LA TECNICA DELL'ECOGRAFIA POLMONARE. APPLICAZIONE NEI QUADRI PIU' COMUNI DI INSUFFICIENZA RESPIRATORIA

ROBERTO COPETTI

DIRETTORE S.O.C.

PRONTO SOCCORSO-MEDICINA D'URGENZA

OSPEDALE DI LATISANA (UDINE)

robcopet@tin.it

CLINICAL EMERGENCY ULTRASOUND

LUNG : wet-dry, pnx, pneumonia, pleural effusion, ALI/ARDS, contusion, atelectasis, pulmonary embolism

HEART: systolic function, diastolic function, valvular disorders, pericardium, aorta

INFERIOR VENA CAVA: evaluation of volume status

ABDOMEN: free fluid, AAA, etc..

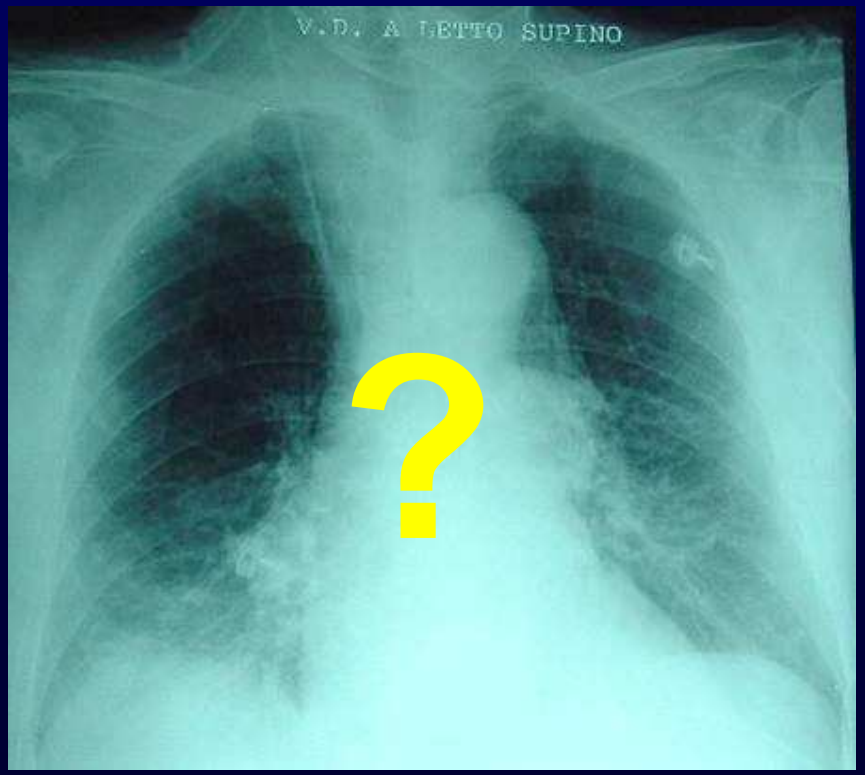
LEGS: DVT

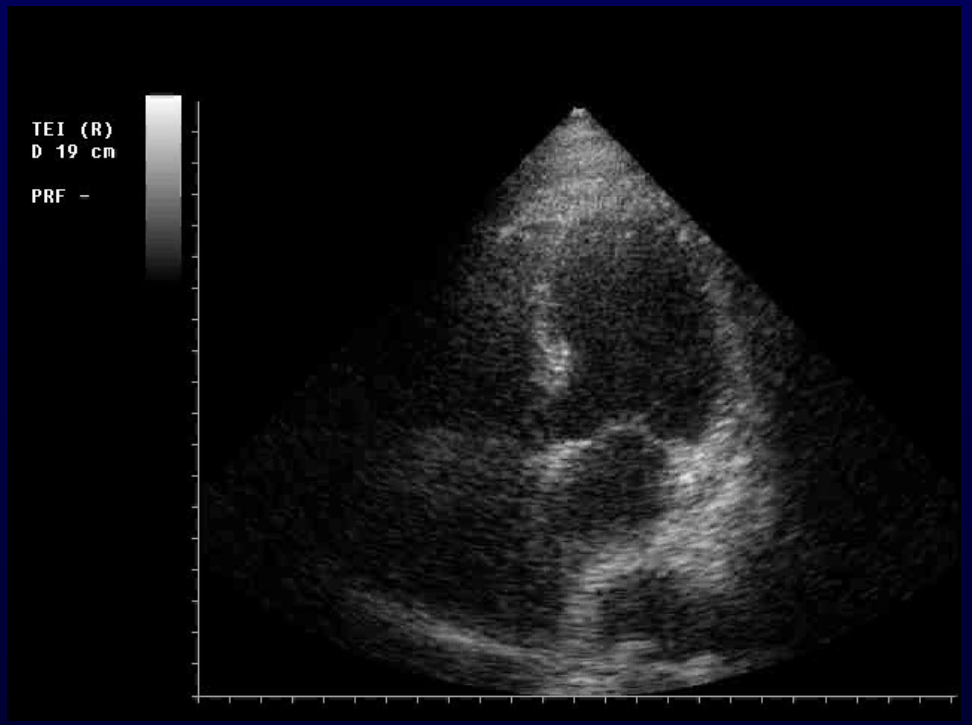
ULTRASOUND GUIDED PROCEDURES

FLUID AND DRUG THERAPHY MANAGEMENT


EMERGENCY ULTRASOUND
CARDIOLOGIST
ANGIOLOGIST
GYNAECOLOGIST
RADIOLOGIST

- ACUTE RESPIRATORY DISTRESS AFTER AORTIC BIFEMORAL BYPASS
- HYPERTENSION, CHRONIC A.F.
- RALES ON RIGHT LUNG BASE
- BP 180/115. HR 115 AF. Sat O_2 90% (FiO_2 0.4). TT 38.5°C





ULTRASOUND AND ALVEOLAR-INTERSTITIAL SYNDROME

The comet-tail artifact. An ultrasound sign of alveolar-interstitial syndrome.

Lichtenstein D, Meziere G, Biderman P, Gepner A, Barre O.

Am J Respir Crit Care Med. 1997 Nov;156(5):1640-6.

Intensive Care Med (1999) 25: 383–388

ORIGINAL

D. Lichtenstein
G. Mezière
P. Biderman
A. Gepner

The comet-tail artifact: an ultrasound sign ruling out pneumothorax

Vet Clin North Am Equine Pract. 1986 Apr;2(1):49-66.

Diseases of the thorax.

Rantanen NW.

Abstract

Diagnostic ultrasound is an important adjunct to existing methods in the diagnosis of thoracic disease in the horse. This article discusses scanning techniques, anatomy of the thoracic cavity, and how diagnosis of pleural effusion, pulmonary abscessation, pneumothorax, and vegetative endocarditis may be facilitated by ultrasound.

J Am Vet Med Assoc. 1989 Jan 15;194(2):278-82.

Ultrasonography as a diagnostic aid in horses with anaerobic bacterial pleuropneumonia and/or pulmonary abscessation: 27 cases (1984-1986).

Reimer JM, Reef VB, Spencer PA.

LUNGS ULTRASOUND IN ADULTS

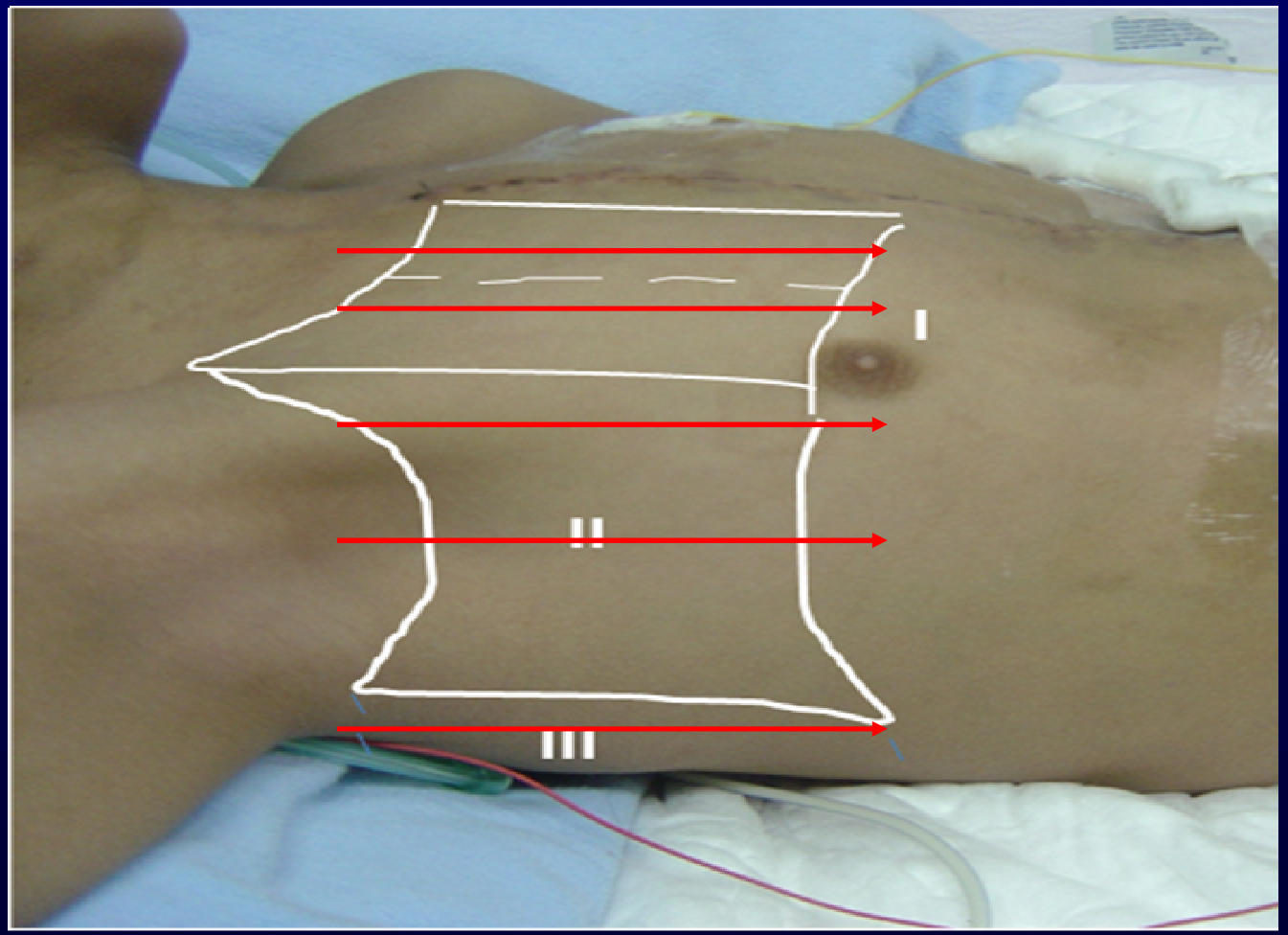
- PLEURAL EFFUSION
- ALVEOLAR-INTERSTITIAL SYNDROME
- PNEUMOTHORAX
- PNEUMONIA
- ATELECTASIS
- ALI/ARDS
- PULMONARY EMBOLISM
- PULMONARY CONTUSION

LUNG EXAMINATION

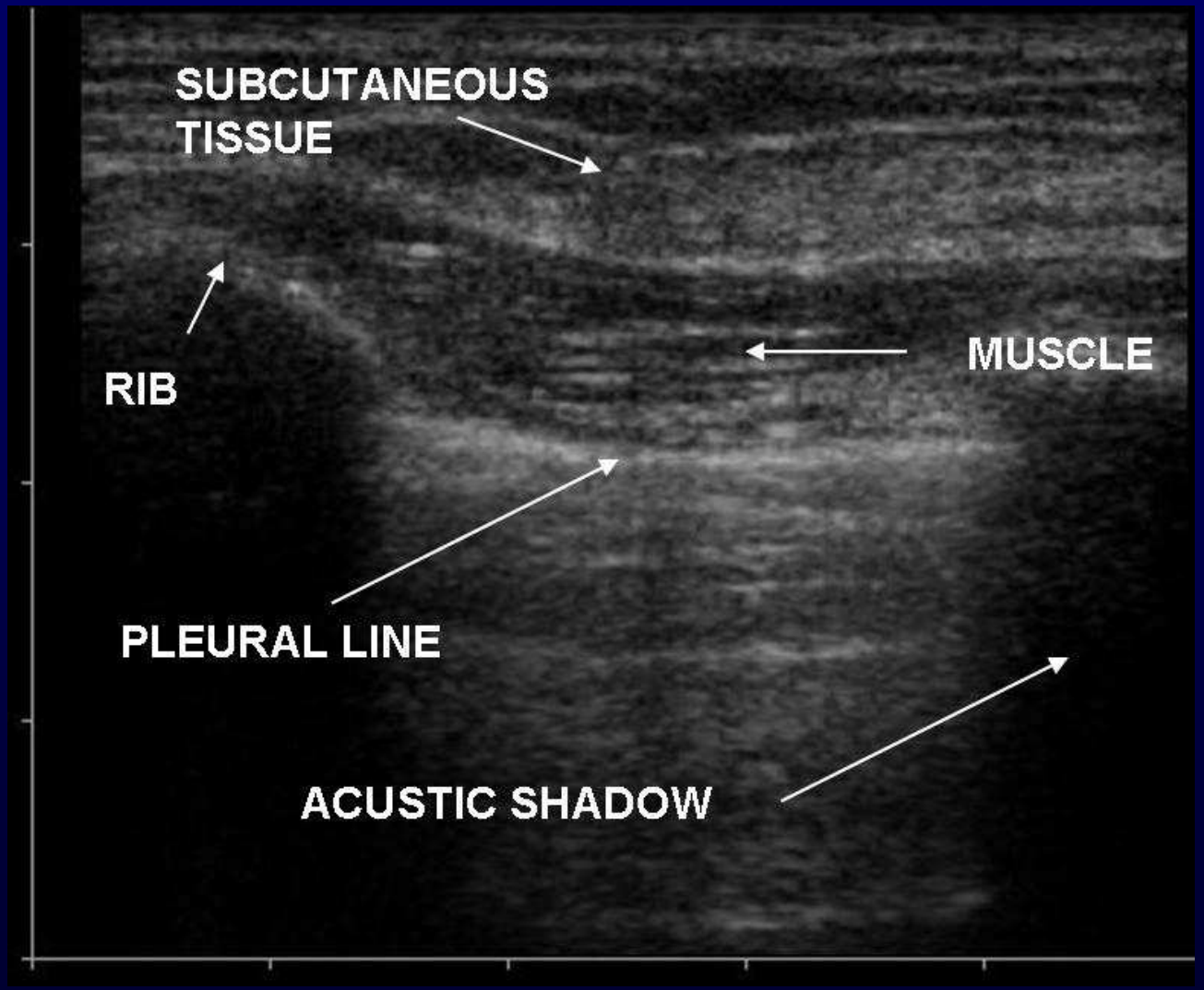
Posterior wall

Anterior and lateral wall

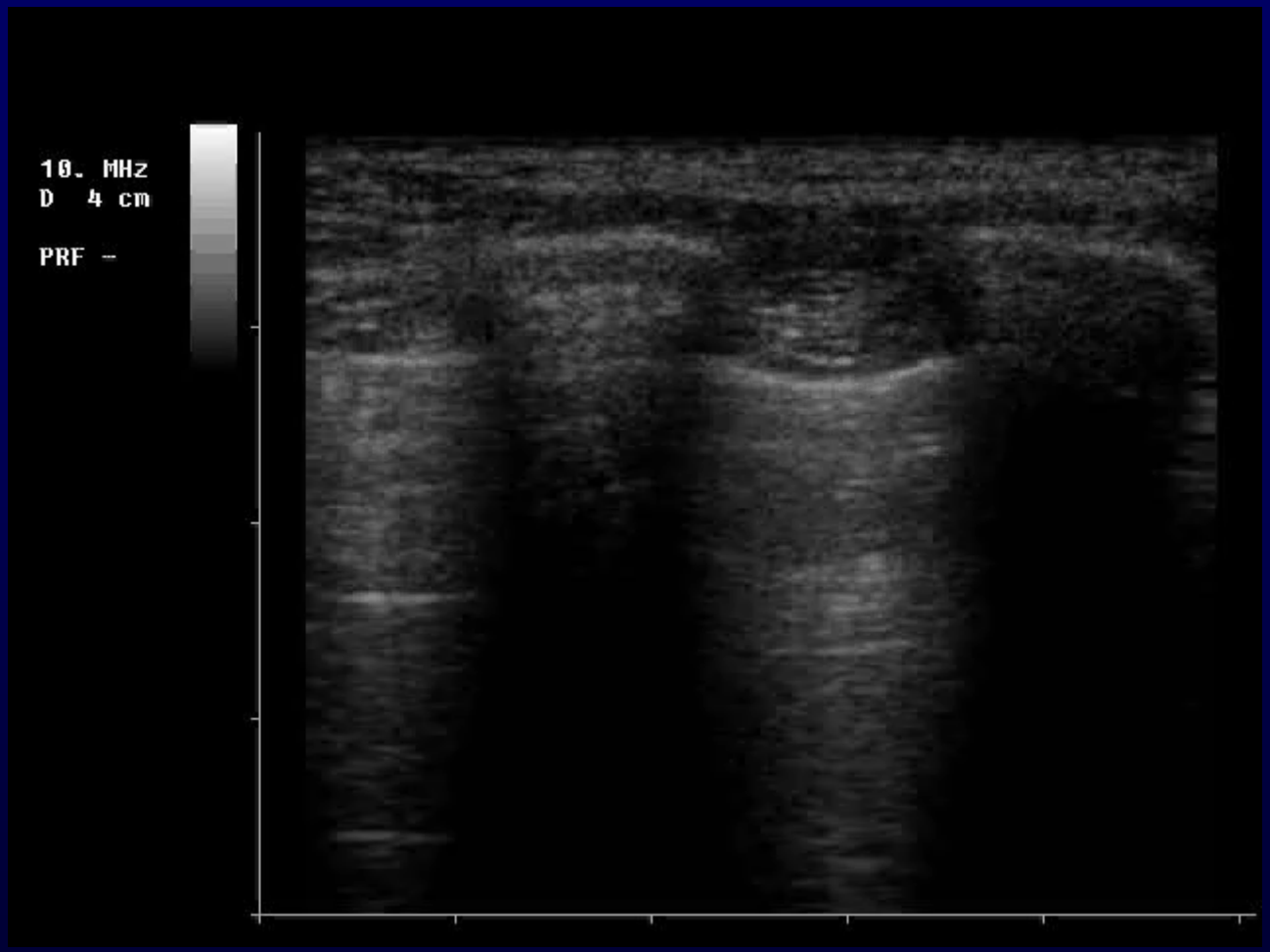
WHERE TO FERMORM THE SCANS ?



ULTRASOUND ANATOMY OF THE THORAX

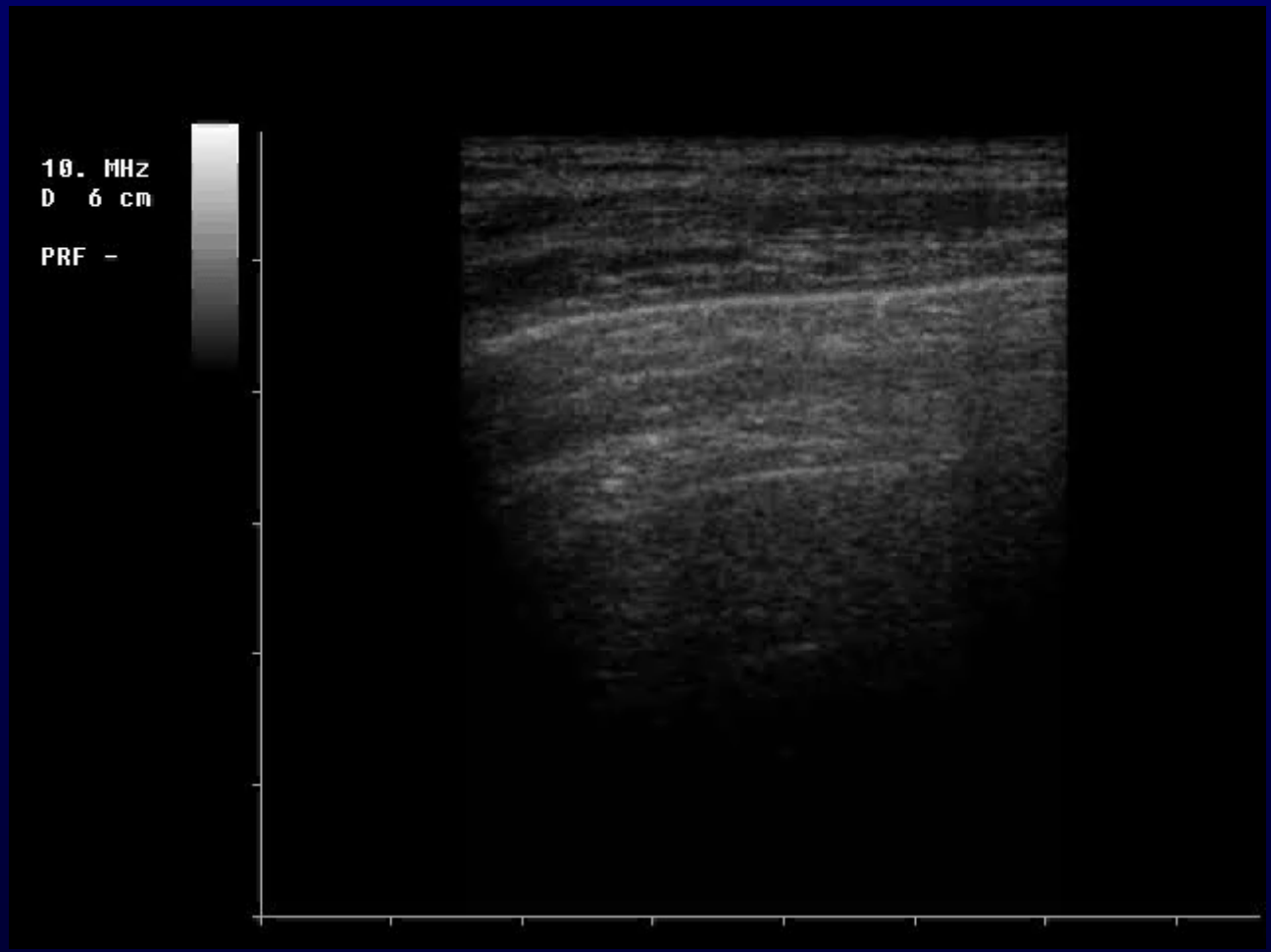


NORMAL LUNG



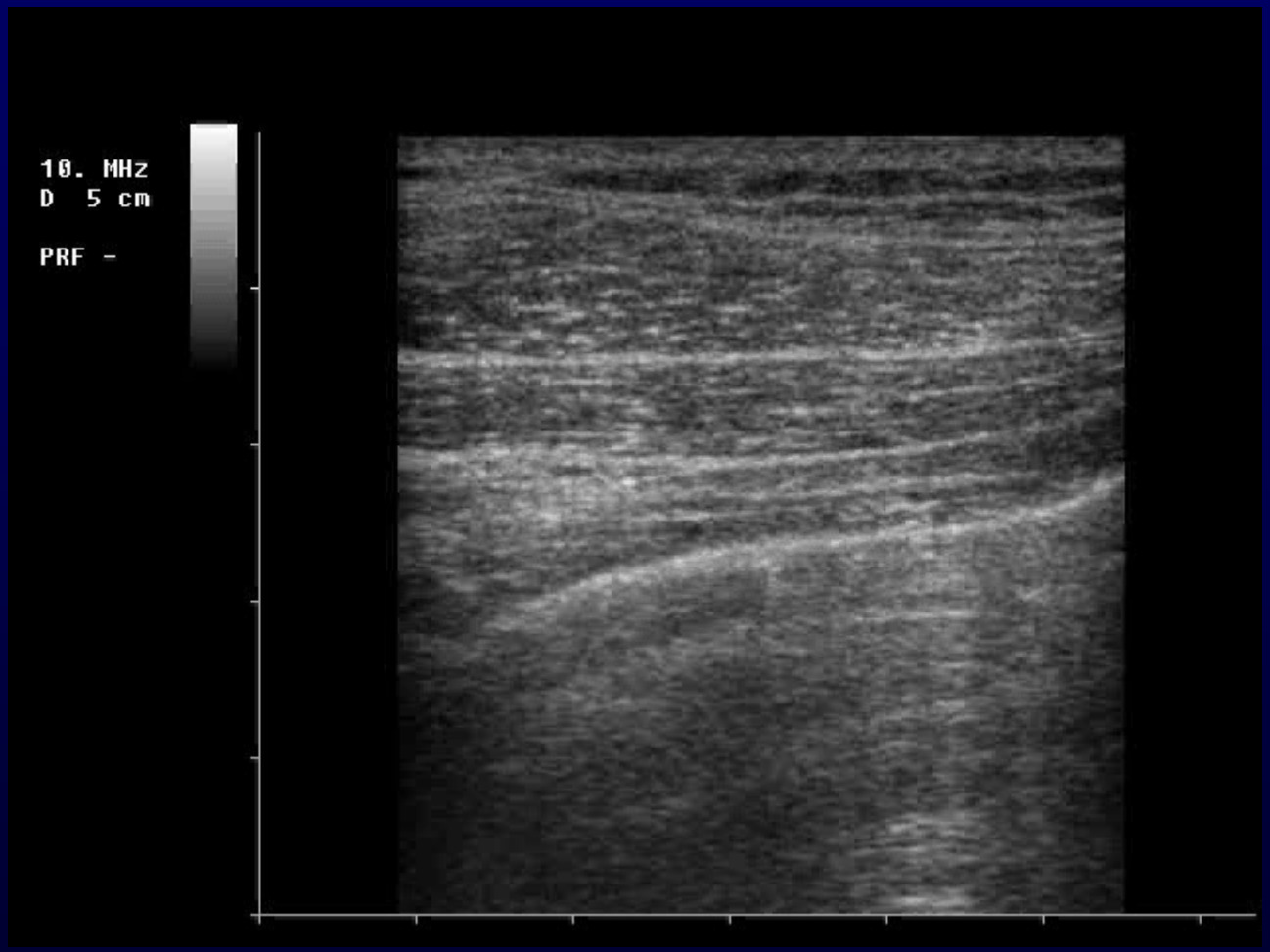
LONGITUDINAL SCAN

NORMAL LUNG

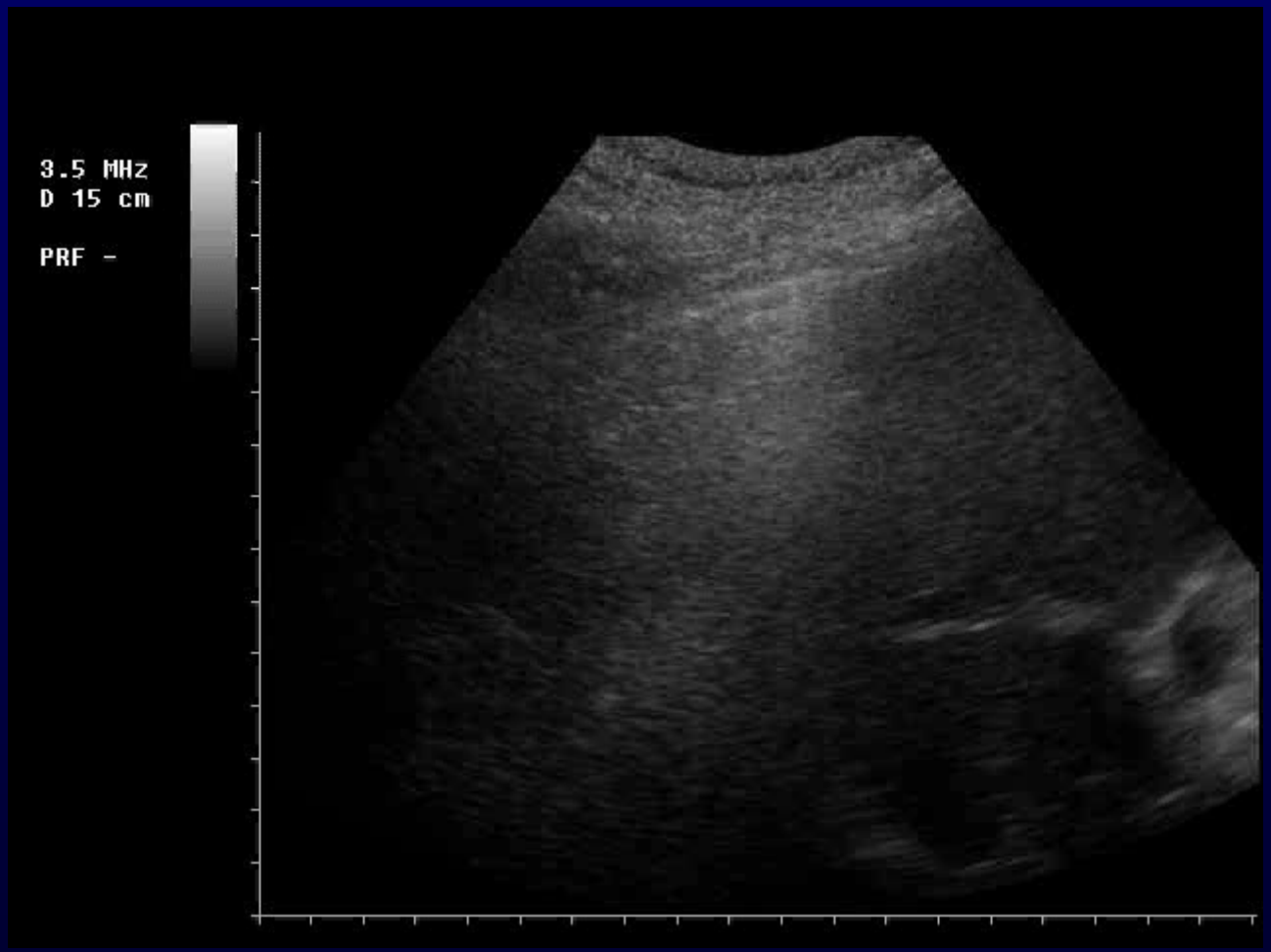


TRANSVERSAL SCAN

APICAL “SLIDING”



BASE “SLIDING”

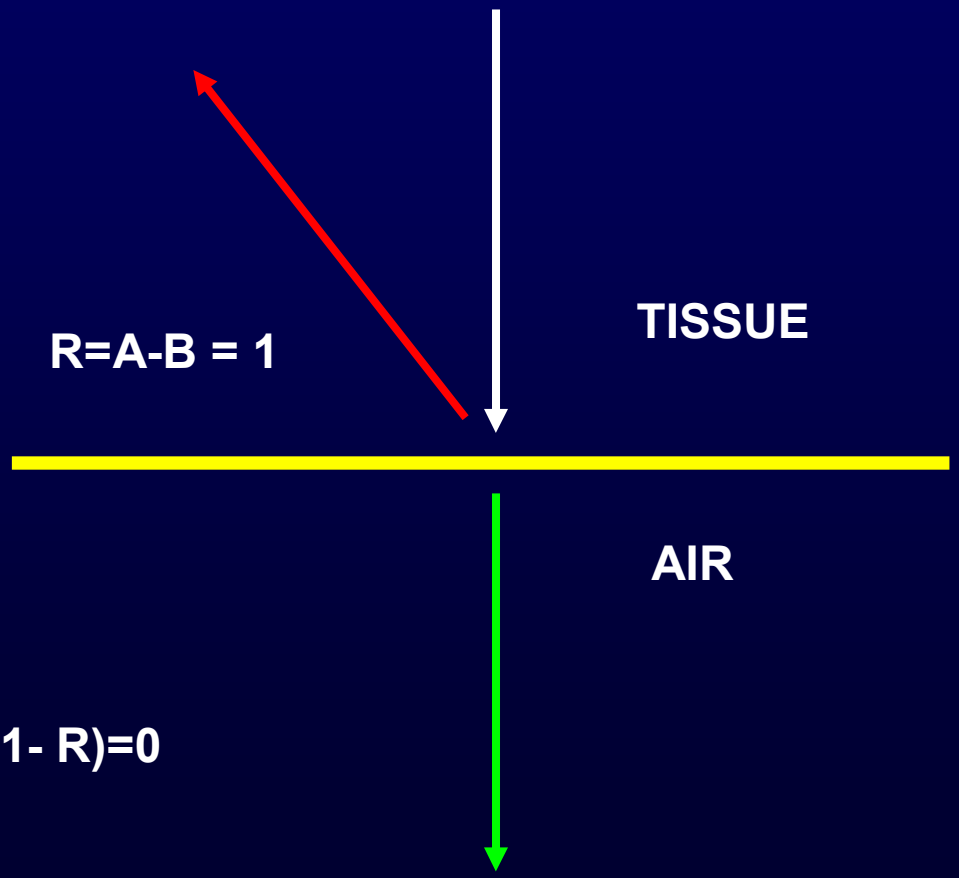


IMPOSSIBLE PICTURES

ACOUSTIC IMPEDANCE

Air 0.0004 X 10^5 g/cm^2 X s (B)

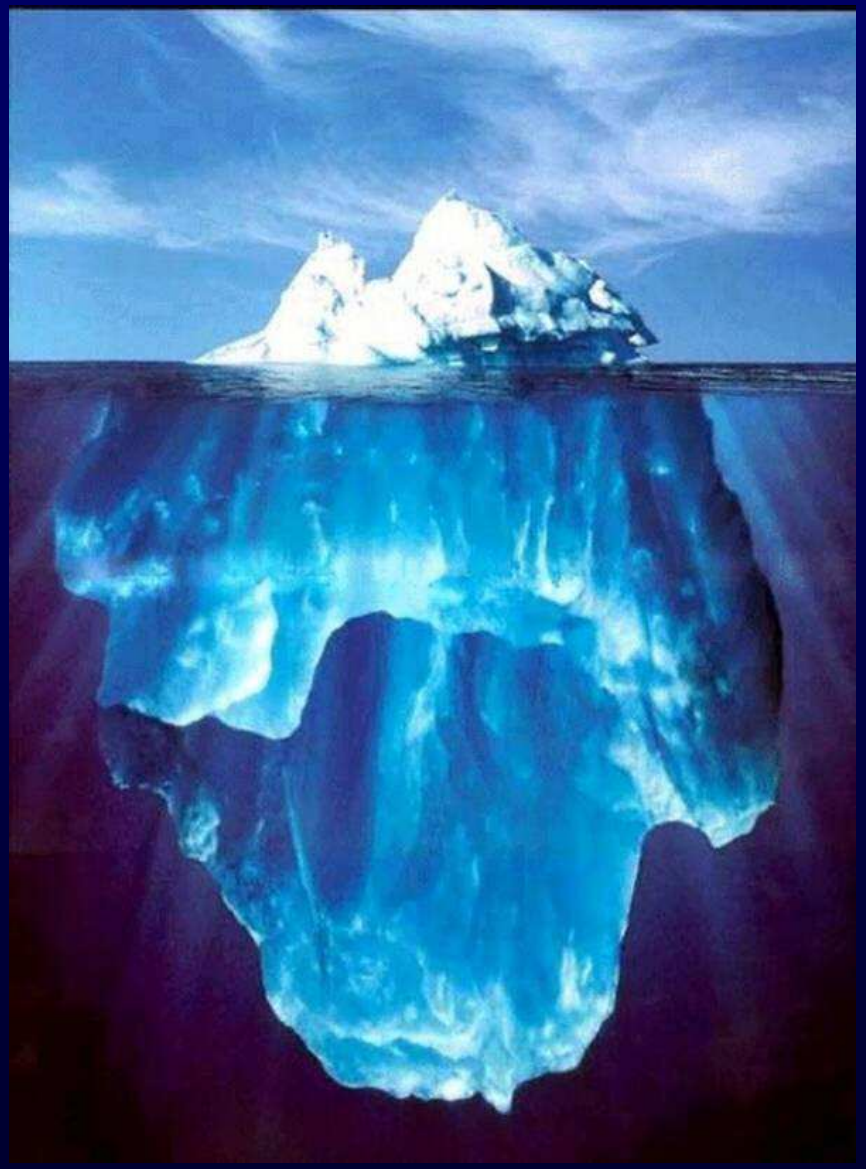
Tissue 1.6 X 10^5 g/cm^2 X s (A)



