2ème Journée Marseillaie de la SKR
26/11/2016

Les outils diagnostics en kinésithérapie respiratoire

Quoi de neuf?

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Groupe Hospitalier Paris Saint-Joseph, Centre de recherche clinique
ED ES Dijon, U866, Université de Bourgogne

AUCUN CONFLIT D’INTÉRÊT

Processus de décision clinique

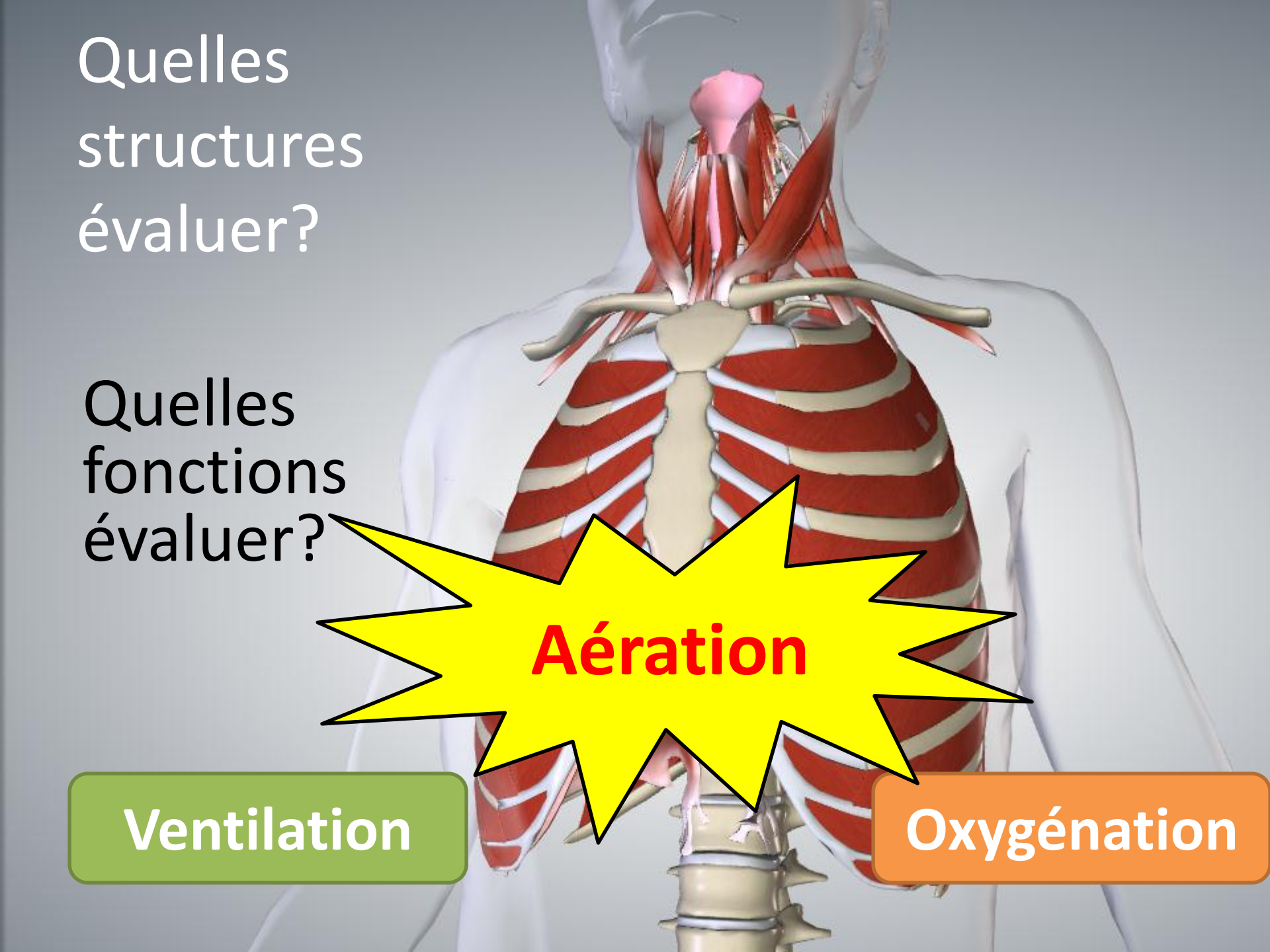
Pourquoi évaluer le patient ?

- Formuler une hypothèse clinique
- Choisir le traitement le plus adapté
- Monitorer le traitement
- Evaluer l'efficacité du traitement

EXAMENS COMPLEMENTAIRES

Quelles structures évaluer?

Quelles fonctions évaluer?

