LUNG ULTRASOUND WHERE ARE WE AFTER 15 YEARS ?

Luigi Cattarossi MD
Neonatal Intensive Care Unit
University Hospital “S. Maria della Misericordia”
Udine - Italy

AZIENDA OSPEDALIERO UNIVERSITARIA
Santa Maria della Misericordia di Udine

Szanowni Koledzy dobry dzień

Neonatology

Original Paper

Neonatology 2007;91:203–209
DOI: 10.1159/000097454

Received: February 27, 2006
Accepted after revision: September 12, 2006
Published online: December 6, 2006

The 'Double Lung Point': An Ultrasound Sign Diagnostic of Transient Tachypnea of the Newborn

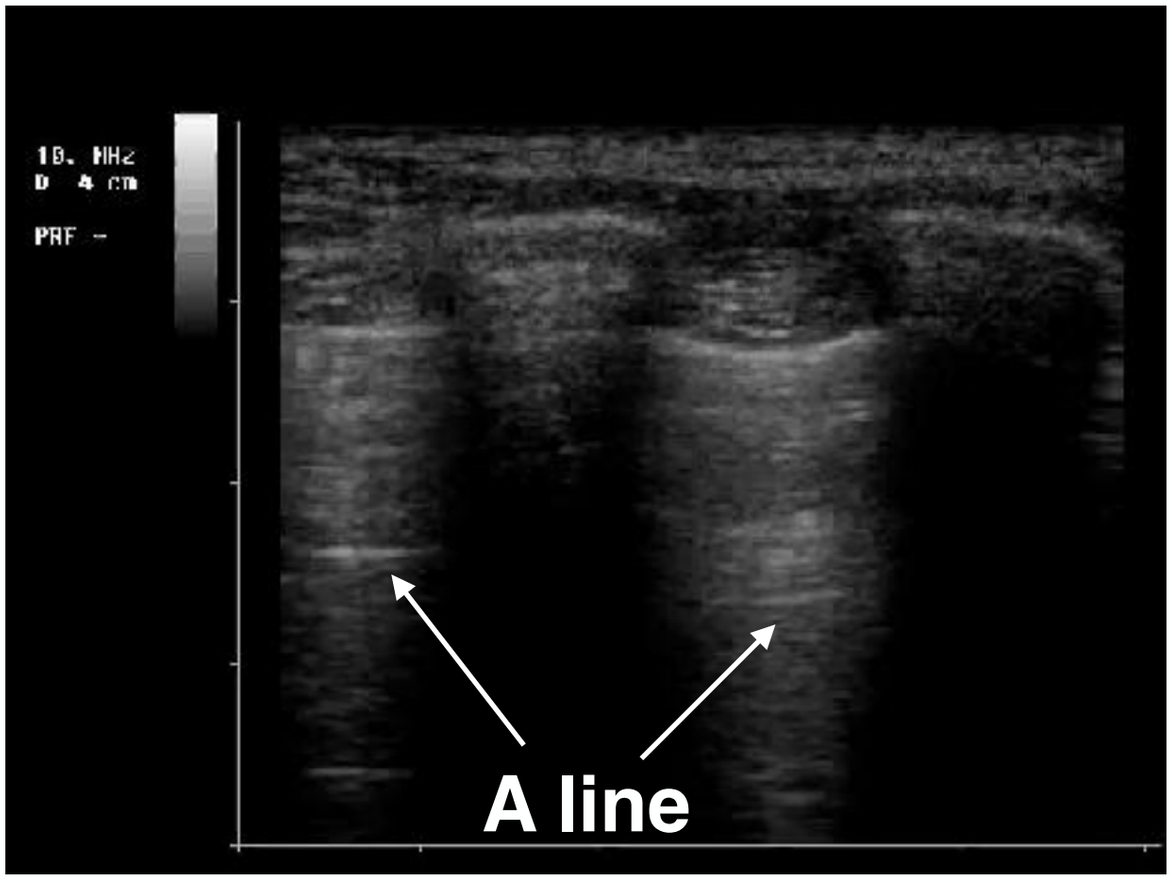
Roberto Copetti[a] Luigi Cattarossi[b]

Departments of [a]Emergency and [b]Pediatrics, S. Antonio Abate Hospital, Tolmezzo, Italy

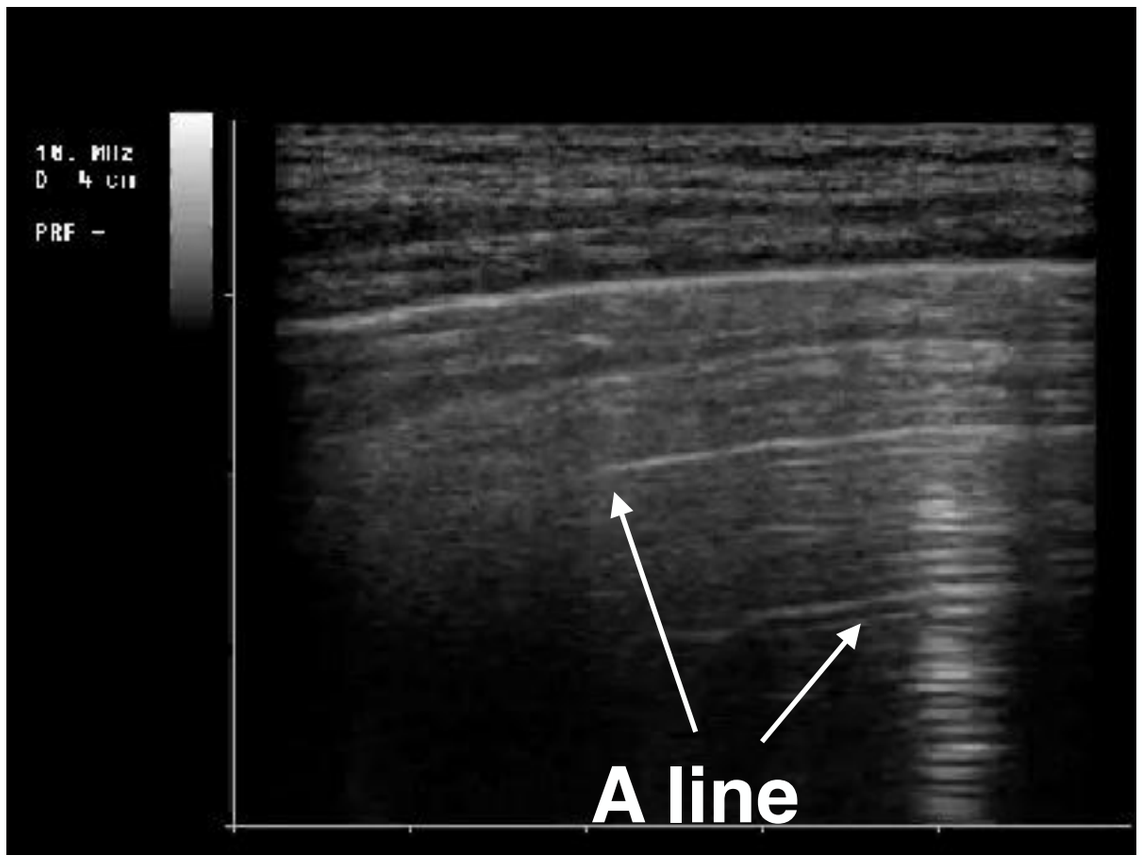
Received: February 27, 2006
Accepted after revision: September 12, 2006
Published online: December 6, 2006

AZIENDA OSPEDALIERO UNIVERSITARIA
Santa Maria della Misericordia di Udine

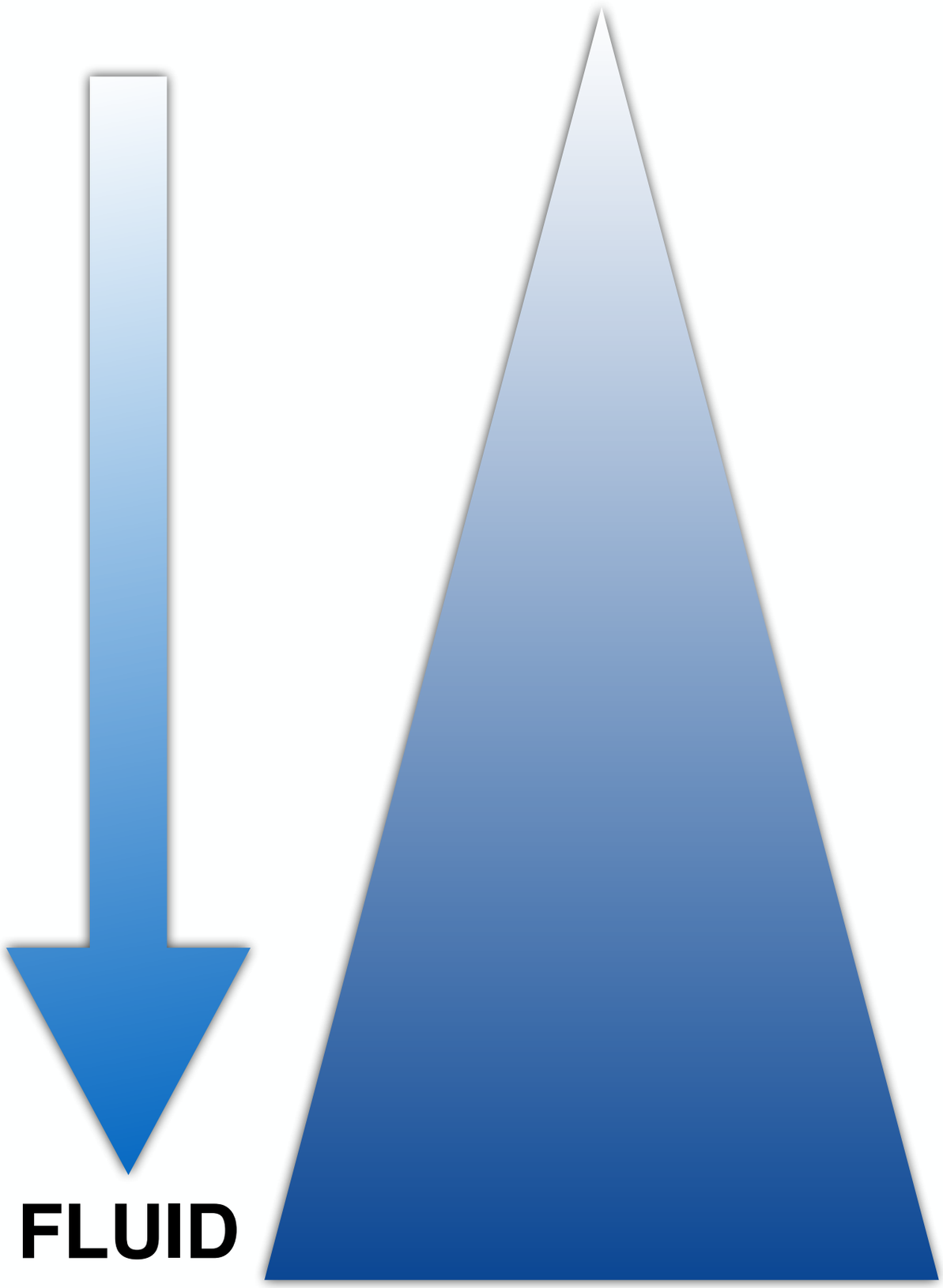
Normal (sagittal scan)



Normal (transversal scan)