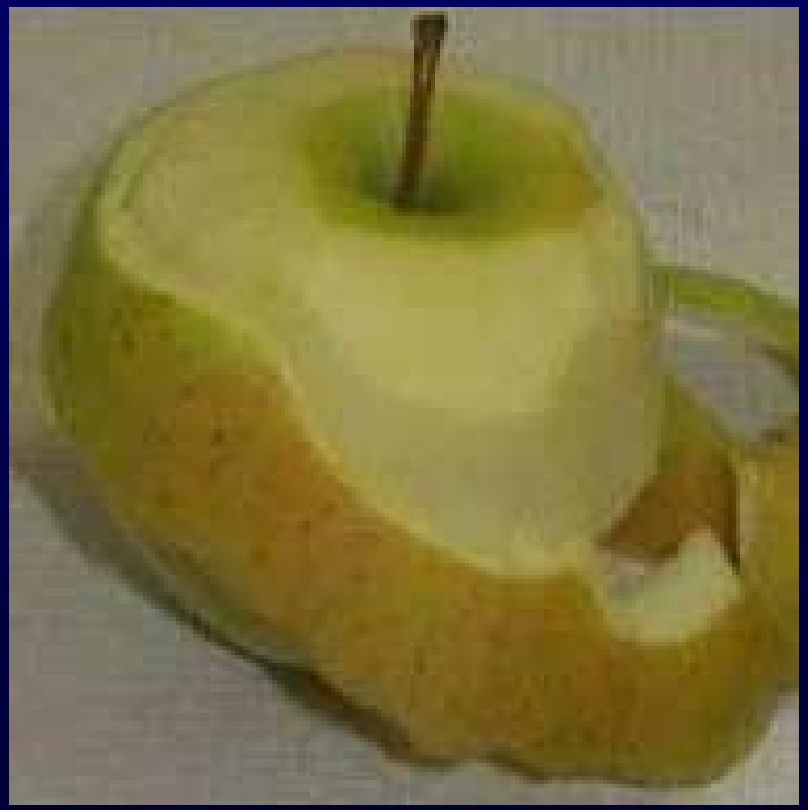
FRACTION OF REFLECTED ENERGY R=A-B = 1

FRACTION OF TRANSMITTED ENERGY (1- R)=0

THE TIP OF THE ICEBERG=PLEURAL LINE



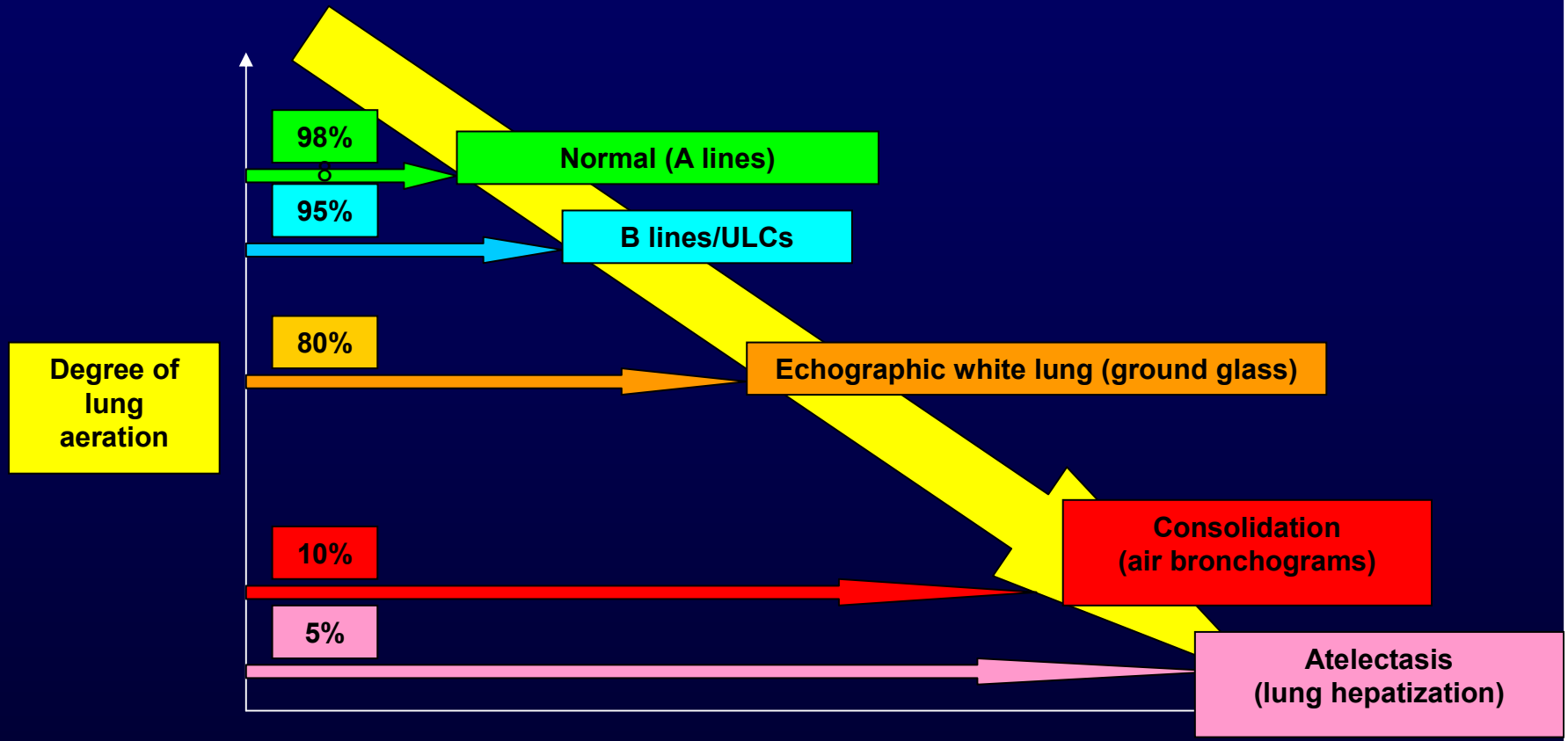
THE PEEL



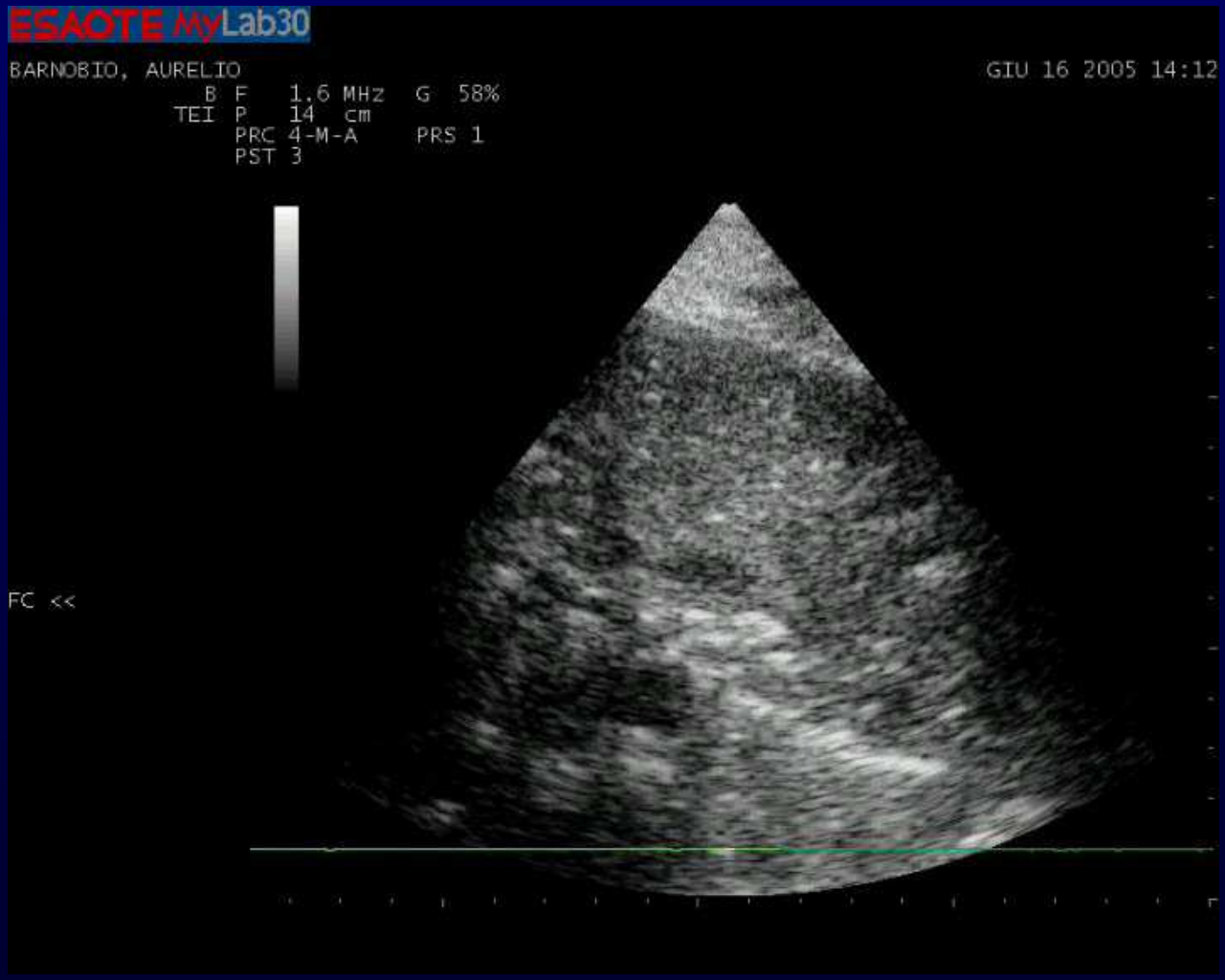
ROTTEN APPLE

THE BROKEN MIRROR

DEGREE OF LUNG AERATION, ARTIFACTS AND REAL IMAGES

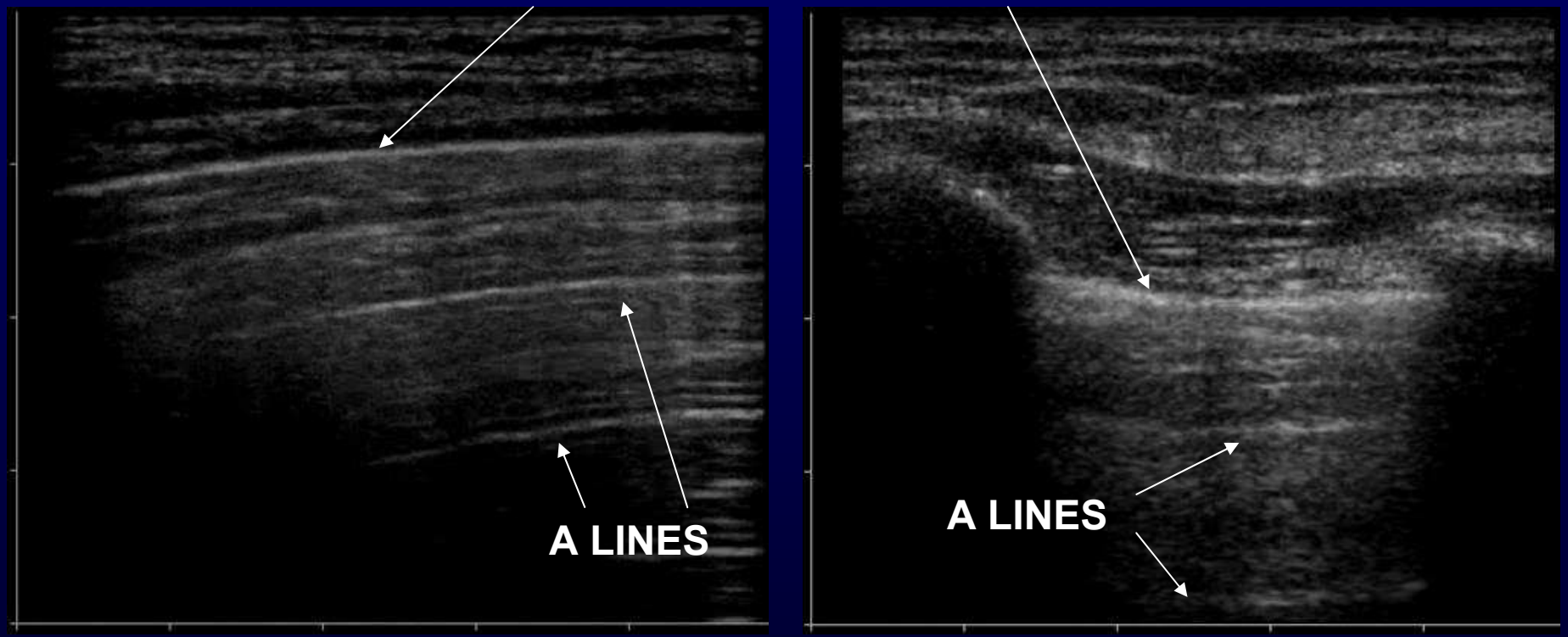


EXPANSION OF THE LUNG AFTER CORRECT TUBE PLACEMENT



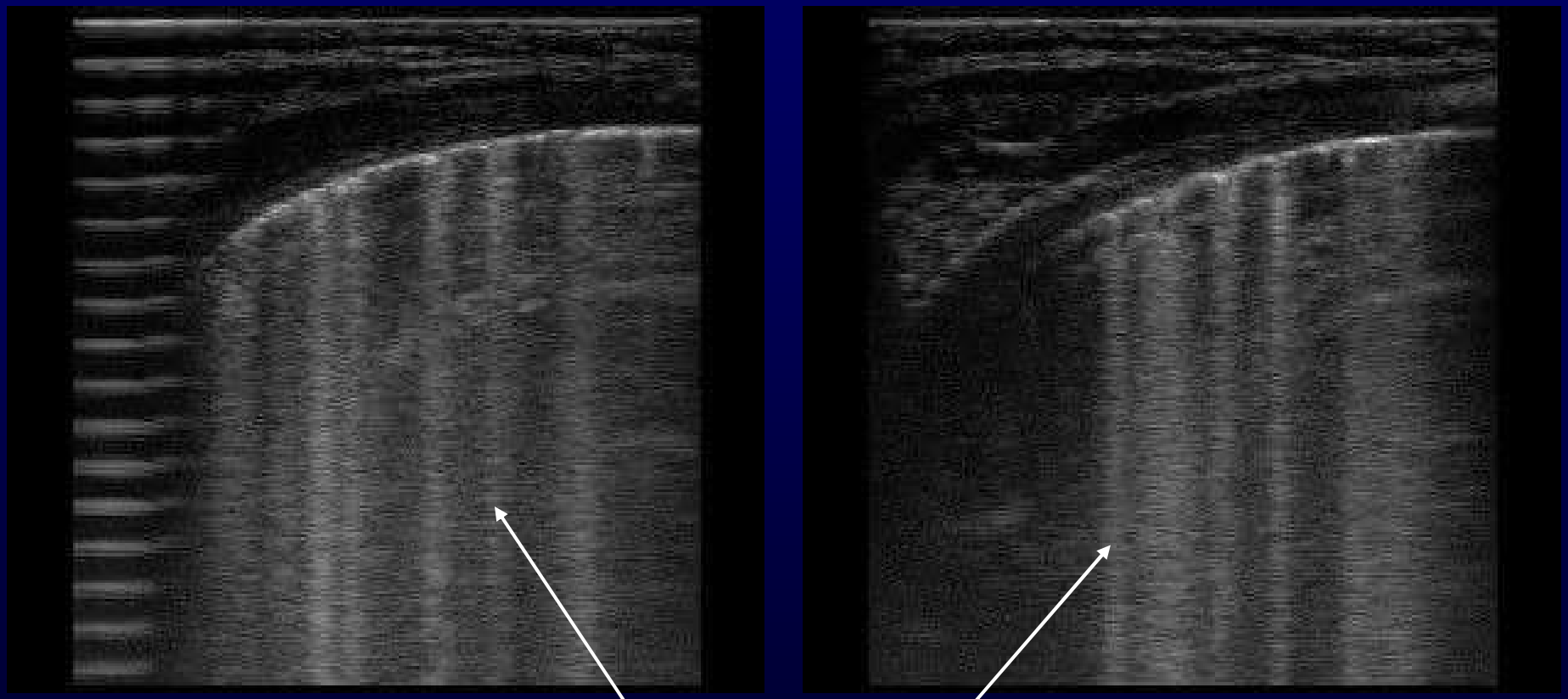
NORMAL LUNG

REGULAR PLEURAL LINE

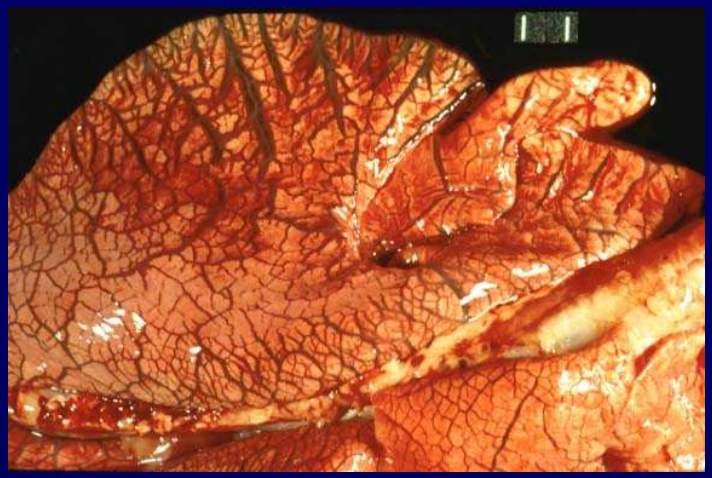


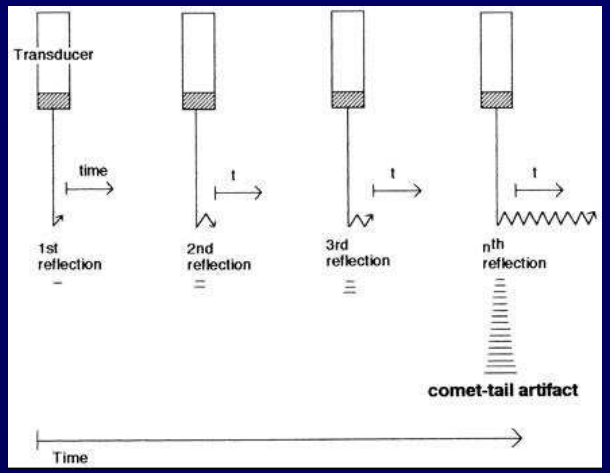
REGULAR PLEURAL LINE – A LINES –"LUNG SLIDING"

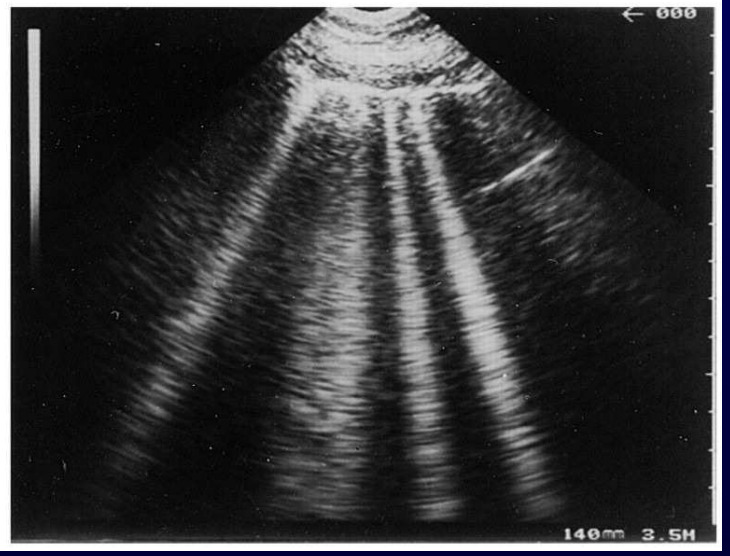
ALVEOLAR-INTERSTITIAL SYNDROME



ULCs / B LINES







Lichtenstein D. et al. The comet-tail artifact. An ultrasound sign of alveolar-interstitial syndrome. Am J Respir Crit Care Med. 1997 Nov;156(5):1640-6.

Sonographic Interstitial Syndrome

The Sound of Lung Water

Gino Soldati, MD, Roberto Copetti, MD, Sara Sher, MD

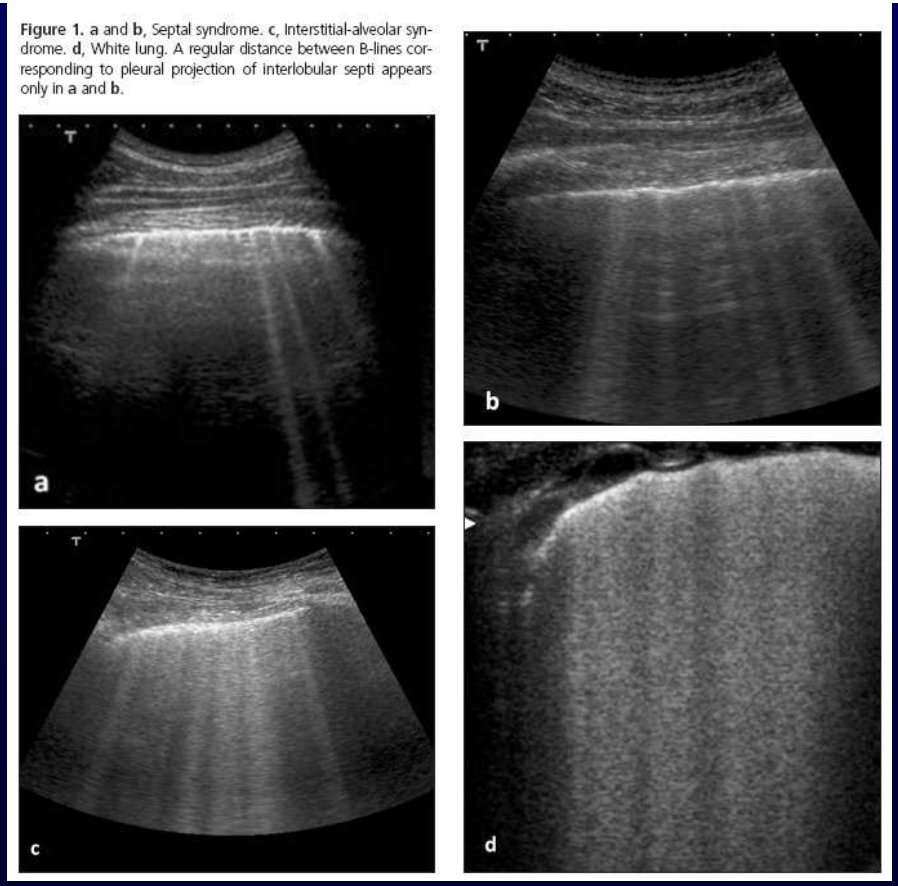
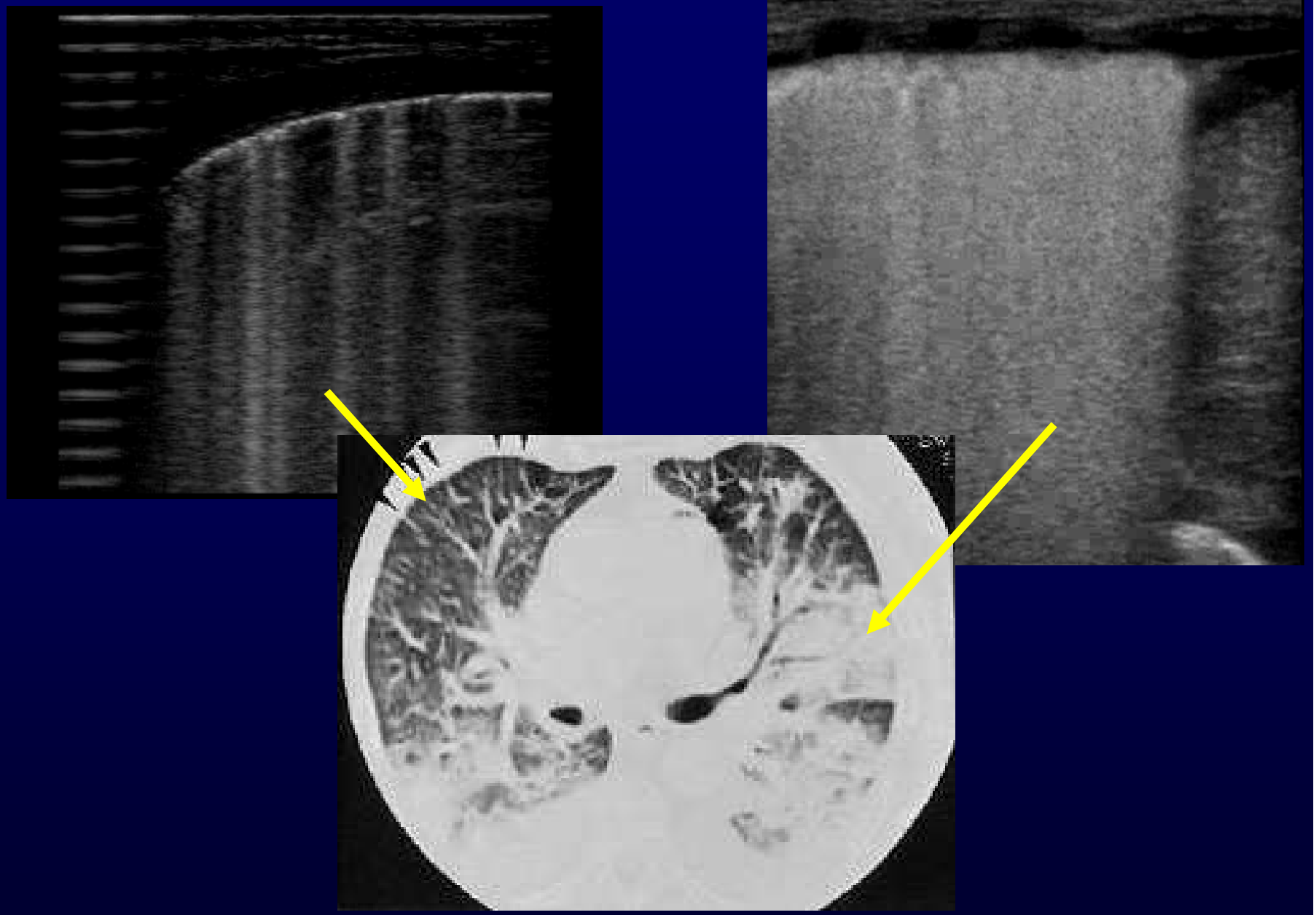


Figure 1. a and **b**, Septal syndrome. **c**, Interstitial-alveolar syndrome. **d**, White lung. A regular distance between B-lines corresponding to pleural projection of interlobular septi appears only in a and **b**.

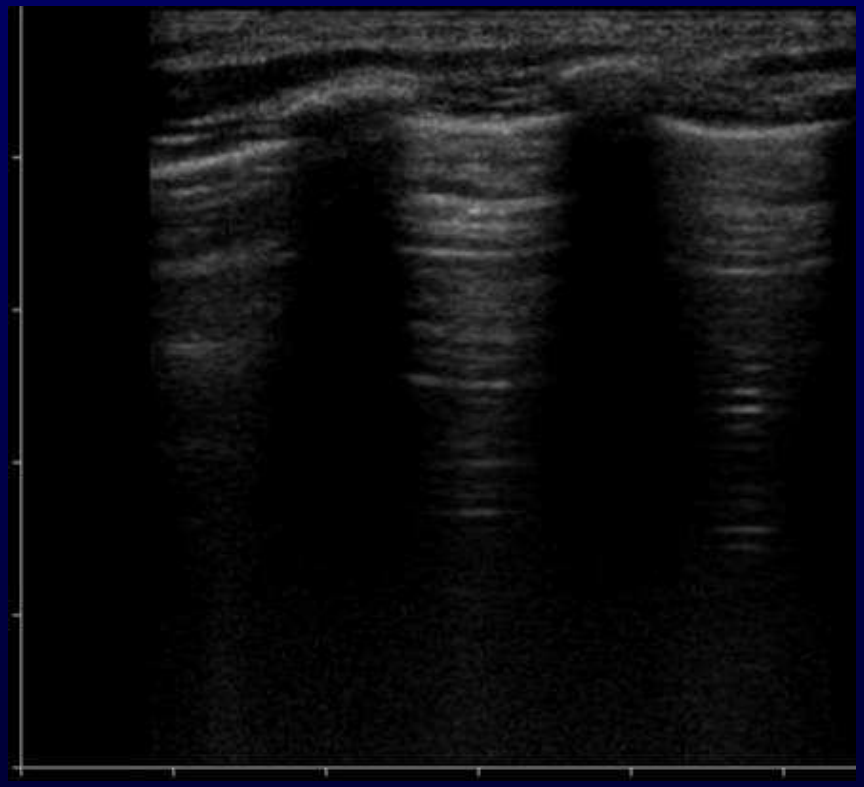
J Ultrasound Med 2009; 28:163–174

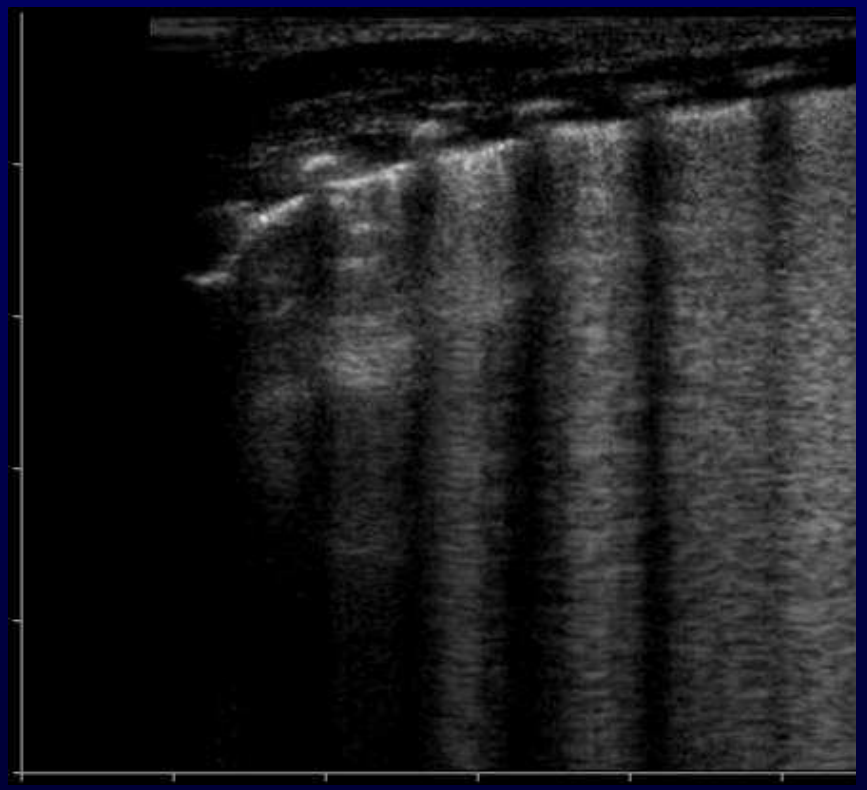


Lichtenstein D. et al. The comet-tail artifact. An ultrasound sign of alveolar-interstitial syndrome. Am J Respir Crit Care Med. 1997 Nov;156(5):1640-6.

