

SDRA: prise en charge des 48 premières heures

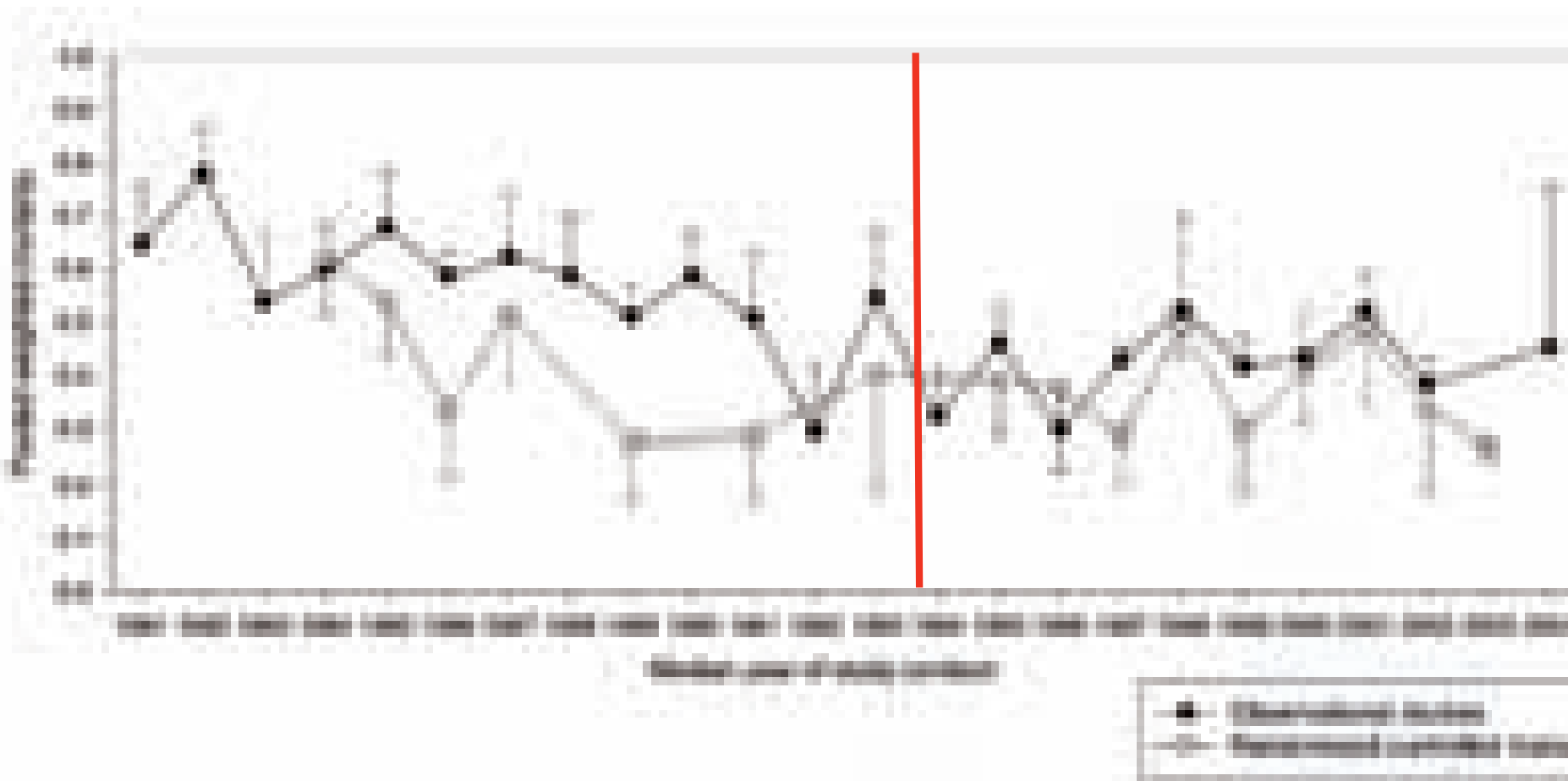
laurent.papazian@gmail.com

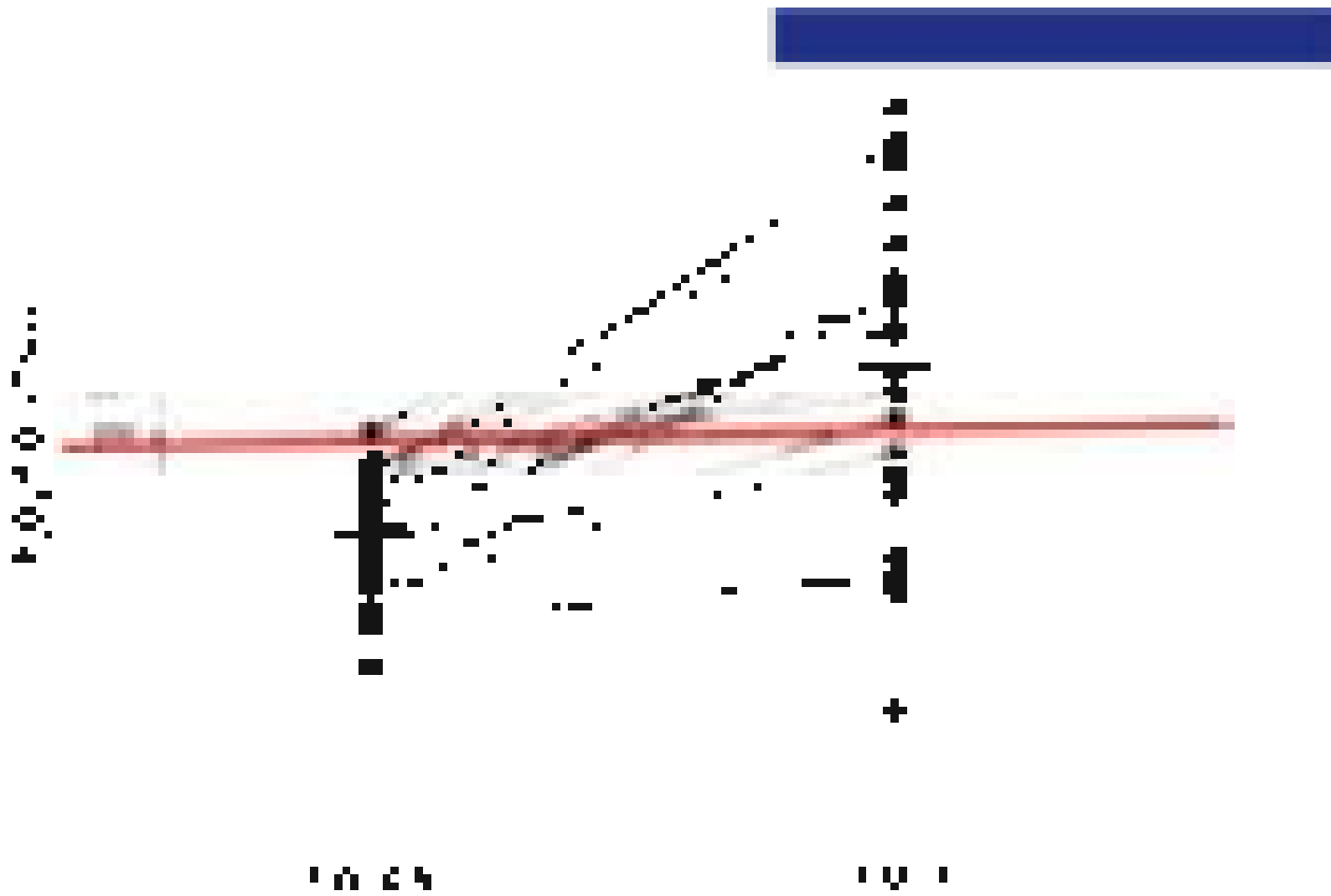


Floral arrangement featuring pink and orange blooms in a dark vase.

Evolution mortalité

Phua et al. AJRCCM 2009





Correction de l'hypoxémie

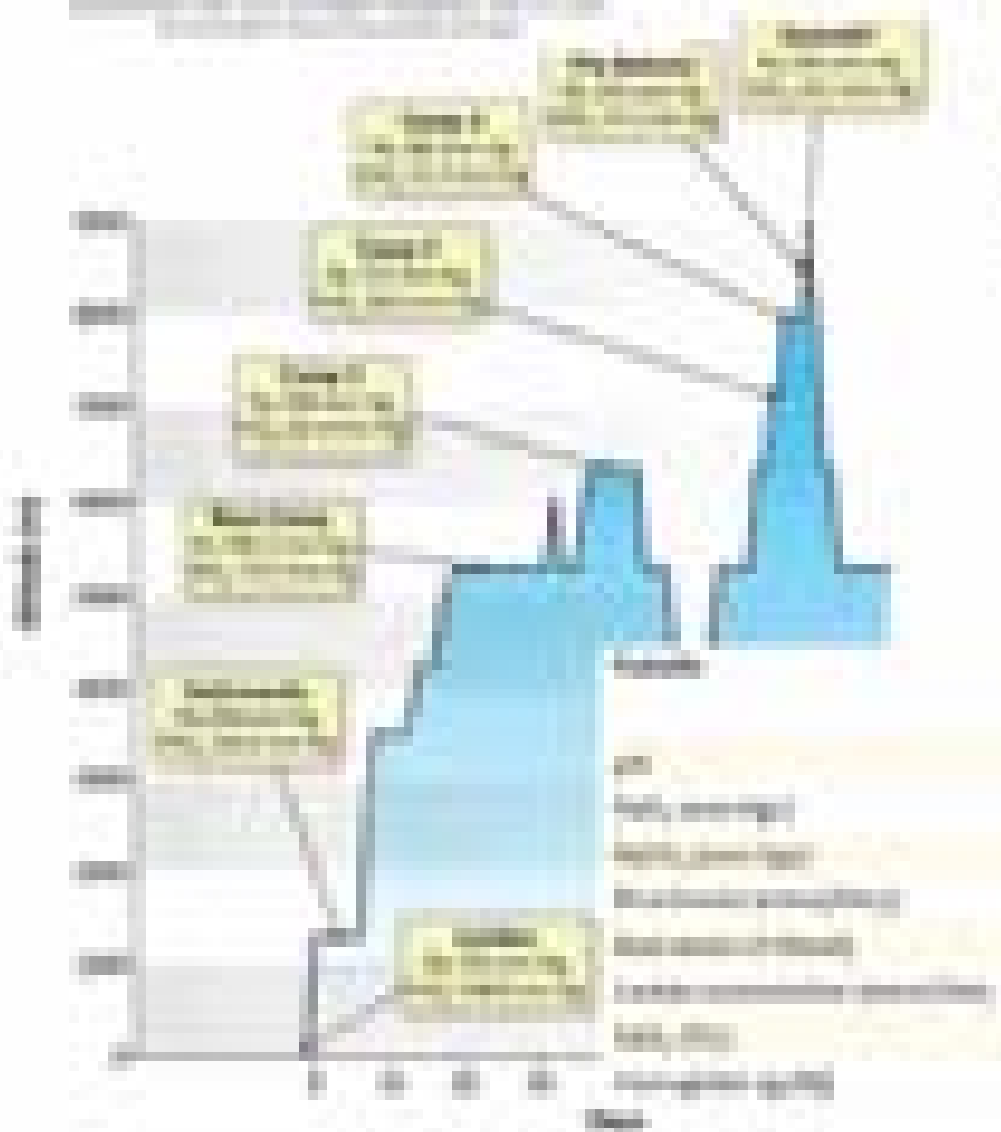
Préservation du parenchyme pulmonaire

2019-2020 Budget

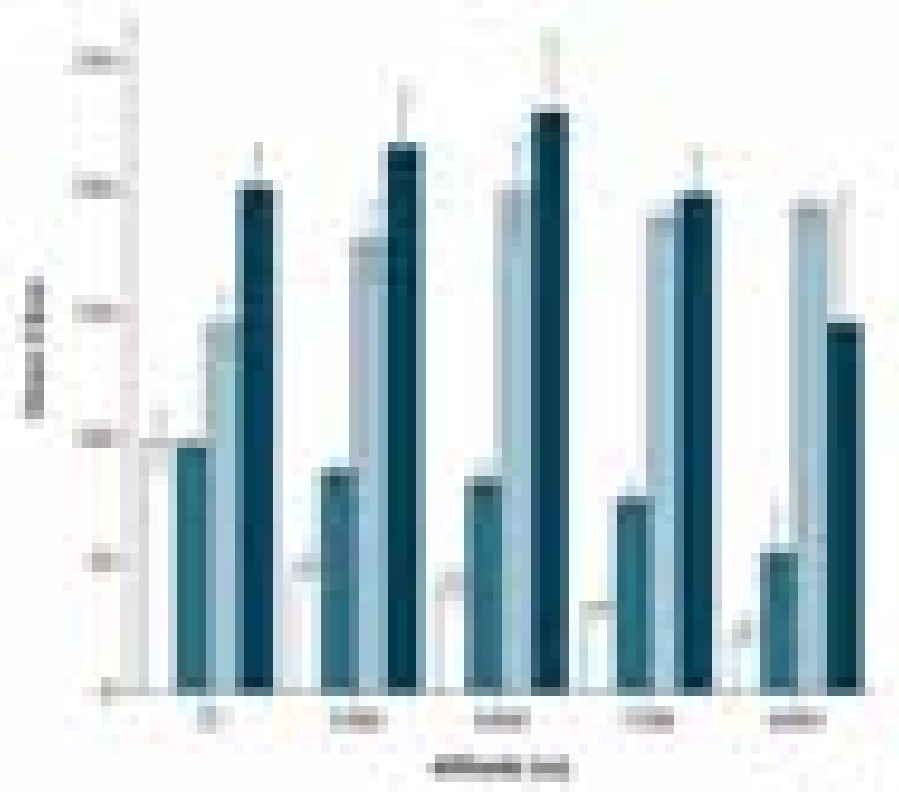
2019-2020 Budget

2019-2020 Budget

2019-2020 Budget



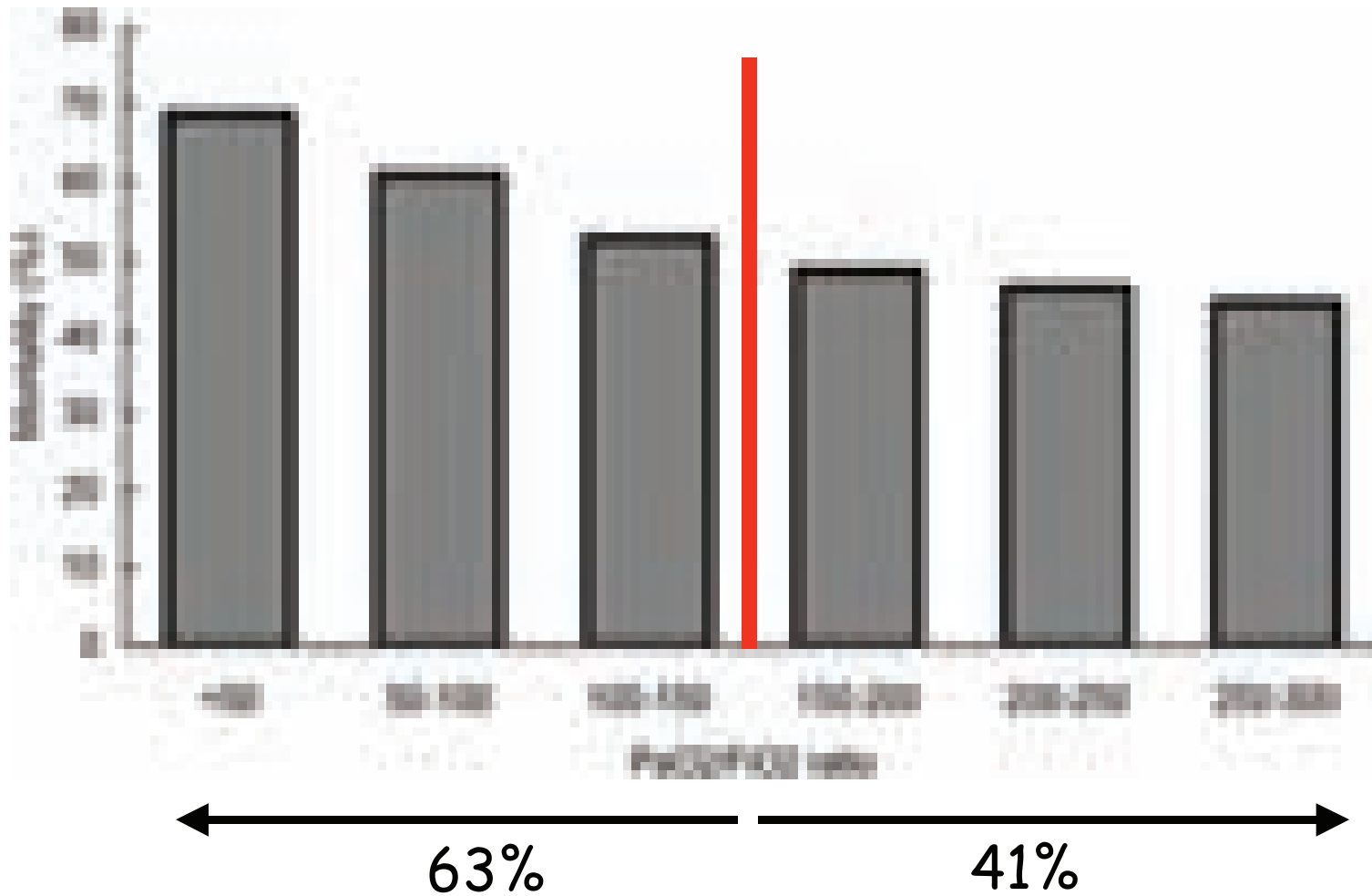
2019-2020 Budget



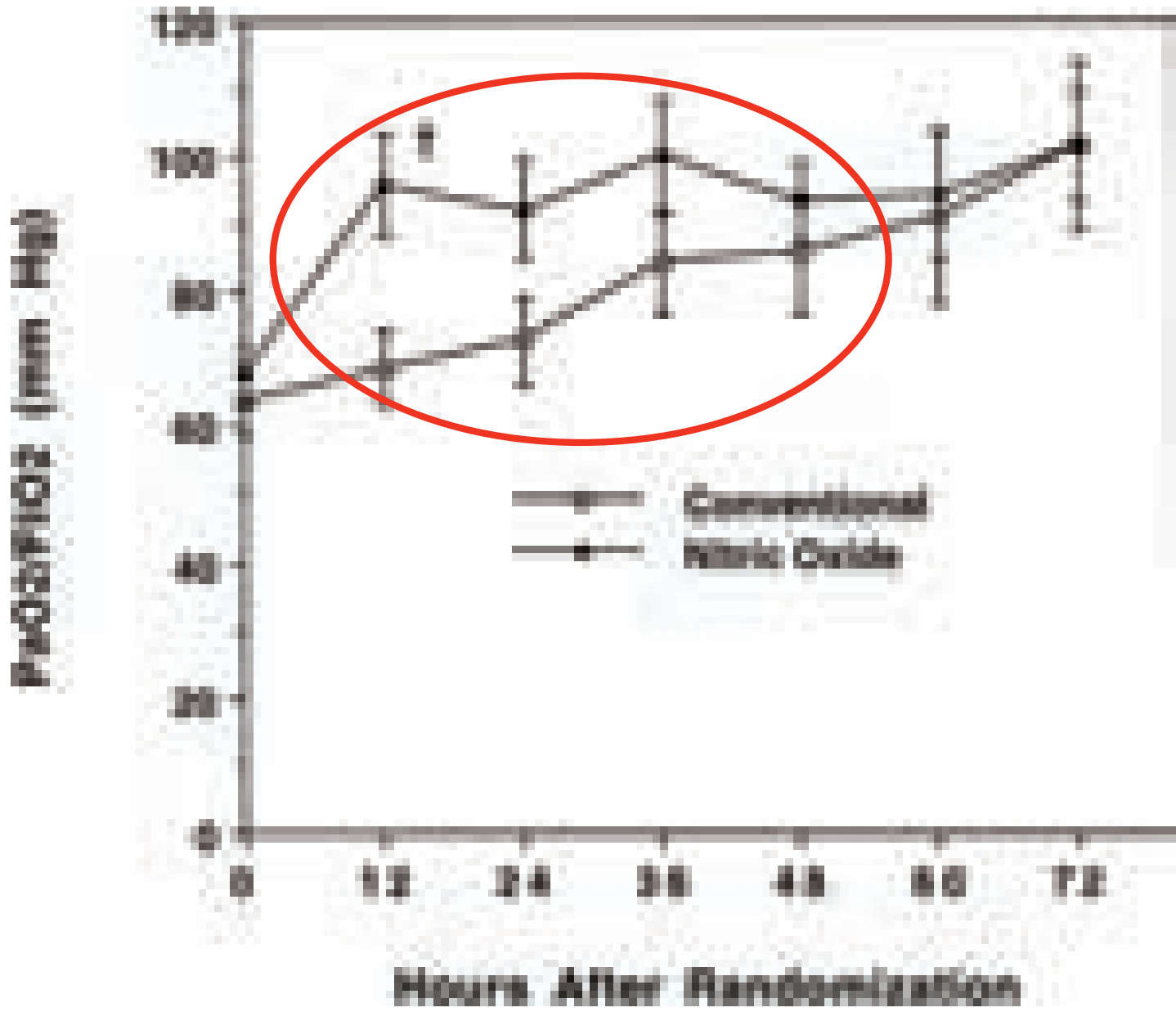
Category	2018-2019 Budget	2019-2020 Budget	2018-2019 Actual	2019-2020 Actual
Personnel	1,000,000	1,000,000	1,000,000	1,000,000
Materials	1,000,000	1,000,000	1,000,000	1,000,000
Utilities	1,000,000	1,000,000	1,000,000	1,000,000
Professional Services	1,000,000	1,000,000	1,000,000	1,000,000
Travel	1,000,000	1,000,000	1,000,000	1,000,000

