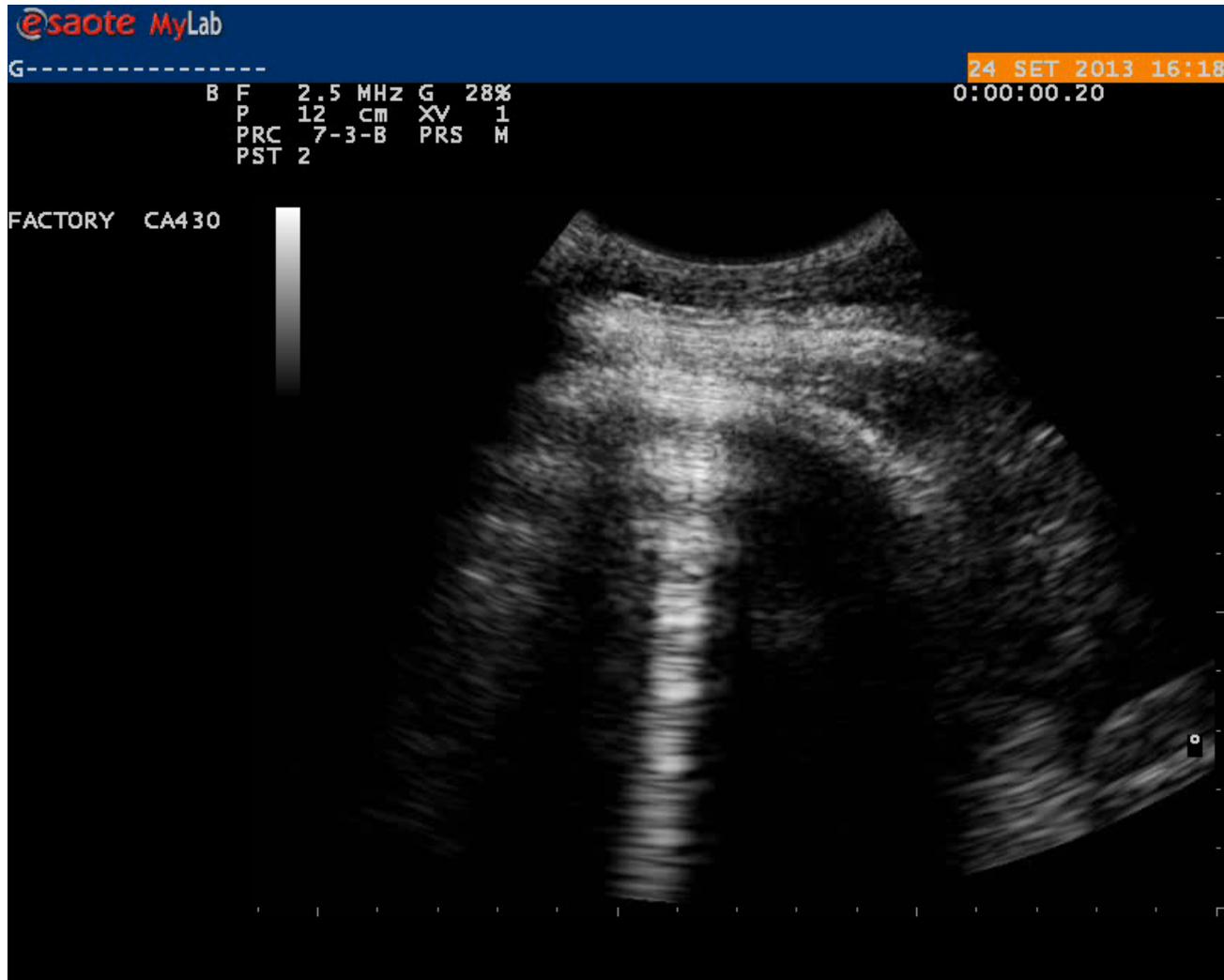
Z-lines



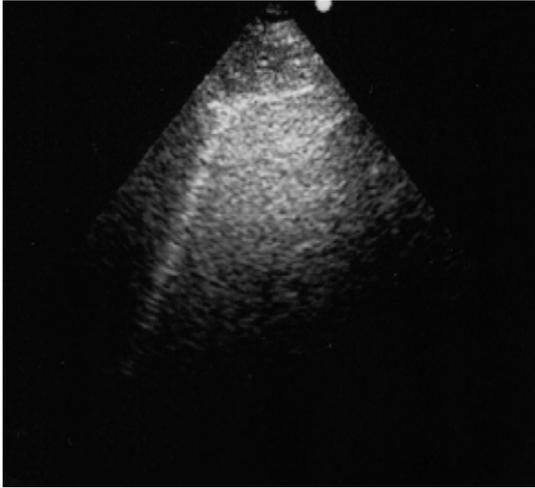
Z-lines



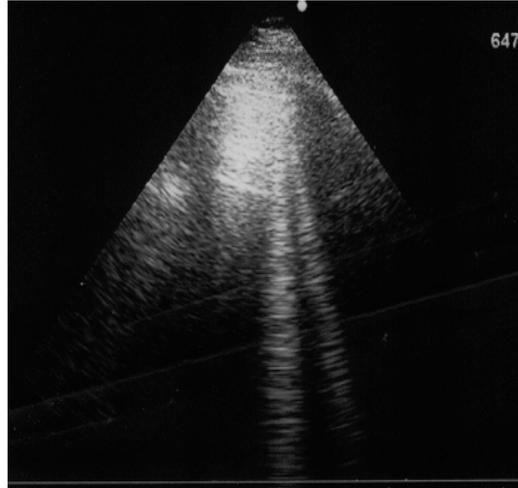
Z-lines and B-lines



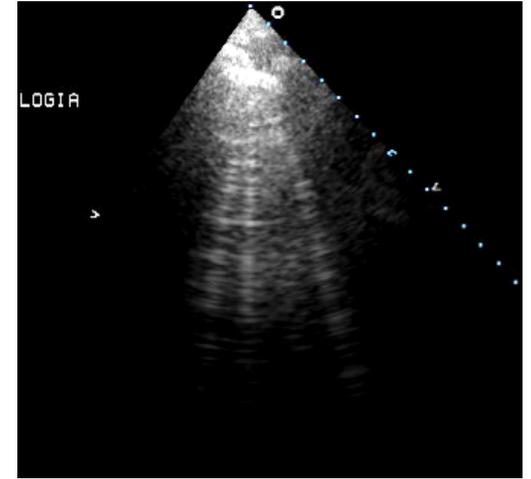
How to quantify B-lines?



