
AER
23 et 24 novembre 2017
Cité Centre de Congrès de Lyon
CHUV
ACTUALITES DU SRDA
Epidémiologie
et
pratiques actuelles
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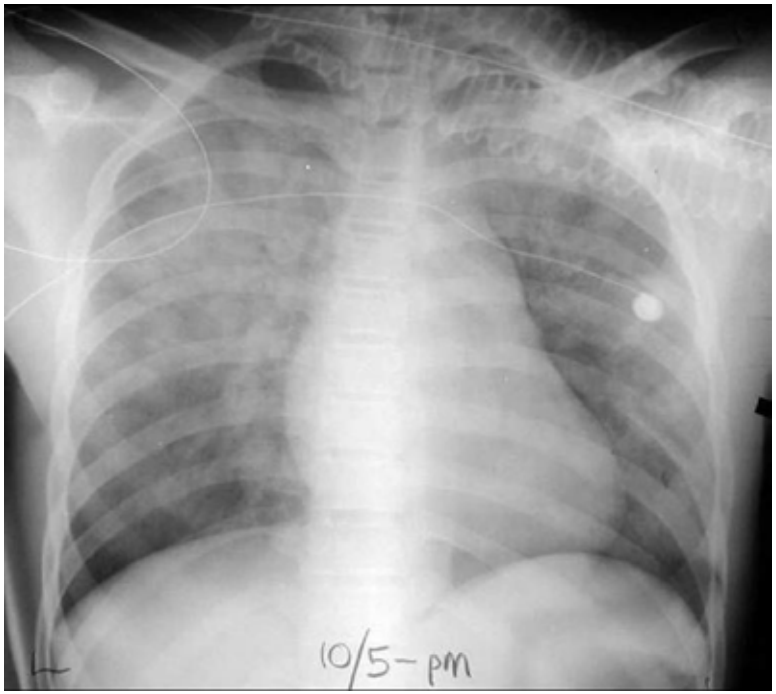
1967

ACUTE RESPIRATORY DISTRESS IN ADULTS

DAVID G. ASHBAUGH
M.D. Ohio State
ASSISTANT PROFESSOR OF SURGERY

The Lancet · Saturday 12 August 1967



« The respiratory distress syndrome was manifested by acute onset of tachypnea, hypoxaemia, and loss of comliance after a variety of stimuli: the syndrome did not respond to usual and ordinary methods of respiratory therapy»

SDRA Définition Actuelle

The Berlin Definition

Table 3. The Berlin Definition of Acute Respiratory Distress Syndrome

	Acute Respiratory Distress Syndrome
Timing	Within 1 week of a known clinical insult or new or worsening respiratory symptoms
Chest imaging[a]	Bilateral opacities—not fully explained by effusions, lobar/lung collapse, or nodules
Origin of edema	Respiratory failure not fully explained by cardiac failure or fluid overload Need objective assessment (eg, echocardiography) to exclude hydrostatic edema if no risk factor present
Oxygenation[b]	
Mild	200 mm Hg < Pa_{O_2}/F_{IO_2} ≤ 300 mm Hg with PEEP or CPAP ≥5 cm H_2O[c]
Moderate	100 mm Hg < Pa_{O_2}/F_{IO_2} ≤ 200 mm Hg with PEEP ≥5 cm H_2O
Severe	Pa_{O_2}/F_{IO_2} ≤ 100 mm Hg with PEEP ≥5 cm H_2O

Abbreviations: CPAP, continuous positive airway pressure; F_{IO_2}, fraction of inspired oxygen; Pa_{O_2}, partial pressure of arterial oxygen; PEEP, positive end-expiratory pressure.

[a] Chest radiograph or computed tomography scan.

[b] If altitude is higher than 1000 m, the correction factor should be calculated as follows: [Pa_{O_2}/F_{IO_2} × (barometric pressure/760)].

[c] This may be delivered noninvasively in the mild acute respiratory distress syndrome group.

The ARDS Definition Task Force. JAMA *2012;307(23):2526-2533*

Epidémiologie

- ✓ Incidence: 59 / 100'000 personnes/an (SDRA légers exclus) *Rubenfeld et al. N Engl J Med, 2005;353:1685-93*
- ✓ 10,4% des admission aux SI

Lungsafe Study, Bellani et al, JAMA 2016; 315: 788-800

- ✓ 23.4 % des patients ventilés

Lungsafe study, Bellani et al, JAMA 2016; 315: 788-800

Pronostic actuel

- ✓ Mortalité hospitalière globale: 40%
  - 34.9 % si SDRA léger
  - 40.3% si SDRA modéré
  - 46.1% si SDRA sévère

Lungsafe Study, Bellani et al, JAMA 2016; 315: 788-800

- ✓ Morbidité importante

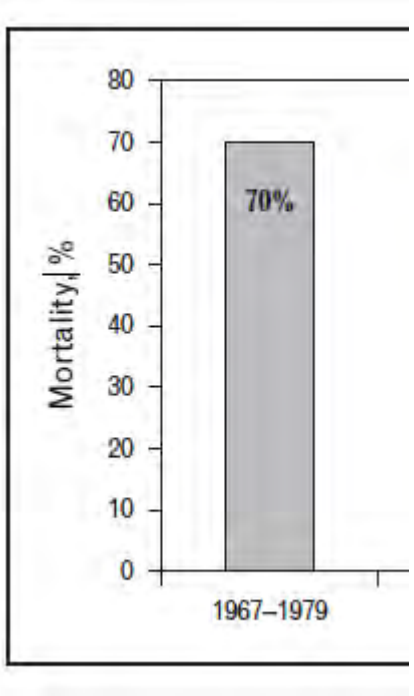
Chiumello D et al. Respir Care 2016; 61:689-99

1967-1979

SDRA Traitement

- ✓Intubation
- ✓Ventilation en pression positive à VT élevés pour normaliser les échanges gazeux
- ✓PEP basse ou absente

SDRA Pronostic

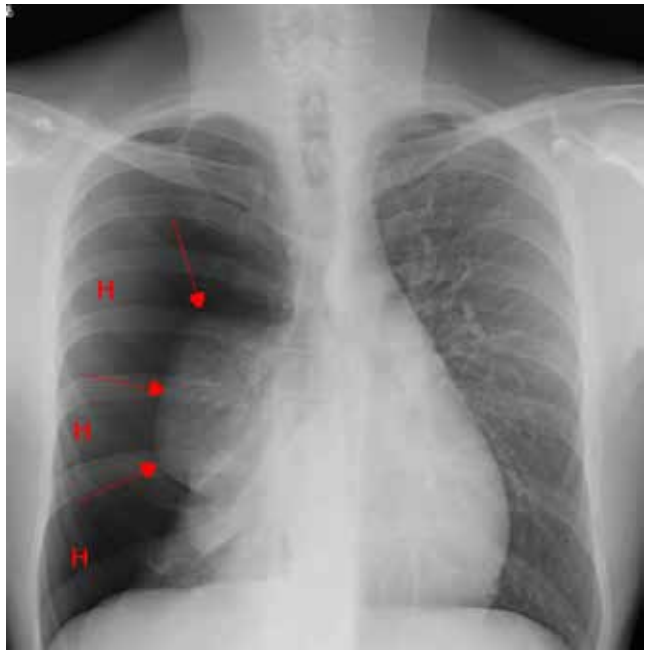


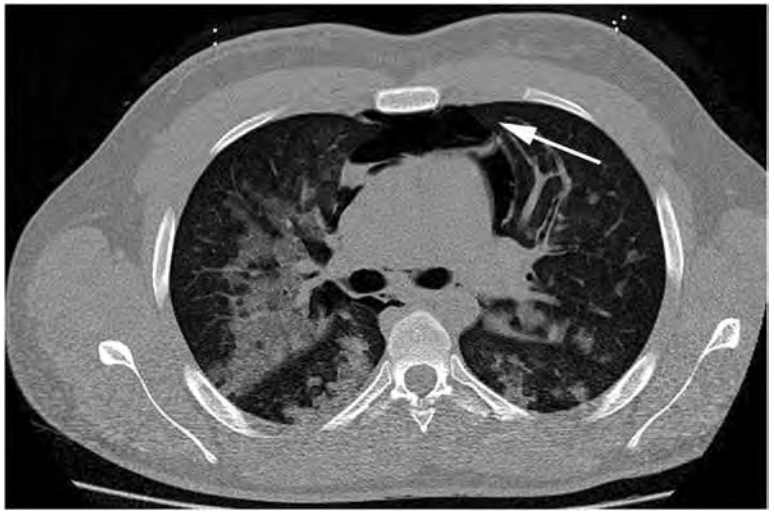
Vilar et al. Curr Opin Crit Care 2014; 20(1) 3-9

