



1888-2010

Décubitus ventral pour la prise en charge du SDRA

JRUR Marseille
le 23 Avril 2010

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Oxygénation

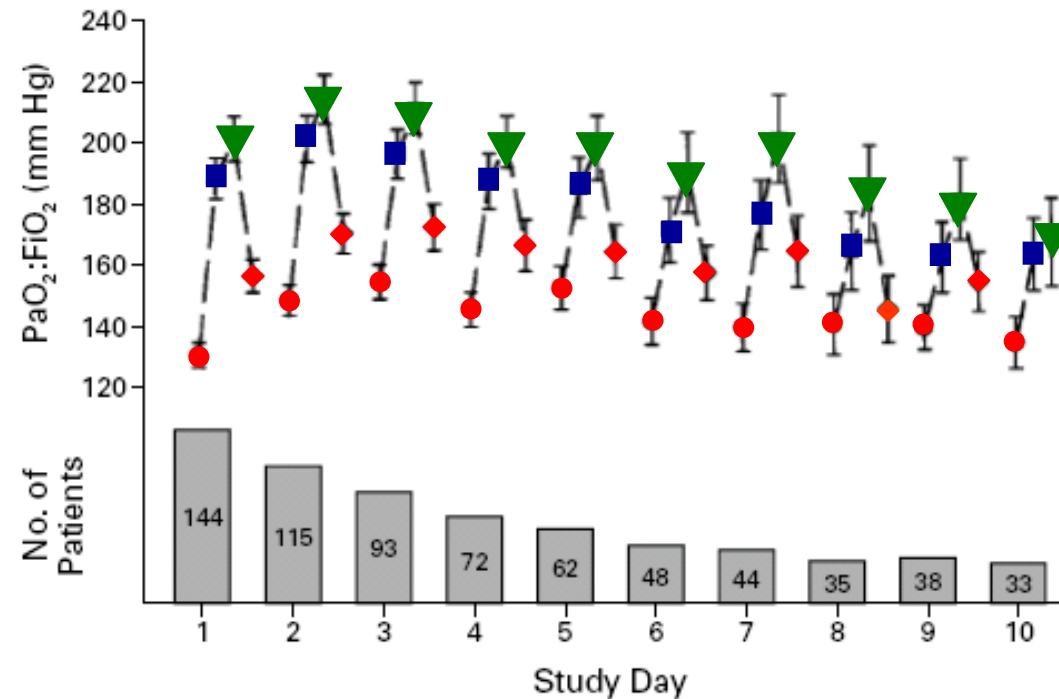


Figure 2. Mean (\pm SE) Ratios of the Partial Pressure of Arterial Oxygen (PaO_2) to the Fraction of Inspired Oxygen (FiO_2) Immediately before Prone Positioning (Circles), after One Hour (Squares), at the End of the Period of Pronation (Triangles), and on the Morning of the Following Day (Diamonds) during the 10-Day Study Period.

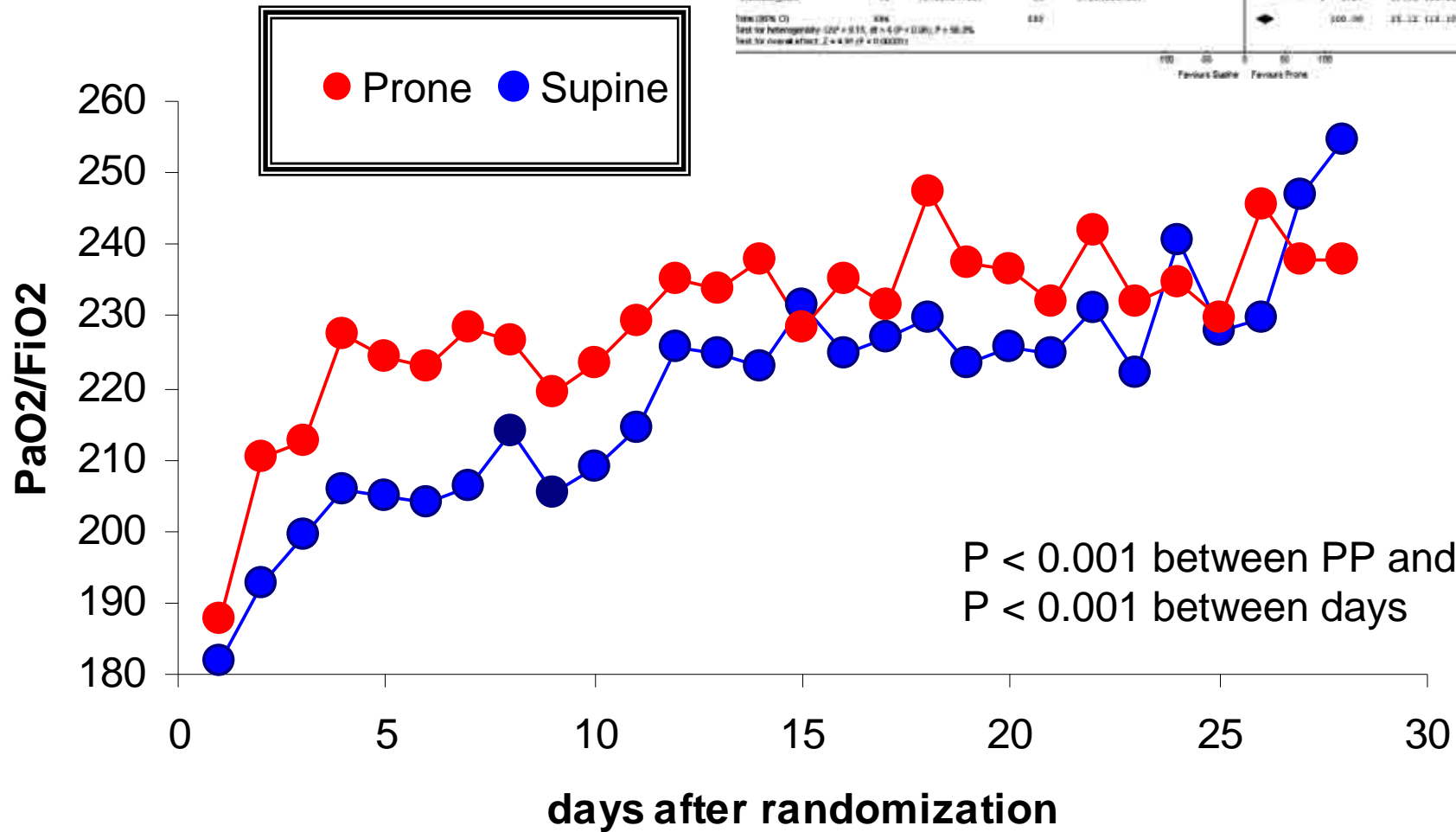


Oxygénation

Prêt: Prone vs Supine position in ARDS
 Concept: St. Prone vs Supine Variables
 Outcome: $\text{PaO}_2/\text{FiO}_2$ change

Study	n	Prone Mean (SD)	n	Supine Mean (SD)	WMD (fixed)	Weight %	WMD (fixed)	Order
or 95% CI					95% CI		95% CI	
Gestblom_2001	172	83.50 (48.40)	112	44.50 (46.10)	39.00	43.61	19.40 (-15.22, 39.89)	1
Guérin_2004	284	77.00 (40.00)	211	61.00 (40.40)	16.00	34.14	16.50 (-19.38, 42.48)	2
Voggenreiter_2005	41	71.00 (79.20)	19	27.70 (78.90)	43.30	8.38	44.10 (-2.87, 91.07)	3
Quint_2005	61	80.00 (48.50)	30	33.50 (51.00)	46.50	7.83	1.00 (-51.14, 97.14)	4
Morales_2006	93	76.00 (47.00)	65	30.00 (44.00)	46.00	8.17	46.00 (14.14, 77.86)	5
Total (95% CI)	641		427		100.00	100.00	25.12 (12.10, 38.13)	

Test for heterogeneity: $I^2 = 8.15$, $H = 4.07$ ($P = 0.38$)
 Test for overall effect: $Z = 4.97$ ($P < 0.00001$)



