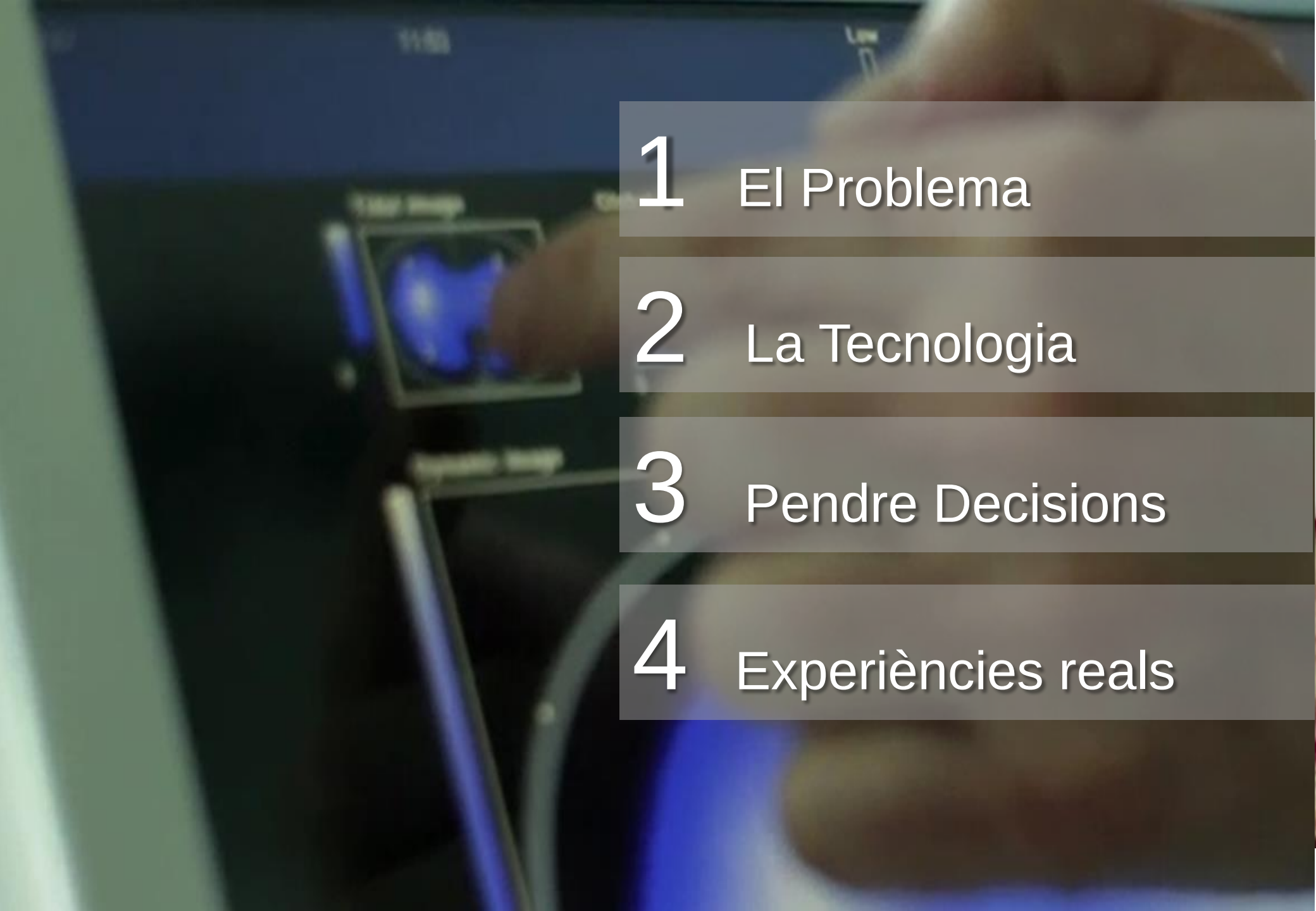
PulmoVista® 500
Fent visible la ventilació

Carles Calaf
Marketing Manager Intensive Care
Dräger



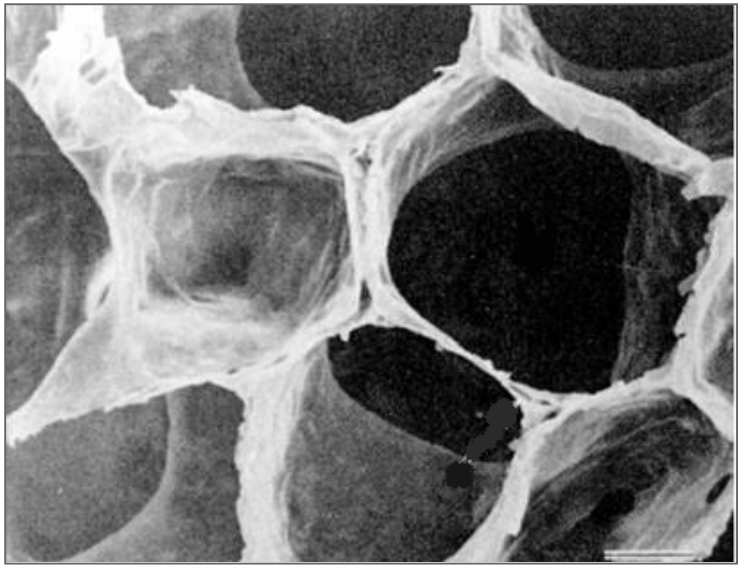
1 El Problema

2 La Tecnologia

3 Pendre Decisions

4 Experiències reals

Alveol al final de la inspiració

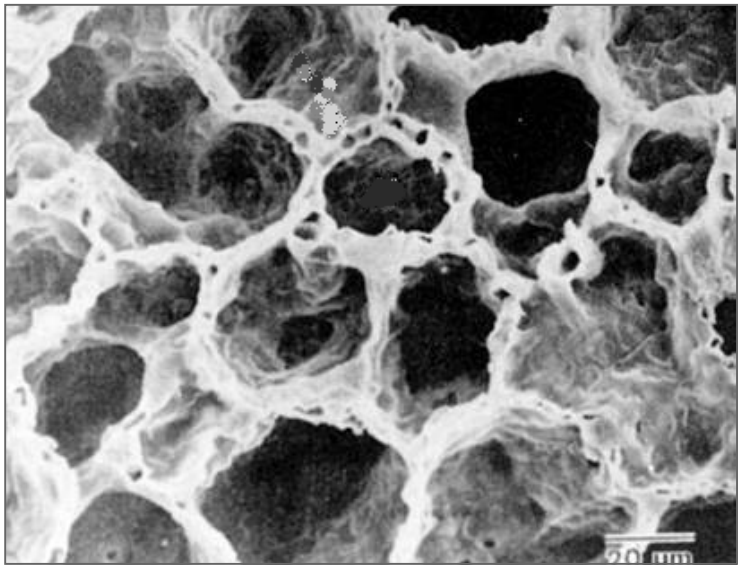


§ La VM està **associada amb lesions pulmonars**[1] regionals:

– **Sobre-distensió**

– **Colapse**

Alveol al final de l'espiració



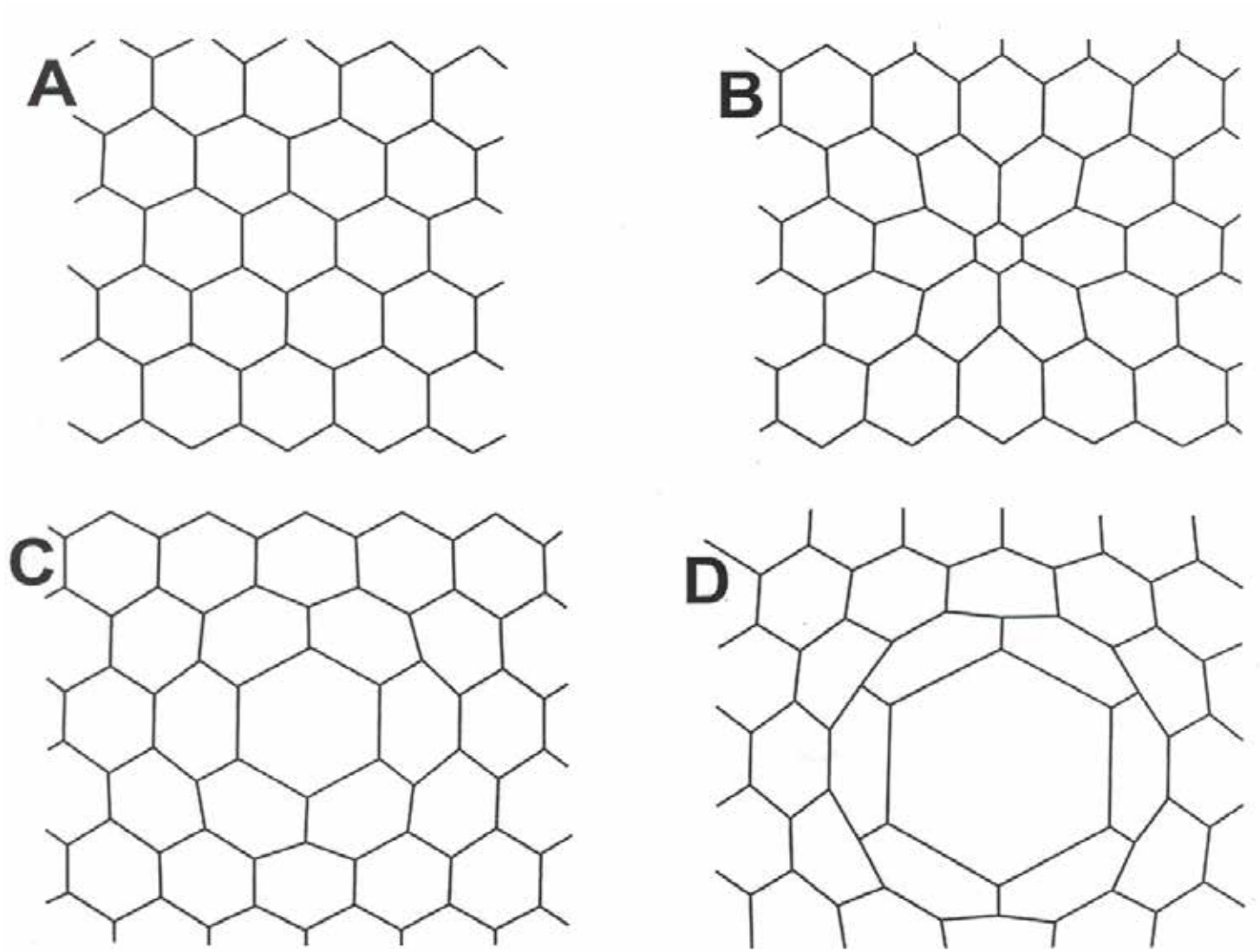
§ La lesió pulmonar causa **resposta inflamatoria**[2] associada amb:

– Allargament de la **estada hospitalaria**.