➔ Barotrauma fréquents

Liés à un stress important sur le parenchyme

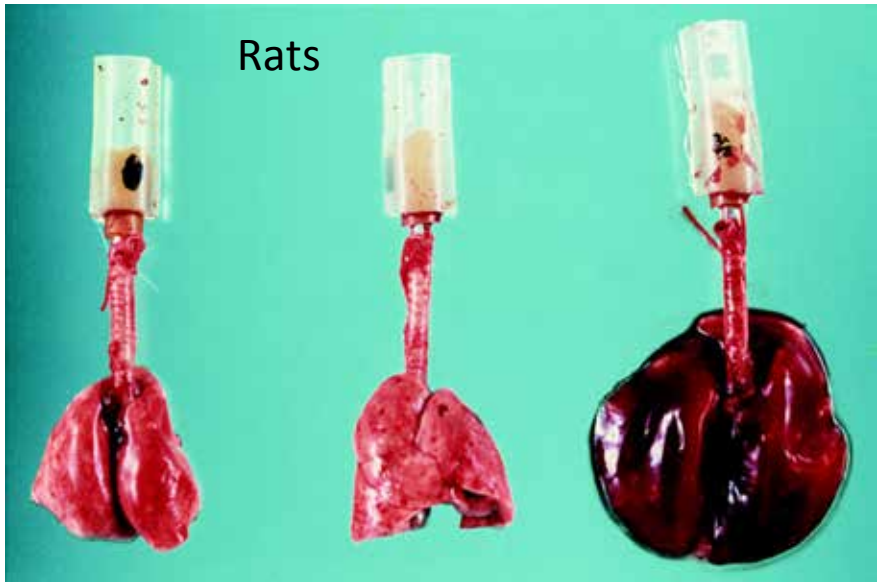
(Ptranspulm = Palvéolaire – Ppleurale)





Années 80

✓Description concept de VILI (volotrauma)



Normal Ventilation non protectrice

5 min 20 min

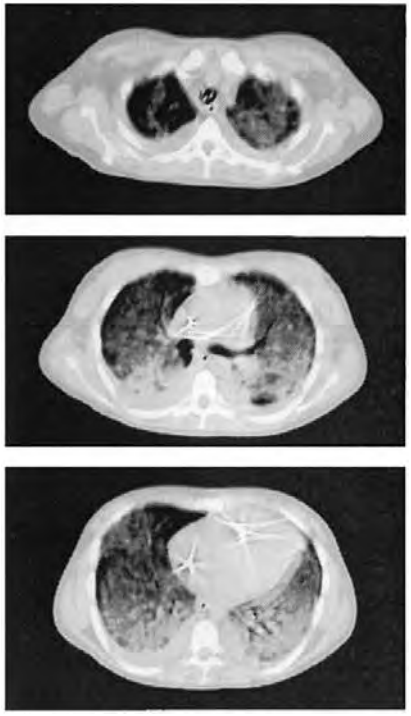
Dreyfuss et al. AJRCCM 1998

VT élevés → lésions (liées à surdistension)

Dreyfuss et al. Am Rev Respir Dis 1988; 137:1159-64

Années 80

✓ SDRA: “Baby-lung” concept



Gattinoni et al.
AJRCCM 2001

- Aération partielle du parenchyme
- Poumon hétérogène
- Petit volume aéré en fin d’expiration
  (élastance de la partie aérée normale)
- Potentiel de recrutement
  (inconstant)

Années 80

✓1ère description Hypoventilation contrôlée

Mechanical Controlled Hypoventilation in Status Asthmaticus[1,2]

SUMMARY This study reports the results obtained with mechanical ventilation in severe respiratory failure secondary to status asthmaticus. Of the 159 patients with status asthmaticus admitted to the Intensive Respiratory Unit over a 5-yr period, 26 required mechanical ventilation for a total of 34 episodes of acute respiratory acidosis. At the time of intubation, 10 patients were in coma and 5 were in respiratory arrest. Controlled mechanical ventilation was maintained for a mean of 2.5 days. Complications were few and reversible. All patients survived. These favorable results are attributed to a new strategy: mechanical ventilation is used to obtain a correction of hypoxemia with hyperoxic mixtures without attempting to restore an adequate alveolar ventilation. The respirator is adjusted to avoid high airway pressures, which appear to be more dangerous than persistent hypercapnia itself. Correction of hypercapnia is obtained later when bronchial obstruction relief provides better conditions of ventilation
risks of barotrauma and cardiocirculatory failure, which are frequently reported as fatal complications, appear to be significantly decreased.

AM REV RESPIR DIS 1984; 129:385-387

Versus 9 à 38 % de mortalité dans groupes contrôle historiques

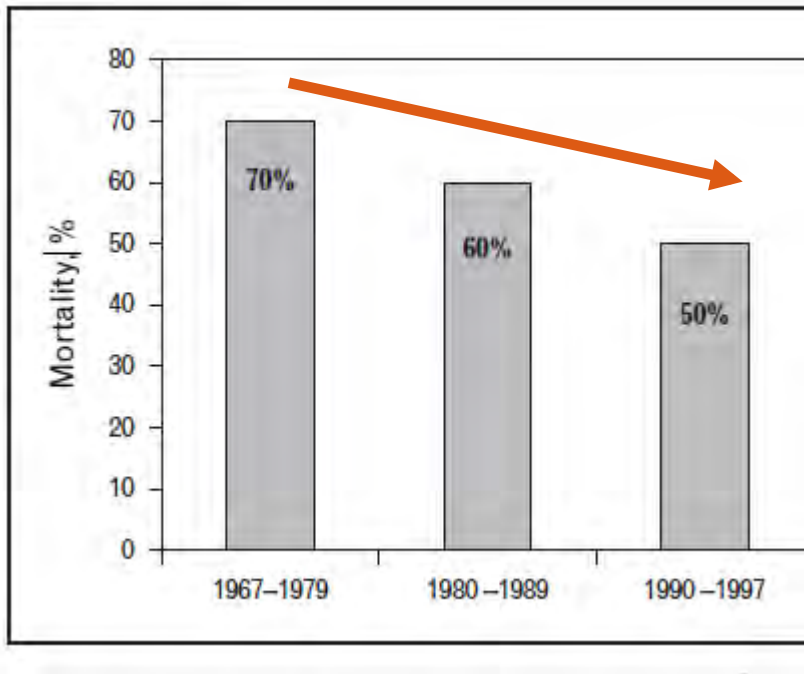
FR basse: 6-10/minute, VT 8-12 ml/kg, P crête max 50 cmH_2O
Si Pcrête trop élevée, ↓ VT et debit inspi.