PaO₂/FIO₂ et mortalité

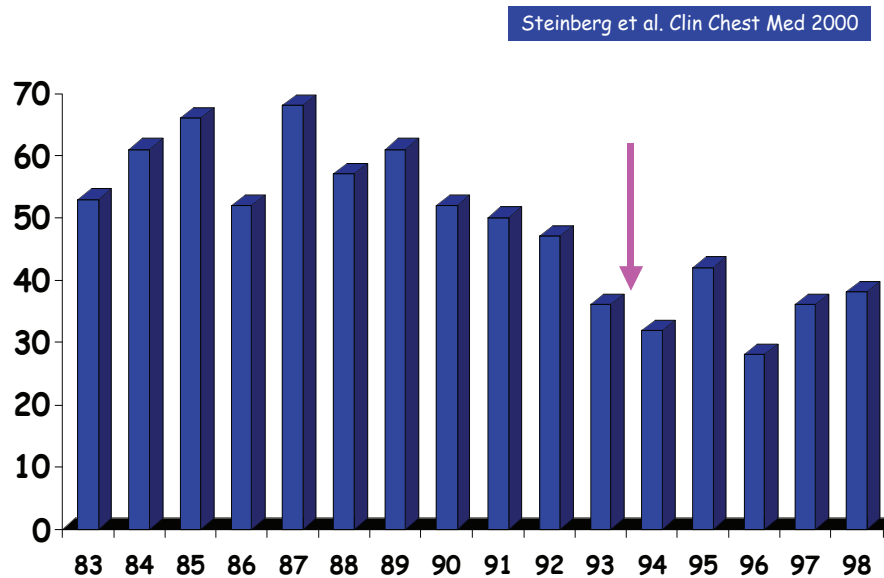
Etude européenne ALIVE



Brun-Buisson et al. ICM 2004



Mortalité hospitalière

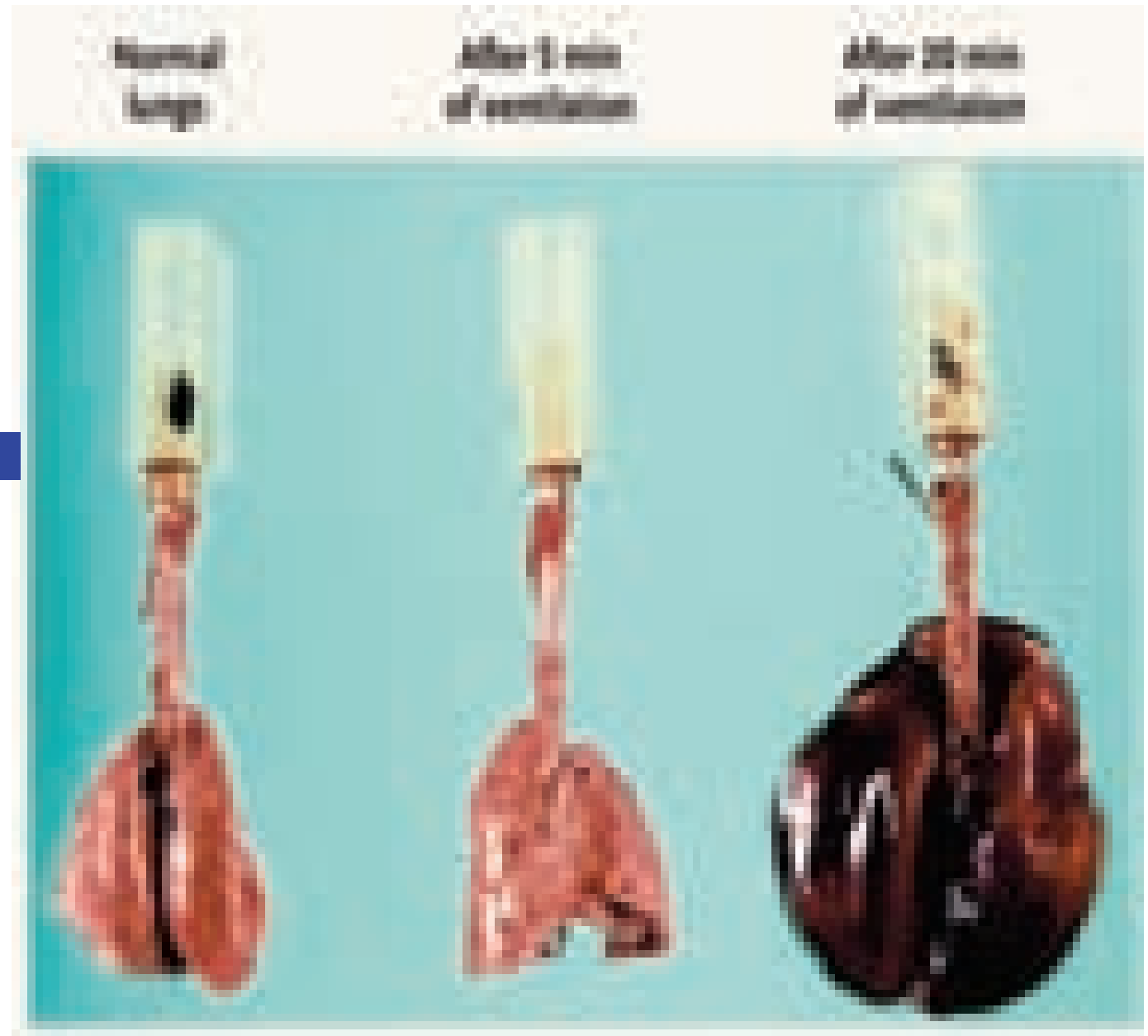


« Par ma foi ! il y a plus de quarante ans que **je fais de la protection du poumon** sans que j'en susse rien, et je vous suis le plus obligé du monde de m'avoir appris cela. »

Adapted from: Molière – Le bourgeois gentilhomme

Effets délétères ventilation mécanique

Dreyfuss et Saumon AJRCCM 98



Second-hit

arguments expérimentaux

- **Sur poumon lésé**
 - ↗ œdème: synergie ANTU - Vt 45 ml/kg

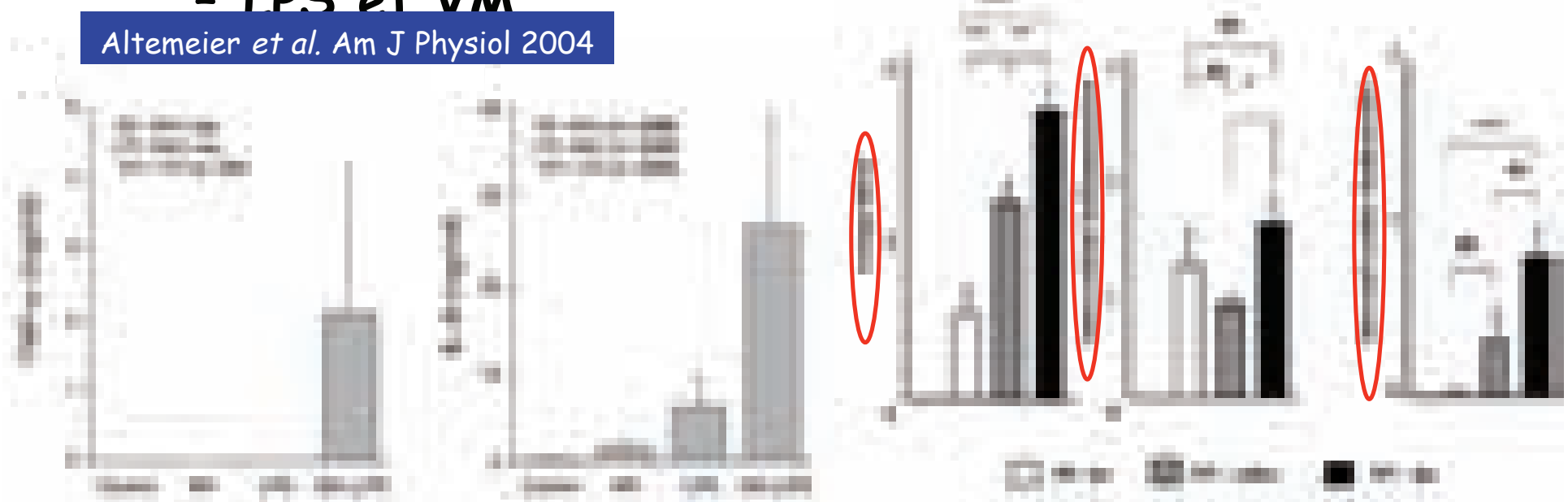
Dreyfuss et al. AJRCCM 95

- **Sur poumon sain**

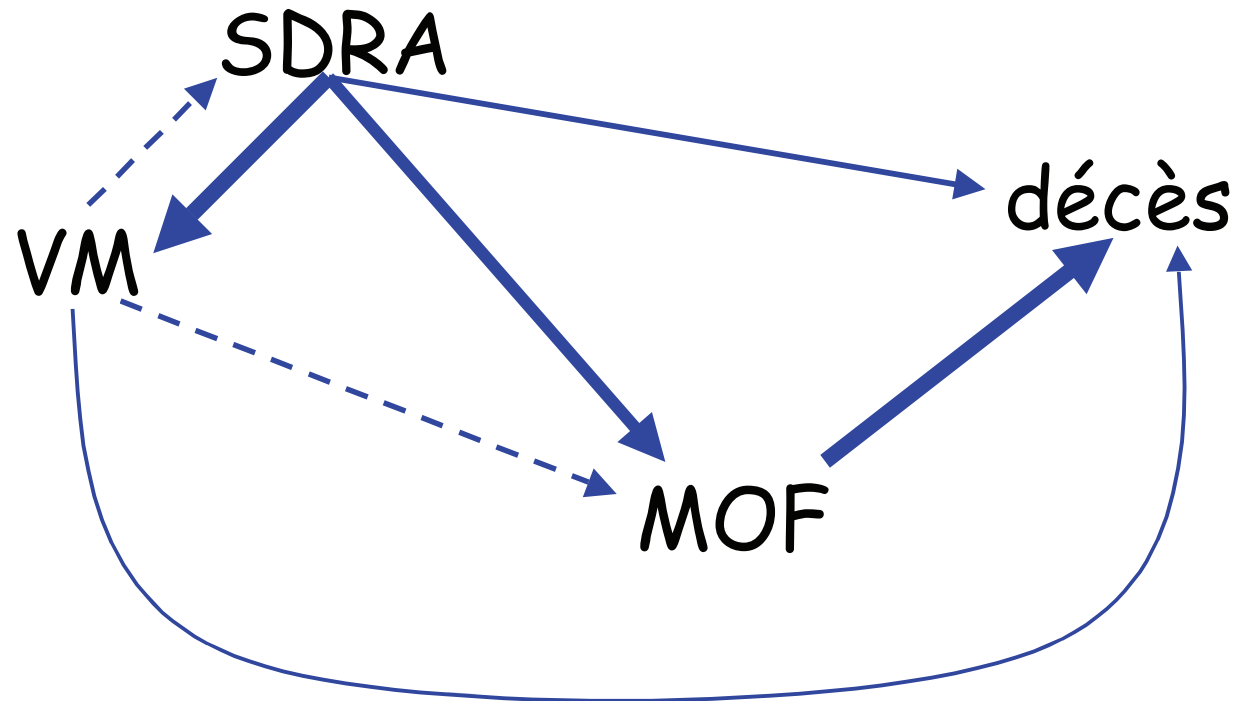
- LPS et VM

Altmeier et al. Am J Physiol 2004

Brégeon et al. Anesthesiology 2005



SDRA, VM et pronostic



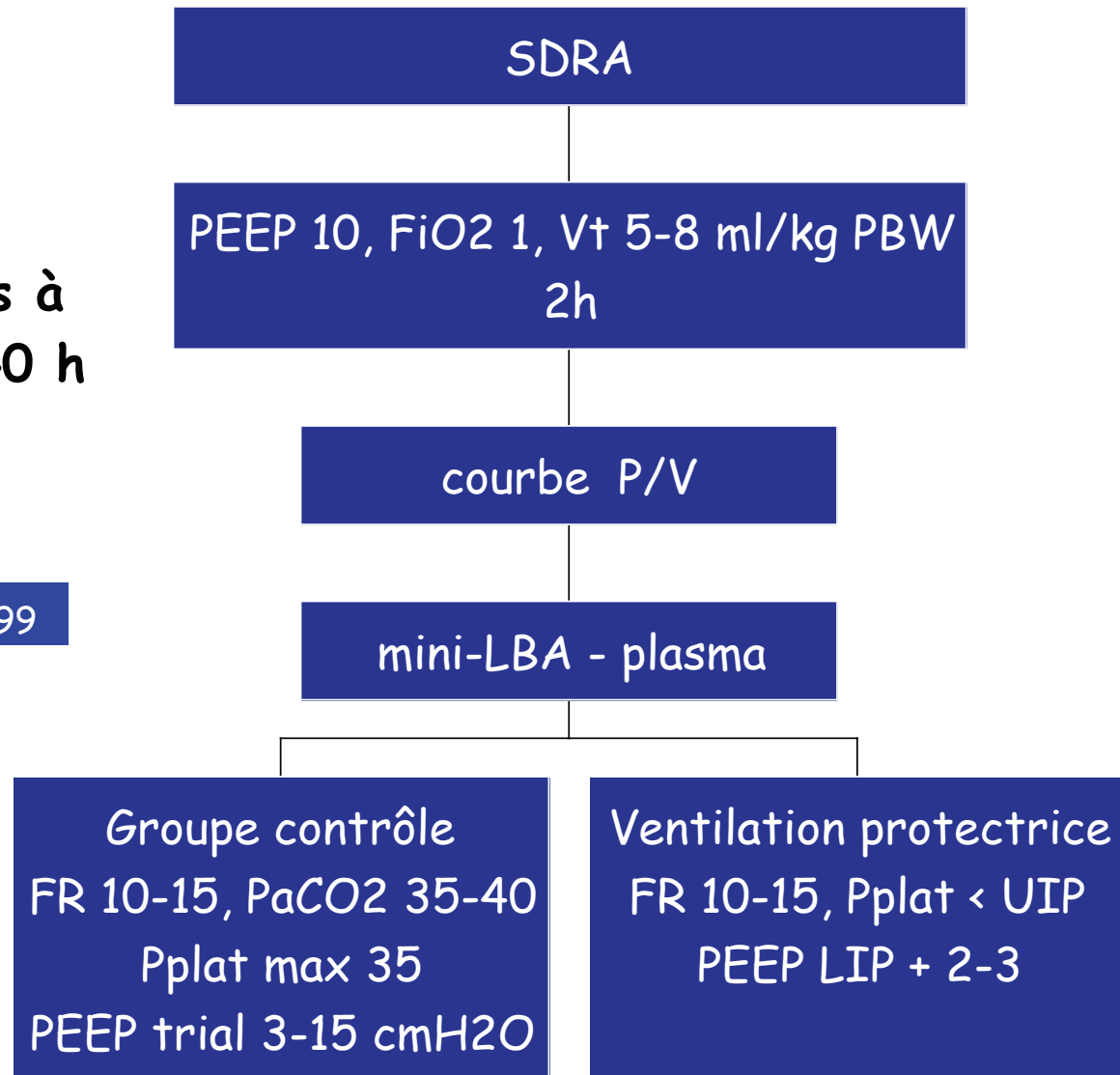
Ce dont on ne parlera pas ce soir...