1



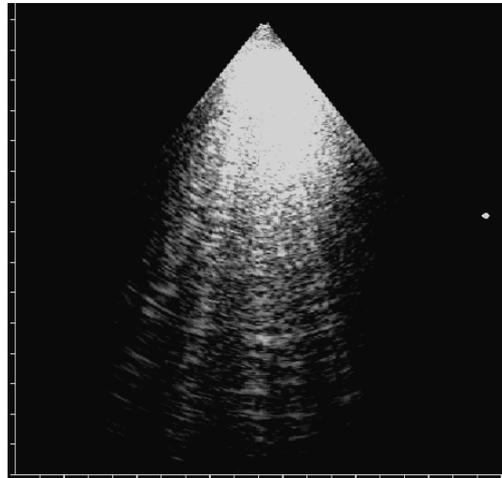
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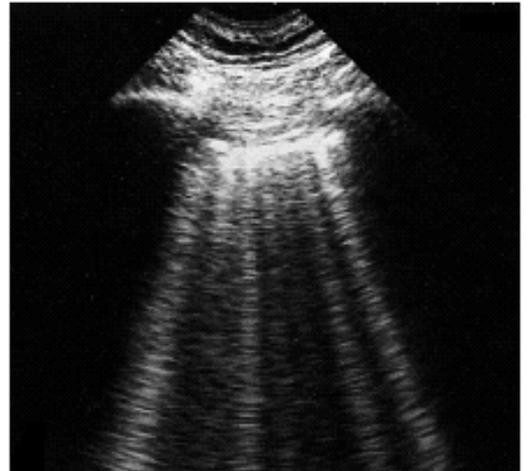
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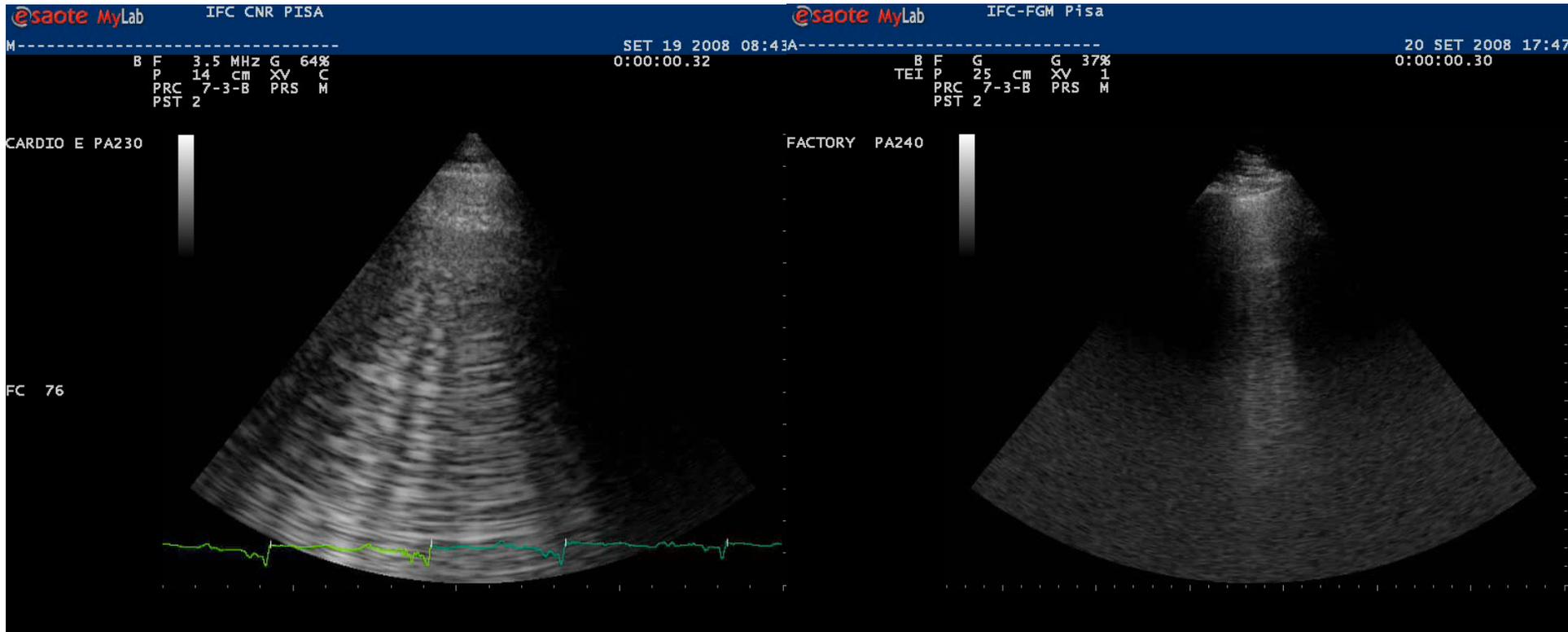