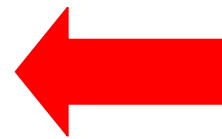


DV

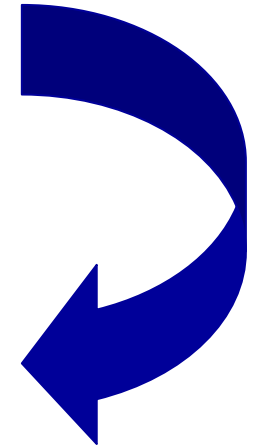


amélioration oxygénation

**DC inchangé
CRF inchangée ?**



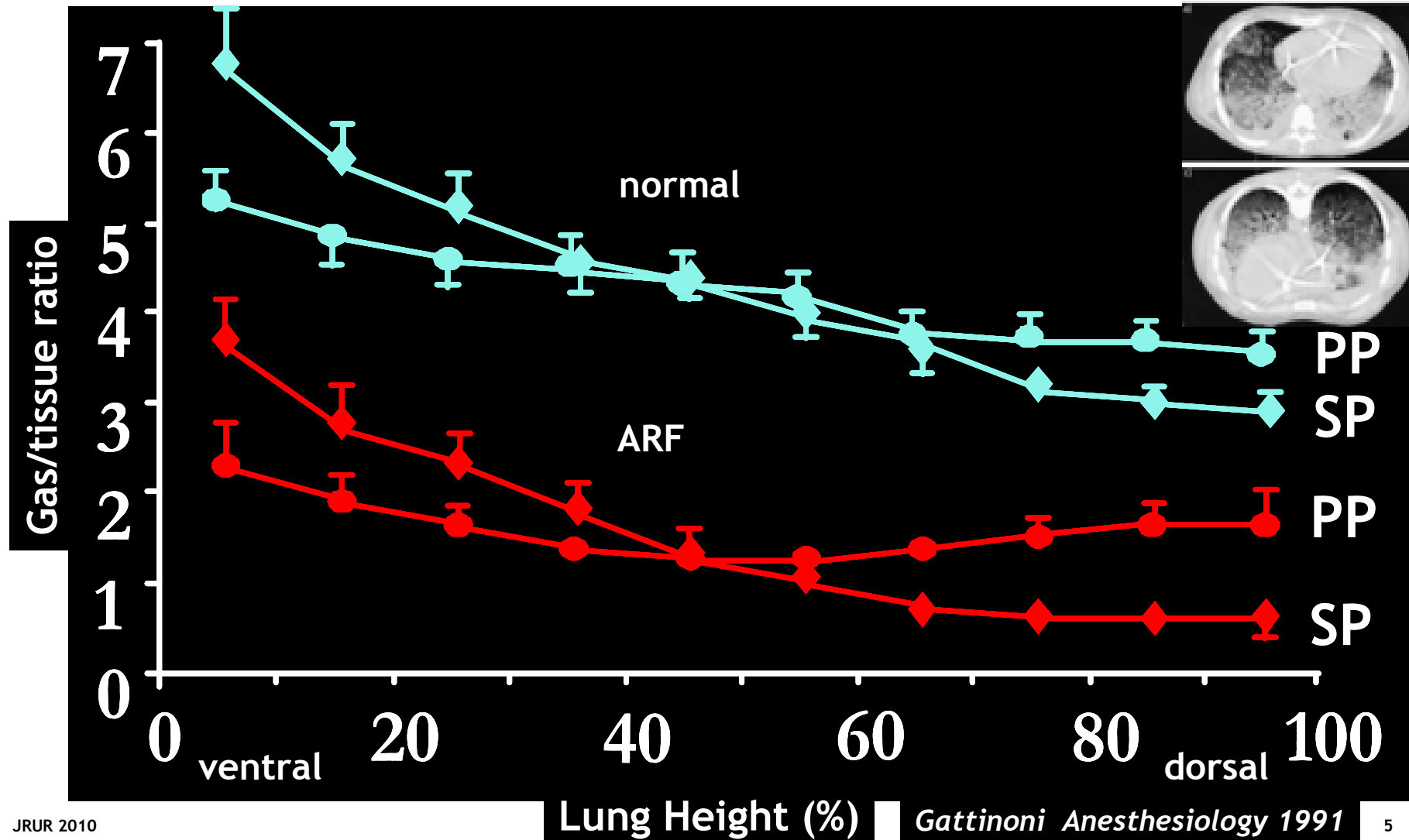
Q_s/Q_T



**Modifications distribution rapports VA/Q
et/ou recrutement alvéolaire**



Distribution du rapport gas/tissu

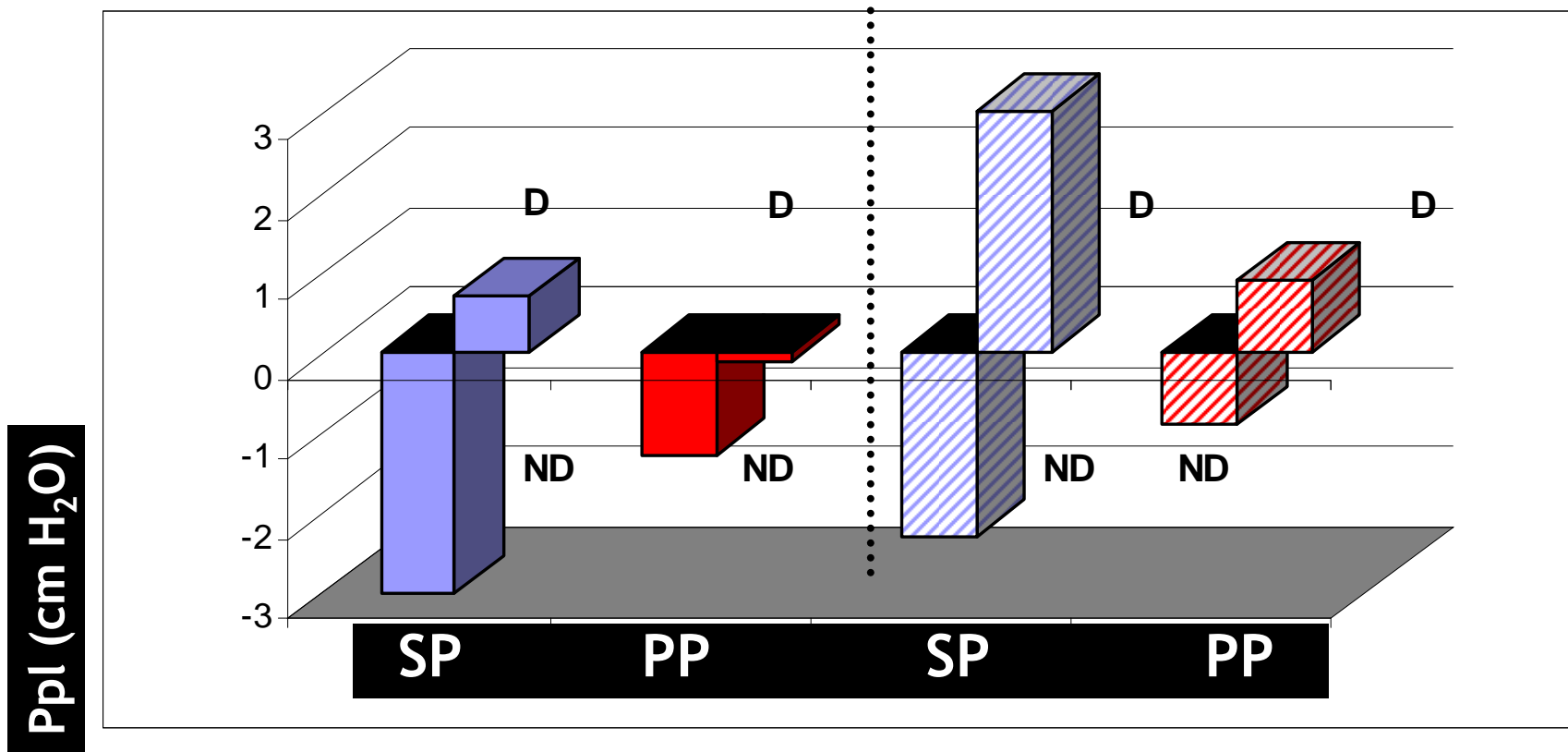




Gradient de Pression pleurale

normal

hypervolemie

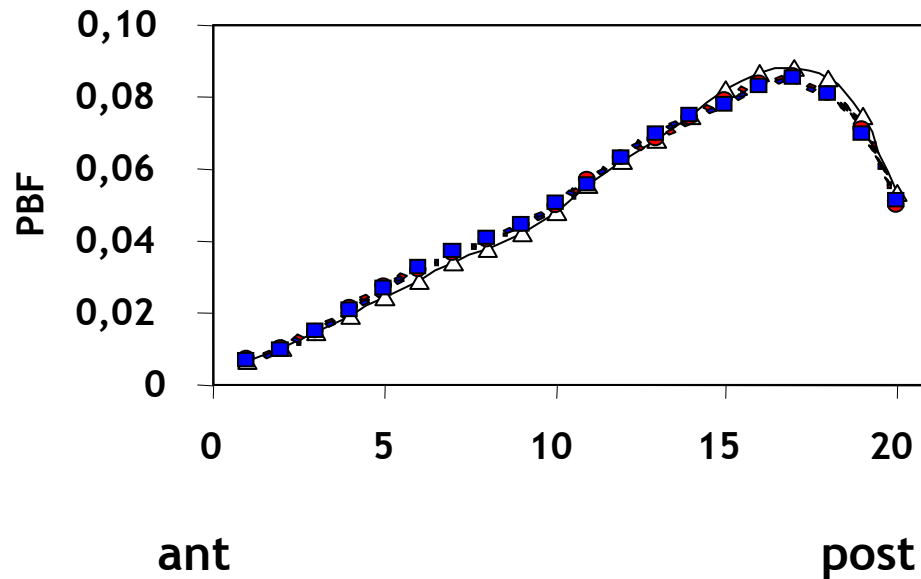


Mutoh et al. (ARRD 1992)

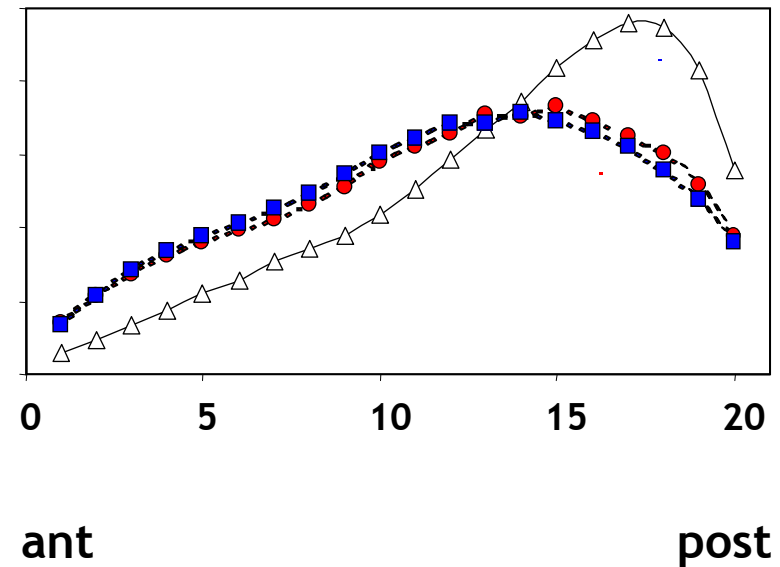


Distribution iso-gravitationnelle du DSP

Supine



Prone



—△— T120

- - - ● - - - T160

- - - ■ - - - T200

Pigs - oleic acid

Richard et al. JAP 2002

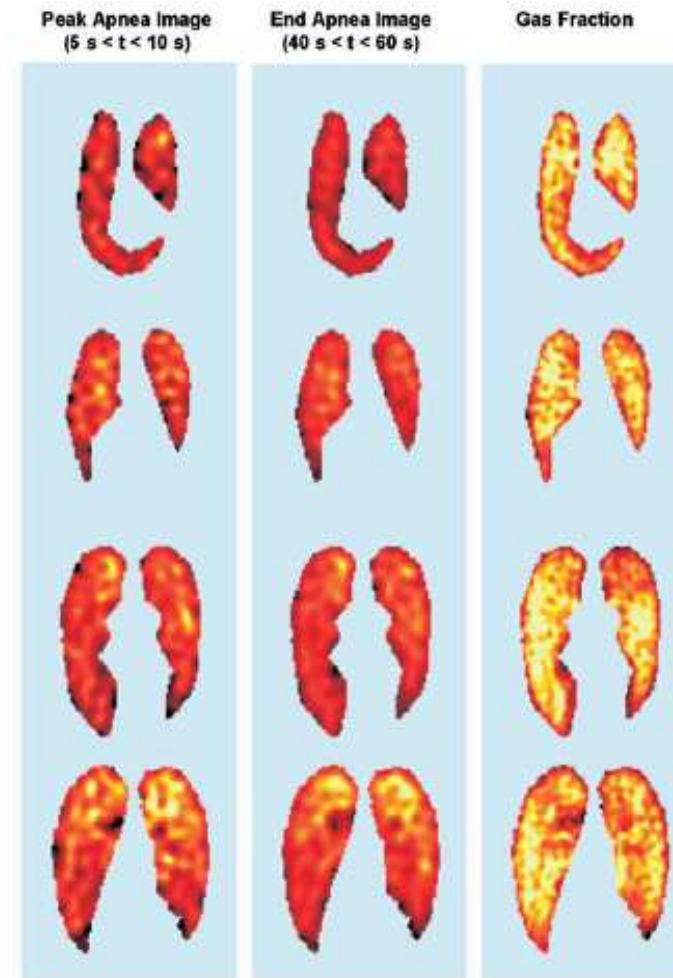
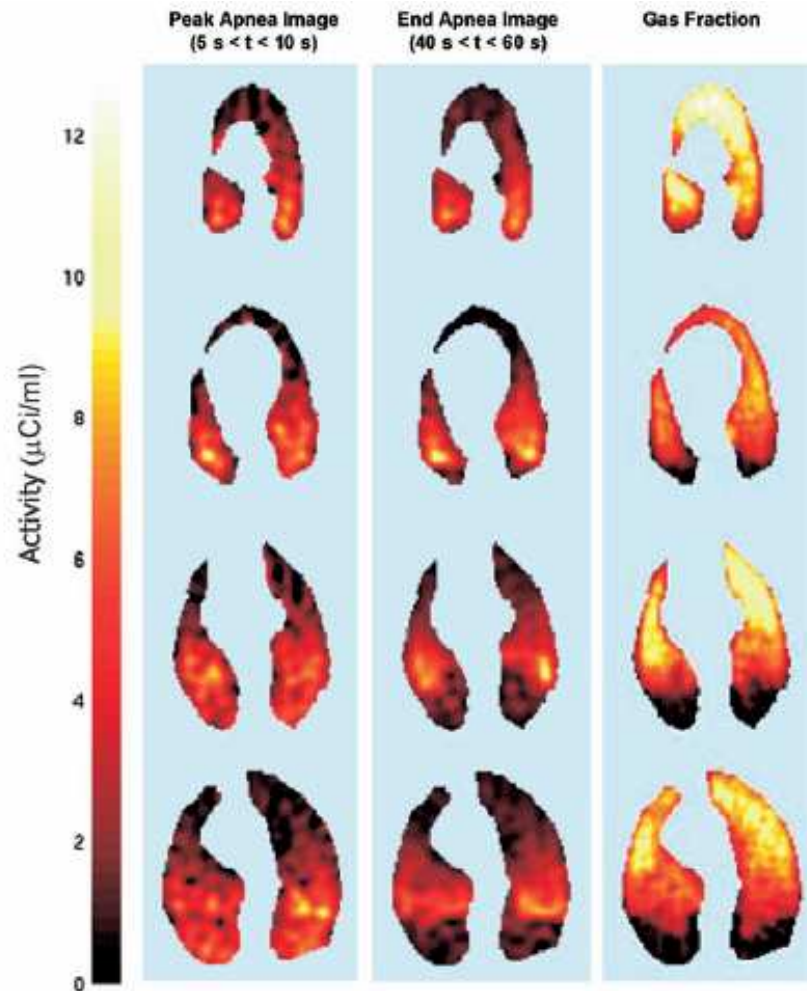


7 moutons -lavage salé

Shunt régional

SP

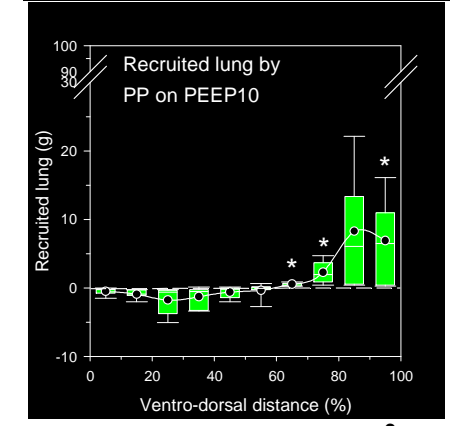
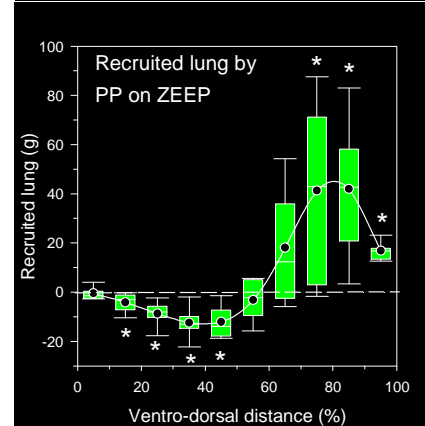
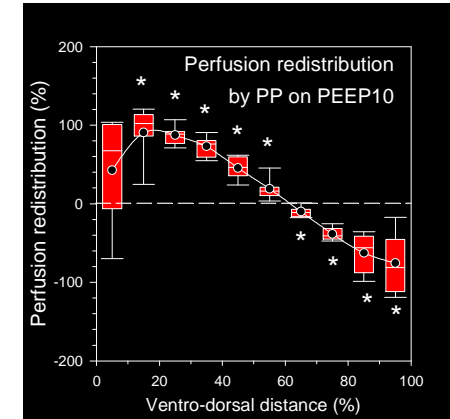
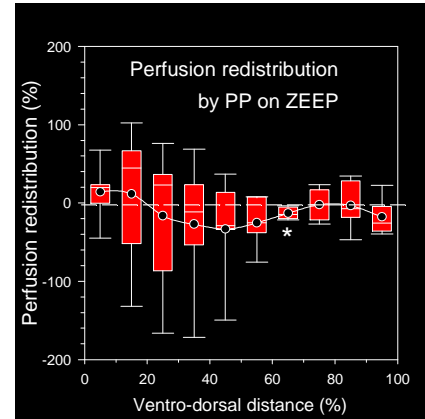
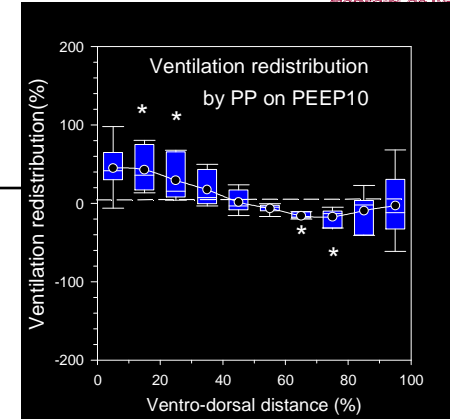
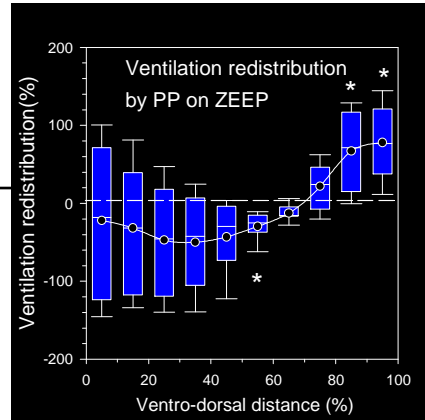
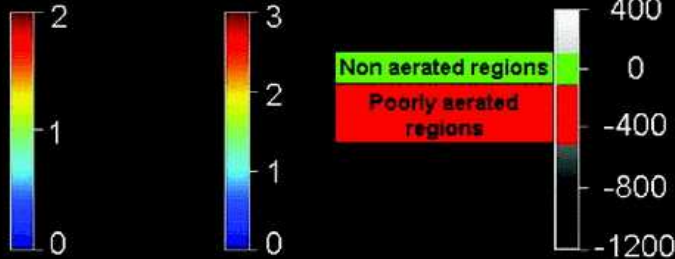
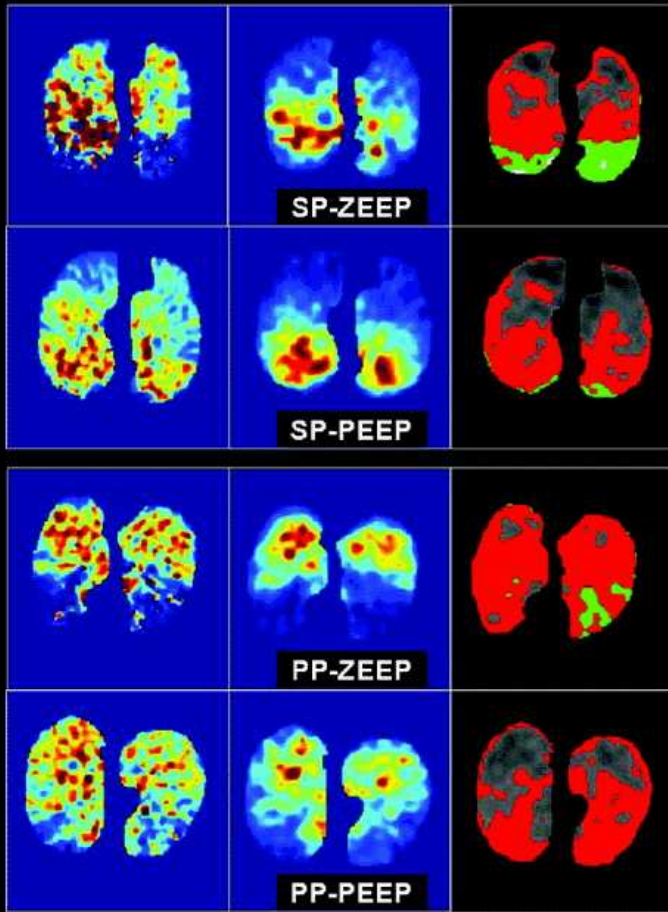
PP