- **Modes ventilatoires**
 - APRV
 - HFO
- **Médicaments**
 - Surfactant
 - VLP
 - Corticoïdes
 - Almitrine
- **Autres adjuvants**
 - VD
 - Nutrition
 - Kiné

Ventilation protectrice au cours du SDRA

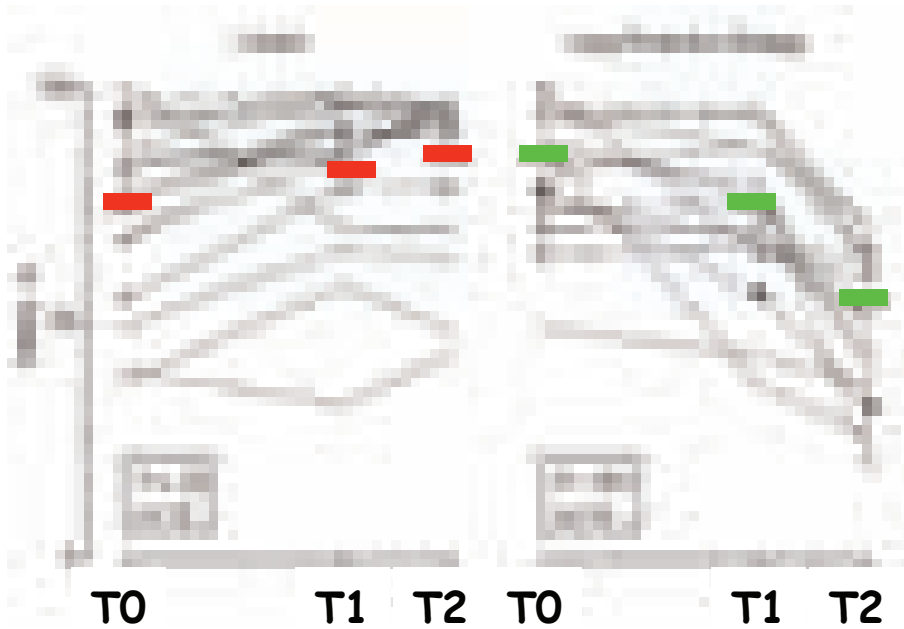
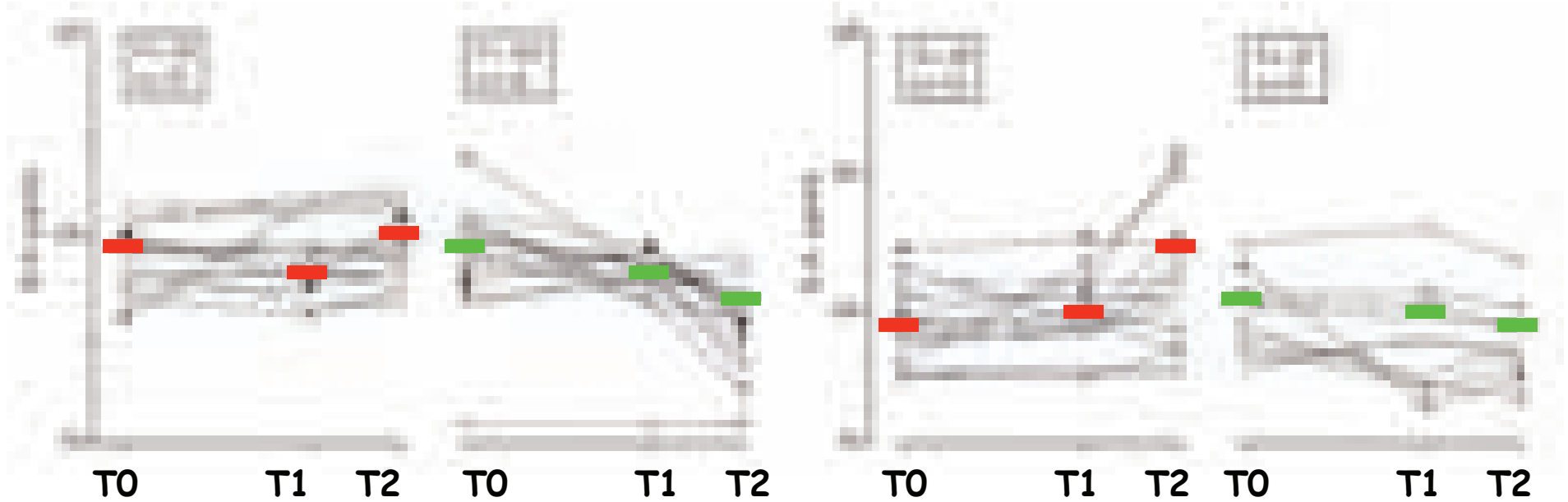
- 37 patients
- Mesures répétées à 24-30 h et 36-40 h

Ranieri *et al.* JAMA 99



LBA

plasma

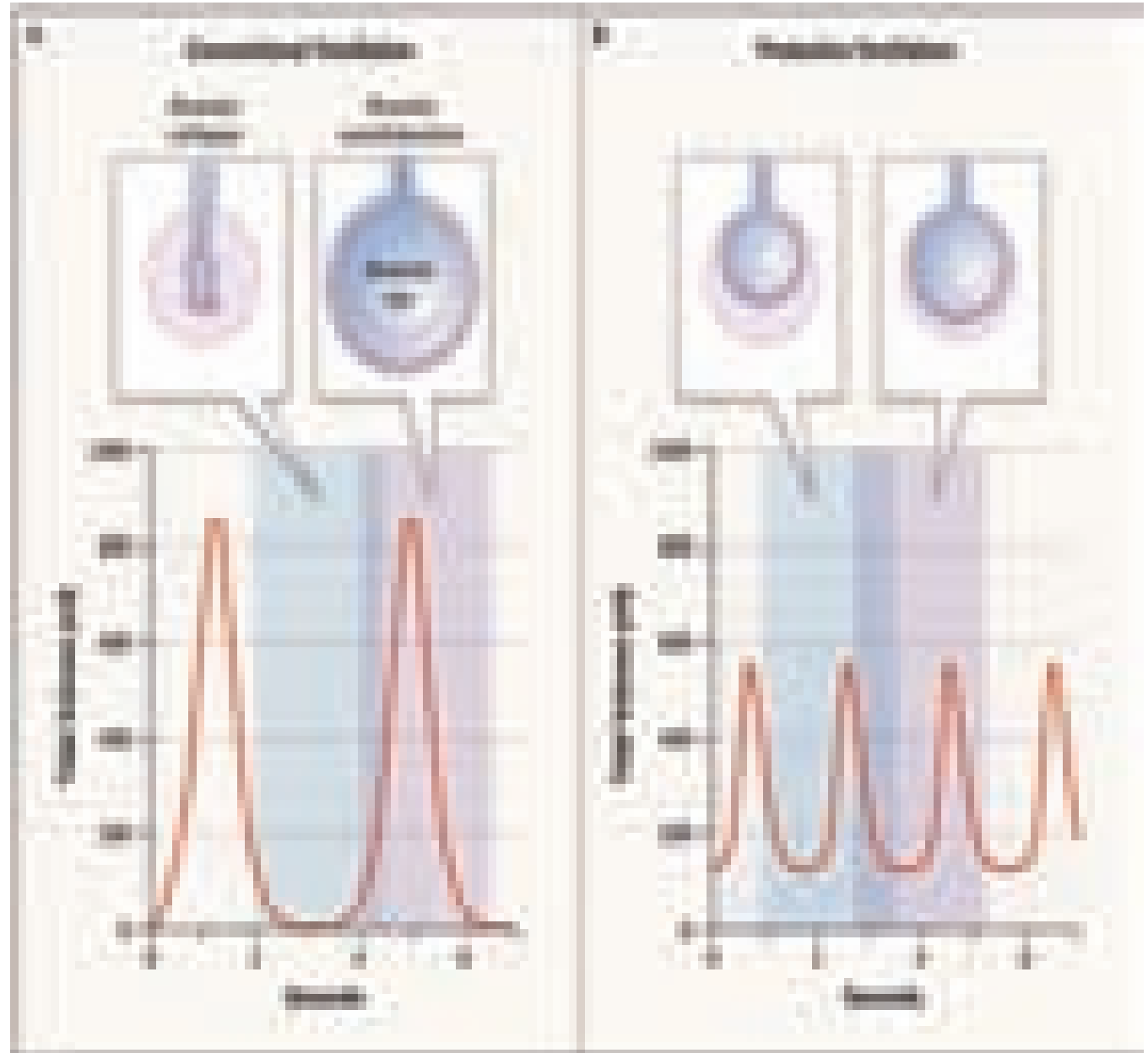


Ranieri et al. JAMA 99

Décompartementalisation

Optimisation du réglage du ventilateur

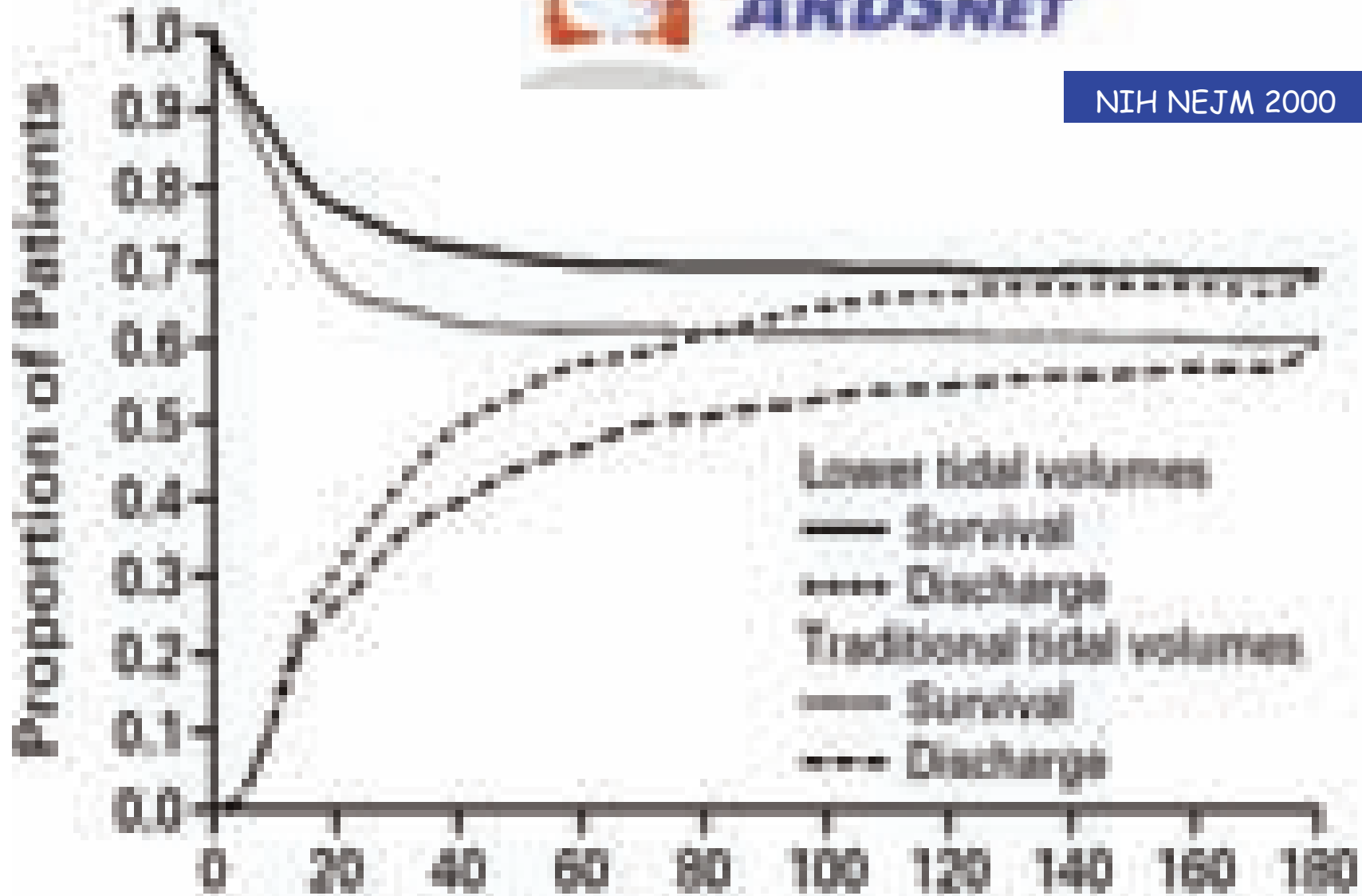
Ventilation protectrice: modèle idéal

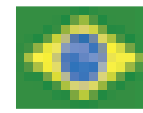
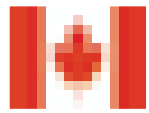


SDRA = NIH ?



NIH NEJM 2000





	PLV	cont	PLV	cont	PLV	cont	PLV	cont	PLV	cont
n	60	60	26	26	58	58	29	24	400	400
Vt	7.0	10.7	7.5	10.2	7.1	10.5	6.0	12.0	6.2	11.8
PEEP	8.6	7.2	9.5	8.3	10.7	10.7	16.4	8.7	9.4	8.6
Pplat	22	27	28	31	26	32	30	37	25	33

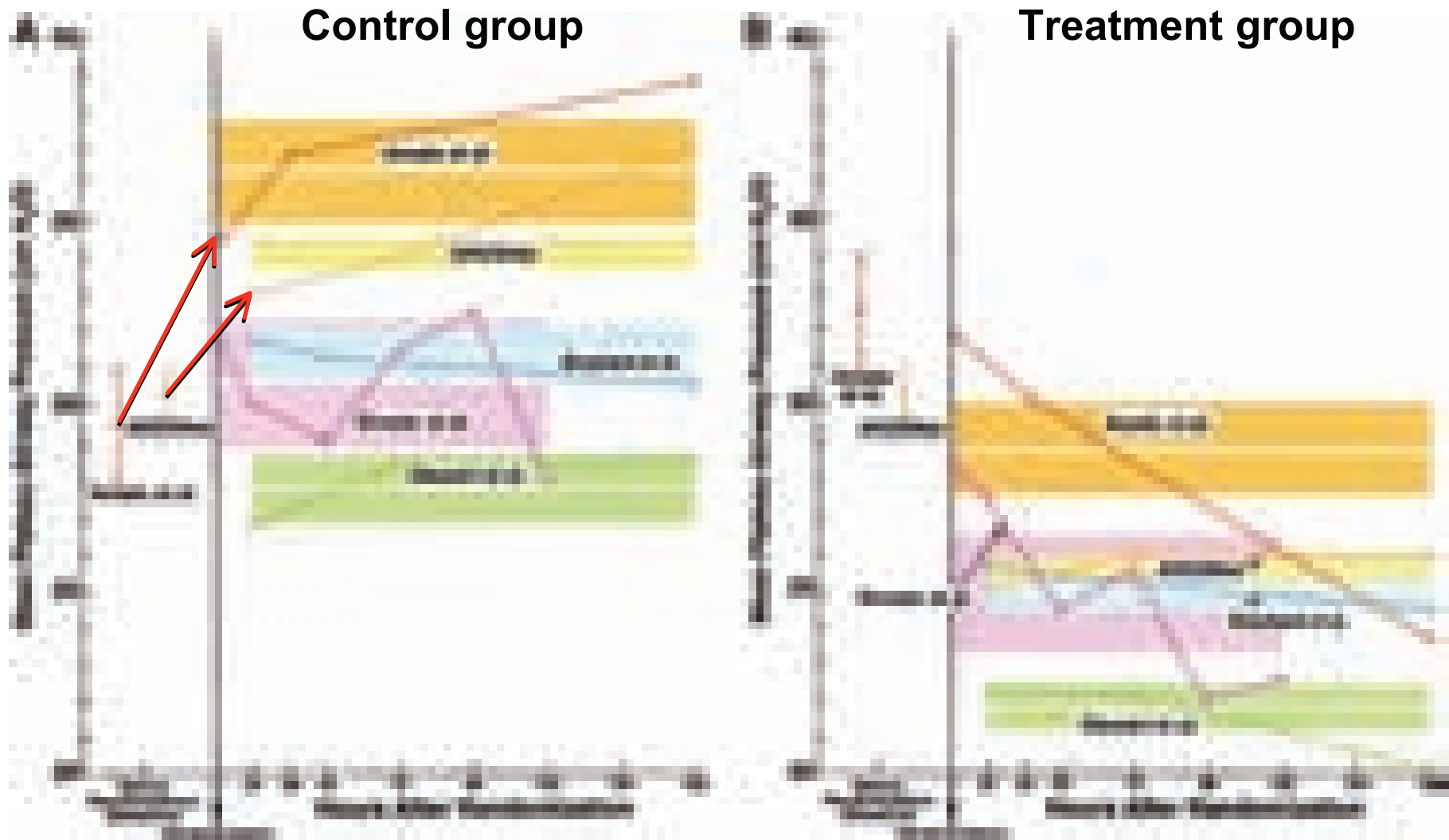


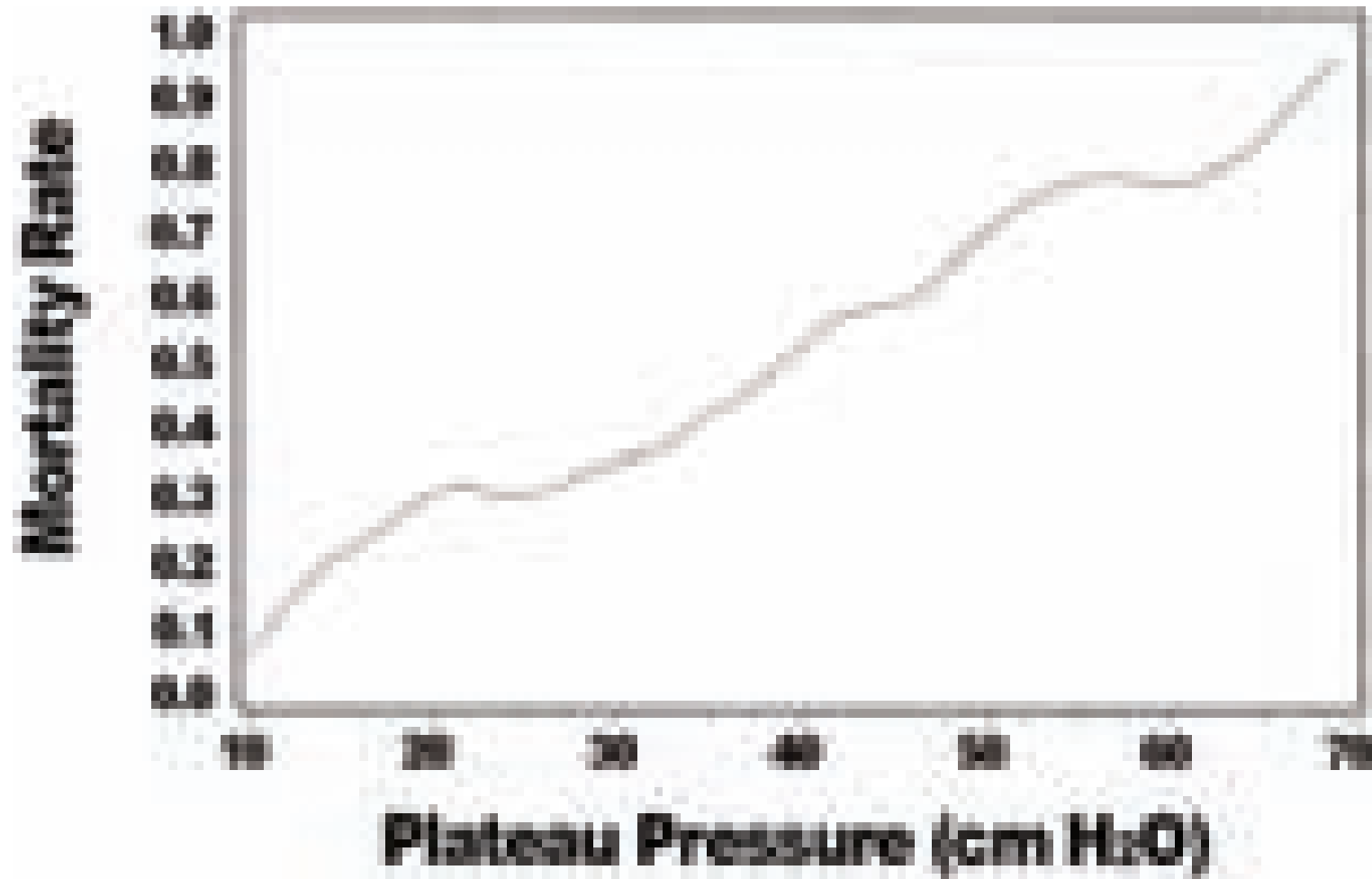
Table 1. Summary of the results of the analysis of variance (ANOVA) for the effect of the different factors on the response variables. The table is rotated 90 degrees counter-clockwise.