– Augment de la **morbi-mortalidad.**

1 Whitehead, T., Slutsky, A. S.(2002); Thorax;57:635–642
2 Ranieri, V.M., Suter, P.M., Tortorella, C. et al (1999); JAMA; 282:54–61

Interdependencia alveolar



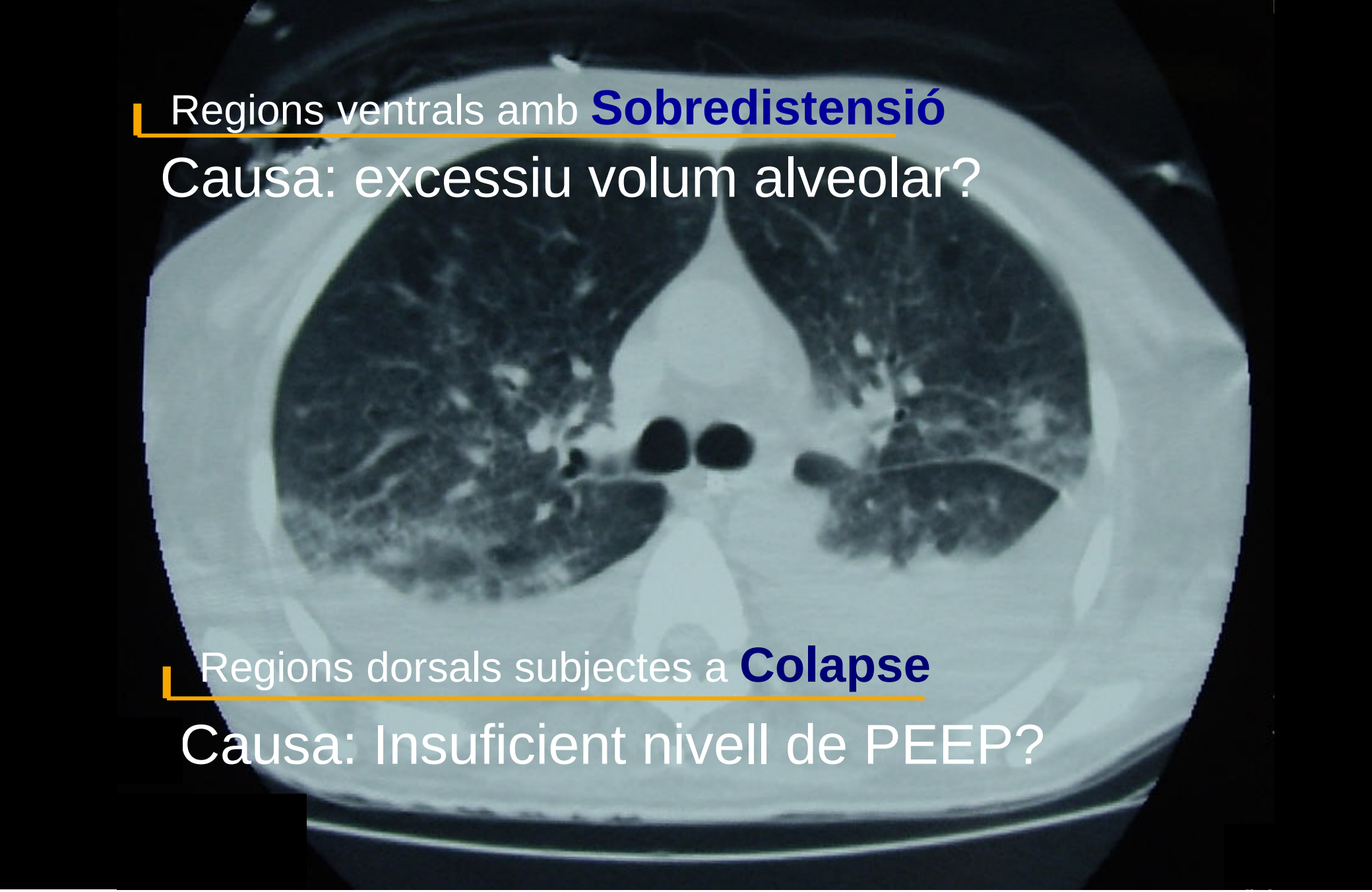
Stress Tensió

Strain Deformació

Strech Estirament

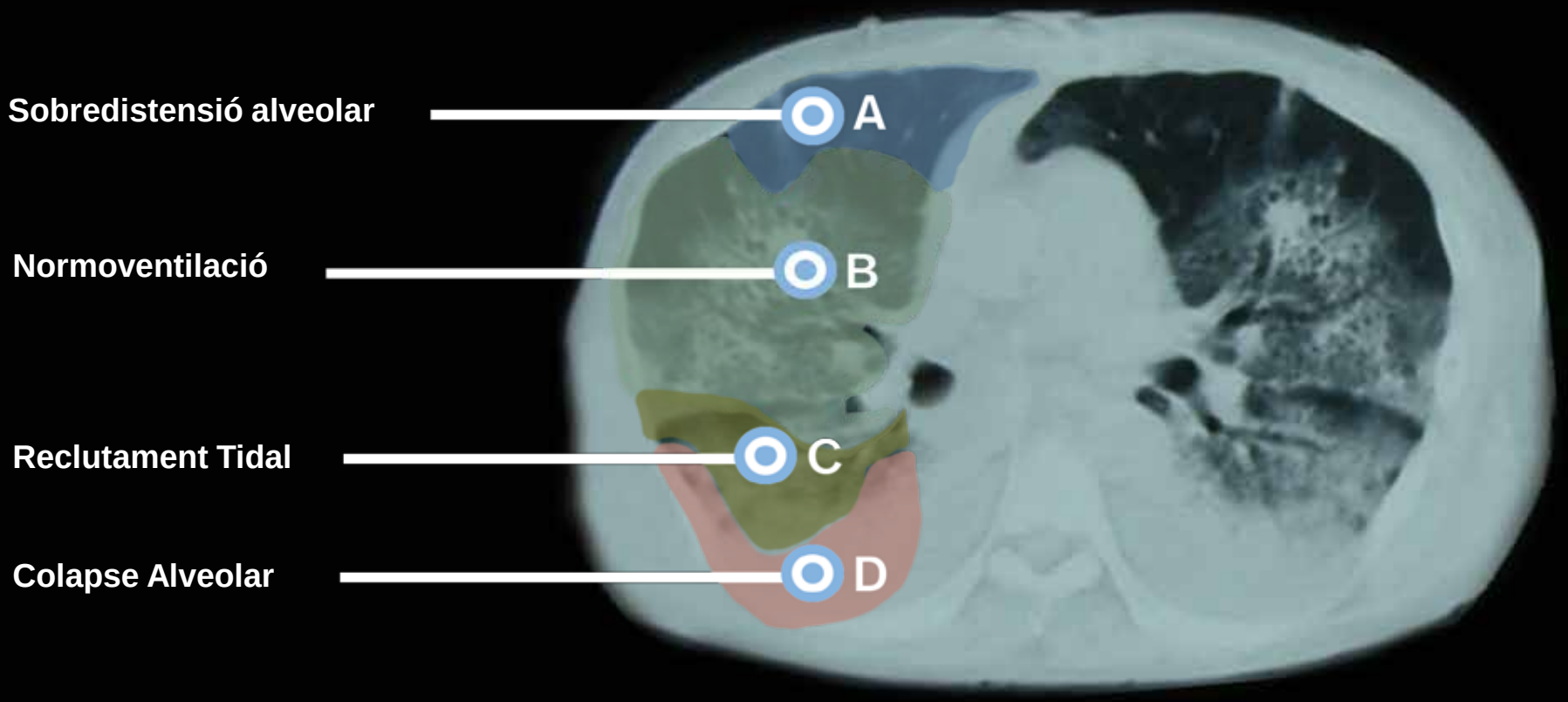
Shear Cisallament

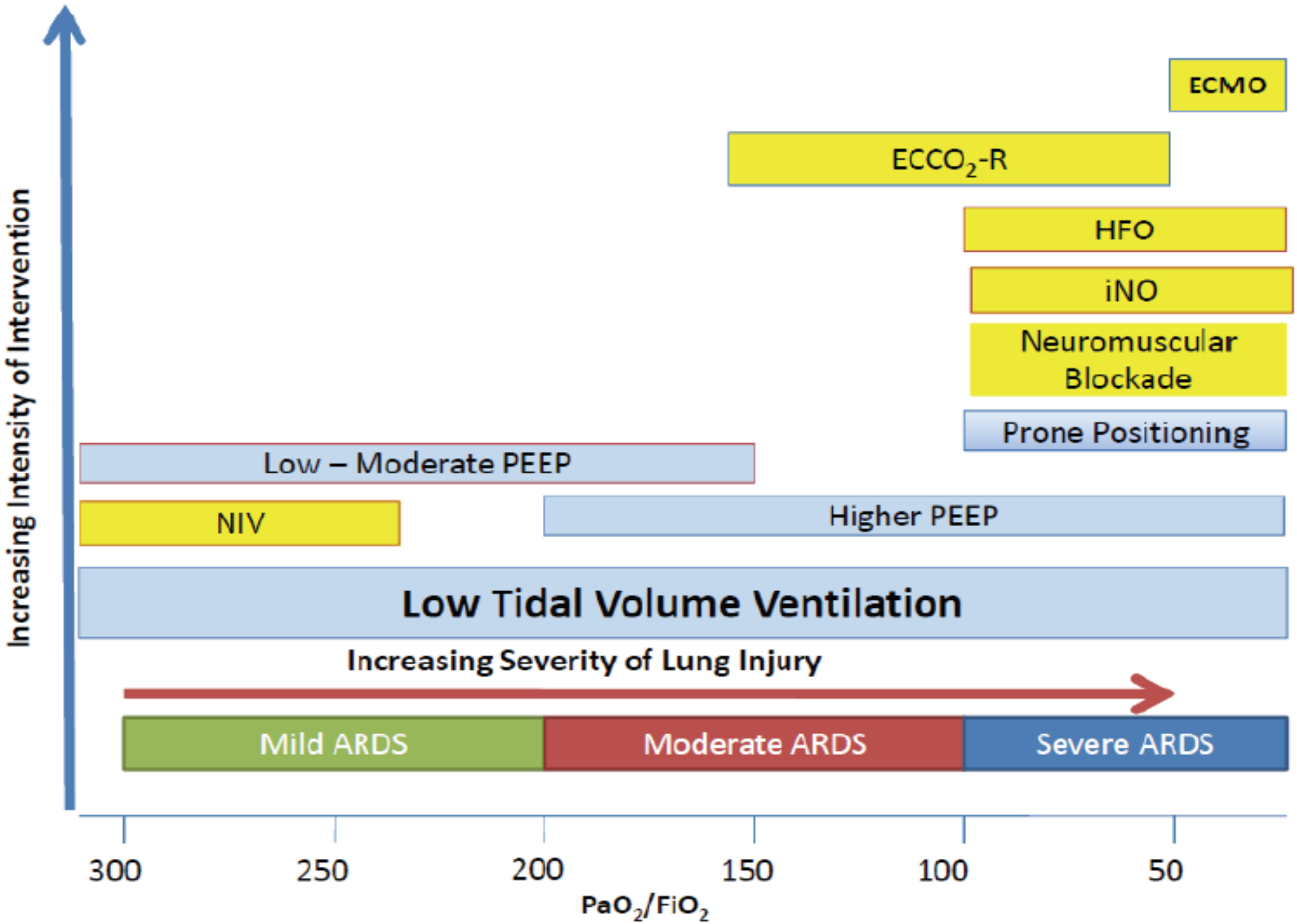
Mead J et al. J Appl Physiol 1970; 28:596-608



Tidal Hyperinflation during Low Tidal Volume Ventilation in Acute Respiratory Distress Syndrome
Am J Respir Crit Care Med Vol 175. pp 160–166, 2007