Années 80 - 90

➔ Ventilation progressivement moins agressive

(↓ VT and ↑PEEP)

➔ ↓ Mortalité

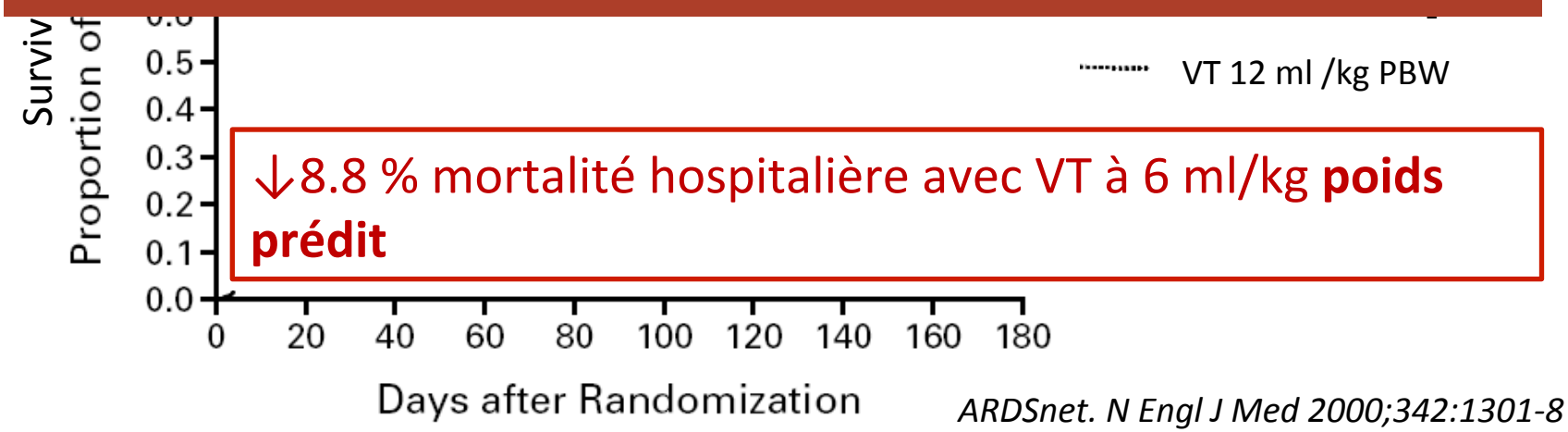


Vilar et al Curr Opin Crit Care 2014; 20(1) 3-9

2000: révolution

VENTILATION WITH LOWER TIDAL VOLUMES AS COMPARED WITH TRADITIONAL TIDAL VOLUMES FOR ACUTE LUNG INJURY AND THE ACUTE RESPIRATORY DISTRESS SYNDROME

Ventilation à bas volume courant = efficace



↓8.8 % mortalité hospitalière avec VT à 6 ml/kg **poids prédit**

ARDSnet. N Engl J Med 2000;342:1301-8

Ventilation à haute vs basse PEEP

Higher vs Lower Positive End-Expiratory Pressure in Patients With Acute Lung Injury and Acute Respiratory Distress Syndrome

Systematic Review and Meta-analysis

JAMA®

Online article and related content current as of March 3, 2010.

Matthias Briel, MD, MSc
Maureen Meade, MD, MSc
Alain Mercat, MD
Roy G. Brower, MD
Daniel Talmor, MD, MPH
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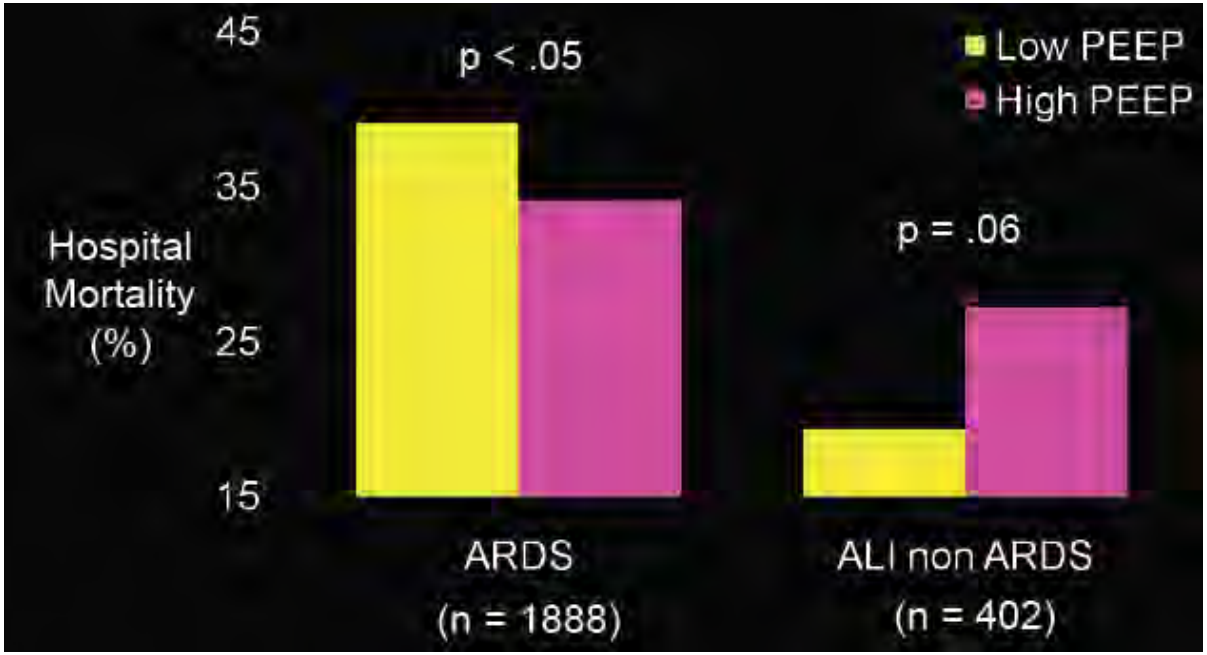


Briel et al. JAMA 2010-,303:865-73

PEP élevée  Hémodynamique

Ventilation en pression positive

↑ Pression intrathoracique

↓ retour veineux

↓ Précharge VD+VG

↓ Débit cardiaque

↓ PtmLV

↓Postcharge VG

↑ Postcharge VD

Insuffisance/dilat VD

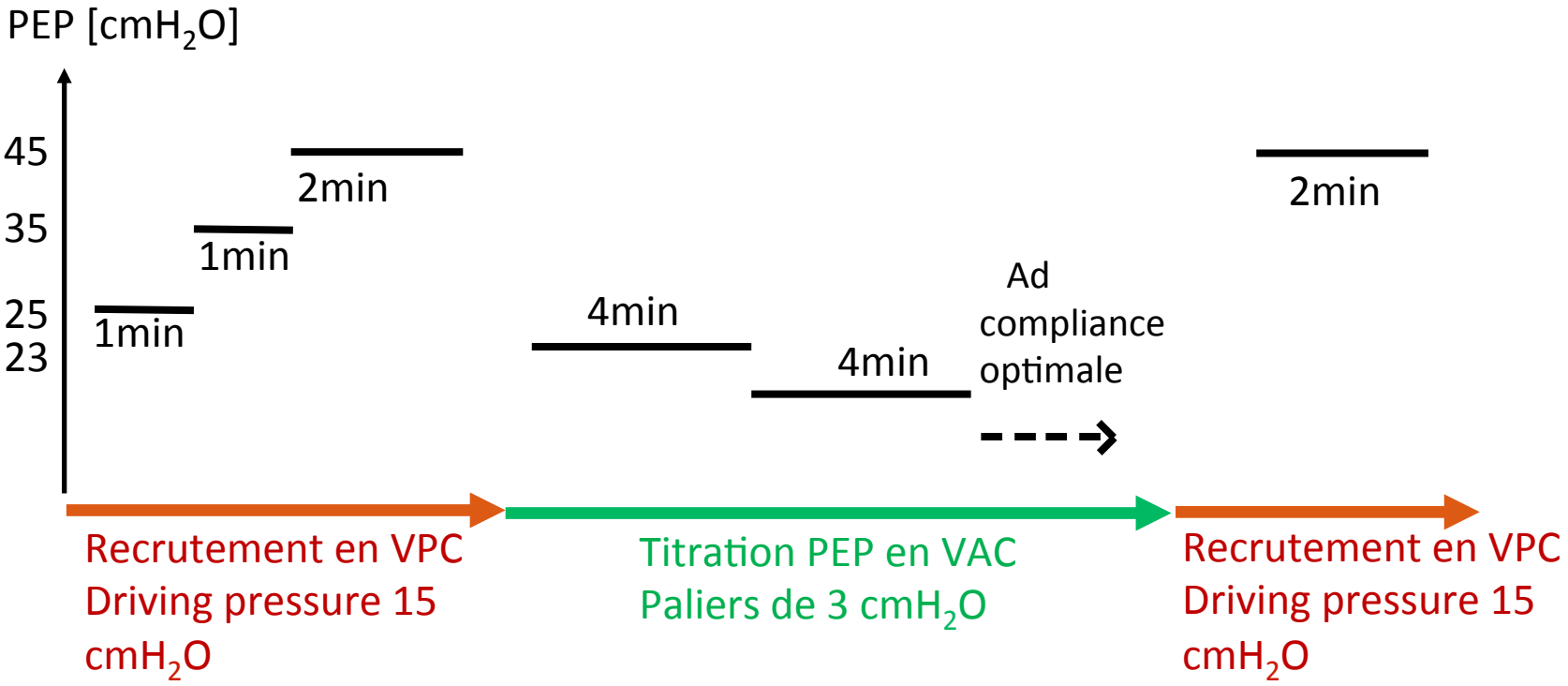
ART Trial

- ✓ SDRA modéré à sévère
- ✓ Groupe contrôle : ARDSNet Strategy
- ✓ Groupe interventionnel
  - Manœuvre recrutement (incremental PEP)
  - Titration PEP (decremental PEP) pour compliance statique optimale
  - Manœuvre recrutement
  - PEP finale = PEP de meilleure compliance + 2 cmH_2O