AIR/FLUID RATIO



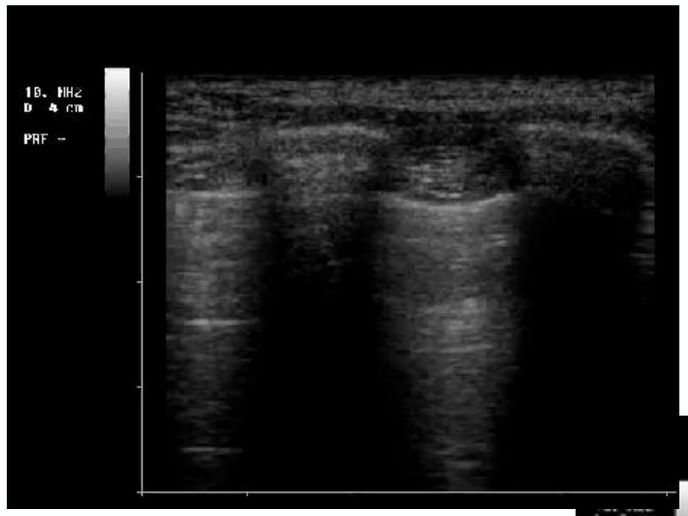
98% - A LINES

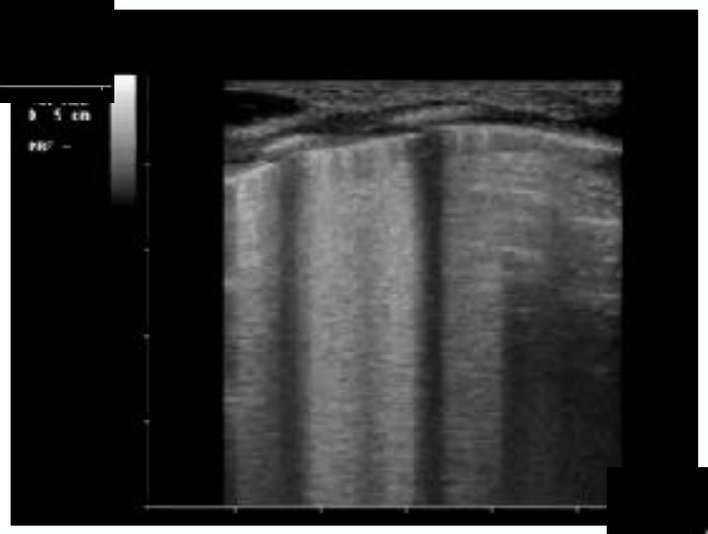
95% - B LINES

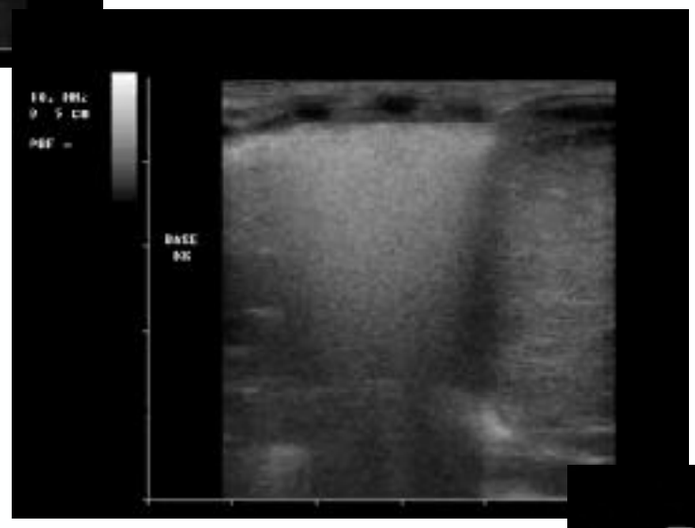
85% - ECHOGRAPHIC WHITE LUNG

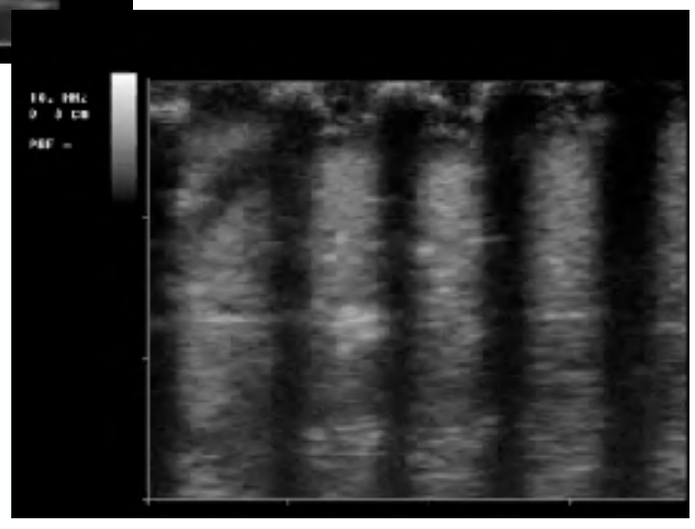
10% - CONSOLIDATION

5% - ATELECTASIS





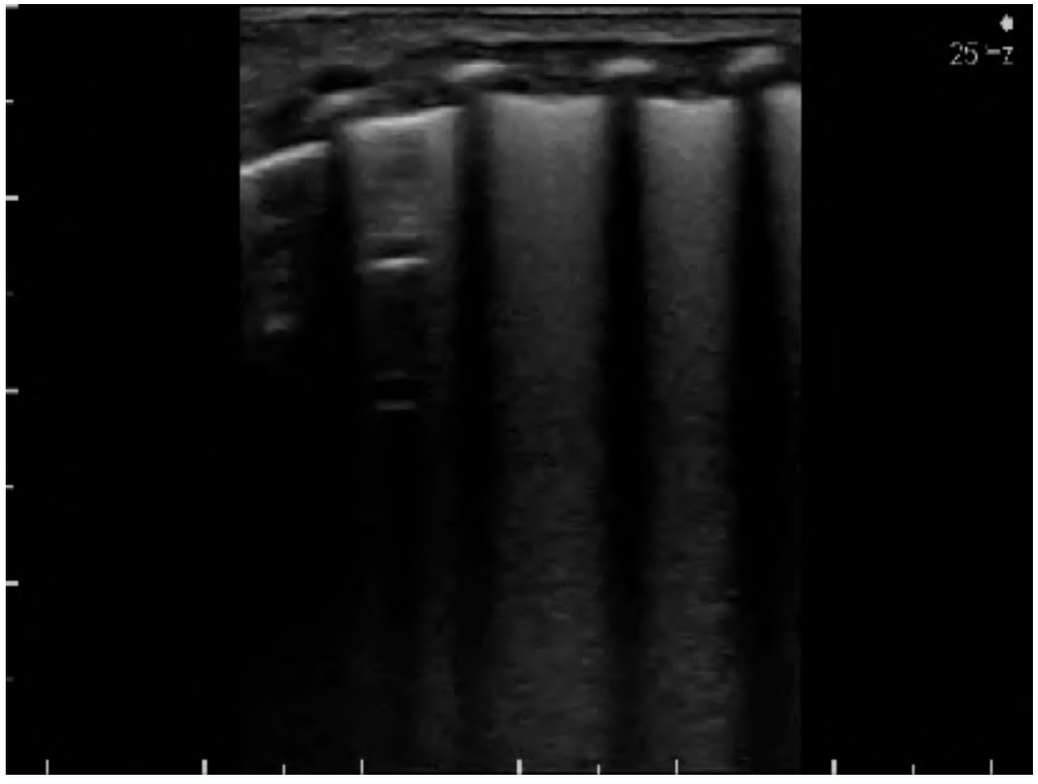


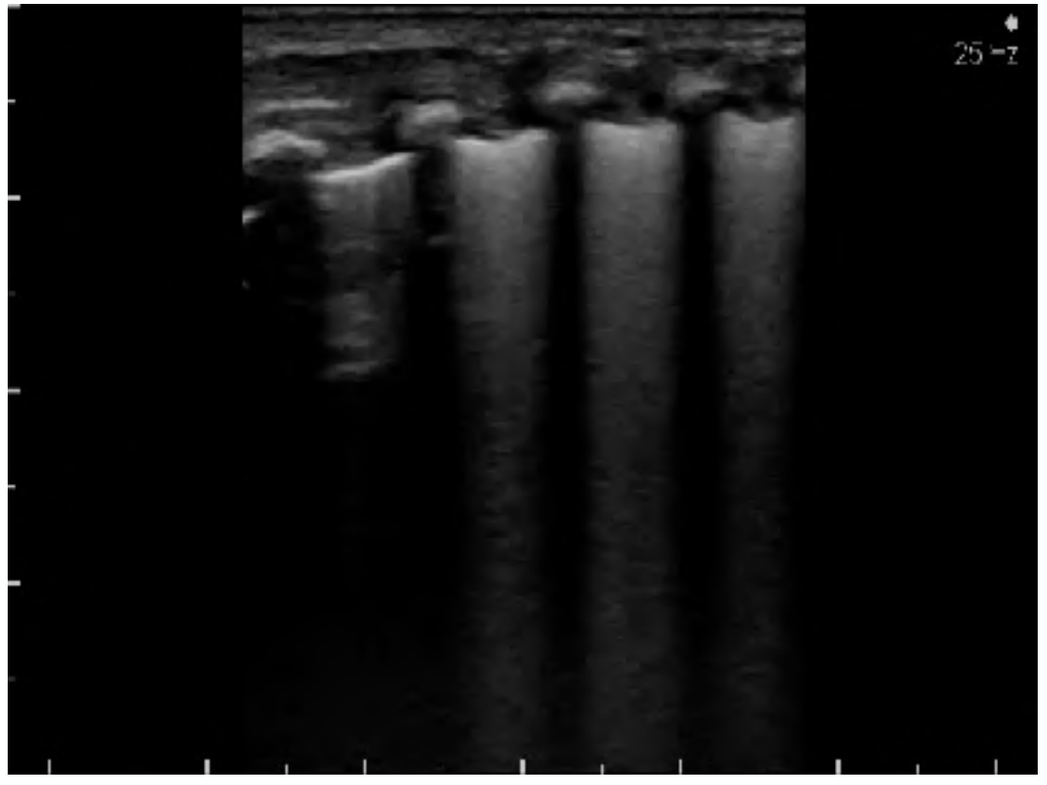


derecruitment

recruitment

Transient Tachypnea of the Newborn





“DOUBLE LUNG POINT”

In the infants with TTN, lung sonography showed a difference in lung echogenicity between the upper and lower lung areas. There were very compact comet-tail artifacts in the inferior fields while these were rare in the superior fields. We designated this finding the 'double lung point' and it was not observed in healthy infants, infants with respiratory distress syndrome, actelectasis, pneumothorax, pneumonia, or pulmonary hemorrhage.

Neonatology
formerly Biology of the Neonate

Original Paper

Neonatology 2008;94:52–59
DOI: 10.1159/000113059

Received: July 5, 2007
Accepted after revision: November 8, 2007
Published online: January 15, 2008

Lung Ultrasound in Respiratory Distress Syndrome: A Useful Tool for Early Diagnosis

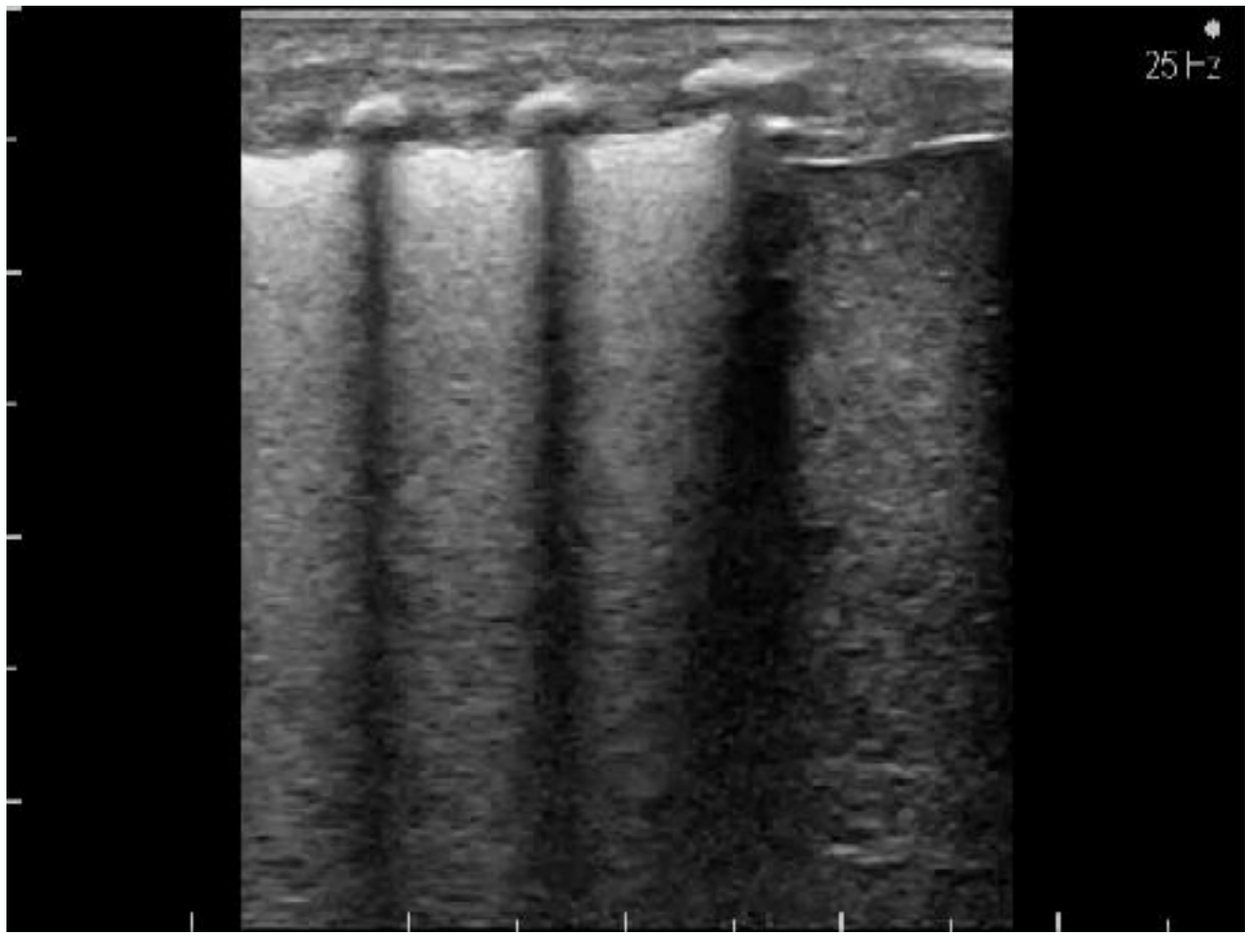
Roberto Copetti[a] Luigi Cattarossi[a] Franco Macagno[b] Marco Violino[b]
Riccardo Furlan[b]