Homogeneitat pulmonar?



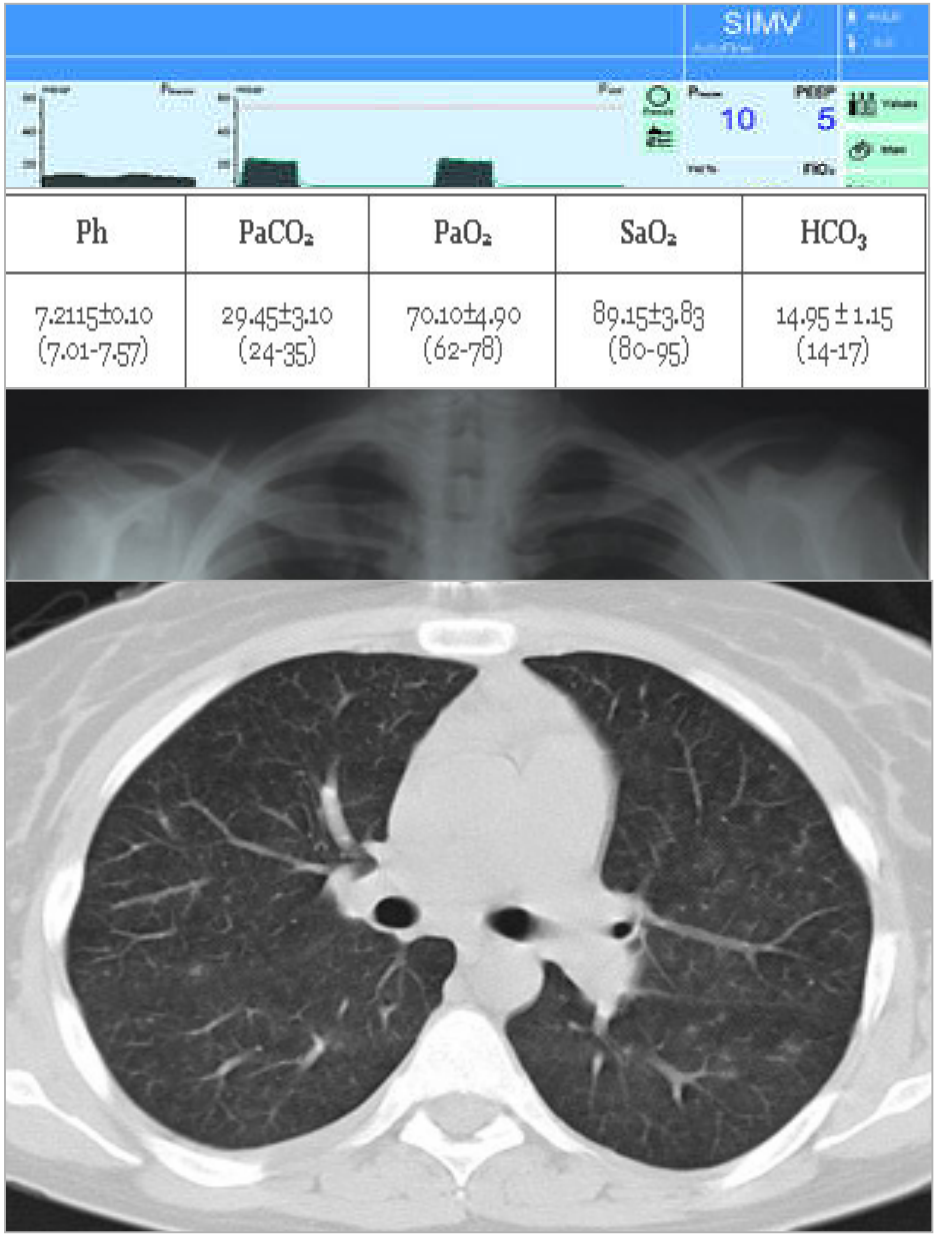

ECMO
ECCO2-R
HFO
iNO
Neuromuscular Blockade
Prone Positioning
Low – Moderate PEEP
NIV
Higher PEEP
Low Tidal Volume Ventilation
Increasing Severity of Lung Injury
Mild ARDS
Moderate ARDS
Severe ARDS
Increasing Intensity of Intervention
300
250
200
150
100
50
PaO2/FiO2

§ **Individualitzar la PEEP** per cada pacient[3]

§ La Lesió Pulmonar Aguda (LPA) és **heterogènia.**

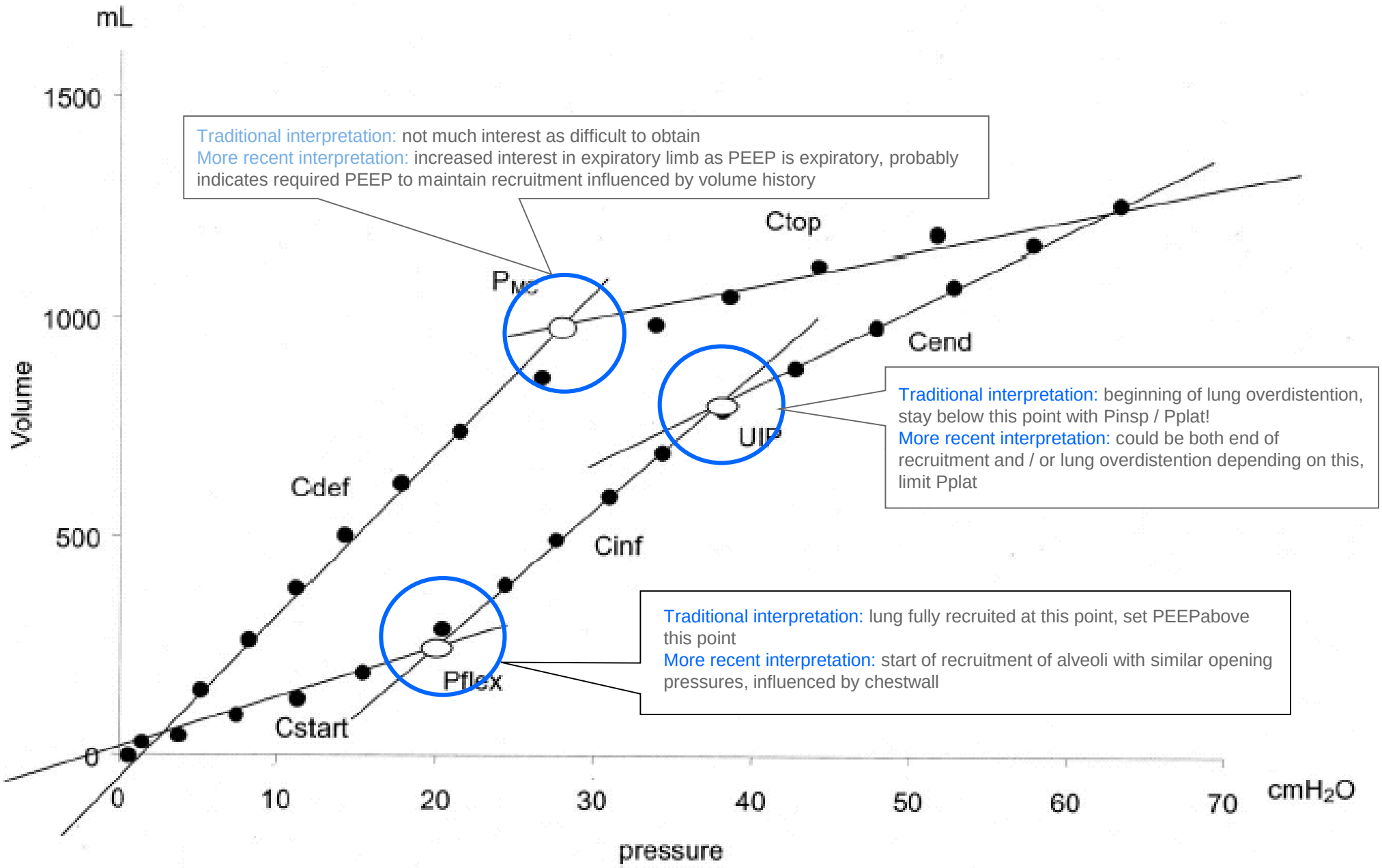
– Els paràmetres convencionales reflexen el **pulmó en conjunt**[4, 5]