Writing Group for the Alveolar Recruitment for Acute Respiratory Distress Syndrome Trial (ART) Investigators
JAMA, 2017; 318: 1335-1345

ART Trial: groupe interventionnel

- 555 premiers patients

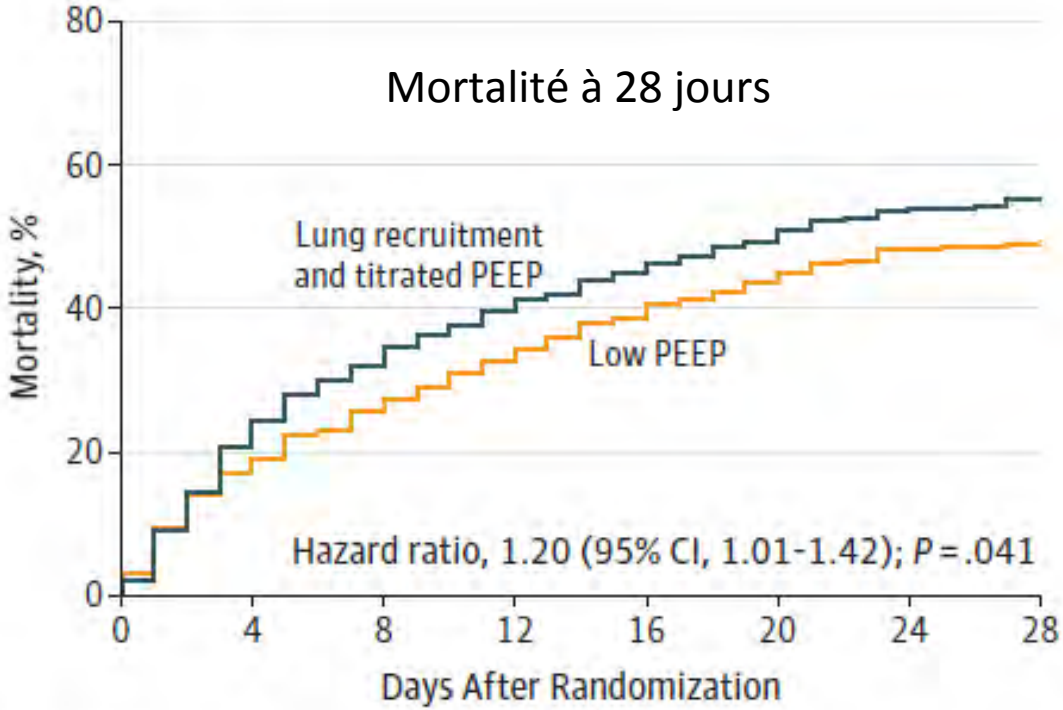


- Patients suivant: PEP max 35 cmH_2O (1 min), steps de titration 3 min

Writing Group for the Alveolar Recruitment for Acute Respiratory Distress Syndrome Trial (ART) Investigators
JAMA, 2017; 318: 1335-1345

ART Trial: outcome primaire

1010 patients avec SDRA modéré à sévère, 120 ICUs, 9 pays



No. at risk								
Lung recruitment and titrated PEEP	501	397	340	303	276	254	233	225
Low PEEP	509	423	378	343	312	286	264	260

↑ mortalité Groupe recrutement

Writing Group for the Alveolar Recruitment for Acute Respiratory Distress Syndrome Trial (ART) Investigators JAMA, 2017; 318: 1335-1345

Quelle PEP?

3 études haute vs basse PEP

Etude	Modalités réglage PEP	Basse PEP [cmH_2O]	Haute PEP [cmH_2O]
ALVEOLI *(Brower, NEJM 2004)*	2 Table PEP/FIO_2	8.3 ± 3.2	13.2 ± 3.5
LOVS *(Meade, JAMA 2008)*	Table standard PEP/FIO2 Pplat < 40 cmH_2O + recrutement	9.8 ± 2.7	14.6 ± 3.4
EXPRESS *(Mercat, JAMA 2008)*	Clinicien vs PEP max pour Pplat 30 cmH_2O (VT 6 ml/kg PBW)	6.7 ± 1.8	13.4 ± 4.7

(individuellement pas d'effet sur mortalité)

Quelle PEP?

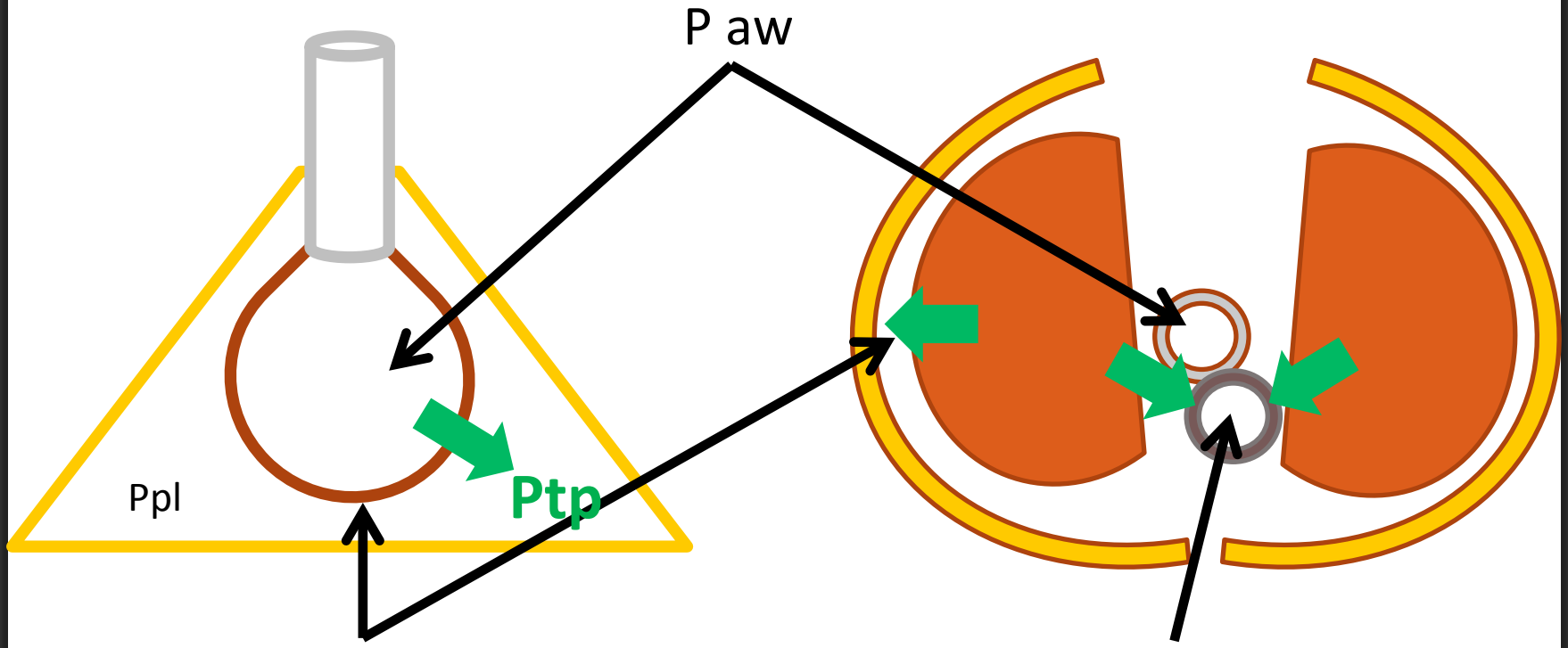
- ✓ Réglage individualisé pour chaque patient selon:

  - ➔ Potentiel estimé de recrutement
  - ➔ Compliance du système respiratoire
  - ➔ Driving pressure (Pplat – PEEP)
  - ➔ Hémodynamique

  … en attendant le résultats des études sur l'intérêt de l'utilisation des valeurs dérivées de la P oeso

Chiumello et al. Critical Care 2017,21:240

Quelle PEP? Basée sur P transpulm?