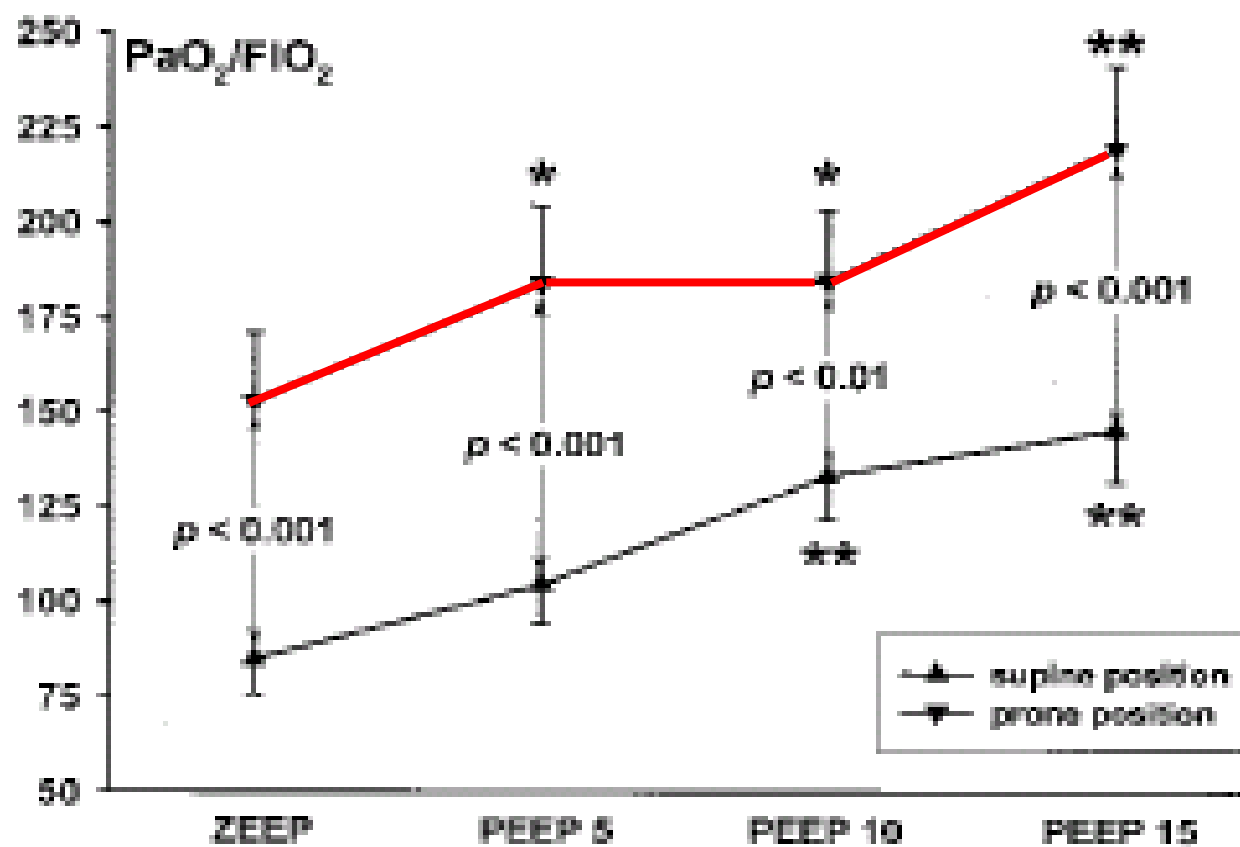
Médecine de l'Homme

VENTILATION PERFUSION DENSITY





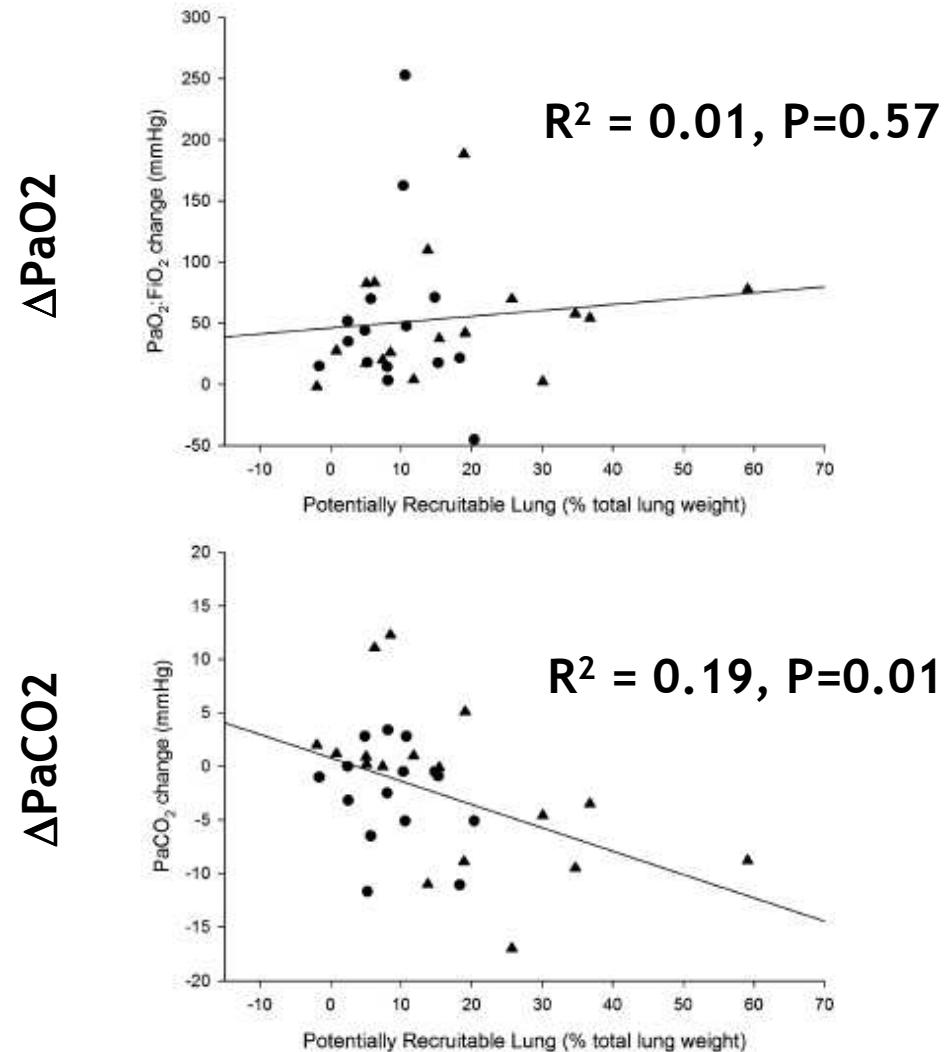
PP



Gannier et al. CCM 2003



Réponse en oxygénation en DV ne corrèle pas avec la recrutabilité

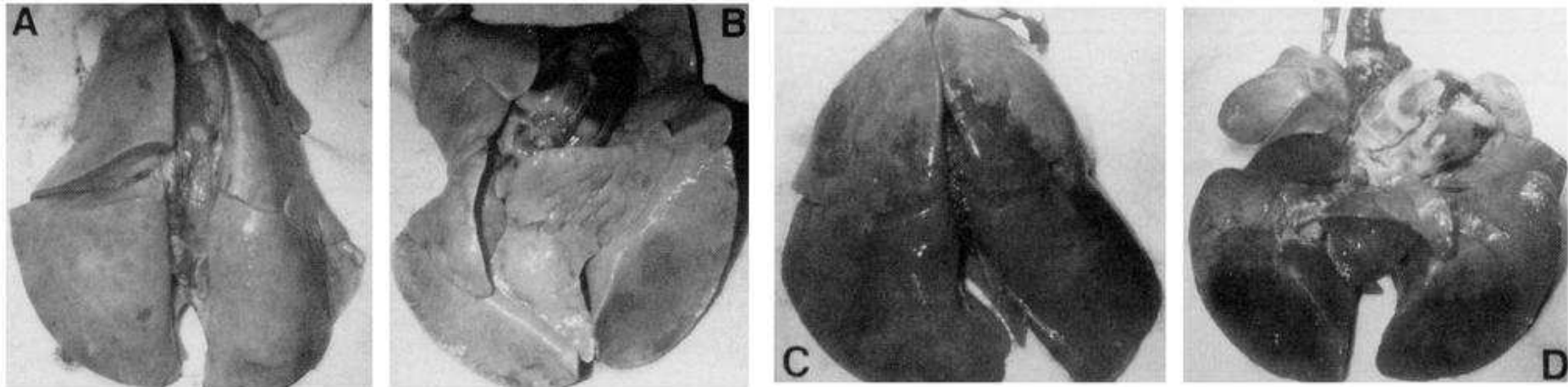


Prutti et al. ICM 2009



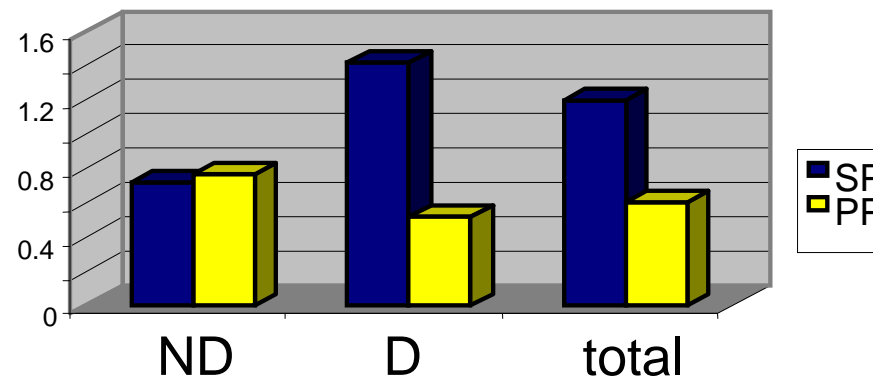
Ventilator-induced lung injury

Chiens normaux, $V_T = 77$ ml/kg, $P_{plat,L} = 35$ cm H₂O



DV 6 hs

DD 6 hs



Broccard et al.
CCM 2000



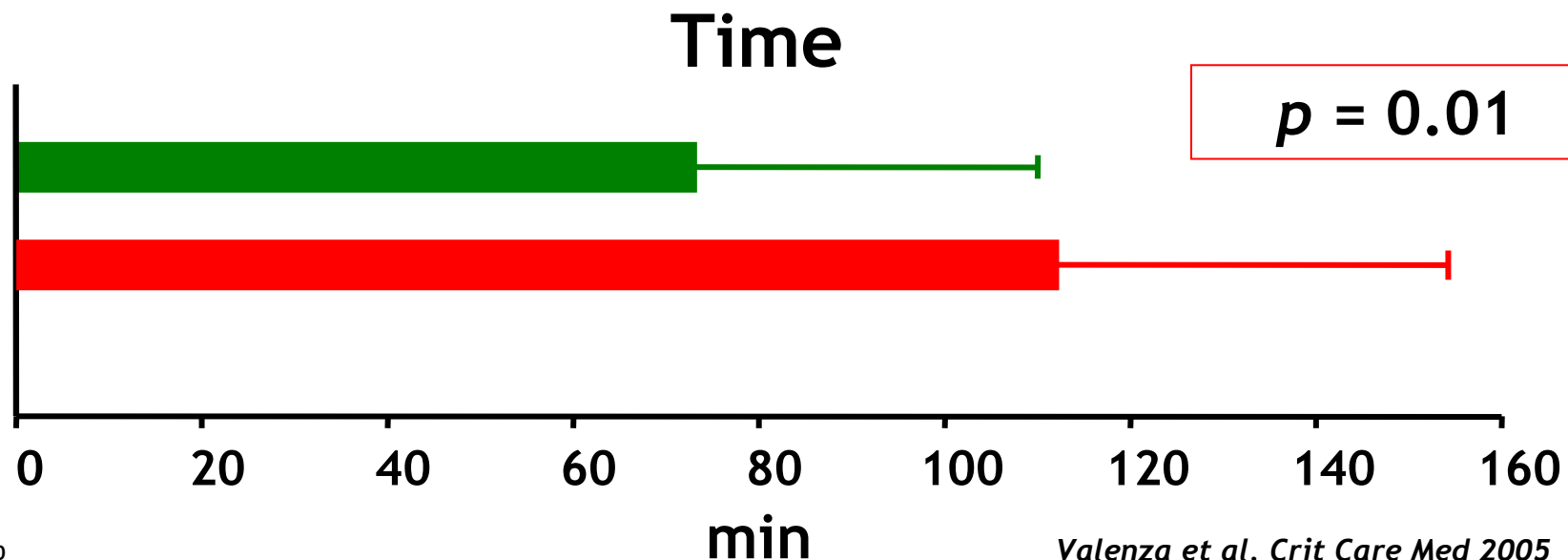
16 rats normaux par groupe

VILI égal

DD

DV

Vt (mL/Kg)	31 ± 2.94	30 ± 3.76	$p = 0.80$
RR (bpm)	24 ± 11	24 ± 11	$p = 0.79$
Paw _m (cmH ₂ O)	6.61 ± 0.11	6.56 ± 0.15	$p = 0.29$
W/D	6.54 ± 0.46	6.57 ± 0.79	$p = 0.91$
Ers%	158 ± 5	155 ± 5	$p = 0.14$

