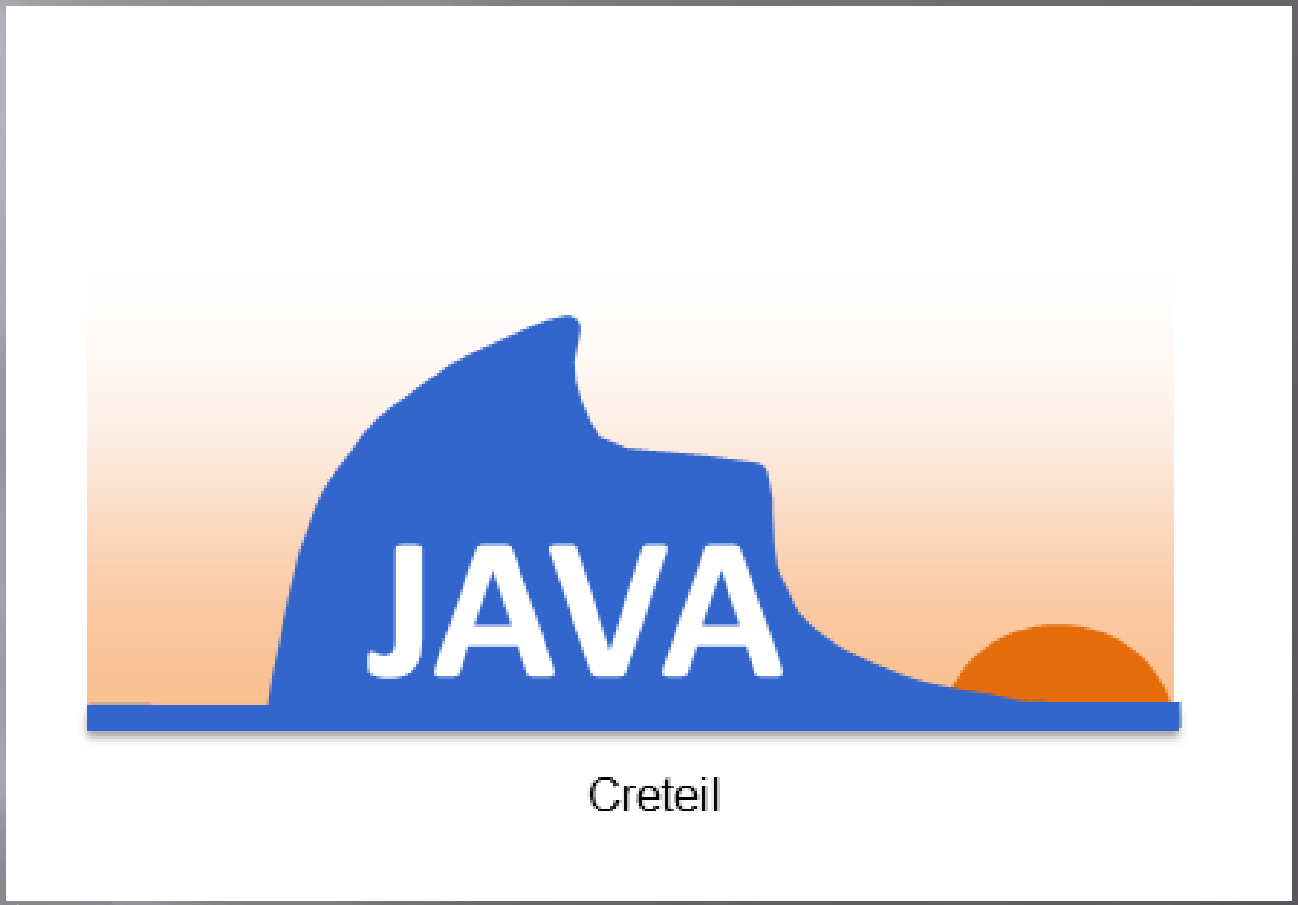


22ème Journée d'Actualités en Ventilation Artificielle

FAUT-IL DRAINER LES ÉPANCHEMENTS PLEURAUX SOUS VENTILATION ?

Keyvan Razazi

JAVA 2015

Conflit d'intérêt

aucun

Epanchements pleuraux en réanimation

- Nombreux facteurs en réanimation favorisant les épanchements pleuraux

Table 2. Causes of pleural

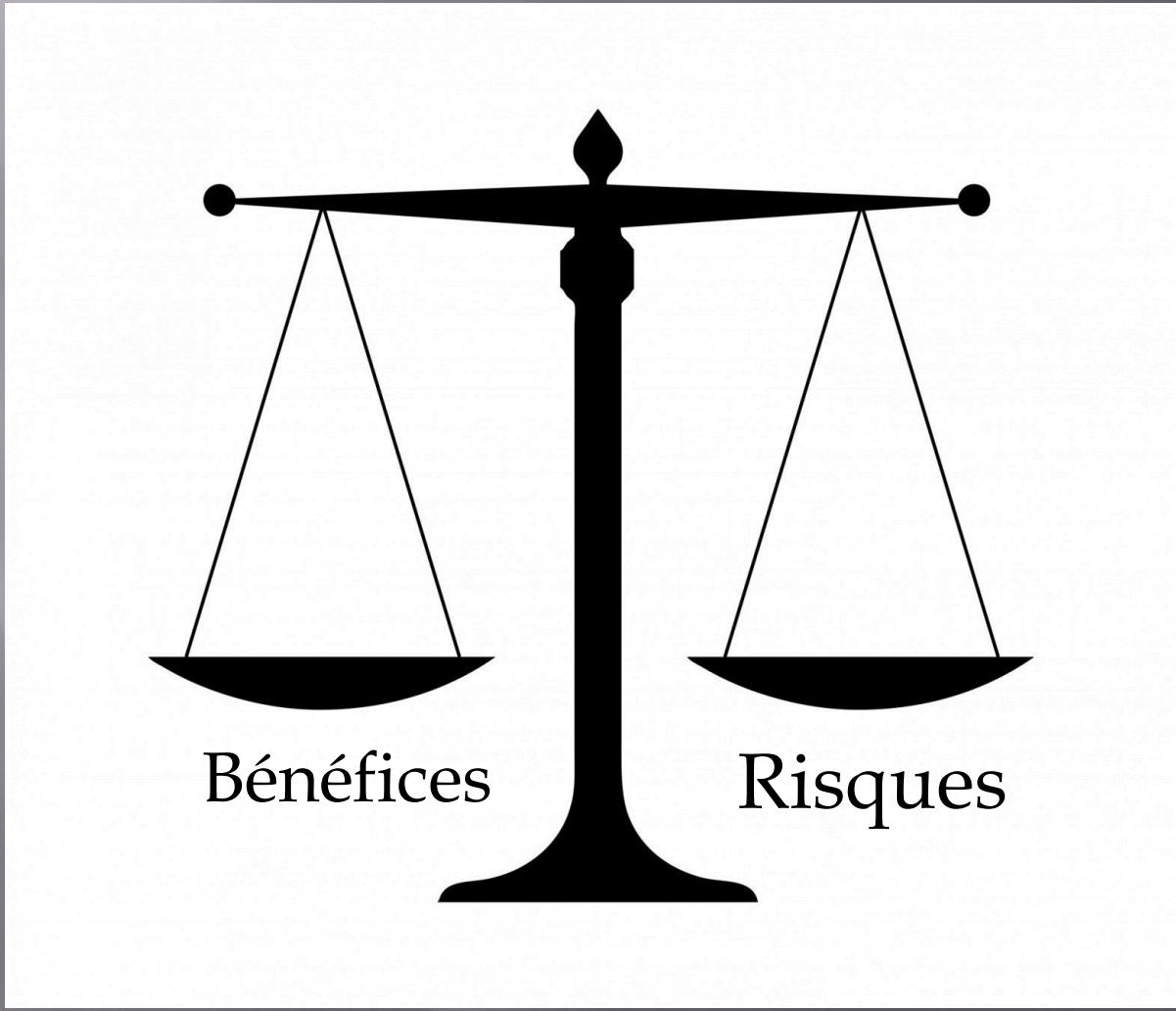
Causes of pleural effusions	Mattison *et al.* [5], n = 62*	Fartoukh *et al.* [4], n = 113*
Congestive heart failure	22 (35.5%)	28 (24.8%)
Hepatic hydrothorax	5 (8%)	6 (5.3%)
Nephrotic syndrome	5 (8%)	1 (0.8%)
Parapneumonic effusions	7 (11.3%)	29 (25.6%)
Empyema	1 (1.6%)	12 (10.6%)
Tuberculosis	/	2 (1.7%)
Malignancies	2 (3.2%)	11 (9.7%)
Pulmonary embolism	/	5 (4.4%)
Hemothorax	/	4 (3.4%)
Postsurgical effusions	/	5 (4.4%)
Atelectasis	14 (22.6%)	2 (1.7%)
Pancreatitis	1 (1.6%)	2 (1.7%)
Other	/	/
Unknown	5 (8%)	6 (5.3%)