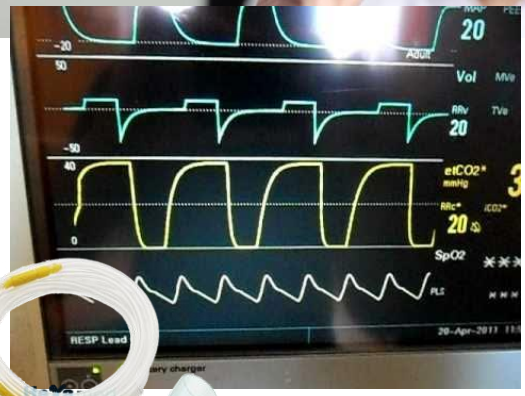


Aération

Ventilation

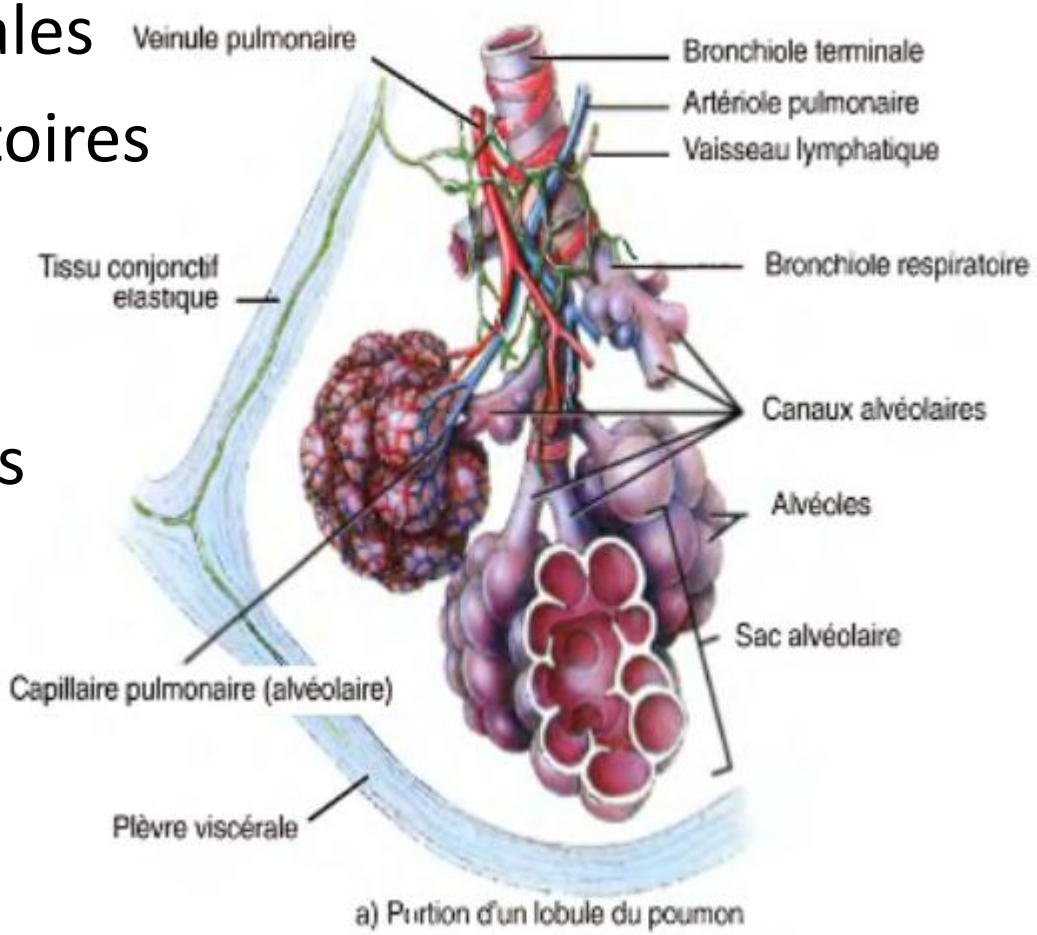
Oxygénation

Evaluer l’oxygénation et la ventilation



L’aération pulmonaire

- Parenchyme pulmonaire
  - Bronchioles terminales
  - Bronchioles respiratoires
  - Alvéoles
  - Lobules
  - Septa interlobulaires



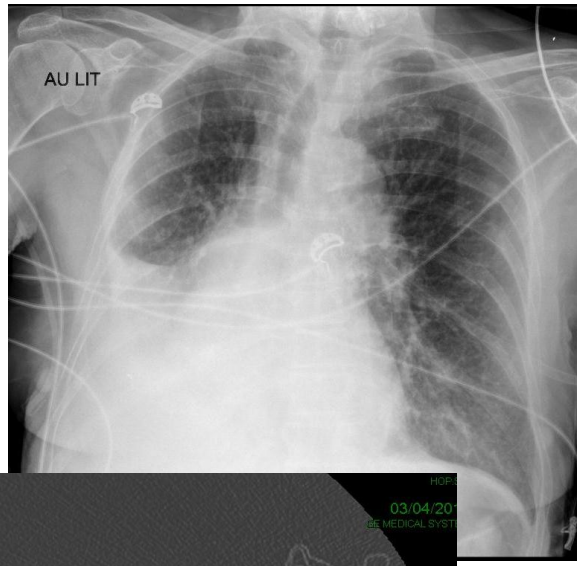
Pathologies du parenchyme

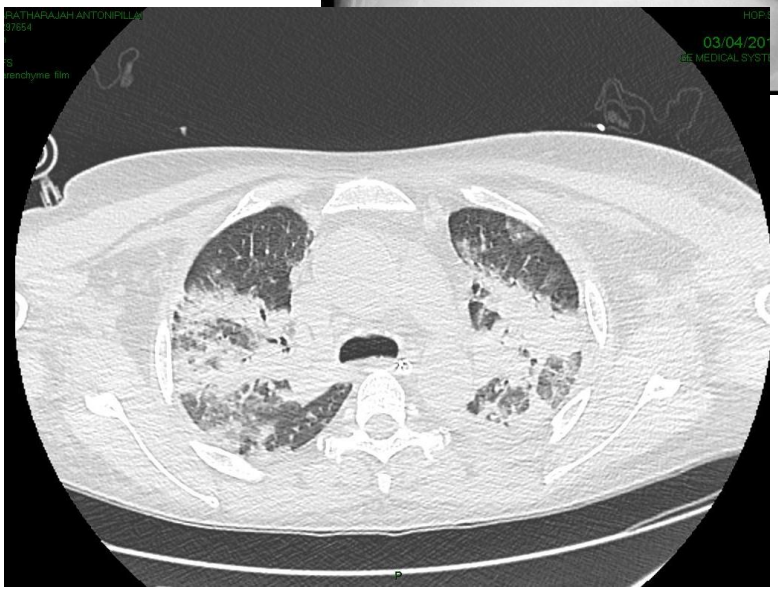
- Atélectasie
  - Absorption
  - Compression
  - Dysfonction du surfactant
- Pneumopathie
- Contusions pulmonaires
- Cancer et métastases
- Atteintes interstitielles (ex.: fibrose)…

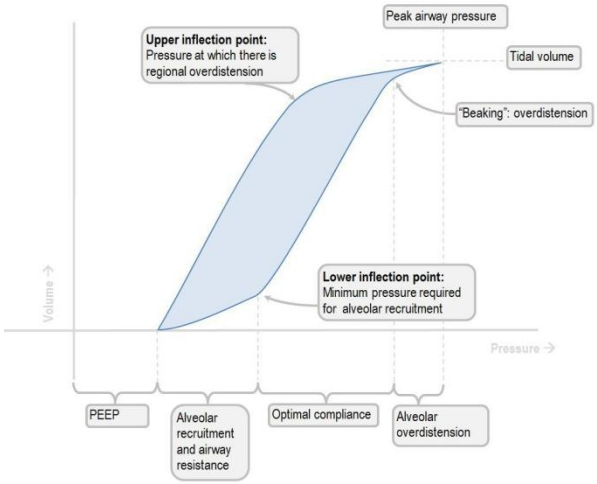
Intérêt de l'évaluation de l'aération pulmonaire

- Préciser l'indication à la kinésithérapie
- Peut-on recruter le poumon ?
- Choisir le traitement par KR
  - PEEP, PPC, VNI, hyperinsuflation, positionnement etc.
- Evaluer l'efficacité ou non du traitement en temps réel
- Suivre l'évolution du patient

Evaluer l’aération pulmonaire







REVIEW

Narrative Review: Should Teaching of the Respiratory Physical Examination Be Restricted Only to Signs with Proven Reliability and Validity?