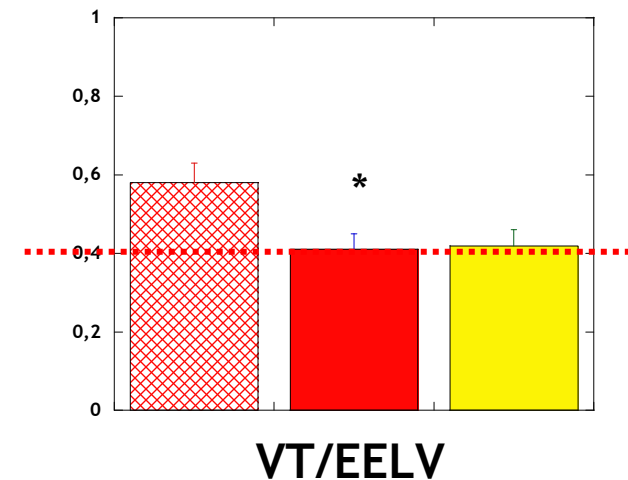
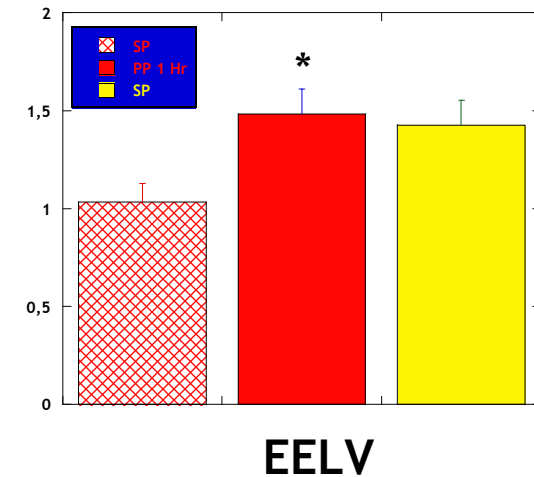
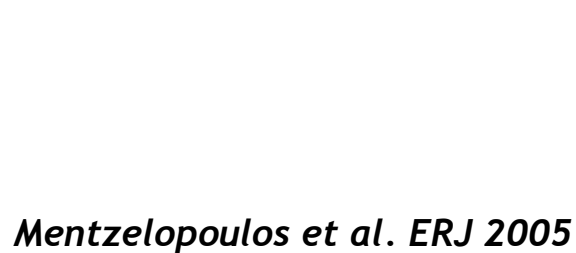
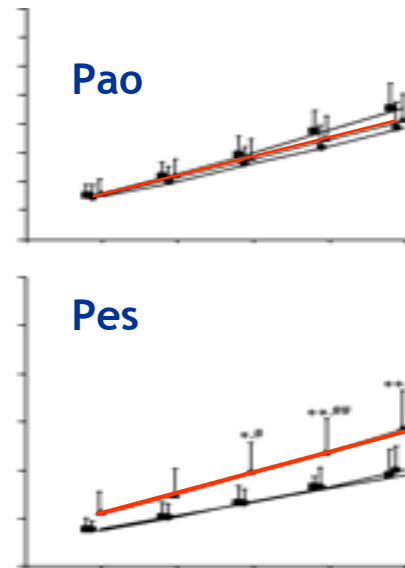
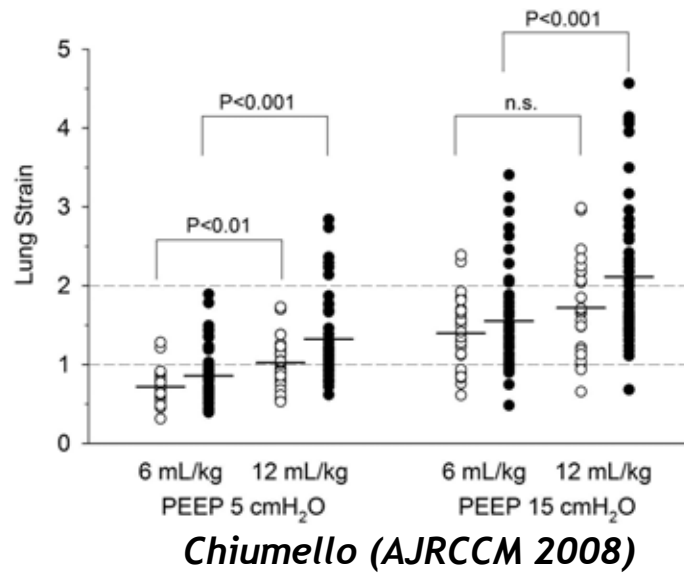




Moins de Stress / Strain

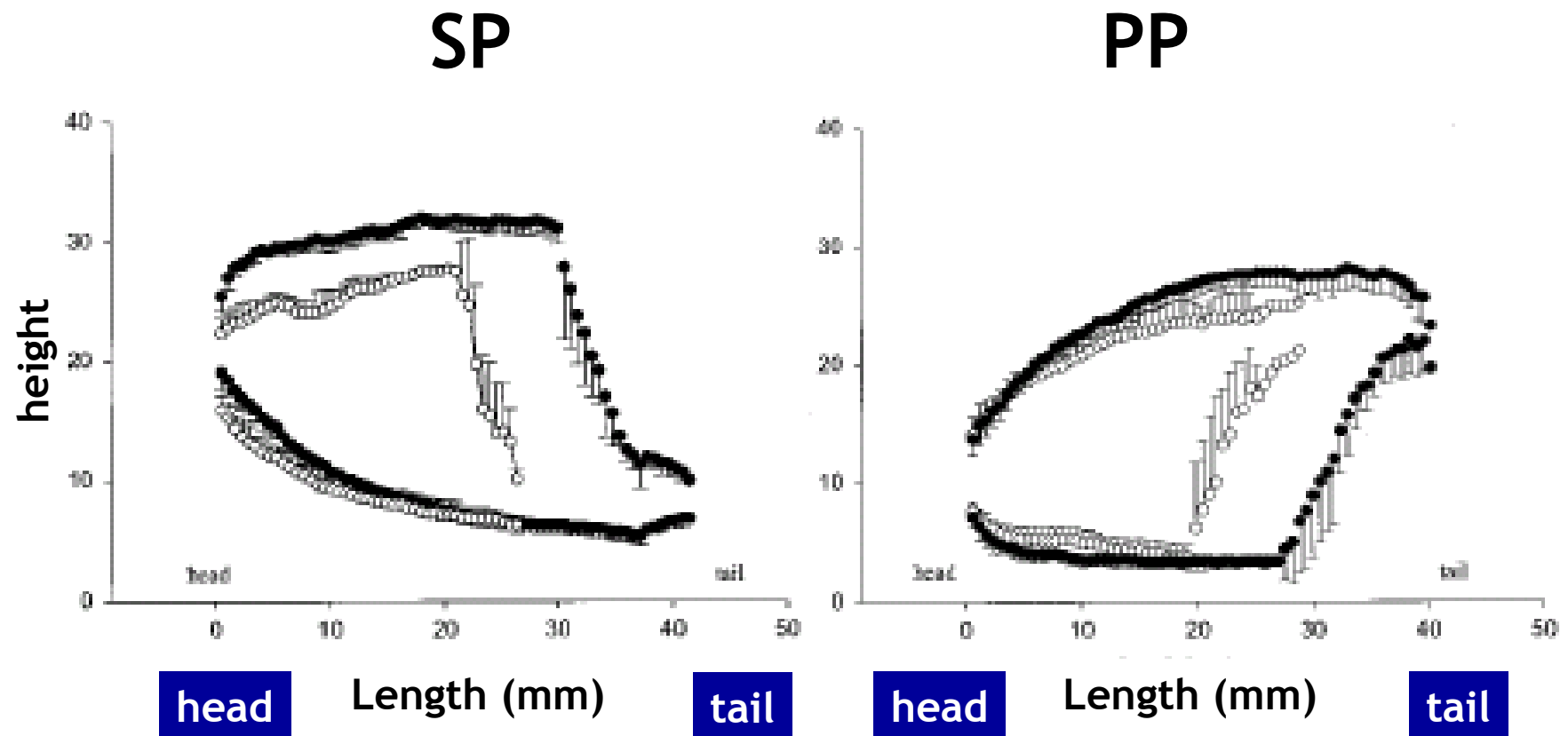
□ P_L = Stress

□ $V_T/EELV$ = Strain





Différence de distribution du VT

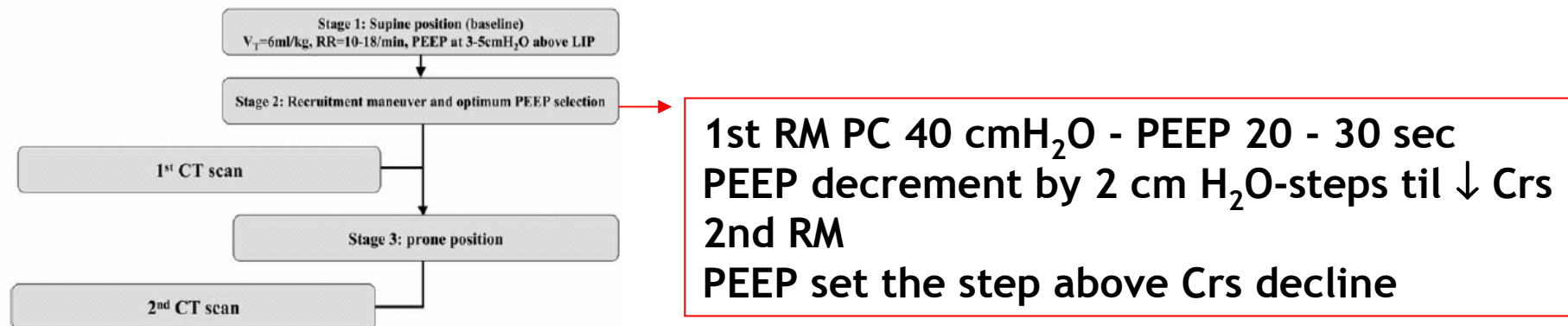


Valenza et al. Crit Care Med 2005



Recrutement Alvéolaire et réduction de l'hyperinflation

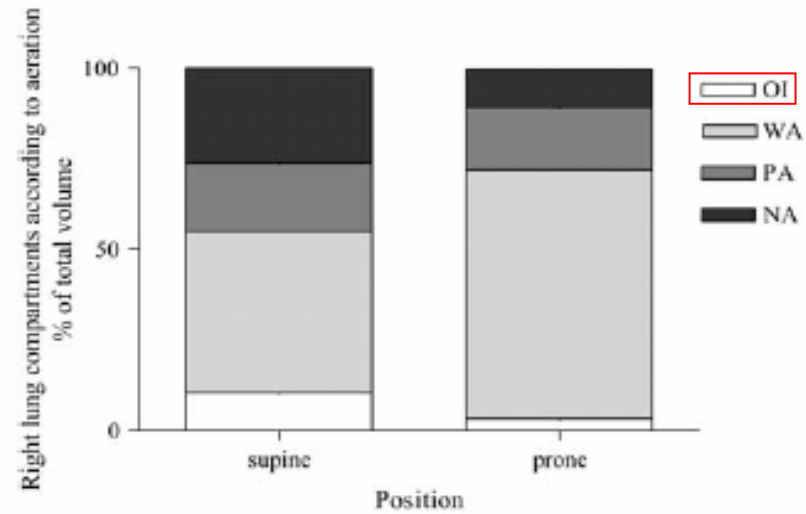
Age, yr	43.15 ± 12.26*
Sex	7 F/14 M
Cause of admission	
Trauma	11
Stroke	7
Sepsis	3
ARDS lobar/diffuse	15/6
Duration of ICU stay, d	13.40 ± 8.03*
Duration of mechanical ventilation, d	11.27 ± 7.64*