Azoulay , Current Opinion in Pulmonary Medicine 2003

Epanchements pleuraux en réanimation

- Nombreux facteurs en réanimation favorisant les épanchements pleuraux
- Fréquent (de 8 à 60 % selon la méthode de screening)
- Associés à un pronostic péjoratif dans certaines pathologies (pneumopathie) Aliberti Chest 2008
- sont associés à une augmentation de la durée de ventilation mécanique Mattison chest 1997

Drainage des épanchements pleuraux :

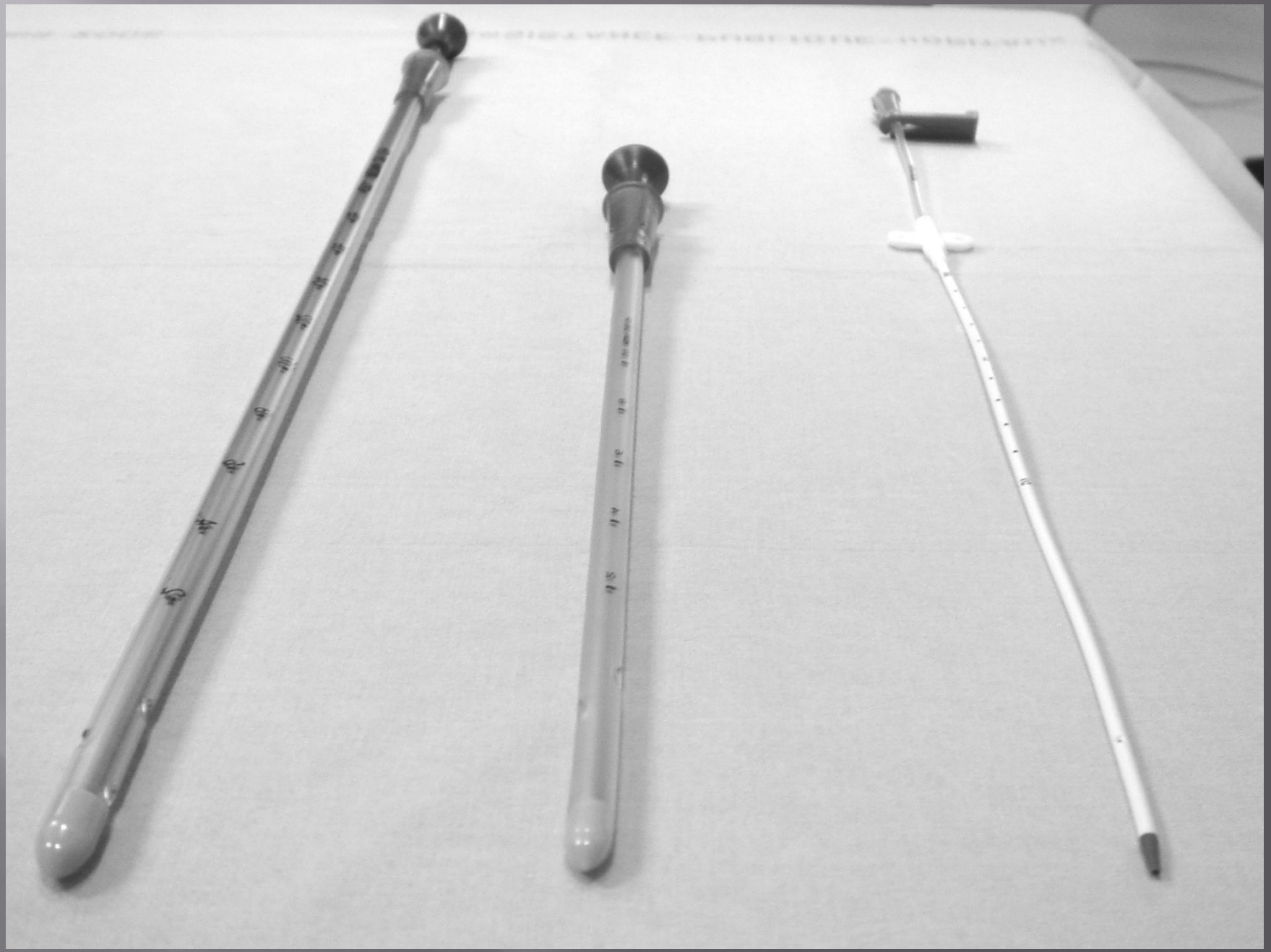


Risques

Table 4 Thoracentesis complication rates in mechanically ventilated patients

Reference	Operator training	Ultrasound guidance	Systematic detection[a]	# Procedures in MV patients	Pneumothorax rate	Hemothor rate
Godwin 1990	Student or resident (84%) or staff intensivist (16%)	None	Yes	32	6.3%	n/a[b]
Yu 1992	Not specified	Puncture site marked	Yes	14	7.1%	n/a
McCartney 1993	Staff intensivist	Puncture site marked in some cases	Yes	31	9.7%	0%
Gervais 1997	Resident or fellow	Puncture site marked	Yes	90	6.7%	n/a
Lichtenstein 1999	Staff intensivist	Puncture site marked	Yes	45	0%	0%
Fartoukh 2002	Not reported	None	Yes	Unknown	n/a	n/a
De Waele 2003	Staff intensivist	None	Yes	33	15%	0%
Singh 2003	Not specified	None	Yes	12	0%	0%
Ahmed 2004	Not reported	Real-time guidance	No	31	0.0%	0%
Mayo 2004	Resident or fellow	Puncture site marked	Yes	232	1.3%	0%
Tu 2004	Not specified	Real-time guidance	Yes	Unknown	0%	n/a
Roch 2005	Not specified	None	Yes	44	0%	4.5%
Vignon 2005	Not specified	Puncture site marked	Yes	17	0%	0%
Balik 2006	Staff intensivist	Puncture site marked	Yes	92	0.0%	0%
Tu 2006	Not specified	Real-time guidance	Yes	184	0%	1.1%
Liang 2009	Staff intensivist	Puncture site marked	Yes	108	0%	n/a