§ Per gestionar atelectasies i sobredistensió es necessita conèixer la **distribució de la ventilació** a les zones ventrals i dorsals[6, 7]

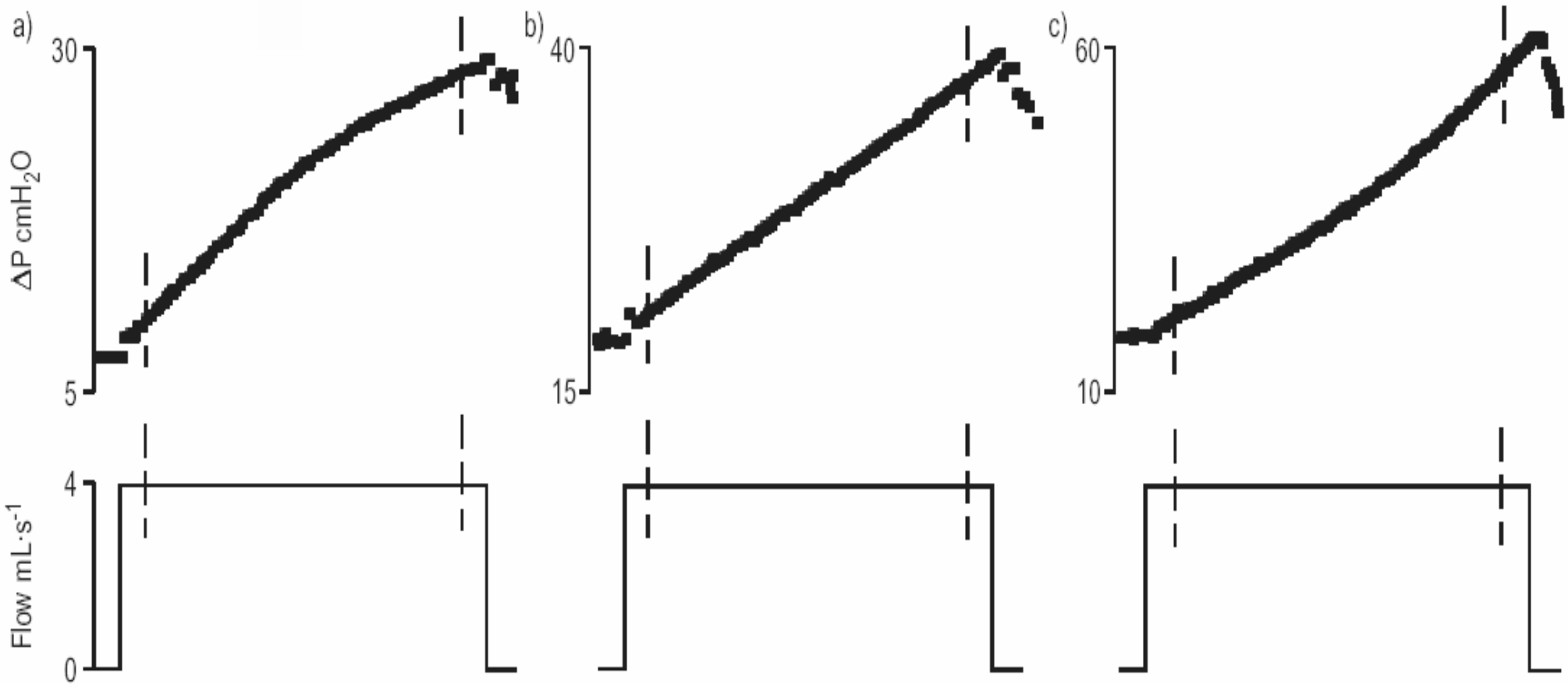


Ph	$PaCO_2$	PaO_2	SaO_2	HCO_3
7.2115±0.10 (7.01-7.57)	29.45±3.10 (24-35)	70.10±4.90 (62-78)	89.15±3.83 (80-95)	14.95 ± 1.15 (14-17)

3 *Hickling, K., (2002) Unpublished protocol*
4 *Crotti, S., Mascheroni, D., Caironi, P. et al. (2001); Am J Respir Crit Care Med 164: 131–140*
5 *Pelosi, P., Goldner, M., McKibben, A. et al. (2001); Am J Respir Crit Care Med 164: 122–130*
6 *Harris, R.S. (2009); Intensive Care Med 35:740–747*
7 *Caramez, P. M., Kacmarek, R. M., Helmy, M. et al (2009); Intensive Care Med 35:740–747*



Nishida T, Suchodolski K, Schettino GP, Sedeek K, Takeuch M, Kacmarek RM. Peak volume history and peak pressure-volume curve pressures independently affect the shape of the pressure-volume curve of the respiratory system. Crit Care Med. 2004 Jun;32(6):1358-64.

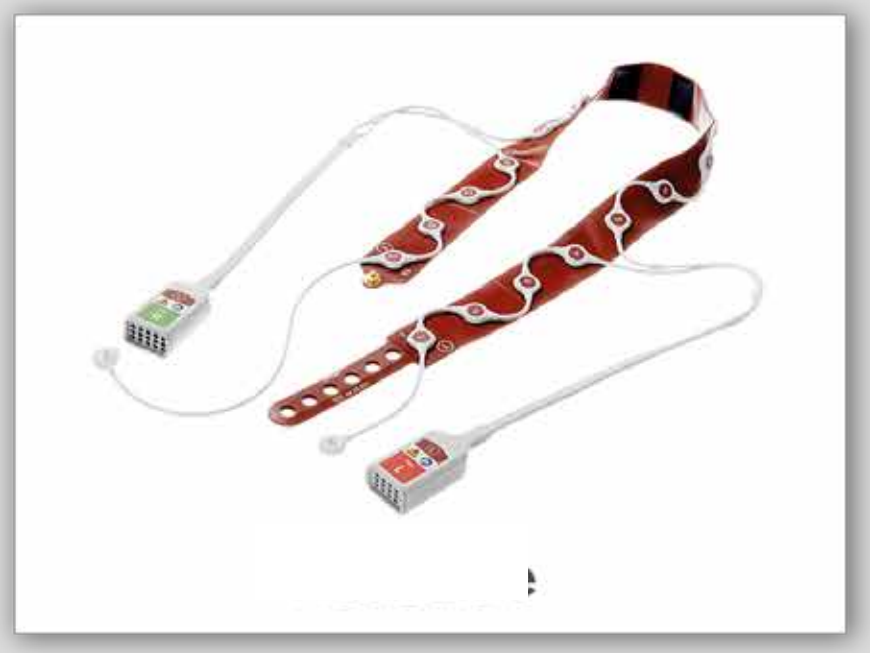


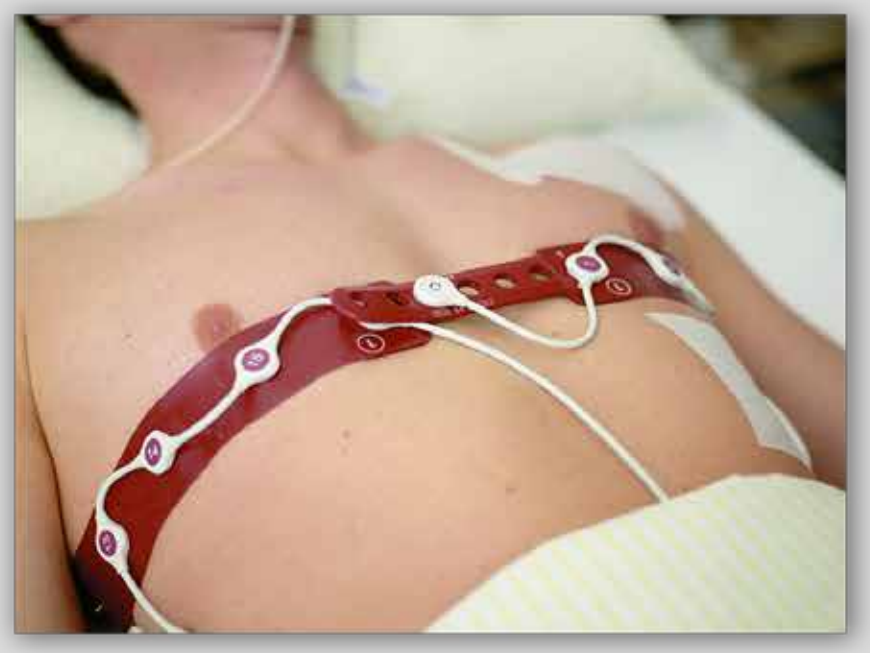
How respiratory system mechanics may help in minimizing ventilator induced lung injury in ARDS patients.
Eur. Repir. J. 2003; 22; Suppl 42, 15s-221s

¿Qué es la TIE?