5



7

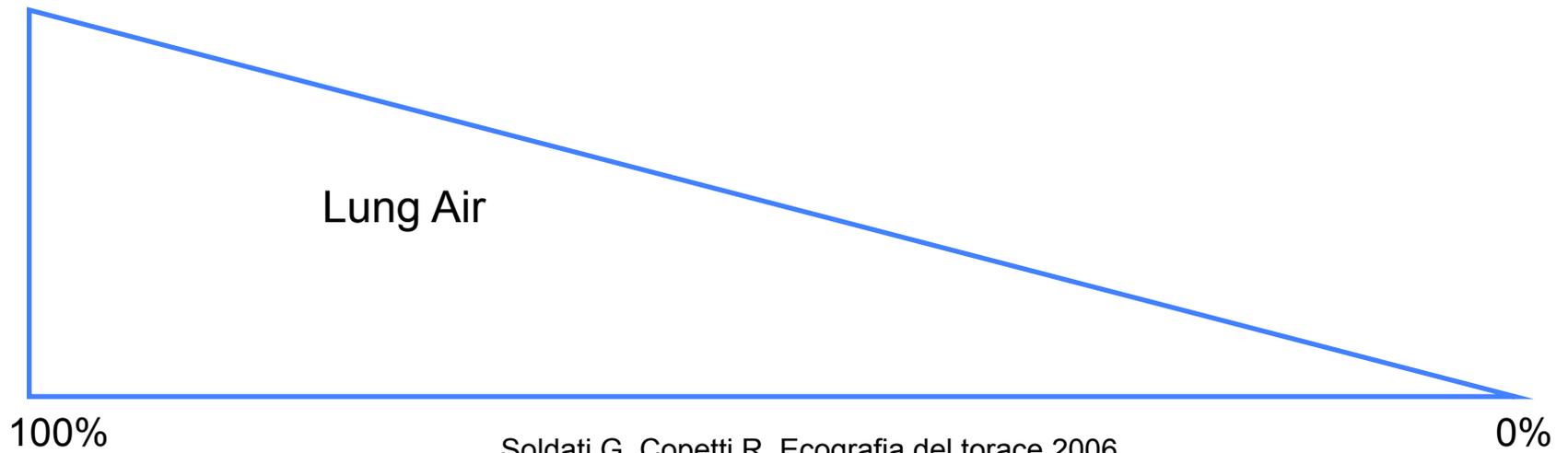
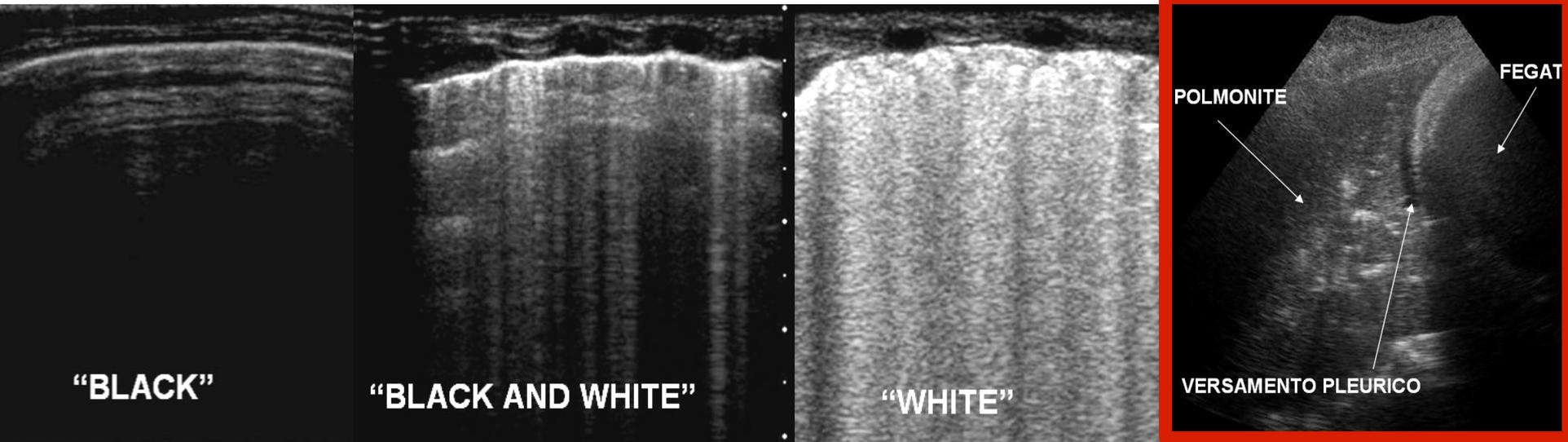
How to quantify B-lines?