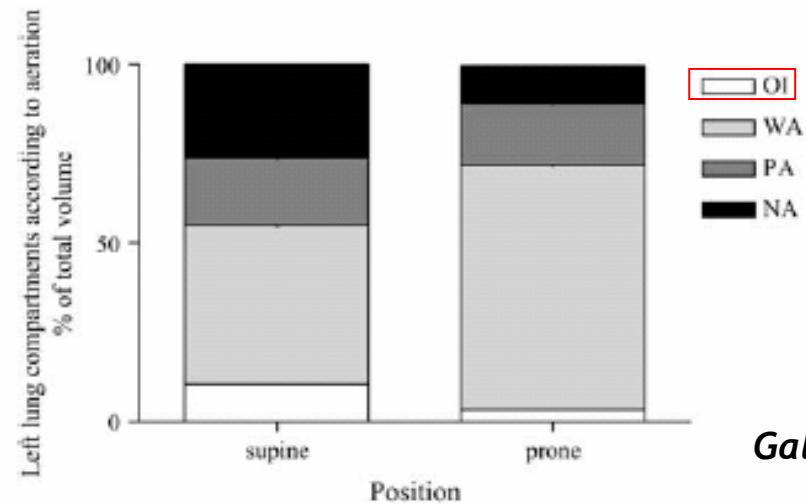


Recrutement Alvéolaire et réduction de l'hyperinflation

Poumon droit



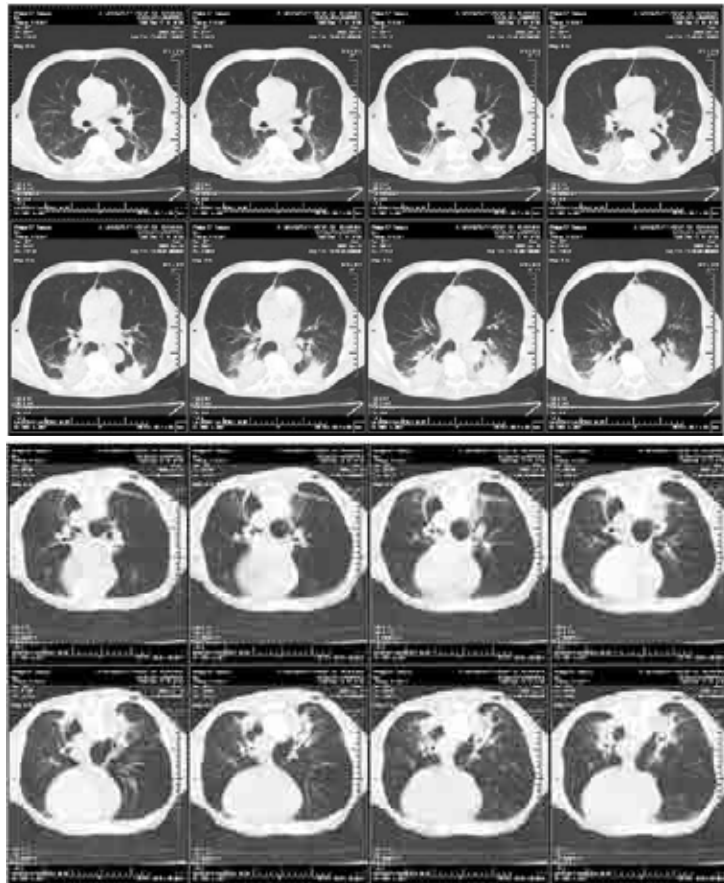
Poumon gauche



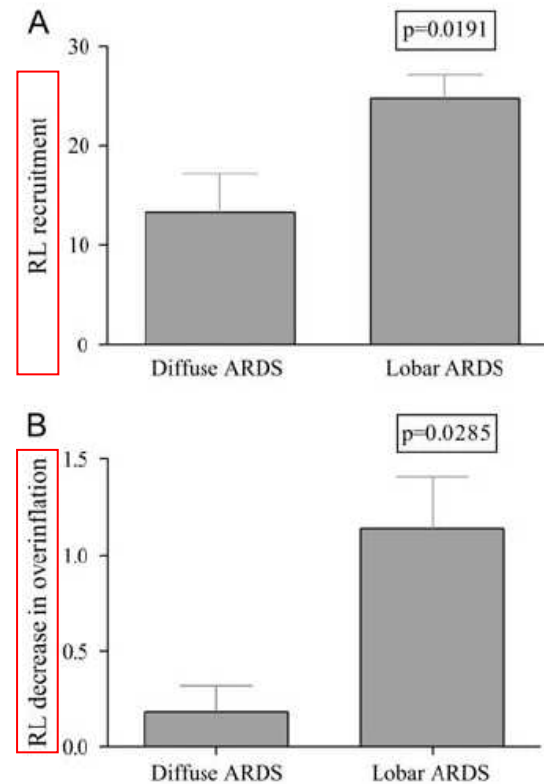
Galiastou AJRCCM 2006



Recrutement Alvéolaire et réduction de l'hyperinflation



Recrutement alvéolaire



Diminution de l'hyperinflation

Galiastou AJRCCM 2006

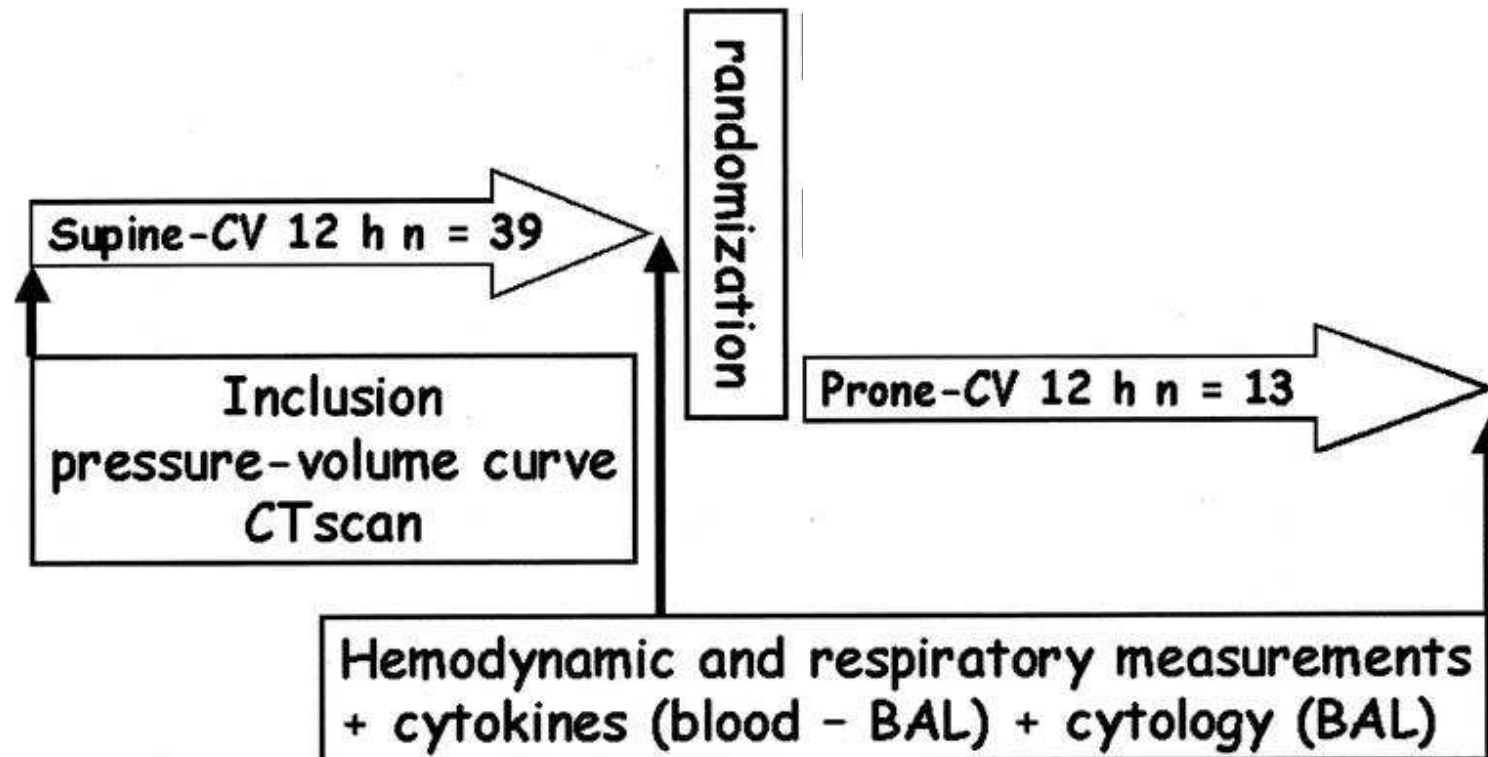


Production Cytokines



Papazian et al. CCM 2005

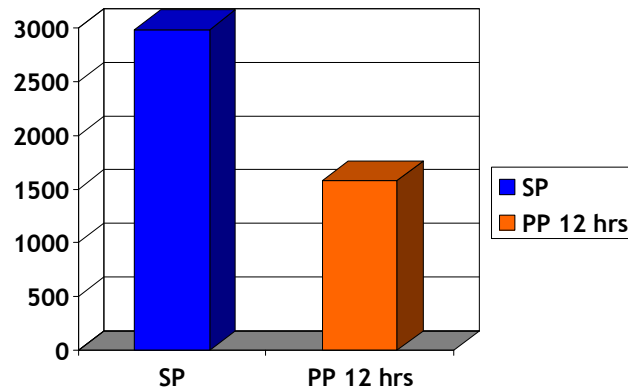
	Baseline Supine-CV <i>n</i> = 39
Tidal volume, mL · kg ⁻¹	6.4 ± 0.7
Respiratory rate, cycles · min ⁻¹	26 ± 6
Plateau pressure, cm H ₂ O	25 ± 6
Mean airway pressure, cm H ₂ O	19 ± 4 ^a
Applied PEEP, cm H ₂ O	12 ± 4
Auto-PEEP, cm H ₂ O	0.9 ± 1.3
Pressure amplitude of oscillation, cm H ₂ O	NA
Paco ₂ , mm Hg	50 ± 11



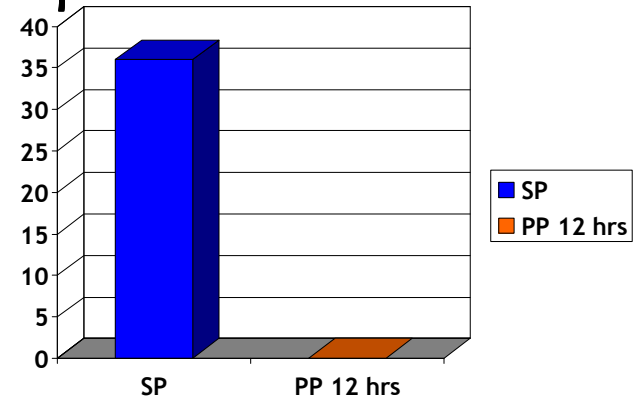


BAL cytokines (pg/ml)