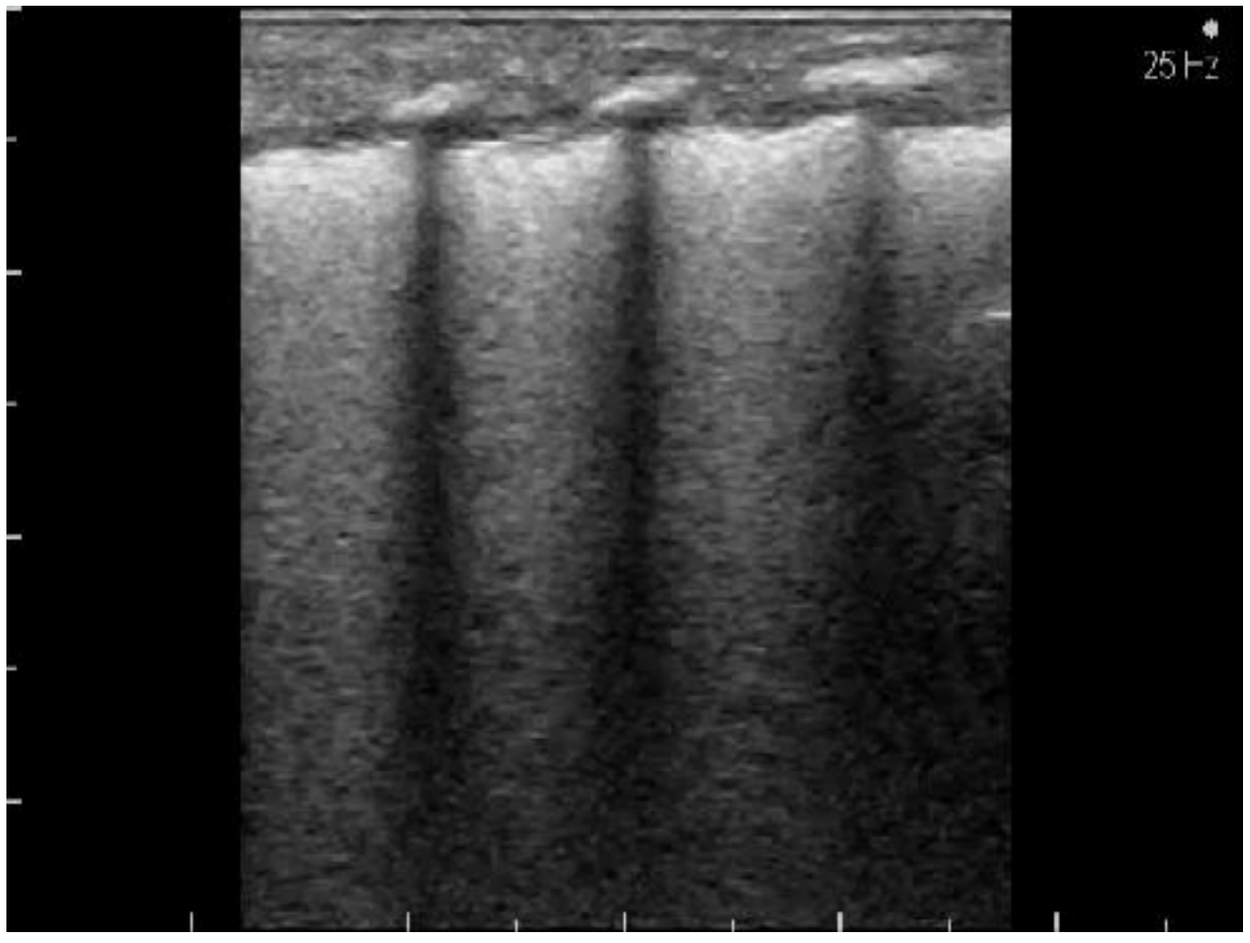
[a]Emergency and Pediatric Departments, S. Antonio Abate Hospital, Tolmezzo, and [b]Department of Neonatology, S. Maria della Misericordia Hospital, Udine, Italy

Received: July 5, 2007
Accepted after revision: November 8, 2007
Published online: January 15, 2008

AZIENDA OSPEDALIERO UNIVERSITARIA
Santa Maria della Misericordia di Udine

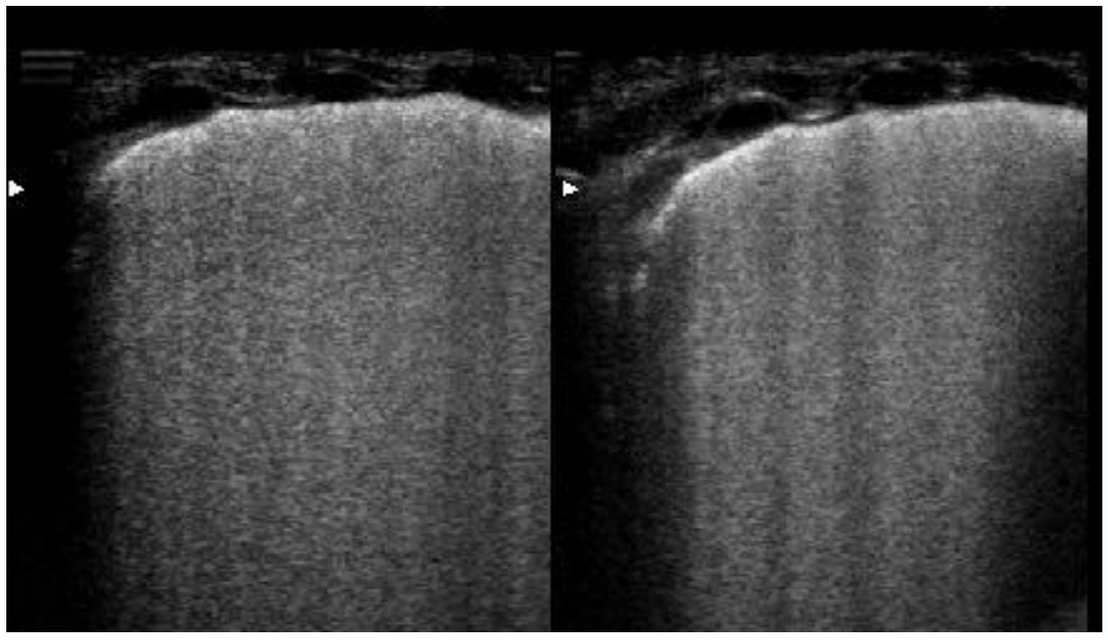
RDS



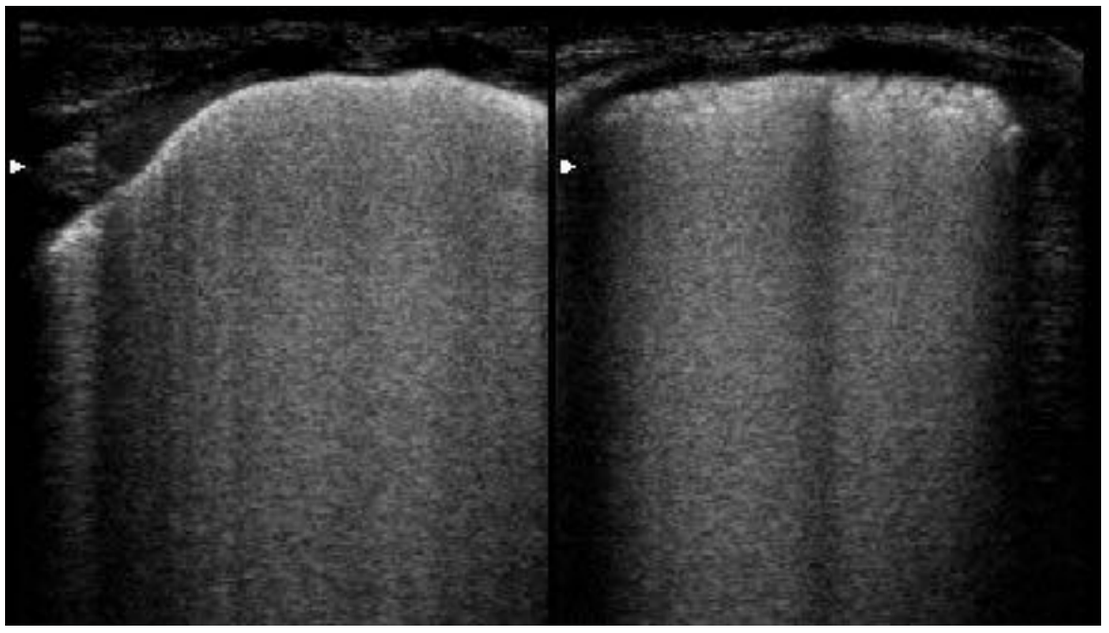


Why lung US appearance does not change after surfactant ?

Before SRF



After SRF



Because US looks at pulmonary interstitium while X-ray at lung aeration

J. Perinat. Med. 38 (2010) 557–563 • Copyright © by Walter de Gruyter • Berlin • New York. DOI 10.1515/JPM.2010.096

Surfactant administration for neonatal respiratory distress does not improve lung interstitial fluid clearance: echographic and experimental evidence

Luigi Cattarossi[1,*], Roberto Copetti[1], Besa Poskurica[2] and Giuseppe Miserocchi[2]

[1] Departments of Paediatrics and Emergency Medicine, San Antonio Abate Hospital, Tolmezzo, Italy
[2] Department of Experimental Medicine, Università Milano-Bicocca, Monza, Italy

J. Perinat. Med. 38 (2010) 557–563 •

Time, min	0	60	120	180	140	360
No. of premature animals treated with surfactant (PS)	10	11	8	6	5	8
No. of premature animals untreated (PN)	13	5	5	-	3	3

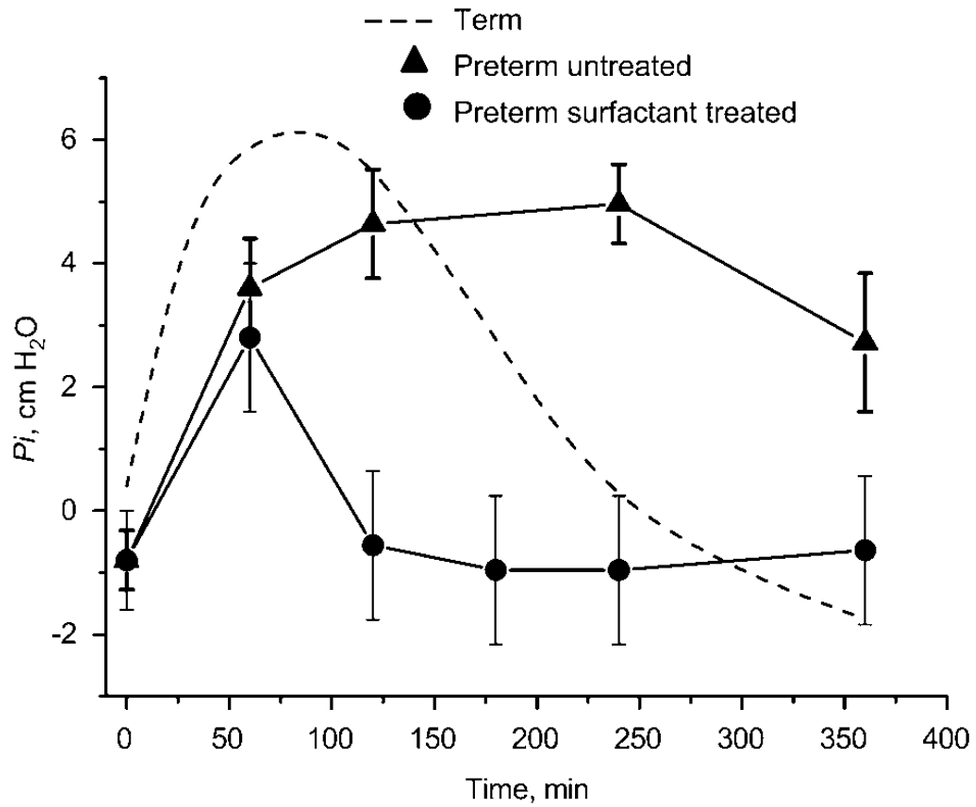


Figure 7 Time course of pulmonary interstitial pressure (*Pi*), in preterm surfactant treated rabbits and in preterm untreated rabbits. The dashed line refers to term newborn rabbits (data from ref. [14]). The insert reports the number of animals studied in each group.