NORMAL

PATHOLOGIC

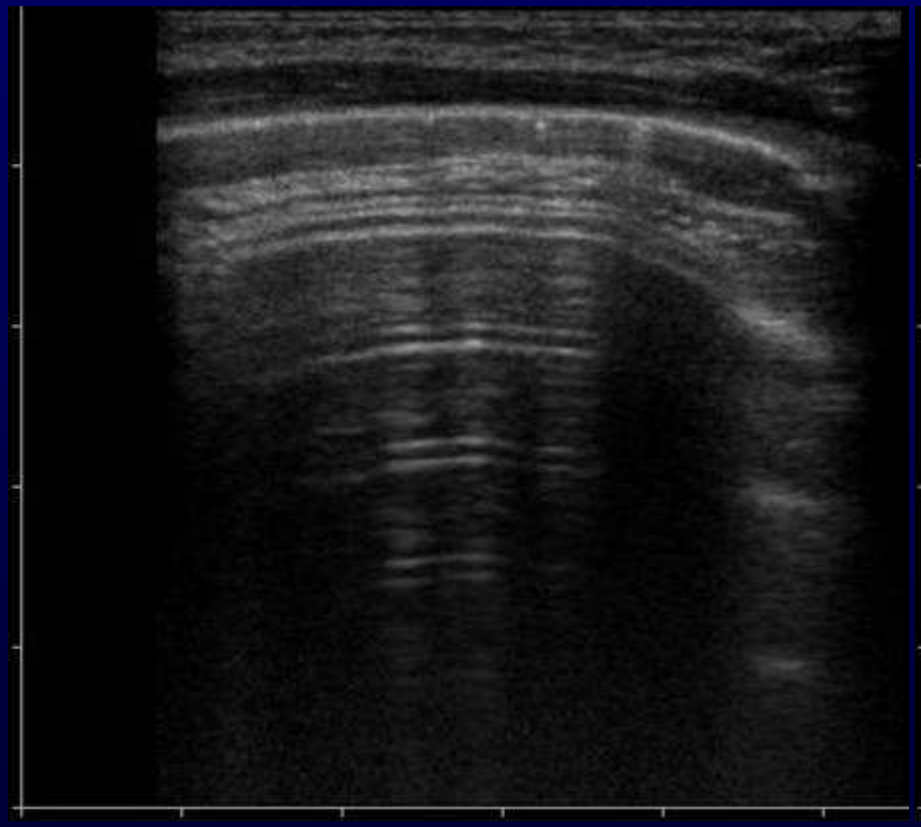


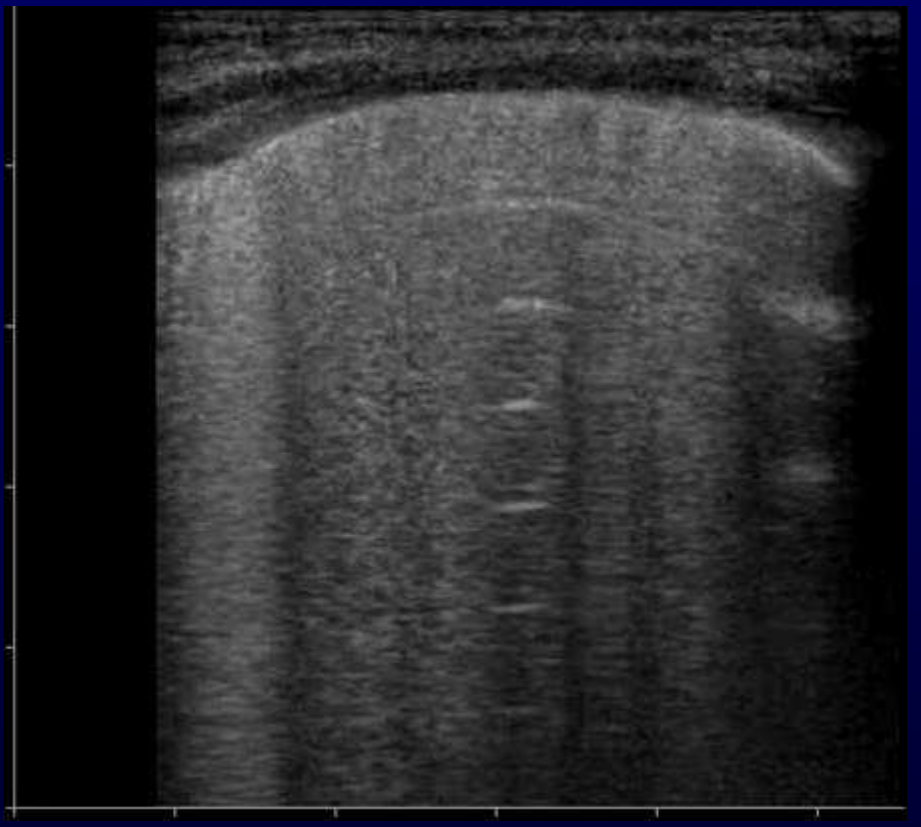


LONGITUDINAL SCAN

NORMAL

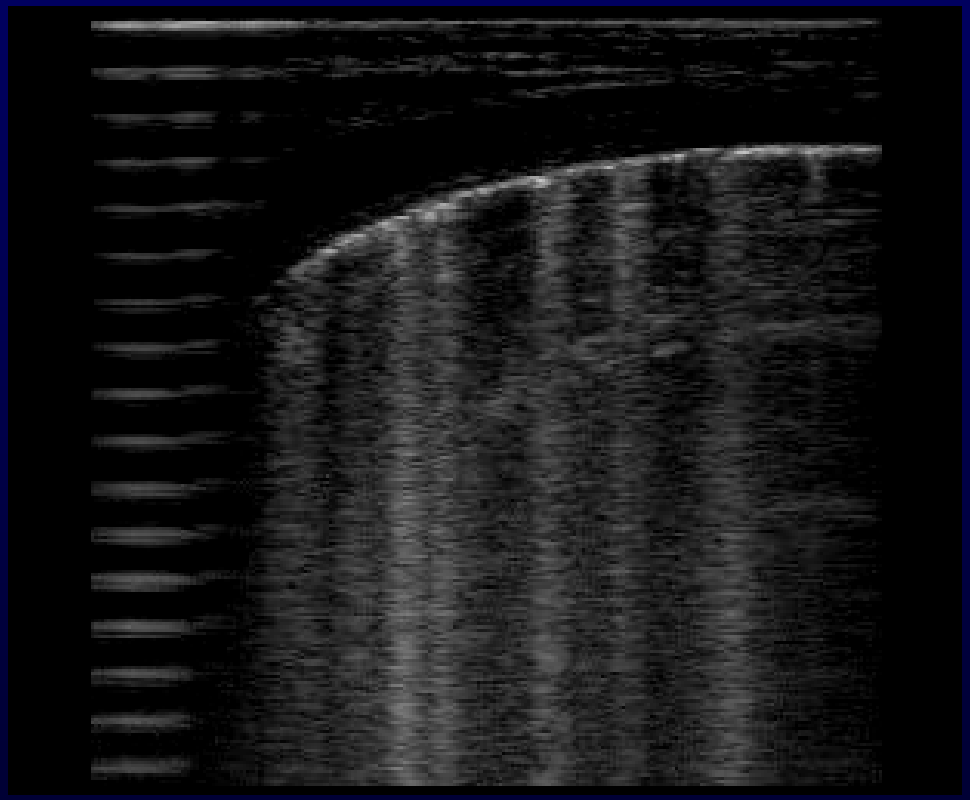
PATHOLOGIC



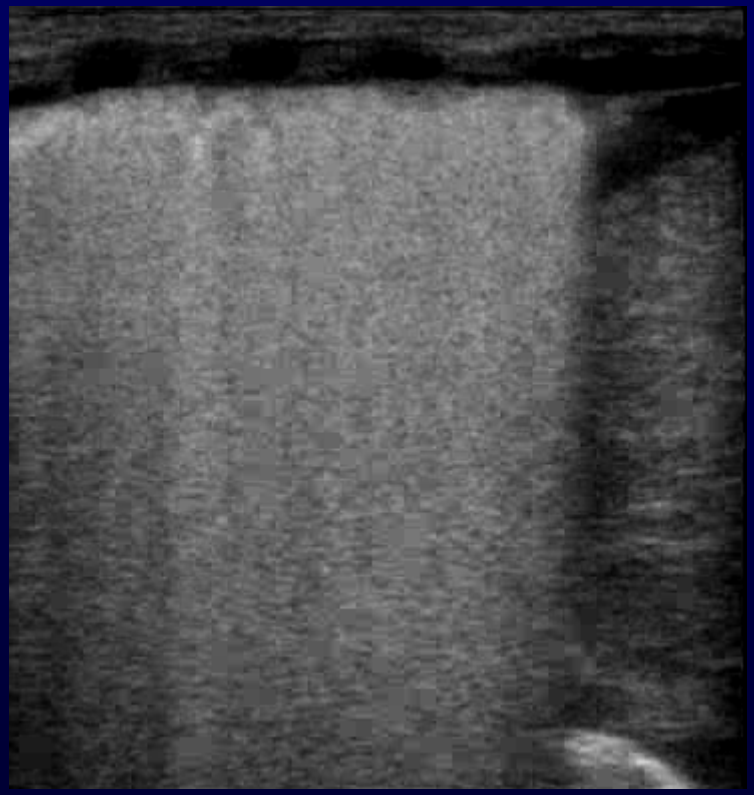


TRANSVERSAL SCAN

DEGREE OF THE ALVEOLAR-INTERSTITIAL SYNDROME

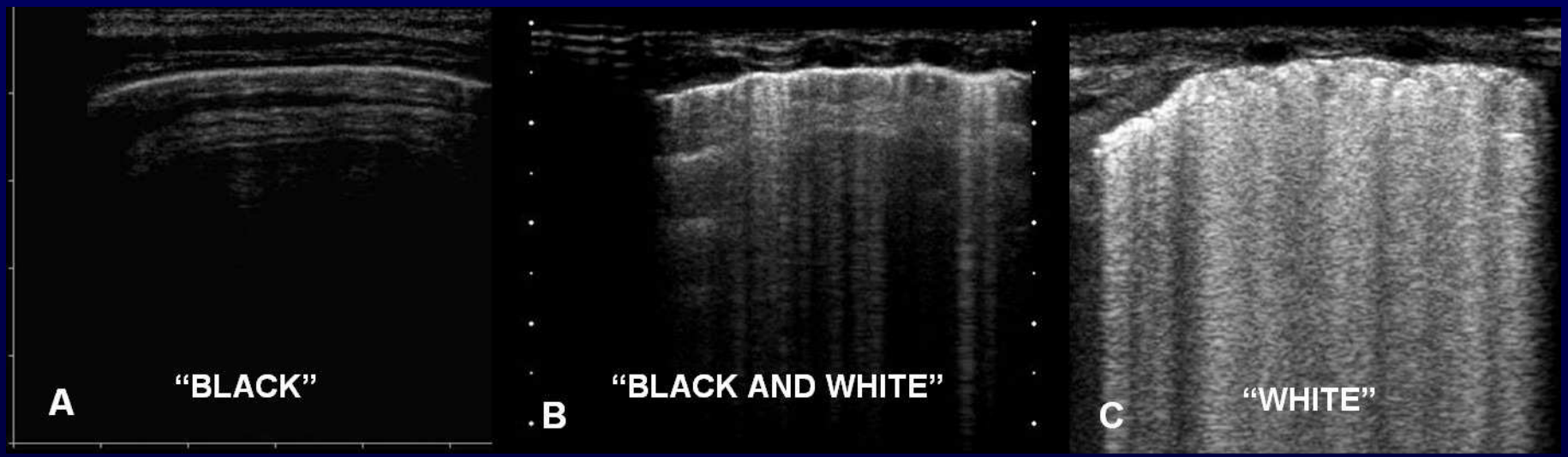


FEW ULCs



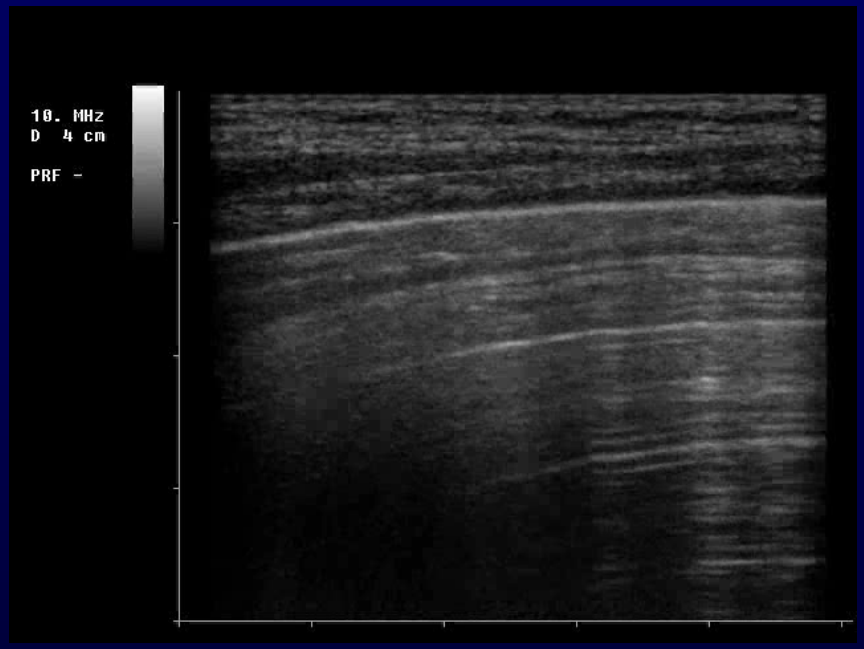
ECHOGRAPHIC “WHITE LUNG”

ULTRASOUND SEMEIOTICS OF ALVEOLAR-INTERSTITIAL SYNDROME

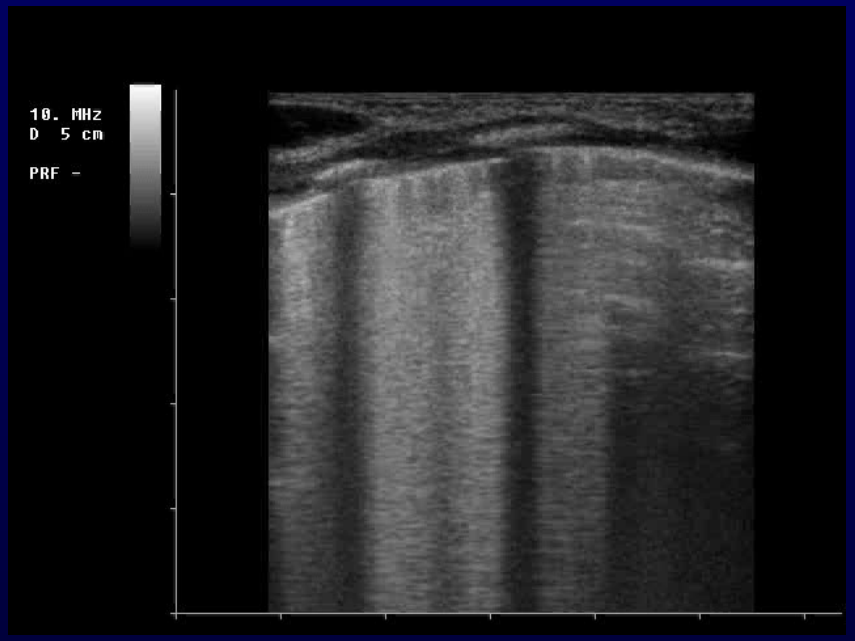


Frassi F, Tesorio P, Gargani L, Agrusta M, Mottola G, Picano E: Le comete ultrasoniche polmonari: un nuovo segno ecografico di acqua extravascolare polmonare. G Ital Cardiol 2007; 8 (suppl 1– 4).

WHICH ONE IS NORMAL?

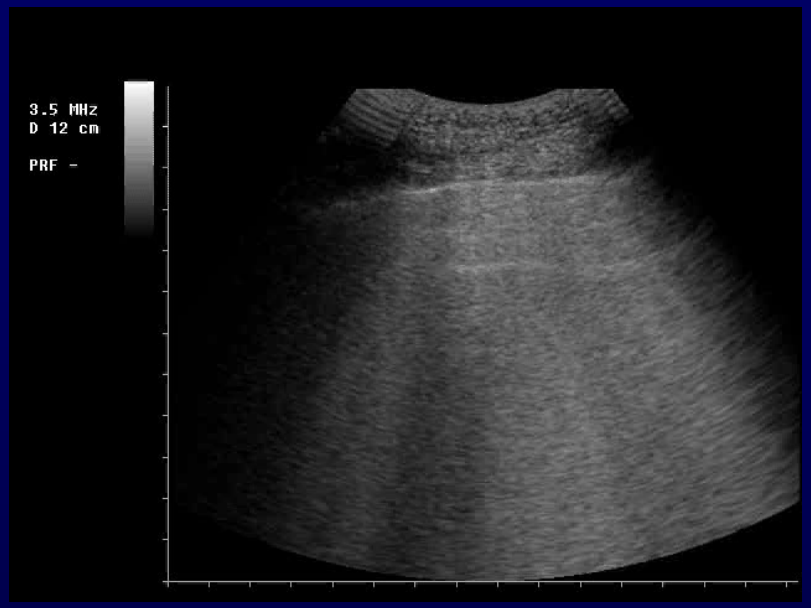


A

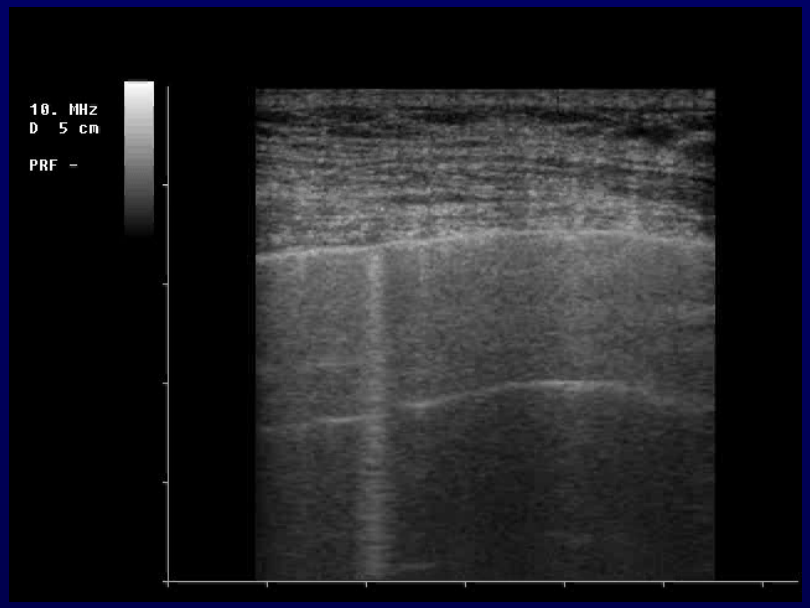


B

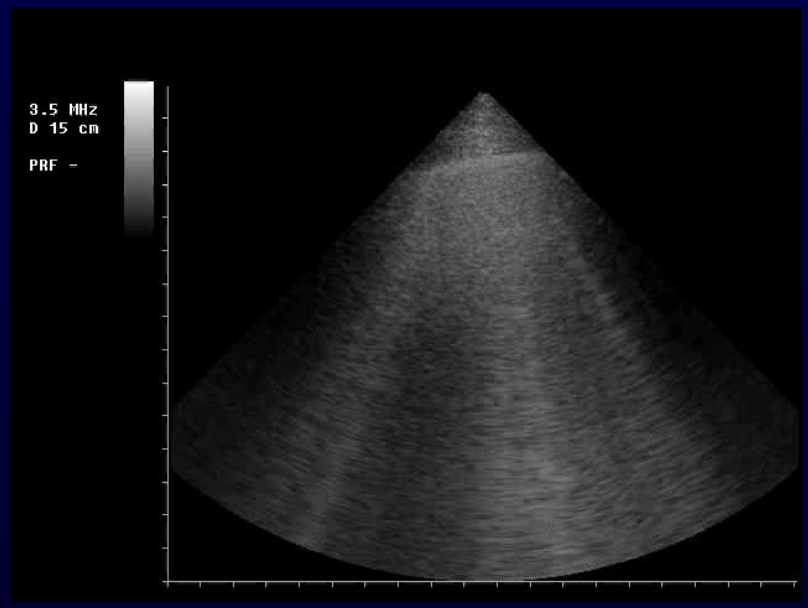
ACUTE PULMONARY EDEMA



CONVEX

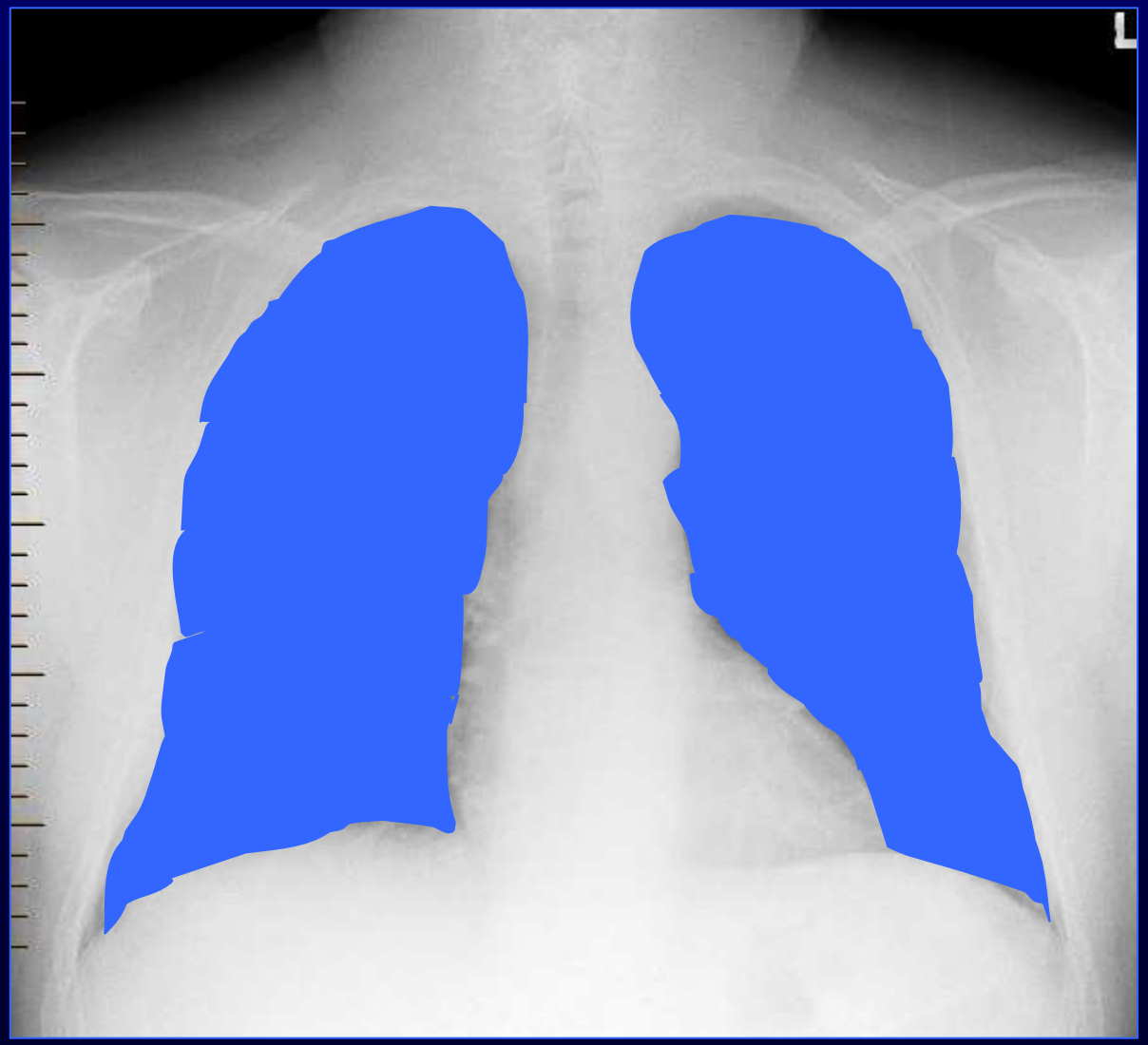


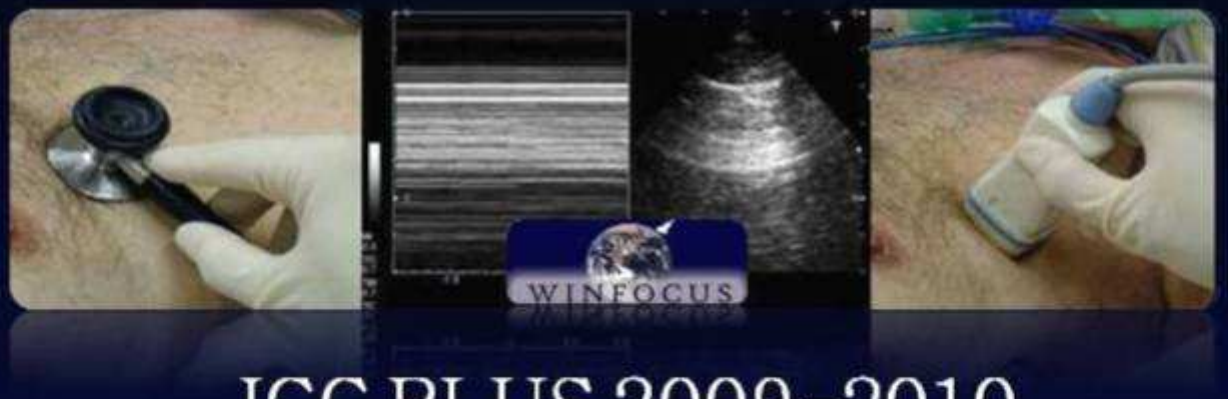
LINEAR



SECTOR

CARDIOGENIC PULMONARY EDEMA





ICC PLUS 2009-2010

1st International Consensus Conference on

Pleural & Lung UltraSound

1st Session

November 28-29, 2009

Sheraton Hotel Airport
Bologna, Italy

2nd Session

May 11-12, 2010

National Research Council
Pisa, Italy

3rd Session

October 7-9, 2010

'A. Gemelli' University
Rome, Italy


PROMOTED BY
1st INTERNATIONAL CONSENSUS CONFERENCE ON
PLEURAL AND LUNG ULTRASOUND
First Session
November 28 – 29, 2009

ULTRASOUND AND ALVEOLAR-INTERSTITIAL SYNDROME

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Lichtenstein D, Meziere G, Biderman P, Gepner A, Barre O.

Am J Respir Crit Care Med. 1997 Nov;156(5):1640-6.

A lung ultrasound sign allowing bedside distinction between pulmonary edema and COPD: the comet-tail artifact.

Lichtenstein D, Meziere G.

Intensive Care Med. 1998 Dec;24(12):1331-4.

"Ultrasound comet-tail images": a marker of pulmonary edema: a comparative study with wedge pressure and extravascular lung water.

Agricola E, Bove T, Oppizzi M, Marino G, Zangrillo A, Margonato A, Picano E.

Chest. 2005 May;127(5):1690-5.

ULTRASOUND AND ALVEOLAR-INTERSTITIAL SYNDROME

1: J Am Soc Echocardiogr. 2006 Apr;19(4):457-63.

Assessment of stress-induced pulmonary interstitial edema by chest ultrasound during exercise echocardiography and its correlation with left ventricular function.

Agricola E, Picano E, Oppizzi M, Pisani M, Meris A, Fragasso G, Margonato A.

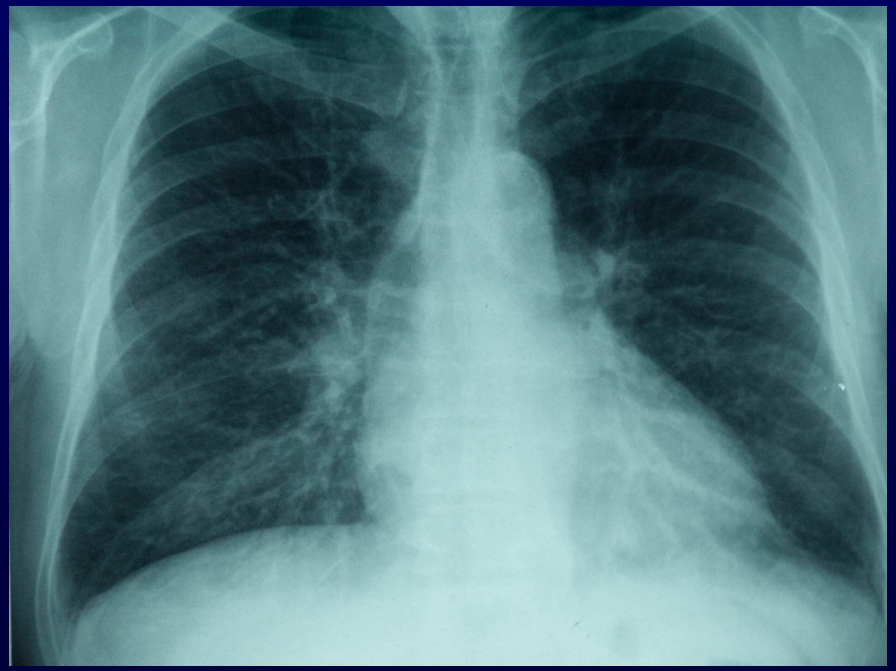
WET OR DRY LUNG ?

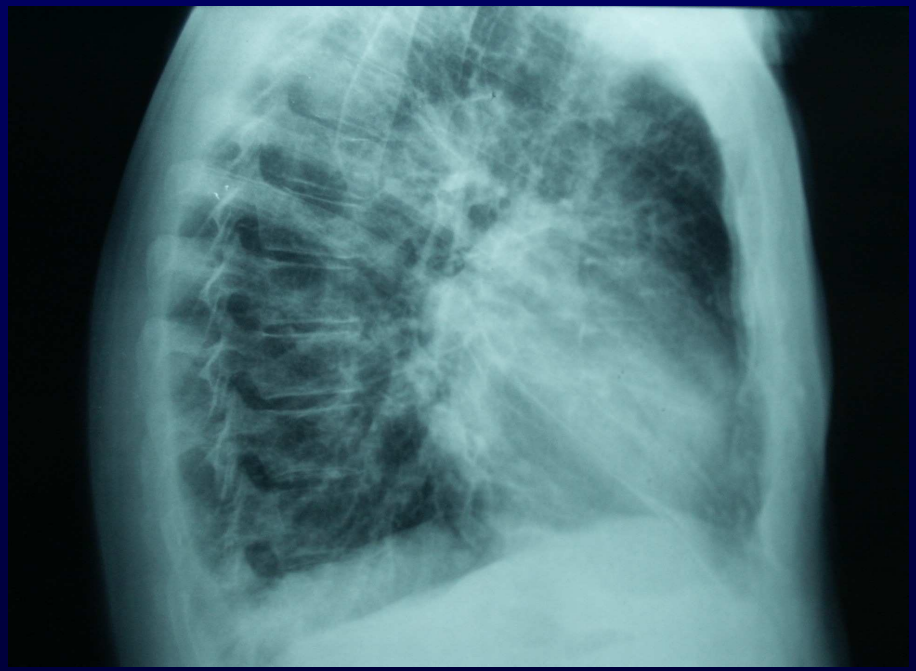
- Normally, extra vascular lung water is 500 mL
- CXR is negative for increases < 30%
- Alveolar flooding usually appears when the extravascular lung water is 75% above the normal limit

Takeda A, Okumura S, Miyamoto T, Hagio M, Fujinaga T. Comparison of extravascular lung water volume with radiographic findings in dogs with experimentally increased permeability pulmonary edema. J Vet Med Sci 1995; 57(3):481-5

Stapczynski JS. Congestive heart failure and pulmonary edema. In: Tintinalli JE, Krome RL, Ruiz E, editors. Emergency medicine: a comprehensive study guide. New York: McGraw-Hill; 1992. p. 216-9.

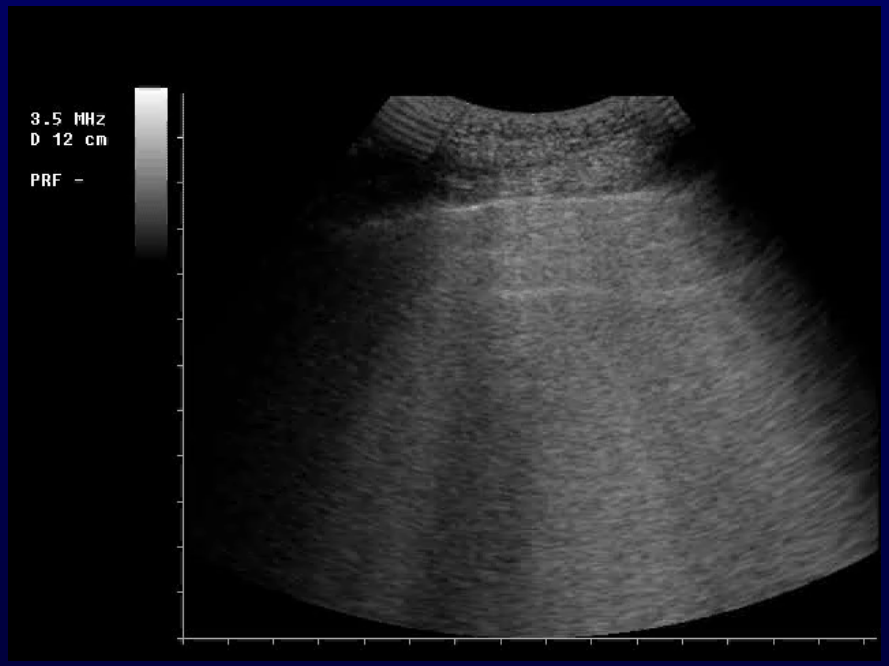
M. 58 y. Exertional dyspnea in the last 7 days. Clear lungs. Sat O_2 in a.r. 96%. BP 180/105. ECG SR, LVH.