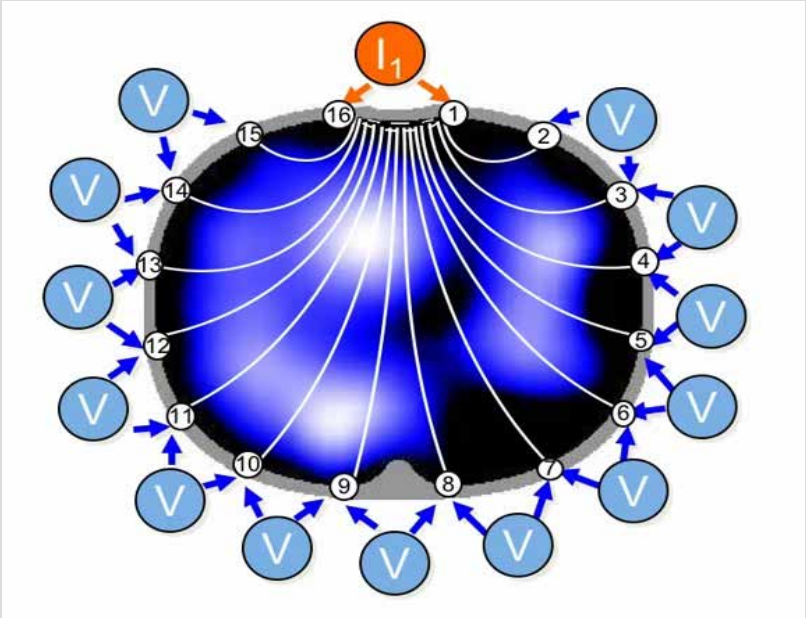
2 La tecnologia

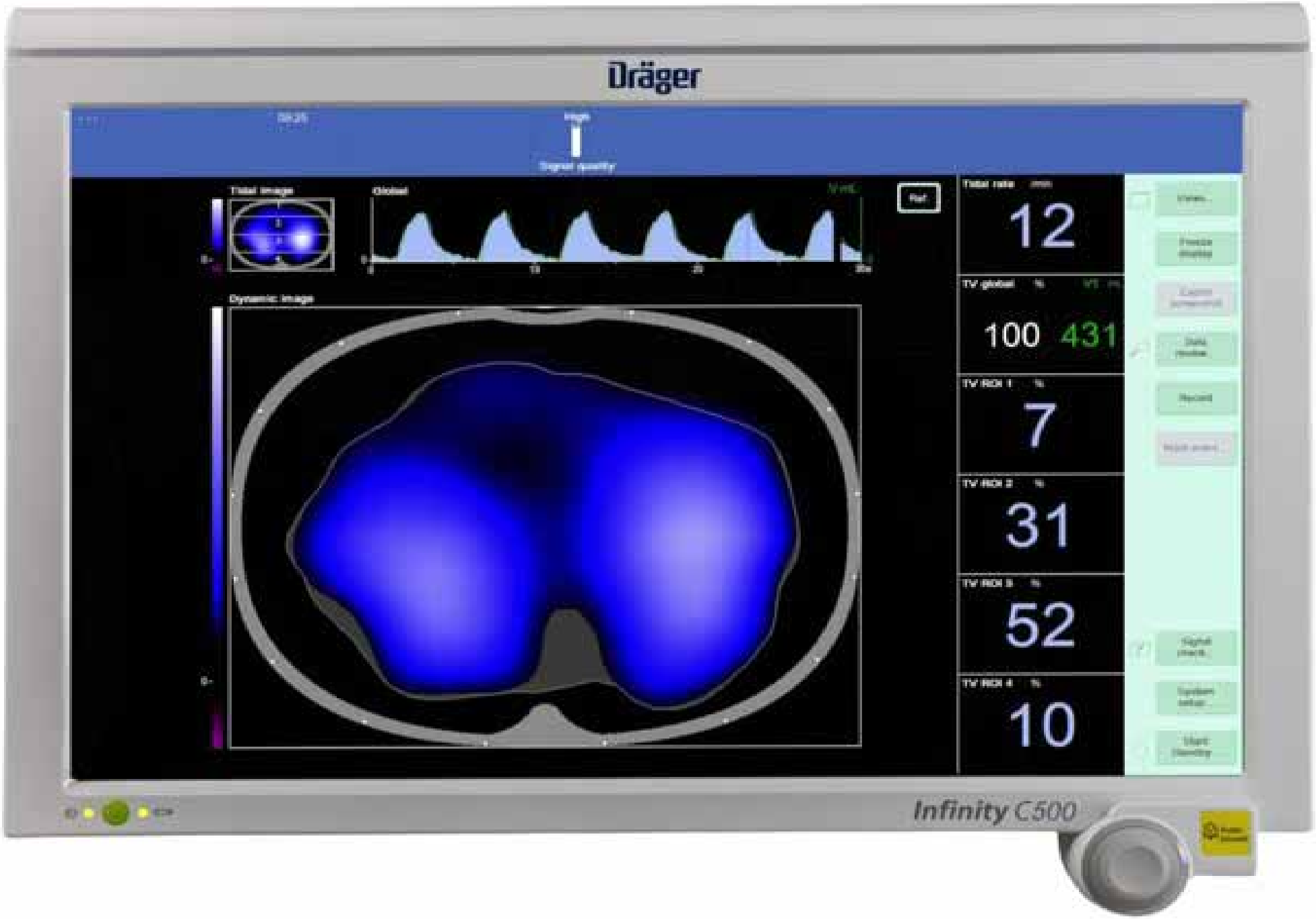
cinturó de 16 electrodes

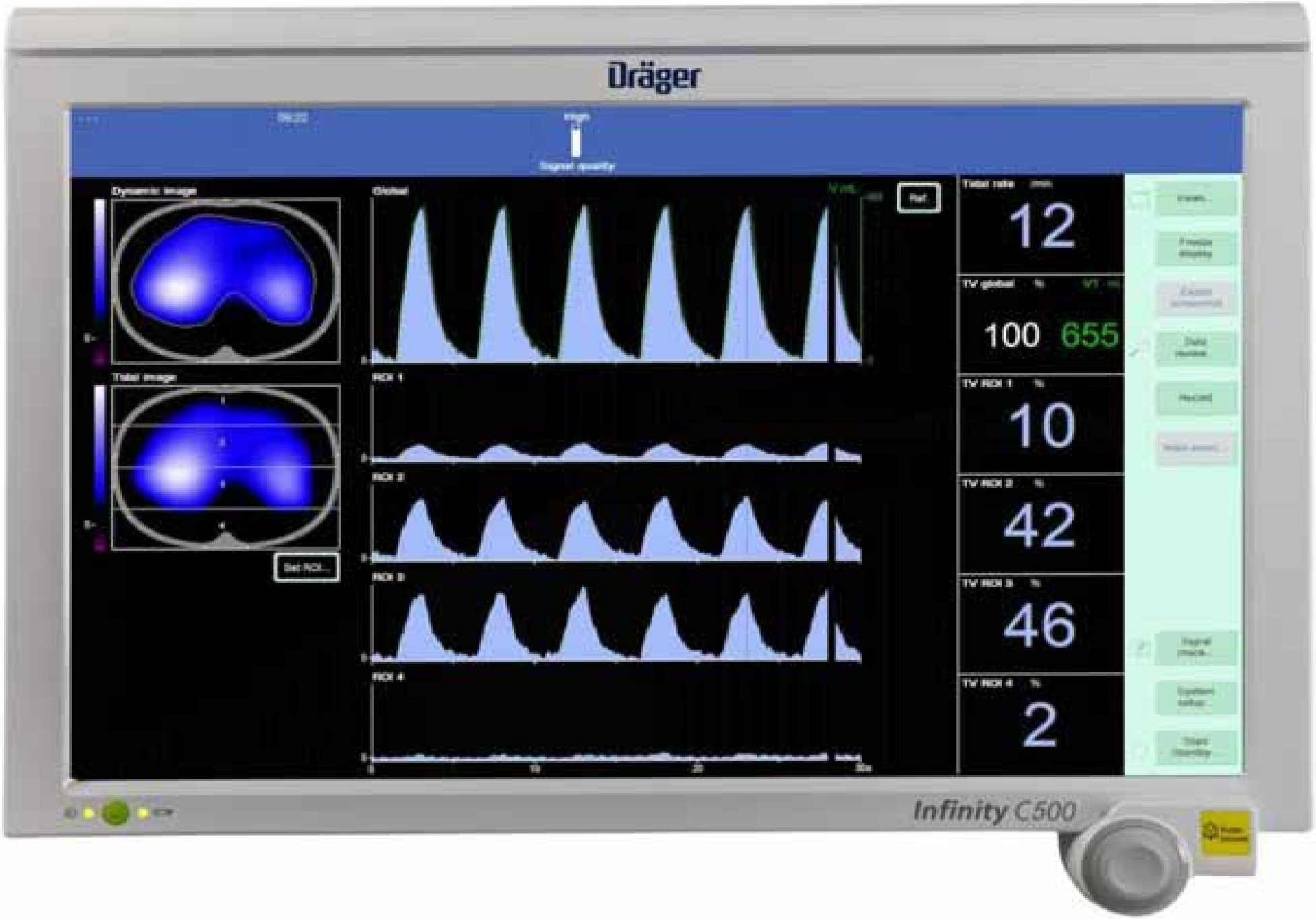




cada sensor és emisor i receptor de petits corrents elèctrics




Dräger
Signal quality
Tidal image
Global
Ref.
Tidal rate
12
TV global
100
431
TV ROI 1
7
TV ROI 2
31
TV ROI 3
52
TV ROI 4
10
Dynamic image
Infinity C500