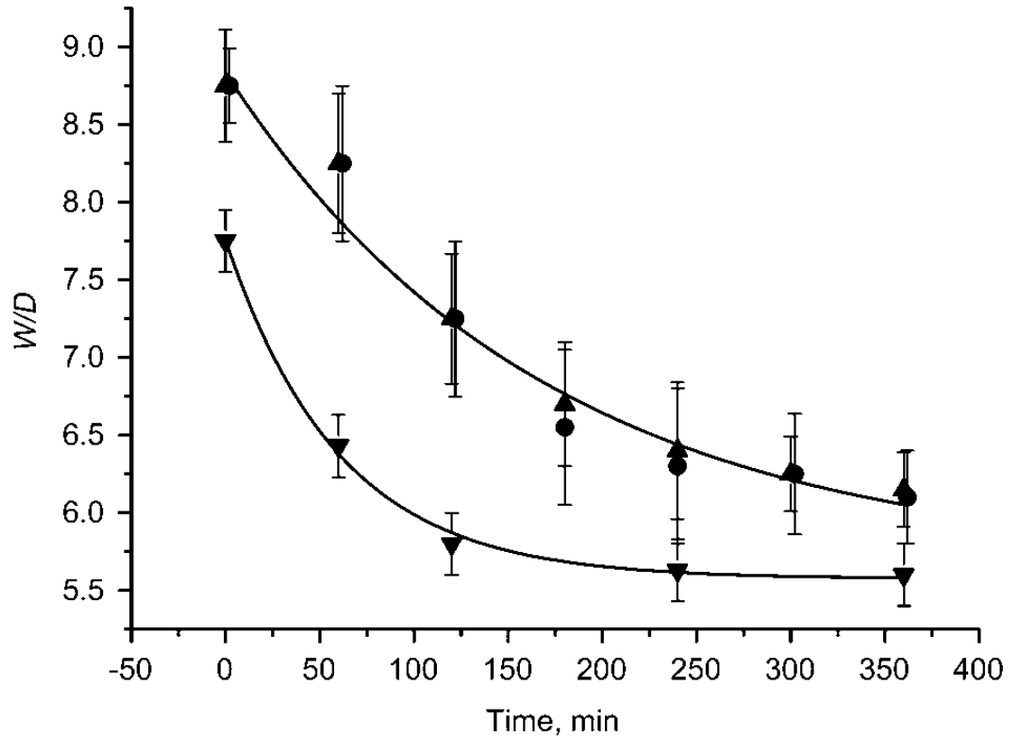


Figure 8 Time course of the wet weight to the dry weight ratio of the lung (*W/D*) in preterm surfactant treated (●) and preterm untreated rabbits (▲) and in term rabbits (▼). The insert reports the coefficients of the mono-exponential decay curves of the preterm surfactant treated + preterm untreated pooled data and for term group.

Pleural line abnormalities, echographic 'white lung' and the absence of 'spared areas' were always seen in infants with RDS.

No correlation was found between ultrasound appearance and different radiological stages of RDS.

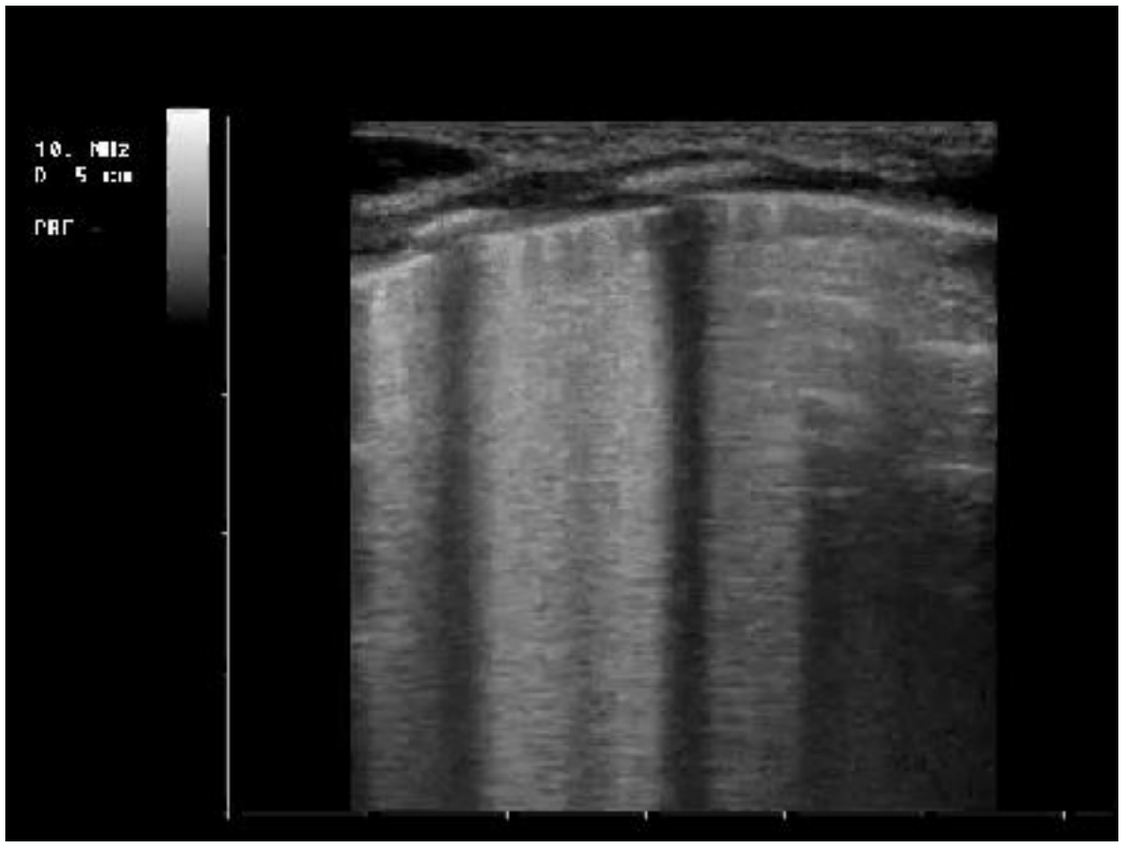
At the same time, recent studies indicated that lung ultrasound images (LUSI) do not show any change after administration of surfactant (persistence of ''white lung'') [2, 3] in the first hours after surfactant administration and, in some infants, even in the following days.

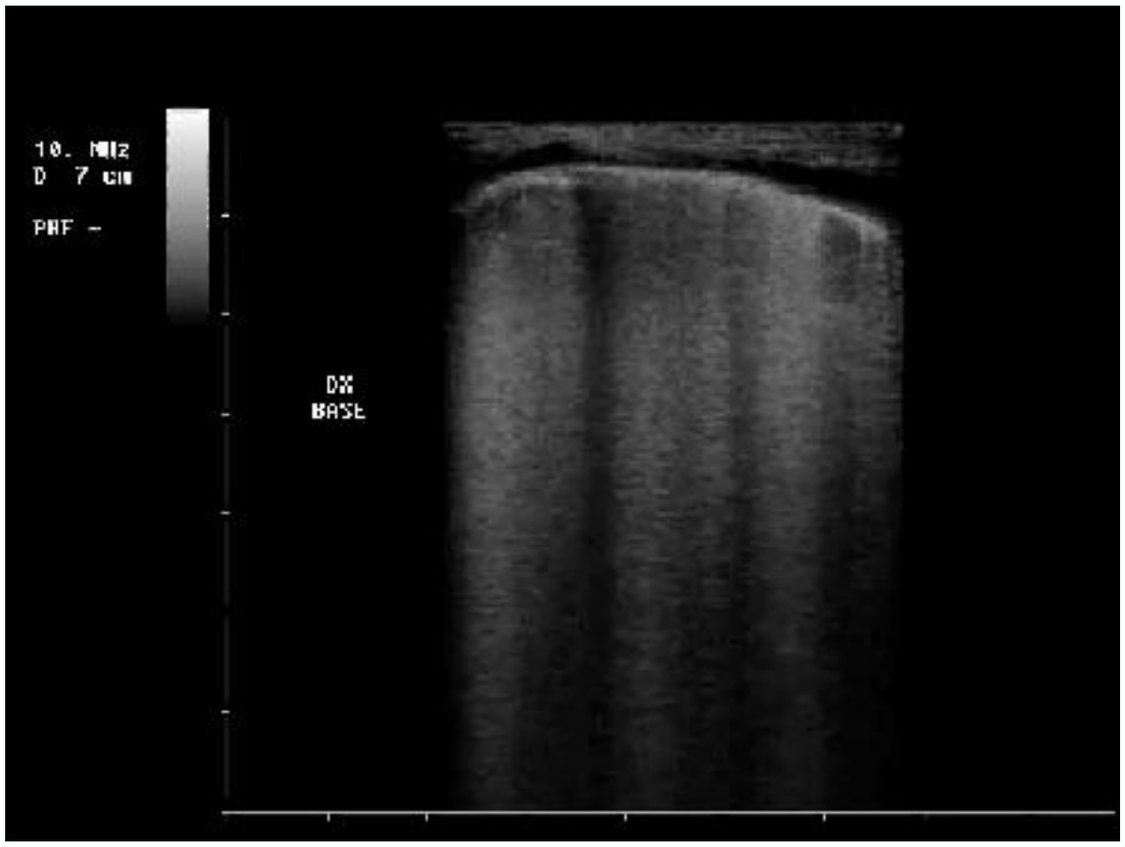
- **TTN is tipically depicted by the “double lung point”**
- **LUS image does not change after surfactant administration**
- **LUS con not set a degree of RDS**

…. and now (2018)?