About 100% = 10 B-lines

About 50% = 5 B-lines

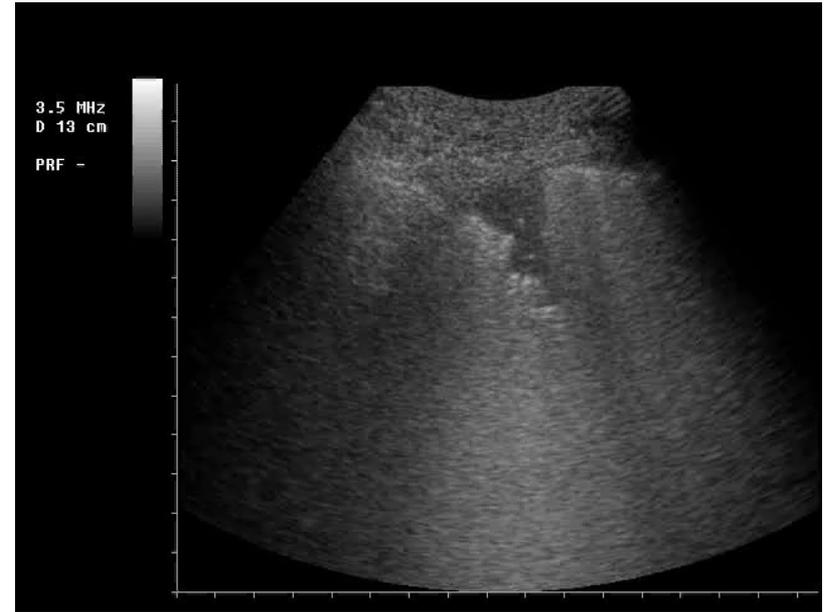
Lung ultrasound



Basic semiotics

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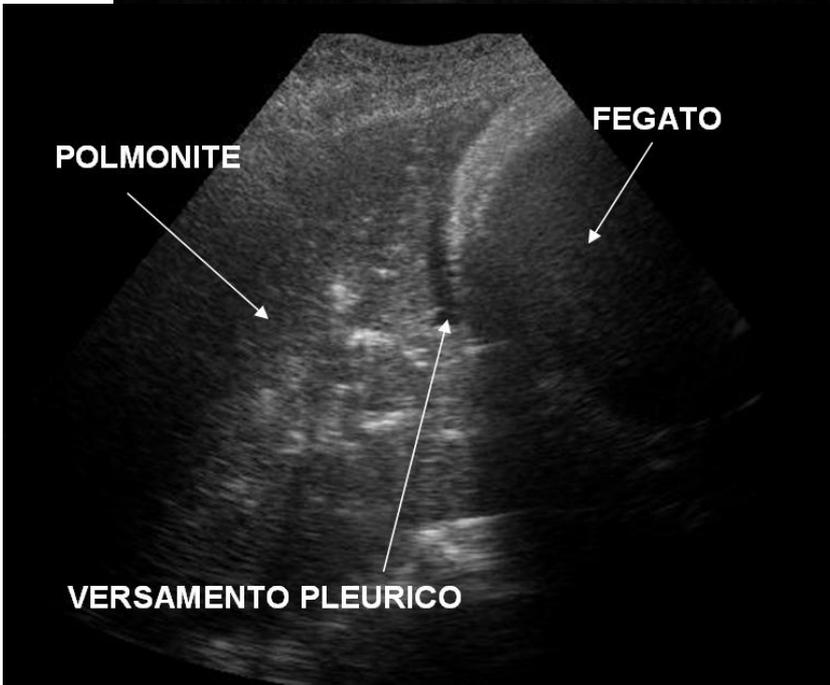
LINEA PLEURICA IPOECOGENA