Goligher, Crit Care 2011



Pleural procedures and thoracic ultrasound: British Thoracic Society pleural disease guideline 2010

Table 2 Frequency of post-insertion complications for small drains (≤16 F)

Complication	Total no.*	Calculated frequency	Range	Studies
Injury	582	0.2%	0–2%	44–51
Malposition	593	0.6%	0–9%	45–52
Empyema	395	0.2%	0–2%	45, 48–51
Drain blockage	341	8.1%	2–18%	45, 48–52

Table 3 Frequency of post-insertion complications for large-bore drains (≥20 F or stated 'large-bore drain')

Complication	Total no.*	Calculated frequency	Range	Studies
Injury	1572	1.4%	0–7.9%	44, 52–60
Malposition	1778	6.5%	1.1–31%	53–61
Empyema	1778	1.4%	0–2%	53–61
Drain blockage	115	5.2%	5.2%	52

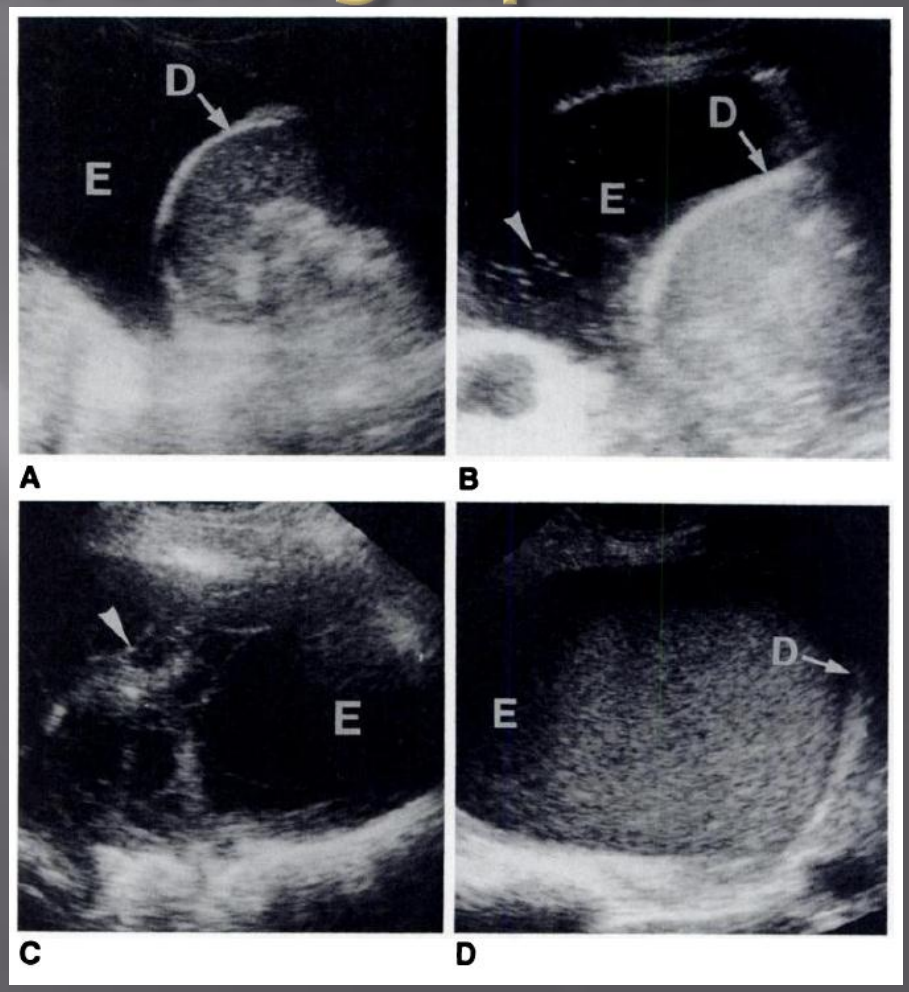
Pleural procedures within the critical care setting

- Ultrasound guidance reduces the complications associated with pleural procedures in the critical care setting and its routine use is recommended. (C)

Drainage des épanchements pleuraux : apport échographie

- Apport diagnostique

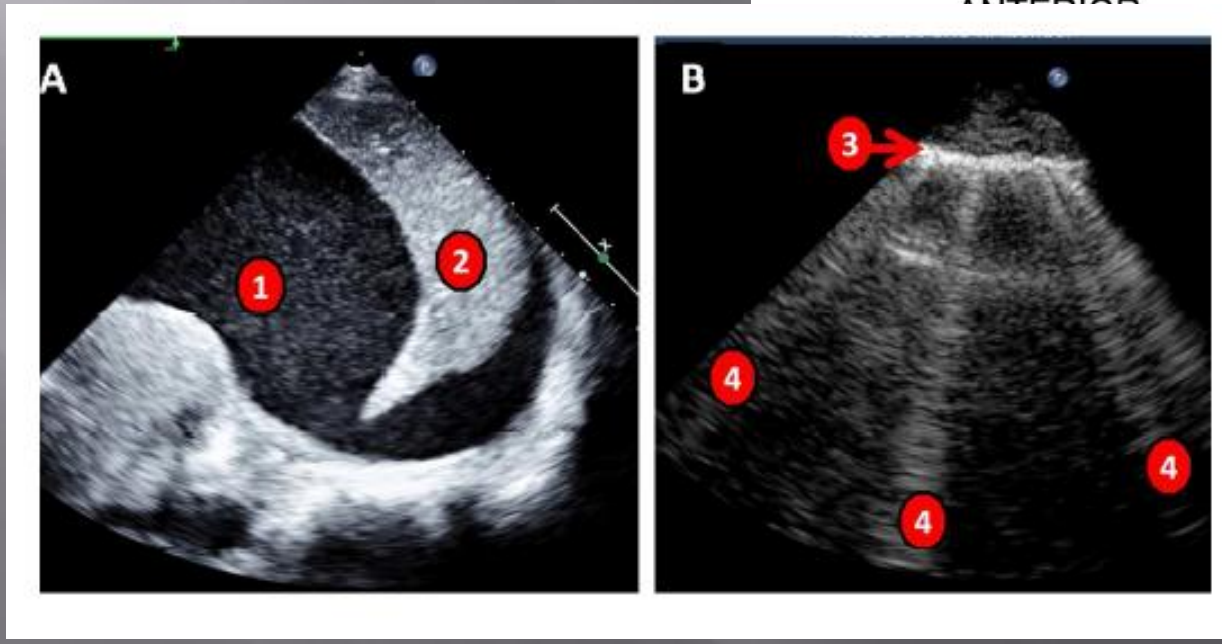
Effusions	Internal Echogenicity			
	Anechoic (n = 172)	Complex Nonseptated (n = 50)	Complex Septated (n = 76)	Homogeneously Echogenic (n = 22)
Transudate (n = 96)	96	0	0	0
Exudate (n = 224)				
Nonmalignant (n = 111)	30	27	40	14
Malignant (n = 113)	46	23	36	8