Pression pleurale (P pl) ≈ Pression oesophagienne (P oeso)

Pression transpulmonaire = P aw - Poeso

Objectifs: Fin inspi < 20-25 cmH_2O? Fin expi > 0 cmH_2O?

Mauri et al. Intensive Care Med 2016;42:1360-73

Driving pressure = Pression motrice

I. SDRA
   - Poumons hétérogènes
   - Petit volume aéré (« baby lung ») / Compliance du système respiratoire basse
   - Taille du volume aéré inconnue ➔ régler un VT sur la base du poids prédit non optimal ➔ il faut normaliser

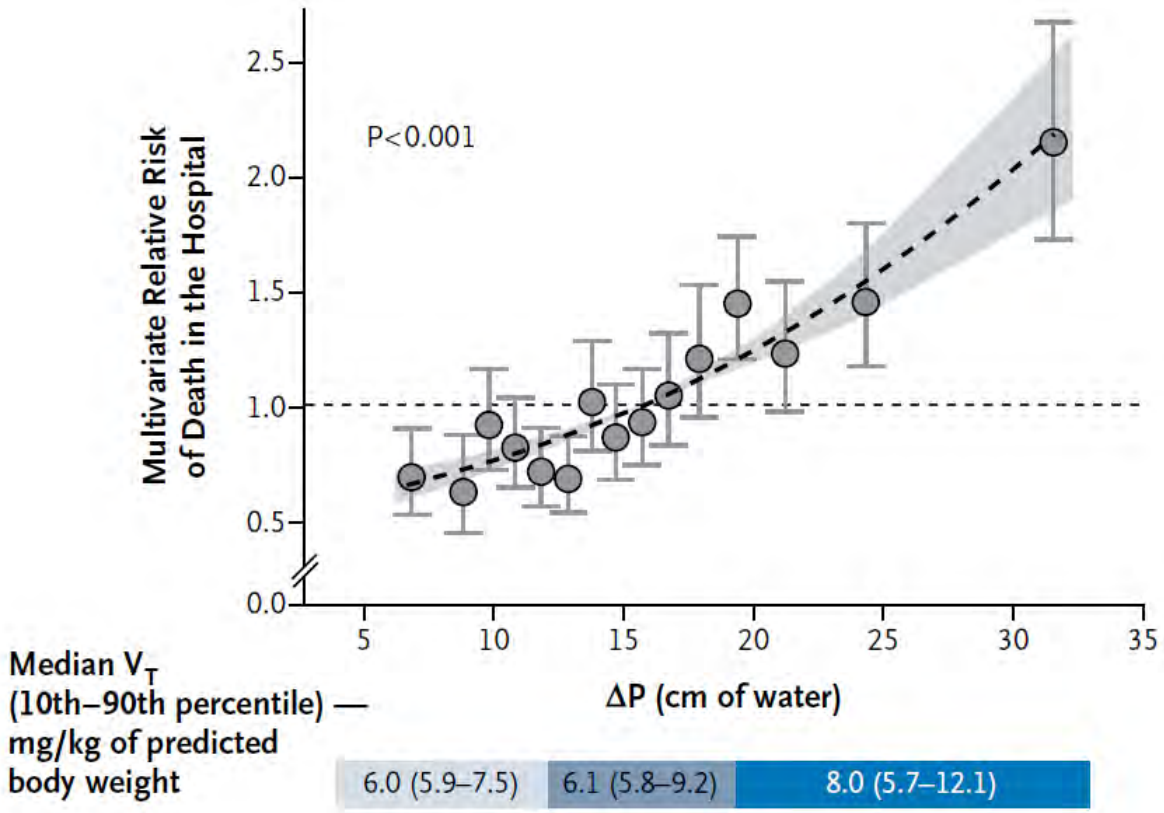
II. Driving pressure = ΔP = VT/ Compliance du système respiratoire ➔ VT normalisé par la taille du poumon aéré (fonctionnel)

ΔP = VT/ (VT/Pplat-PEP tot) = Pplat- PEPtot
Approximation PEP tot = PEP

ΔP = Pplat- PEP

Amato et al. N Engl J Med. 2015;372(8):747-55

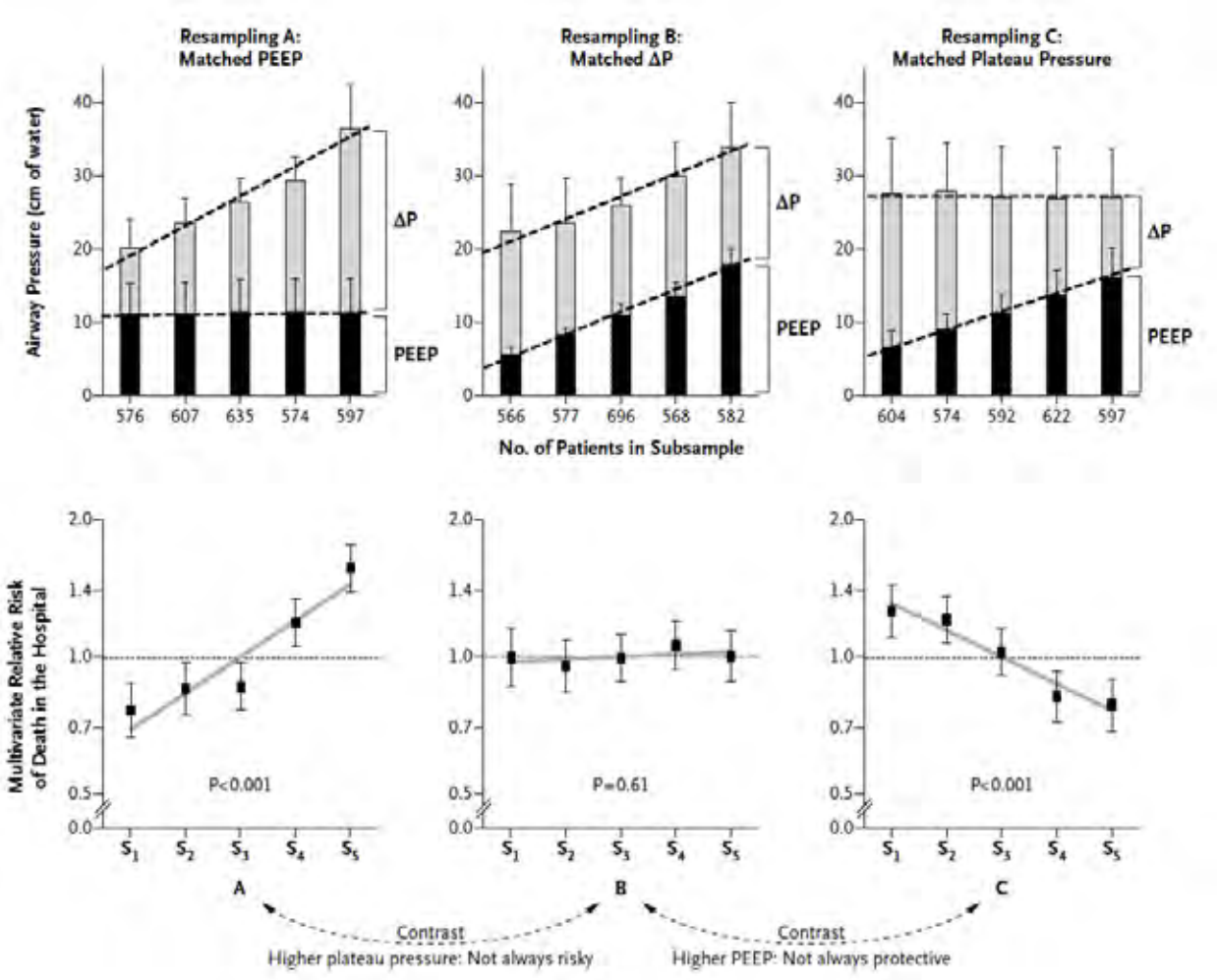
Driving pressure (ΔP) élevée ➔ ↓ survie



3562 patients issus de 9 études randomisées (individual data analysis)