Jochanan Benbassat, MD[1] and Reuben Baumal, MD[2]

Table 1. Reliability of Respiratory Physical Examination Signs Elicited by Inspection, Palpation and Percussion

Sign	Inter-examiner reliability[a]	Reference
Dullness on percussion	0	
	0	
	"	
	0	
	0	
	[b]	
Hyperresonance on percussion	"	
	"	
	0.2	
	0.25 to 0.43	32
	0.50	33
	[b]	25,28
Diaphragmatic expansion	"20% disagreement"	26
	"60% agreement"	30
	0.05	59
Cardiac dullness (impaired/absent)	"32% disagreement"	22
	"24% disagreement"	26
	0.47	59
Auscultatory percussion (hyperresonance)	0.37	59
Auscultatory percussion (reduced)	"10% disagreement"	56
	-0.04 to 0.45[c]	60
	0.76	61

Table 2. Reliability of Respiratory Physical Examination Signs Elicited by Auscultation

Sign	Inter-examiner reliability[a]	Reference
Rales/crackles/	0.36	31
		58
		32
		33
		60
		61
		25,28
		31
		60
		25
		61
		25
		25
		32
	0.51	33
	0.50	59
	0.43	58
	0.85	34
	-0.05 to 0.65[c]	60
	[b]	28
Wheezing at maximal forced exhalation	"90% agreement"	57
Expiratory phase (prolonged)	0.53	31
	0.35	33
Pleural friction rub	-0.02	31
	0.51	33
	-0.02	61

Examen clinique
Faible Se, Sp et reproductibilité
Faible qualité de la littérature

Narrative Review: Should Teaching of the Respiratory Physical Examination Be Restricted Only to Signs with Proven Reliability and Validity?

Auscultation
Faible Se, Sp et reproductibilité
Faible qualité de la littérature

However, pending the publication of properly controlled studies, the reliability and validity of most respiratory PE signs remain uncertain. In 1986, Mulrow et al.[32] concluded that "despite their routine use, most physical examination techniques, including pulmonary auscultation and percussion, are poorly standardized and of uncertain [diagnostic] value." This conclusion is also pertinent today.

Therefore, we believe that a meticulously performed respiratory PE, which aims *to explore a diagnostic hypothesis*, as opposed to a PE that aims to detect a disease in an asymptomatic person, remains a cornerstone of clinical practice. We

Table 4 ... ation

Sign	D					R egative[a]	Reference
Breath sounds (diminished)						.6	50
						.1	61
Breath sounds (diminished)						.5	59
						.8	58
							55
Breath sounds (diminished)						0.9	43
			0.49	0.80	2.5	0.6	41
			0.34	0.85	2.3	0.8	39
Breat (dim					∞	0.0	49
					∞	0.5	
Rales crep				–0.79	1.2–4.8	0.5–0.8	60c
					2.0	0.6	54
					2.6	0.6	41
					1.6	0.8	39
					2.7	0.9	38
					1.2	0.8	48
					-	-	35
Rales/crackles/ crepitations	OAD	Spirometry	0.01	0.99	1.0	1.0	58
Rales/crackles/ crepitations	Ventilator-associated pneumonia						
Rales/crackles/ crepitations	Pulmonary emboli						
Rhonchi	Pneumonia						
			0.15	0.90	1.5	0.9	38
Reduced vocal resonance	Pleural effusion	Chest x-ray	0.76	0.88	6.3	0.3	61

Radiographie thoracique

Leech et al., Physiother Res Int, 2015

Table 1. Diagnostic performance of CXR when compared with CT in ICU

	Sensitivity (%)	Specificity (%)	Reference
Pleural effusion	23–42	94–97	(Rocco *et al.*, 2008)
	65	81	(Xirouchaki *et al.*, 2011)
Interstitial syndrome		46	80
		60	100
Lung consolidation		38	89
		68	95
Contusion	24–39	89–96	(Rocco *et al.*, 2008)
Pneumothorax	50.2 (95 CI, 43.5–57.0)	99.4 (95 CI, 98.3–99.8)	(Alrajhi *et al.*, 2012) ■ ◆
	0	99	(Xirouchaki *et al.*, 2011)

Therefore, the true effectiveness of physiotherapy treatment in critical care settings could be either under-estimated or over-estimated, potentially leading to

Alors quel examen complémentaire choisir ?

Besoin d'outils fiables qui permet de justifier la mise en place d'un traitement kinésithérapique et de ses modalités

thebmj

BMJ 2015;351:h5527 doi: 10.1136/bmj.h5527 (Published 28 October 2015)

RESEARCH METHODS & REPORTING

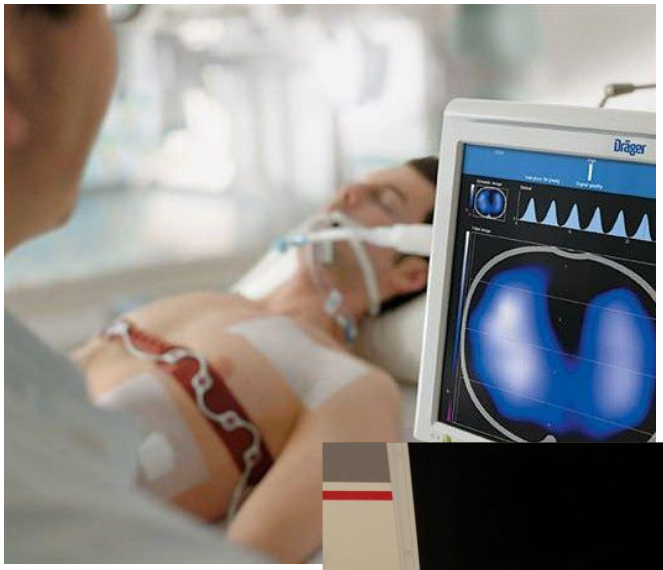
CrossMark
click for updates

STARD 20 ... s for reporting ...