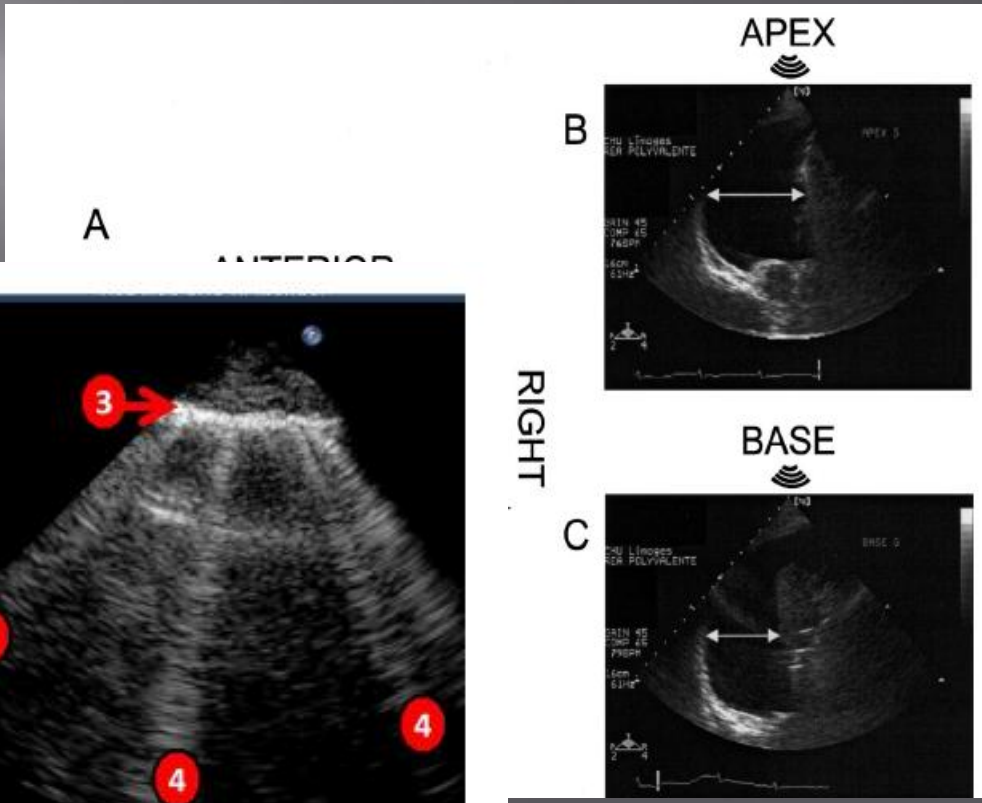


Yang AJR 1992

Drainage des épanchements pleuraux : apport échographie

- Apport diagnostique
- quantification
- sécurité
- visualisation effet





ignon CCM 2005

Effects of Pleural Effusion Drainage on Oxygenation, Respiratory Mechanics, and Hemodynamics in Mechanically Ventilated Patients

Keyvan Razazi[1,2], Arnaud W. Thille[3,4], Guillaume Carteaux[1,2], Olfa Beji[1], Christian Brun-Buisson[1,5,6], Laurent Brochard[7]*, and Armand Mekontso Dessap[1,2,6]*

- 20 patients (61.2 ± 18.5 ans) ventilés mécaniquement
- Effet du drainage sur Mécanique, Ppl, PaO2, EELV, hémodynamique à 3h et 24h
- Au moins 25 mm à l'US, visible EI sup et inf (#500 mL ou plus)
- 1579 ± 684 mL à H24

Table 1. Pleural drainage characteristics

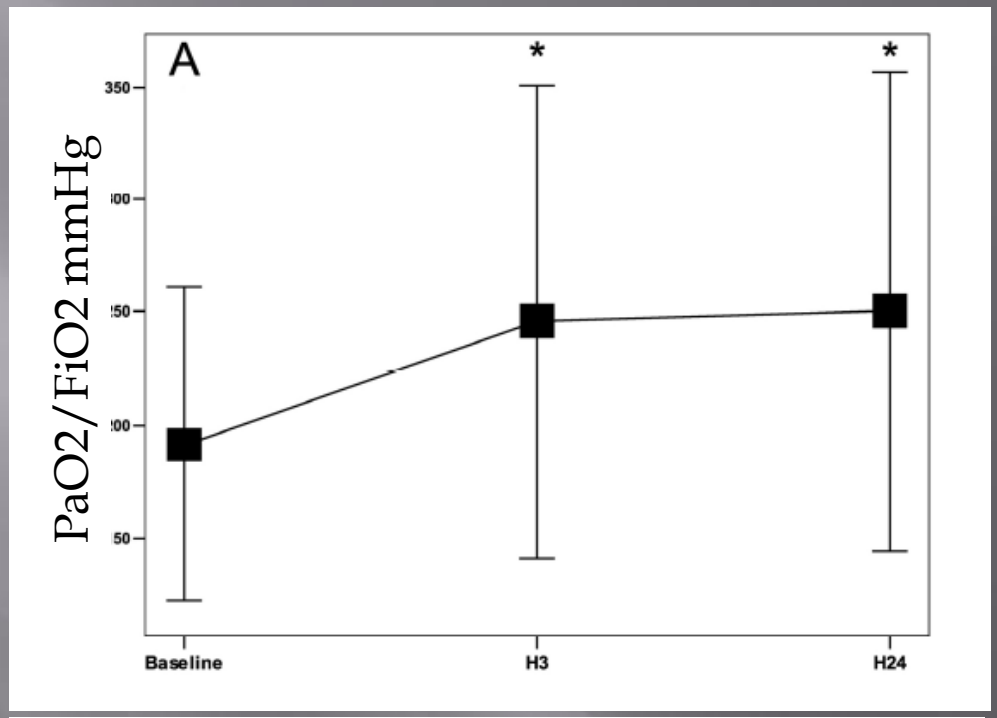
Variables	n = 20
Characteristics of effusion	
Transudate	9 (45%)
Exudate	11 (65%)
Duration of mechanical ventilation support before effusion drainage, days	5 (6)
Acute respiratory distress syndrome diagnosis	
Suspected before effusion drainage	9 (45%)
Confirmed after effusion drainage	7 (35%)
Bilateral pleural effusion	17 (85%)
Side of effusion drainage	
Left	11 (55%)
Right	8 (40%)
Bilateral	1 (5%)
Hemodynamics during the study	
Shock	12 (60%)
Norepinephrine infusion	10 (50%)
Dobutamine infusion	2 (10%)
Drainage method	
Small-bore catheter	16 (80%)
Chest tube	4 (20%)