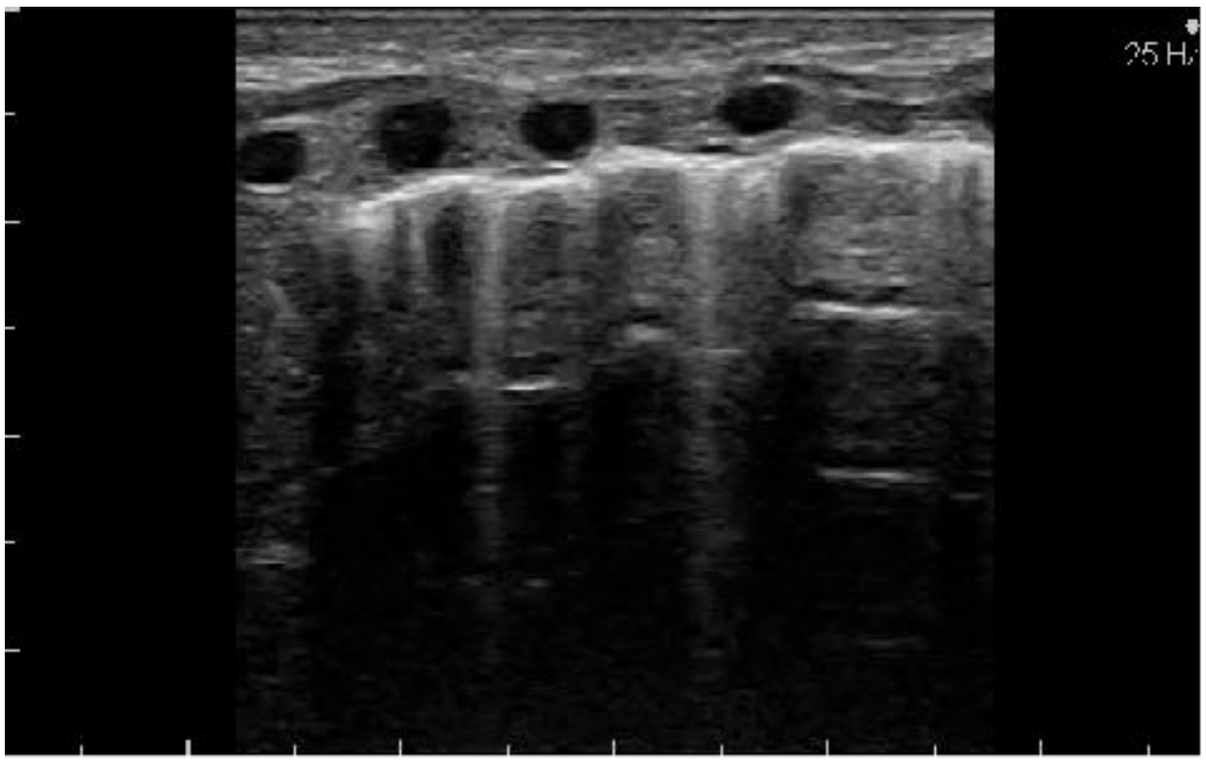
TRANSIENT TACHYPNEA OF THE NEWBORN

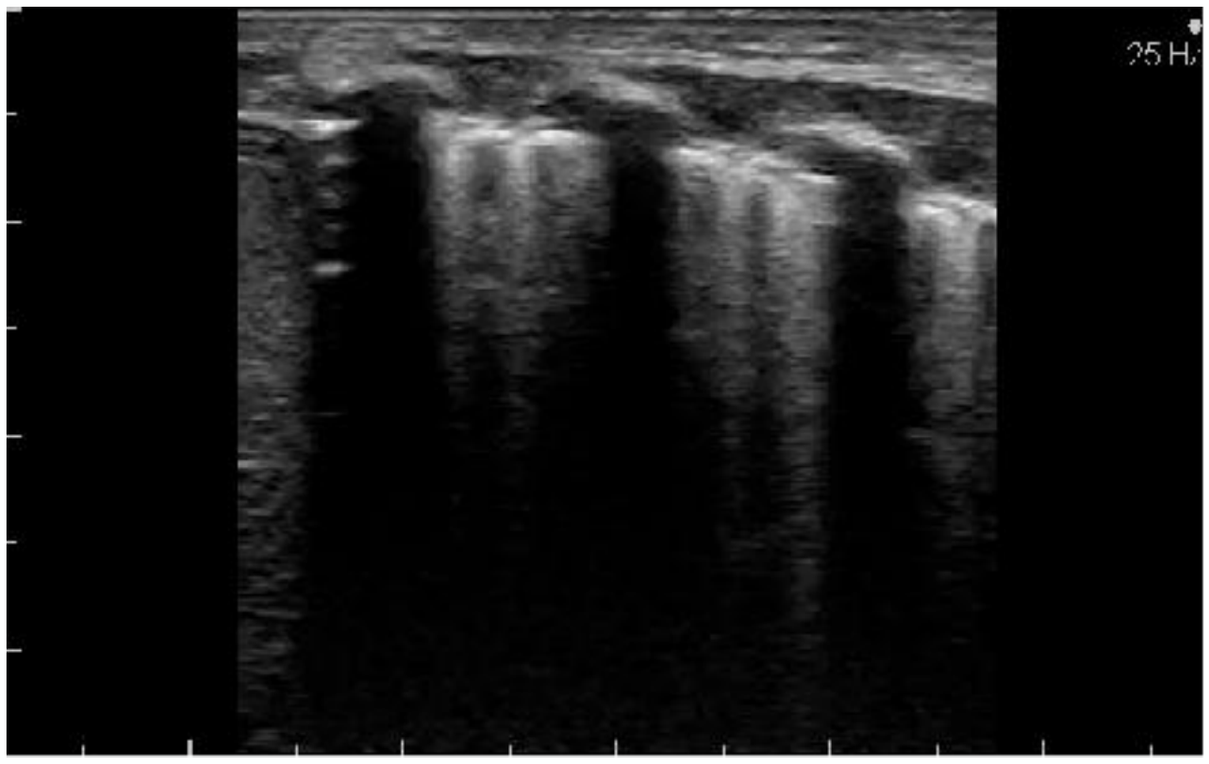
Transient Tachypnea of the Newborn (echographic wet lung)



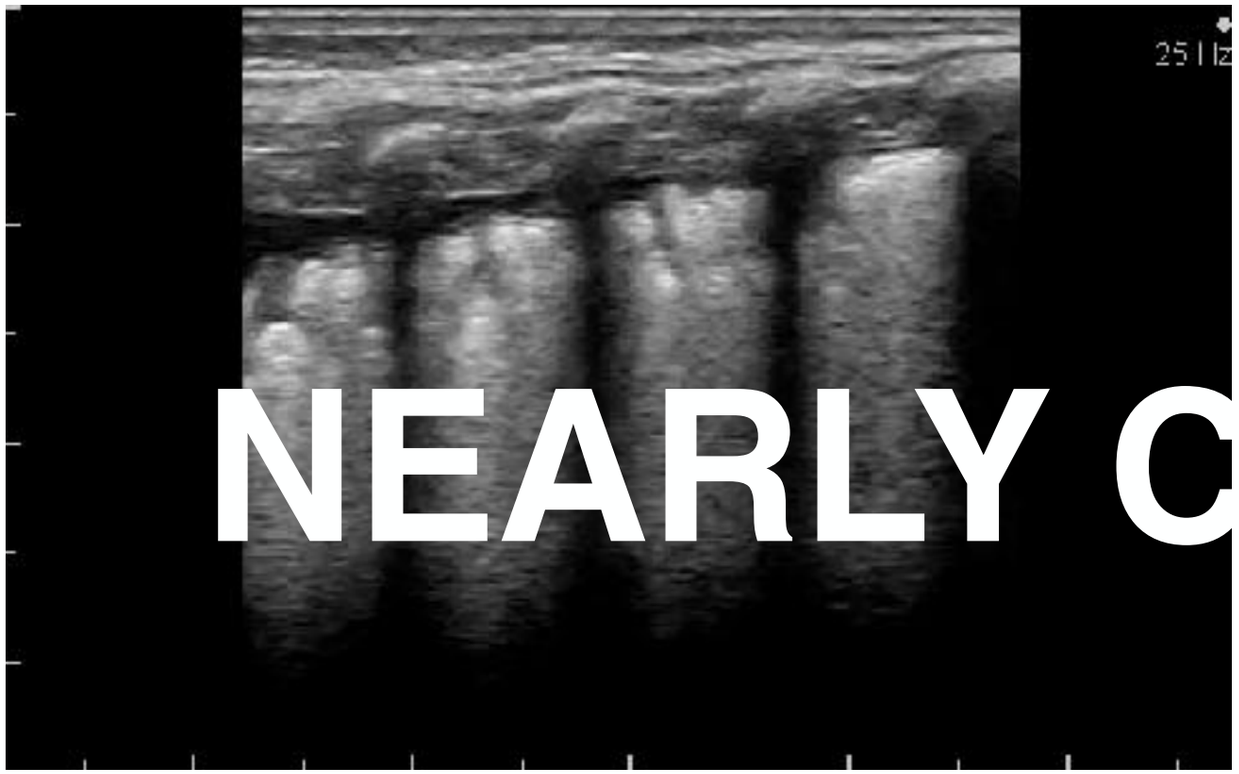


Transient Tachypnea of the Newborn (echographic wet lung)