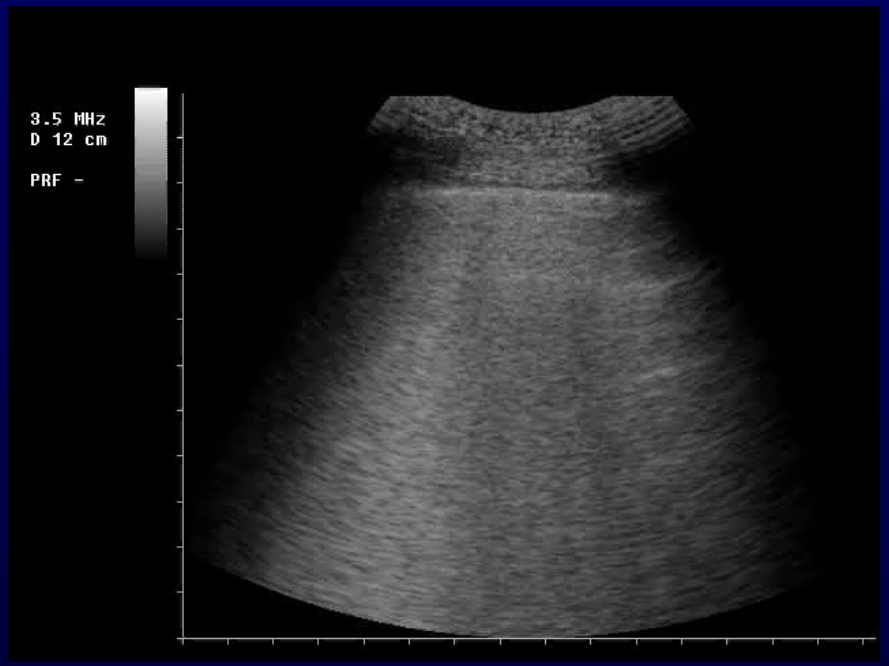


CXR

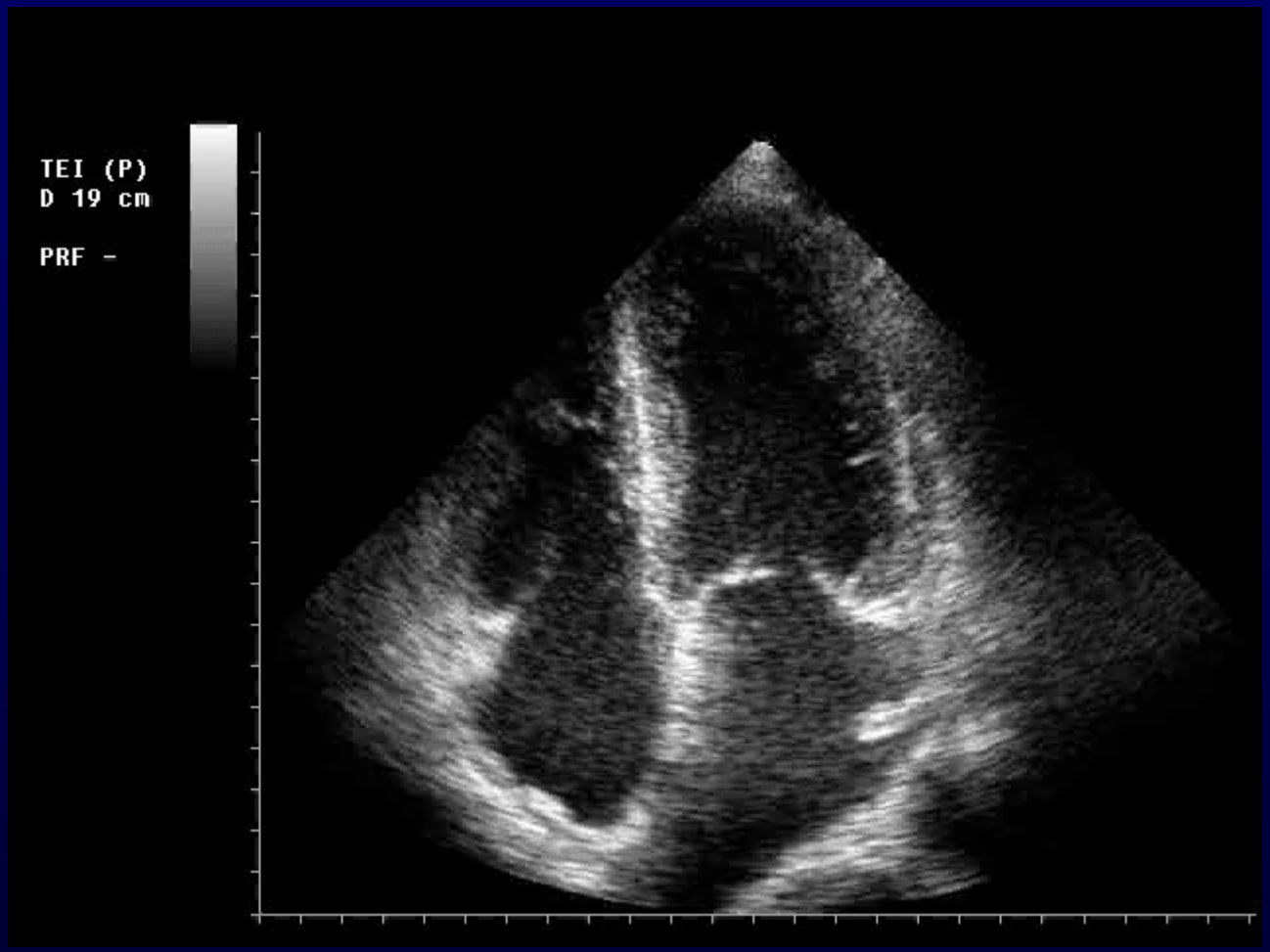
LUNG ULTRASOUND



RIGHT LUNG

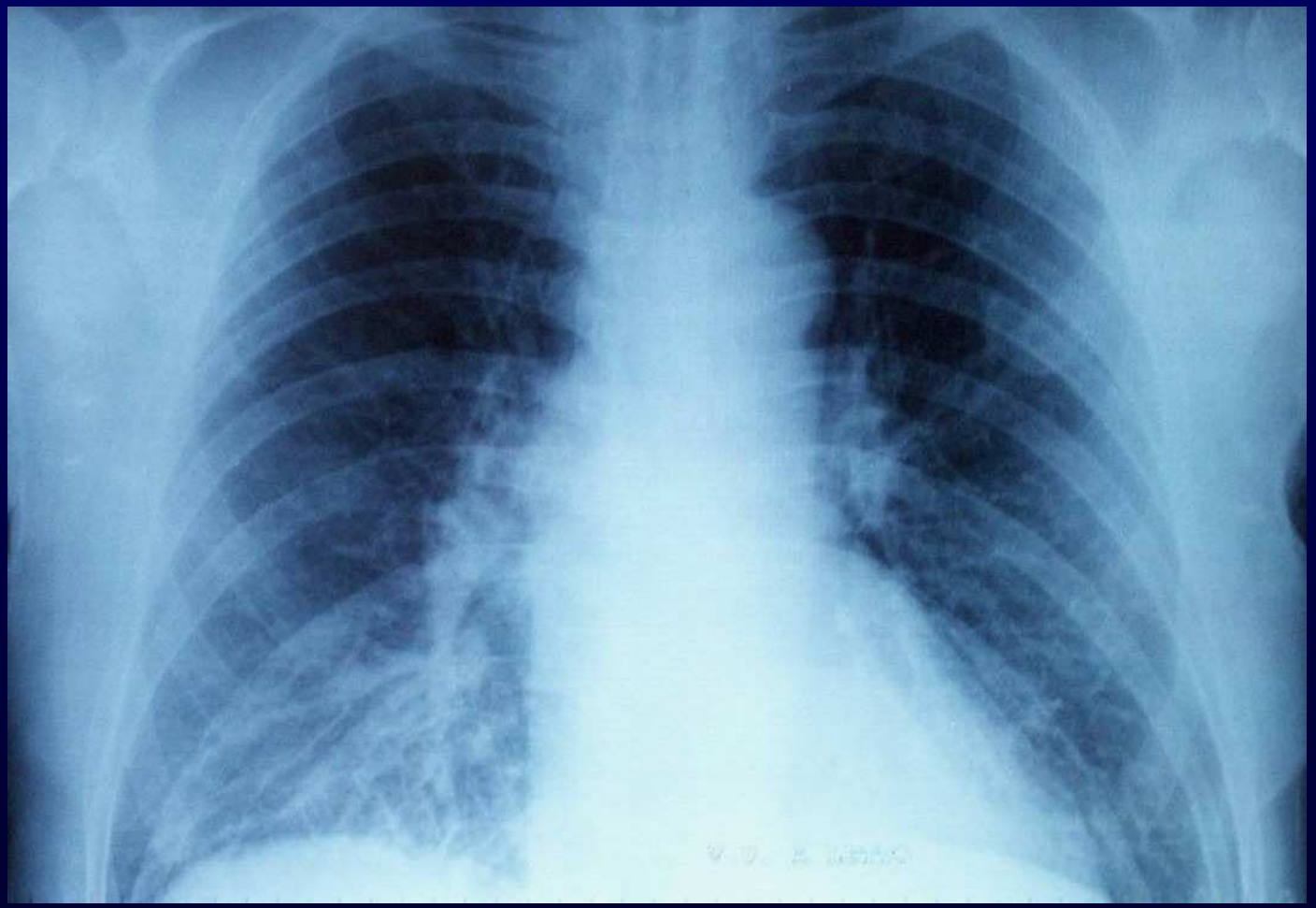


LEFT LUNG

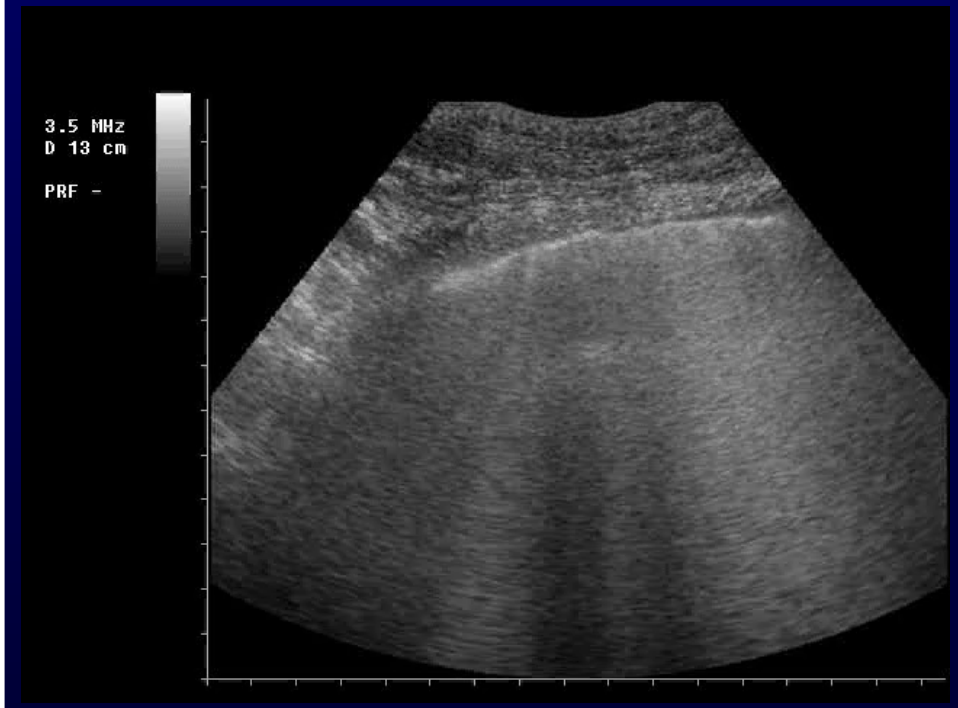


ECHOCARDIOGRAPHY

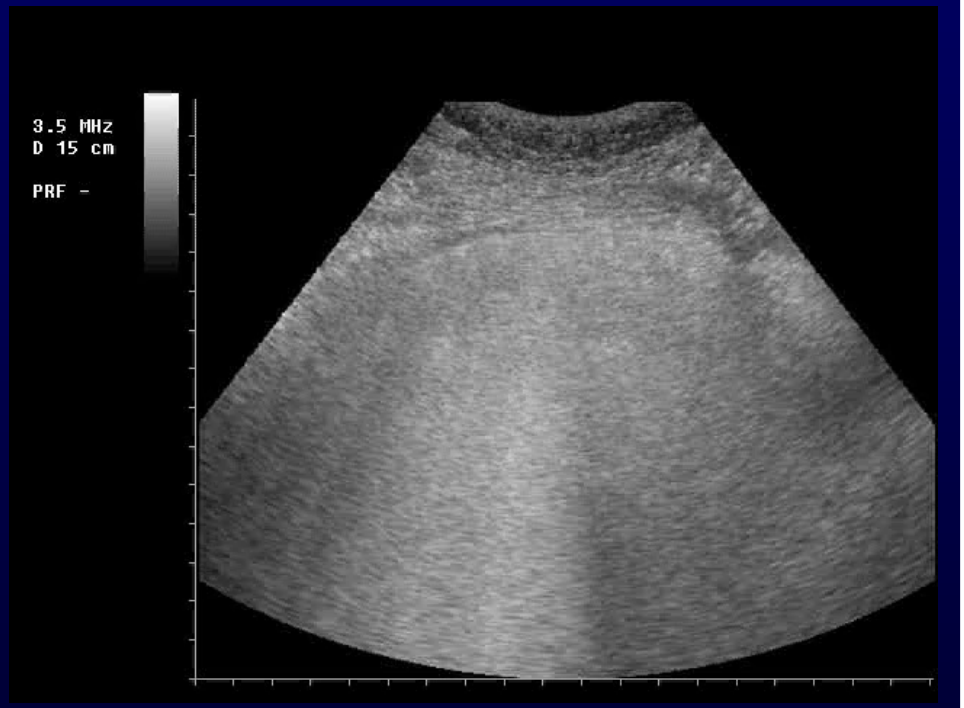
- DYSPNEA IN THE LAST 2 H
- BP 140/50, NORMAL ECG, NORMAL PHYSICAL EXAMINATION



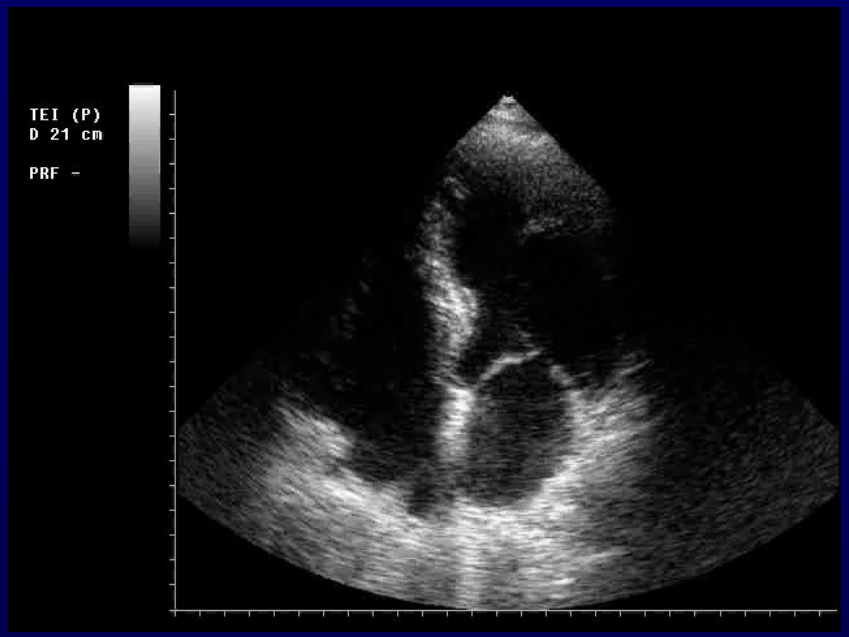
LUNG ULTRASOUND

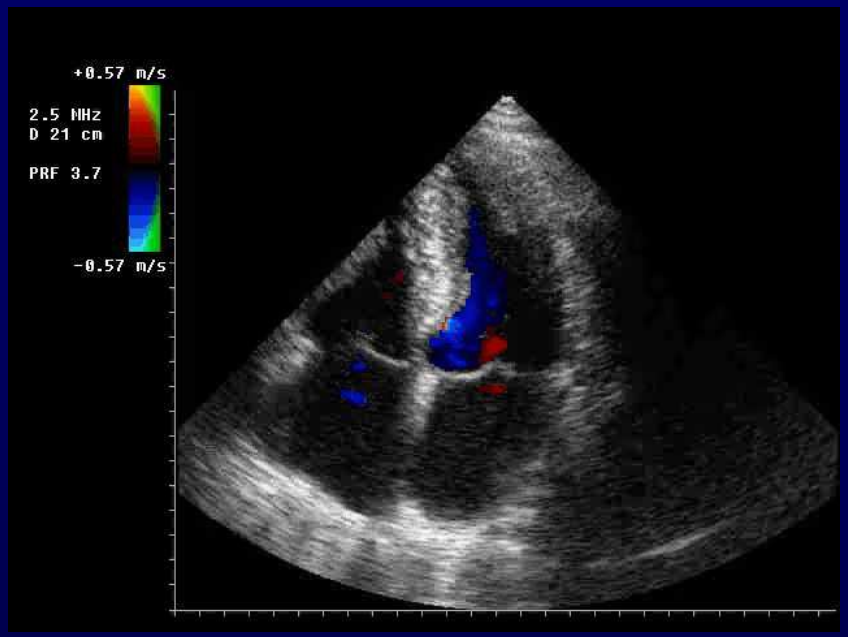


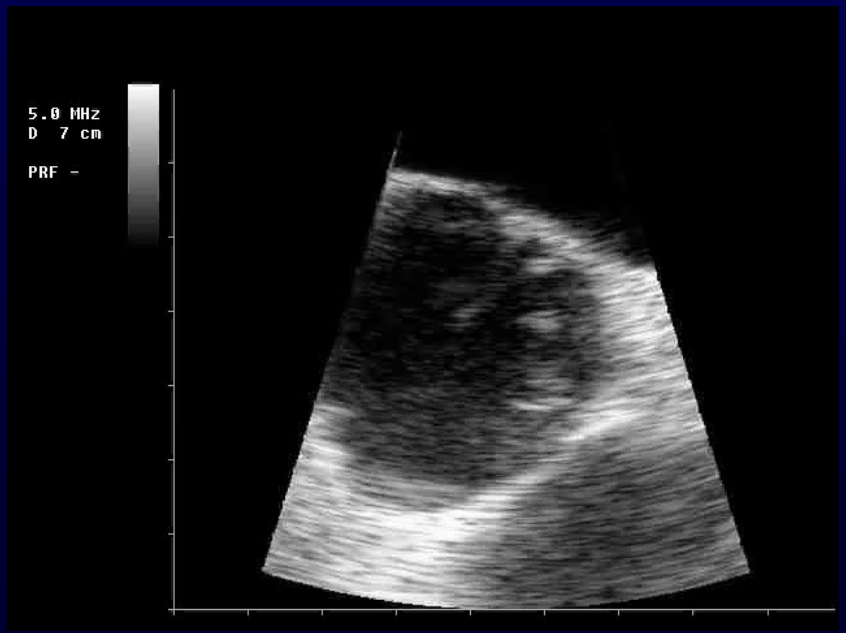
RIGHT LUNG



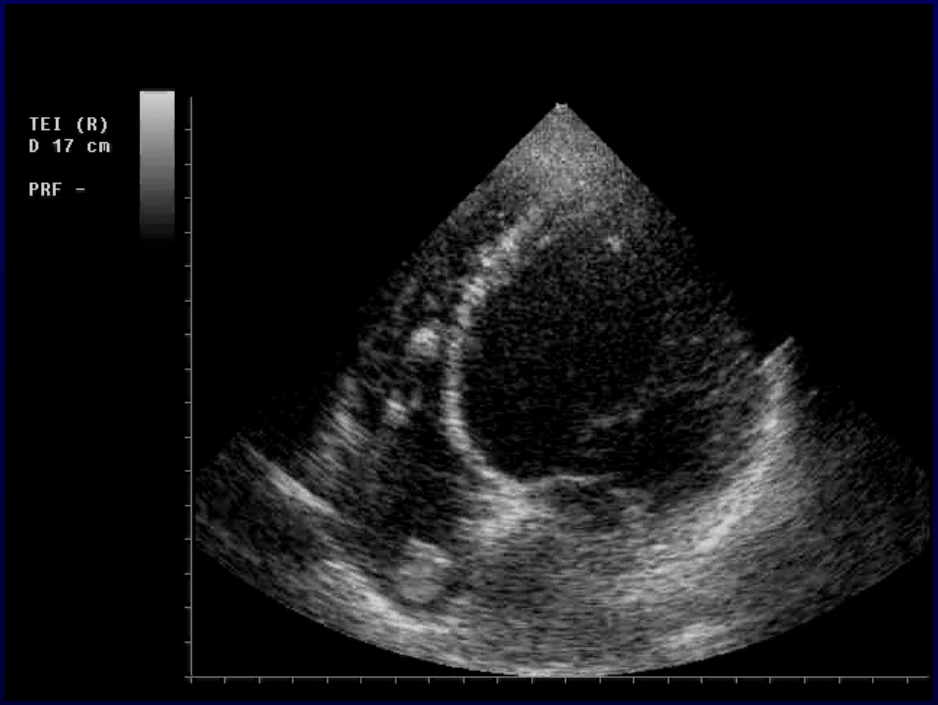
LEFT LUNG

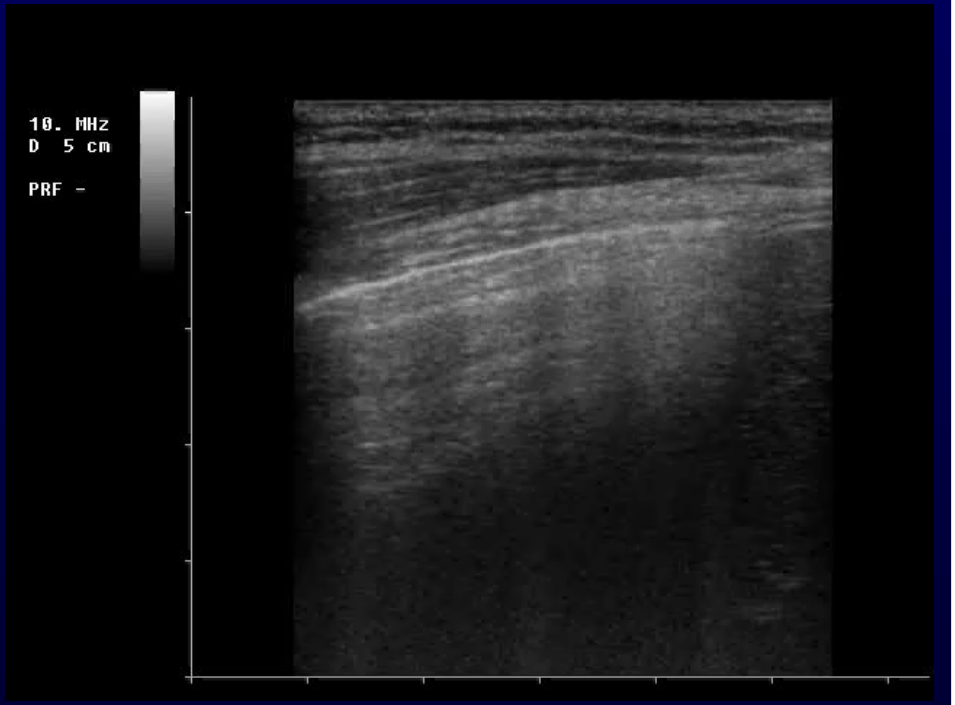

TEI (P)
D 21 cm
PRF -

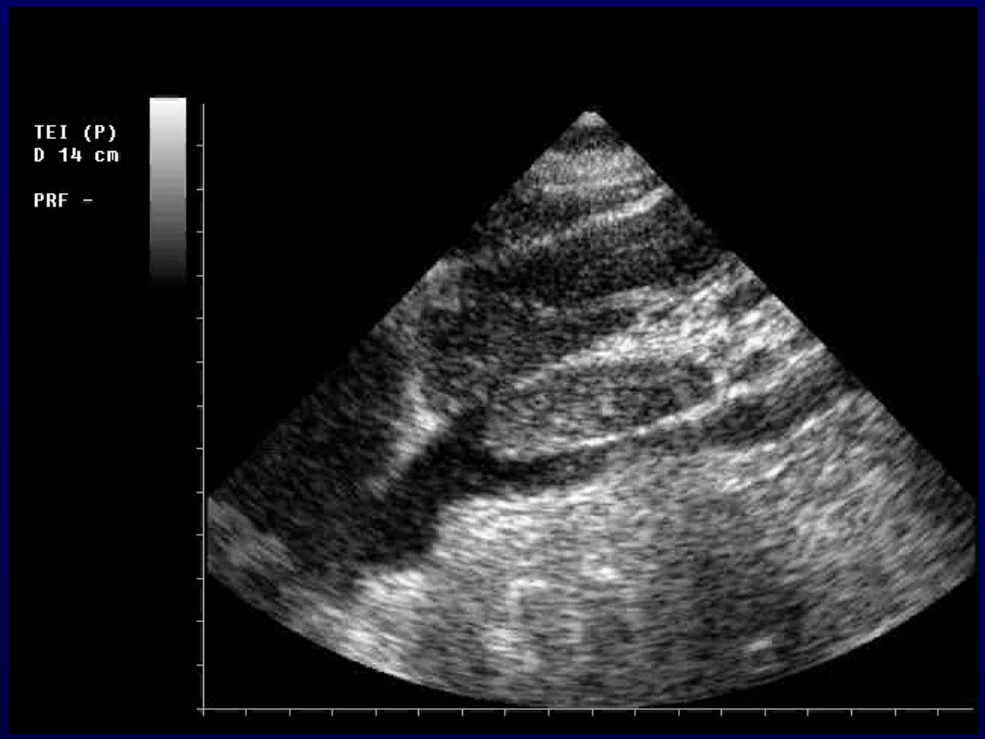

+0.57 m/s
2.5 MHz
D 21 cm
PRF 3.7
-0.57 m/s

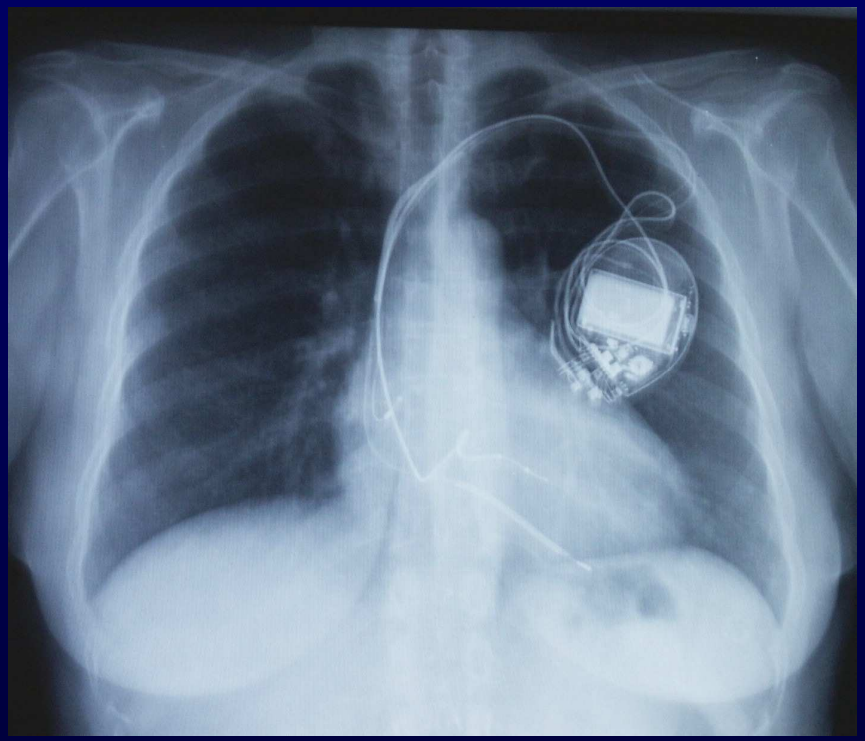

5.0 MHz
D 7 cm
PRF -

- M. 57 AA
- DCM – ICD
- EXERTIONAL DYSPNEA IN THE LAST 2 DAYS






TEI (P)
D 14 cm
PRF -



US / APE

SENSITIVITY

100%

Lung ultrasound: an open window on dyspnoic patients

Roberto Copetti, M.D.

S. ANTONIO ABATE GENERAL HOSPITAL – TOLMEZZO (ITALY)

ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008

Eur Heart J. 2008 ; 29 :2388-2442

THE PHYSICIAN AND DYSPNOIC PATIENT

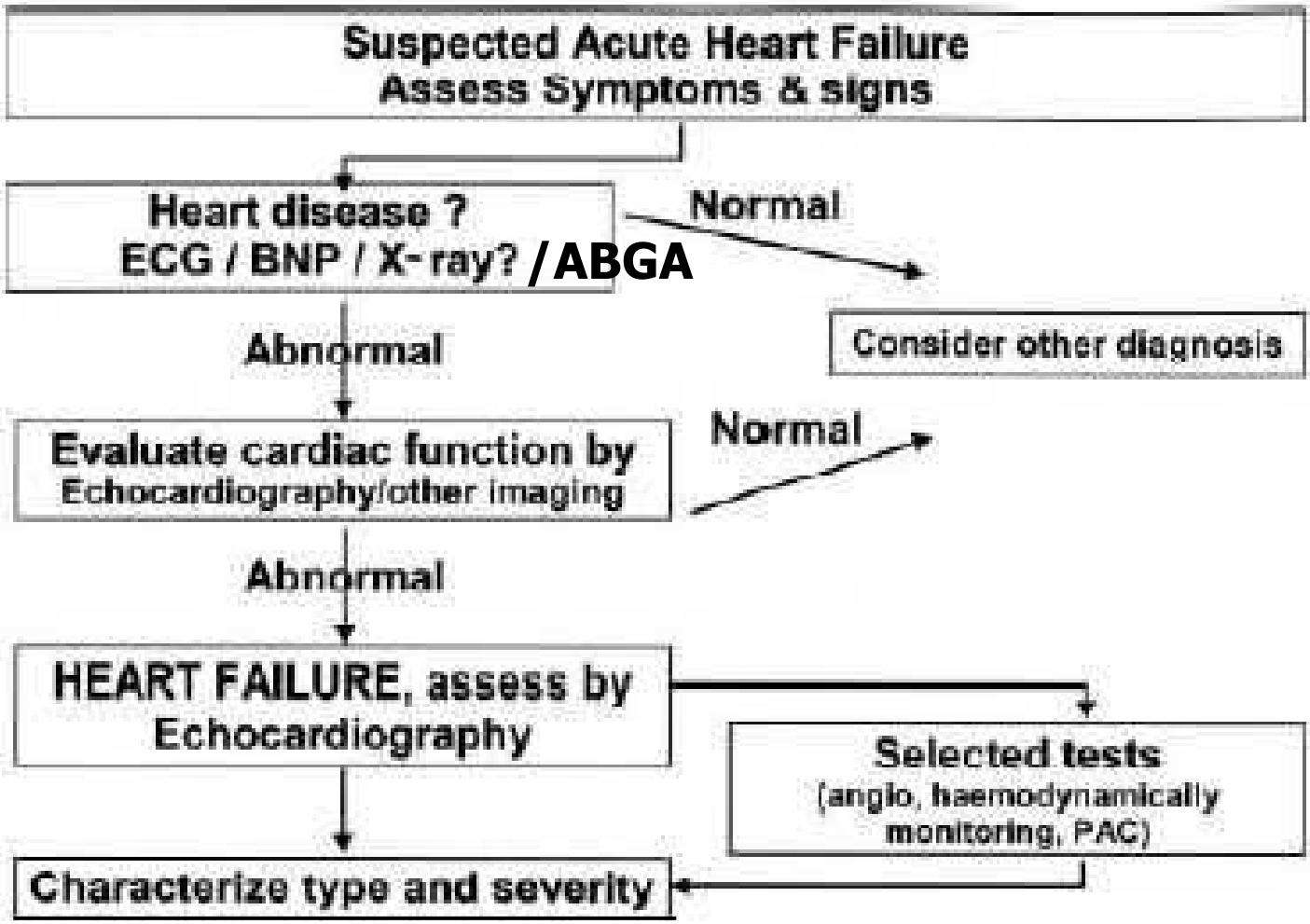
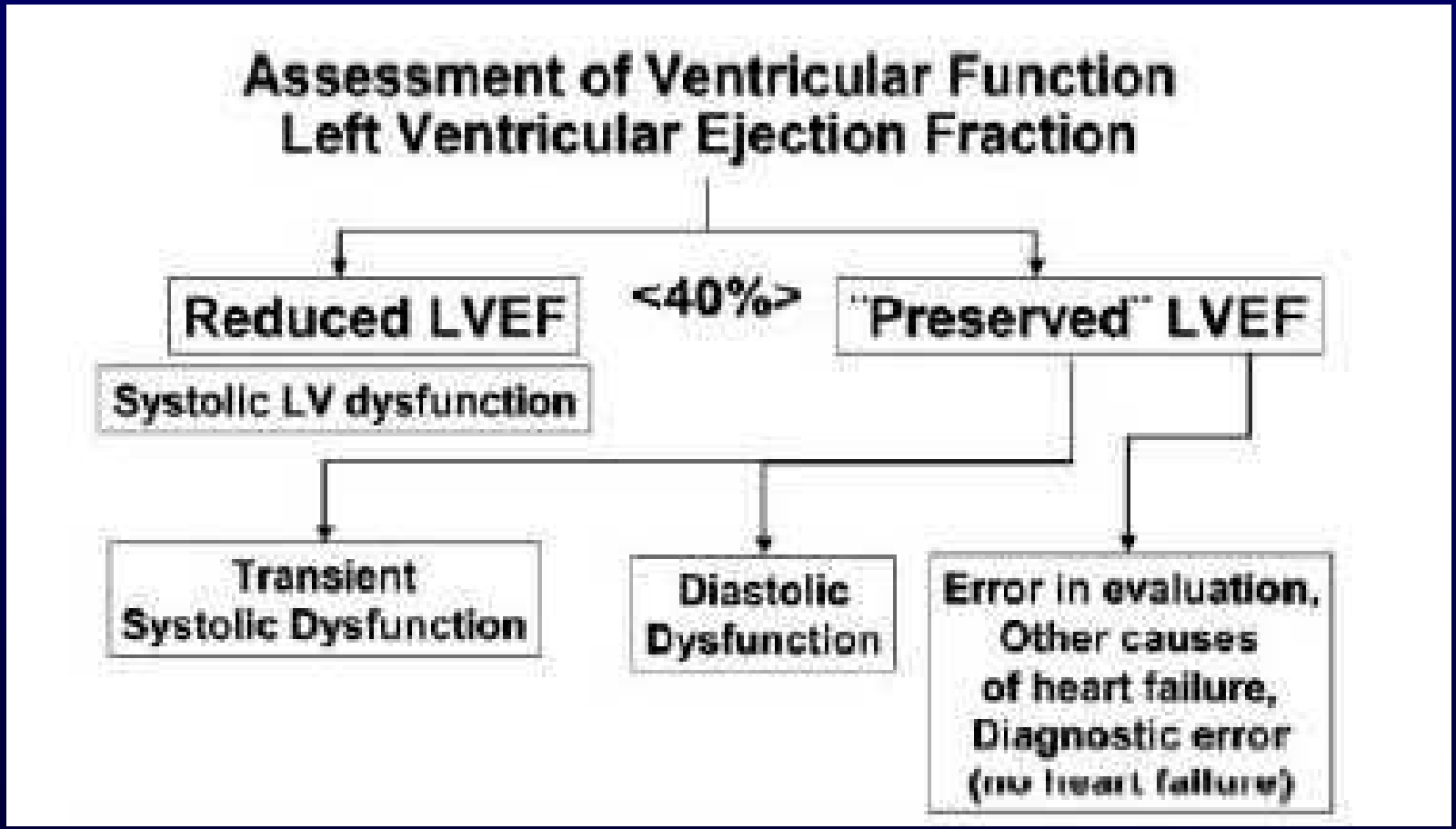


Figure 3 Diagnosis of AHF.

Eur Heart J. 2008 ; 29 :2388-2442



Eur Heart J. 2008 ; 29 :2388-2442

PERFORMANCE OF THE CLINICAL EVALUATION DIAGNOSING INCREASED FILLING PRESSURE

Left atrial pressure ≥ 20 mm Hg

	SENSIBILITY	SPECIFICITY	PPV	NPV
NECK VEIN DISTENTION	50	66	40	74
HEPATOJUGULAR REFLUX	69	61	45	81
PERIFERAL EDEMA	25	77	33	69
RALES	25	77	33	69
S3	25	90	57	70
ORTHOPNEA	84	46	41	86

N Engl J Med 327:1715,1992

Table 3.—Performance of the Clinical Evaluation for Detecting an Increased Filling Pressure or a Decreased Ejection Fraction

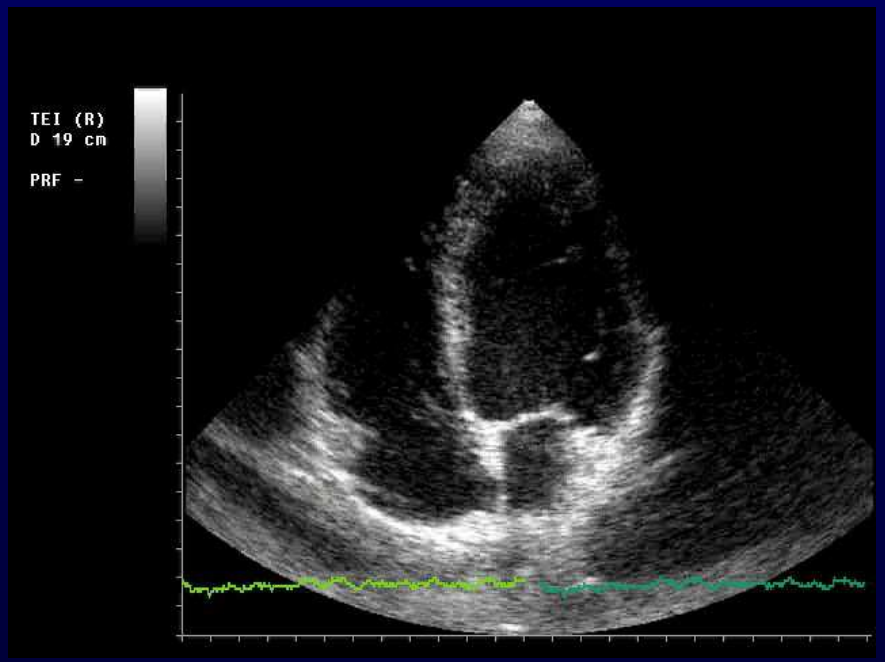
Author	Sensitivity, %	Specificity, %	Likelihood Ratios		Level of Evidence	Prevalence of Disease, %
			Positive	Negative		
Increased filling pressure						
Patients referred for elective evaluation						
Harlan et al[12]	52	85	3.5	0.6	I	21
Carlson et al[18]	90	85	5.9	0.1	III	31
Postinfarction patients						
Forrester et al[19]	85	85	5.7	0.2	II	64
Intensive care unit patients						
Fein et al[21]	91	47	2.0	0.2	II	49
Eisenberg et al[23]	57	35	1.0	1.2	III	67
Tuchschmidt et al[22]	53	94	8.8	0.5	III	55
Connors et al[24]	51	67	2.0	0.7	III	61
Connors et al[25]	50	78	2.0	0.6	III	45
Steingrub et al[26]	35	85	3.0	0.7	III	31
Summary	54	69	1.7	0.7	. . .	. . .

JAMA. 1997; 277:1712-1719

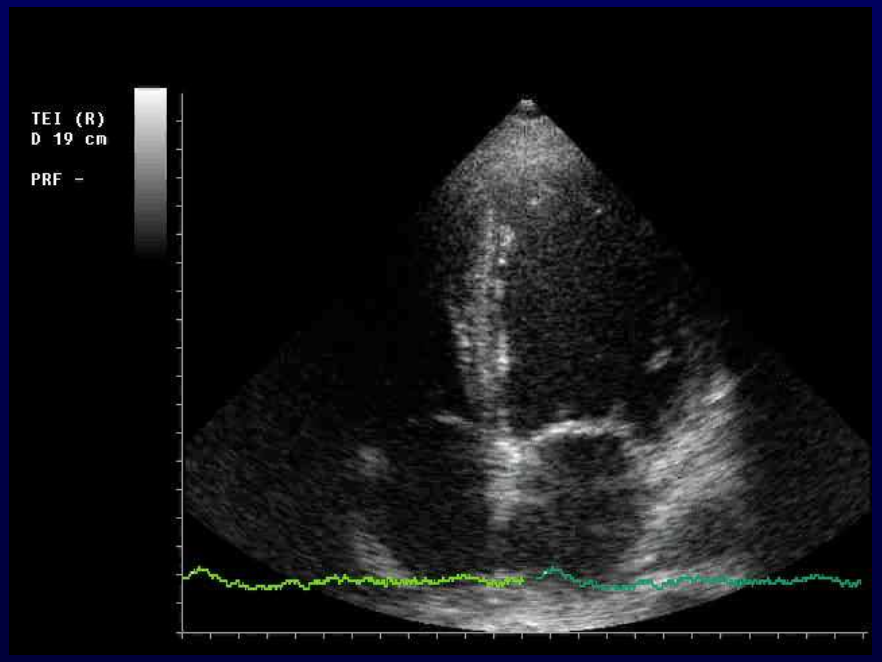
“…E GUIDARE COME UN PAZZO A FARI SPENTI NELLA NOTTE PER VEDERE SE POI E’ TANTO DIFFICILE MORIRE…”

MOGOL, BATTISTI L. – RICORDI - ALBUM “EMOZIONI” - 1970

WHICH ONE IS NORMAL?

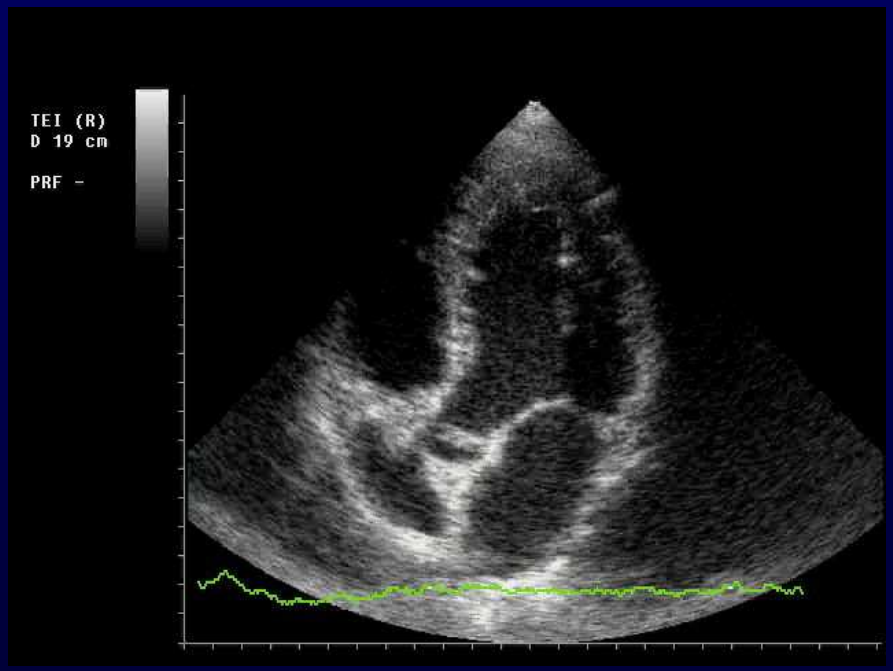


A

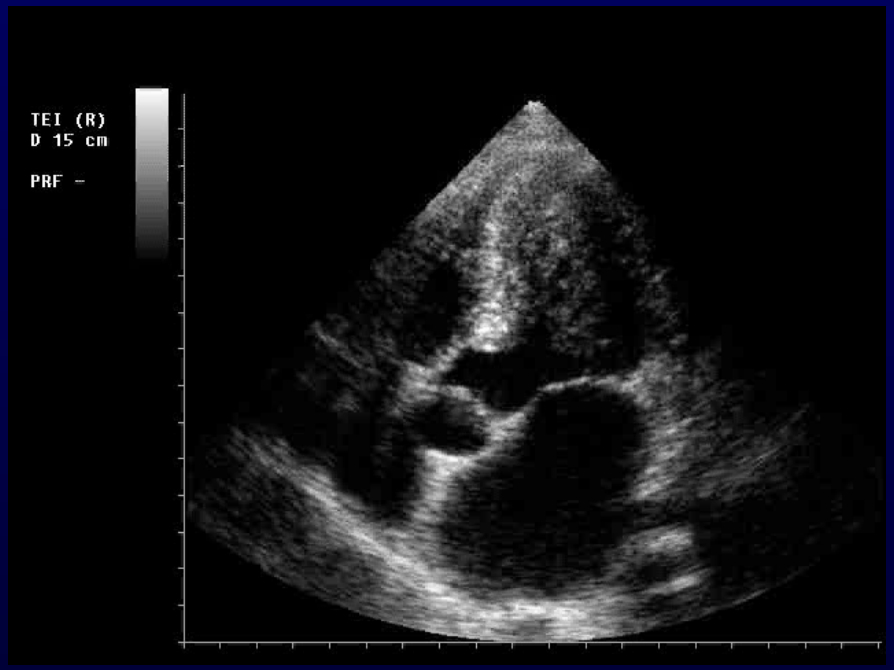


B

WHICH ONE IS NORMAL?