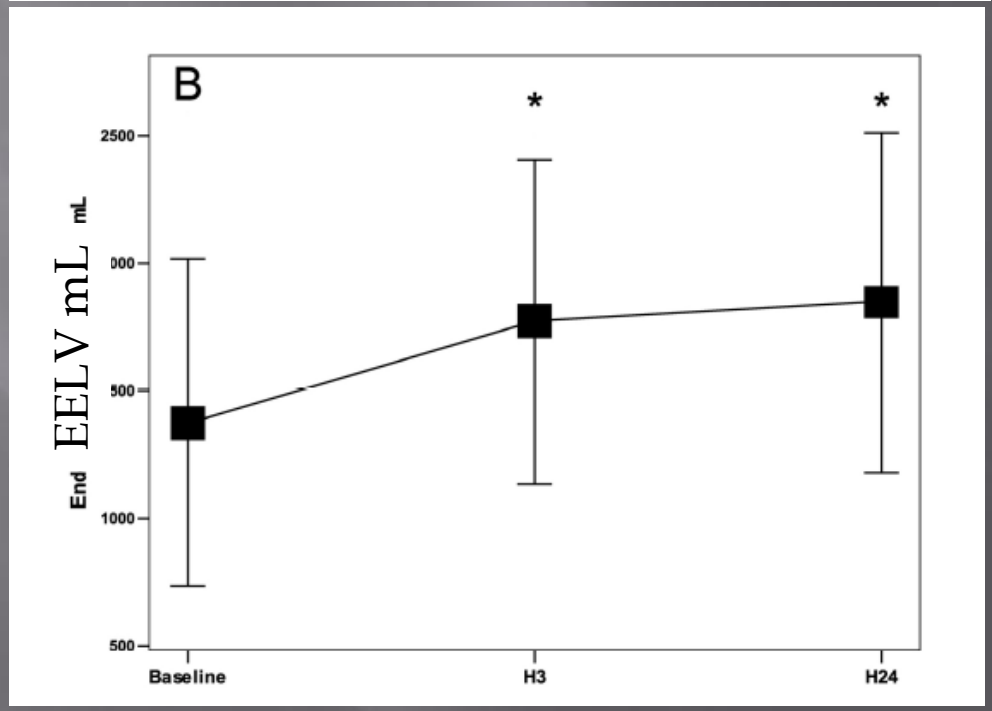
Data are mean (±SD) or number (%).

Table 2. Respiratory mechanics, oxygenation, and hemodynamics before and 3 and 24 hours after pleural drainage

Respiratory Mechanics	Baseline	H3	H24	*P*-Value*
Volume of effusion drainage, ml	0 (0)	1,052 (492)†	1,579 (684)†‡	<0.001
End-expiratory pleural distance, mm	57 (19)	—	8 (11)†	<0.001
End-expiratory pleural pressure, cm H_2O	11.5 (8.4)	1.8 (5.5)†	0.3 (4.7)†‡	<0.001
End-expiratory transpulmonary pressure,§ cm H_2O	−5.5 (7.3)	4 (5.9)†	5.9 (3.9)†‡	<0.001
Peak pressure, cm H_2O	41 (8)	40 (8)	39 (9)	0.18
Plateau pressure, cm H_2O	20 (5)	19 (4)	18 (5)†‡	0.003
Total positive end-expiratory pressure, cm H_2O	6 (2)	6 (2)	6 (2)	0.25
Respiratory system compliance, ml/cm H_2O	32 (13)	32 (9)	36 (11)‡	0.026
Respiratory system resistance, cm H_2O/L/s	22 (7)	21 (8)	20 (7)	0.032
End-expiratory lung volume, ml	1258 (643)	1723 (644)†	1753 (676)†	0.005
Lung volume increase, % of drained volume	–	42 (38)	39 (51)	–

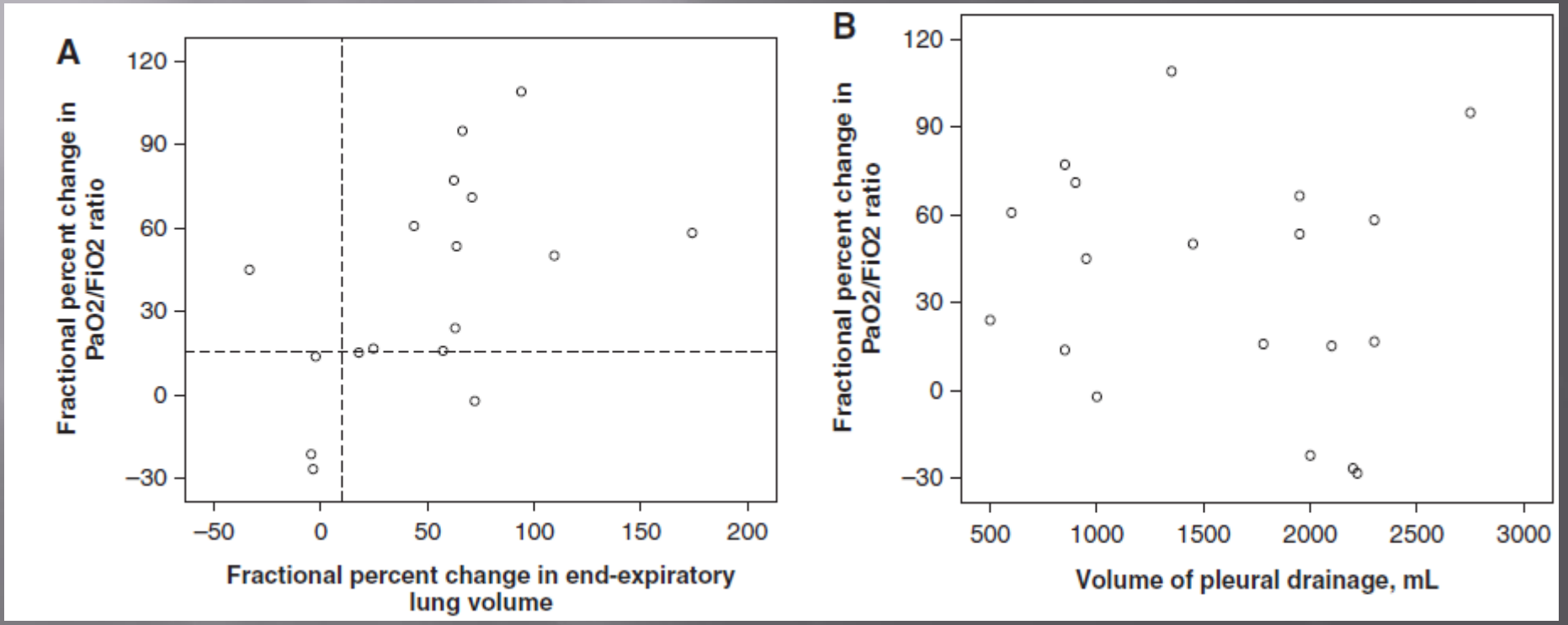
	Baseline	H3	H24	*P*-Value*
Hemodynamics				
Norepinephrine infusion dose¶, mg/h	2.0 (2.0)	2.1 (2.2)	2.3 (3.0)	0.77
Dobutamine infusion dose‖, μg/kg/h	5.0 (0.0)	5.0 (0.0)	5.0 (0.0)	>0.99
Mean arterial pressure, mm Hg	81 (13)	81 (13)	81 (15)	0.96
Heart rate, bpm	102 (25)	101 (24)	104 (24)	0.51
Cardiac output, L/min	6.2 (2.2)	–	6.2 (1.4)	0.094


A
*
*
PaO2/FiO2 mmHg
350
150
50
Baseline
H3
H24


B
*
*
EELV mL
End
2500
1000
500
Baseline
H3
H24

Changement de P/F et d'EELV

Changement de P/F et Volume drainé



r = 0.517, p = 0.033

r=-0.17, p=0.499

Effet du drainage sur l'oxygénation et la mécanique

Auteur et année	Nombre de drainages	PEP réglée (cm H_2O)	Volume drainé (mL)	PaO_2/FiO_2 (cm H_2O) Avant	PaO_2/FiO_2 (cm H_2O) Après	Crs (mL/cm H_2O) Avant	Crs (mL/cm H_2O) Après
Talmor 1998 [26]	19	17 ± 1	863 ± 164 (H8)	151 ± 15	245 ± 29* (H24)	27 ± 4	33 ± 4 (H24)
De Waele 2003[31]	24	-	1077 ± 667 (H24)	190 ± 84	217 ± 89 (H24)	-	-
Ahmed 2004 [30]	22	-	1262 ± 762 (PDI)	245 ± 103	270 ±101	-	-
Roch 2005[32]	44	6 ± 2	730 ± 440 (H3)	214 ± 83[a] 206±62[b]	232 ± 110[a] 251 ± 91[b]*	-	-
Doelken 2006 [28]	9	1 ± 2	1077 (H24)	96 ±29.7	102 ±21.9	15 ± 5	15 ± 5
Walden 2010 [27]	15	8 ± 3	1872 ± 998	169 ±56	238±73*(PDI)	35 ± 19	49 ± 26* (H48)
Chen 2010 [29]	26	9 ± 1	1012mL±58	243.2±19.9	336 ±17.8*	21.6±1.1	22.6±1.2

En cas de SDRA?