Dräger
Signal quality
Dynamic image
Global
Ref.
Tidal image
ROI 1
ROI 2
ROI 3
ROI 4
Set ROI...
Tidal rate
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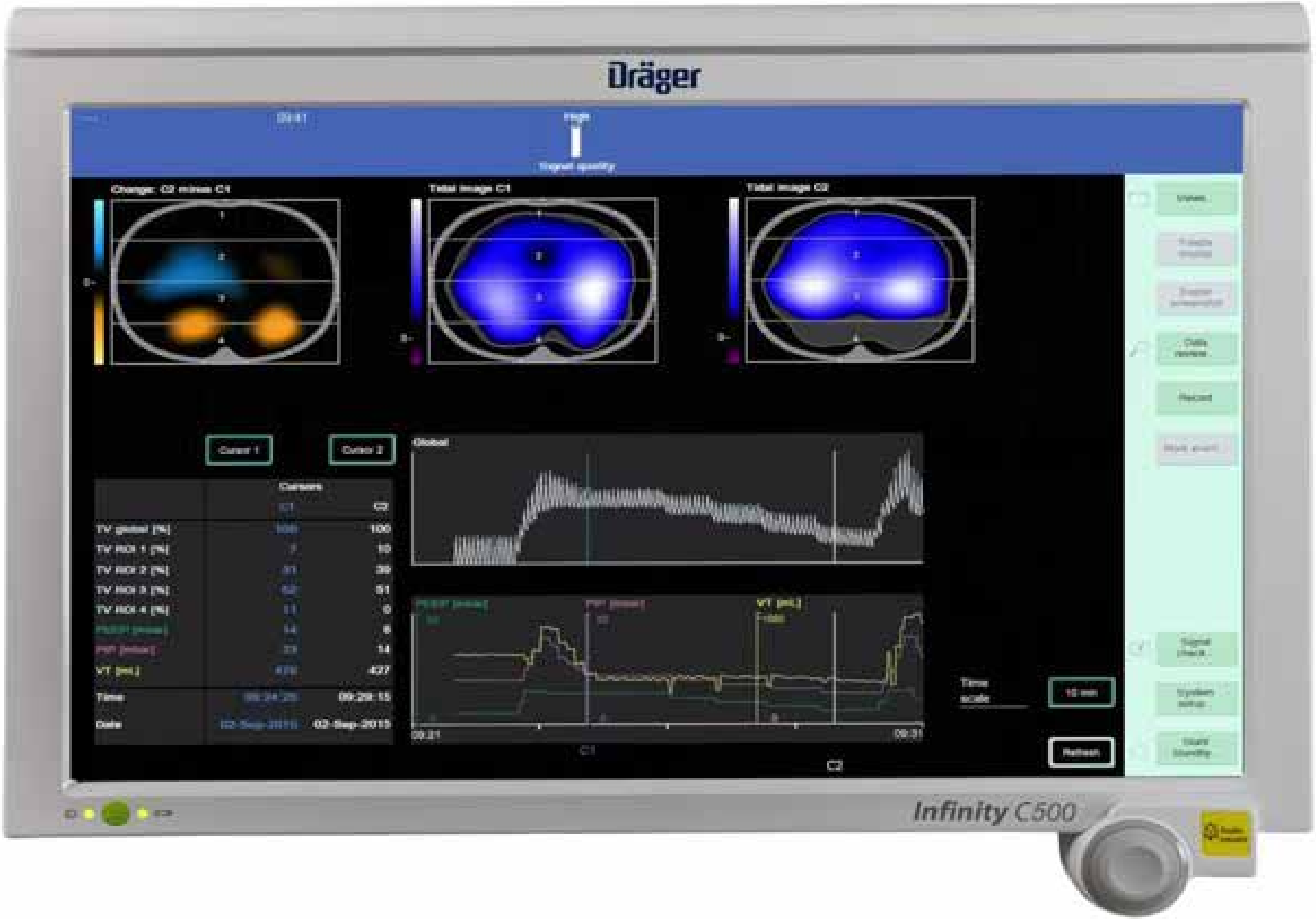
TV global
100
655
TV ROI 1
10
TV ROI 2
42
TV ROI 3
46
TV ROI 4
2
Infinity C500

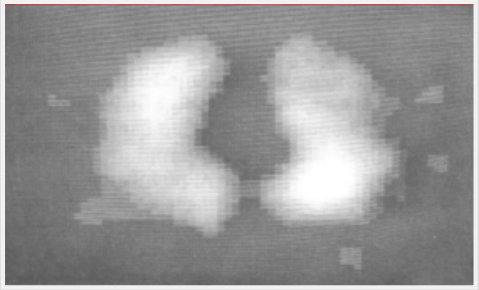

Dräger
Change: C2 minus C1
Tidal image C1
Tidal image C2
Cursor 1
Cursor 2
Cursors
C1
C2
TV global [%]
TV ROI 1 [%]
TV ROI 2 [%]
TV ROI 3 [%]
TV ROI 4 [%]
PEEP [mbar]
PIP [mbar]
VT [mL]
Time
Date
02-Sep-2015
Global
Time scale
10 min
Refresh
Infinity C500

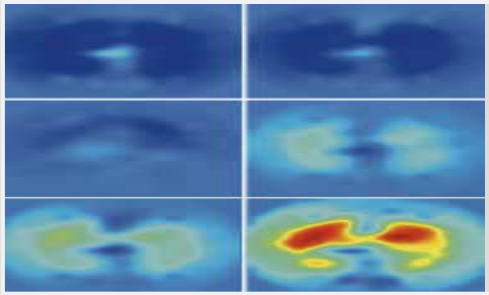
canvis a la impedancia que apareixen durant la ventilació a temps real

Tejido	Impedancia / Resistividad	
Sangre		150 Ω * cm
Pulmón	espiración	700 Ω * cm
	inspiración	2400 Ω * cm
Grasa		2000-2700 Ω * cm
Huesos		16600 Ω * cm
Músculo	longitudinal	125 Ω * cm
	transversal	1800 Ω * cm
Músculo del corazón	longitudinal	160-575 Ω * cm
	transversal	420-5200 Ω * cm

evolució tecnologica

1.985 - First relative EIT images
Performed at Sheffield University (UK)





1.991 - Dräger purchased GOE MF II
(1st generation) from Goettingen University

2.006 - EIT Evaluation Kit 2 (3rd generation)
only 15 devices produced

Integrative Medicine
Complementary Medicine
Orthodox Medicine
3 Pendre Decisions
MAKE THE RIGHT CHOICE