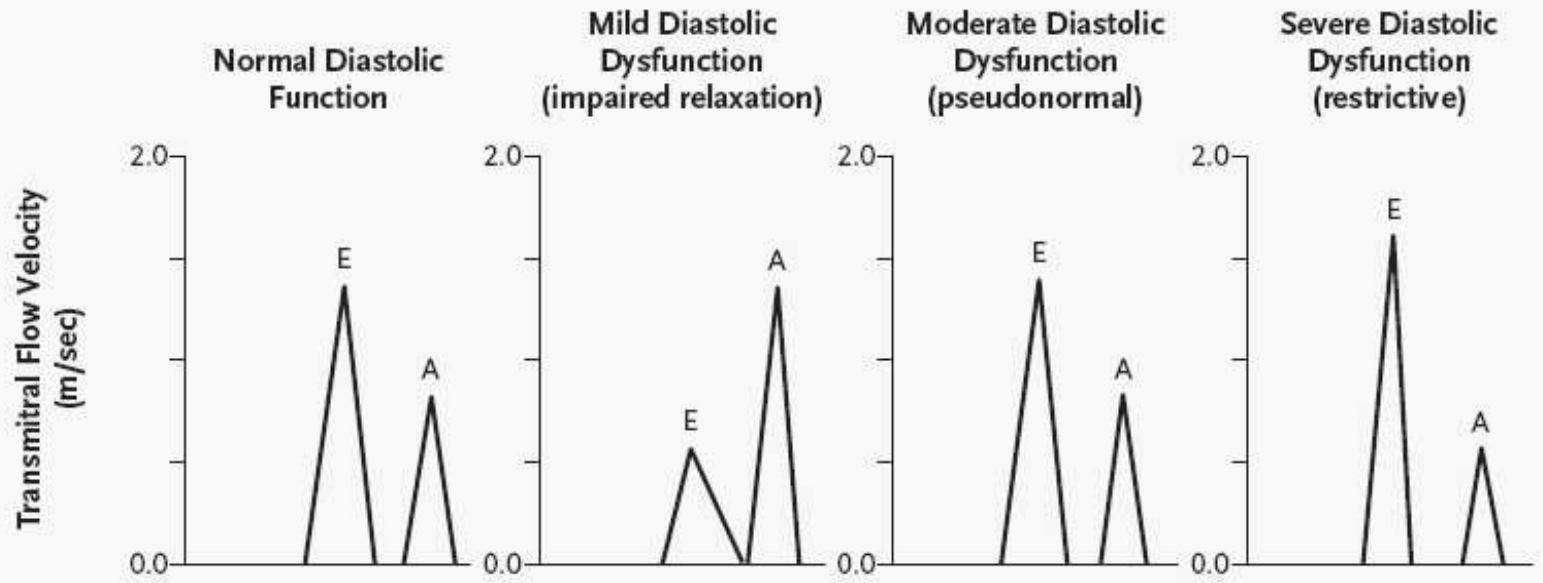


A



B

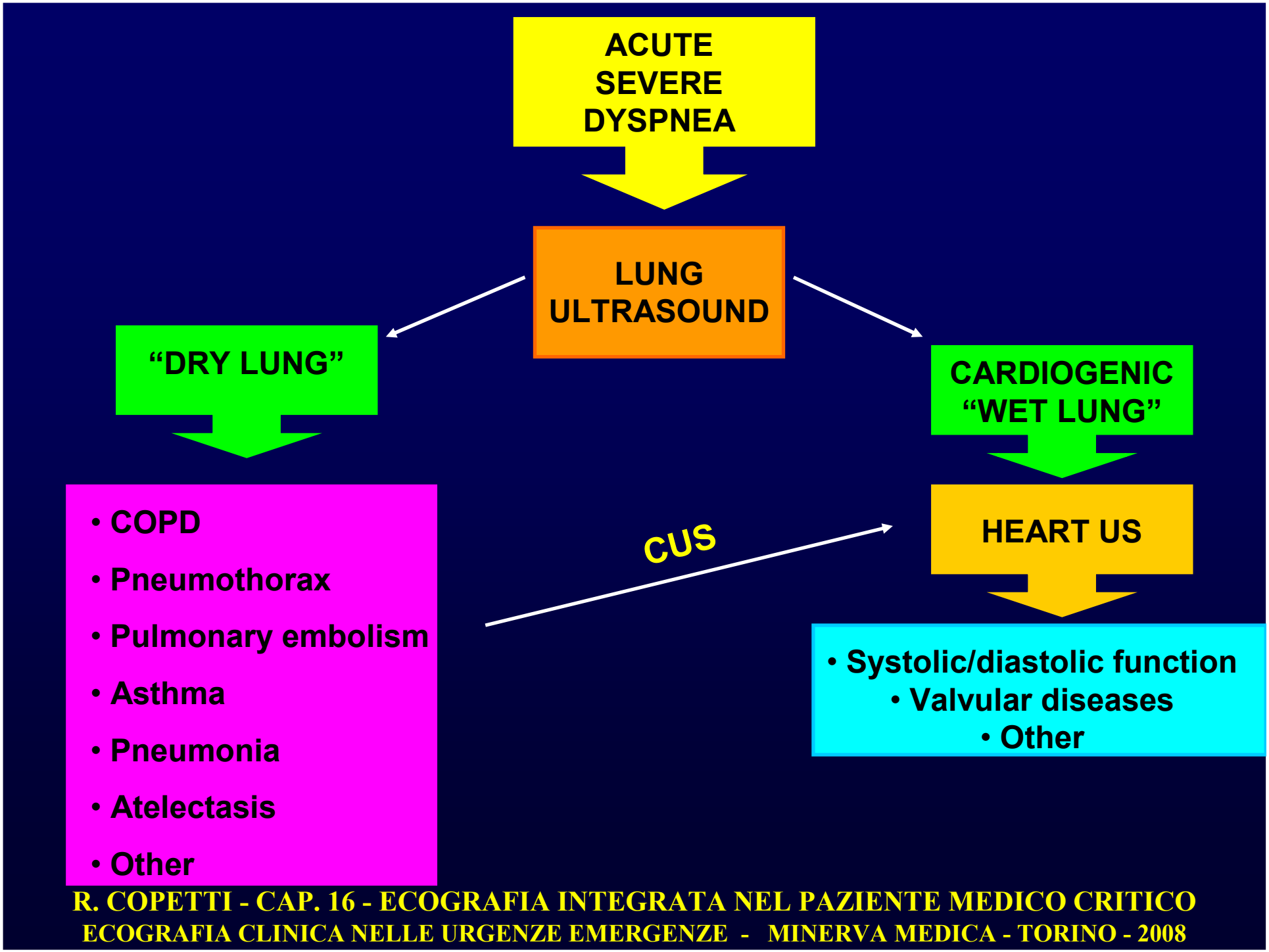
DIASTOLIC DYSFUNCTION



	Normal Diastolic Function	Mild Diastolic Dysfunction (impaired relaxation)	Moderate Diastolic Dysfunction (pseudonormal)	Severe Diastolic Dysfunction (restrictive)
Left Ventricular Relaxation	Normal	Impaired	Impaired	Impaired
Left Ventricular Compliance	Normal	Normal to ↓	↓↓	↓↓↓
Atrial Pressure	Normal	Normal to ↑	↑↑	↑↑↑

Figure 3. Patterns of Left Ventricular Diastolic Filling as Shown by Standard Doppler Echocardiography.

N Engl J Med. 2004; 351:1097-105


ACUTE SEVERE DYSPNEA
LUNG ULTRASOUND
"DRY LUNG"
CARDIOGENIC "WET LUNG"
• COPD
• Pneumothorax
• Pulmonary embolism
• Asthma
• Pneumonia
• Atelectasis
• Other
CUS
HEART US
• Systolic/diastolic function
• Valvular diseases
• Other

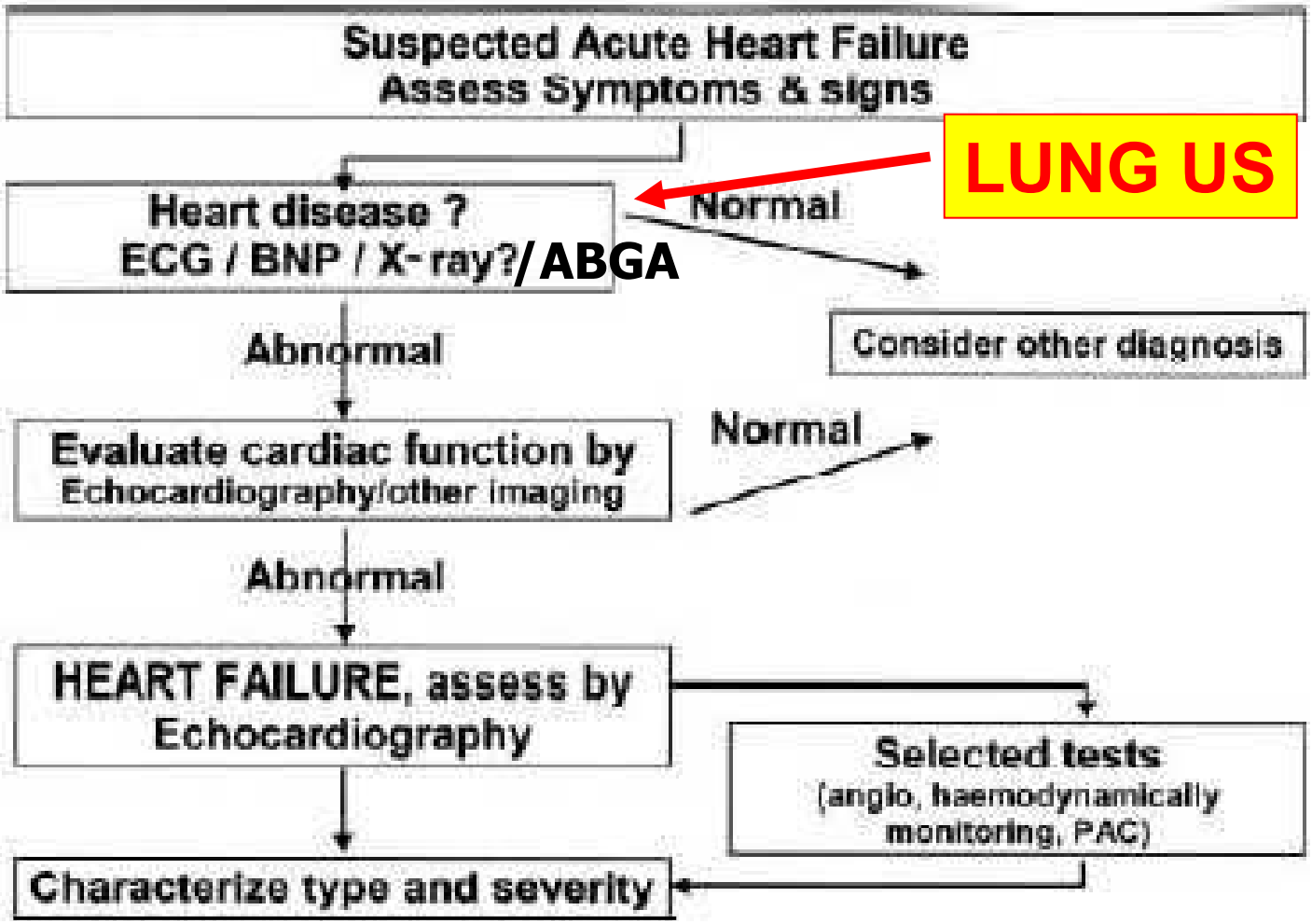
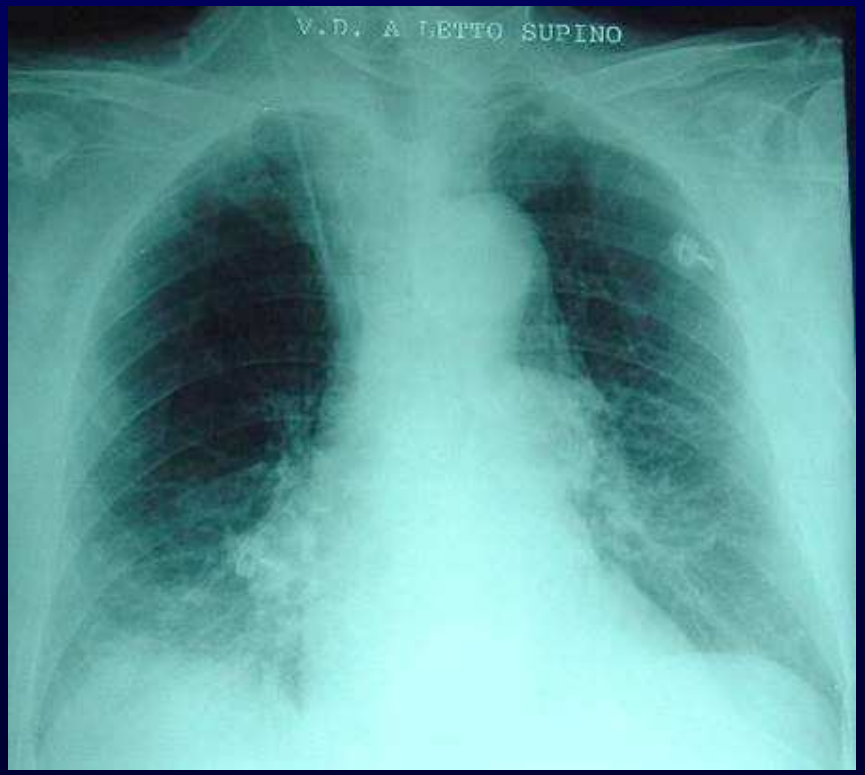
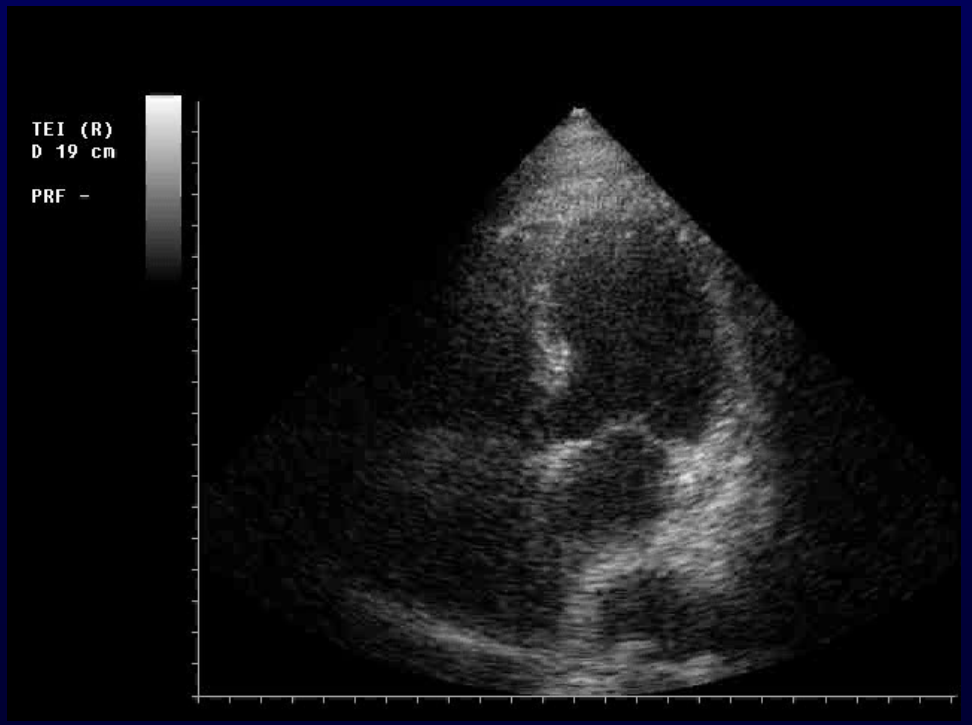


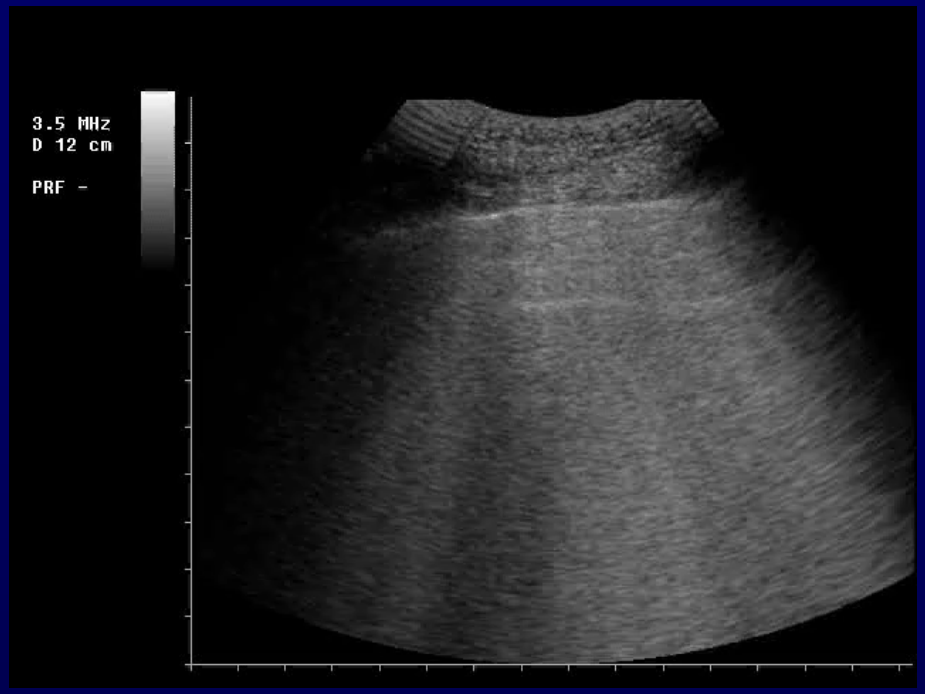
Figure 3 Diagnosis of AHF.

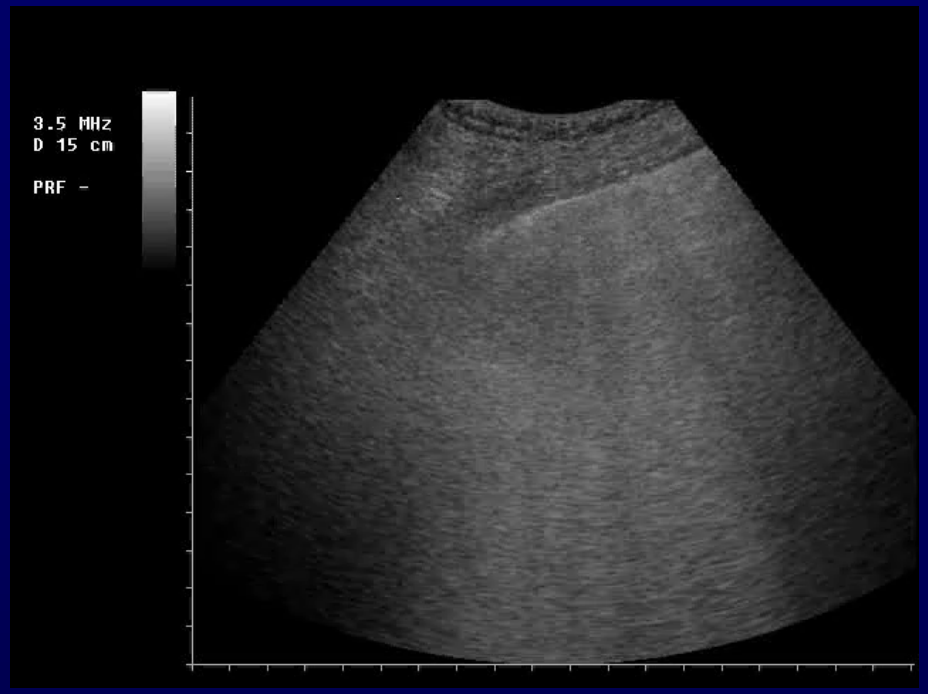
Eur Heart J. 2008 ; 29 :2388-2442

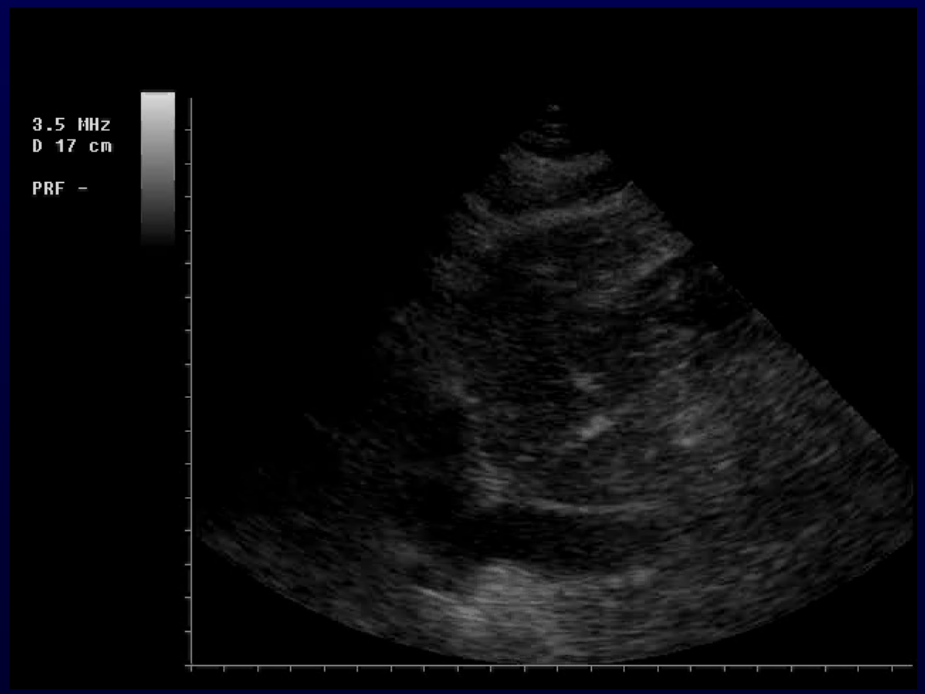
- ACUTE RESPIRATORY DISTRESS
- HYPERTENSION, CHRONIC A.F.
- RALES ON RIGHT LUNG BASE
- BP 180/115. HR 115 AF. Sat O_2 90% (FiO_2 0.4). TT 38.5°C






3.5 MHz
D 12 cm
PRF -


3.5 MHz
D 15 cm
PRF -


3.5 MHz
D 17 cm
PRF -

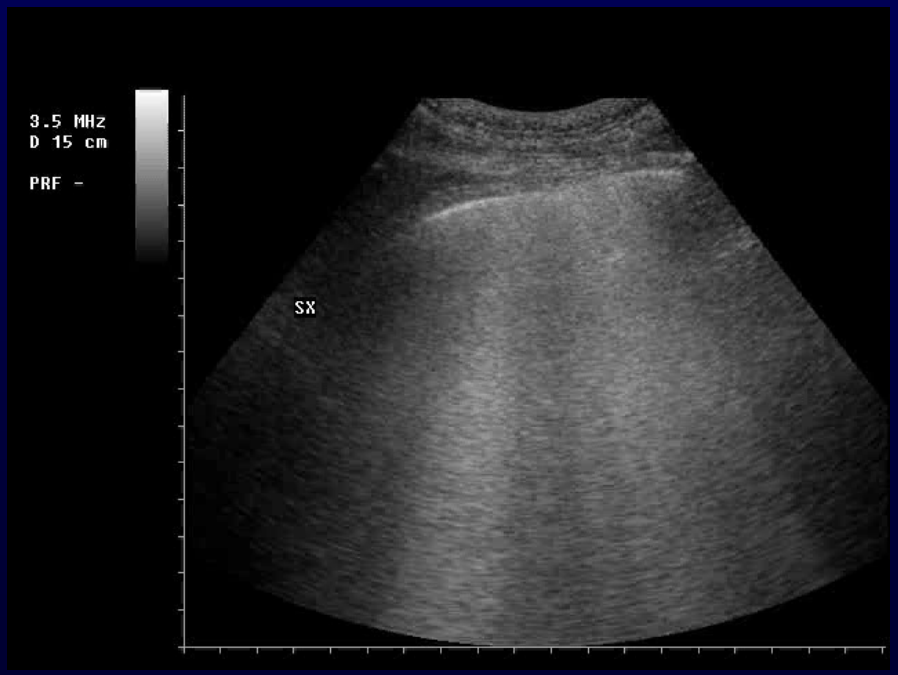
- “FLASH” PULMONARY EDEMA
- DIASTOLIC DYSFUNCTION

DIURETICS ?

RESPIRATORY DISTRESS. SURGERY FOR FRACTURE OF THE FEMUR. T.T. 39.C°. ECG: S.T.120/m. SAT O_2 87% (FiO_2 0.6).

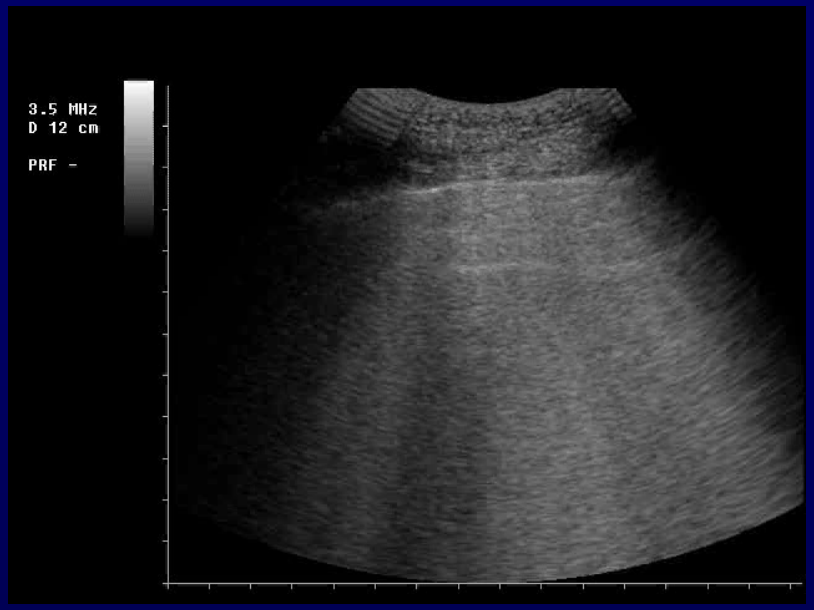
RCP 300

LUNG ULTRASOUND

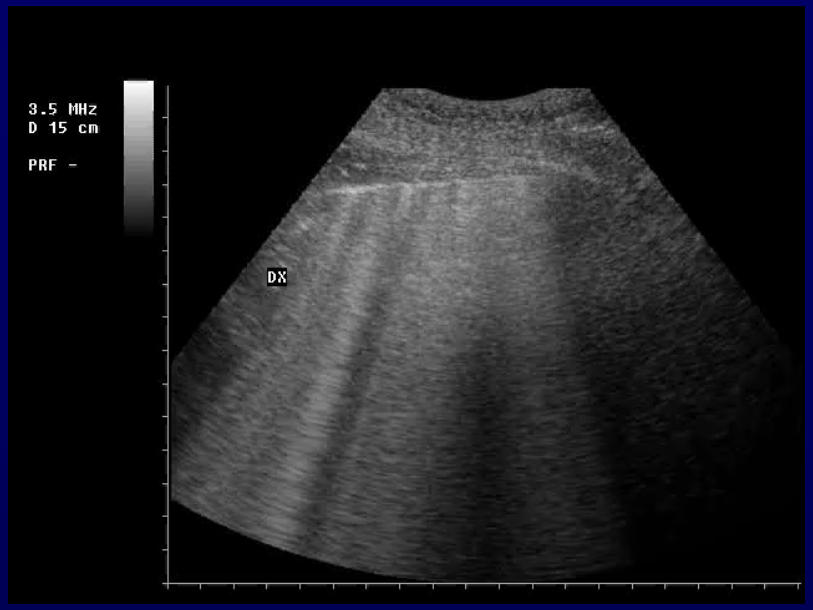


ULTRASOUND ALVEOLAR-INTERSTITIAL SYNDROME

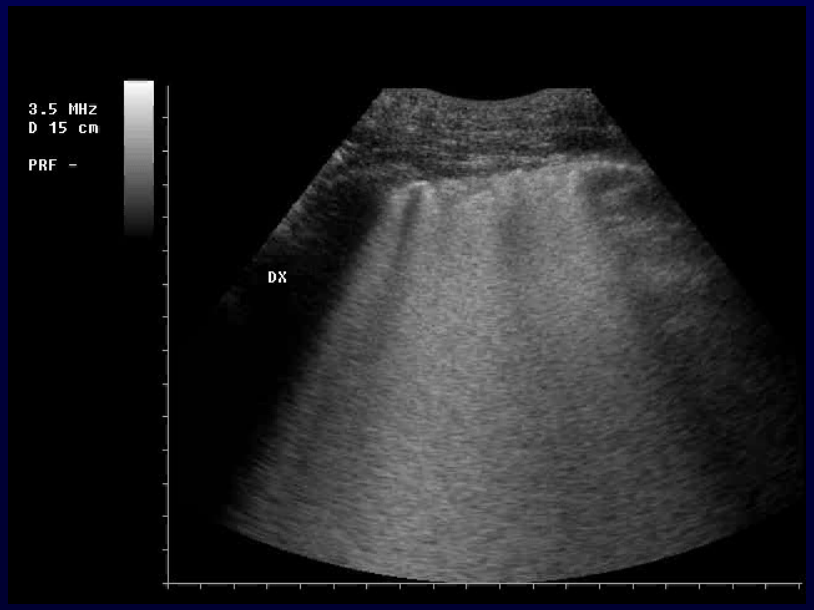
- PULMONARY EDEMA
- PULMONARY FIBROSIS
- INTERSTITIAL PNEUMONIA
- ALI / ARDS



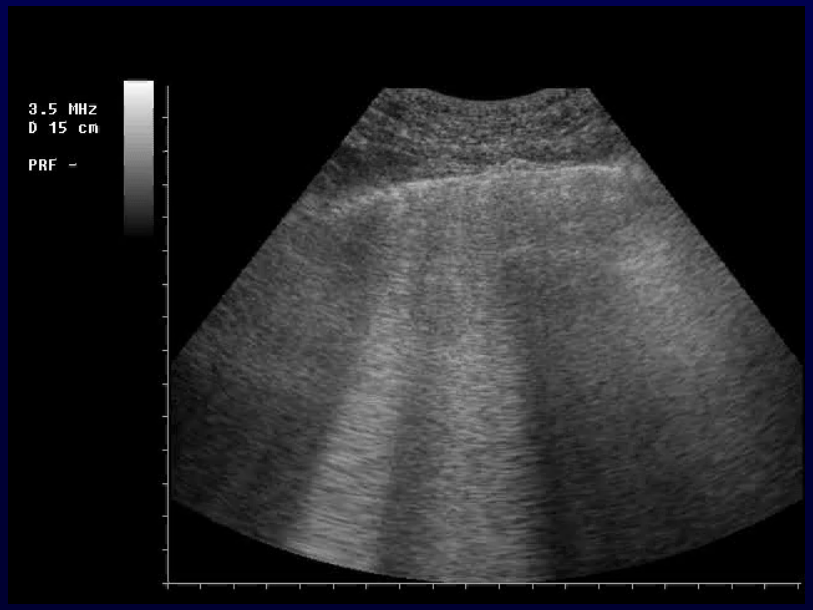
APE



INTERSTITIAL PNEUMONIA



PULMONARY FIBROSIS



ARDS

LUNG ULTRASOUND

?

ALI/ARDS

ALI/ARDS

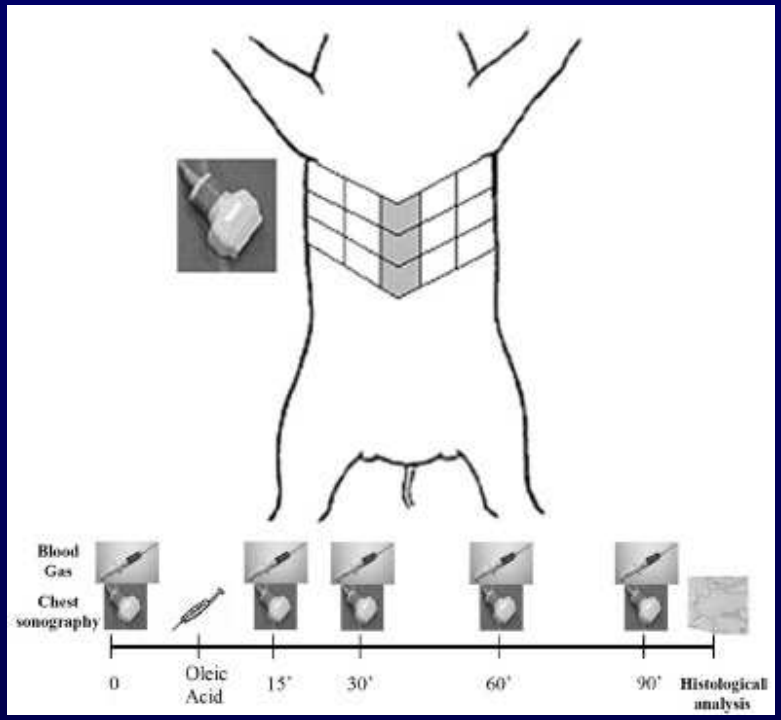
?

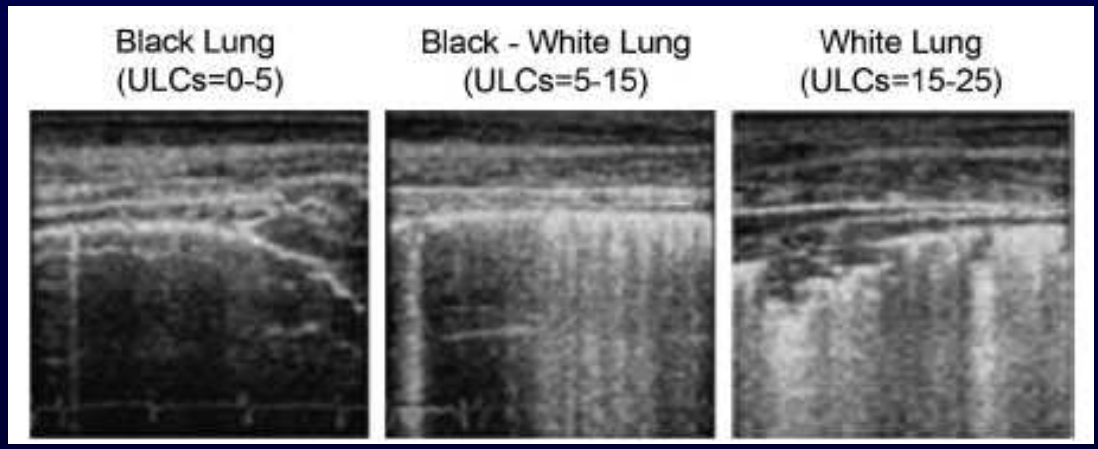
APE

Early detection of acute lung injury uncoupled to hypoxemia in pigs using ultrasound lung comets*

Luna Gargani, MD; Vincenzo Lionetti, MD; Claudio Di Cristofano, MD; Generoso Bevilacqua, MD, PhD; Fabio A. Recchia, MD, PhD; Eugenio Picano, MD, PhD, FESC

Crit Care Med 2007 Vol. 35, No. 12





Crit Care Med 2007 Vol. 35, No. 12

Cardiovascular Ultrasound

BioMed Central

Research

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Chest sonography: a useful tool to differentiate acute cardiogenic pulmonary edema from acute respiratory distress syndrome

Roberto Copetti*[1], Gino Soldati[2] and Paolo Copetti[1]

Address: [1]Emergency Department S. Antonio Abate General Hospital, Tolmezzo, Italy and [2]Emergency Department Valle del Serchio General Hospital, Lucca, Italy

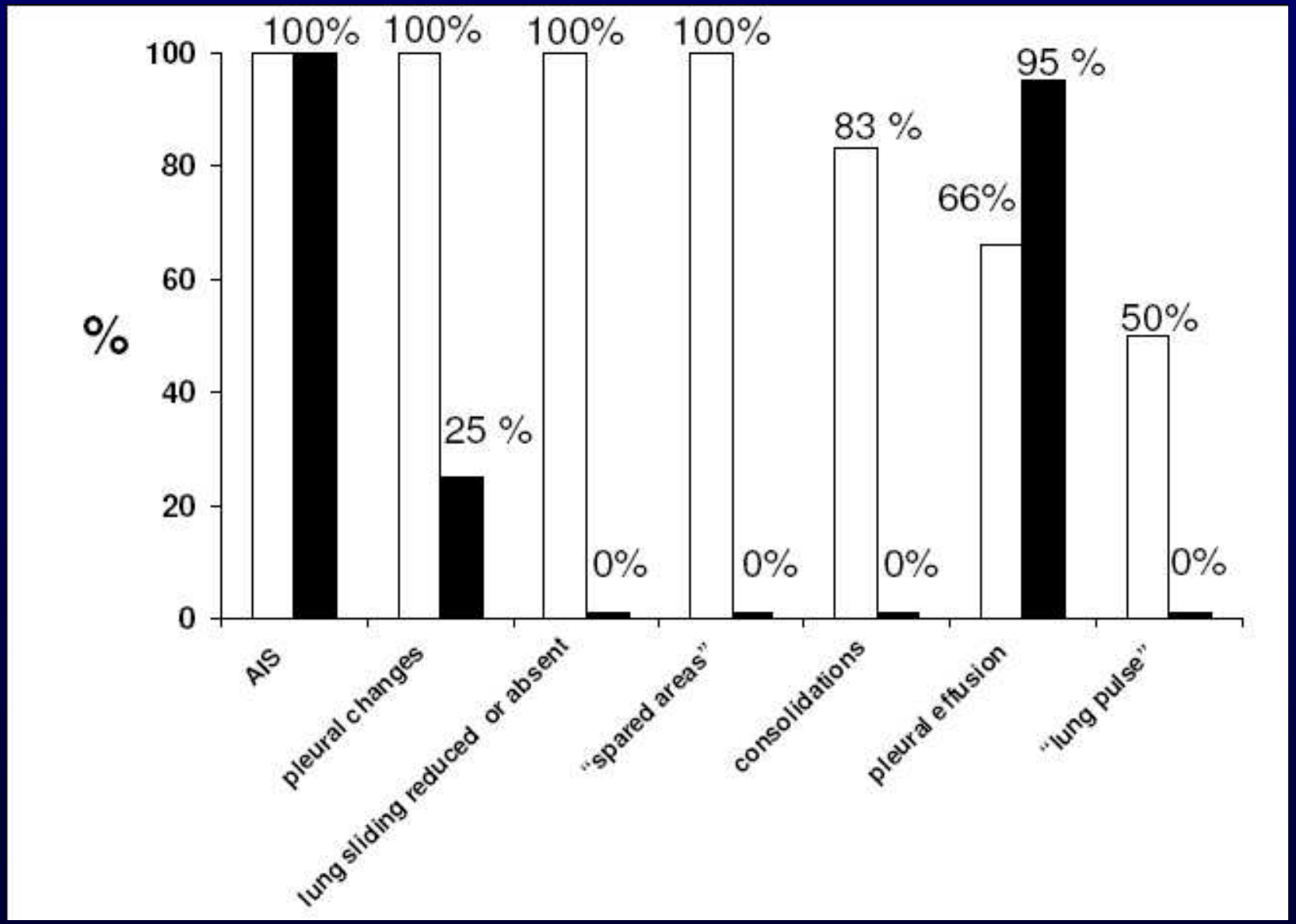
Email: Roberto Copetti* - robcopet@tin.it; Gino Soldati - g.soldati@usl2.toscana.it; Paolo Copetti - paolo.cop@libero.it

* Corresponding author

Published: 29 April 2008

Cardiovascular Ultrasound 2008, **6**:16 doi:10.1186/1476-7120-6-16

Received: 25 February 2008
Accepted: 29 April 2008



Copetti R. et al. Chest sonography: a useful tool to differentiate acute cardiogenic pulmonary edema from acute respiratory distress syndrome. Cardiovascular Ultrasound 2008, 6:16

Table 3: Distribution of ultrasound signs in the two studied groups

	ALI/ARDS (18 pt.)	APE (40 pt.)	p
Sex (n° males)	11 (61%)	25 (62.5%)	0.92 (ns)
Mechanical ventilation (n)	16 (88.8%)	8 (20%)	< 0.0001
AIS	18 (100%)	40 (100%)	ns
Pleural line abnormalities	18 (100%)	10 (25%)	< 0.0001
Reduction or absence of lung sliding	18 (100%)	0	< 0.0001
"Spared areas"	18 (100%)	0	< 0.0001
Consolidations	15 (83.3%)	0	< 0.0001
Pleural effusion	12 (66.6%)	38 (95%)	0.004
"Lung pulse"	9 (50%)	0	< 0.0001

Copetti R. et al. Chest sonography: a useful tool to differentiate acute cardiogenic pulmonary edema from acute respiratory distress syndrome. Cardiovascular Ultrasound 2008, 6:16

ALI/ARDS DIAGNOSIS

A three-criteria system including chest radiograph, oxygenation score, and exclusion of cardiogenic causes.