POLMONITE

FEGATO

VERSAMENTO PLEURICO



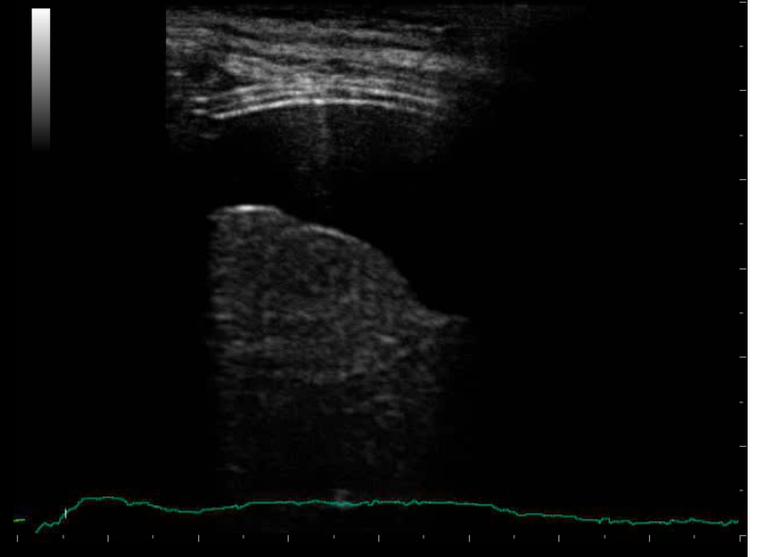
@saote MyLab IFC CNR PISA

B-----
OTT 17 2007 17:41
0:00:00.20

B F 10 MHz G 64%
P 6 cm XV C
PRC 7-3-B PRS M
PST 2

CARDIO E LAS23

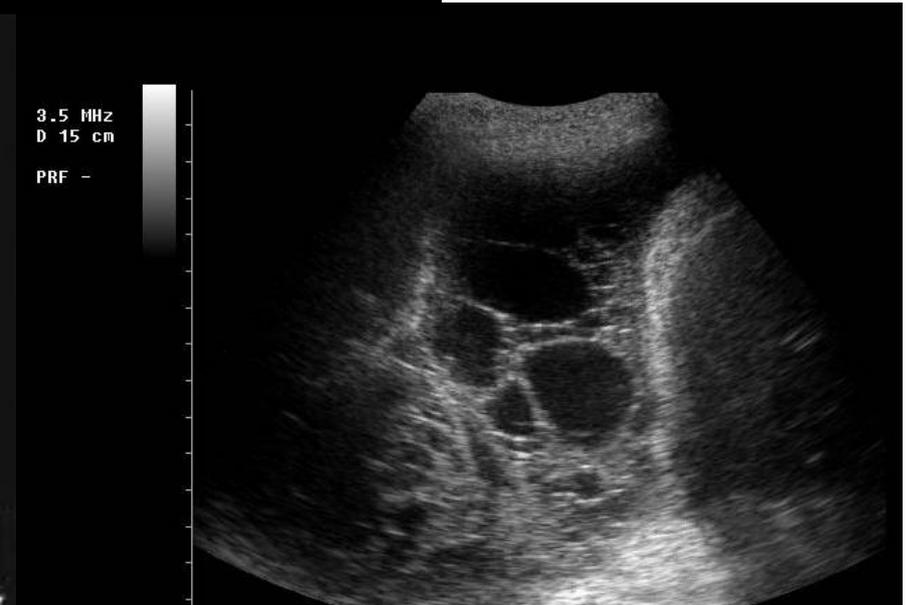
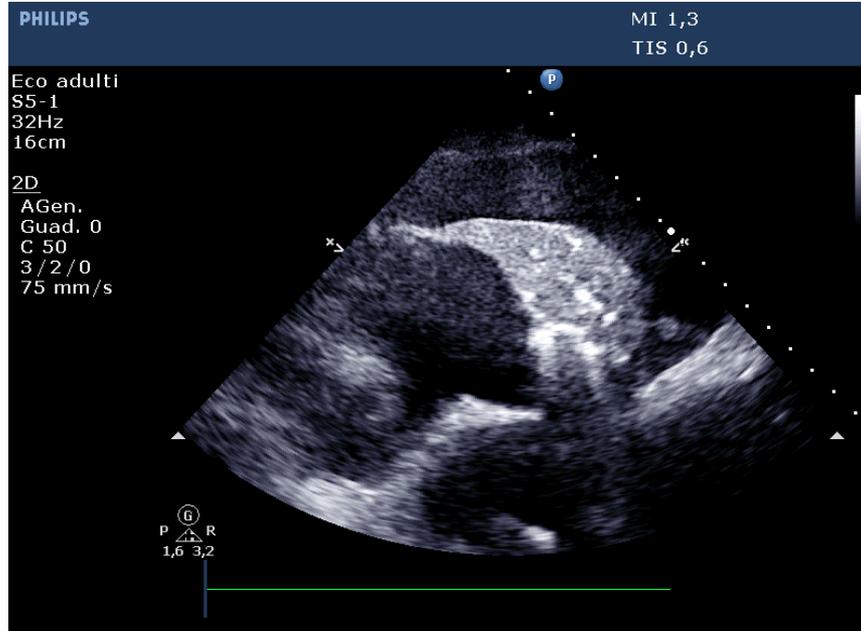
FC <<