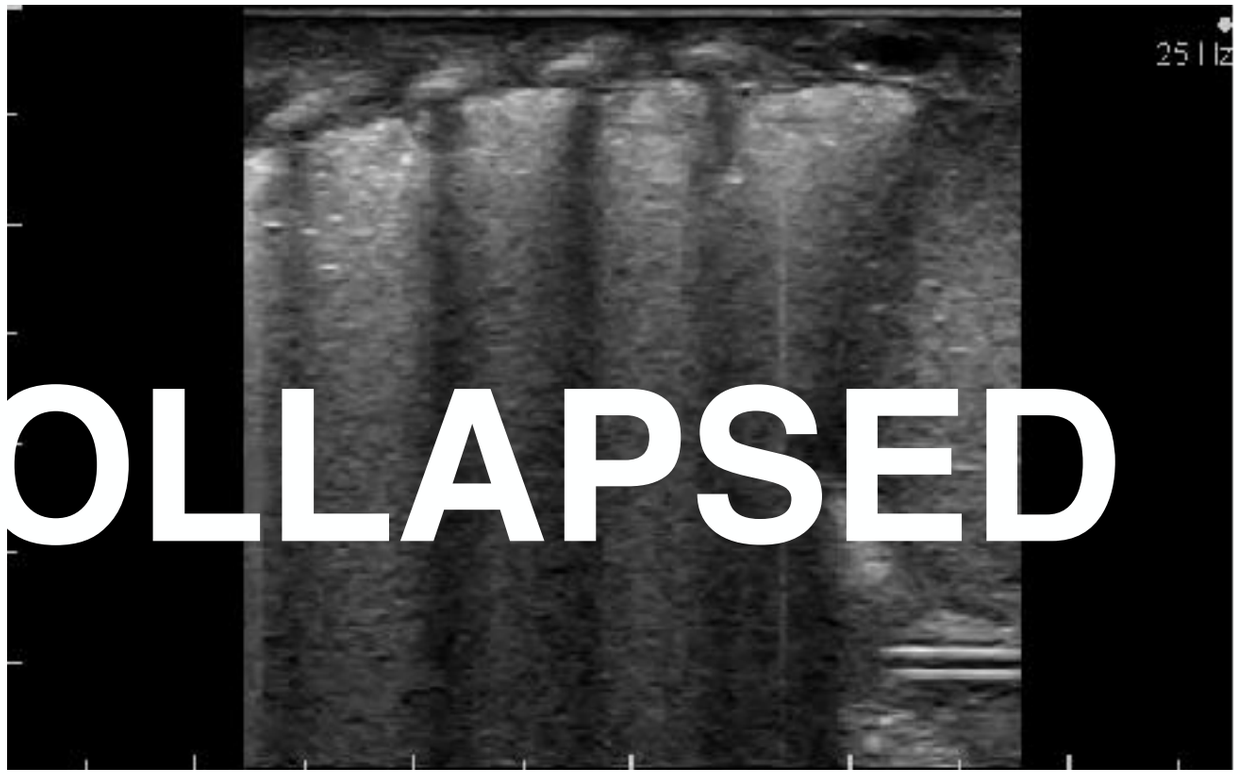




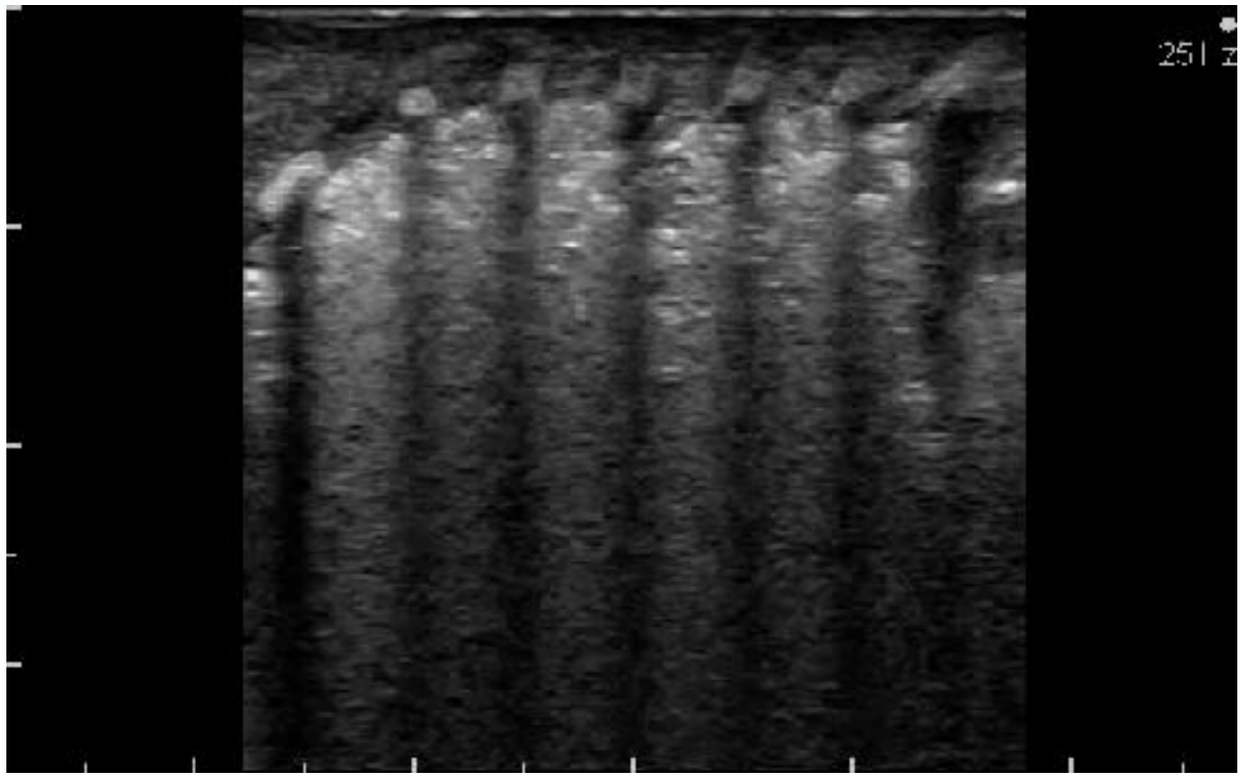
RESPIRATORY DISTRESS SYNDROME

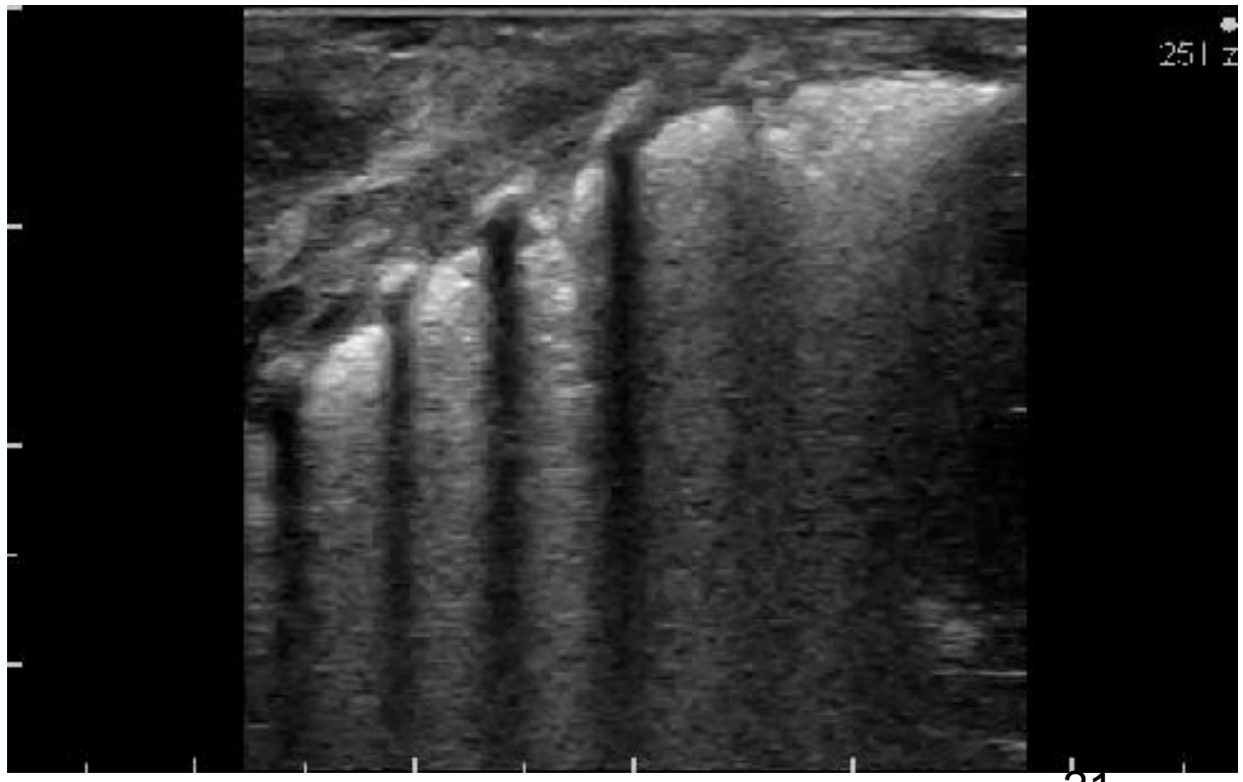


NEARLY C



OLLAPSED



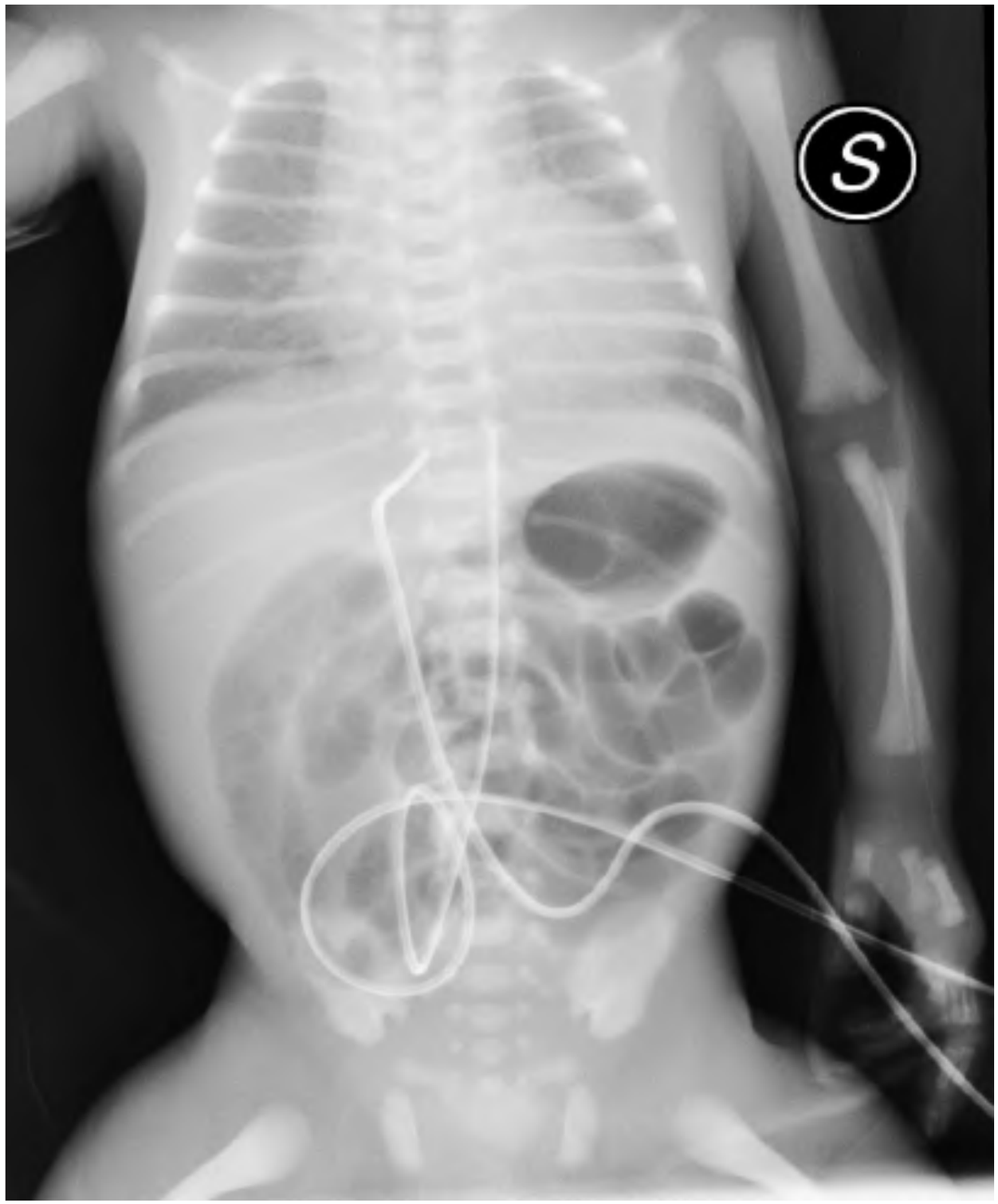


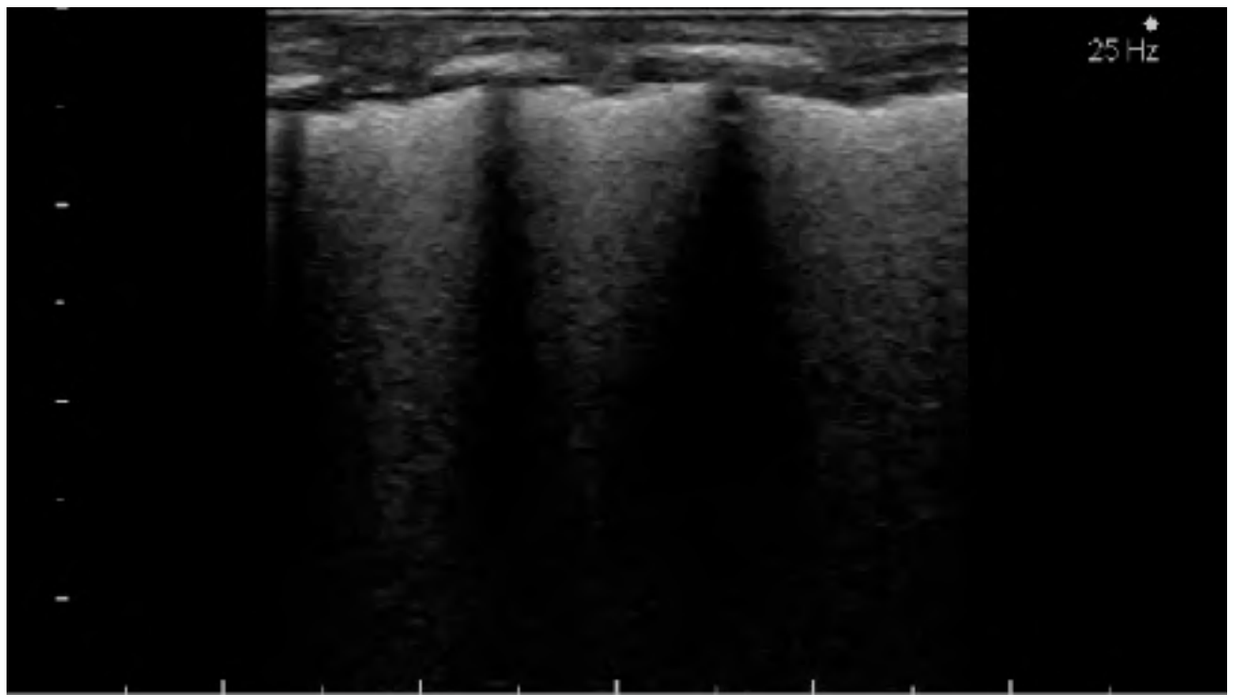