➔ ΔP optimale < 15 cmH_2O

Amato et al. N Engl J Med. 2015;372(8):747-55

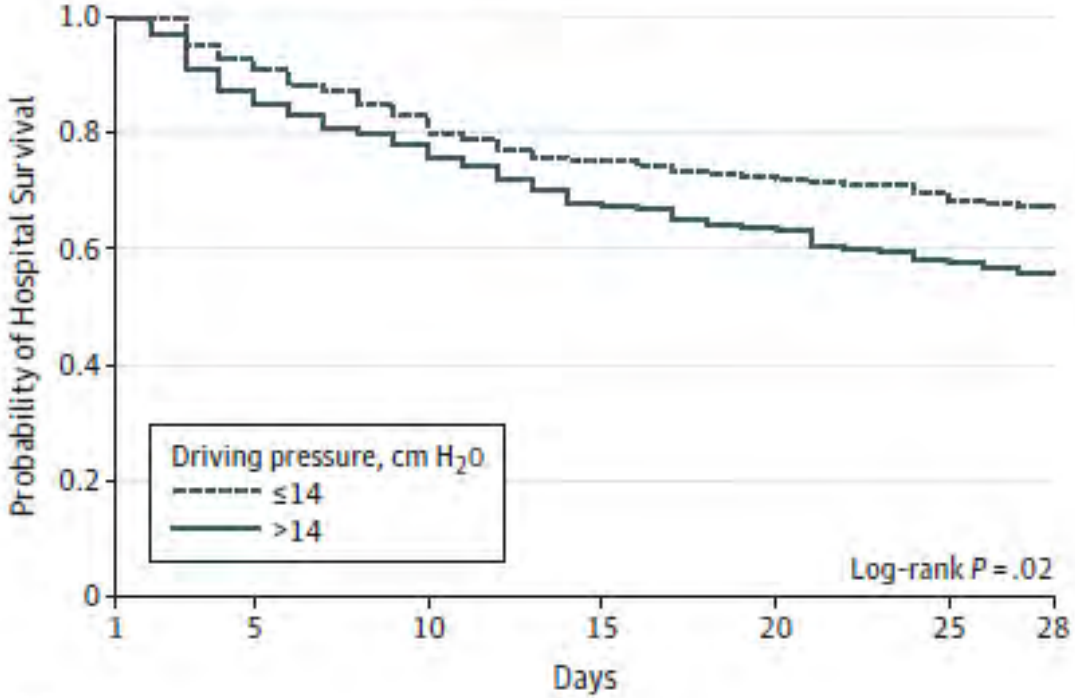


➔ ΔP (mais pas PEP ou Pplat) est associé à mortalité

Amato et al. N Engl J Med. 2015;372(8):747-55

Lungsafe study

C Probability of hospital survival by driving pressure



No. at risk

Driving pressure, cm H_2O							
≤14	370	342	306	277	266	254	245
>14	342	298	262	225	211	192	185

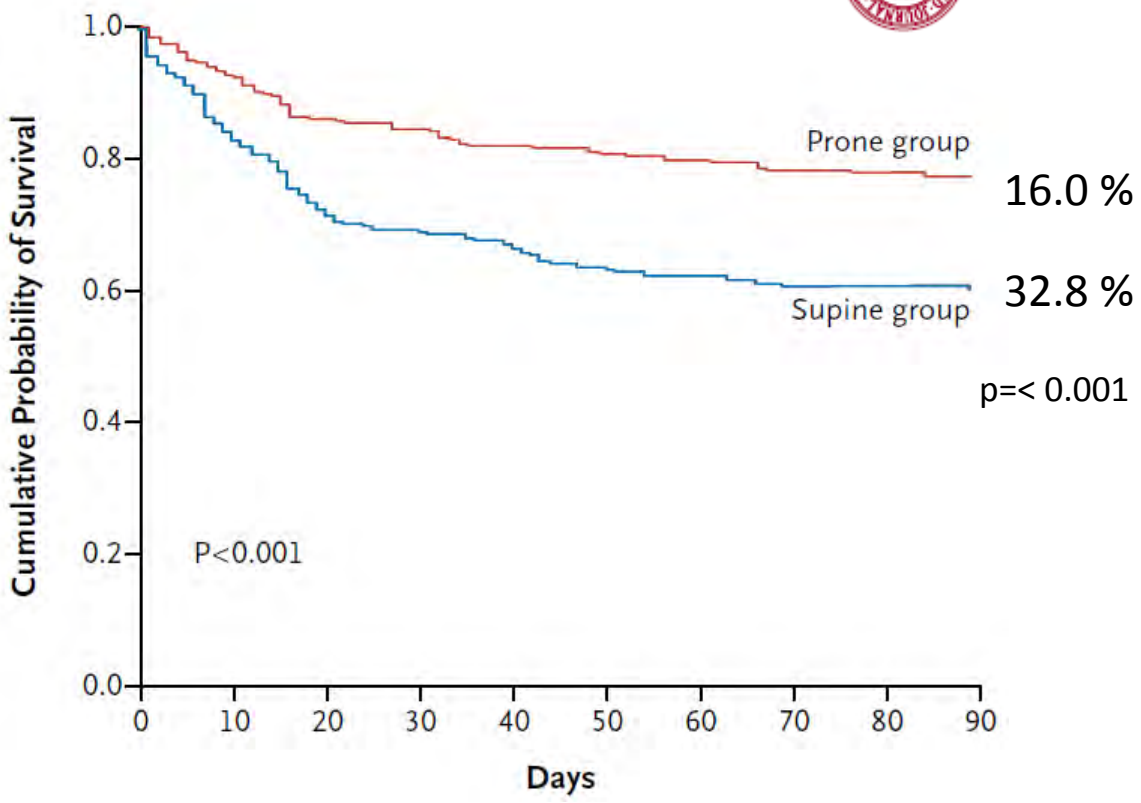
Bellani et al. JAMA 2016;315(8):788-800

SDRA sévère ➔ DV

Prone Positioning in Severe Acute Respiratory Distress Syndrome

PROSEVA STUDY
Prone position 16h/24
vs
Supine

c/o patients avec PaO_2/FIO_2 < 150 mmHg



16.0 %

32.8 %

p=< 0.001

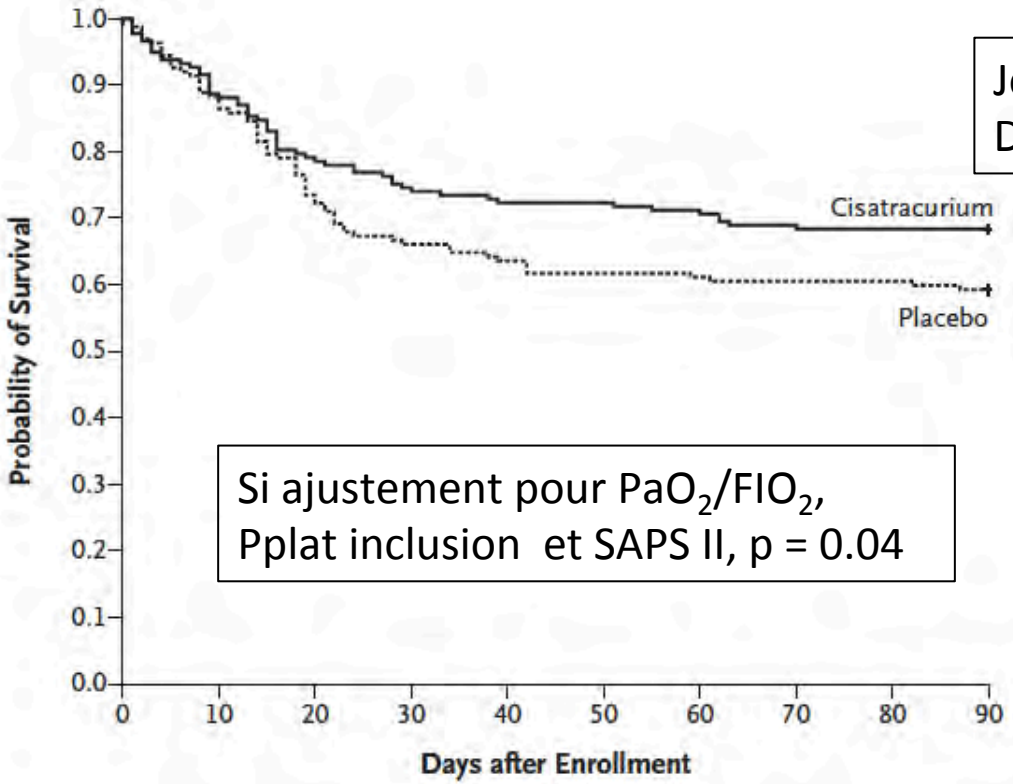
Guerin. et al. NEJM ; 368:2159-68 (2013)