Table 1. Pleural drainage characteristics

Variables	n = 20
Characteristics of effusion	
Transudate	9 (45%)
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Duration of mechanical ventilation support before effusion drainage, days	5 (6)
Acute respiratory distress syndrome diagnosis	
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Drainage method	
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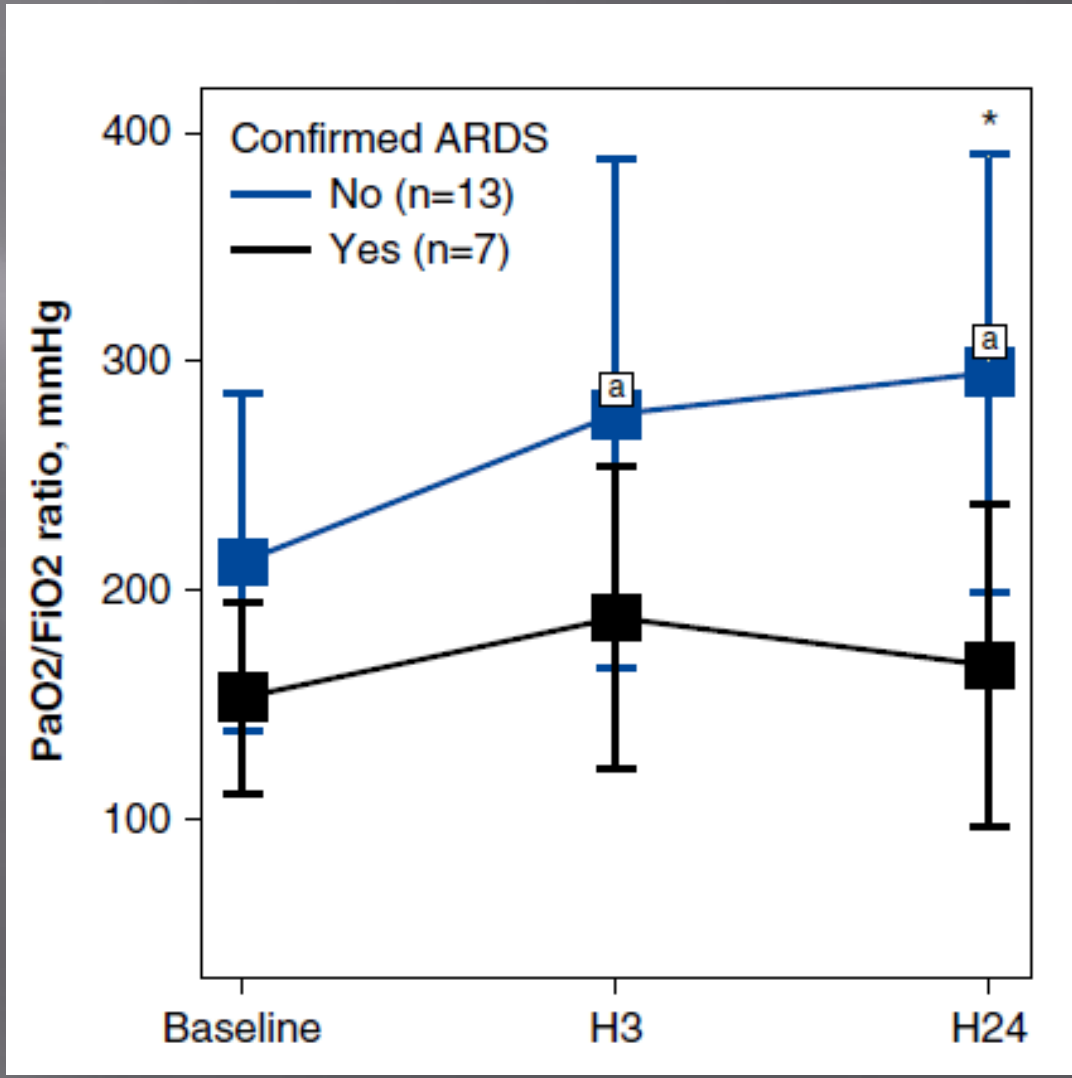
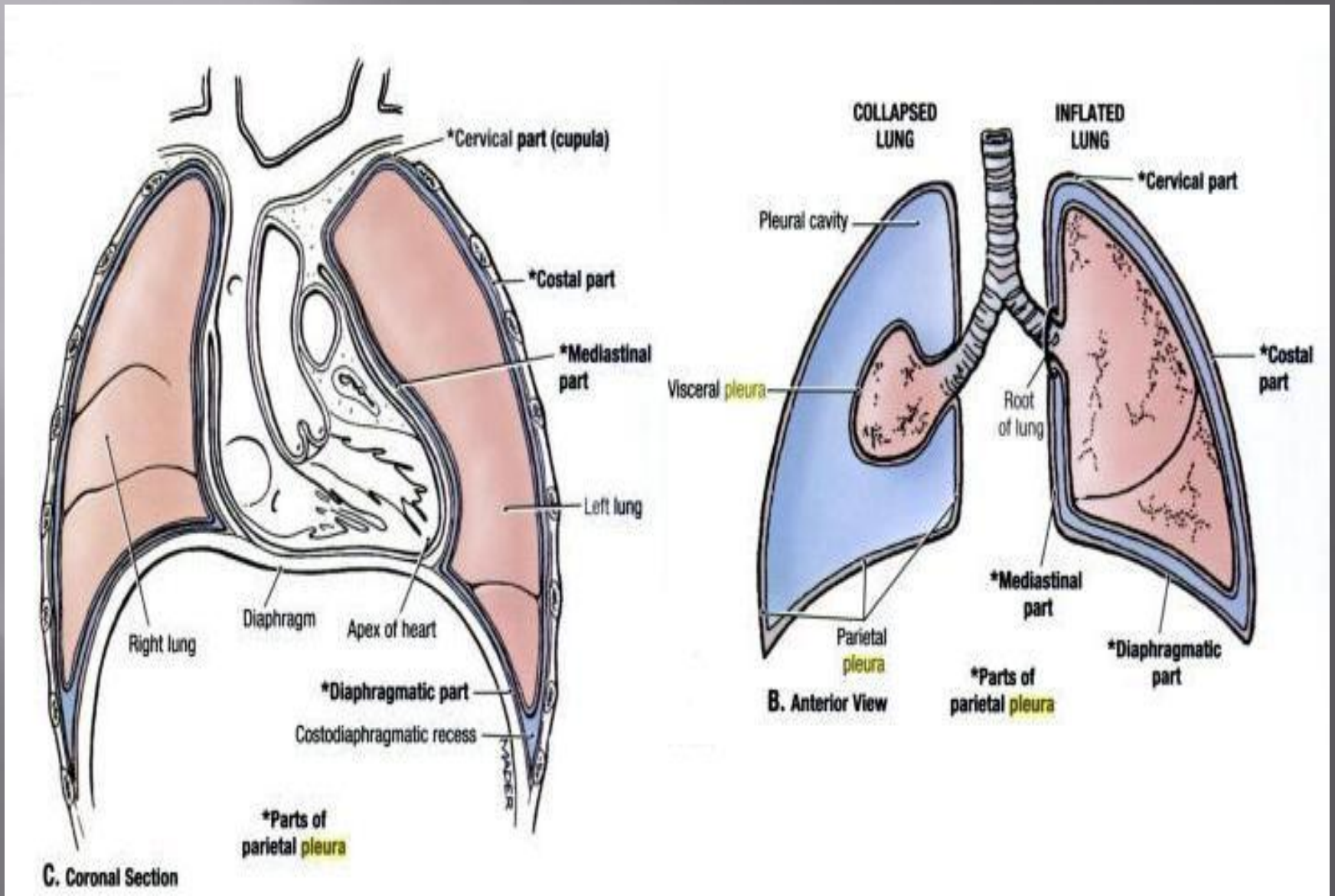
Chest tube	4 (20%)