Outils diagnostic:
Fiabilité (=reproductibilité)
Validité (précision diagnostic)

DE NOUVEAUX OUTILS RÉPONDENT-ILS À NOTRE BESOIN ?

« Nouveaux outils »



Computerized Aided Lung Sound Analysis (CALSA)

IOP PUBLISHING PHYSIOLOGICAL MEASUREMENT

Physiol. Meas. **30** (2009) 903–912 doi:10.1088/0967-3334/30/9/003

The reliability of lung crackle characteristics in cystic fibrosis and bronchiectasis patients in a clinical setting

Alda Marques[1,4], Anne Bruton[2] and Anna Barney[3]

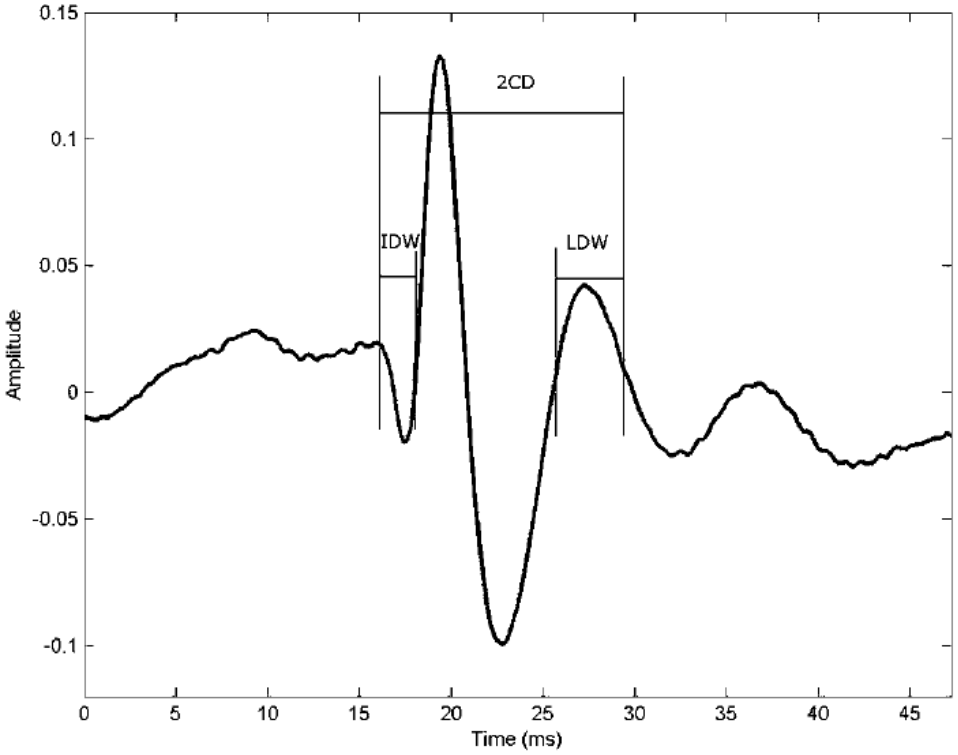


Figure 1. Crackle parameters. Values are in milliseconds (ms). IDW: initial deflection width, 2CD: two-cycle deflection, and LDW: largest deflection width.

Reproductibilité et précision

Table 2. Relative reliability of the crackles' IDW and 2CD ($n = 54$). Values are from intraclass correlation coefficient (ICC) with the 95% confidence intervals (CI). T: trachea, AR: anterior right, AL: anterior left, LR: lateral right, LL: lateral left, PR: posterior rig

	ICC (95% CI) IDW	ICC (95% CI) 2CD
T	0.77 (0.61;0.87)	0.94 (0.90;0.97)
AR	0.76 (0.59;0.86)	0.89 (0.80;0.93)
AL	0.81 (0.68;0.89)	0.83 (0.70;0.90)
LR	0.83 (0.70;0.90)	0.91 (0.85;0.95)
LL	0.84 (0.73;0.91)	0.87 (0.78;0.93)
PR	0.82 (0.70;0.90)	0.91 (0.84;0.95)
PL	0.85 (0.73;0.91)	0.94 (0.89;0.96)

Se= 0.78
Sp= 0.88
VPP = 0.87

Automated Lung Sound Analysis in Patients With Pneumonia

Raymond LH Murphy MD, Andrey Vyshedskiy PhD, Verna-Ann Power-Charnitsky MSc, Dhirendra S Bana MD, Patricia M Marinelli RN, Anna Wong-Tse RN, and Rozanne Paciej

RESPIRATORY CARE • DECEMBER 2004 VOL 49 NO 12

ICC = 0,77

Vibration Response Imaging

- Système de capture des vibrations générées par la circulation d'air
  - Mouvement d'entrée/sortie d'air génèrent des vibrations
  - Propagation des vibrations au travers du tissu pulmonaire
  - Recueillis par des capteurs