Response Variable	Factor	Mean	SE	DF	F	P	MSD
Survival (%)	Sex	8.6	0.5	1	3.2	0.08	0.5
	Age	8.6	0.5	1	3.2	0.08	0.5
	Sex x Age	8.6	0.5	1	3.2	0.08	0.5
Survival (log10 CFU/g)	Sex	8.6	0.5	1	3.2	0.08	0.5
	Age	8.6	0.5	1	3.2	0.08	0.5
	Sex x Age	8.6	0.5	1	3.2	0.08	0.5
Survival (log10 CFU/g)	Sex	8.6	0.5	1	3.2	0.08	0.5
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Survival (log10 CFU/g)	Sex	8.6	0.5	1	3.2	0.08	0.5
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	Sex x Age	8.6	0.5	1	3.2	0.08	0.5

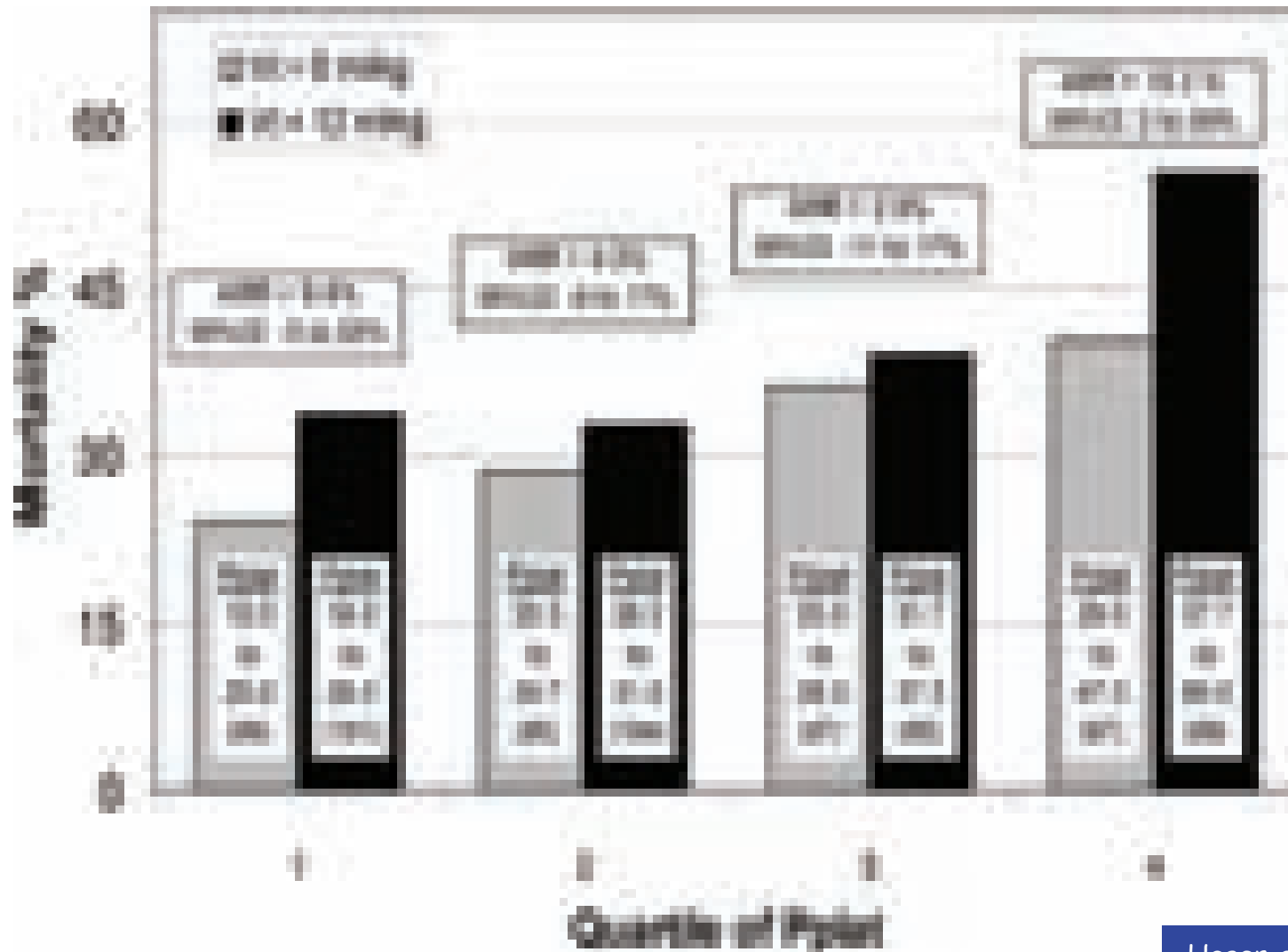
3)

8.6 (7.4-10.0)

Relation Pplat à J1 – mortalité dans l'étude du NIH



Bénéfice d'une réduction du V_t quelle que soit la P_{plat}

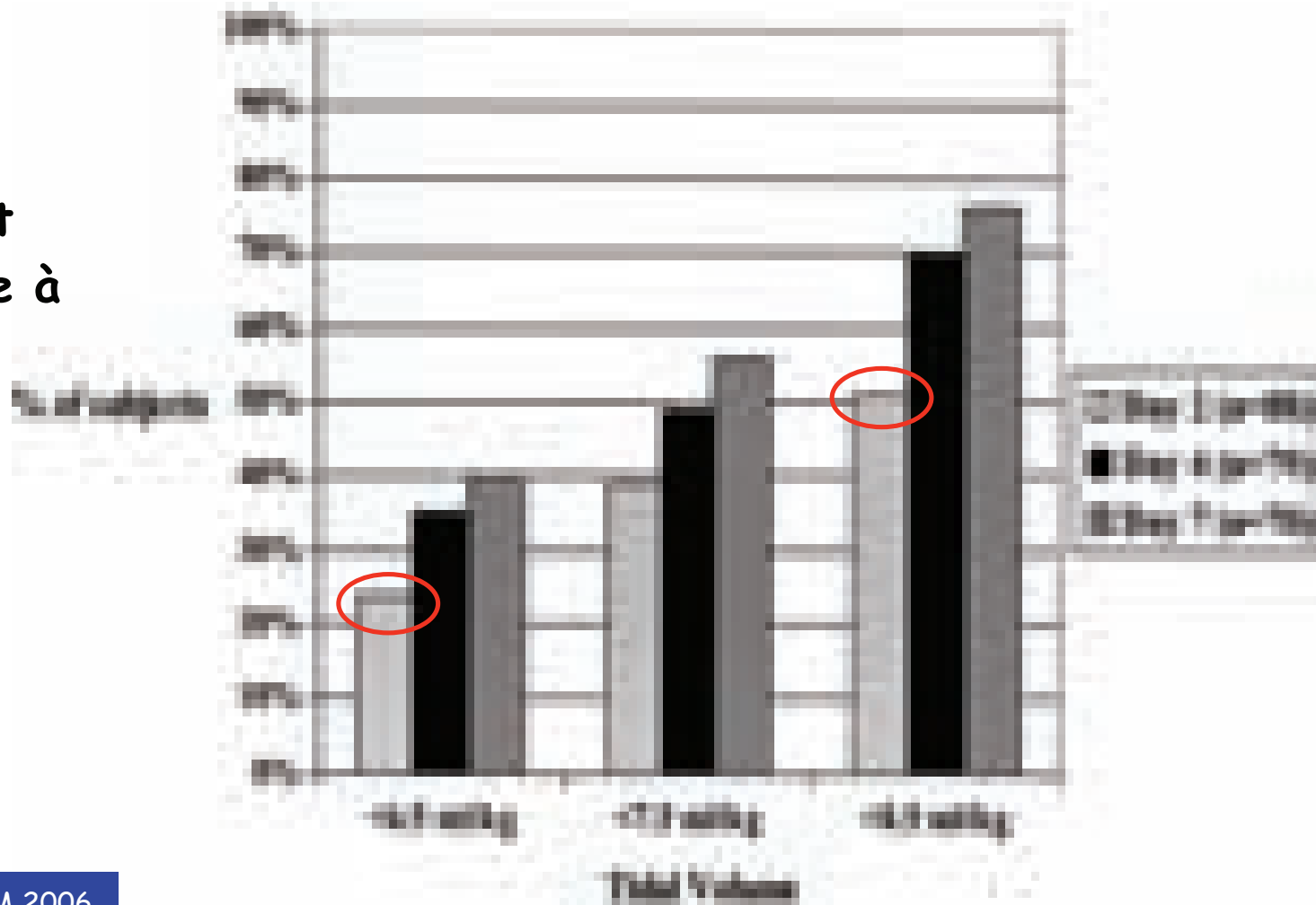


Application réduction Vt

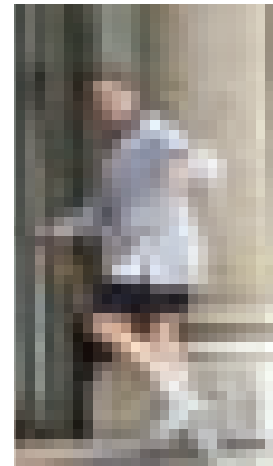
N = 88 ALI

2000-2002

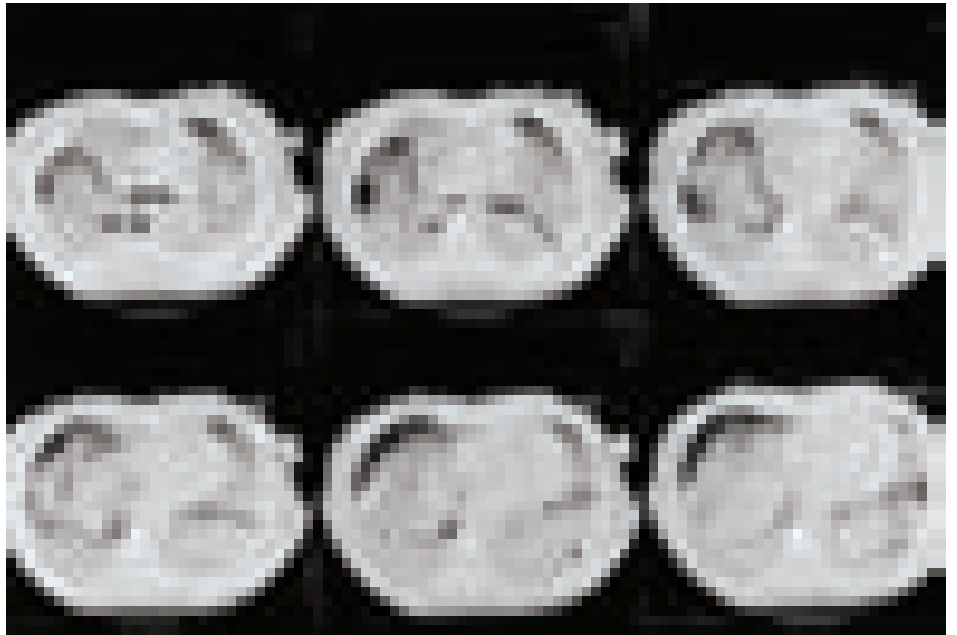
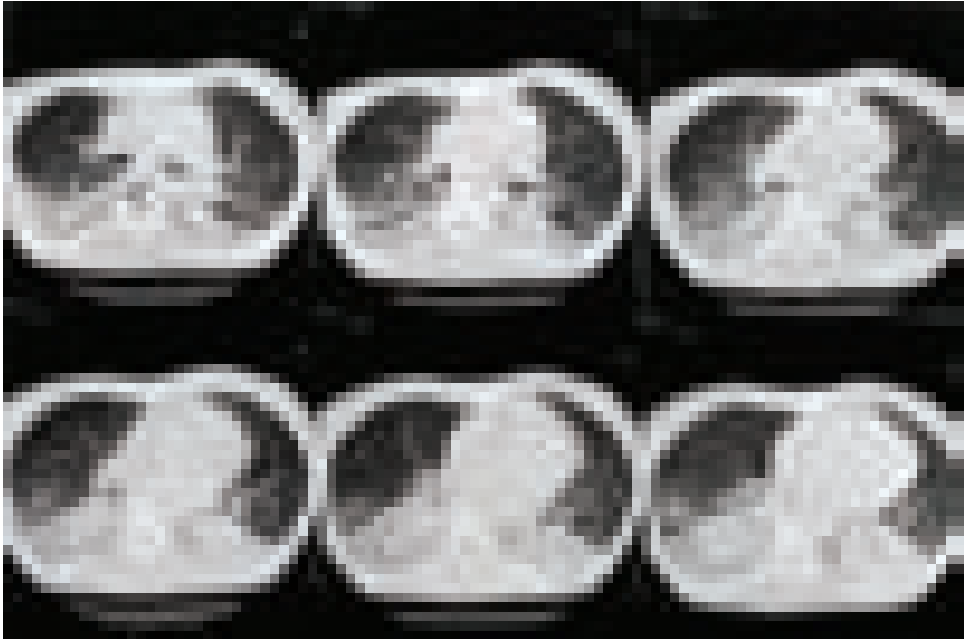
Equipe ayant
participée à
ARMA

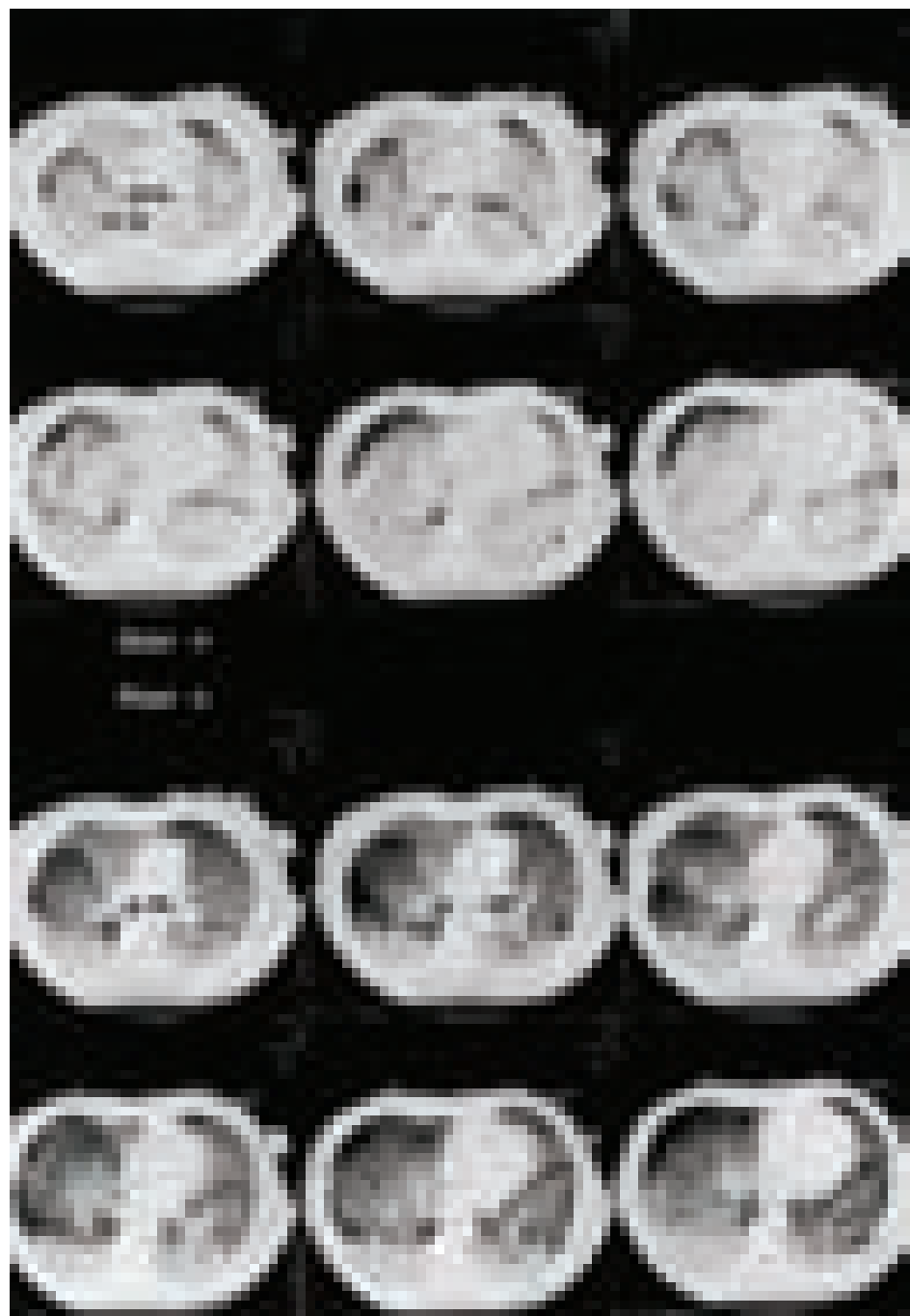
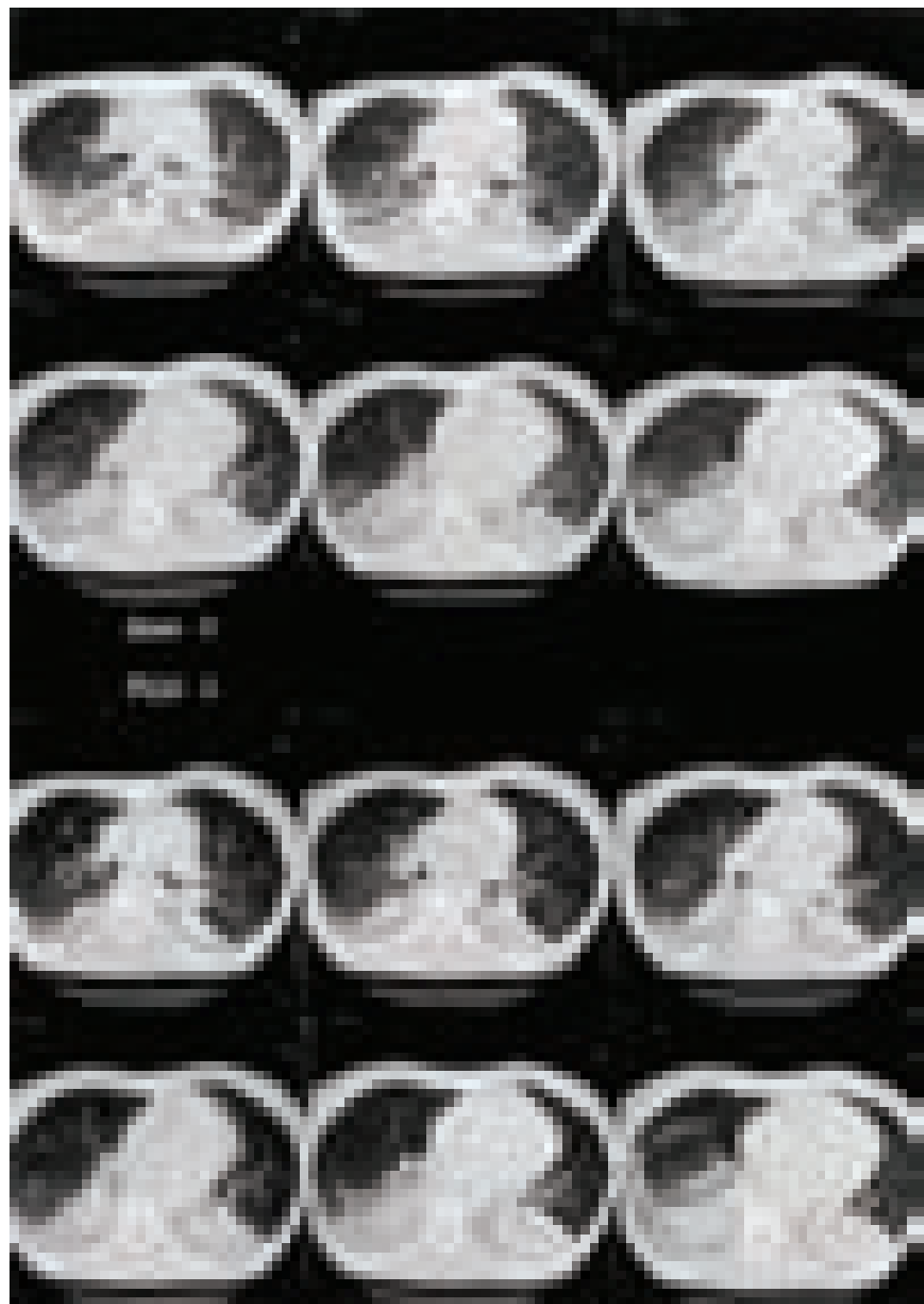


Faut-il, sous prétexte d'ouverture,
limiter le débat à...