Data are mean (±SD) or number (%).



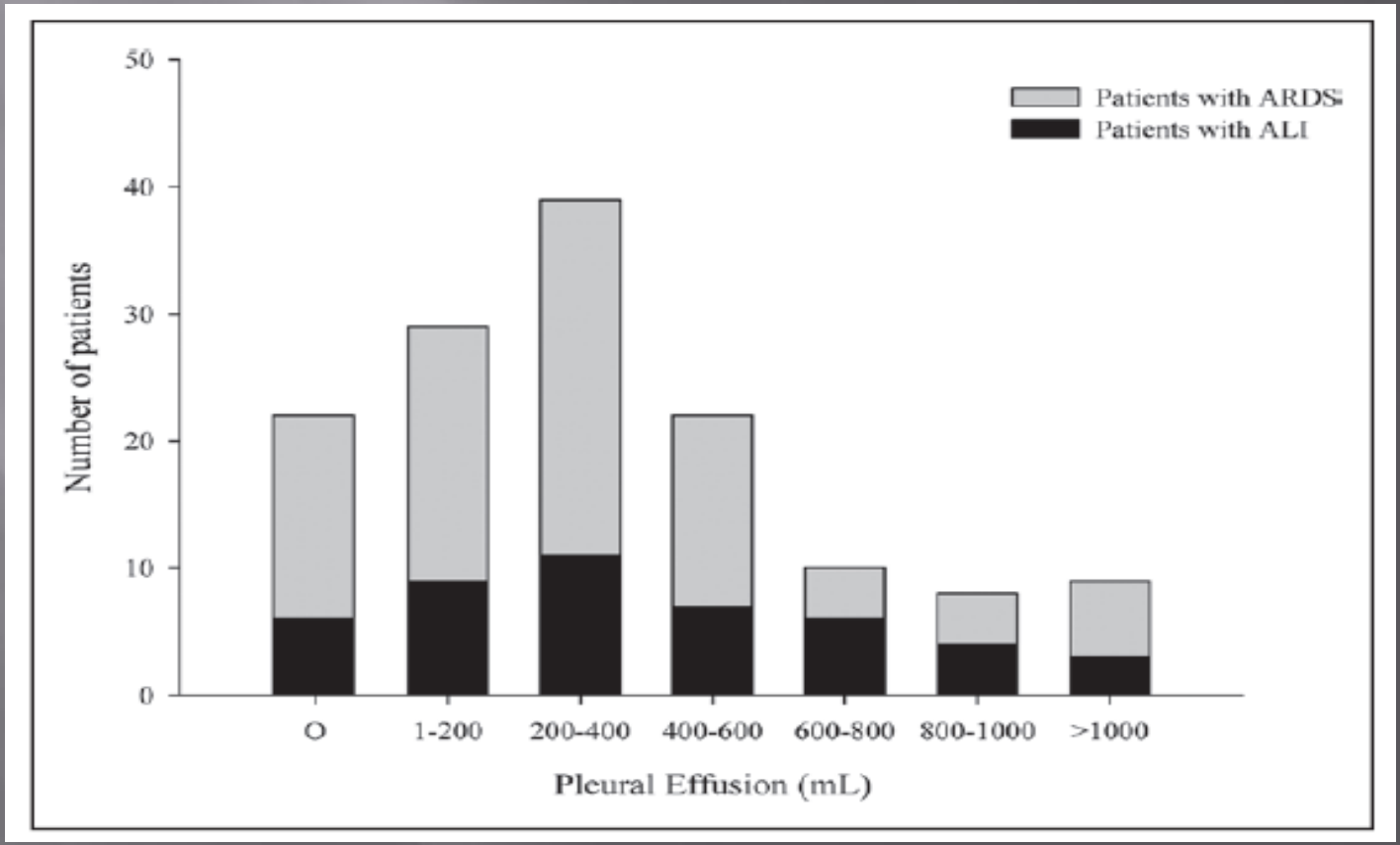

*Cervical part (cupula)
*Costal part
*Mediastinal part
Left lung
Right lung
Diaphragm
Apex of heart
*Diaphragmatic part
Costodiaphragmatic recess
*Parts of parietal pleura
C. Coronal Section
COLLAPSED LUNG
INFLATED LUNG
*Cervical part
Pleural cavity
*Costal part
Visceral pleura
Root of lung
*Mediastinal part
*Diaphragmatic part
Parietal pleura
*Parts of parietal pleura
B. Anterior View

Pleural Effusion in Patients With Acute Lung Injury: A CT Scan Study*

Davide Chiumello, MD[1]; Antonella Marino, MD[2]; Massimo Cressoni, MD[2]; Cristina Mietto, MD[2]; Virna Berto, MD[2]; Elisabetta Gallazzi, MD[2]; Chiara Chiurazzi, MD[2]; Marco Lazzerini, MD[3]; Paolo Cadringher, MSE[2]; Michael Quintel, MD[4]; Luciano Gattinoni, MD, FRCP[1,2]