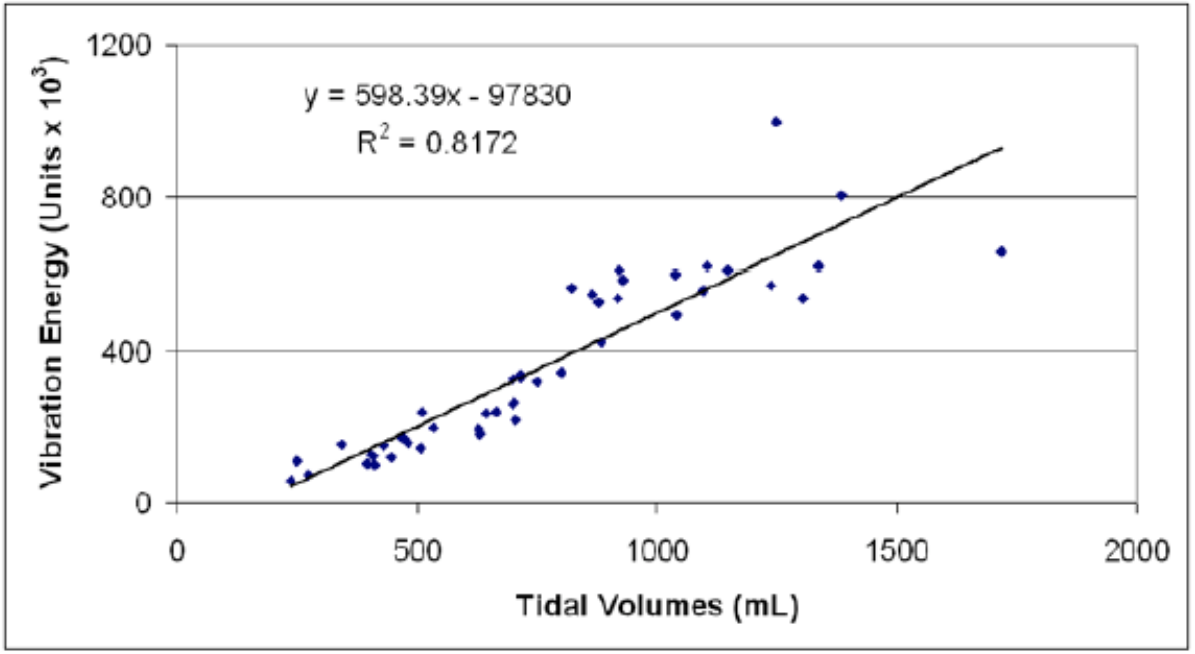
Research

Open Access

Regional distribution of acoustic-based lung vibration as a function of mechanical ventilation mode

R Phillip Dellinger[1], Smith Jean[1], Ismail Cinel[1], Christina Tay[1], Susmita Rajanala[1], Yael A Glickman[2] and Joseph E Parrillo[1]

Critical Care Vol 11 No 1 Dellinger *et al.*



The effect of tidal volume/airflow on vibration intensity. There is a strong correlation and linear relationship between tidal volume and lung vibration intensity.

Research

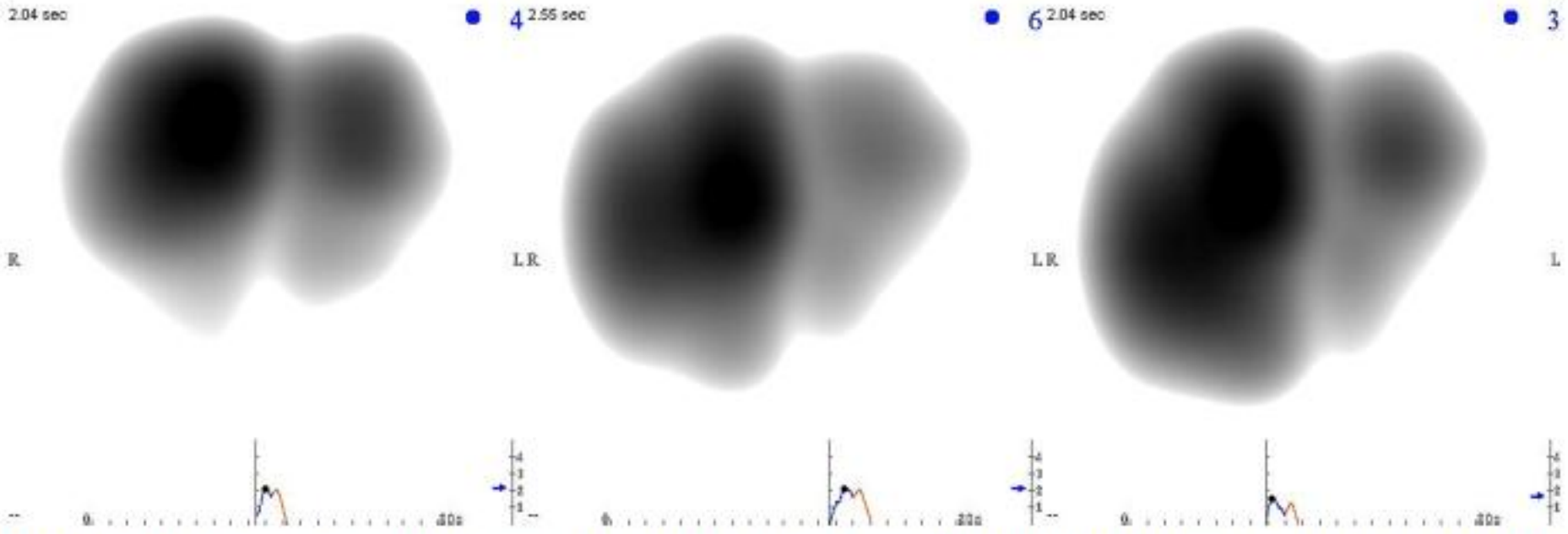
Open Access

Regional distribution of acoustic-based lung vibration as a function of mechanical ventilation mode

R Phillip Dellinger[1], Smith Jean[1], Ismail Cinel[1], Christina Tay[1], Susmita Rajanala[1], Yael A Glickman[2] and Joseph E Parrillo[1]