Grand Vt vs. Petit Vt ?





Recrutement, surdistension, mécanique ventilatoire et PEEP

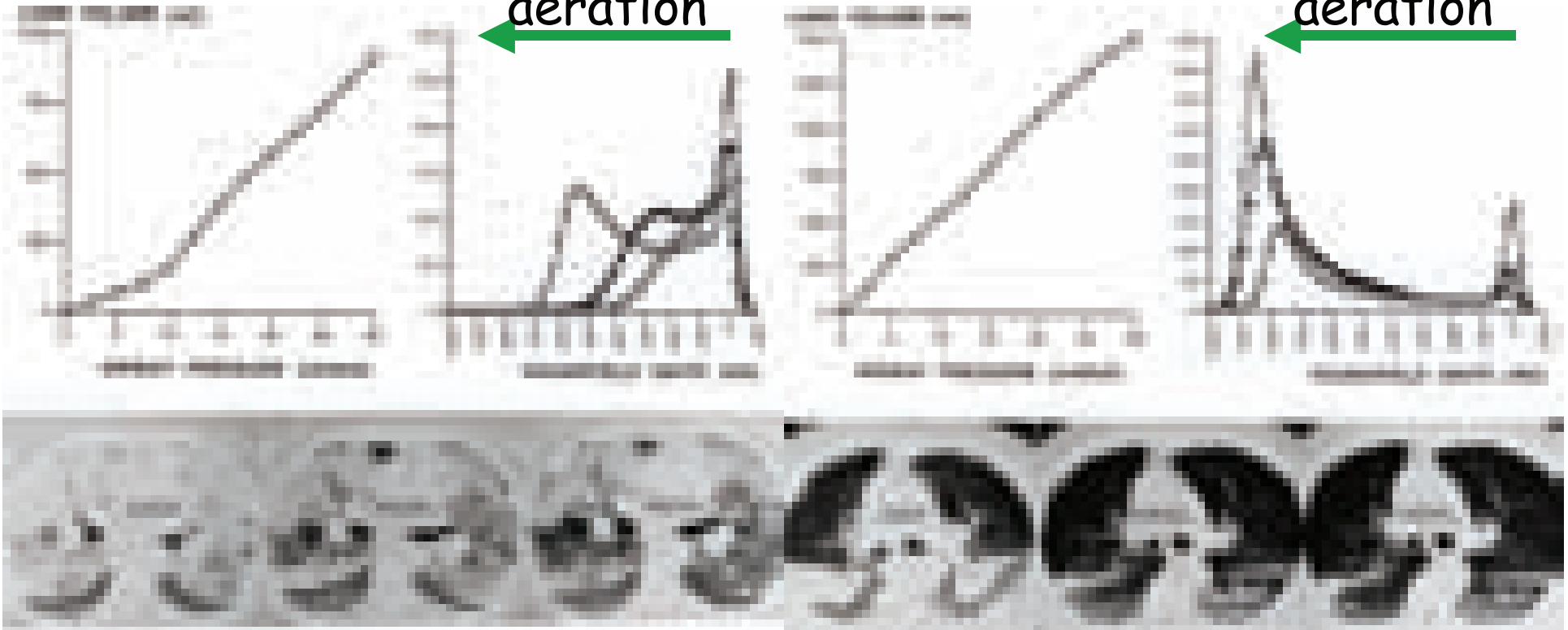
Viera et coll. AJRCCM 99

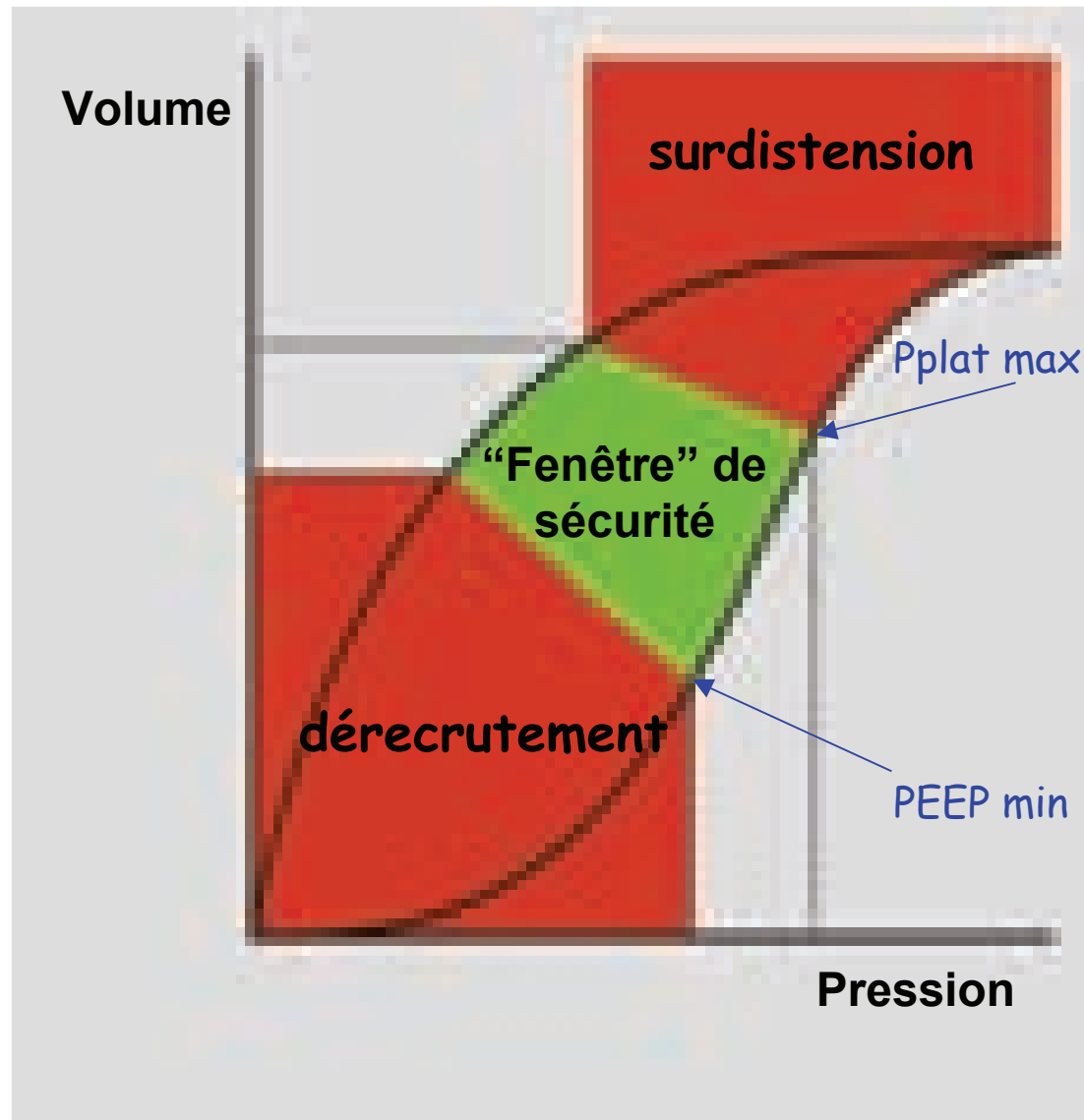
Avec LIP

Sans LIP

aération

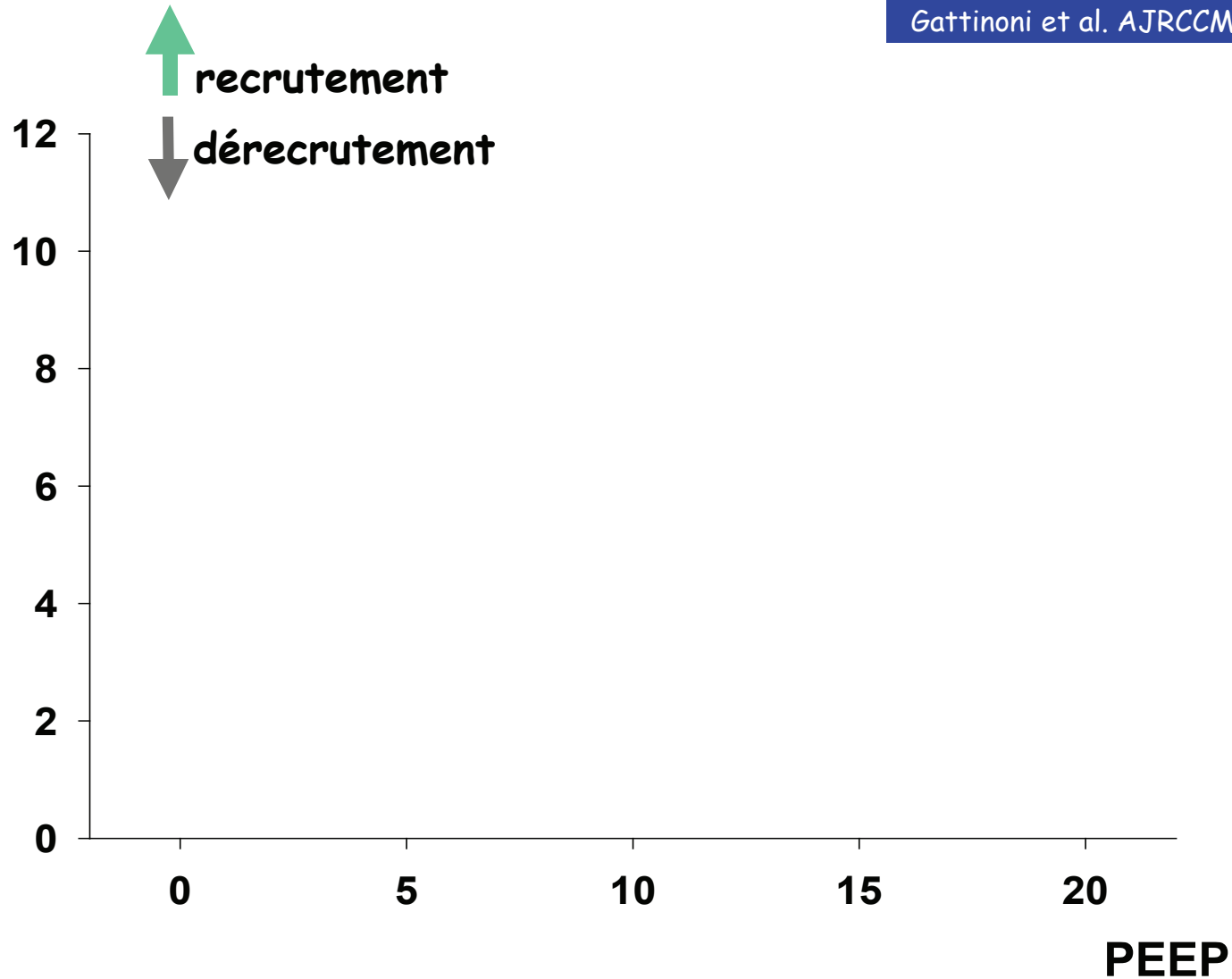
aération





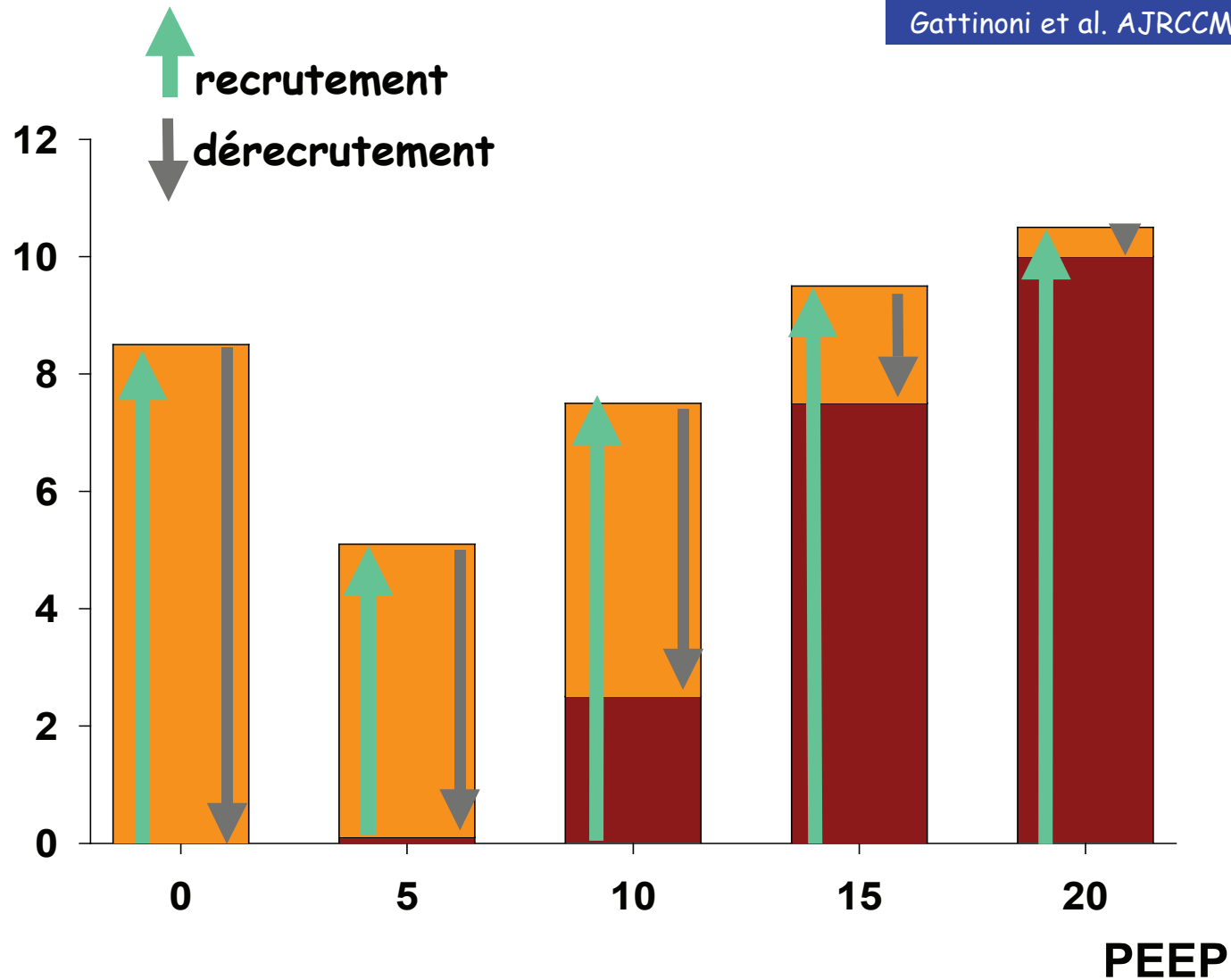
Vt, PEEP et recrutement

Gattinoni et al. AJRCCM 95



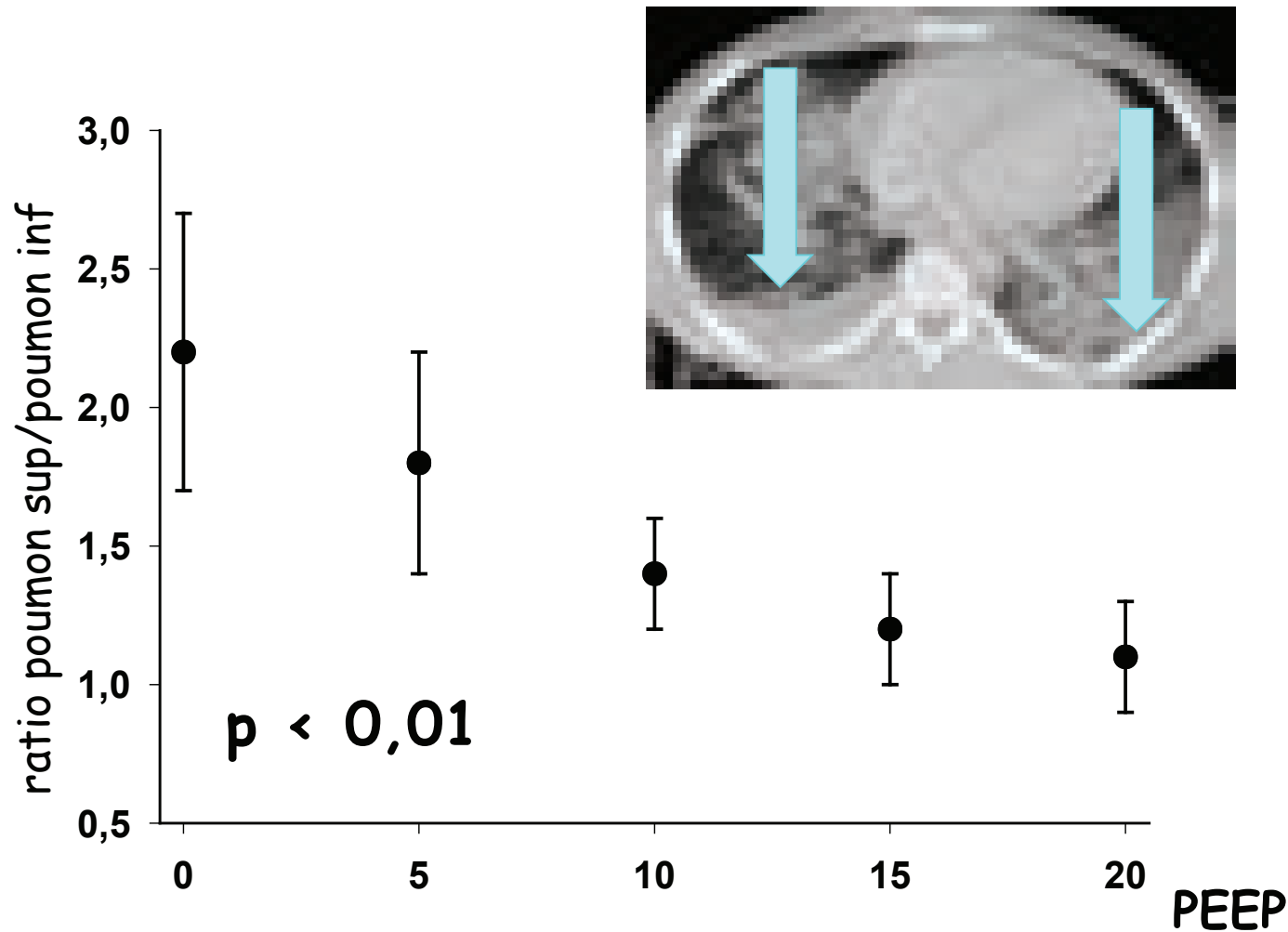
Vt, PEEP et recrutement

Gattinoni et al. AJRCCM 95



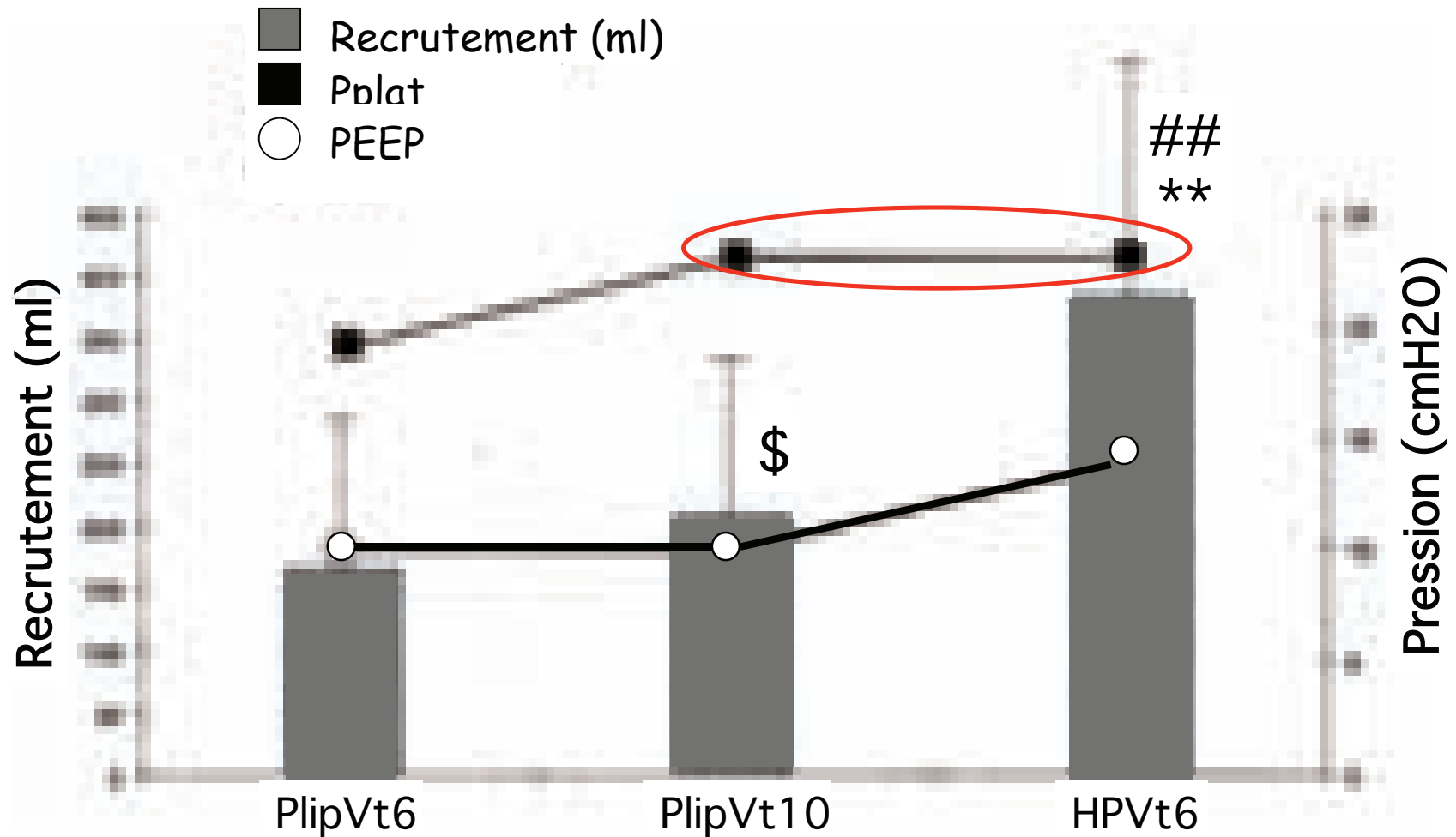
Distribution du V_t en fonction de la PEEP