- Acute onset, bilateral infiltates on chest radiography

- Pulmonary-artery wedge pressure of < 18 mm Hg or the absence of clinical evidence of left atrial hypertension

- Acute lung injury considered present if PaO_2/FiO_2 is ≤ 300 and the ARDS subset was defined with a more severe oxygenation deficit, PaO_2/FiO_2 ≤ 200

Bernard GR, Artigas A, Brigham KL, Carlet J, Falke K, Hudson L, Lamy M, Legall JR, Morris A, Spragg R. The American European consensus conference on ARDS: definitions mechanisms, relevant outcomes and clinical trial coordination. ***Am J Respir Crit Care Med*** **1994;149:818–824.**

Radiographically, the findings are indistinguishable from those of cardiogenic pulmonary edema. Bilateral infiltrates may be patchy or asymmetric and may include pleural effusions.

- The CT has shown us that the lung was not uniformly involved. There are areas of the lung that are severely affected by an injury, areas that are mildly involved, and areas that are not involved at all.

- Alveolar filling, consolidation, and atelectasis occur predominantly in dependent lung zones, whereas other areas may be relatively spared.

- CT scan useful for to investigate the “potential for recruitment”

- CT scan useful in detecting complications (occult pneumothorax, pneumomediastinum, pneumatocele, septic embli)

DISADVANTAGES OF CT SCAN

- Costly resource of limited availability
- Exposes the patient to a high amount of radiation
- Exposes the patient to the risk of transfer to the CT suite
- CT specificity in not 100%

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

CURRENT CONCEPTS

Computed Tomography — An Increasing Source of Radiation Exposure

David J. Brenner, Ph.D., D.Sc., and Eric J. Hall, D.Phil., D.Sc.

N Engl J Med 357;22 November 29, 2007

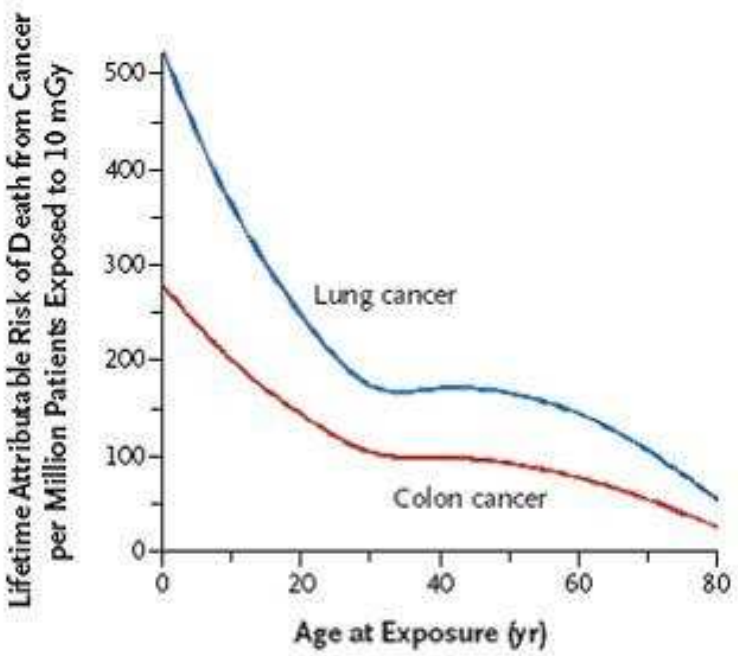


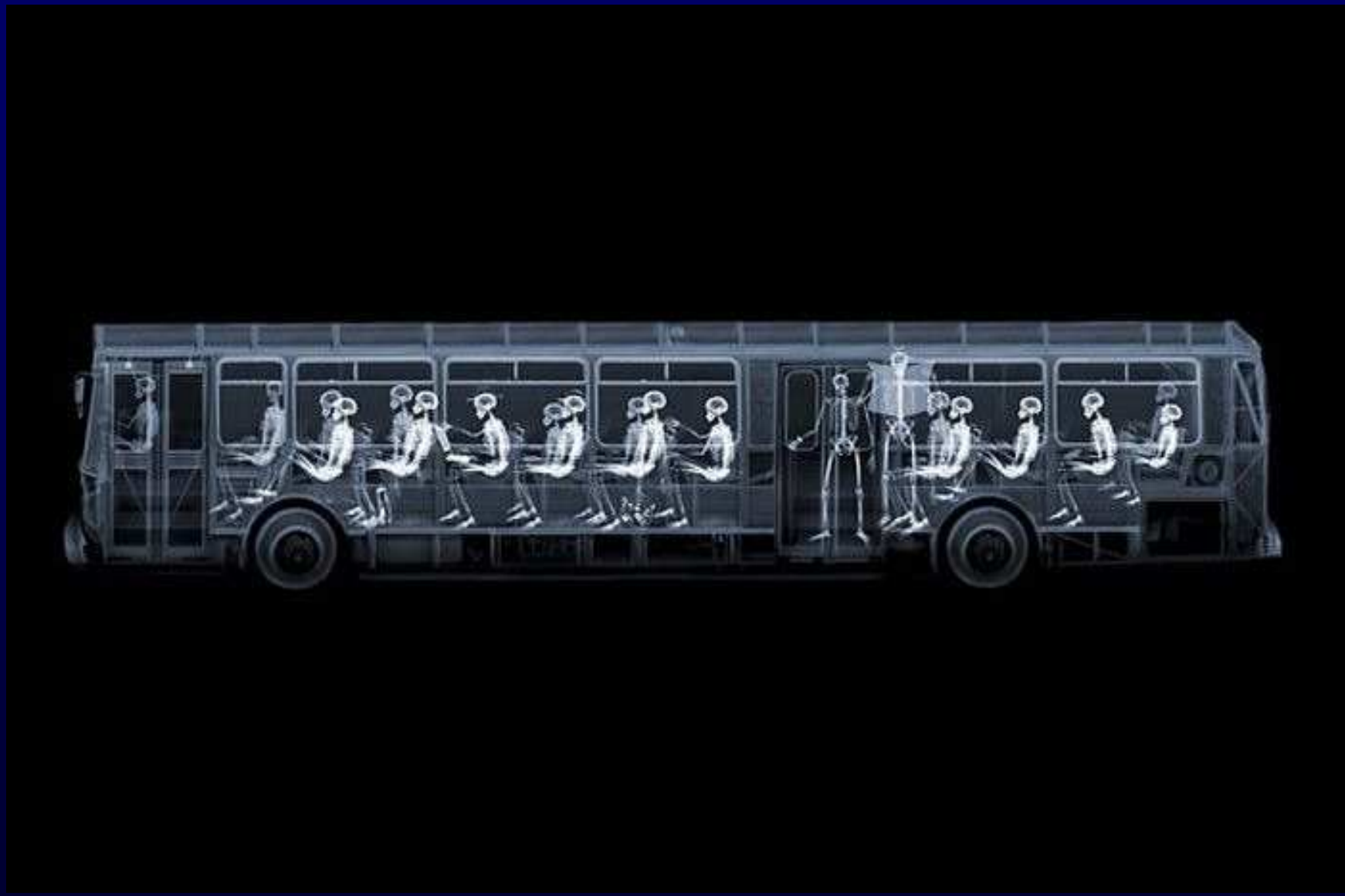
Figure 4. Estimated Dependence of Lifetime Radiation-Induced Risk of Cancer on Age at Exposure for Two of the Most Common Radiogenic Cancers.

Cancer risks decrease with increasing age both because children have more years of life during which a potential cancer can be expressed (latency periods for solid tumors are typically decades) and because growing children are inherently more radiosensitive, since they have a larger proportion of dividing cells. These risk estimates, applicable to a Western population, are from a 2005 report by the National Academy of Sciences[25] and are ultimately derived from studies of the survivors of the atomic bombings. The data have been averaged according to sex.

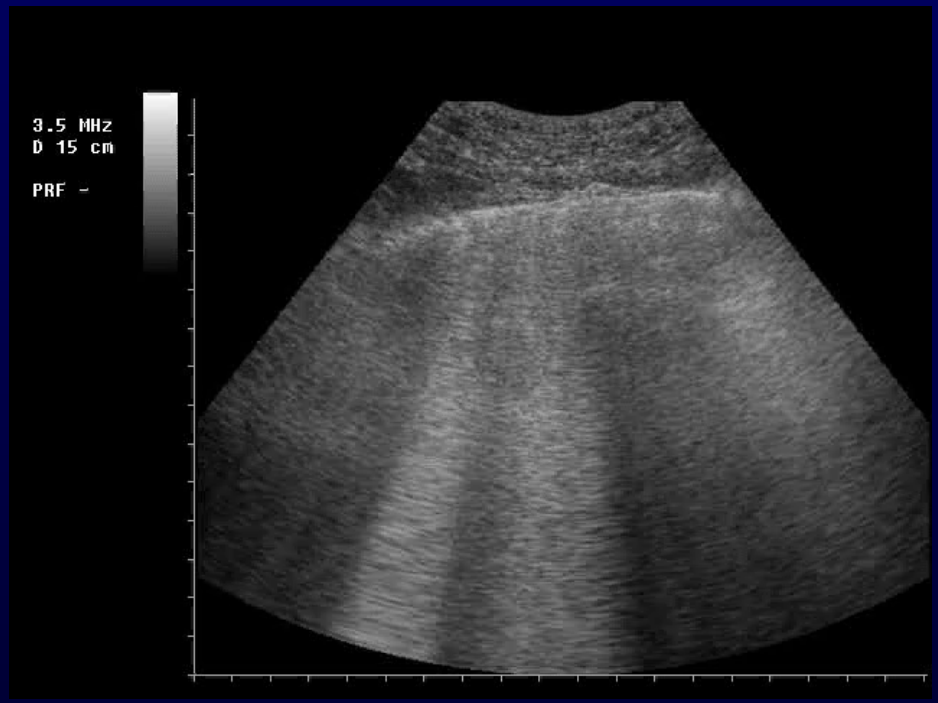
On the basis of such risk estimates and data on CT use from 1991 through 1996, it has been estimated that about 0.4% of all cancers in the United States may be attributable to the radiation from CT studies.

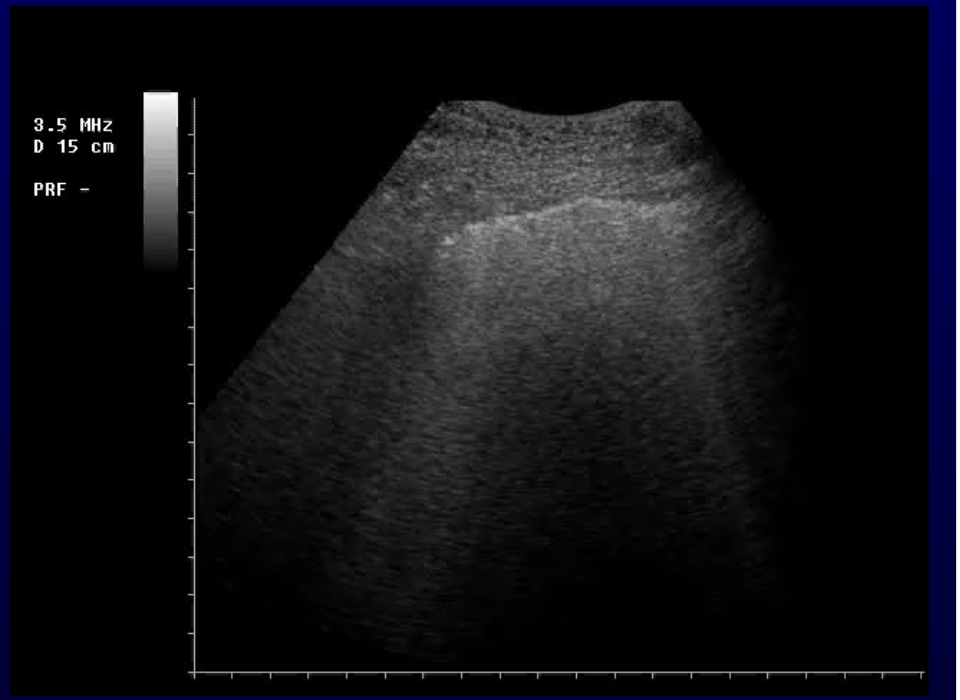
By adjusting this estimate for current CT use this estimate might now be in the range of 1.5 to 2.0%.

N Engl J Med 357;22 November 29, 2007

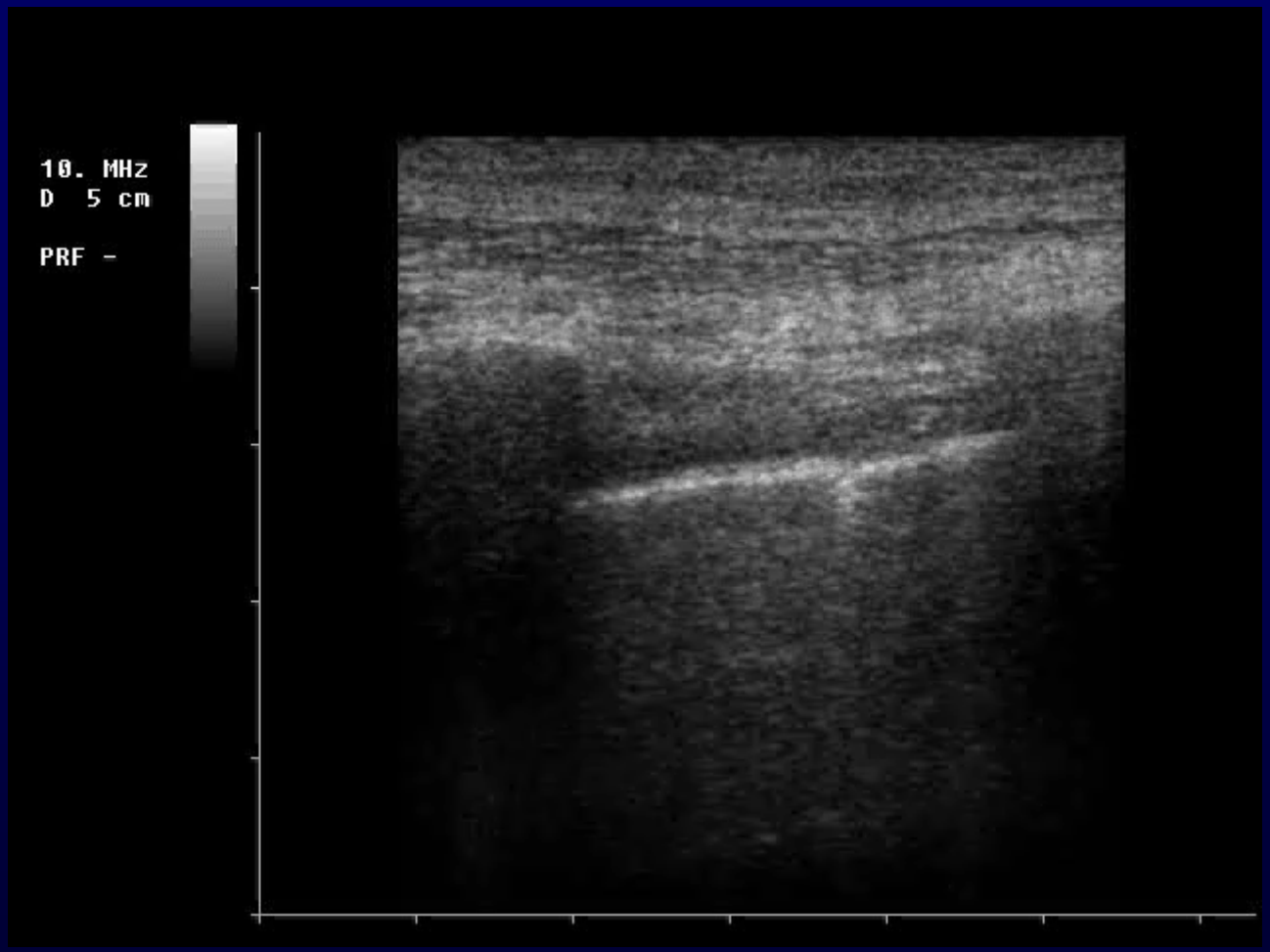


ALI - ARDS

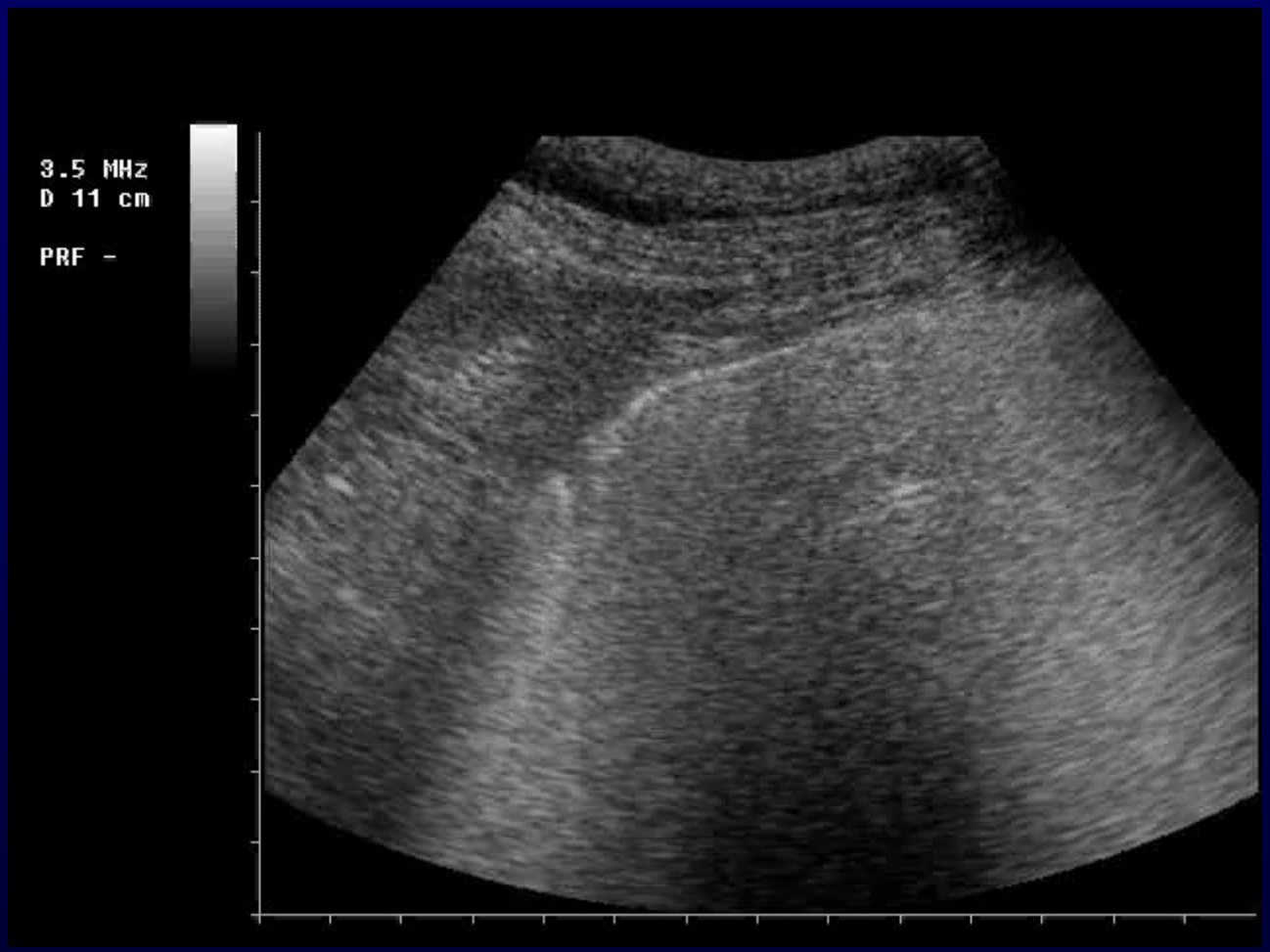




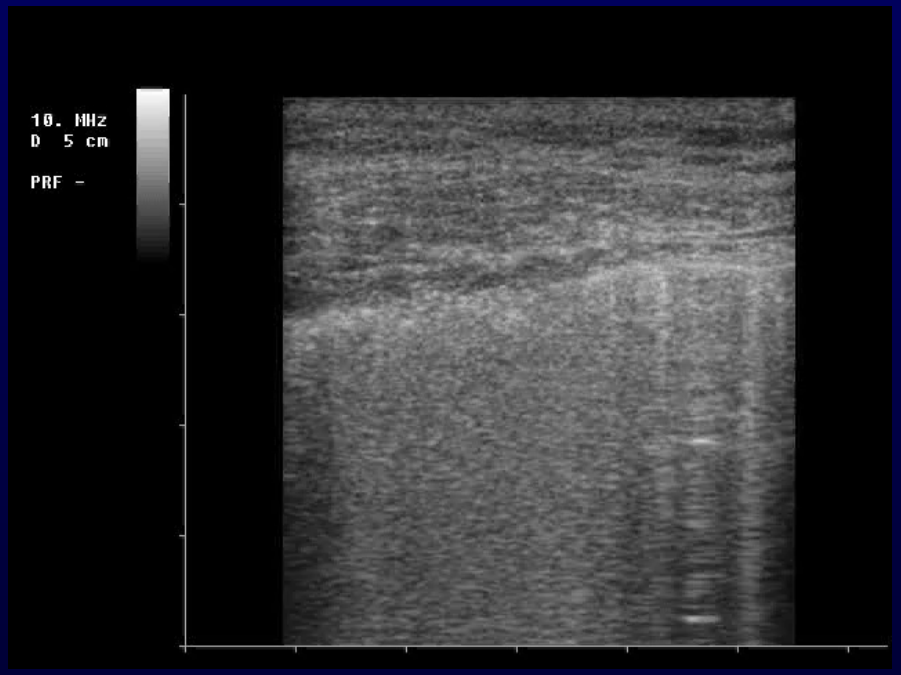
ALI - ARDS

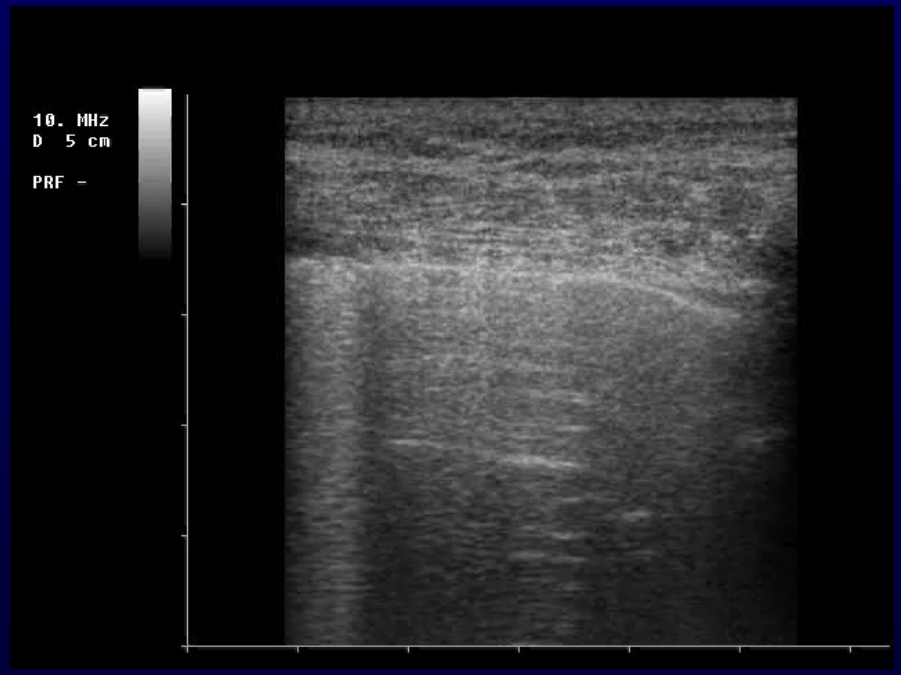


ALI - ARDS

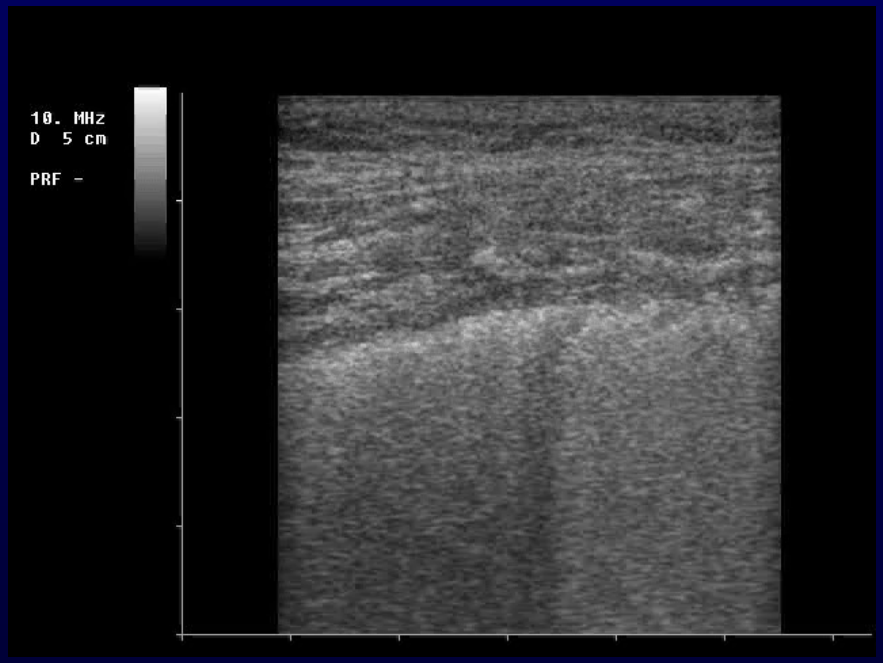


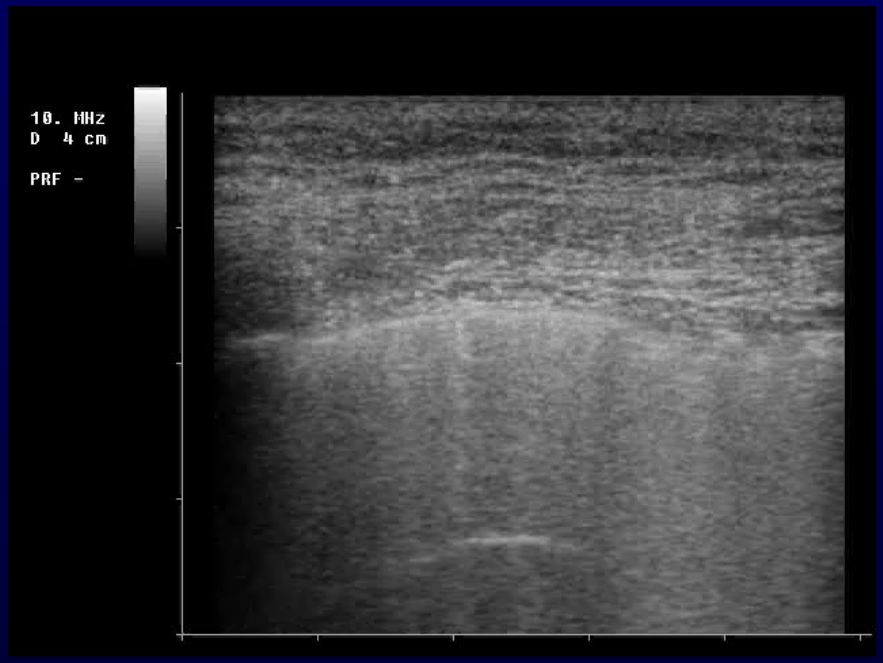
ALI - ARDS





ALI - ARDS





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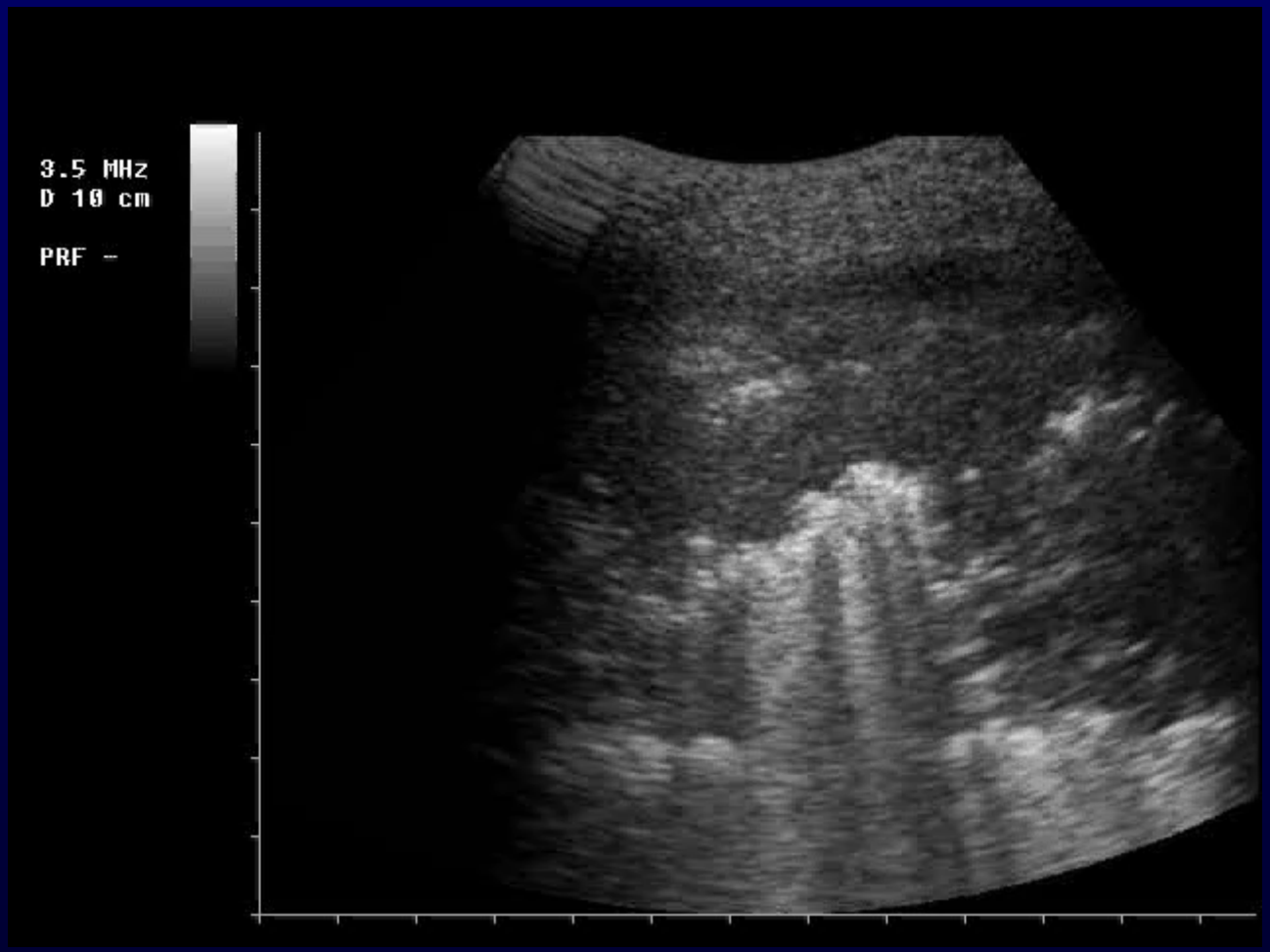
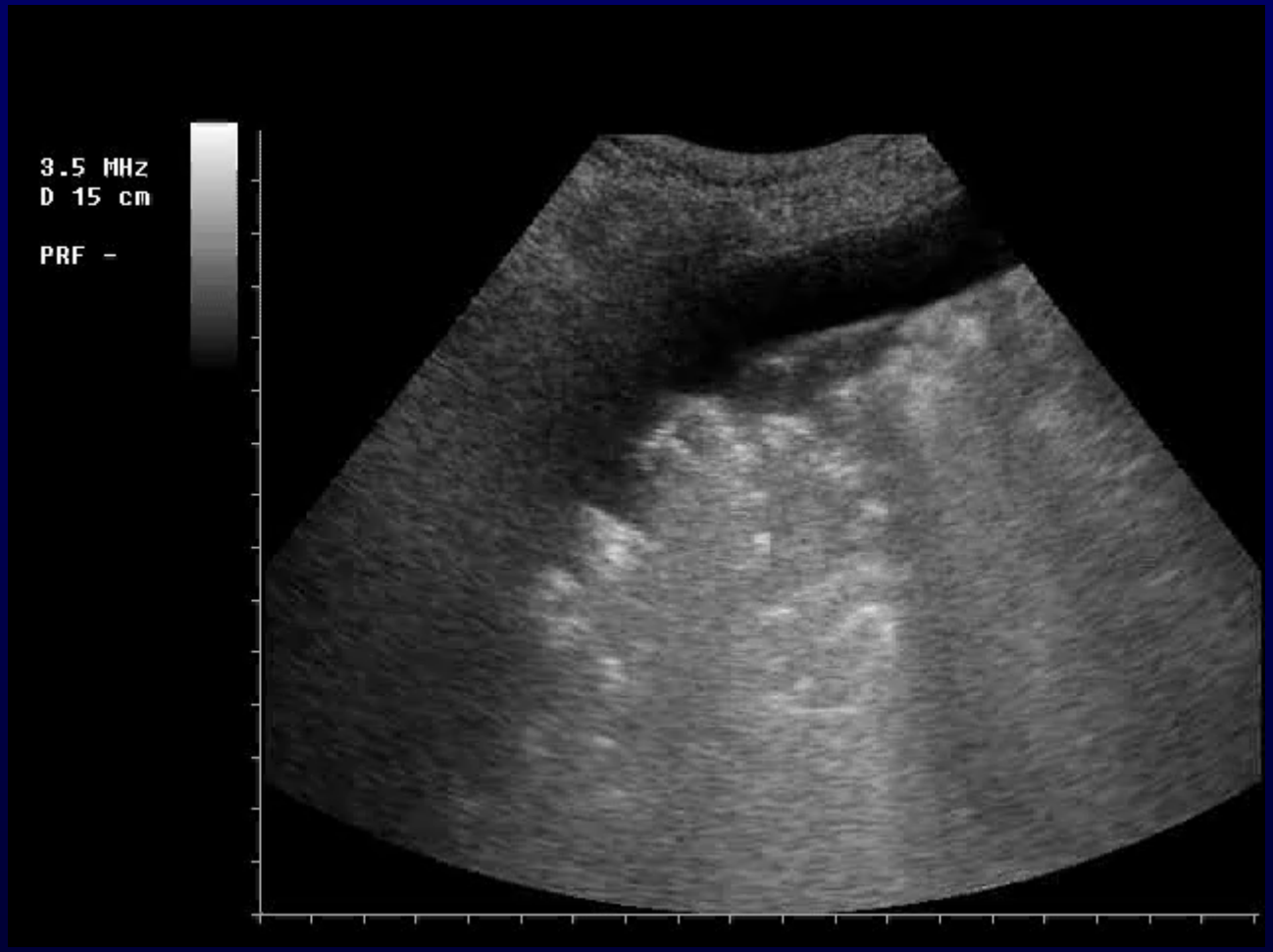