Critical Care Vol 11 No 1 Dellinger *et al.*

Figure 3



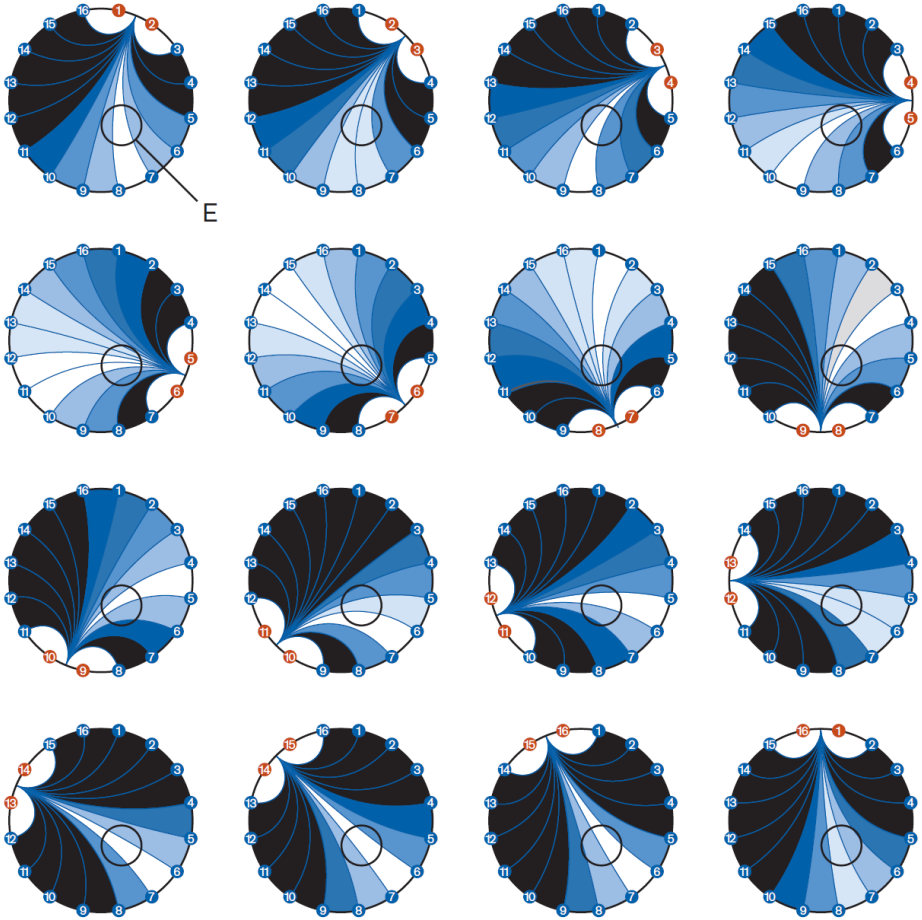
Vibration response images on va… ordings of a 73-year-old mechanically ventilated female with respi… ural fluid in both lungs. Assist volume control, assist pressure con…

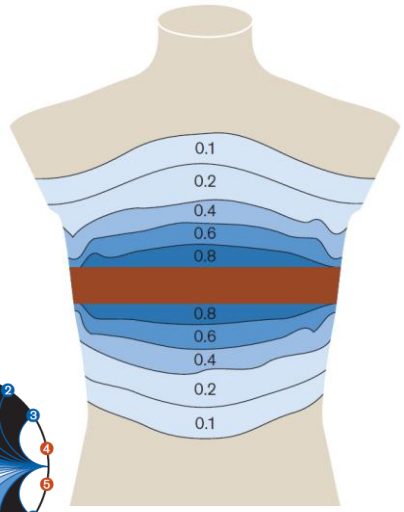
Pas d'étude retrouvée évaluant la précision diagnostic

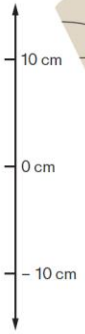
Electric Impedance Tomography

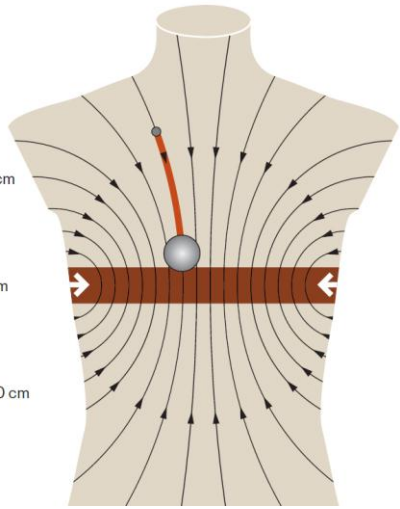
EIT

- Premiers appareils pour clinicien en 2001
  - Electrodes à mettre
  - Câbles à mettre
  - 20mn de préparation
  - Software moins intuitifs
- Appareil moderne (Pulmovista) en 2006
  - Ceinture d'electrodes câblées
  - 3mn d'installation
  - Software pour clinicien


E


0.1
0.2
0.4
0.6
0.8
0.8
0.6
0.4
0.2
0.1

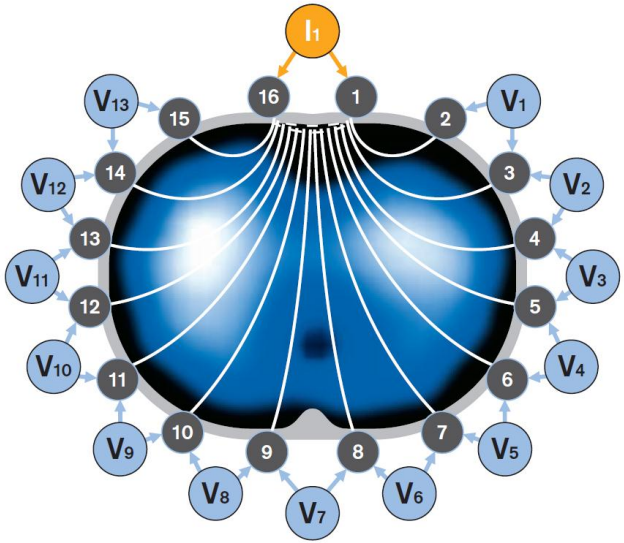

10 cm
0 cm
– 10 cm



EIT

- Application d’ un courant de faible intensite par 2 électrodes
- Mesure de l’impédance résultatnte par
- Les autres électrodes recueillent le signal électrique
- Modification de l’impédance

liée à la ventilation et perfusion



EIT


09:48
High
Low pass 70 [/min]
Signal quality
Change: C2 minus C1
Tidal image C1
Tidal image C2
Views...
Freeze display
Export screenshot
Data review...
Record
Mark event...
Signal check...
System setup...
Start/ Standby...
Cursor 1
Cursor 2
Cursors
C1
C2
TV global [%] 100 100
TV ROI 1 [%] 11 6
TV ROI 2 [%] 42 34
TV ROI 3 [%] 45 51
TV ROI 4 [%] 2 9
VT [mL] 409 457
PEEP [mbar] 6 12
PIP [mbar] 14 20
Time 09:41:06 09:38:02
Date 11-Nov-2014 11-Nov-2014
Global
VT [mL]
PEEP [mbar]
PIP [mbar]
1050
50
50
0
0
0
09:33
09:43
C1
Time scale
10 min
Refresh