SDRA sévère (précoce) ➔ Curare

Neuromuscular Blockers in Early Acute Respiratory Distress Syndrome

ACURASYS STUDY
Cisatracurium 48 premières heures
vs
pas de curare

c/o patients avec PaO_2/FIO_2 < 150 mmHg



Jour 90
Data brutes

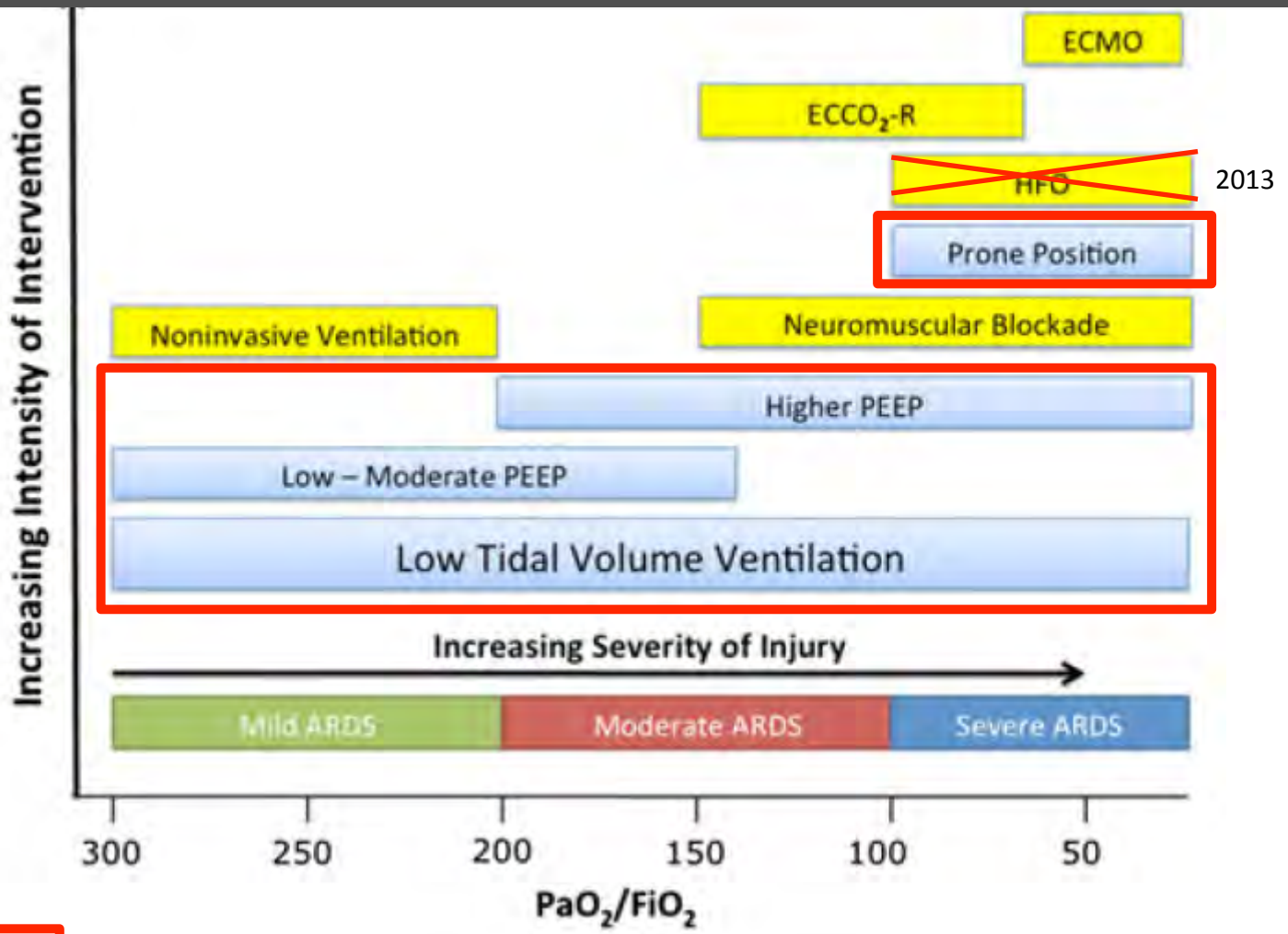
31.6%
40.7%

p= 0.08

Si ajustement pour PaO_2/FIO_2,
Pplat inclusion et SAPS II, p = 0.04

Papazian. et al. NEJM ; 303(9):865-73 (2010)

2012-2017



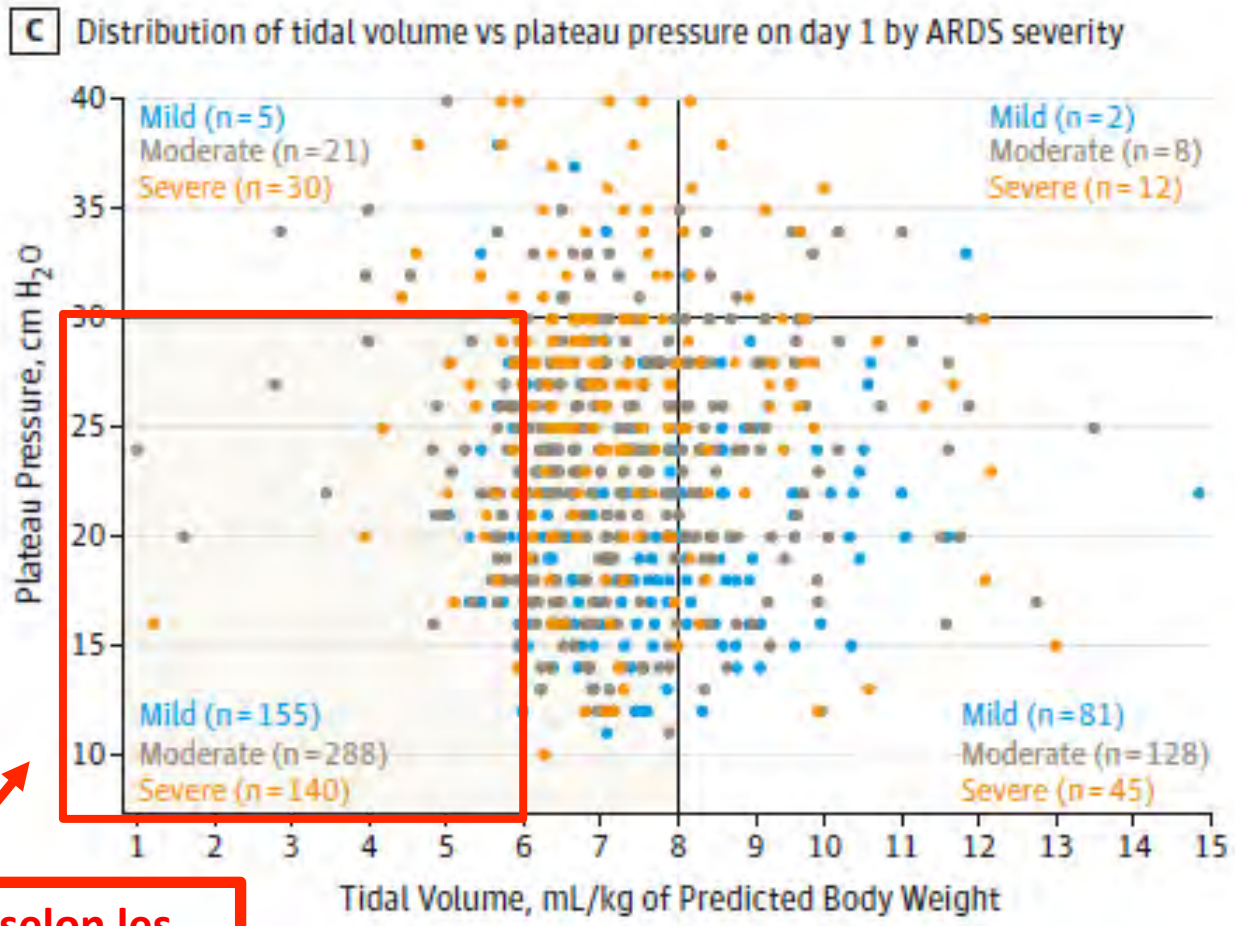
En accord avec quidelines 2017 ATS/ESICM. Fan et al. AJRCCM 2017; 195:1253-63