Basic semiotics

- Lung sliding
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- Pleural effusion

Pleural effusion



Which probe?

Convex, microconvex



Universal probes

Linear probe



Pneumothorax,
pleural and sub-pleural alterations,
small consolidations

Cardiac probe



Interstitial syndrome,
pleural effusion,
large consolidations

Where to put the probe?

Heart failure



Dependent zones

Pleural effusion



Costophrenic angles

Pneumothorax



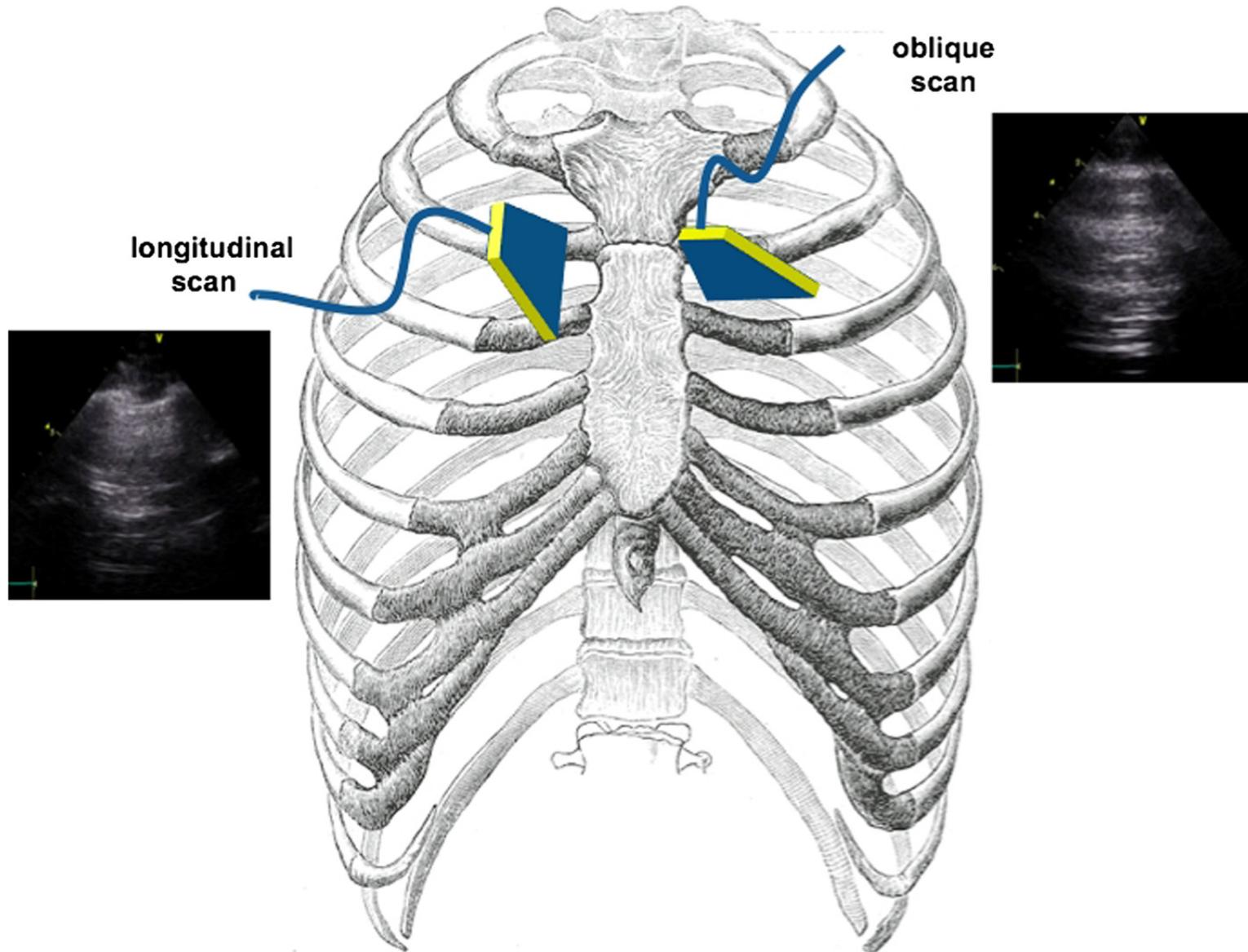