Imbalances in Regional Lung Ventilation

A Validation Study on Electrical Impedance Tomography

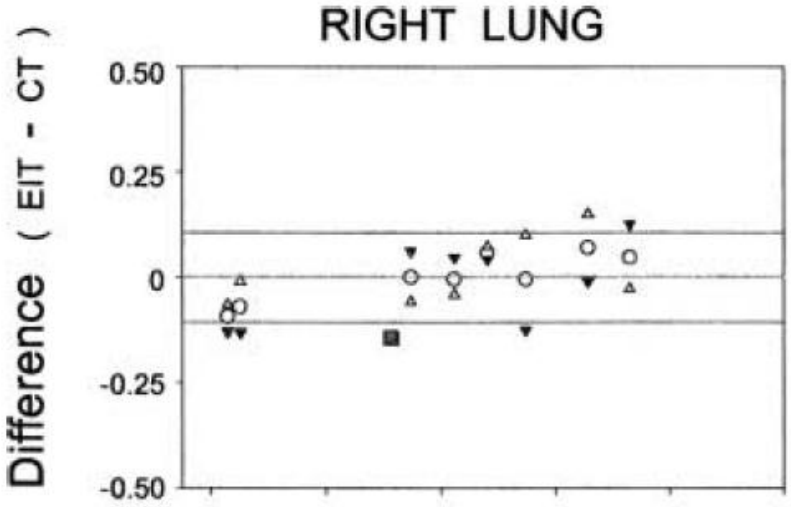
Josué A. Victorino, João B. Borges, Valdelis N. Okamoto, Gustavo F. J. Matos, Mauro R. Tucci, Maria P. R. Caramez, Harki Tanaka, Fernando Suarez Sipmann, Durval C. B. Santos, Carmen S. V. Barbas, Carlos R. R. Carvalho, and Marcelo B. P. Amato

AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE VOL 169 2004

Reproductibility:

Within-subject SD = 5%

Corrélation (avec CT scan)



L’échographie pulmonaire

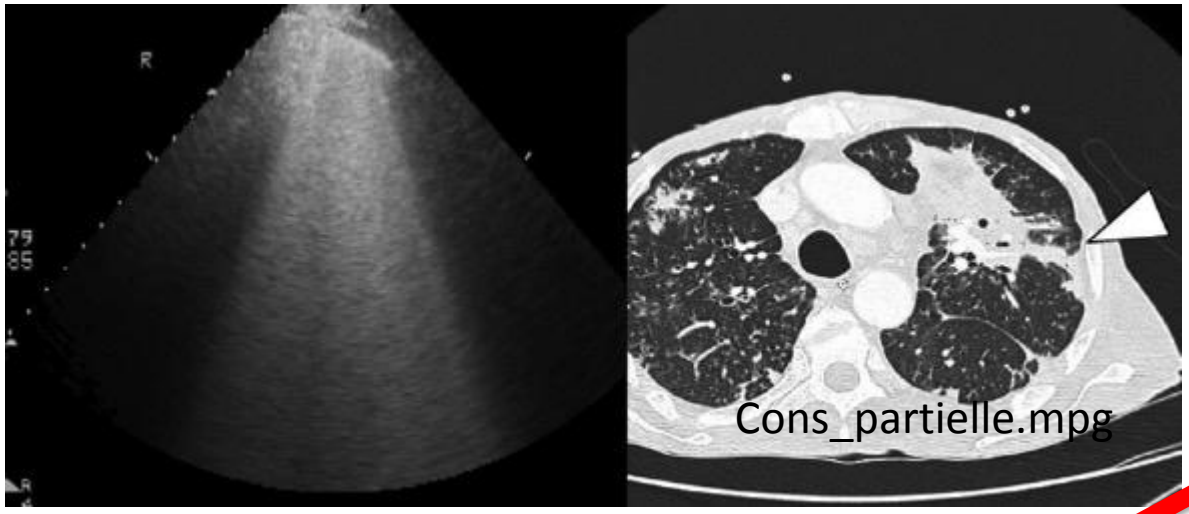
Principes en écho thoracique*

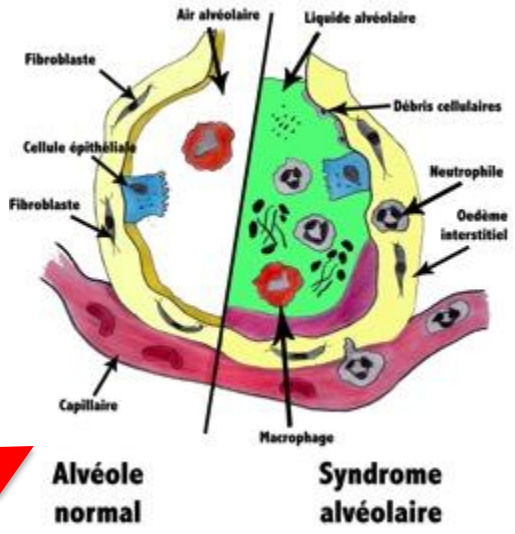
- Un appareil non sophistiqué est parfaitement adapté
- Le thorax est une région où **air** et **eau** se mêlent
  - Différence d'impédance acoustique élevée qui génère les signes
- La sémiologie pleuro-pulmonaire part de la ligne pleurale
- Elle est centrée sur l'analyse d'artefacts
- La sémiologie pleuro-pulmonaire est dynamique
- Presque tous les désordres thoraciques aigus ont un contact avec la paroi
- La poumon est l'organe le plus volumineux:
  - définition de territoire

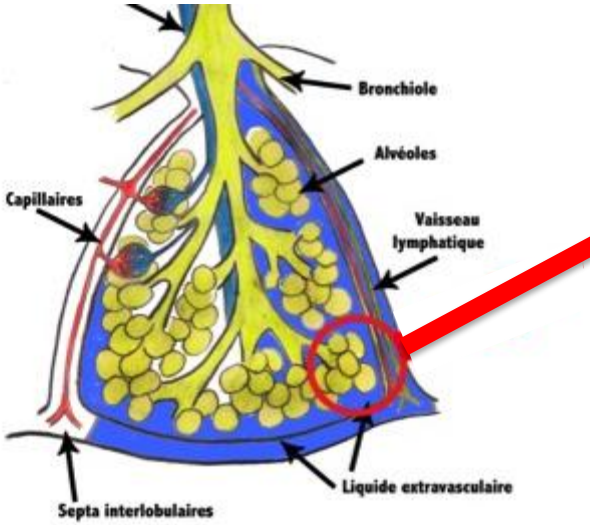
*Lichtenstein et al., Lung ultrasound in the critically ill, Ann Intensive Care, 2014