Ferguson N.D et al Intensive Care Med (2012) 38:1573–1582

LUNG SAFE STUDY = La vraie vie

- ✓ Cohorte multicentrique prospective (inclusions sur 1 mois de tous les patients ventilés)
- ✓ 459 ICUs, 50 pays
- ✓ 29'144 patients hospitalisés en SI, 3022 patients avec SDRA ➔ 10.4%
  - 30% Léger (PaO_2/FIO_2 >200 mmHg) ➔ Mortalité 34.9%
  - 46.6% Modéré (PaO_2/FIO_2 entre 100 et 200 mmHg) ➔ Mortalité 40.3%
  - 23.4% Sévère (PaO_2/FIO_2 <100 mmHg) ➔ Mortalité 46.1%

Bellani et al. JAMA 2016;315(8):788-800



Ventilés selon les recommendations pour VT et Pplat

Et… PEP < 12 cmH_2O c/o 82.6% des patients

Et… DV chez 16.3 % des ARDS sévères

Bellani et al. JAMA 2016;315(8):788-800

En conclusion

➔ SDRA = pathologie fréquente

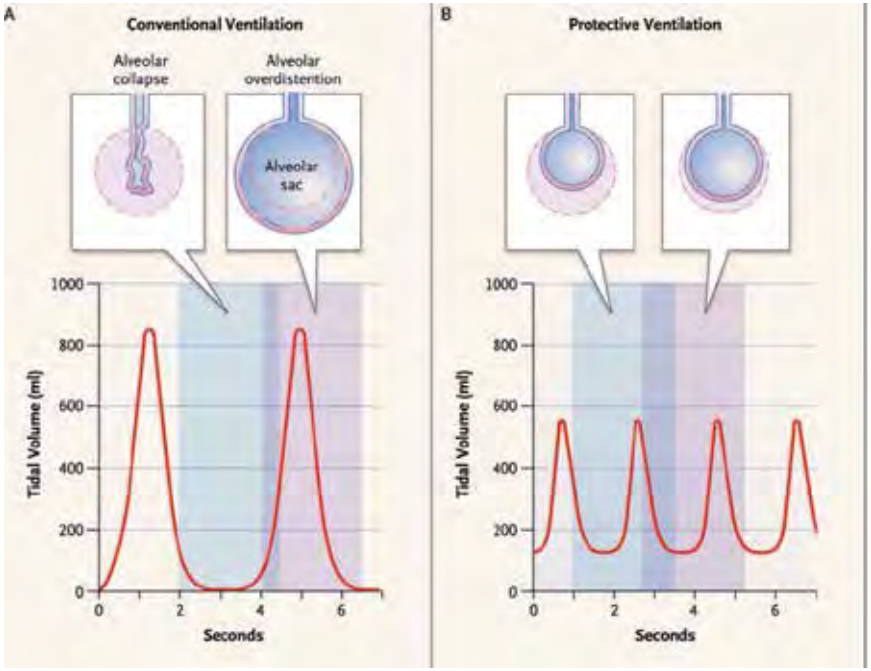
- 10.4 % admissions SI
- 23.4 % des patients ventilés

➔ SDRA = pathologie grave

- Mortalité hospitalière globale 40%
- Morbidité importante

En conclusion

➔ La ventilation protectrice, c'est…

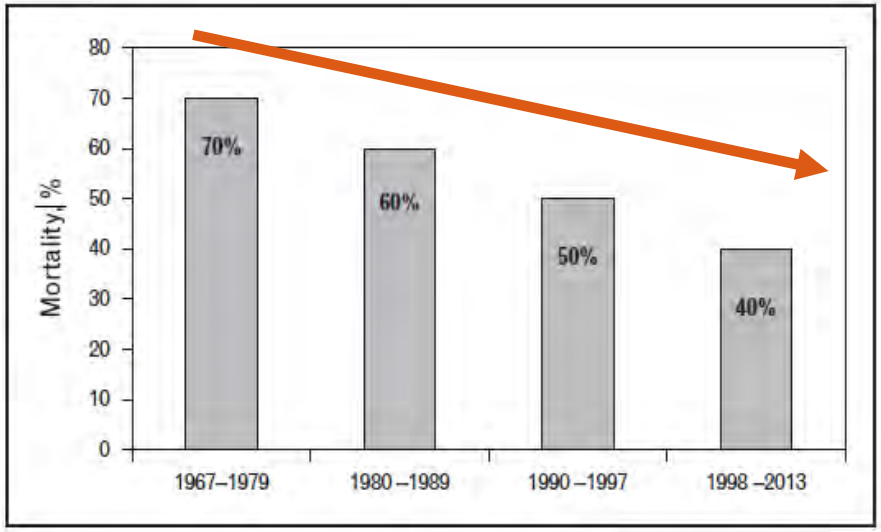


- ✓ VT bas (6ml/kgPBW)/ P plat (<28-30 cmH_2O) pour prévenir surdistension
- ✓ PEP suffisante pour prévenir le dérecrutement /atelectrauma
- ✓ Hypercapnie permissive au besoin
- ✓ + le DV si SDRA sévère

Malhotra et al. N Engl J Med 2007;357:1113-20

En conclusion

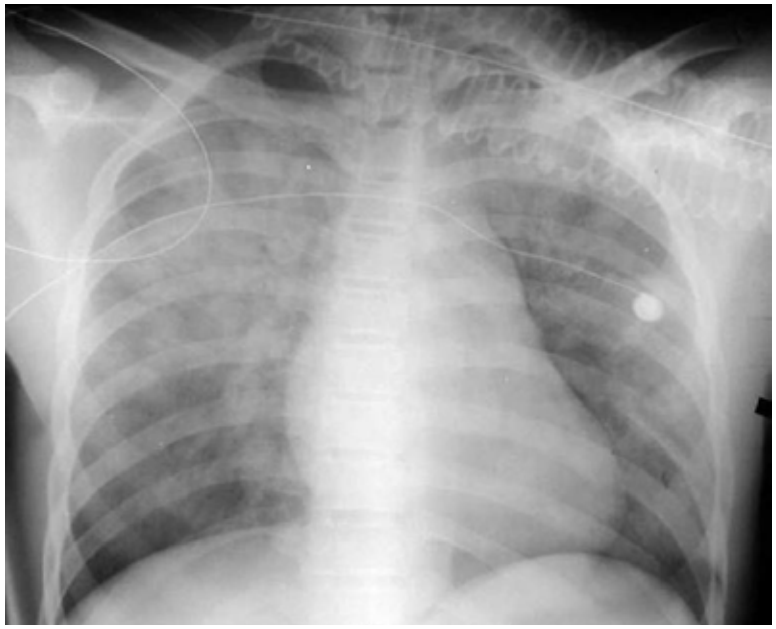
➔ Ventilation protectrice: efficace !



Vilar Curr Opin Crit Care 2014; 20(1) 3-9

➔ Mais insuffisamment appliqué…

Merci pour votre attention



Questions?