Gattinoni et al. AJRCCM 95



Vt, PEEP et recrutement

Richard et al. CCM 2003



ExPress

VT 6 ml / kg (PBW)

RR \leq 35 / mn ; 7.30 < pH < 7.45

55 mmHg < PaO₂ < 80 mmHg

88% < SpO₂ < 95%

Minimal

alveolar distension

PEEP set for

$5 \leq \text{PEEP}_{\text{tot}} \leq 9$

Maximal

alveolar recruitment

PEEP set for

$28 \leq \text{P}_{\text{plat}} \leq 30$

2008

Minimal treatment group

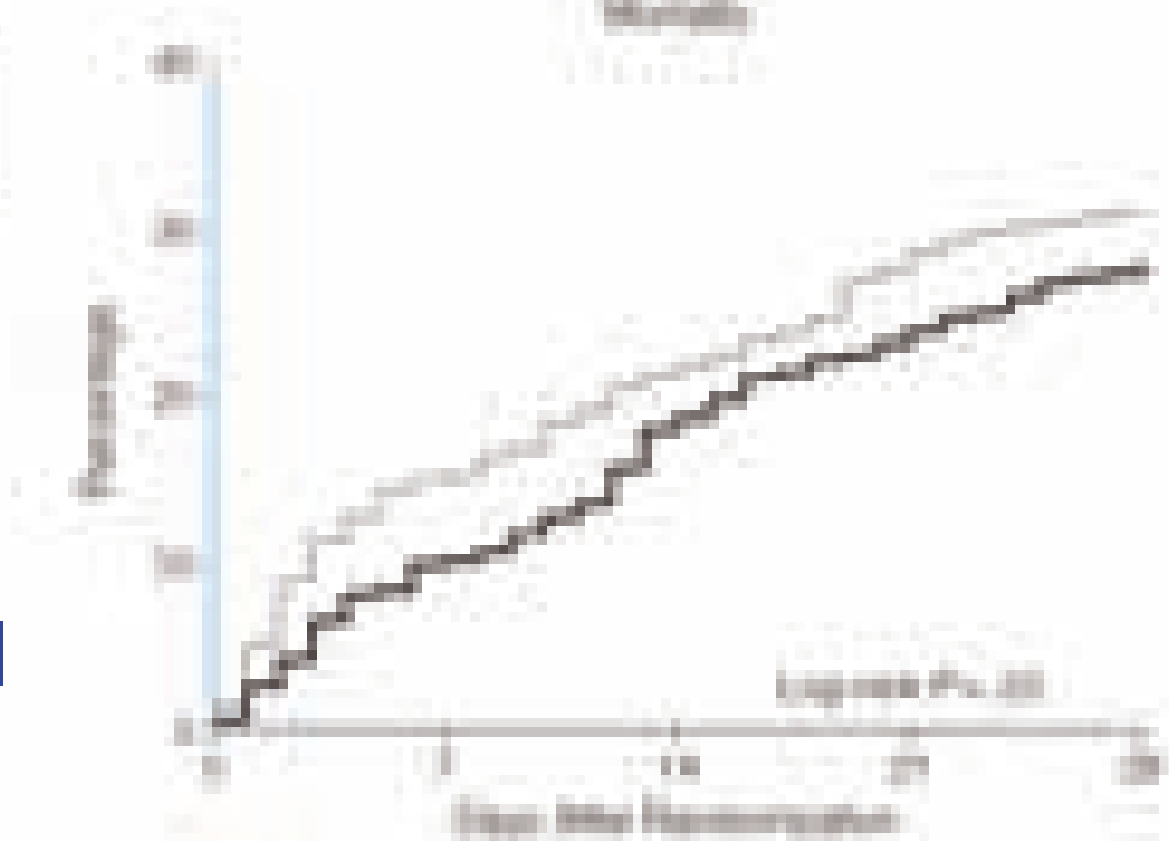
Increased treatment group

Total PGE₂ between 2 and 8 hrs PGE₂

Plasma pressure between 20 and 23 cm H₂O

All Patients

Months

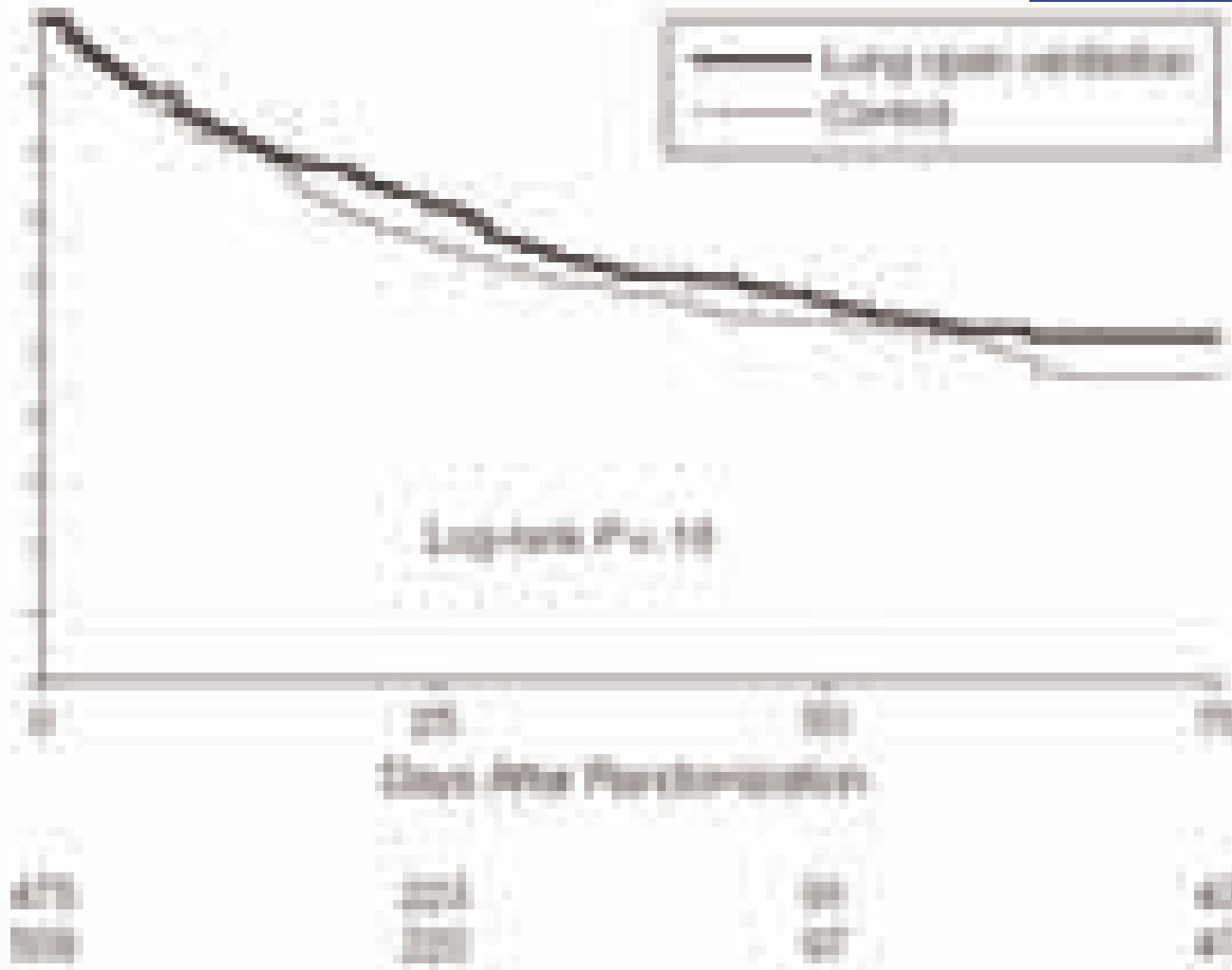


Mercat et al. JAMA 2008

Group	0	2	4	6	8
Minimal treatment	0	~100	~250	~450	~600
Increased treatment	0	~100	~150	~300	~450

Study	Number of Reported Deaths (n)							
	0	1	2	3	4	5	6	7
Study 1	10	15	20	15	10	5	2	1
Study 2	12	18	25	20	15	10	5	3
Study 3	8	14	22	18	12	8	4	2
Study 4	11	16	23	19	14	9	6	3
Study 5	9	13	21	17	11	7	4	2

O'Meade et al. JAMA 2008



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Assessment Strategy

	Change in GDP				
	High income of states	Low income of states	High income of regions	Low income of states	High income of states
Developing countries (total green)	+	+	+	+	+
Developed green	+	+	+	+	+

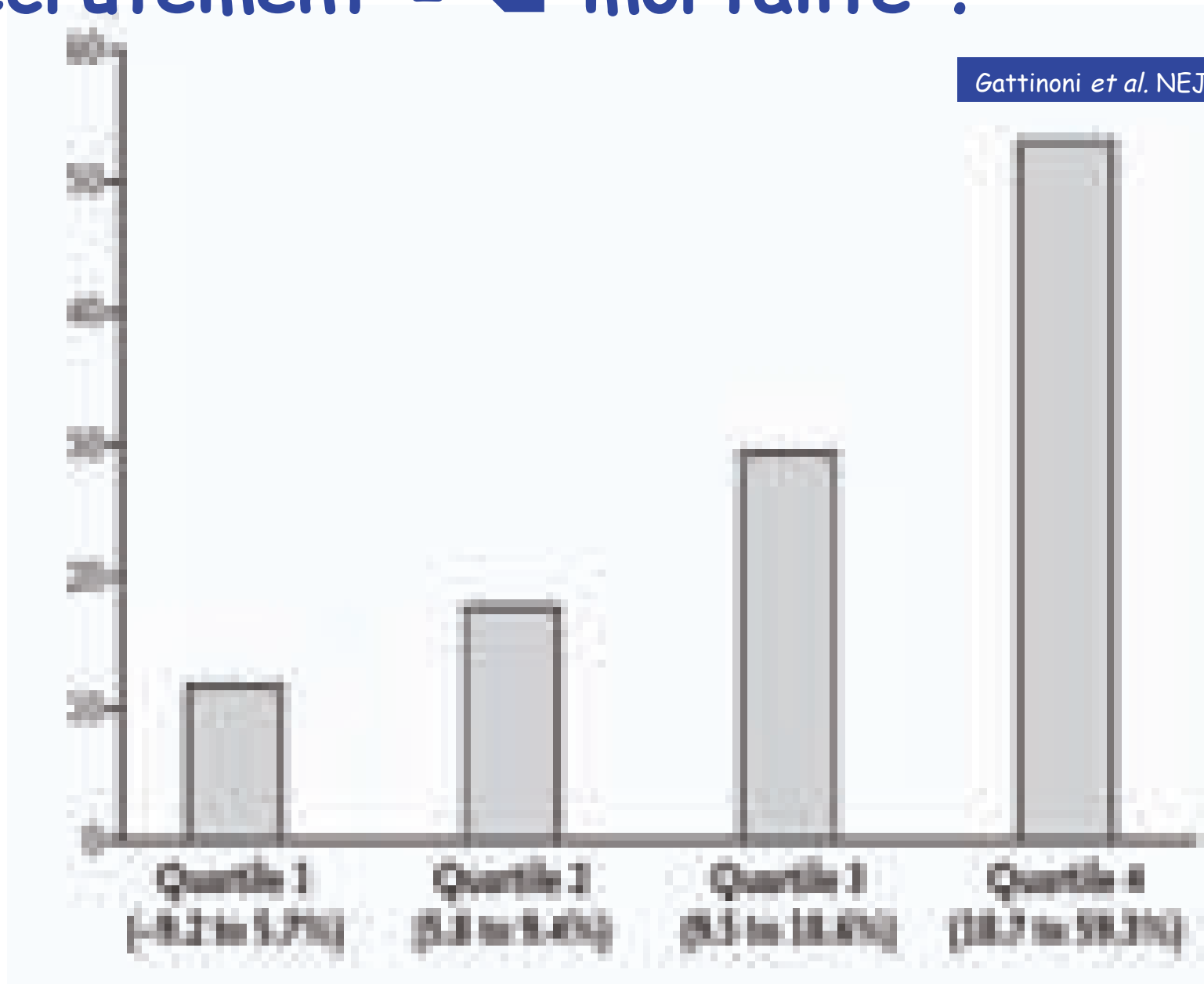
Outcome	Intensive Treatment (n=70)	Conventional Treatment	P-value
	(n=70)	(n=70)	
28-Day mortality (n=70)	6 (8%)	12 (17%)	0.002
90-Day mortality (n=70)	8 (11%)	14 (20%)	0.03
Length of ICU stay (days)			0.001
Median	10	15	
Interquartile range	8-15	9-22	
No. of ICU transfers at 28 days			0.001
Median	0	0	
Interquartile range	0-0	0-1	
No. of ventilator-free days at 28 days			0.001
Median	2.5	0	
Interquartile range	0-5	0-7	
No. of days of ventilation during admission			0.001
Median	10	15	
Interquartile range	7-14	10-20	

Apprécier l'hystérésis



Demory, Arnal *et al.* Intensive Care Med 2008

Recrutement = ↘ mortalité ?

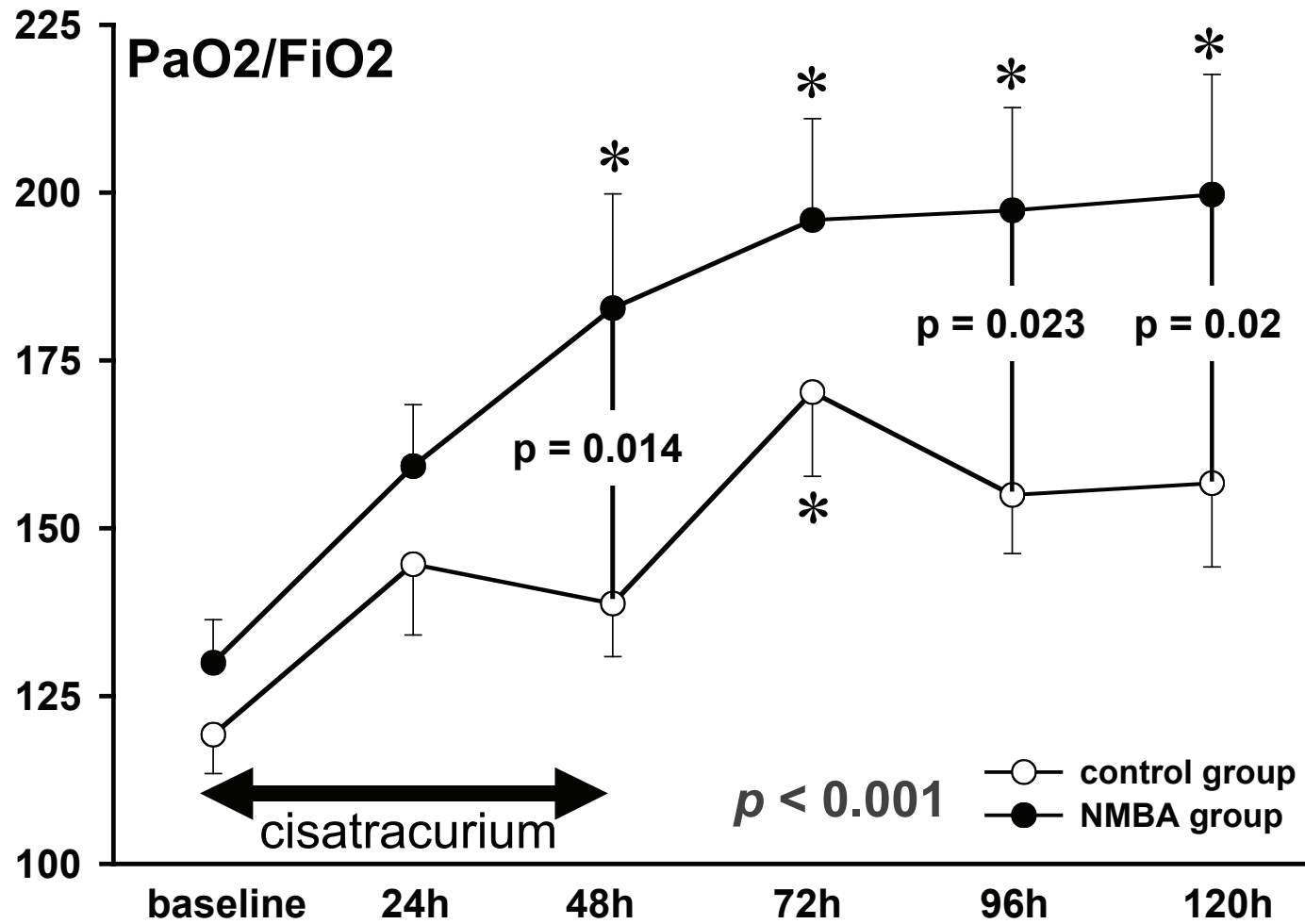


A ce stade

- Optimisation du réglage du respirateur
 - réduire le **volume courant** (6-8 ml/kg...)
 - limiter les pressions (**P_{plat}** < 32 cmH₂O)
 - utiliser une **PEEP** suffisamment élevée (≥ 10 cmH₂O, max ?)
 - réglage PEEP
 - Réglage pragmatique
 - Présentation morphologique
 - Courbes P/V automatisées ?
 - Pression transpulmonaire ?
 - limiter les objectifs de PaO₂ 60-75 mmHg (donc