Critical Care Medicine

129 pts



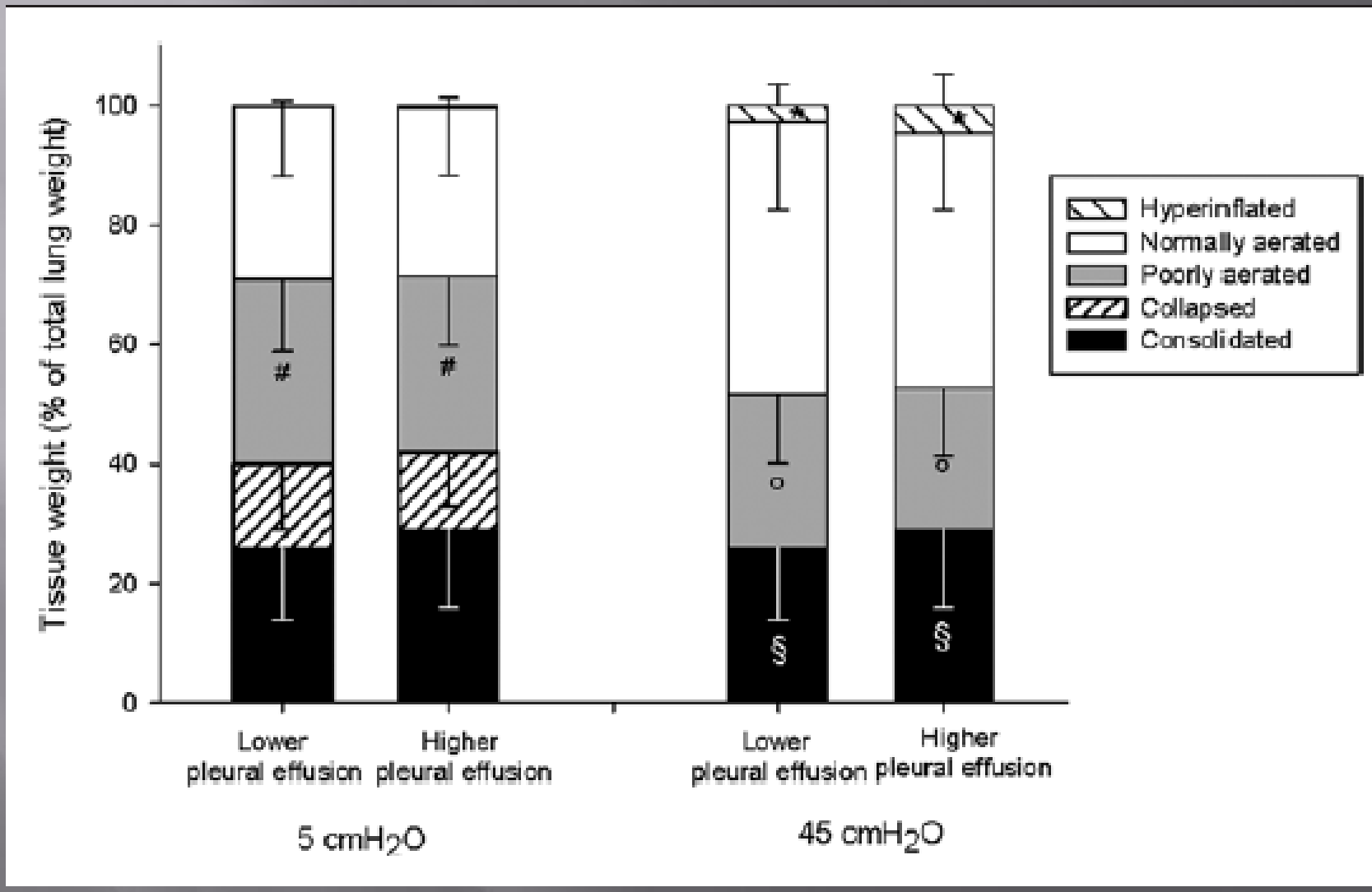

Tissue weight (% of total lung weight)
100
80
60
40
20
0
Hyperinflated
Normally aerated
Poorly aerated
Collapsed
Consolidated
#
#
o
o
§
§
Lower pleural effusion
Higher pleural effusion
Lower pleural effusion
Higher pleural effusion
5 cmH2O
45 cmH2O

TABLE 3. Chest Wall/Lung Volume Displacement at 5 and 15 cm H_2O of Positive End-Expiratory Pressure

	Positive End-Expiratory Pressure	Overall Population ($n = 60$)	Lower Pleural Effusion Group ($n = 30$)	Higher Pleural Effusion Group ($n = 30$)	p
Pleural effusion volume (mL)		343±296	103±111	583±215	<0.0001
Average superimposed pressure (cm H_2O)[a]		8±1.8	8.1±2	7.9±1.7	0.72
Max superimposed pressure (cm H_2O)[b]		13.5±2.9	13.5±3.1	13.5±2.8	0.95
Respiratory system elastance (cm H_2O/L)	5 cm H_2O	27.5±8.7	27.9±9.3	27.1±8.1	0.71
	15 cm H_2O	27.3±7.8	26.9±7.9	27.7±7.9	0.67
Lung elastance (cm H_2O/L)	5 cm H_2O	20.5±8.3	21.7±8.3	19.2±8.2	0.26
	15 cm H_2O	20.2±6.6	20.7±6.5	19.8±6.9	0.62
Chest wall elastance (cm H_2O/L)	5 cm H_2O	7±4.5	6.2±3.8	7.8±5.1	0.17
	15 cm H_2O	7.1±4.6	6.2±4.3	7.9±4.8	0.15
Delta pleural pressure due to pleural effusion (cm H_2O)[c]	5 cm H_2O	1.7±1.9	0.5±0.6	2.9±2	<0.0001
	15 cm H_2O	1.7±2	0.5±0.7	2.9±2.1	<0.0001
Delta volume chest wall (outward) (mL)[d]	5 cm H_2O	243±212	80±87	405±172	<0.0001
	15 cm H_2O	243±217	75±84	410±175	<0.0001
Delta volume lung (inward) (mL)[e]	5 cm H_2O	100±119	23±29	178±124	<0.0001
	15 cm H_2O	100±130	28±36	173±149	<0.0001

Drainage des épanchements pleuraux

- Le drainage des larges épanchements (500 mL) est peu risqué et améliore la mécanique respiratoire et pulmonaire en positivant la pression expiratoire transpulmonaire et en augmentant le volume pulmonaire
- L'effet sur l'oxygénation existe et est corrélé au volume pulmonaire
- L'effet semble moins marqué en cas de SDRA

Epanchement pleural et sevrage de la ventilation mécanique

Chest Tube Drainage of Transudative Pleural Effusions Hastens Liberation From Mechanical Ventilation

Yizhak Kupfer, MD; Chanaka Seneviratne, MD; Kabu Chawla, MD; Kavan Ramachandran, MD; and Sidney Tessler, MD, FCCP

CHEST / 139 / 3 / MARCH, 201

Table 2—*Outcomes of Chest Tube Drainage vs Standard Care*

Outcomes	Standard (n = 88)	Chest Tube (n = 80)	*P* Value
Duration of MV support prior to study enrollment, d	1.5 ± 0.5	1.4 ± 0.6	.690
Total duration of MV support, d	6.5 ± 1.1	3.8 ± 0.5	.030
Patients liberated within 48 h of study enrollment, No. (%)	46 (52%)	61 (76%)	.001
Baseline Pao_2/Fio_2, mm Hg	380 ± 65	368 ± 47	.710
Pao_2/Fio_2 24 h after study entry, mm Hg	396 ± 40	378 ± 51	.670

Data are presented as mean ± SD unless indicated otherwise.
MV = mechanical ventilatory.

Impact de l'Epanchement pleural dans le Sevrage de la Ventilation mécanique (Etude ESV)

Etudes multicentriques

Objectifs :

- déterminer la prévalence des épanchements pleuraux au cours du sevrage de la ventilation mécanique
- Déterminer si la présence d'un épanchement pleural ou sa quantité au cours du sevrage sont associées à un sevrage difficile ou prolongé.
- Déterminer les facteurs de risque d'épanchement pleural au cours du sevrage
- Caractériser l'évolution de l'épanchement pleural au cours du sevrage en fonction des traitements reçus (diurétique, drainage etc…)

Critères d'inclusion :

- Patient>18 ans
- Ventilation>24heures
- Critères de ZEEP : OK

Critères d'exclusion

- Drain pleural
- Extubation terminale
- Grossesse