DEGREES OF RDS ON LUS

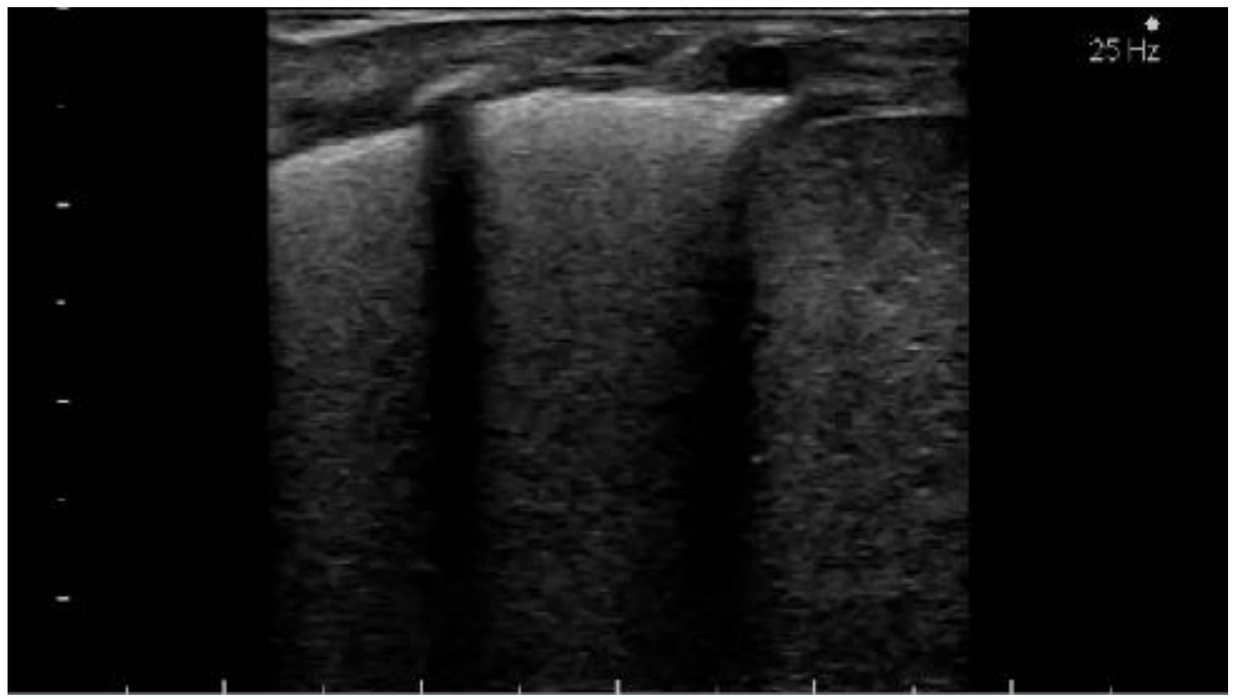
1. WHITE LUNG AND PLEURAL LINE CHANGES

2. PRE-COLLAPSED LUNG AND PLEURAL LINE CHANGES

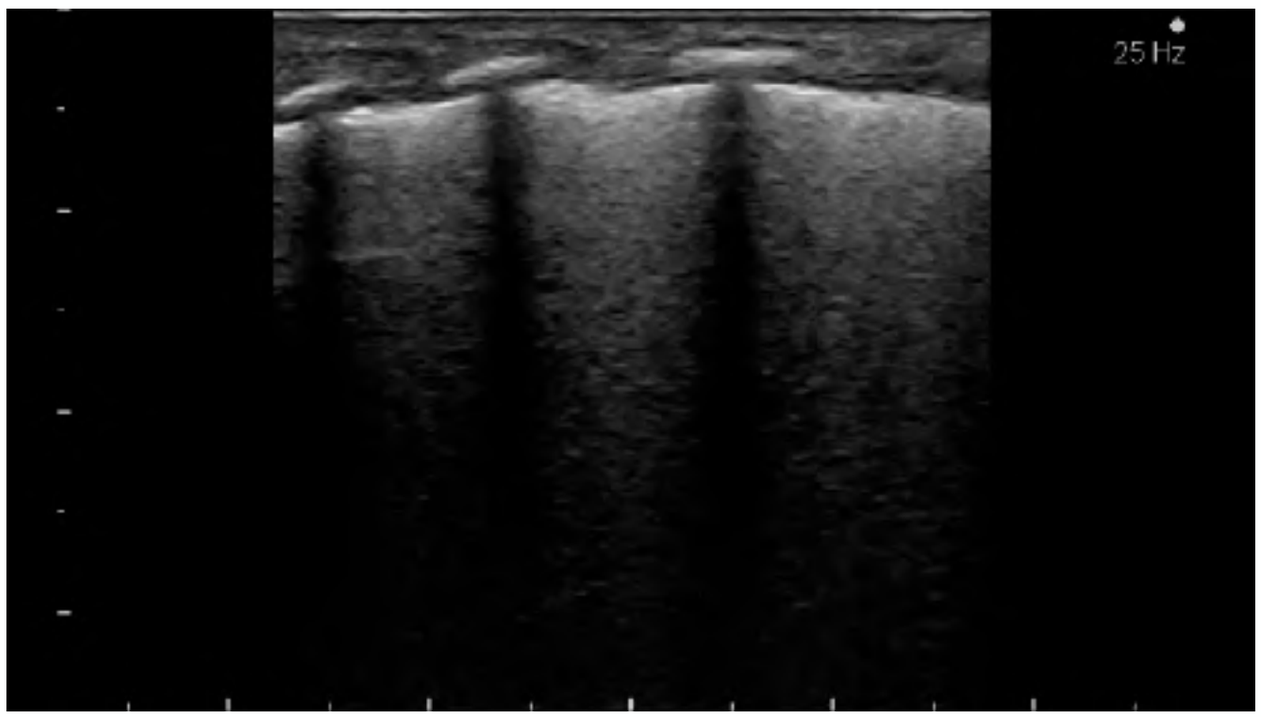
RDS : NO CHANGES ON LUS AFTER SURFACTANT ADMINISTRATION.