Adjuvants médicamenteux

Curares et oxygénation



ACURASYS

- Principe: V_t 6-8 ml/kg, $P_{plat} \leq 32$ cmH₂O
- Inclusion: $PaO_2 / FiO_2 < 150$ avec une PEEP ≥ 5
évoluant depuis moins de 48 h
- Randomisation: stratification
 - Centre
 - Age
 - Durée de ventilation avant inclusion

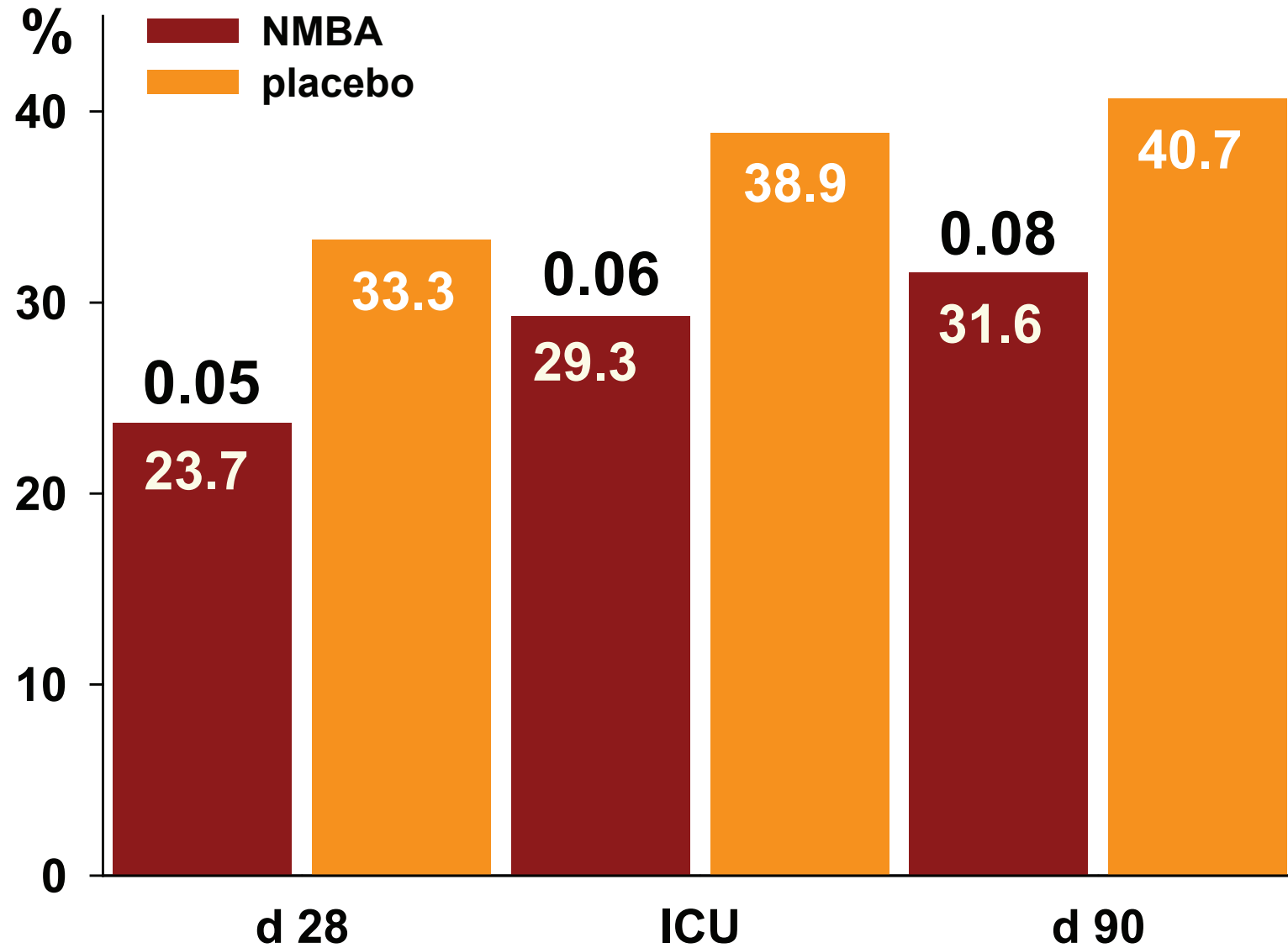
Inclusion

	NMBA N=177	Placebo N=162	<i>p</i>
Age	58±16	58±15	NS
PEEP applied	9.2±3.2	9.2±3.5	NS
Vt	6.55±1.12	6.48±0.92	NS
Plateau pressure	25.0±5.1	24.4±4.7	NS
PaO ₂ /FiO ₂	106±36	115±41	0.029
IGS2	50±16	47±14	NS
Direct lung injury	142 (80%)	123 (76%)	NS
Délai IOT-inclusion < 48h	152 (86%)	140 (86%)	NS
Délai SDRA-inclusion, h	22±23	19±16	NS

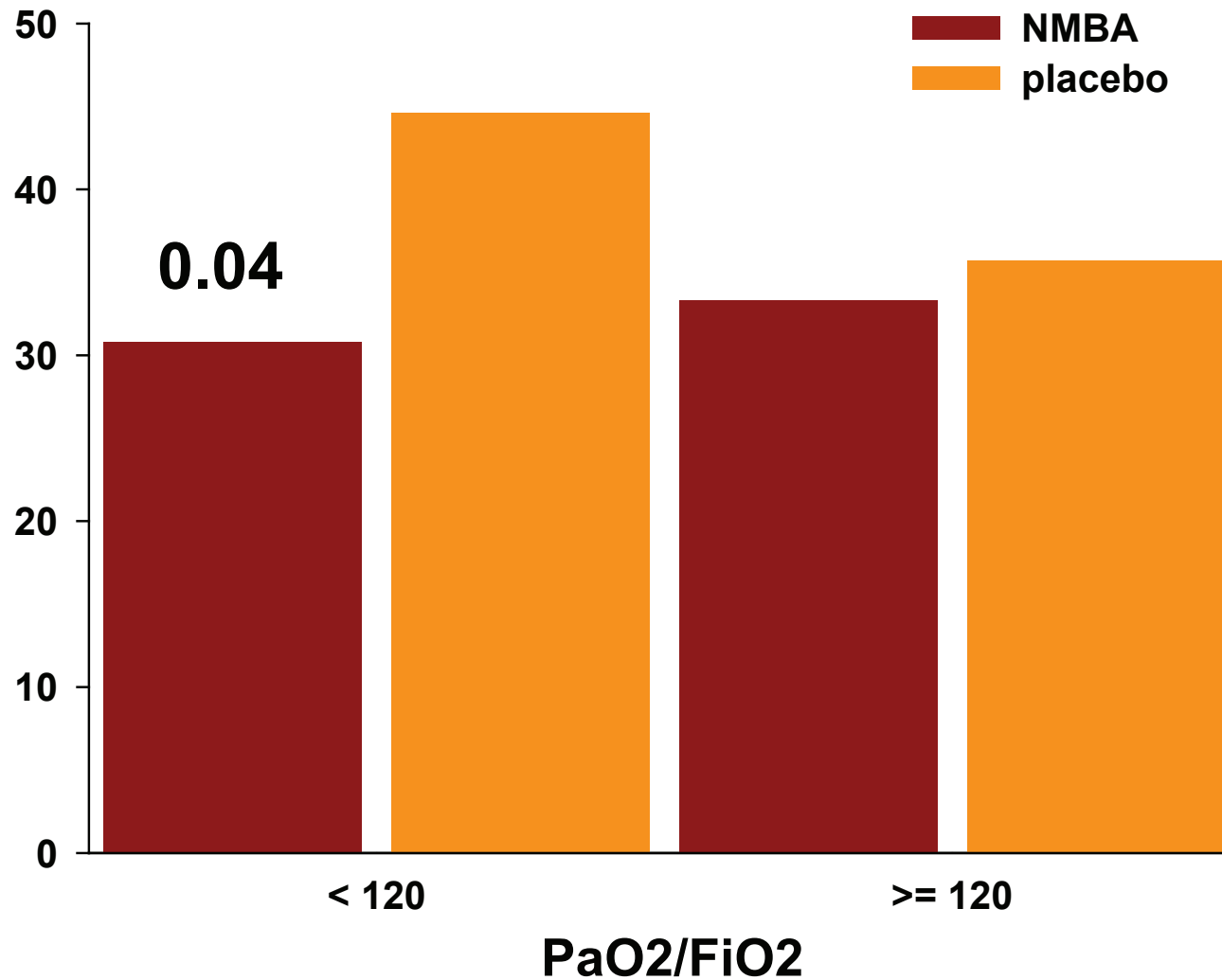
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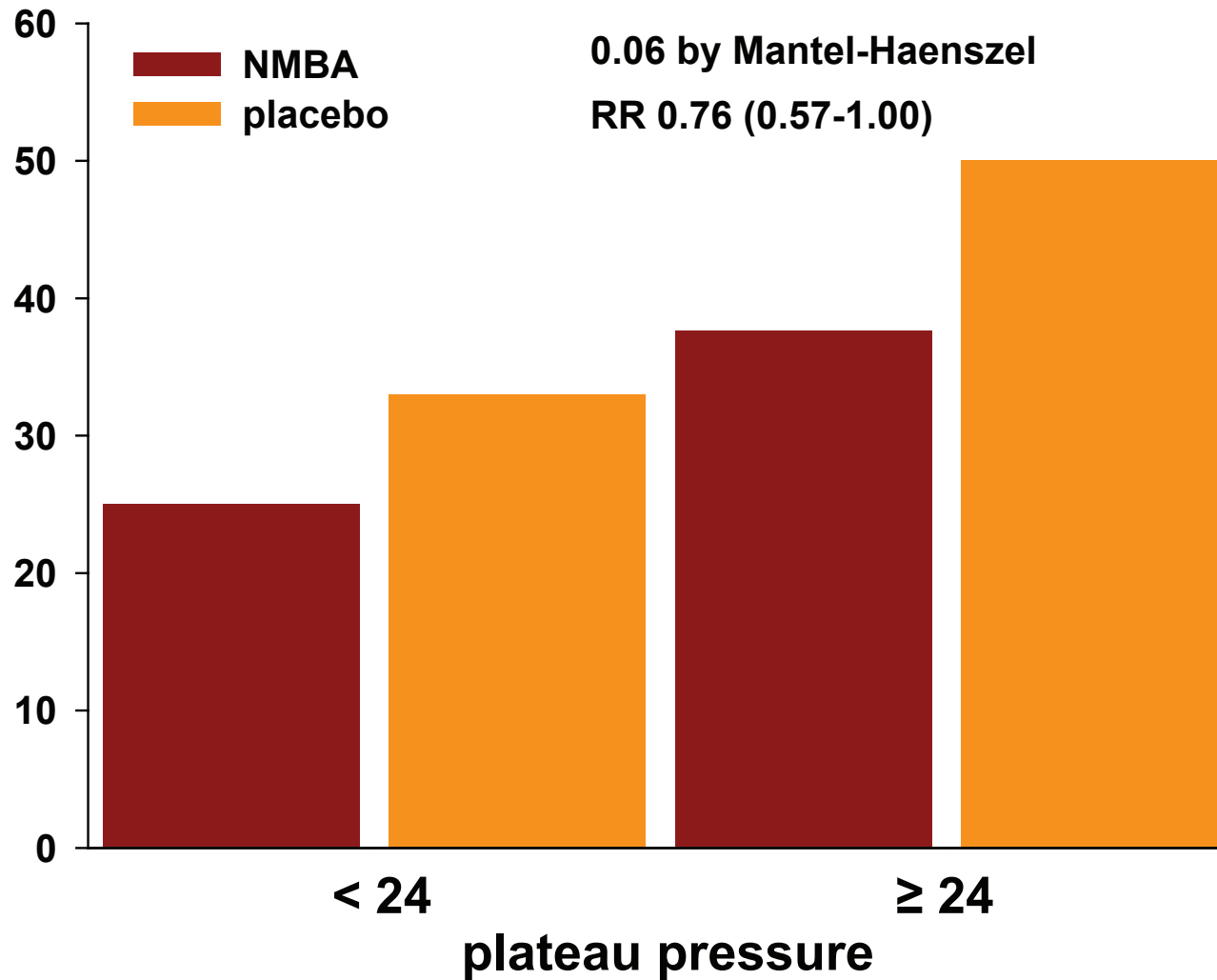
Mortalité



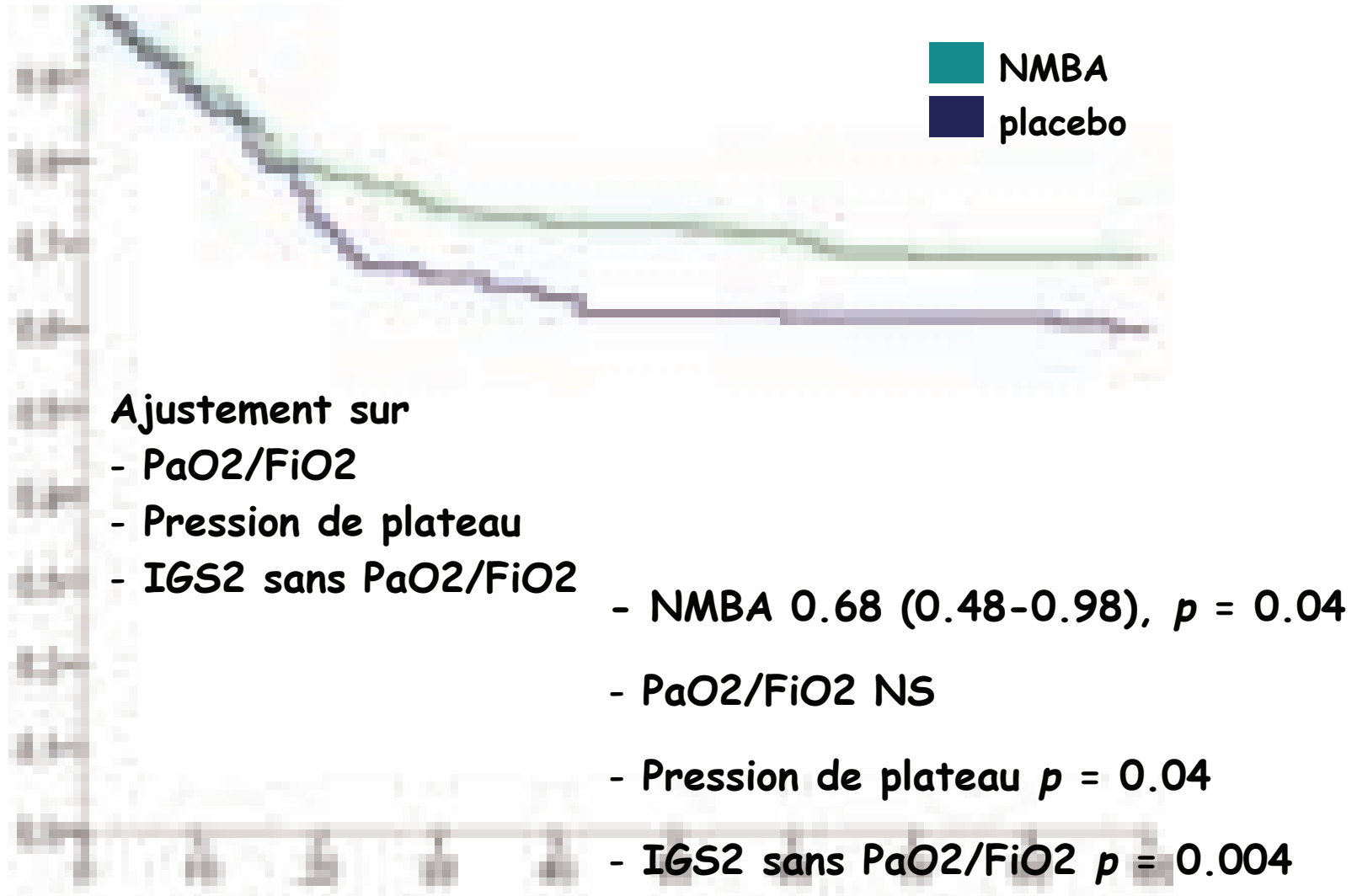
Mortalité à J90 et PaO2/FiO2



Mortalité à J90 et pression de plateau à l'inclusion



Courbe de survie



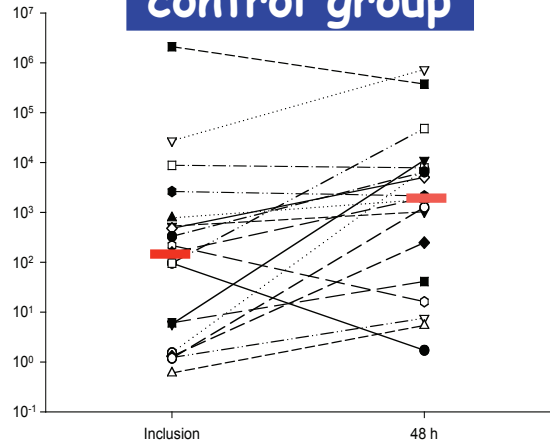
Ventilator-free days and alive

	NMBA	Placebo	<i>p</i>
VFD 28	10.6 ± 9.7	8.5 ± 9.4	0.04
VFD 60	32.1 ± 23.0	26.7 ± 23.7	0.03
VFD 90	53.1 ± 35.8	44.6 ± 37.5	0.03

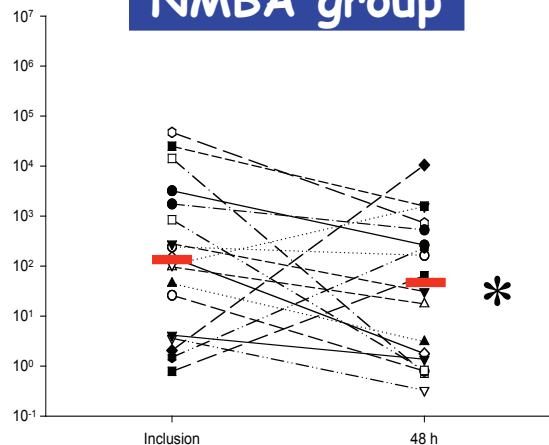
Pourquoi ?