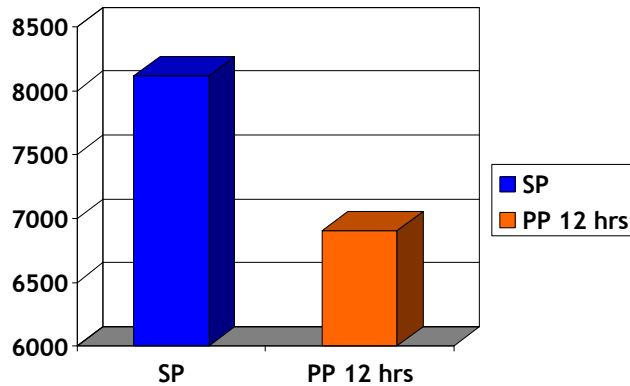
IL-8



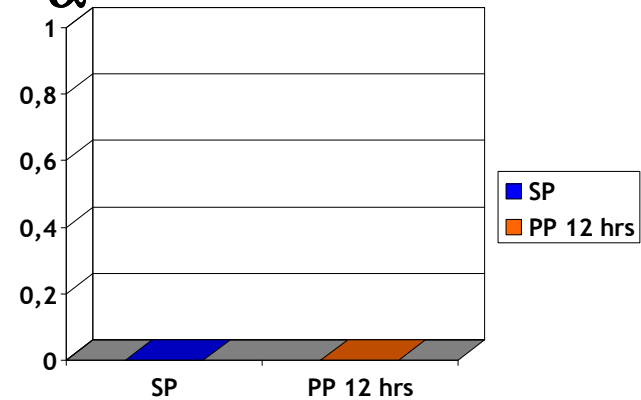
IL-1 β *



IL-6



TNF- α

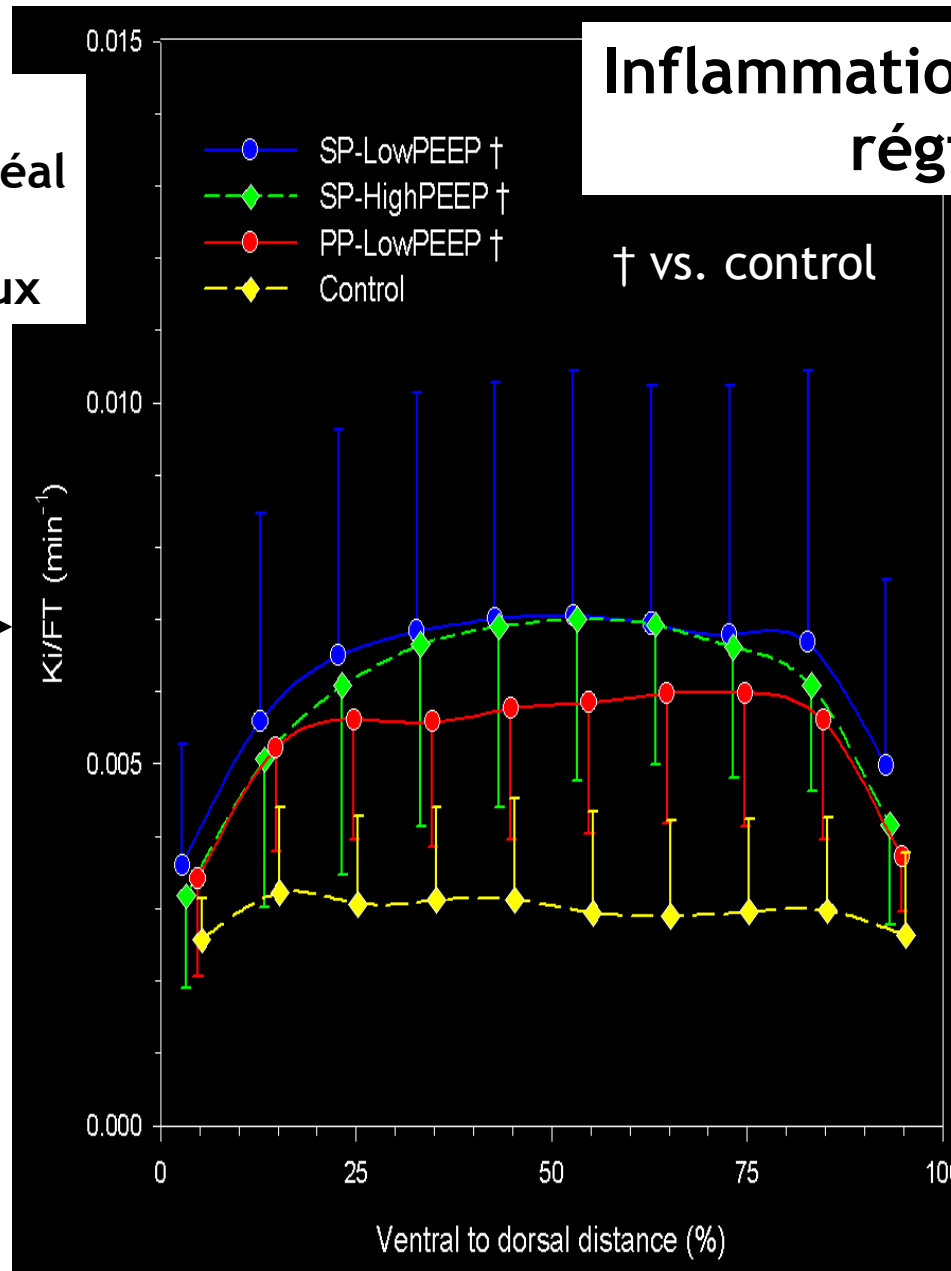




26 porcs
HCl intra-trachéal

7 porcs normaux

FDG uptake
par PNN activés



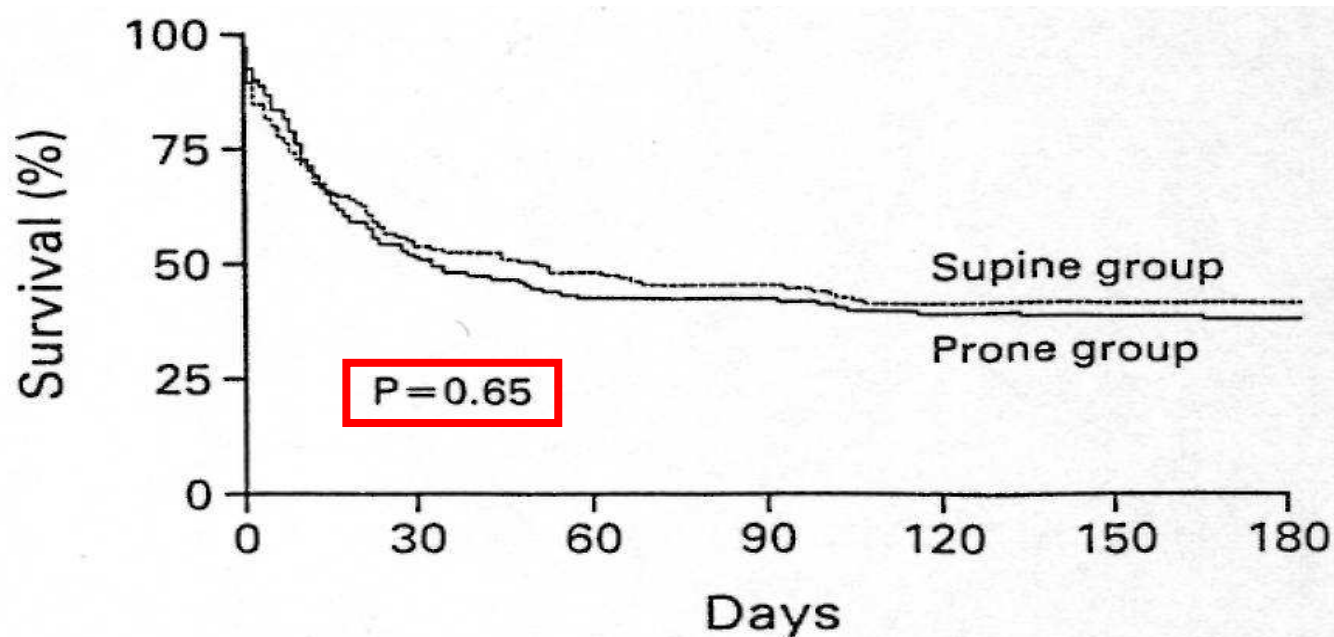
JC Richard et al.
submitted



Survie du patient

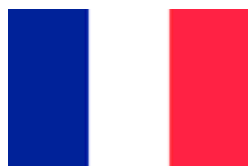


Gattinoni et al. (NEJM 2001)

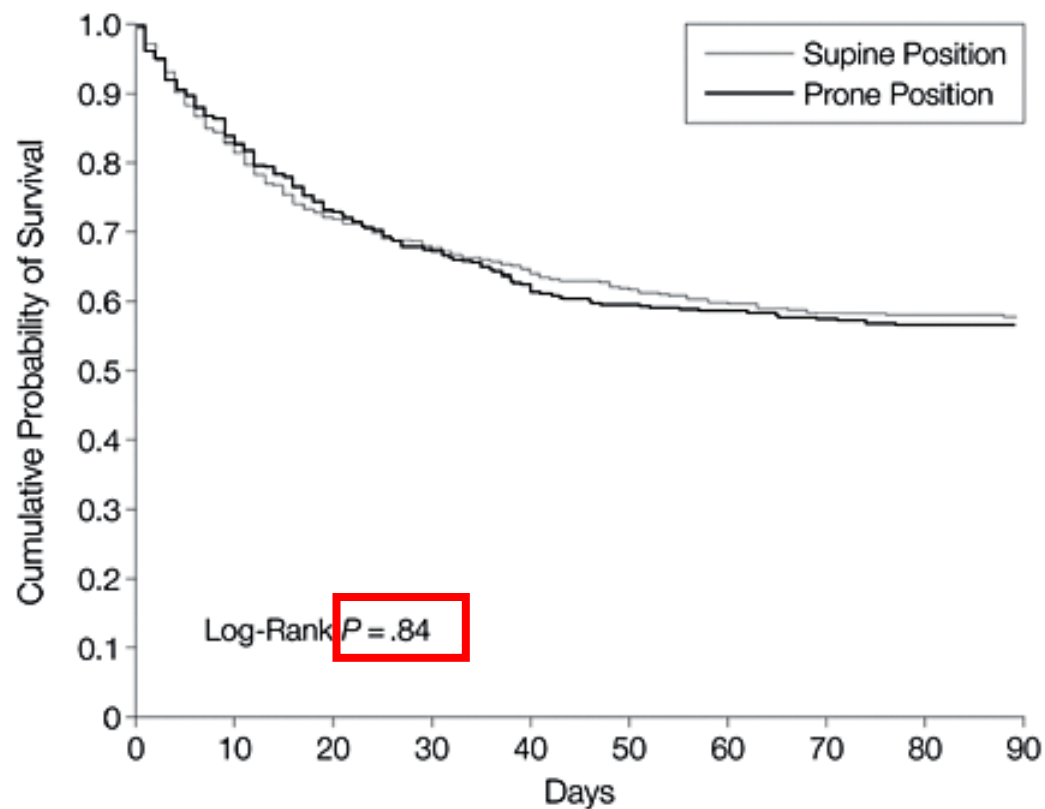


NO. AT RISK

Supine group	152	82	72	68	62	62	62
Prone group	152	78	63	63	58	57	56



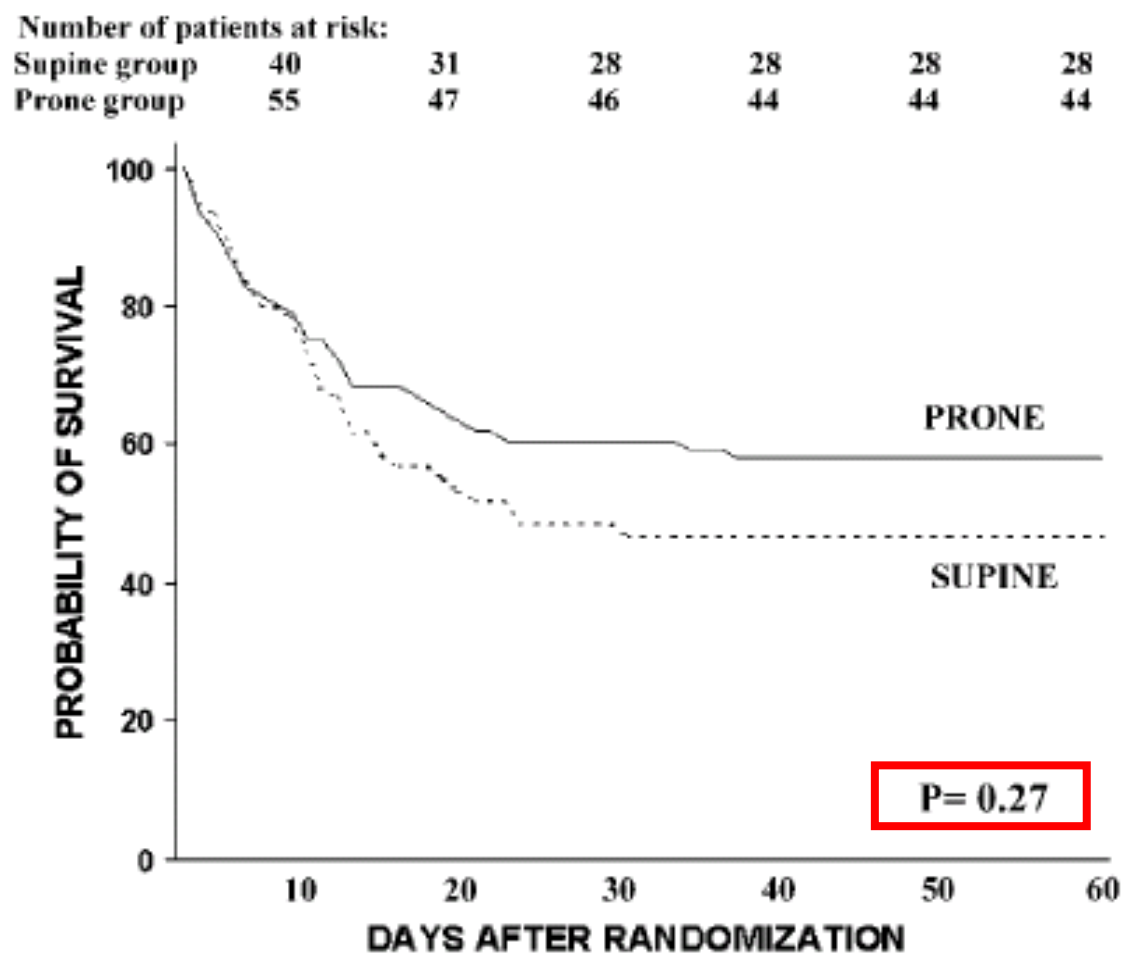
Guérin et al. JAMA 2004

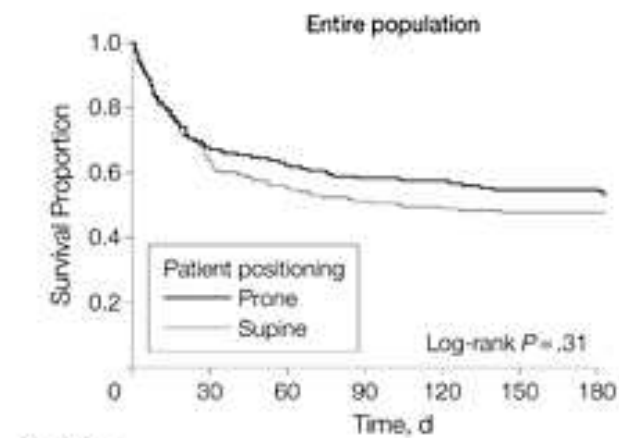


No. at Risk		0	10	20	30	40	50	60	70	80	90
Supine Position	378	314	273	257	244	234	226	220	219	218	
Prone Position	413	346	302	279	258	246	242	237	234	234	

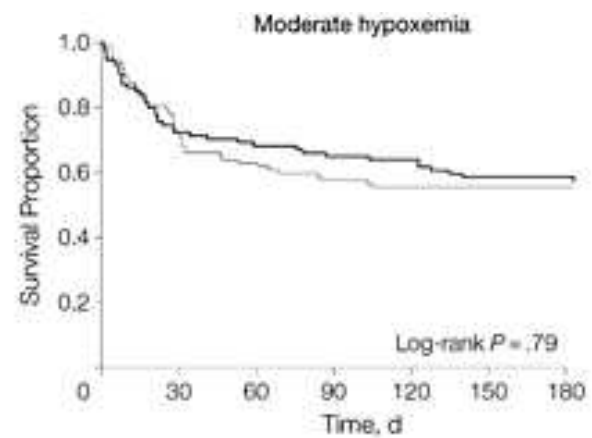


Mancebo et al. AJRCCM 2006

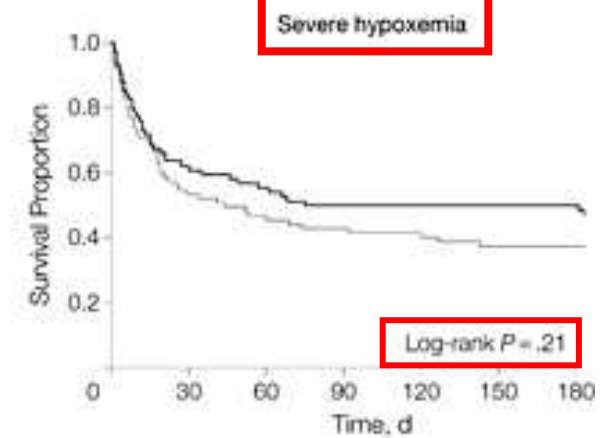




No. at risk	0	30	60	90	120	150	180
Prone	168	113	104	96	95	90	90
Supine	174	110	95	87	84	81	81