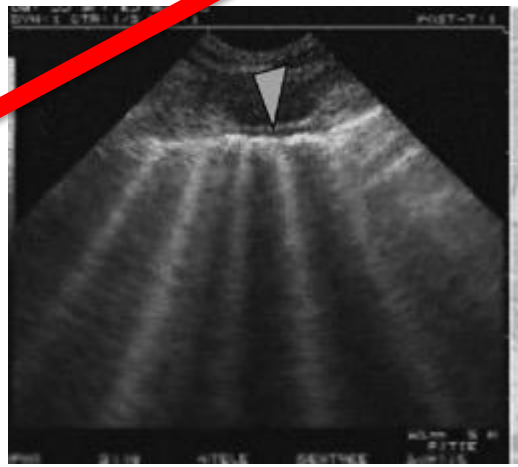
Lignes B & syndrome interstitiel

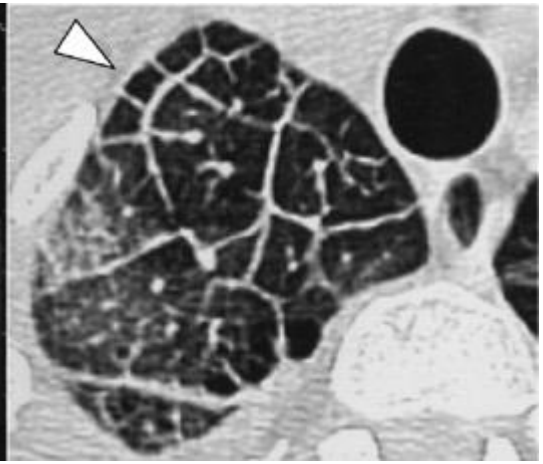
Bouhemad et al., Ultrasound assessment of antibiotic-induced pulmonary reaeration in ventilator-associated pneumonia, Crit Care Med, 2010











Pneumopathie

Précision diagnostic

	Auscultation, %	Chest Radiography, %	Lung Ultrasonography, %
Pleural effusion			
Sensitivity	42	39	92
Specificity	90	85	93
Diagnostic accuracy	61	47	93
Alveolar consolidation			
Sensitivity	8	68	93
Specificity	100	95	100
Diagnostic accuracy	36	75	97
Alveolar–interstitial syndrome			
Sensitivity	34	60	98
Specificity	90	100	88
Diagnostic accuracy	55	72	95

Lichtenstein et al., Comparative Diagnostic Performances of Auscultation, Chest Radiography, and Lung Ultrasonography in Acute Respiratory Distress Syndrome, Anesthesiology, 2004

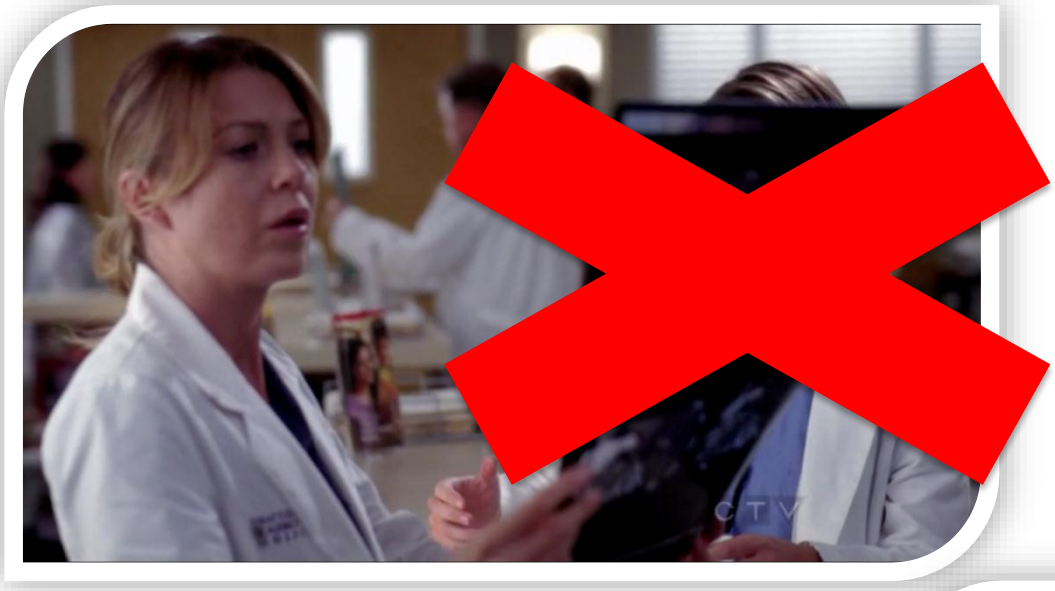
Synthèse

Outil diagnostic	CALSA	EIT	VRI	LUS
Immédiatement disponible pour le kiné au lit du patient	+/-	+	+/-	+
Répétable en pré et post-kinésithérapie	+	+	+/-	+
Feedback en temps réel durant la kinésithérapie	+/-	+	-	+
Exposition aux radiations	-	-	-	-
Transport du patient	-	-	+/-	-
Formation nécessaire (pour pratiquer)	+	+	+	+
Formation nécessaire (pour interpréter)	+	+/-	+/-	+
Précision diagnostic	+/-	?	?	+

Conclusion (1)

- Examen clinique
  - Formulation d'une hypothèse diagnostique
- Confirmation de l'hypothèse clinique
  - Examen complémentaire
- Examen complémentaire
  - Fiabilité, validité
  - Doit pouvoir répondre à une question posée
  - Doit pouvoir être utilisé au lit du patient
  - Doit être efficient: temps/coût

Conclusion (2)



Merci de votre attention !