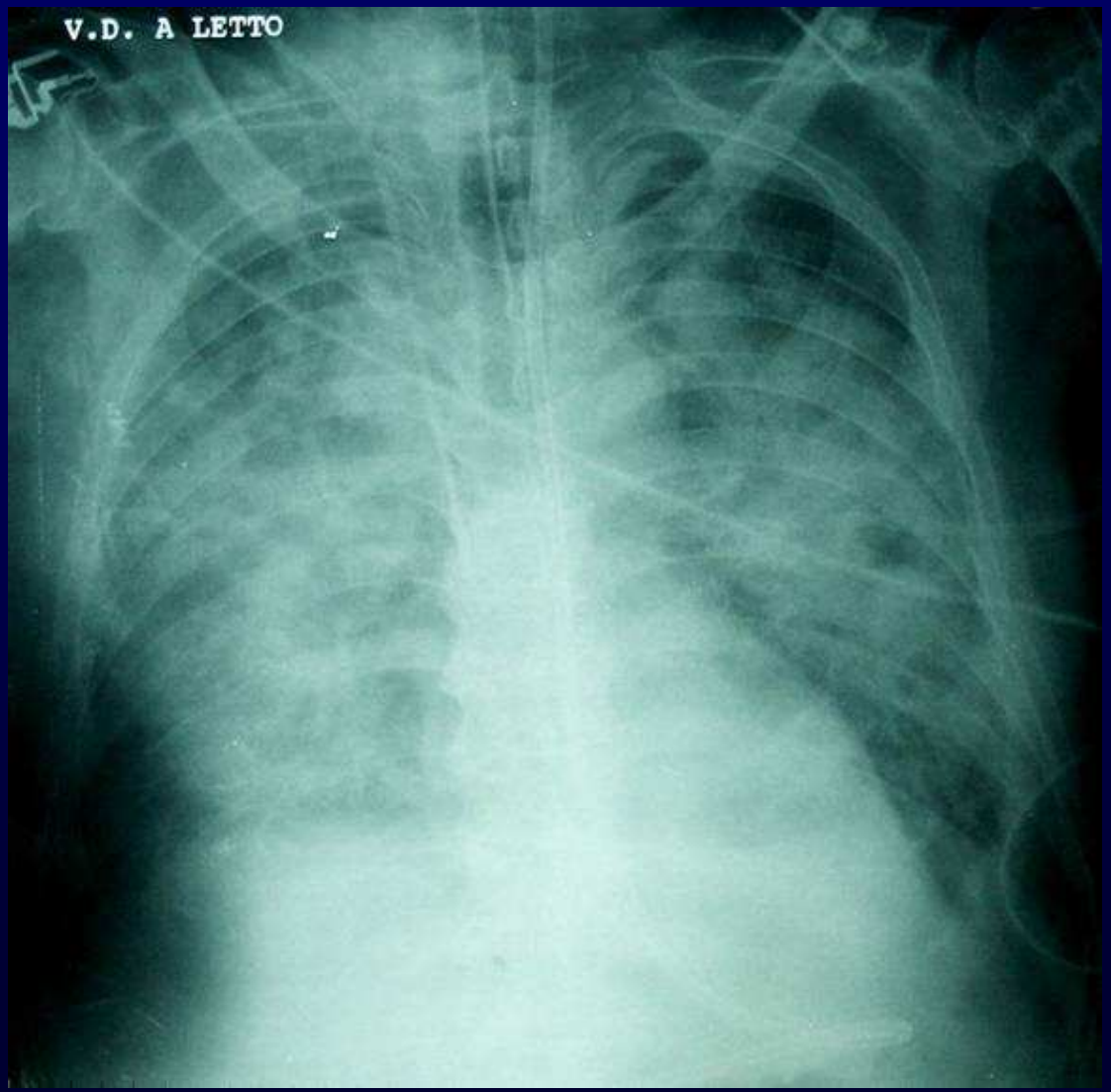
ALI - ARDS



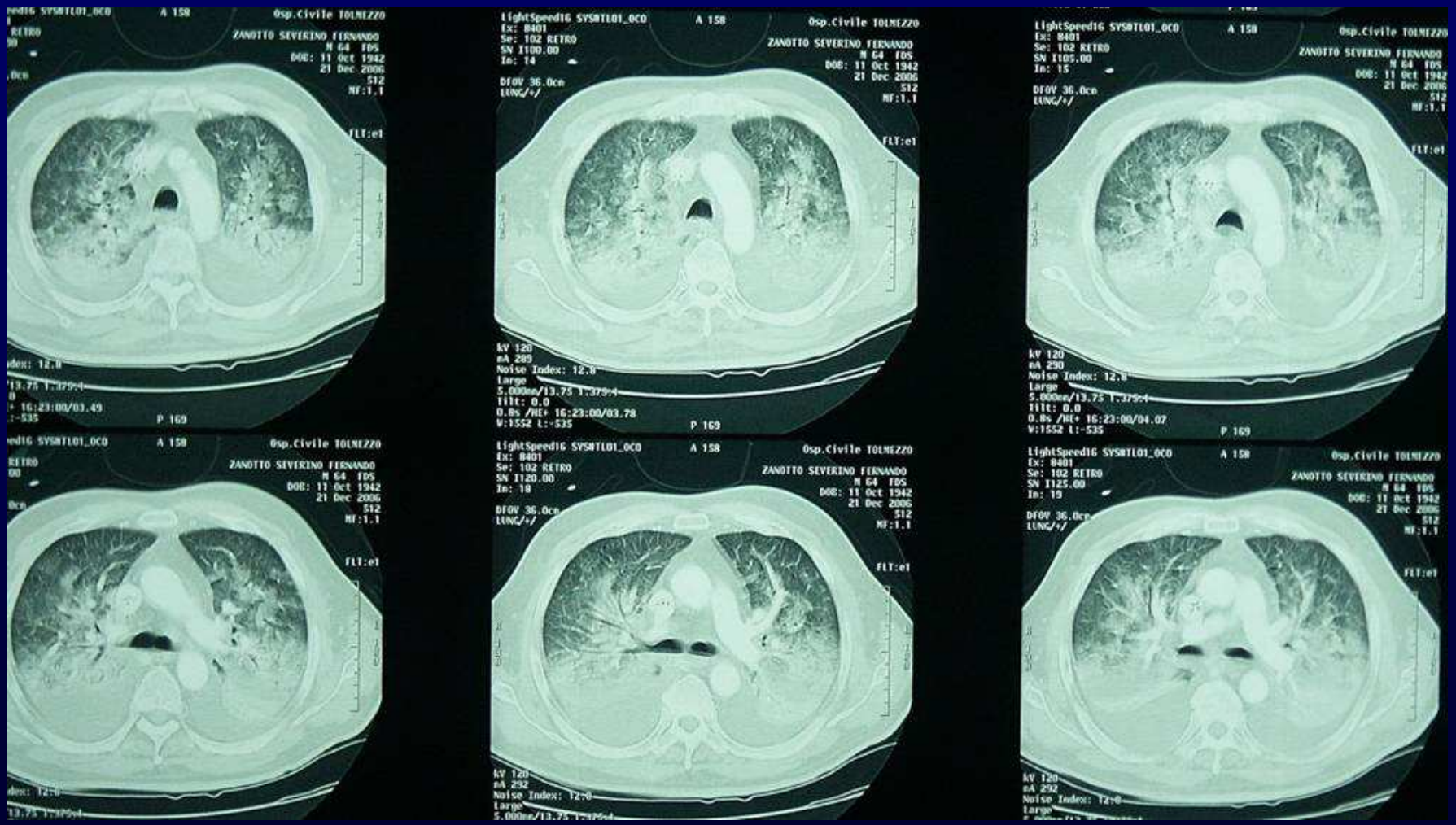
CASE 1

- M 63 y
- LEFT NEPHRECTOMY FOR TRAUMA 5 DAYS BEFORE
- ACUTE RESPIRATORY DISTRESS
- FEVER (> 38° C) IN THE LAST 48 H (RCP 300 – n.v. 0-5)
- BP 110/75 mmHg, HR 125/m, Sat O_2 80% (FiO_2 0.6)
- ECG: S.T., NOT SPECIFIC DIFFUSE ALTERATIONS OF ST-T
- EGA: pH 7.12, PCO_2 46 mmHg, $HCO3^-$ 12 mmEq/l, PO_2 48 mmHg
- PaO_2/FiO_2 = 80

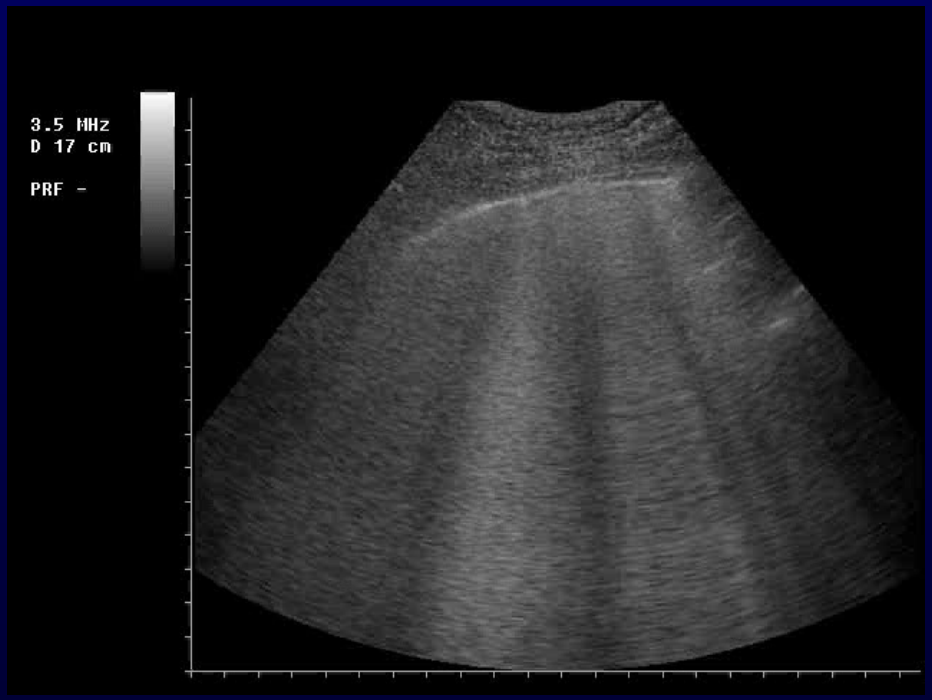
CXR



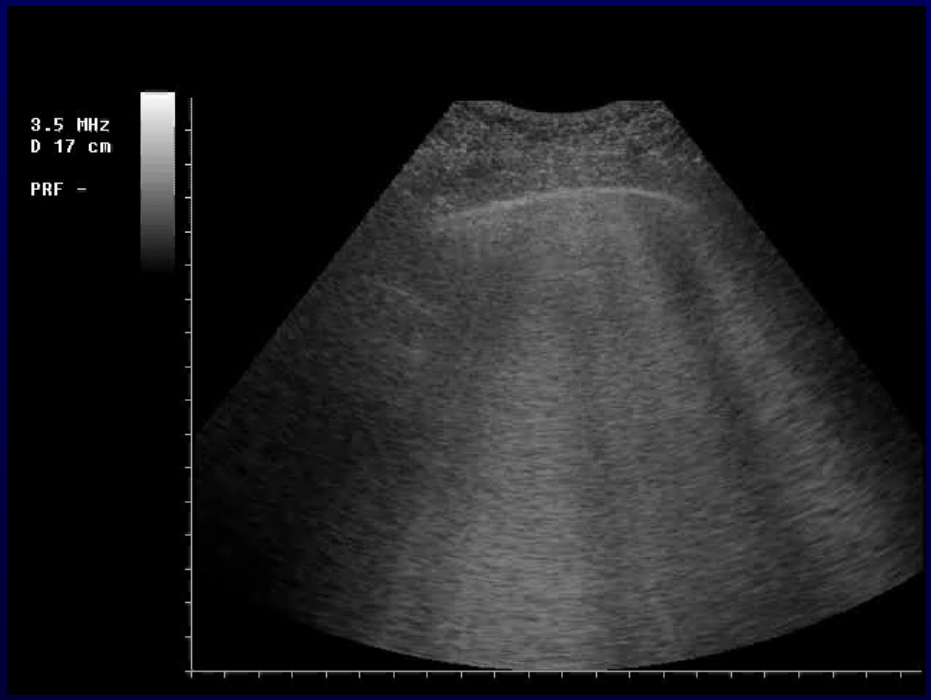
CT


Osp.Civile TOLMEZZO
ZANOTTO SEVERINO FERNANDO
DOB: 11 Oct 1942
21 Dec 2006
FLT:e1
P 169

LUNG ULTRASOUND

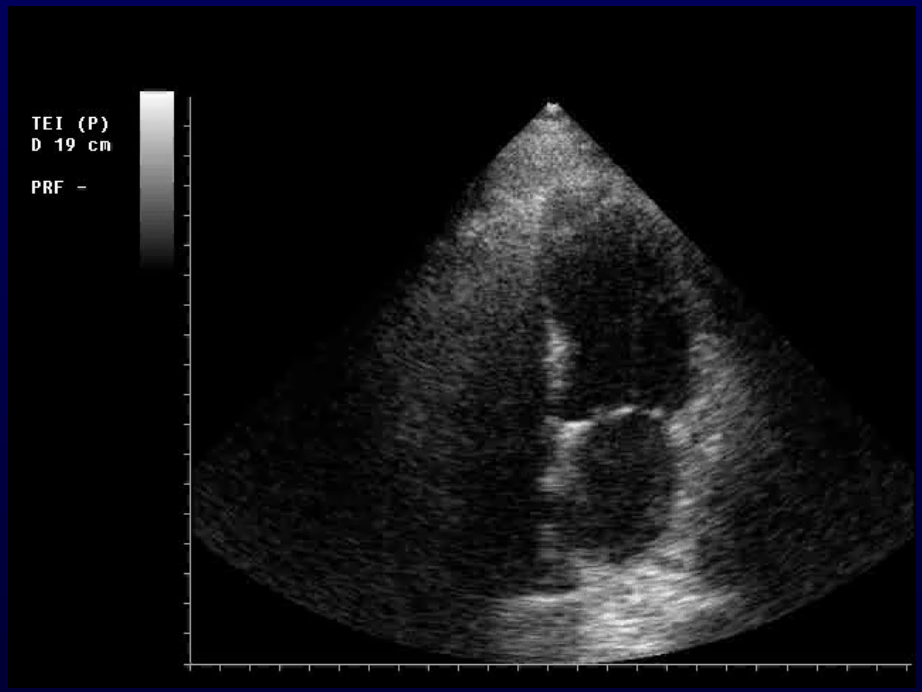


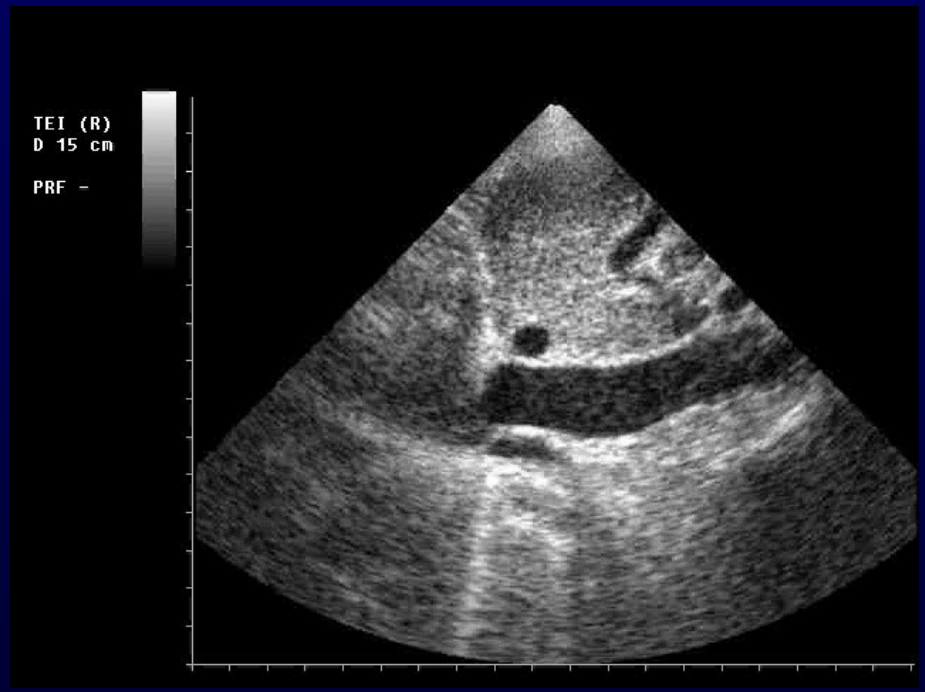
RIGHT LUNG



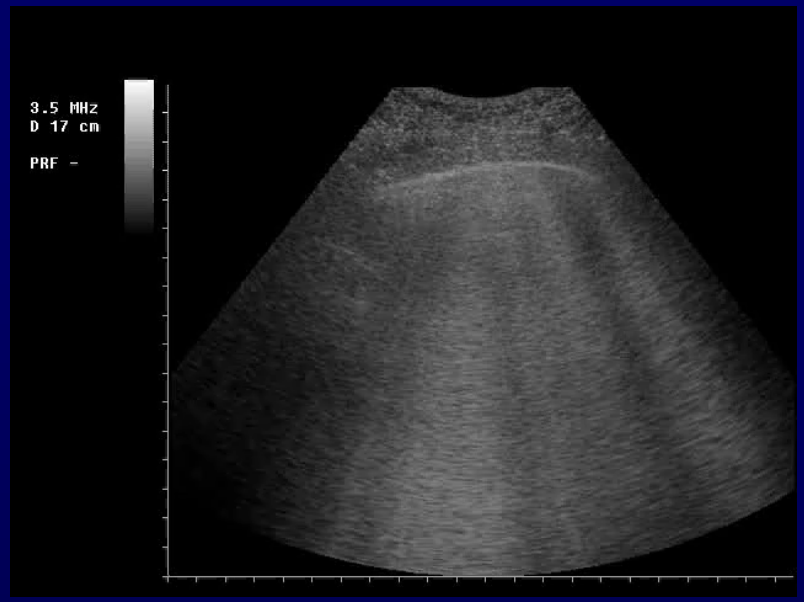
LEFT LUNG

HEART AND IVC ULTRASOUND

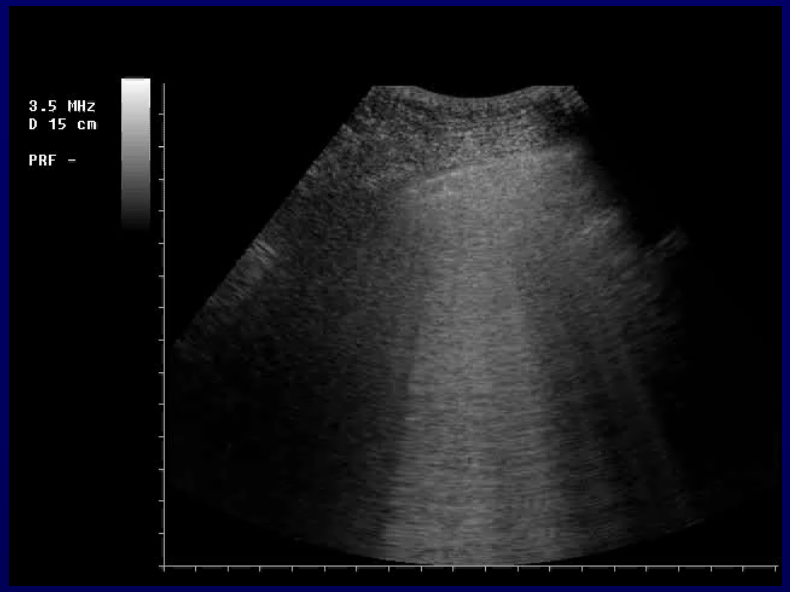




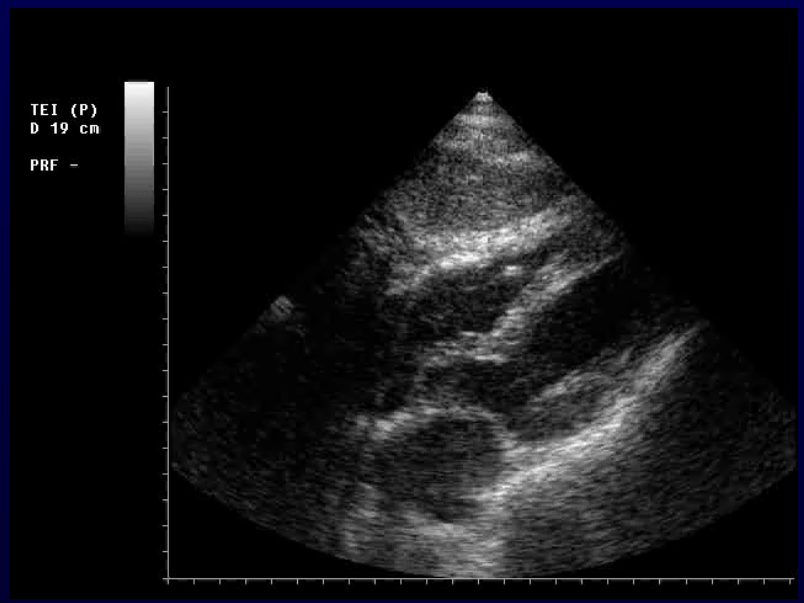
MECHANICAL VENTILATION – DIURETIC THERAPY



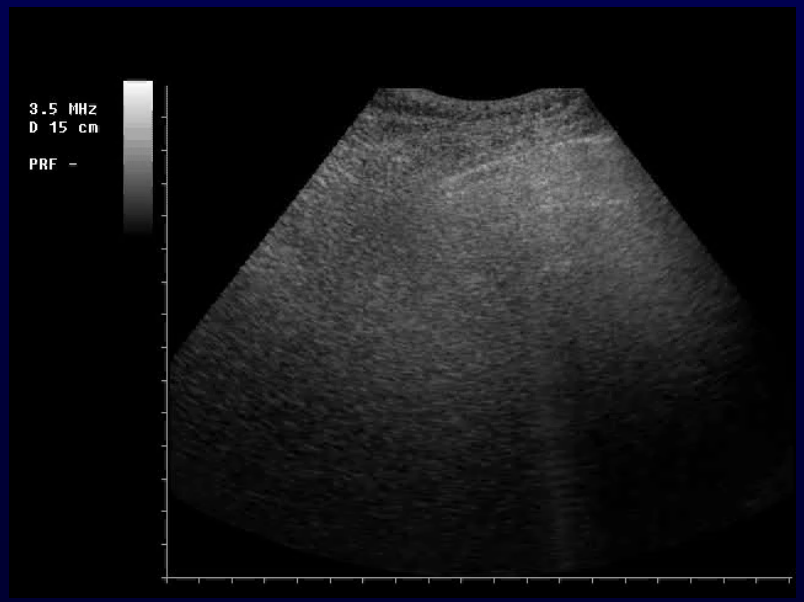
1st



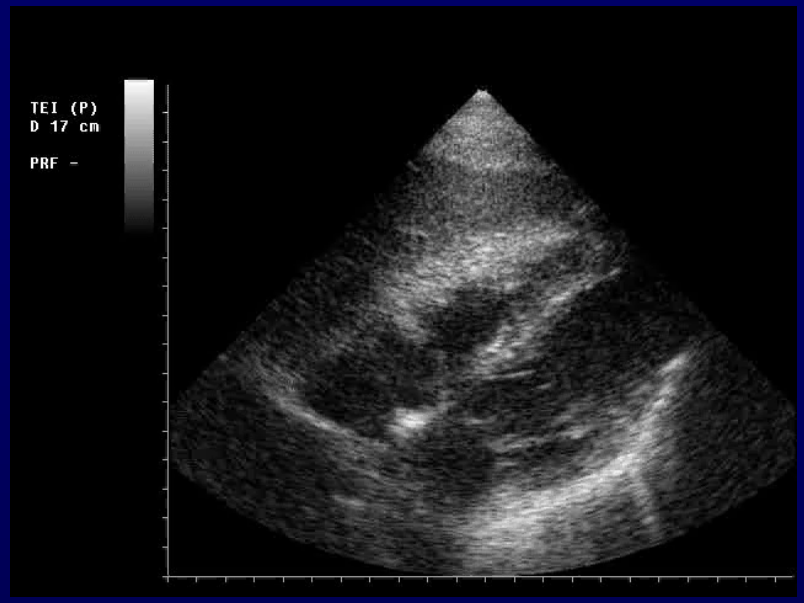
2nd 1 H after



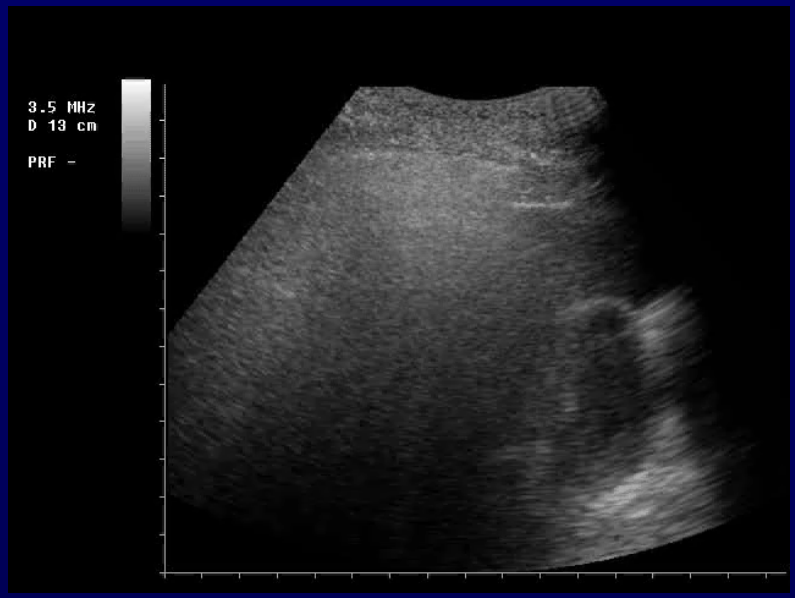
DOBUTAMINE



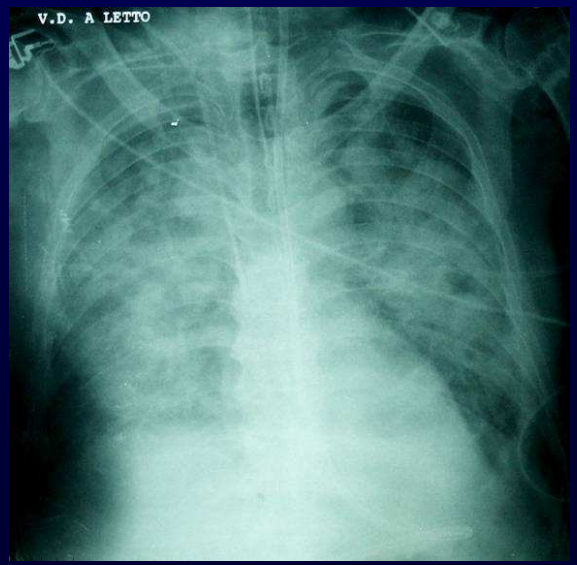
3rd 4 H after



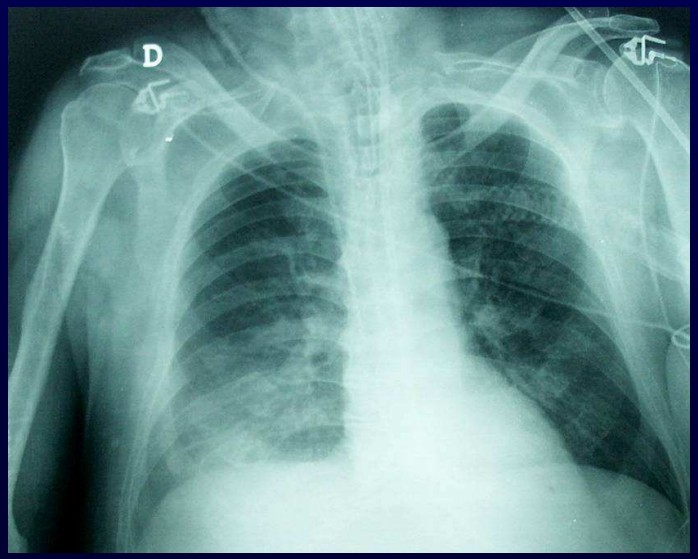
8 H after



8 H after

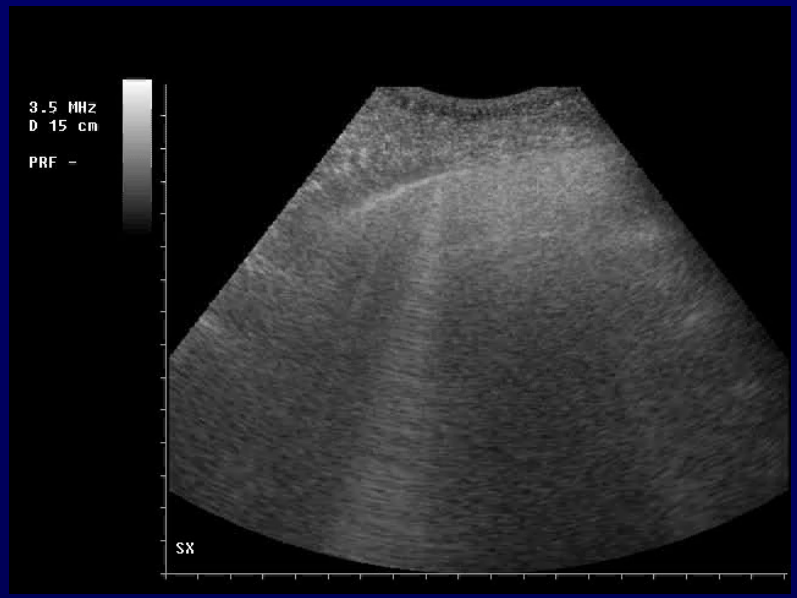


1st



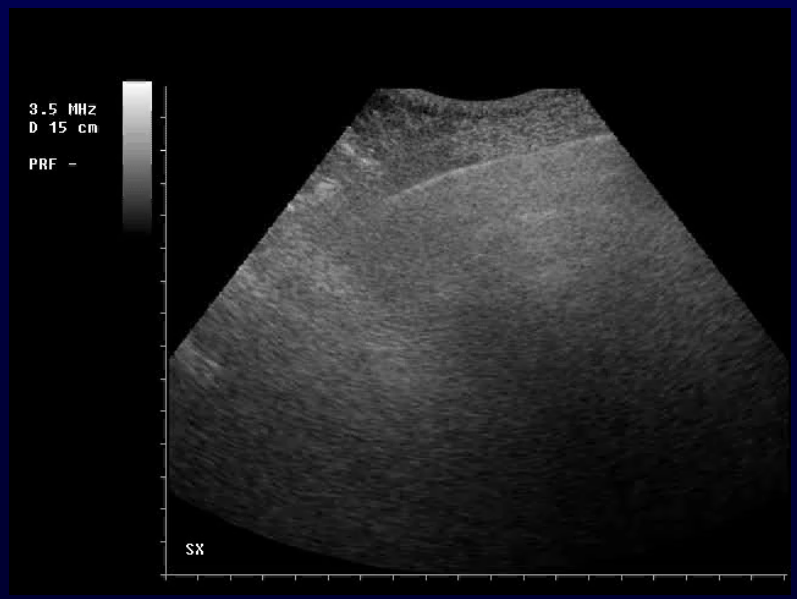
16 H after

H 9.40



H 10.45

H 11.19



H 11.45

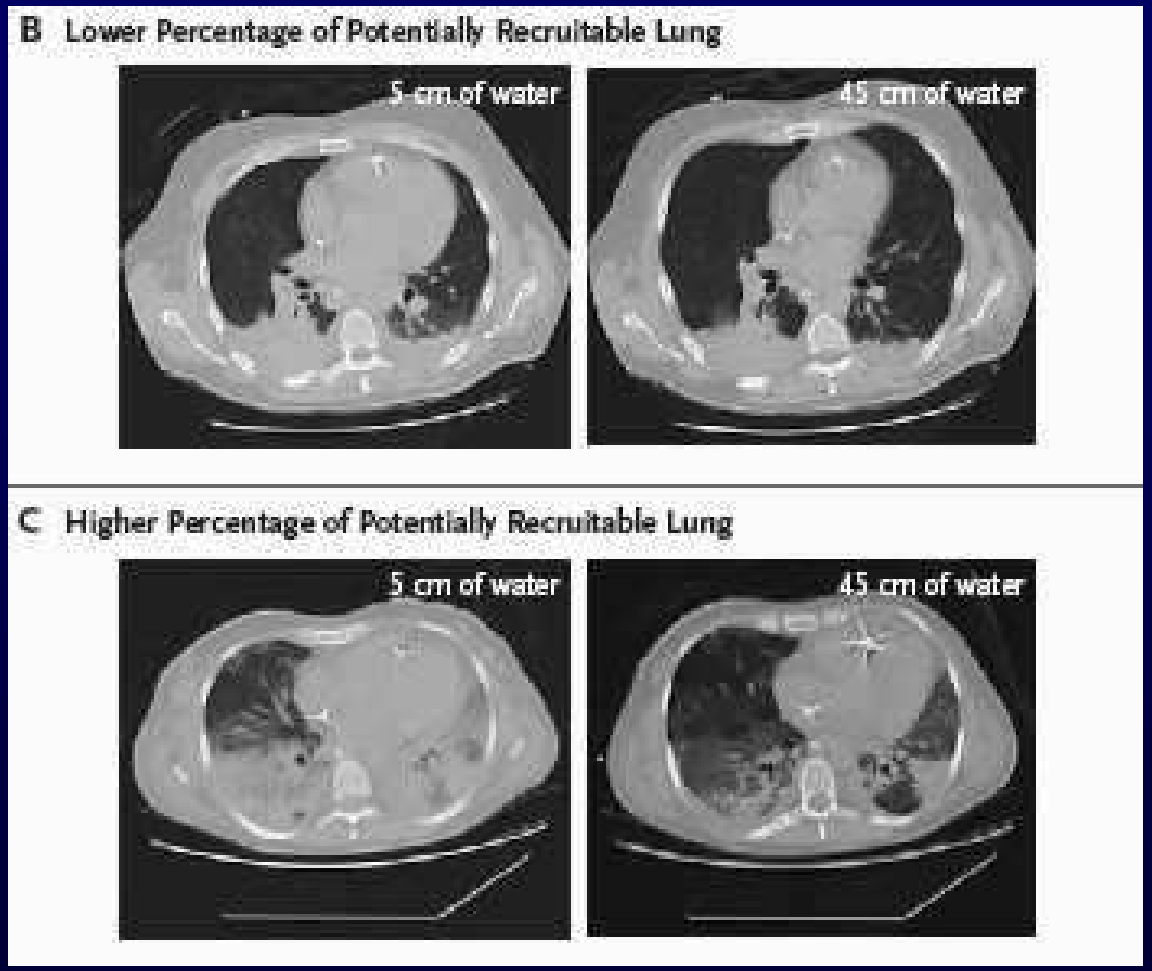
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 27, 2006 VOL. 354 NO. 17

Lung Recruitment in Patients with the Acute Respiratory Distress Syndrome

Luciano Gattinoni, M.D., F.R.C.P., Pietro Caironi, M.D., Massimo Cressoni, M.D., Davide Chiumello, M.D., V. Marco Ranieri, M.D., Michael Quintel, M.D., Ph.D., Sebastiano Russo, M.D., Nicolò Patroniti, M.D., Rodrigo Cornejo, M.D., and Guillermo Bugedo, M.D.