No. at risk	0	30	60	90	120	150	180
Prone	94	68	64	60	59	54	54
Supine	98	70	60	55	53	53	53

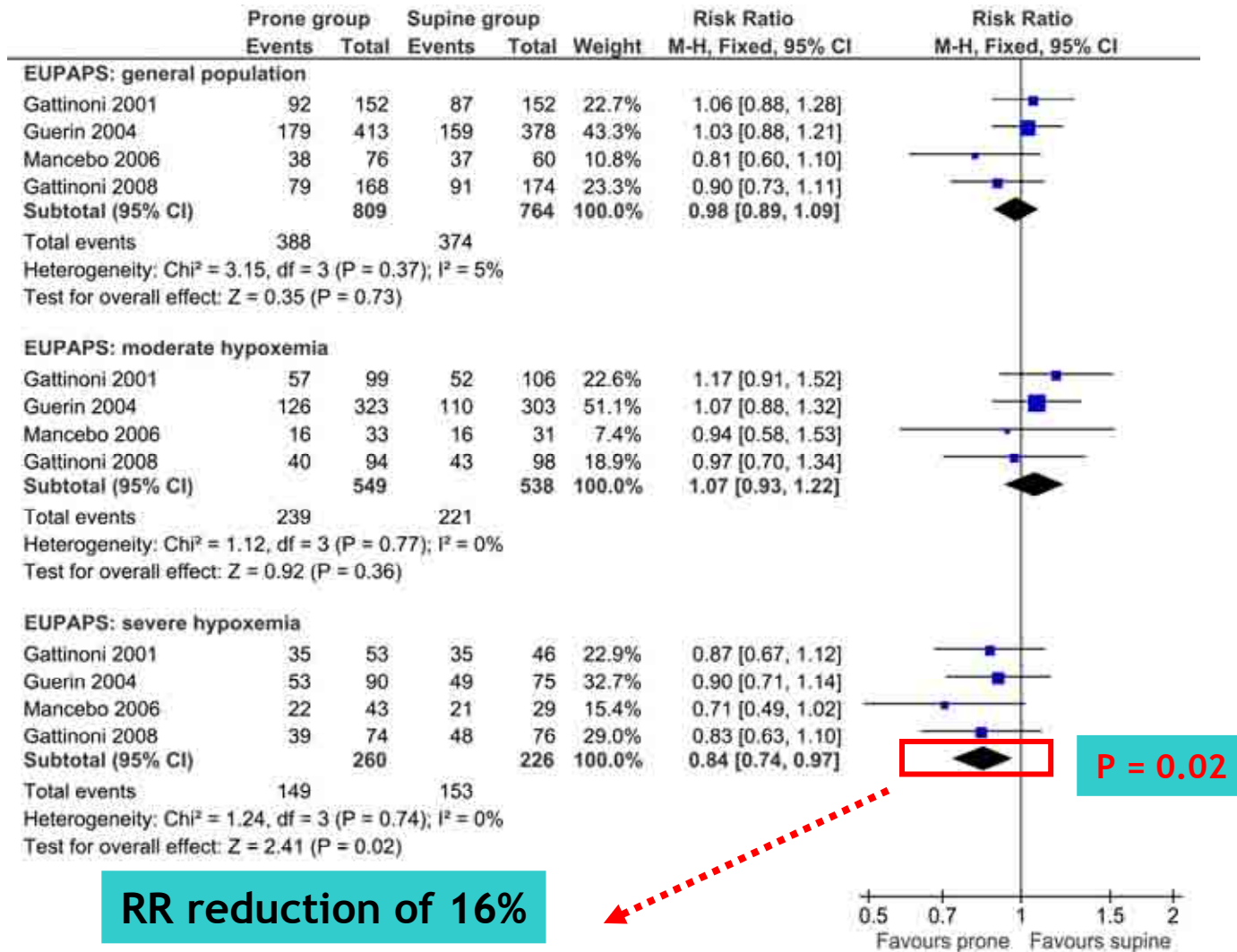


No. at risk	0	30	60	90	120	150	180
Prone	74	45	40	36	35	35	36
Supine	76	40	35	32	31	28	28

Taccone et al. JAMA 2009



Sud S. et al. Prone Ventilation Reduces Mortality in Patients with Acute Respiratory failure and Severe Hypoxemia: Systematic Review and Meta-Analysis



RR reduction of 16%

P = 0.02



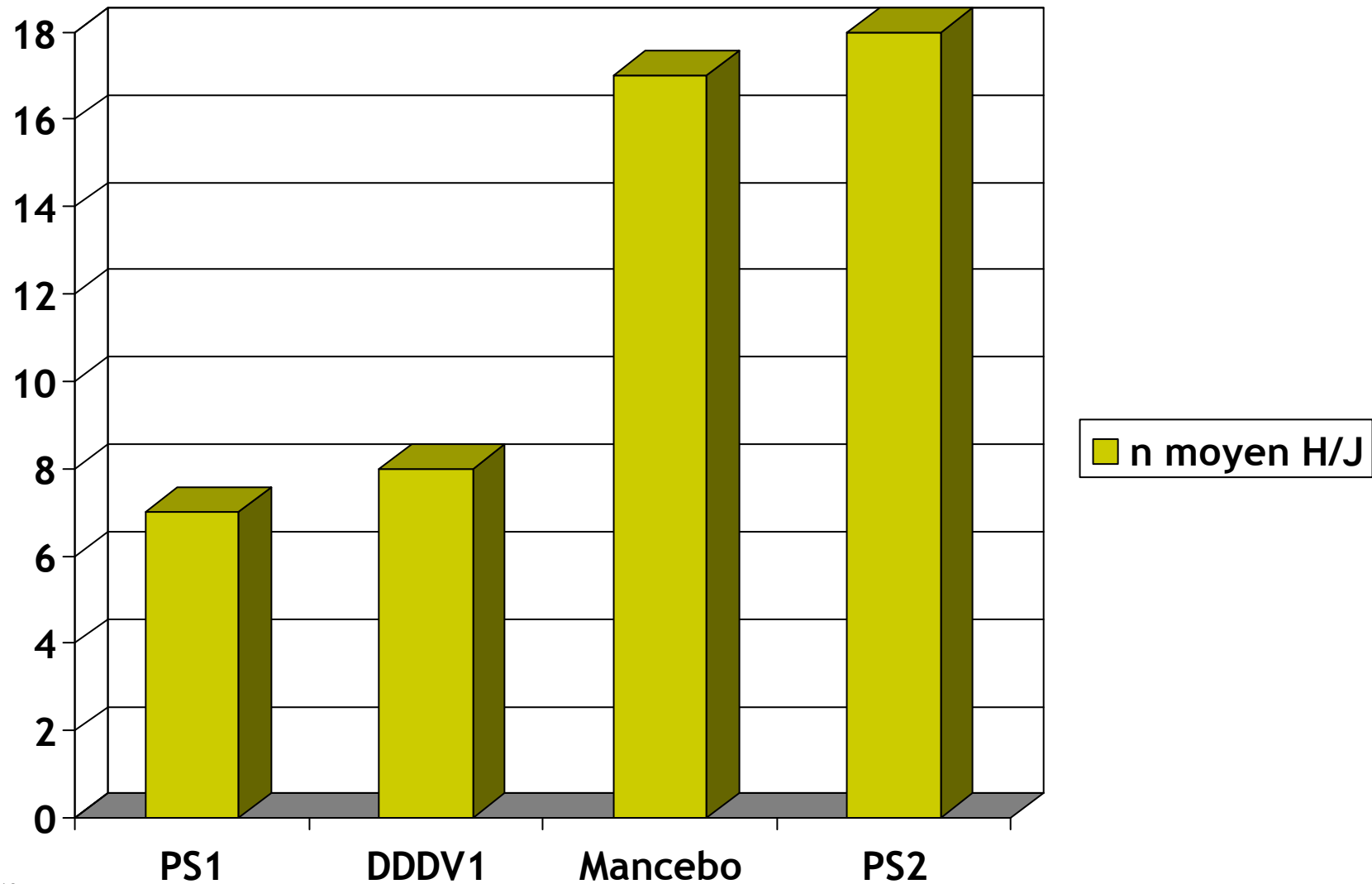
Méta-analyse sur données individuelles



Gattinoni et al. *Minerva Anesthesiology* 2010 (in press)



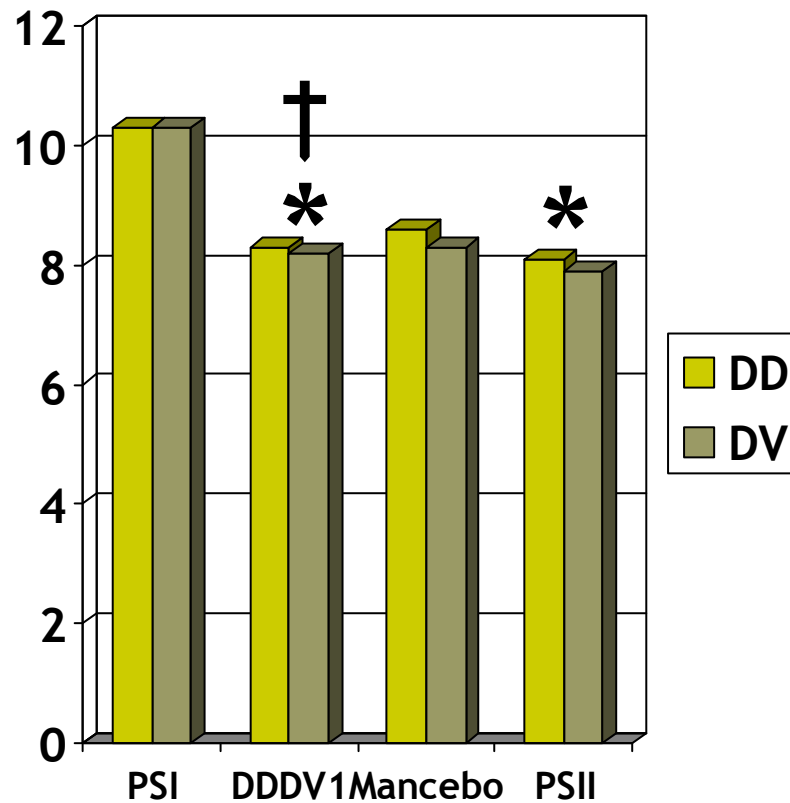
Durée des séances de DV





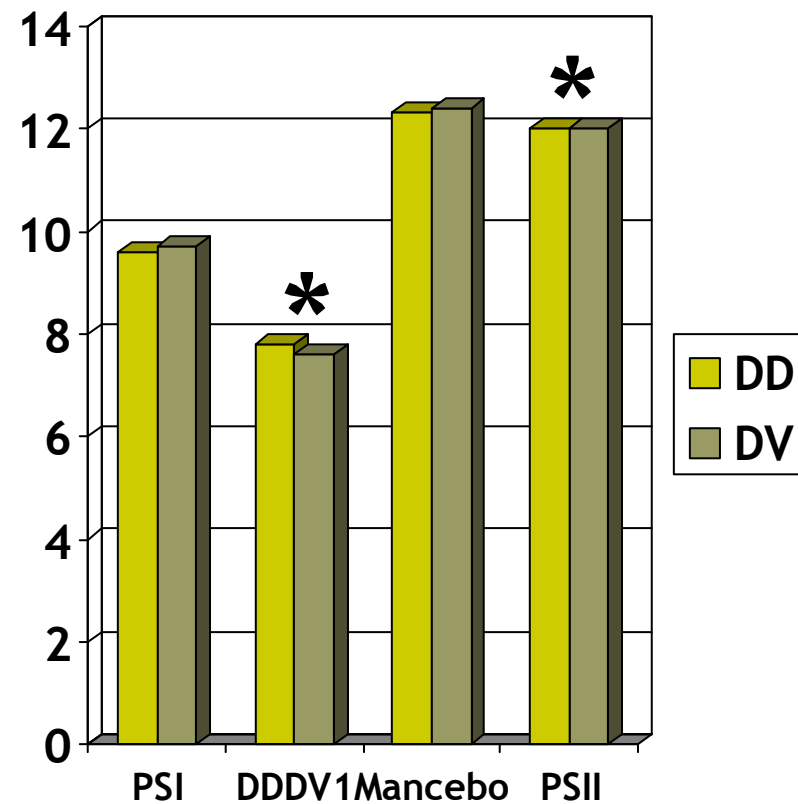
Réglages du ventilateur

VT (ml/kg)



† poids mesuré

PEEP (cmH₂O)