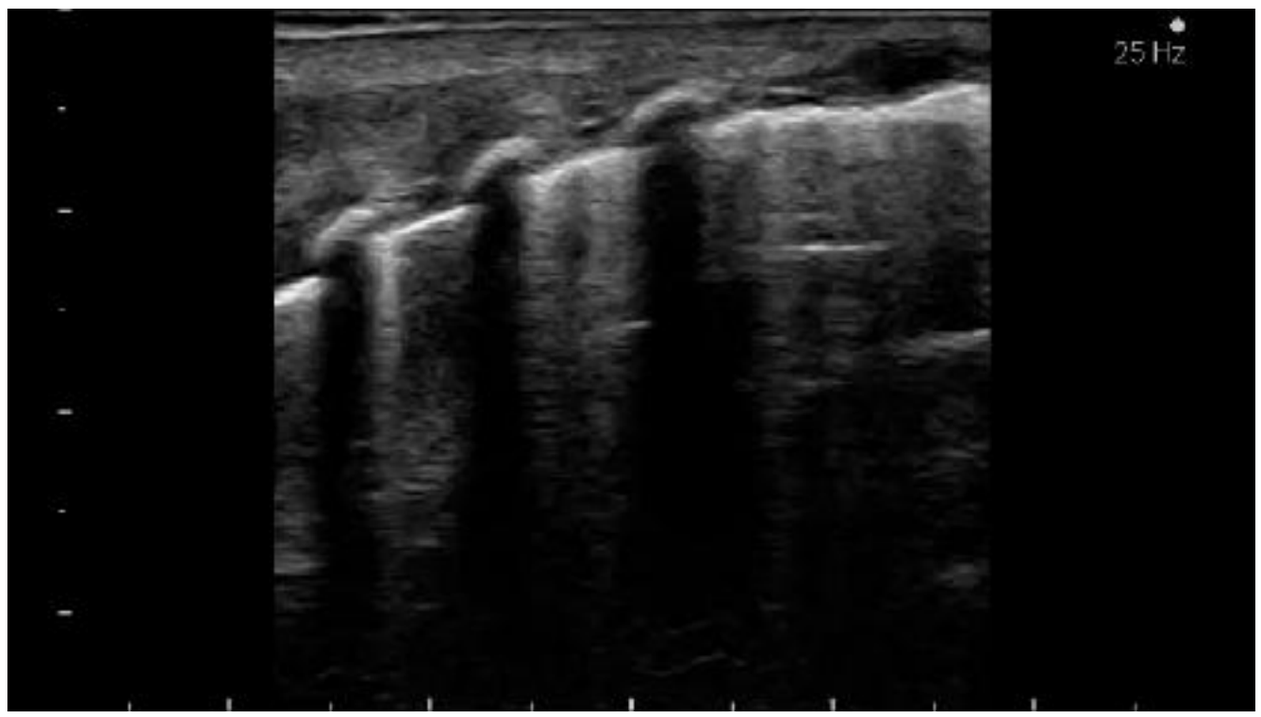

S



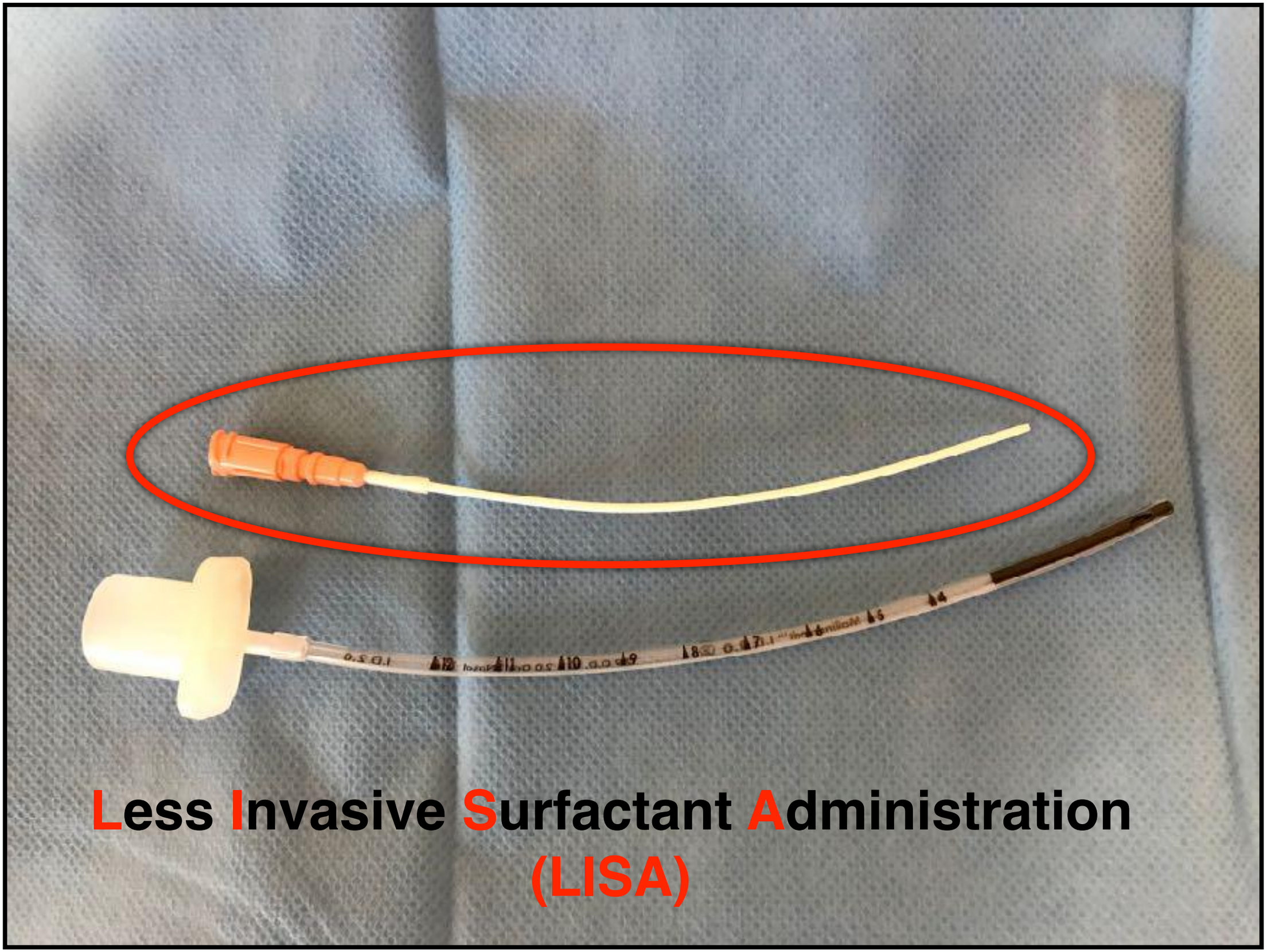


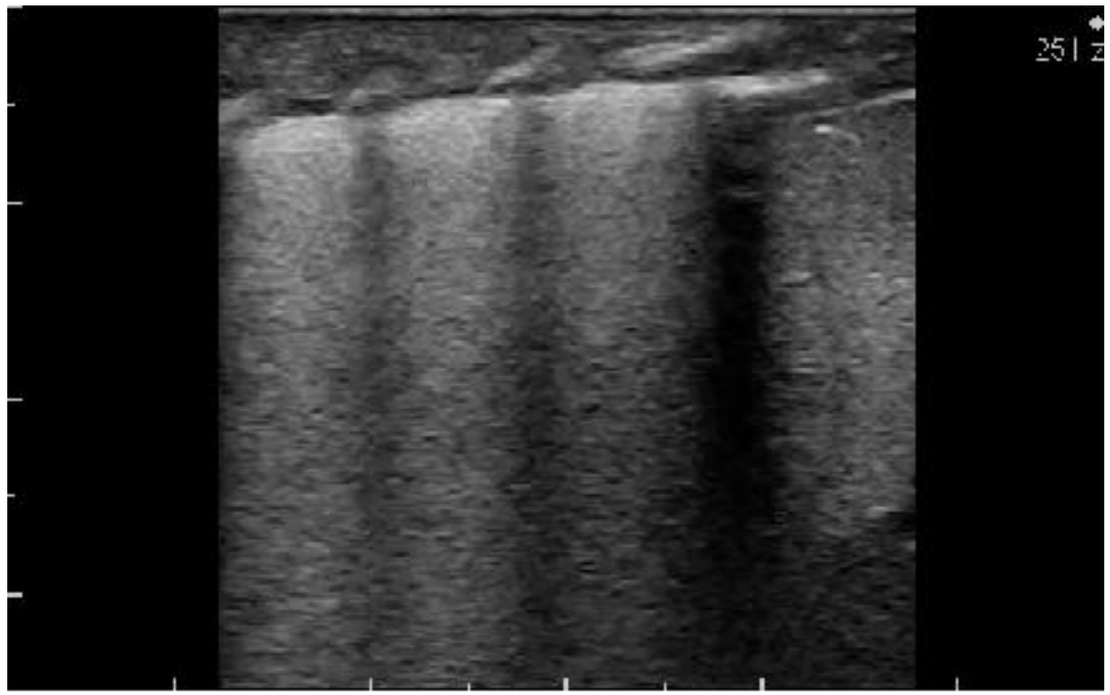
BASELINE

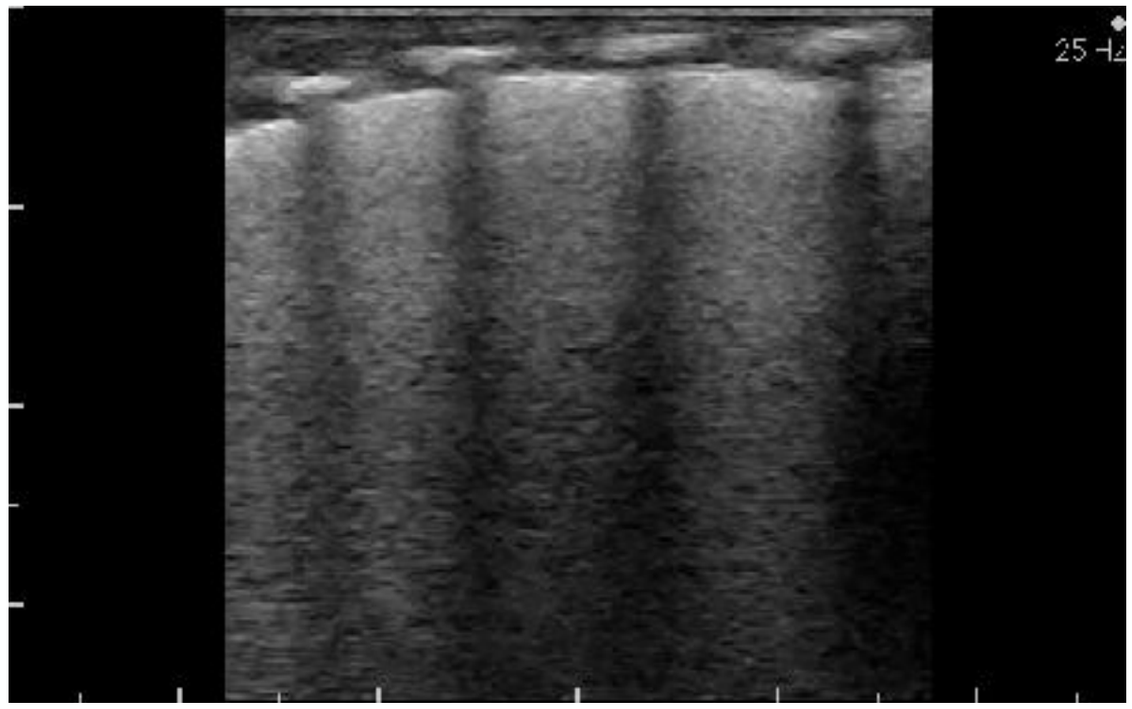




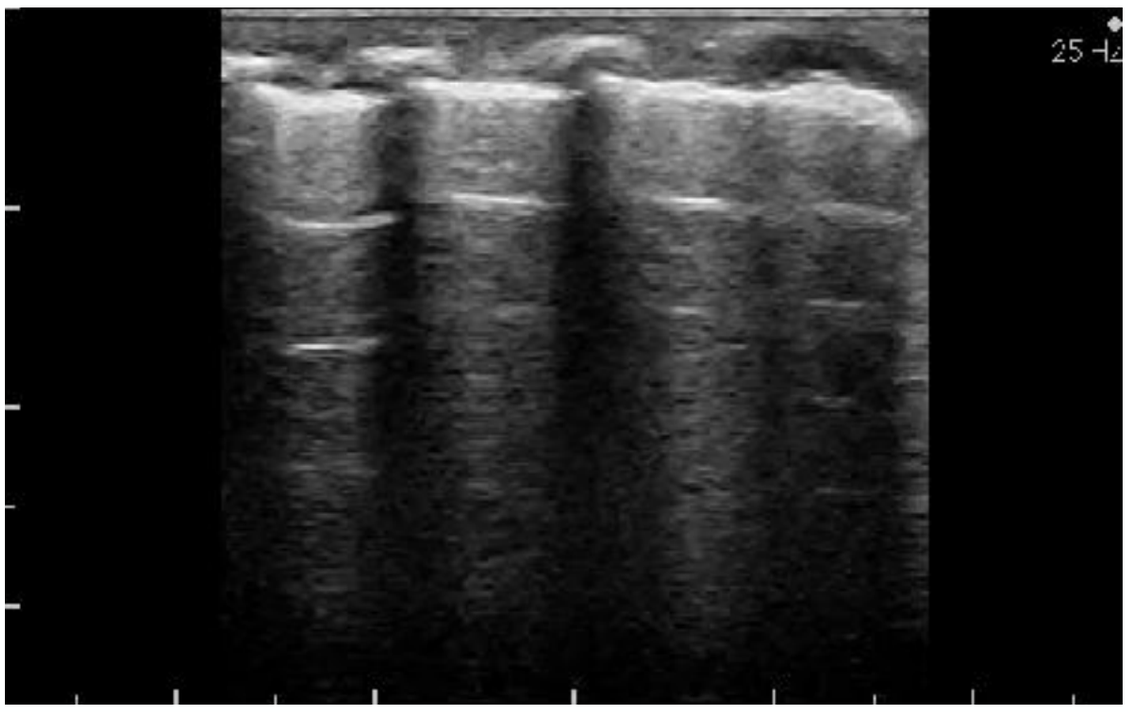
ONE HOUR AFTER SURFACTANT

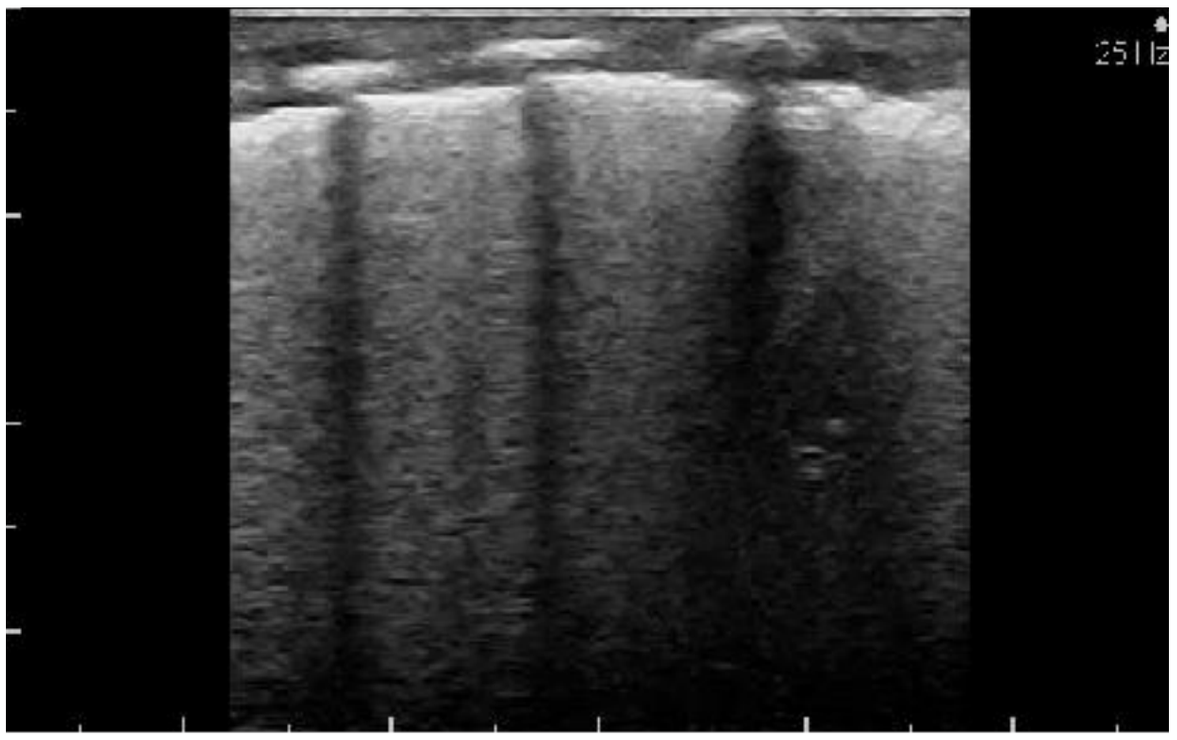

Less Invasive Surfactant Administration
(LISA)





BASELINE

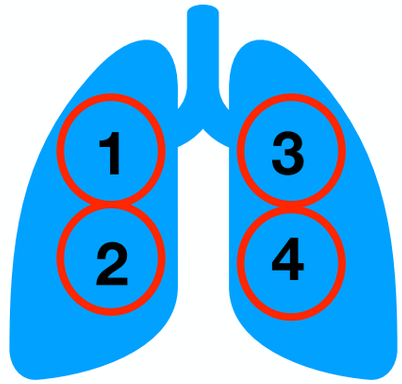




ONE HOUR AFTER SURFACTANT

WHAT IS THE BEST METHOD TO ANALYZE THE IMAGES ?

SCORE OR COMPUTERIZED ANALISYS ?



	LUS FEATURES	SCORE (0 - 16)		
A	LUNG ARTIFACT	BLACK = 0	BLACK & WHITE = 1	WHITE = 2
B	THICKENED PLEURAL LINE	NO = 0	YES = 1	-
C	SUBPLEURAL CONSOLIDATIONS	NO = 0	YES = 1	
D	LUNG SLIDING	PRESENT = 0	ABSENT = X	-

A score > 12 may indicate that surfactant is needed

If lung sliding is absent (X on D) and the score for A, B, C is 0, suspect PTX

(C.A. Forcellini - Modified)

CONCLUSION

- **LUNG ULTRASOUND IS A WELL ESTABLISHED PROCEDURE IN NEONATES**

- **LUNG ULTRASOUND GENERAL CONCEPTS HAS BEEN CONFIRMED OVER TIME**

- **LUNG ULTRASOUND SHOULD BE STILL INTENDED AS A PRACTICAL TOOL IN THE CLINICIAN HANDS THAT MAY INDICATE APPROPRIATE DIAGNOSIS AND THERAPY**

…and we have been also taught to respect those unwritten laws that belong to the universal recognized feeling of what is right and what is wise.

Here in Athens we are doing so.

Pericles, speech to the Athenians, 431 B.C.


THANK YOU FOR YOUR KIND
ATTENTION
ARRIVEE