N Engl J Med 354;17 april 27, 2006



N Engl J Med 354;17 april 27, 2006

The NEW ENGLAND JOURNAL of MEDICINE

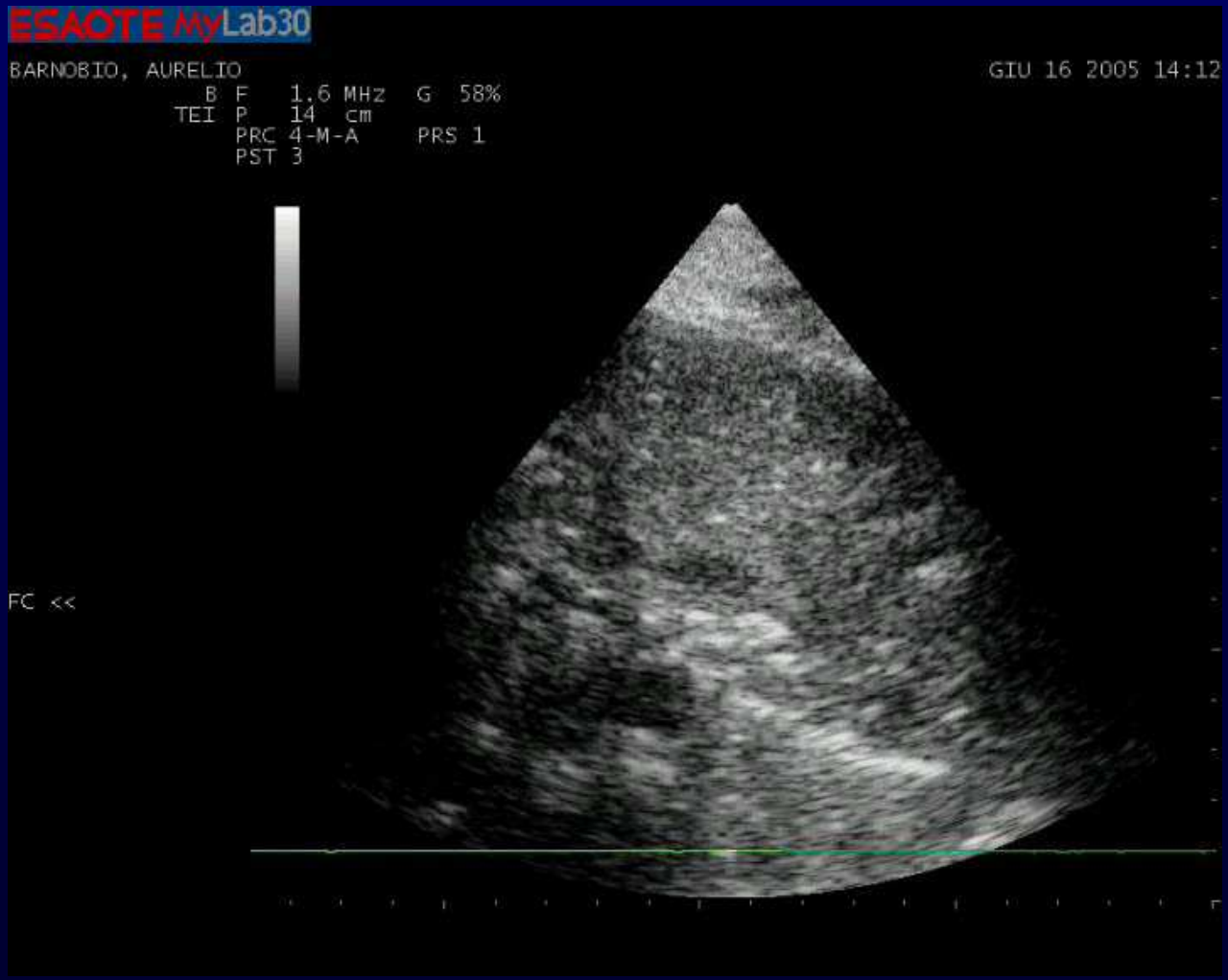
EDITORIALS

PEEP or No PEEP — Lung Recruitment May Be the Solution

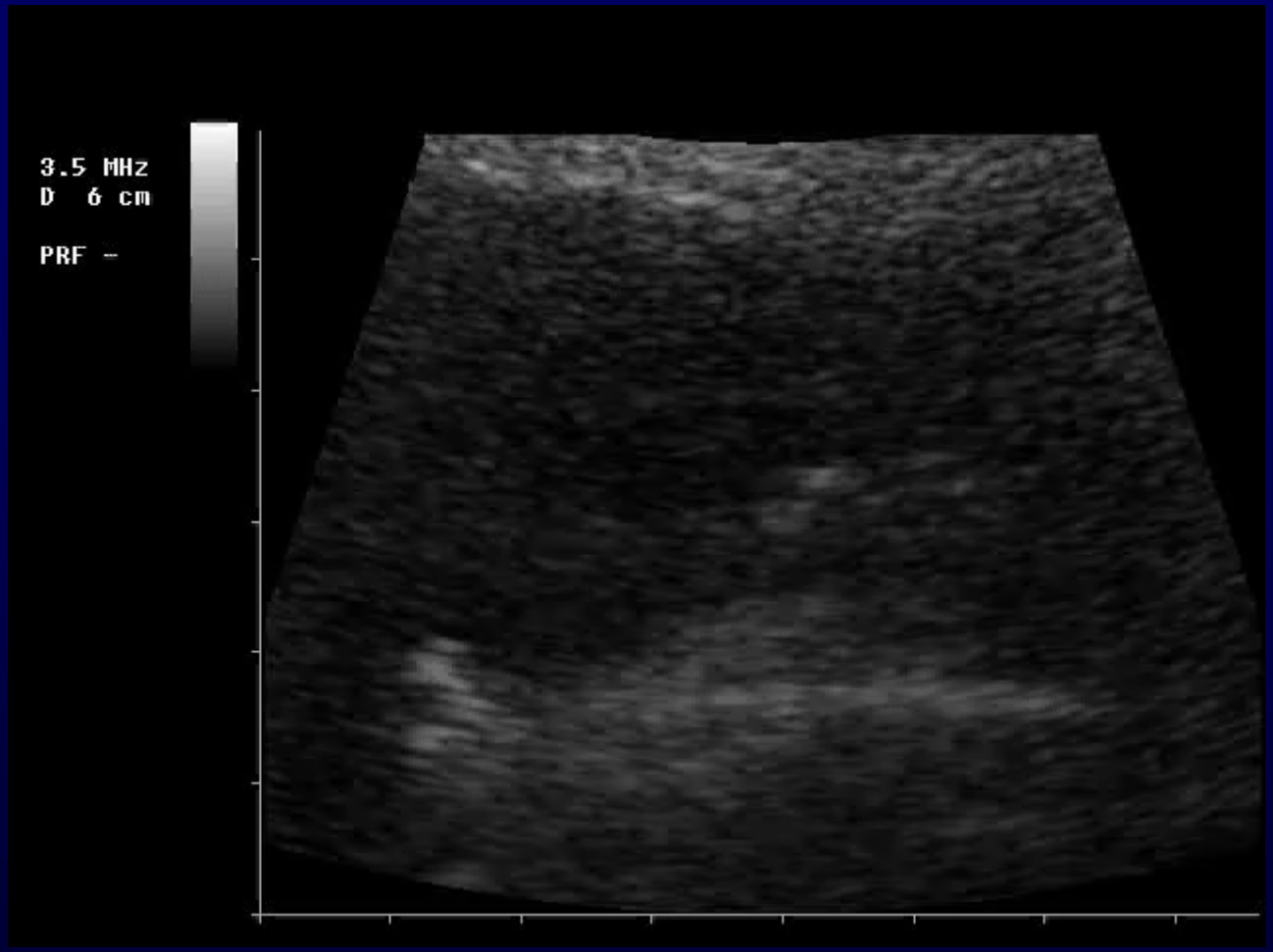
Arthur S. Slutsky, M.D., and Leonard D. Hudson, M.D.

N Engl J Med 354;17 april 27, 2006

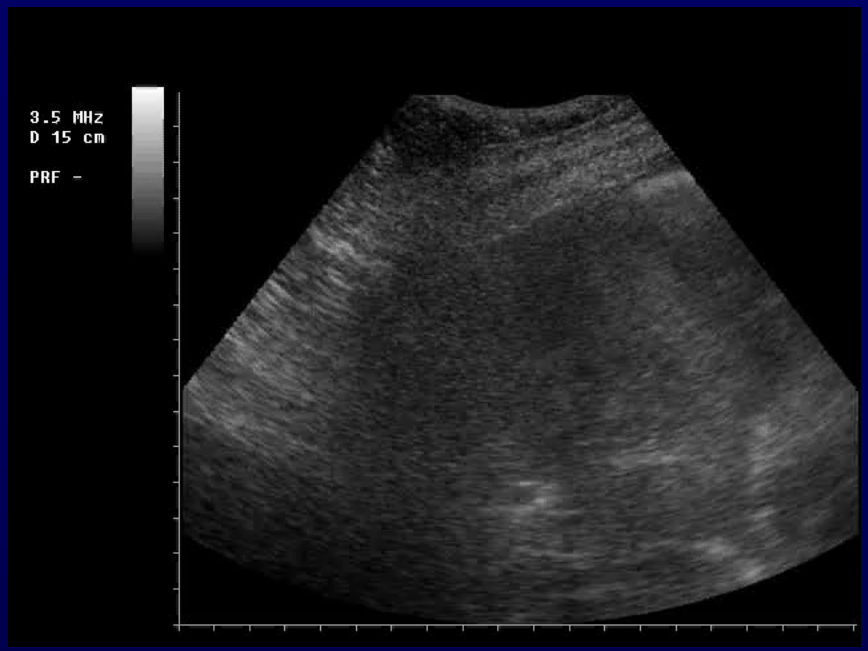
ATELECTASIS



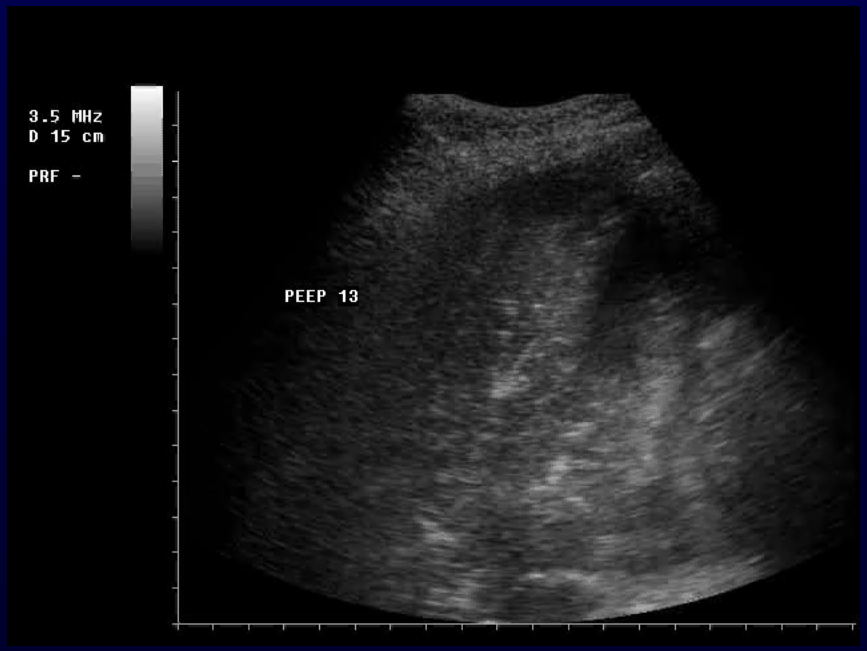
ALI - ARDS



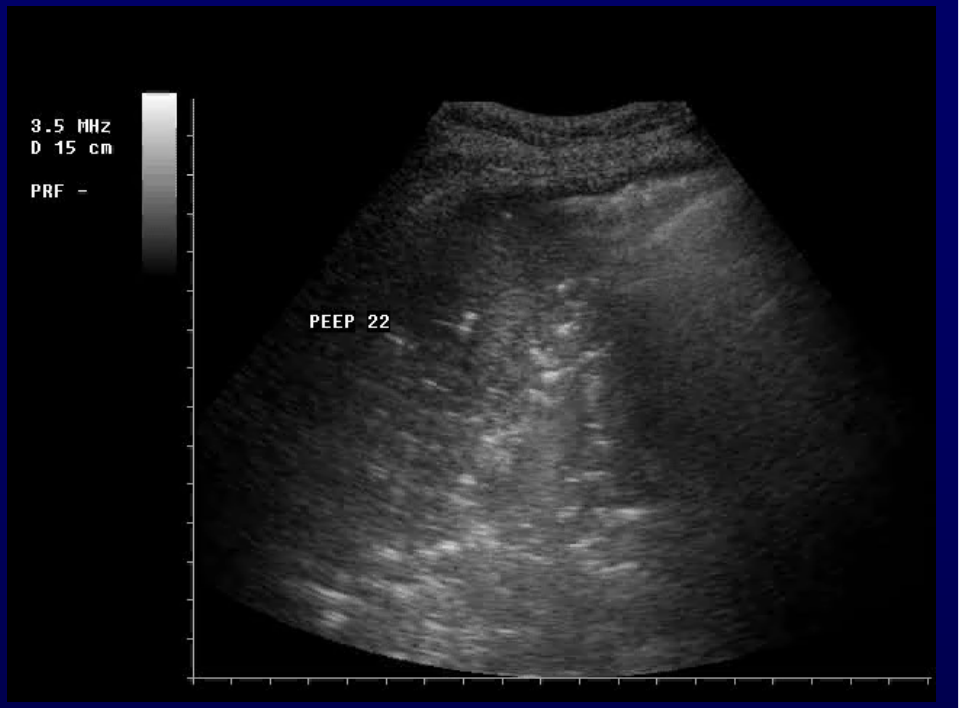
DYNAMIC AIR BRONCHOGRAMS DURING MECHANICAL VENTILATION IN ADULT WITH ARDS


3.5 MHz
D 15 cm
PRF -


3.5 MHz
D 15 cm
PRF -
PEEP 10


3.5 MHz
D 15 cm
PRF -
PEEP 13


3.5 MHz
D 15 cm
PRF -
PEEP 17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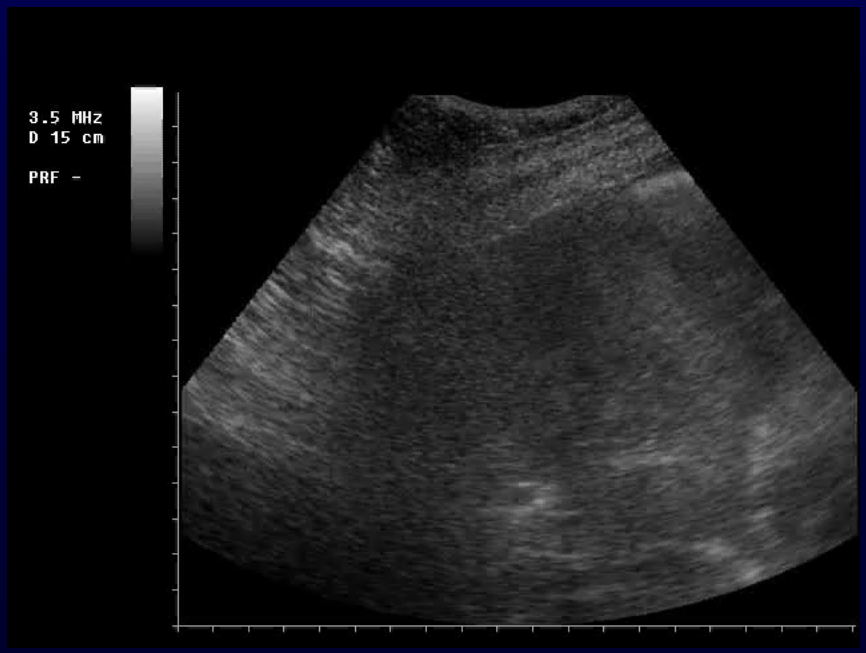
3.5 MHz
D 15 cm
PRF -


esaote MyLab
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POLMONITE RECRUITMENT,
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0:00:00.54
B F 2.5 MHz G 49%
P 19 cm XV C
PRC 10-4-A PRS 4
PST 3
ADDOME CA430


esaote MyLab
AREA DI EMERGENZA/OSPEDALE TOLMEZZO
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esaote MyLab
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esaote MyLab
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esaote MyLab
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esaote MyLab
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esaote MyLab
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P 19 cm XV C
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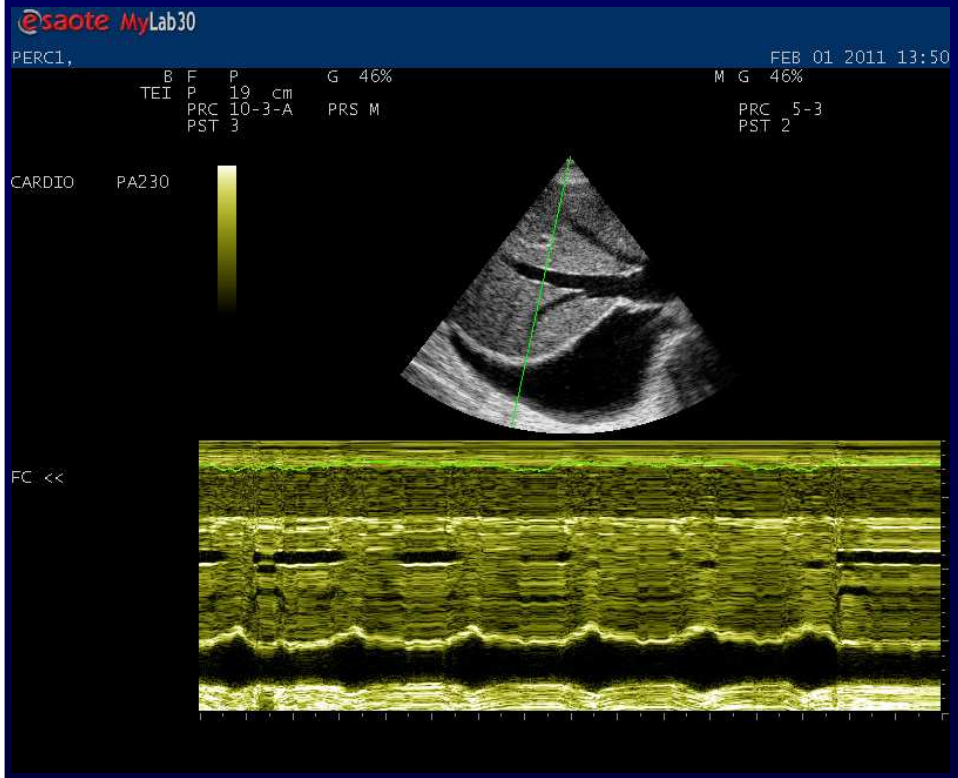
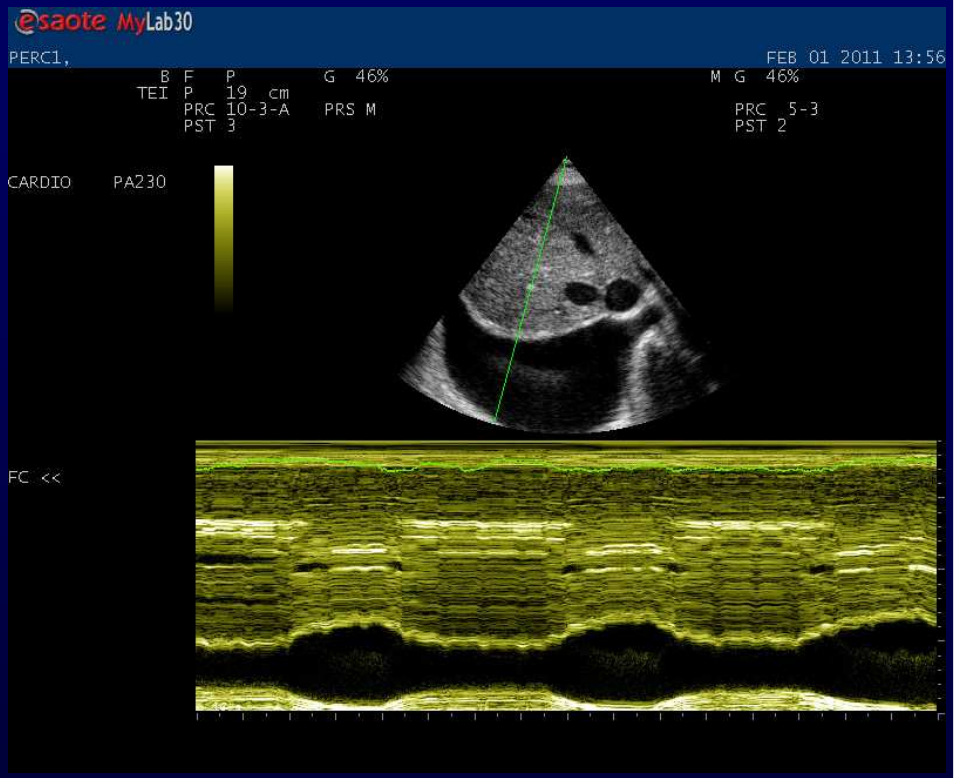
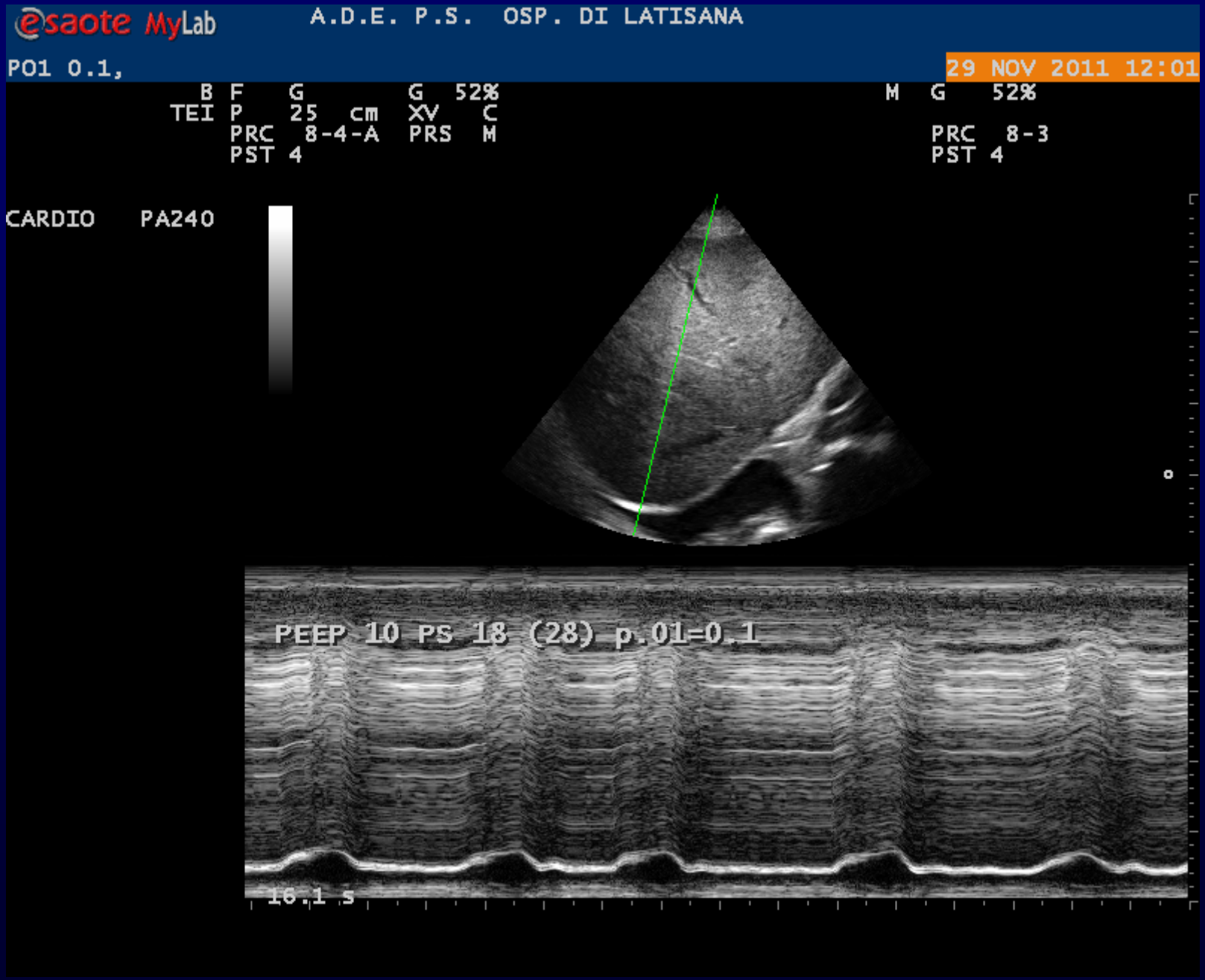
MONITORING MECHANICAL VENTILATION

MONITORING MECHANICAL VENTILATION






esaote MyLab
A.D.E. P.S. OSP. DI LATISANA
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TEI P 25 cm XV C
PRC 8-4-A PRS M
PST 4
M G 52%
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PST 4
CARDIO PA240
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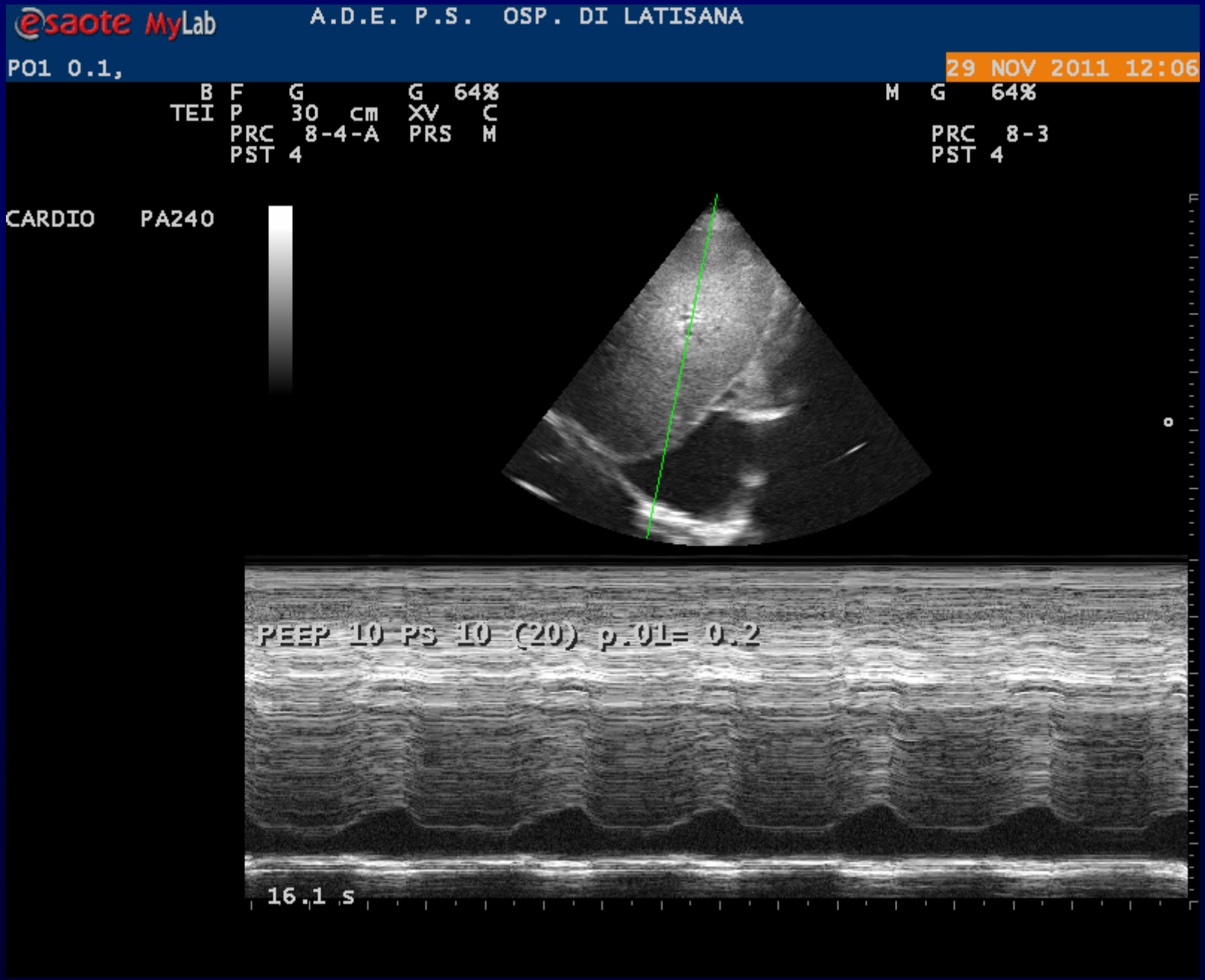
16.1 s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A.D.E. P.S. OSP. DI LATISANA
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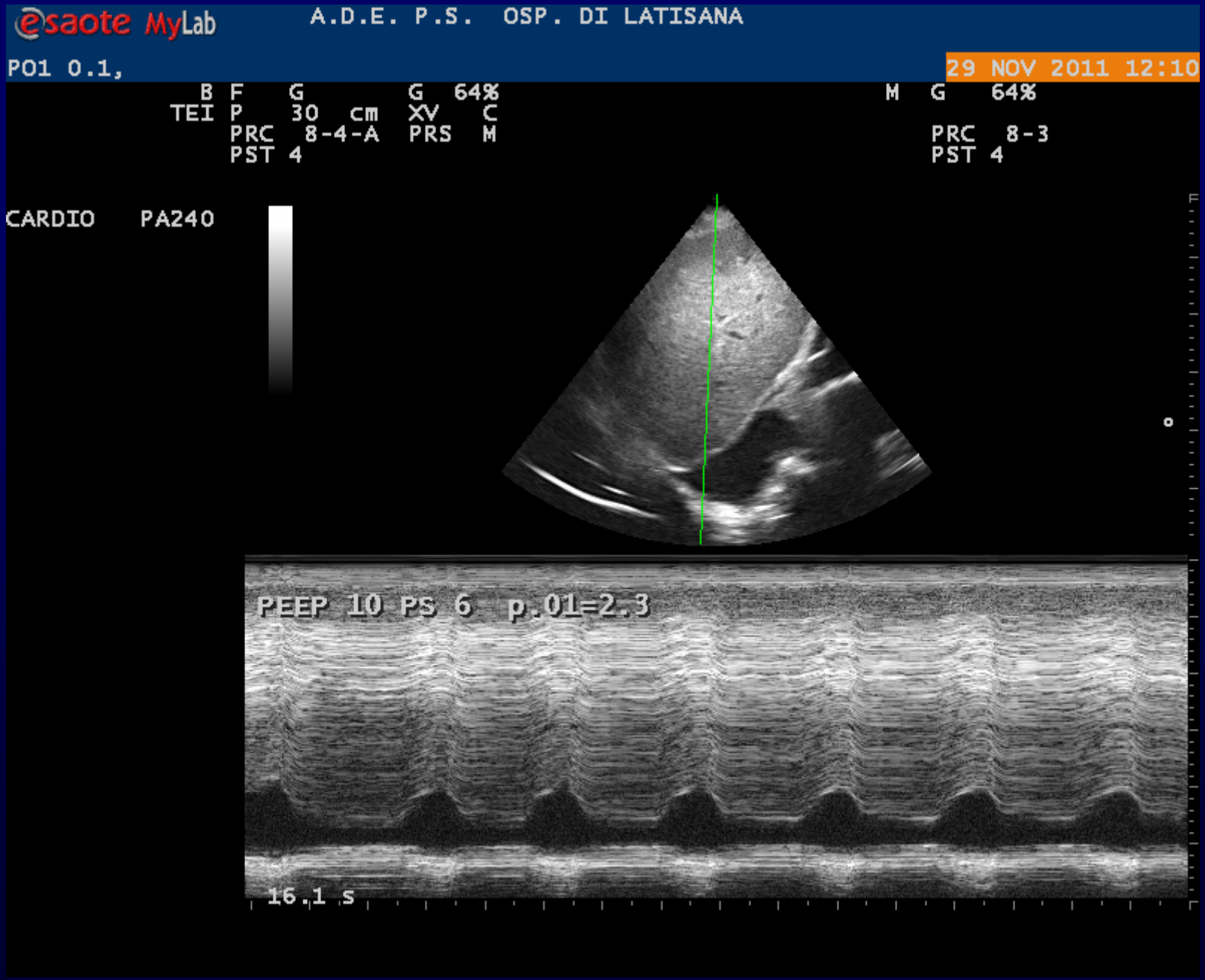
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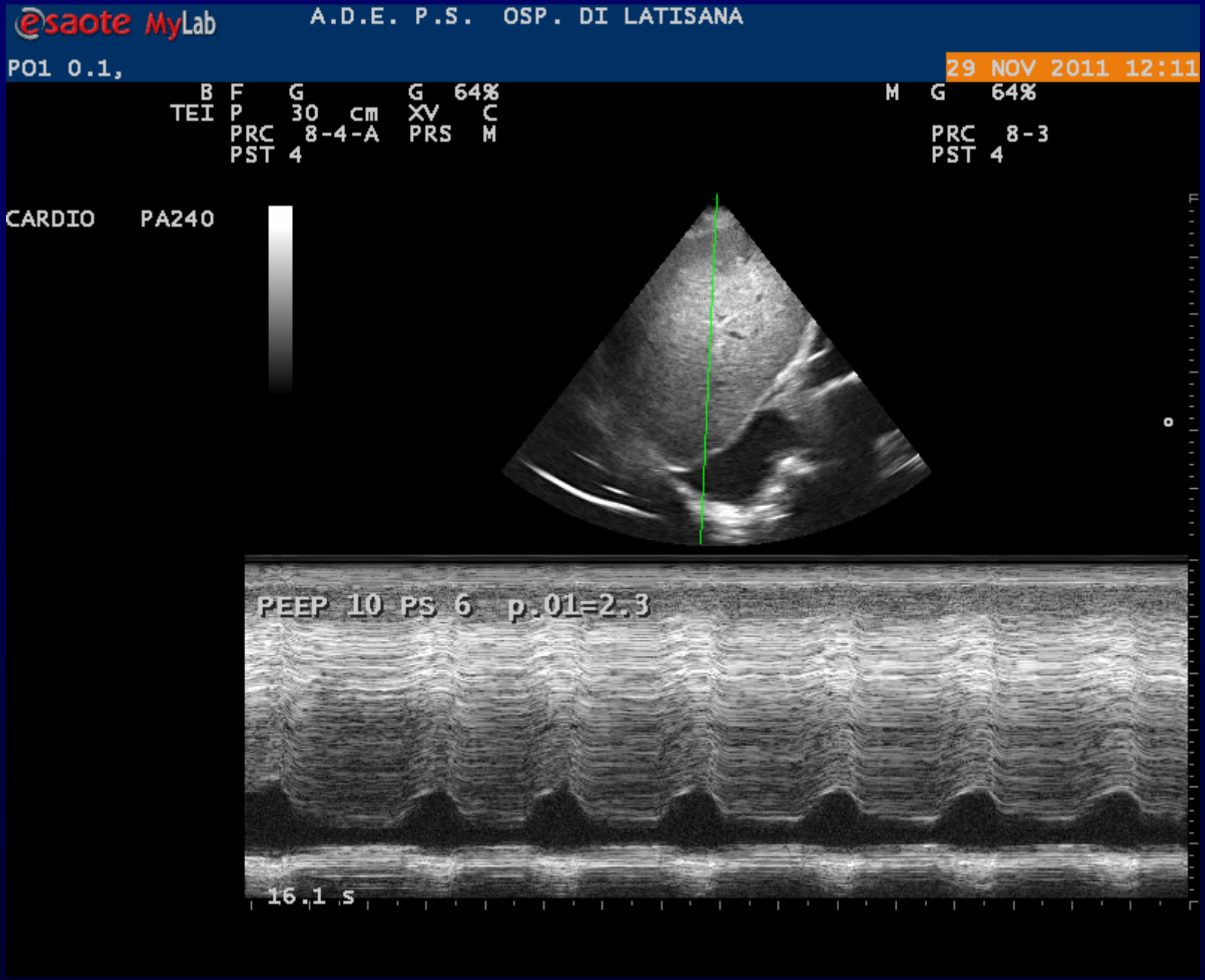
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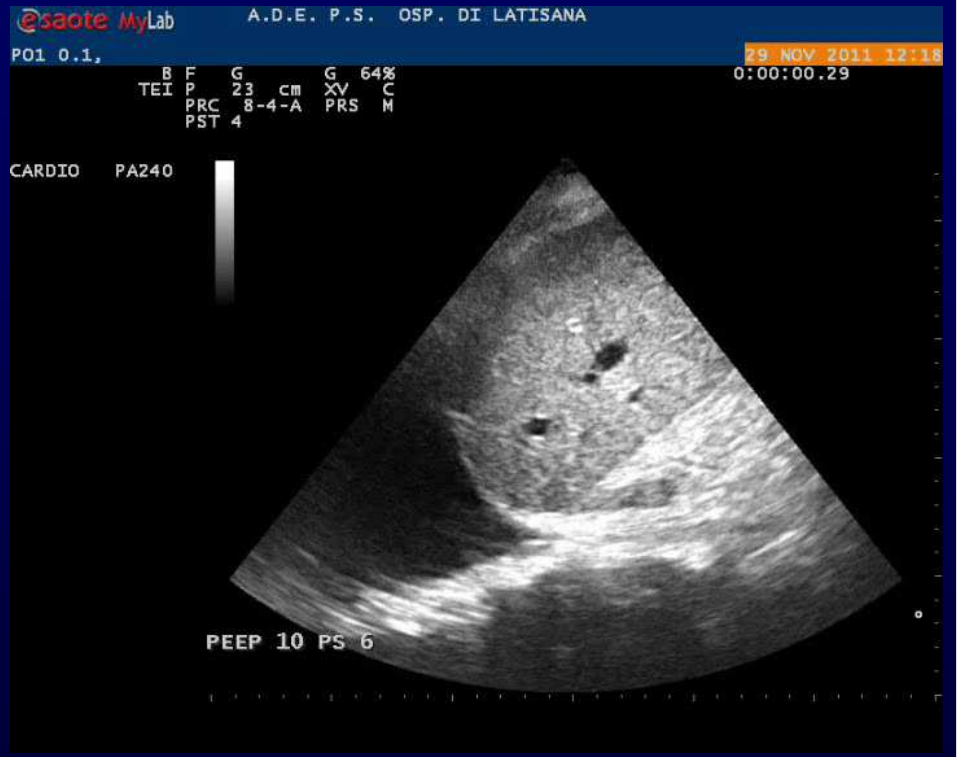
MONITORING MECHANICAL VENTILATION



MONITORING MECHANICAL VENTILATION


ARRIVEE

GRAZIE PER LA VOSTRA ATTENZIONE