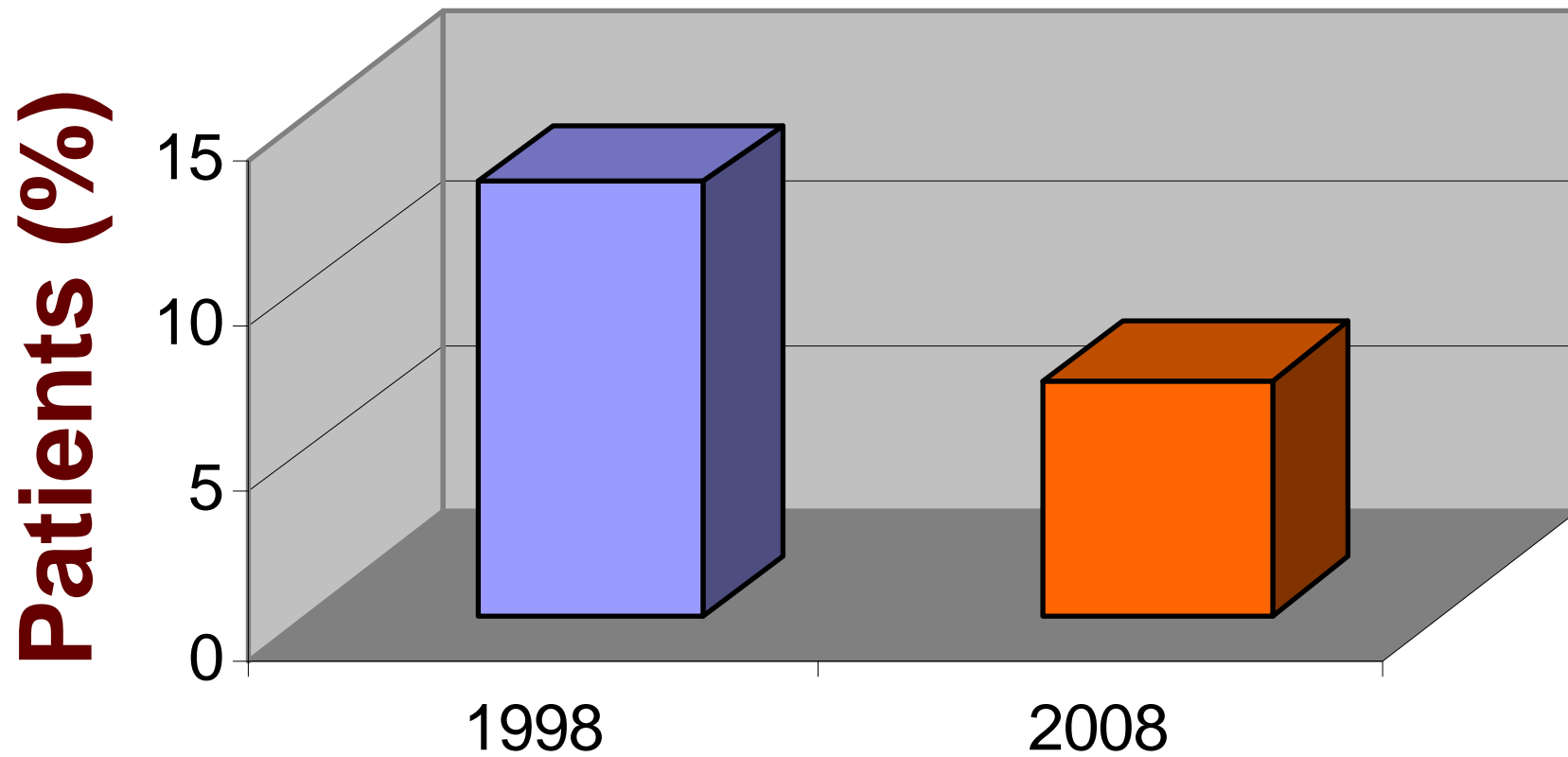


* Tous les patients



Taux d'utilisation du DV

Esteban et al. AJRCCM 2008





DV comme traitement adjuvant dans les essais récents

P/F < 80

P/F < 150

P/F < 300

	CESAR		Acurasys		Express study		LOVS study	
	ECMO (n=90)	control (n=90)	NMBA (n=177)	placebo (n=162)	Low PEEP (n=382)	High PEEP (n=385)	Low PEEP (n=508)	High PEEP (n=475)
Prone	36%	42%	28%	29%	18.8 %	8.8 %	2.3 %	2.6 %
NOi	10%	7%	28%	33%	25.7 %	14.8 %	4 %	6.9 %



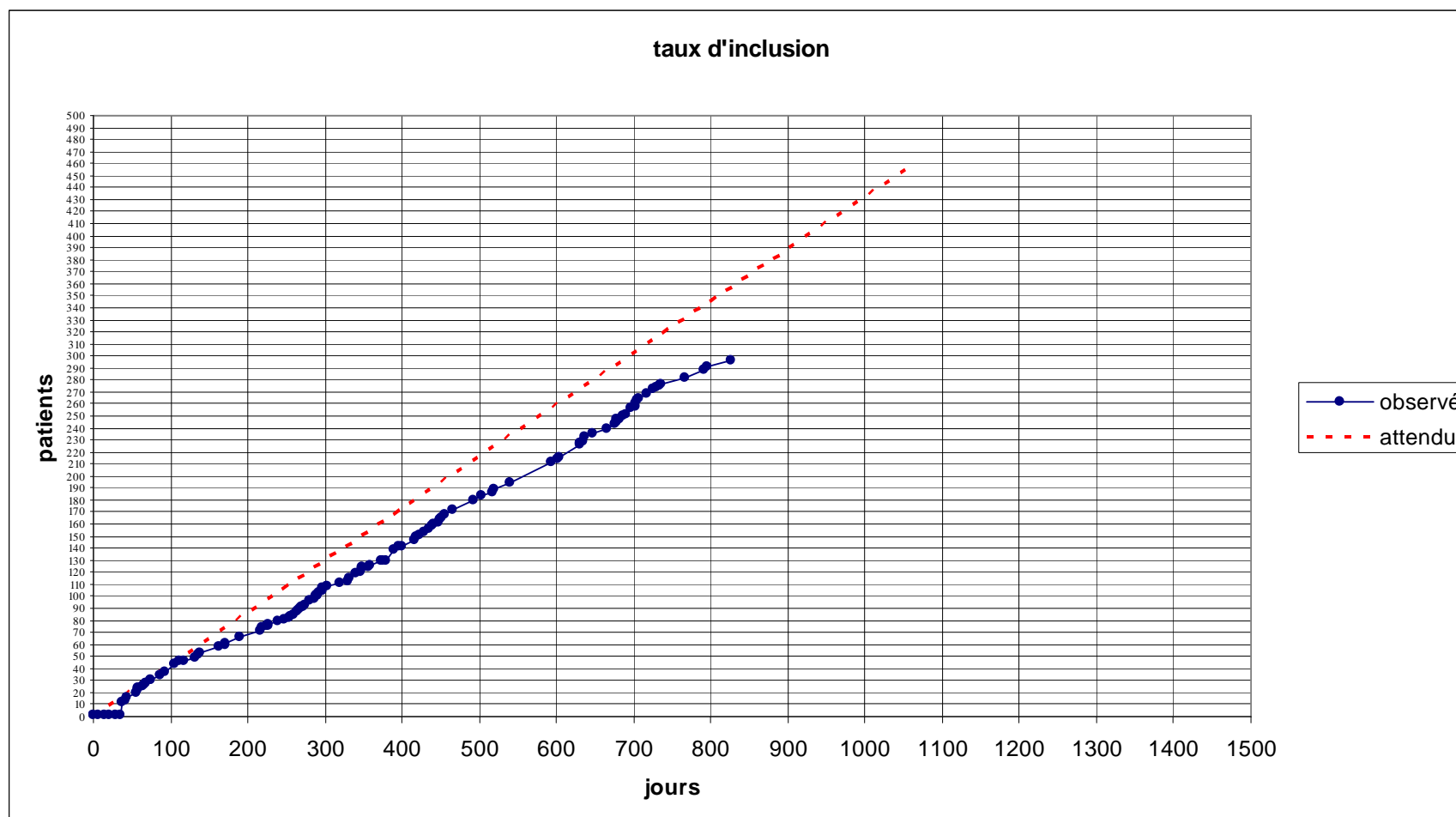
5^{ème} essai randomisé contrôlé en cours en France

Proseva

- **Objectifs**
 - Réduction de mortalité avec le DV
- **Critère de jugement principal**
 - Mortalité J28
- **Bras petit VT étude ARMA en DD vs en DV**
- **DV au moins 16 Hs/J**
- **Patients avec SDRA sévère et persistant**
 - $P/F < 150$ mmHg $F_1O_2 \geq 60\%$ $PEP \geq 5$ cmH₂O
 - Critères de SDRA présents après 12-24 Hrs
- **Puissance**
 - Réduction de mortalité de 60 à 45% par le DV, α 5%, β 20%
 - 230 patients par groupe



Situation actuelle



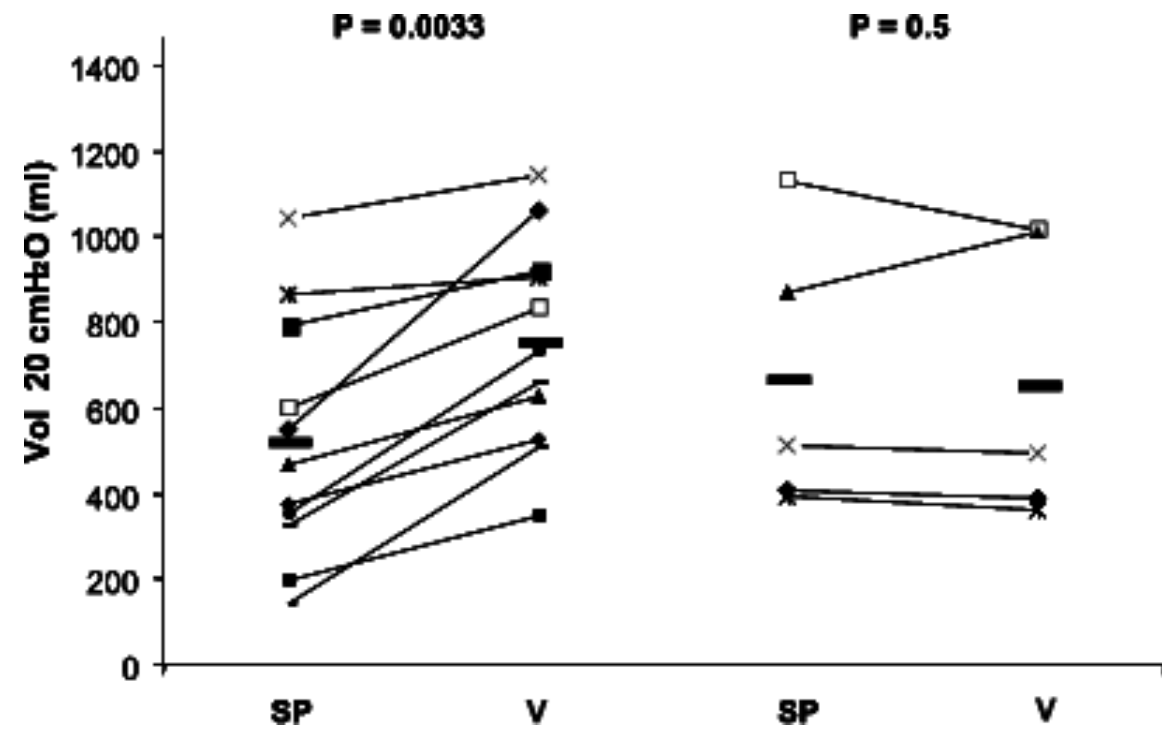


Position Verticale

JCM Richard ICM 2006



Augmentation de PaO₂ > 40% =
répondeurs





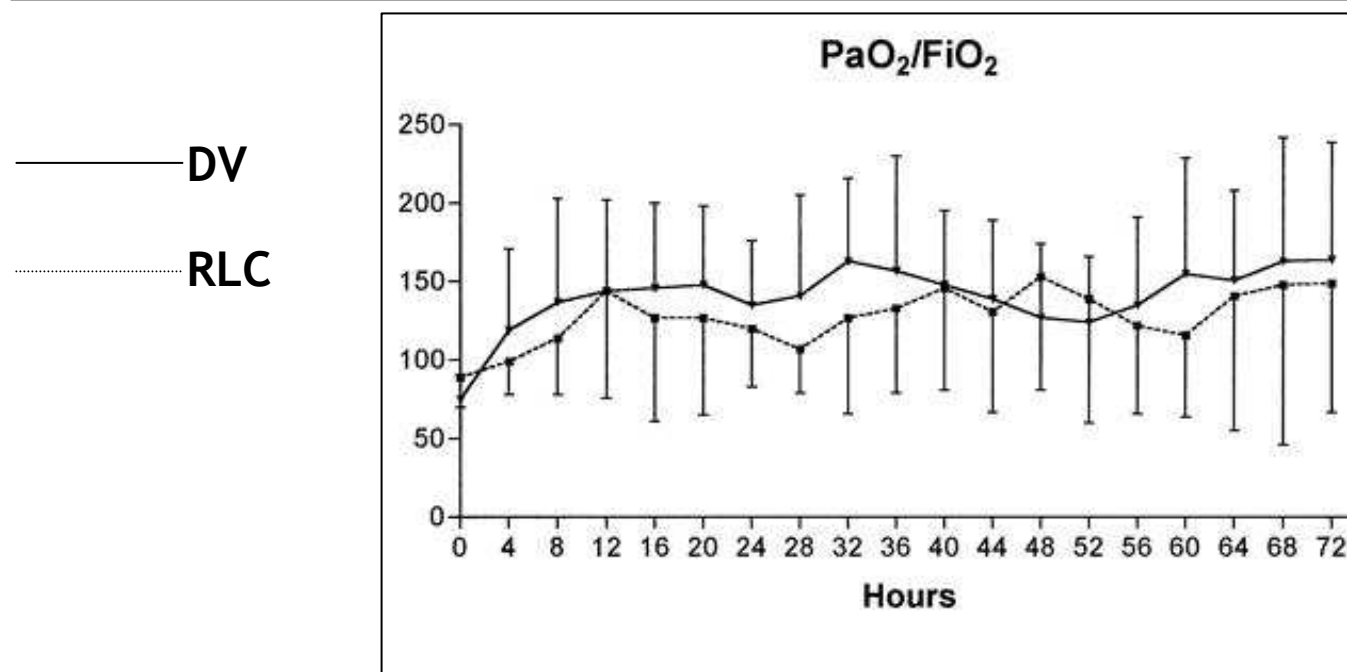
Rotation Latérale Continue





DV vs. RLC

Staudinger et al. CCM 2001



- 26 SDRA DV (n= 12) vs. RLC (n=14)
- DV: 22-20 Hrs/J
- RLC: 4 min par cycle, 124°
- P/F basal: **82** (49-107) mmHg DV vs. **88** (67-136) mmHg RLC
- P/F amélioré chez 10 pts DV (**83%**) et 7 RLC (**50%**)
- Manque de puissance: Δ P/F 30 mmHg, DS 30 mmHg, α 5%, β **30%**



Conclusions

- **DV : non en routine pour tous les SDRA**
- **Peut-être systématiquement pour les SDRA les plus hypoxémiques**
 - **Si mis en route précocement, pour des séances prolongées**