Results

regional V/Q

ARDSnet PEEP

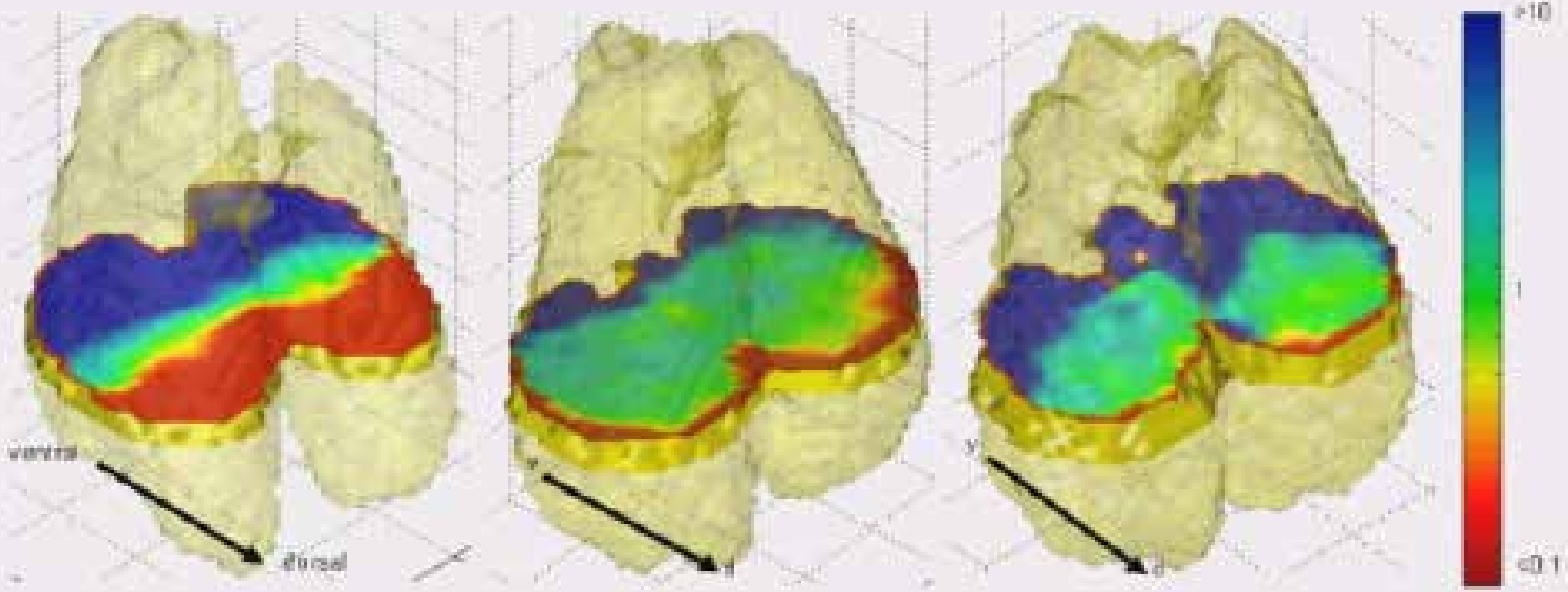
PEEP 10 cm H_2O

EIT PEEP

PEEP 20 cm H_2O

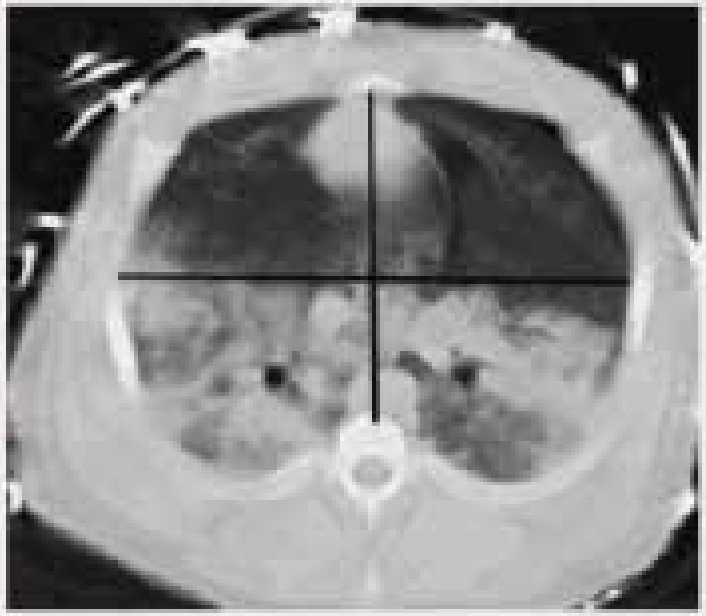
Open Lung PEEP

PEEP 24 cm H_2O

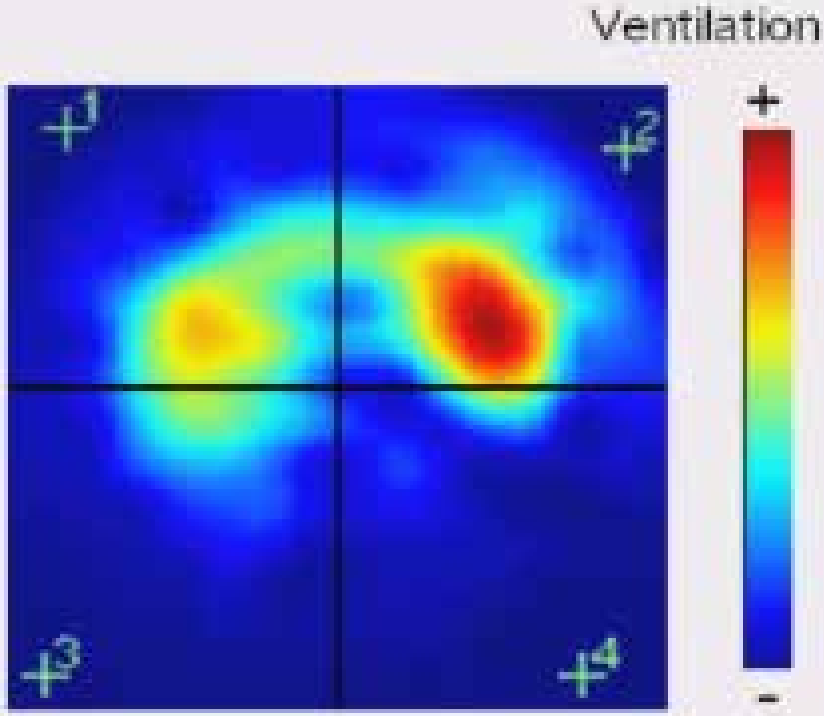


Regional Gascontent

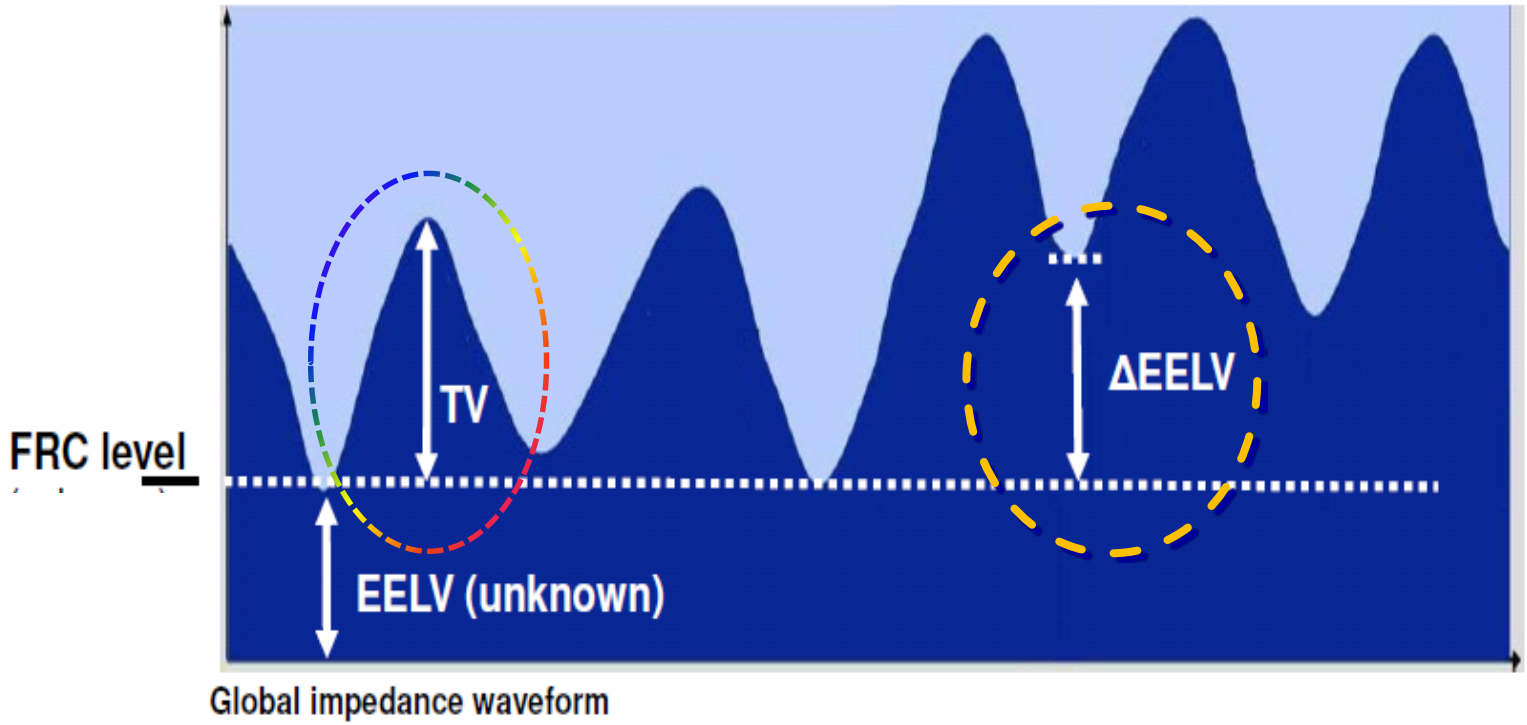
Computertomography and Electroimpedance Tomography



CT
Not at the bedside
radiation
Intermittently applicable



EIT
at the bedside
non invasive
continously applicable



Els paràmetres TIE representen canvis en el volum pulmonar:

– **VT** (Variació Tidal)… **Distribució del Volum Tidal**

– **EELV** (End-Expiratory Lung Impedance)… **nivell de la CRF**

– **▲EELV** (Canvis al EELV)… **Canvis al final de la espiració**

INDIVIDUALITZAR LA ESTRATEGIA RESPIRATORIA

métode inocuu - no invasiu - a la capçalera del pacient

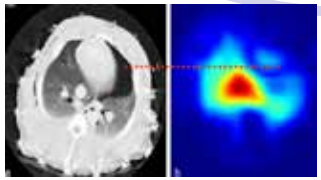
4 Experiències

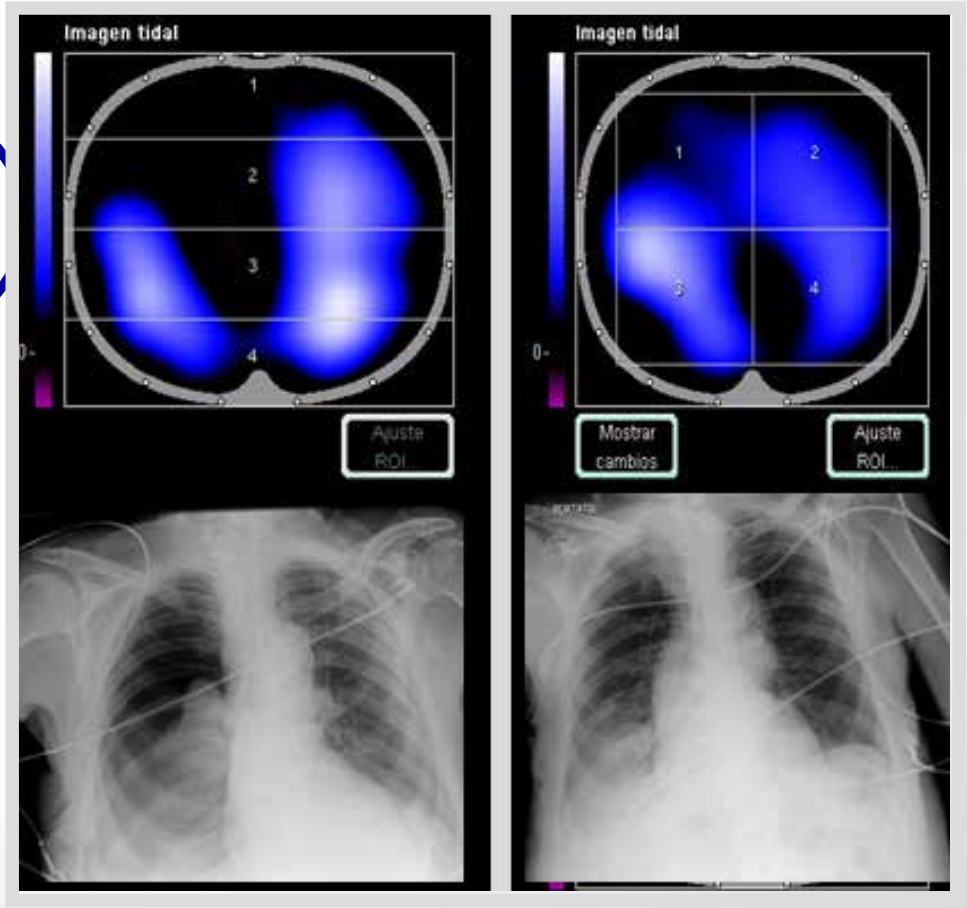
Pneumotòrax

CLINICAL APPLICATIONS OF THORACIC ELECTRICAL IMPEDANCE TOMOGRAPHY

H. Luepschen[a], T. Meier[b], M. Grosshern[b], T. Leibecke[c], H. Gehring[b], S. Leonhardt[a]

[a]Medical Information Technology, Helmholtz-Institute, RWTH Aachen University, Germany
[b]Department of Anaesthesiology, University of Luebeck, Germany
[c]Department of Radiology, University of Luebeck, Germany

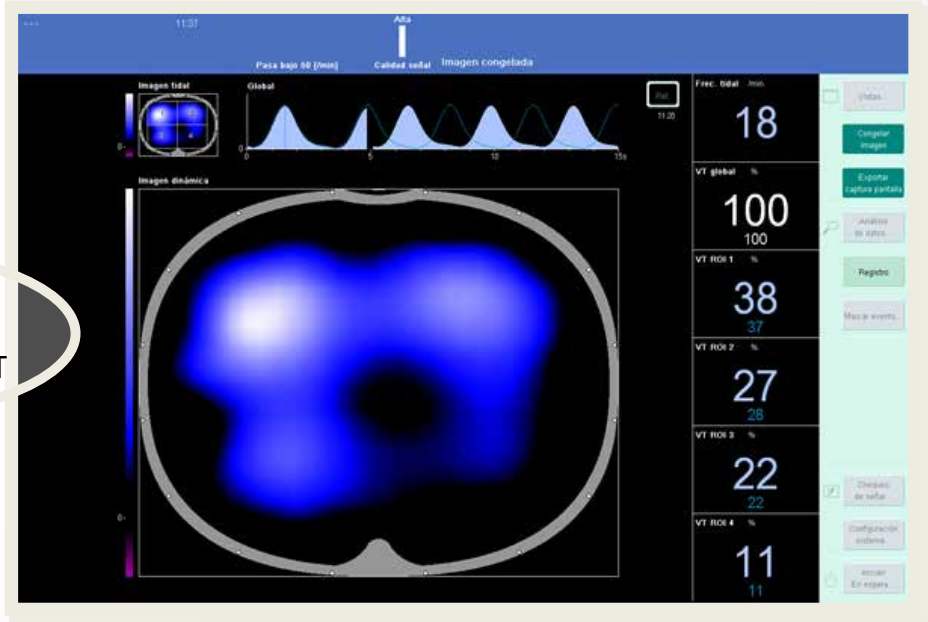




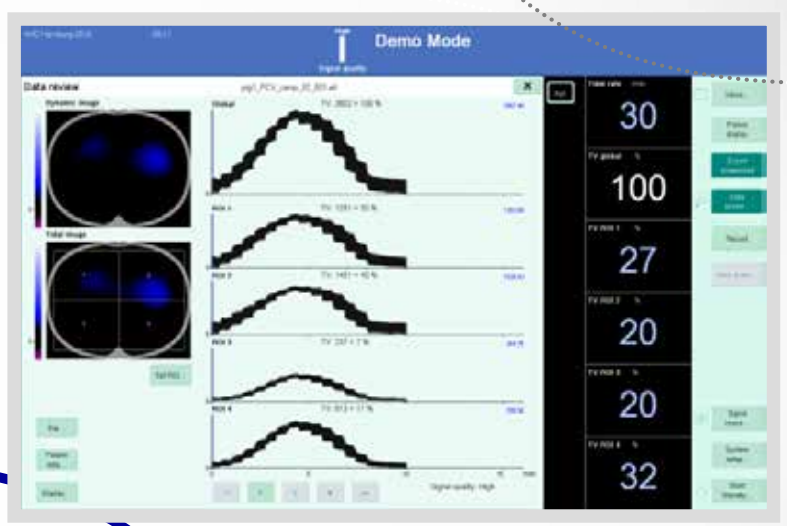
Atelectasia lòbul inferior

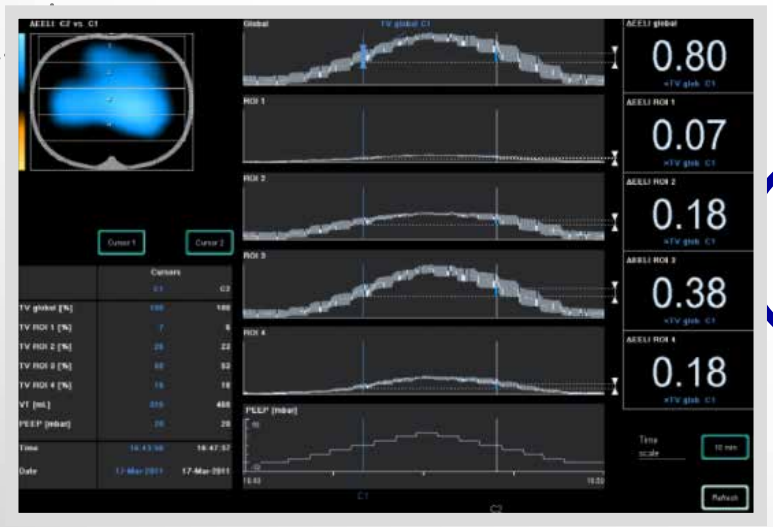
Etiologia

Excessiva introducció TOT



Reclutament Alveolar

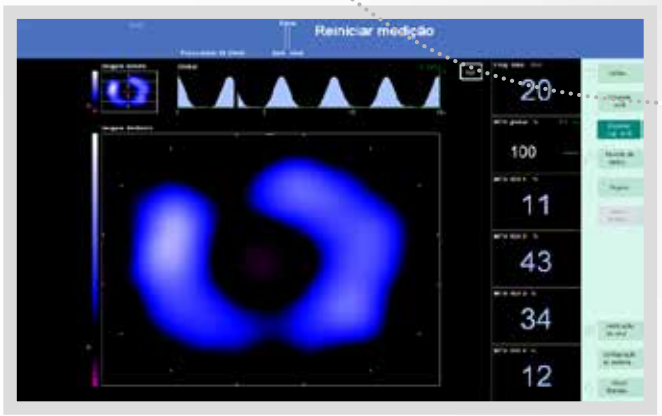




Búsqueda PEEP ideal

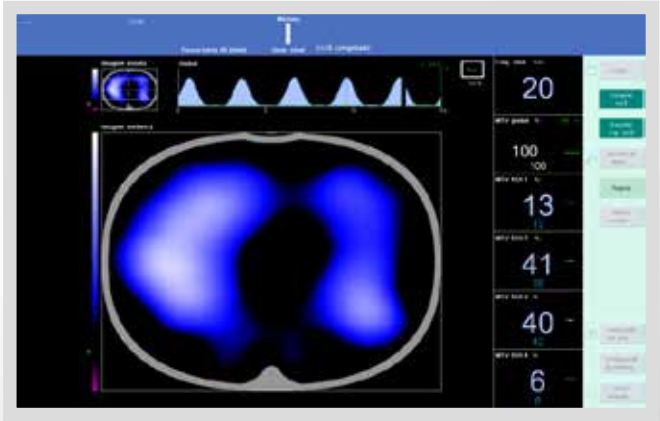
Anàlisis del Efecte Pendelluft

Tractament Postural

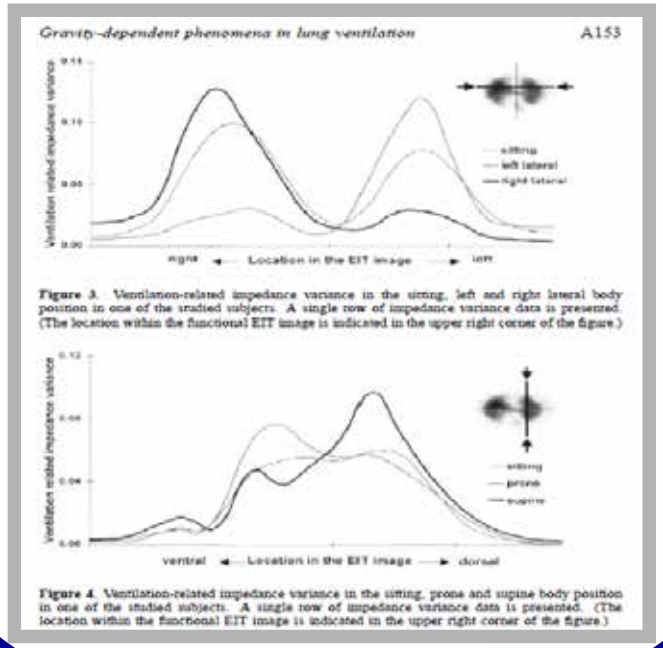


Monitorització a llarg plaç

2 hores de diferència



Responedors vs No Responedors



Predicció

Decúbit Pro

Moltes gràcies
per la vostre atenció