Anti-dependent zones

Consolidation

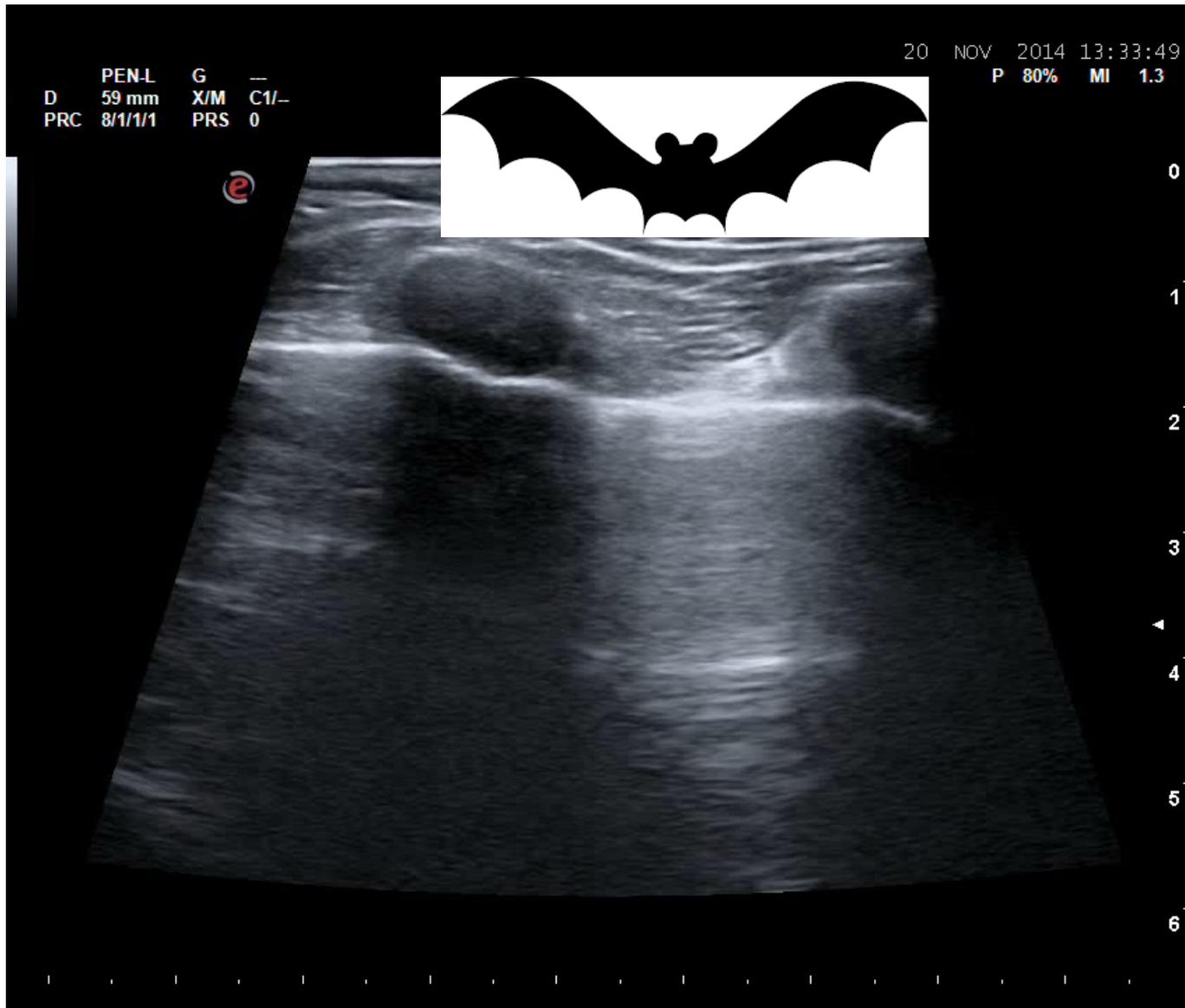


Painful zone

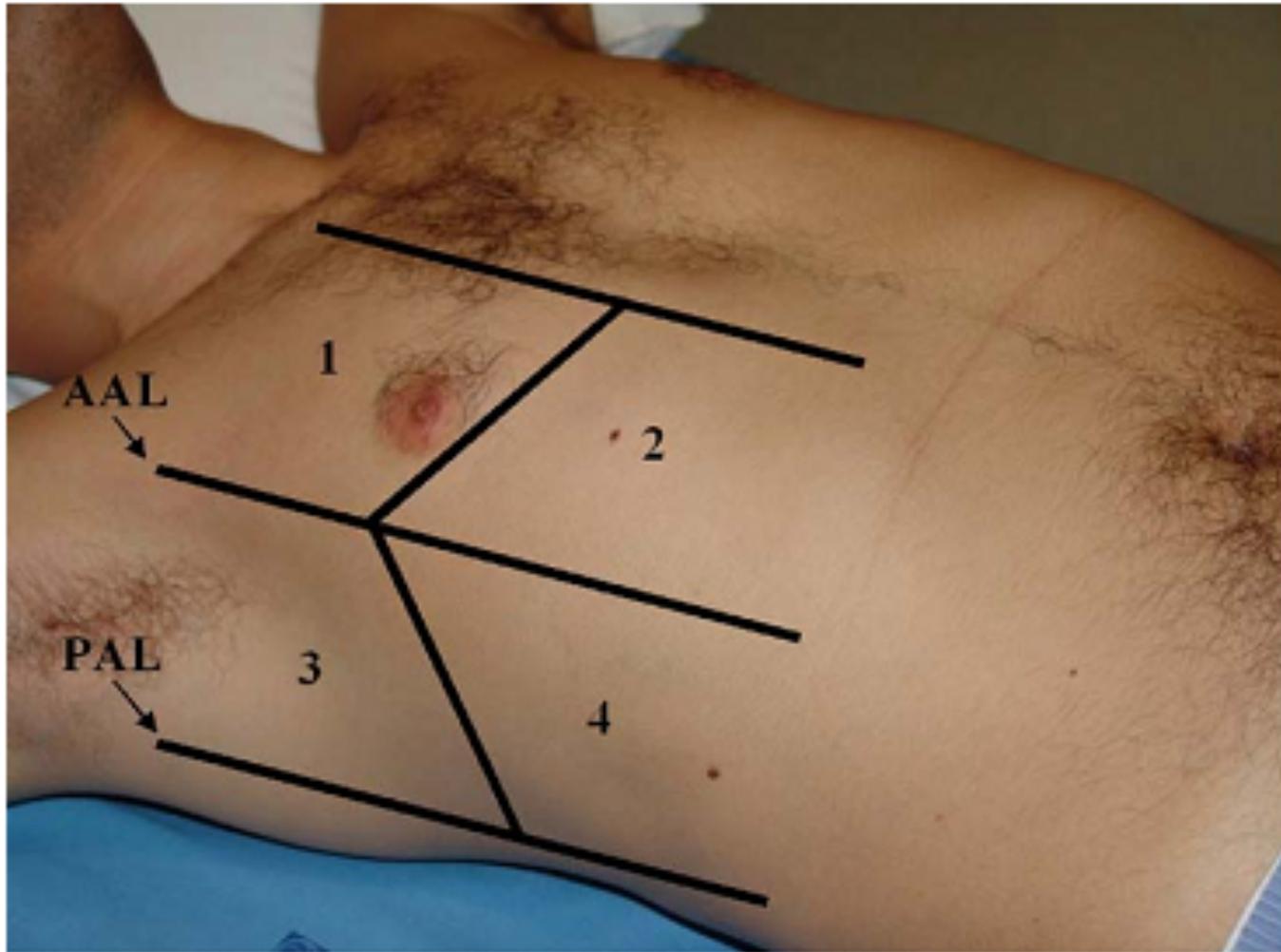
How to put the probe?



A Flemish bat sign



Methods



Methods

ANTERO-LATERAL CHEST

	Mid-axillary	Anterior axillary	Mid-clavear	Para-sternal	Inter-costal space	Para-sternal	Mid-clavear	Anterior axillary	Mid-axillary	
right side					2					left side
					3					
					4					
					5					

Three photographs illustrate the physical placement of the chest leads on a patient's torso, corresponding to the grid above. Orange arrows point from the grid to the photos:

- The first photo shows a lead placed in the **Anterior axillary** position on the **right side**.
- The second photo shows a lead placed in the **Para-sternal** position in the **Inter-costal space 4** on the **right side**.
- The third photo shows a lead placed in the **Anterior axillary** position on the **left side**.

Methods

POSTERIOR CHEST