- Homogénéisation ventilation régionale ?
- Effet propre de la molécule ?
- Effet « protecteur » ?

control group



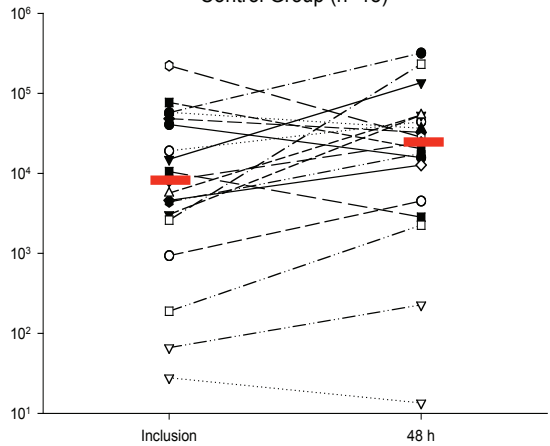
NMBA group



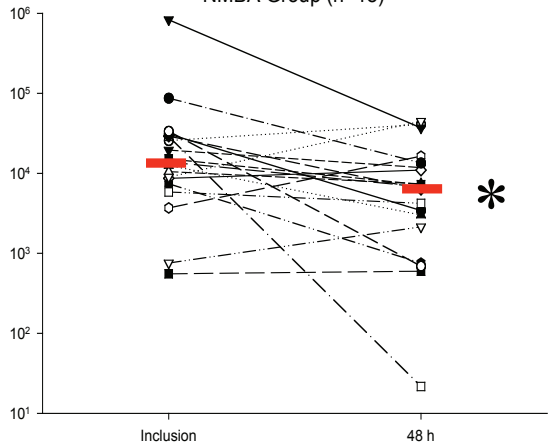
LBA

IL1 β

Control Group (n=18)

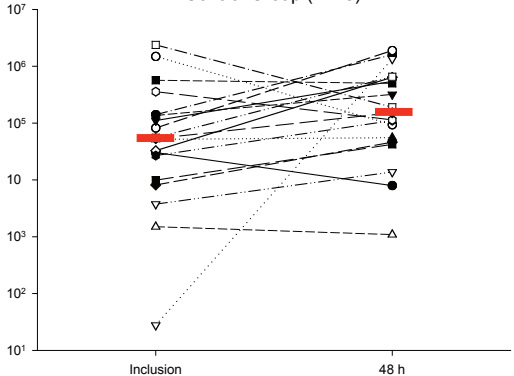


NMBA Group (n=18)

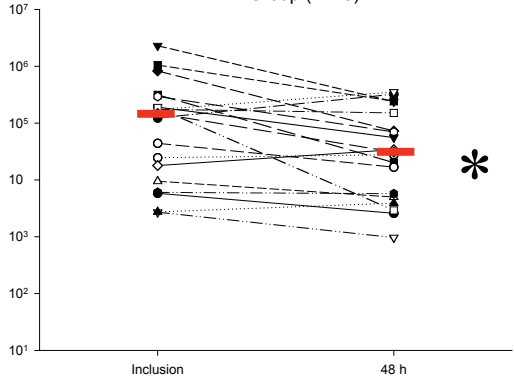


IL6

Control Group (n=18)

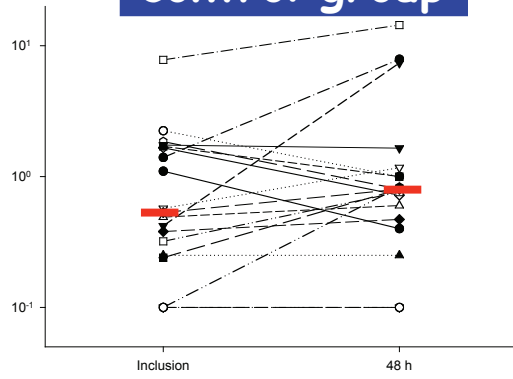


NMBA Group (n=18)

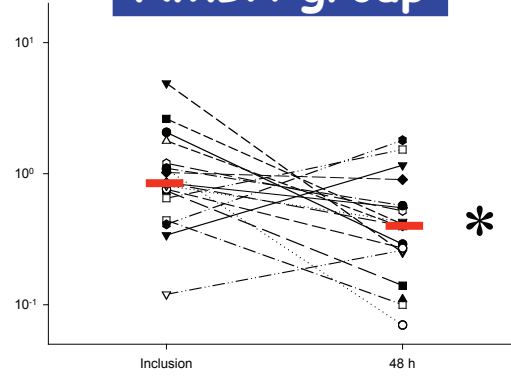


IL8

control group



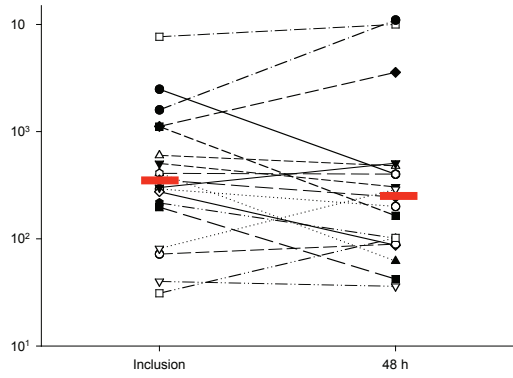
NMBA group



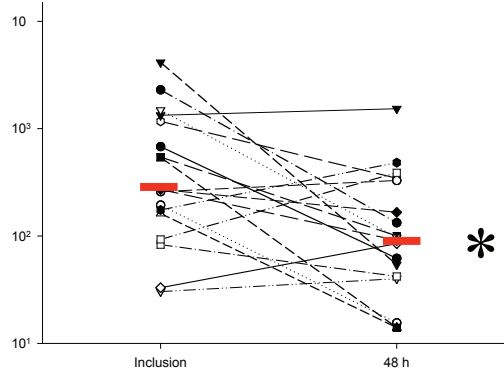
sérum

IL1 β

Control Group (n=18)

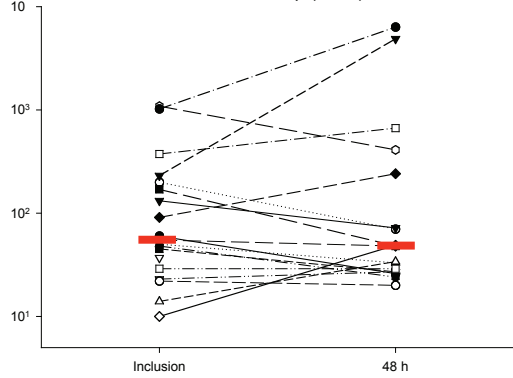


NMBA Group (n=18)

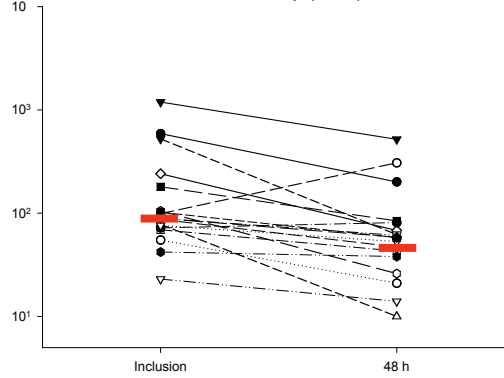


IL6

Control Group (n=18)



NMBA Group (n=18)



IL8

A ce stade

- Optimisation du réglage du respirateur
- Curariser
 - Cisatracurium
 - Règle TPS
 - T tôt (< 48h)
 - P peu (2 j)
 - S sévère (PAFI 150)

Quelques avantages du NO

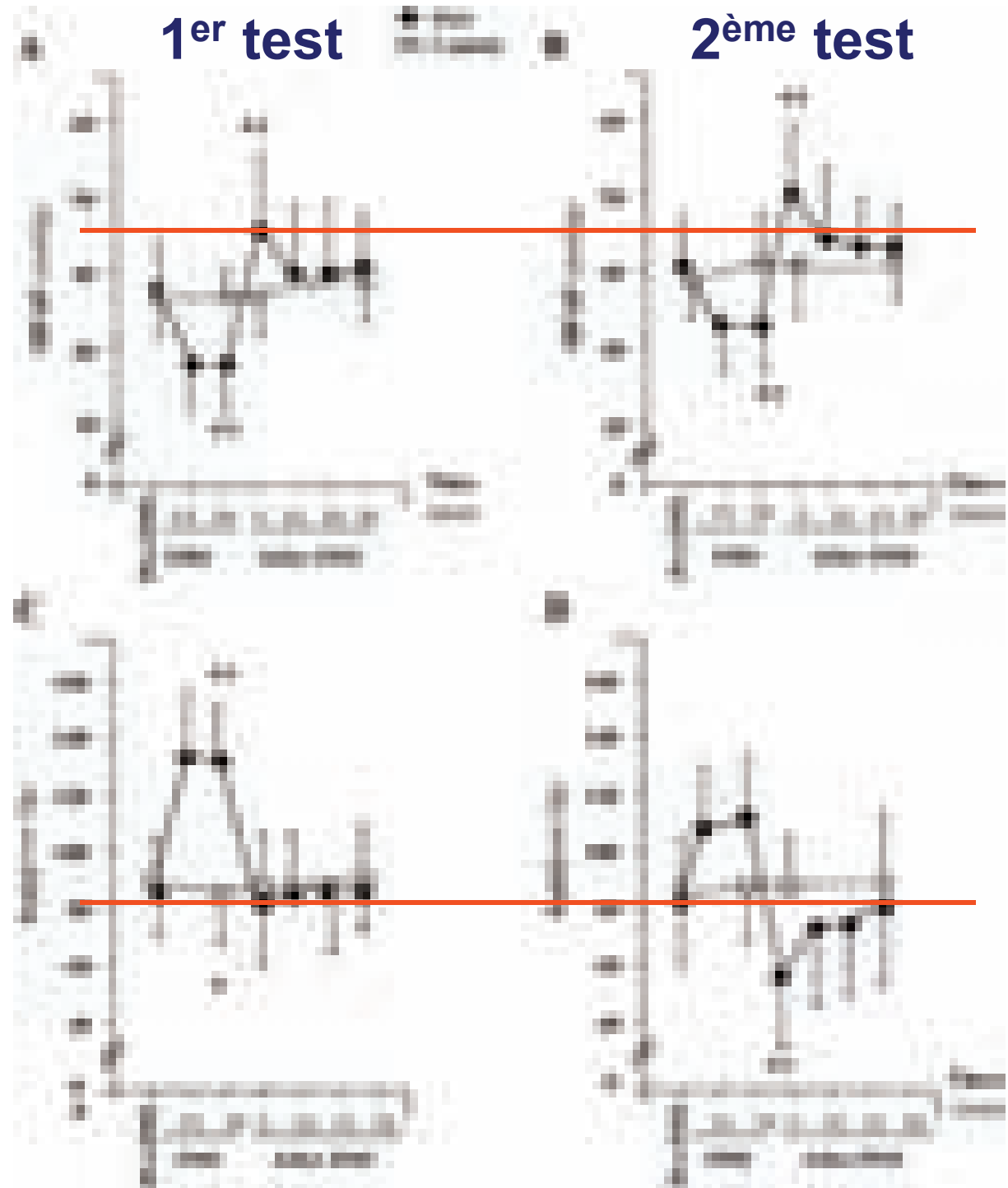
- Remplace NO endogène (50-100 ppb VAS)
- Diminution de l'utilisation de techniques plus coûteuses et plus agressives
- Effet additif (PEEP, almitrine, DV, HFO ...)
- Effets anti-inflammatoires

Effet rebond

* $p < 0.05$ vs pre-INO

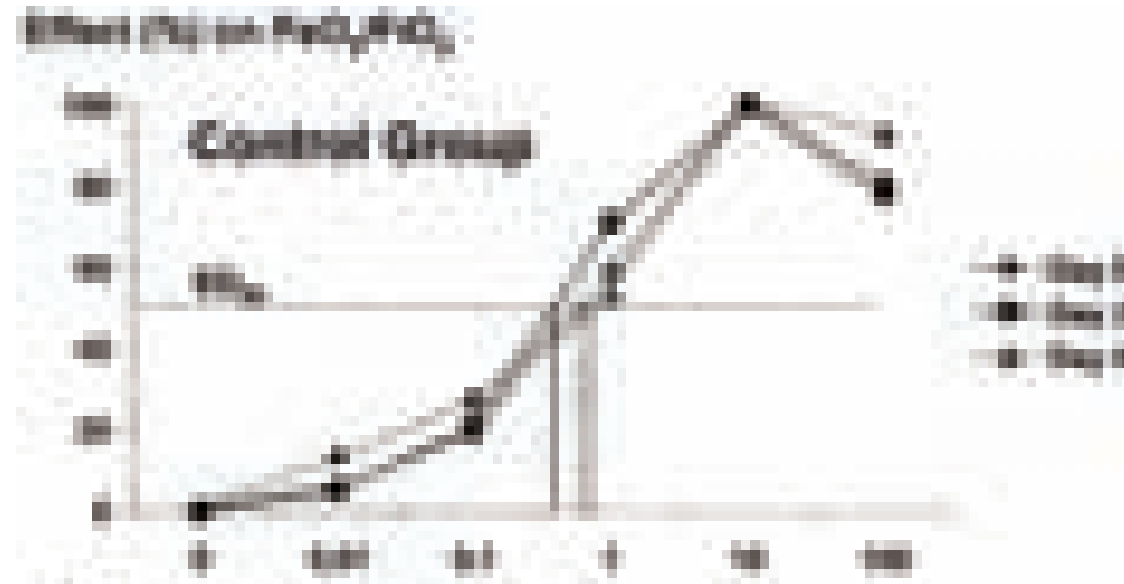
† $p < 0.05$ vs control

Chen et al. AJP 2001



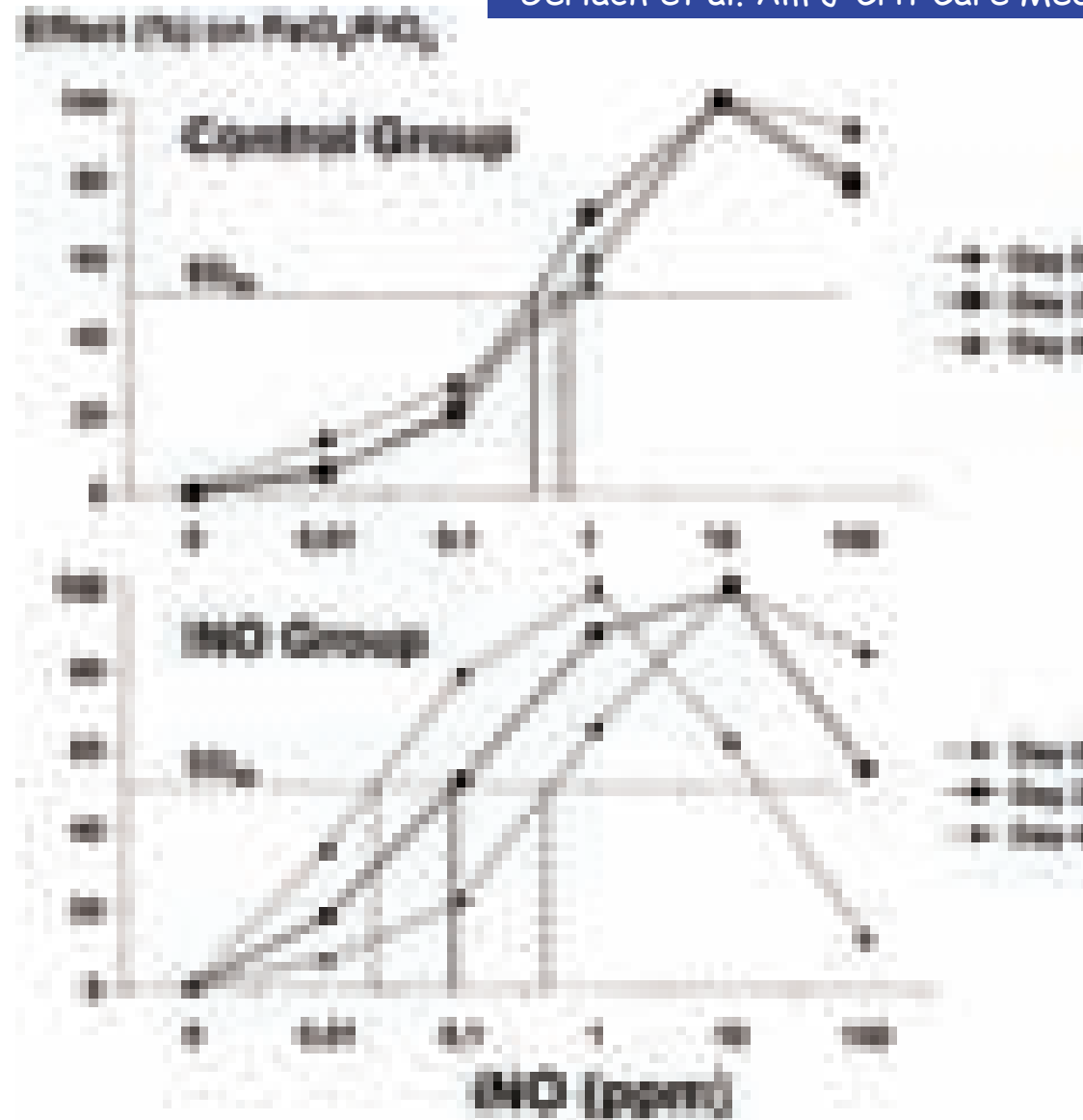
Réévaluer dose

Gerlach et al. Am J Crit Care Med 2003



Effet dose: variabilité

Gerlach et al. Am J Crit Care Med 2003



Essais multicentriques

	n	% R	mortalité
Dellinger CCM 98	177	60%	32/30
Lundin ICM 99	180	67%	44/41
Payen	203	60%	68/66
Taylor JAMA 2004	385	?	23/21

Protéine C activée

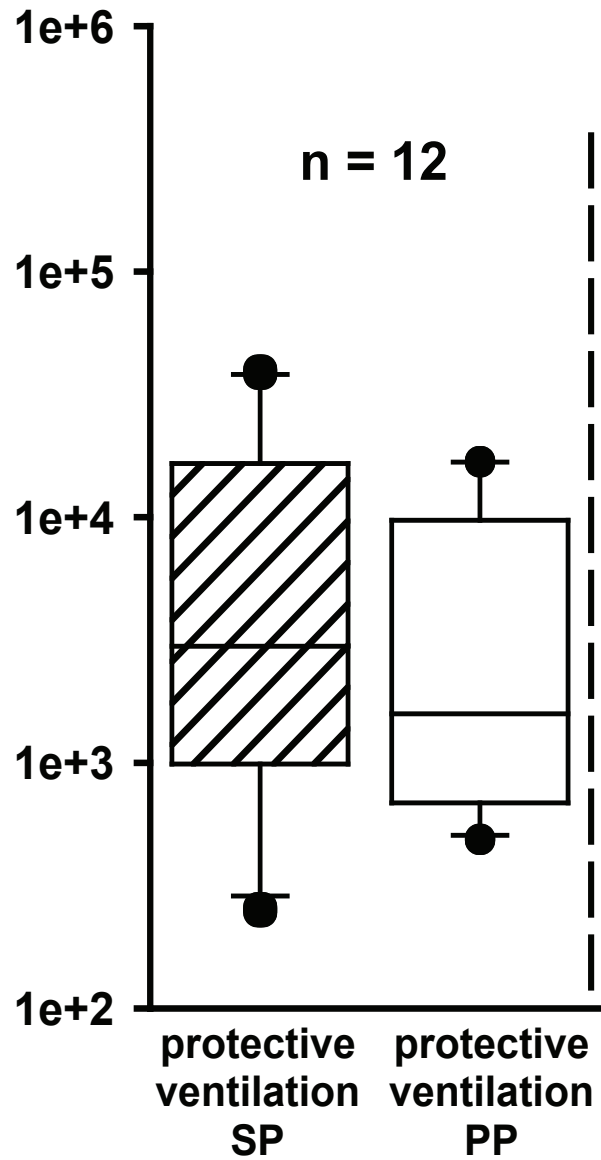
24 mg/kg/h for 96 h et placebo

	Placebo (n = 20)	APC (n = 20)	P-value
Ventilator-free days, median (IQR)	19 (0-24)	19 (14-22)	0.78
Death by Day 60, n (%)	5 (25%)	5 (25%)	1.00
Ventilator-free days among survivors, median (IQR)	21 (3-25)	20 (14-23)	0.36
Organ failure-free days, median (IQR)	21 (14-27)	21 (14-27)	0.48
Cardiovascular failure, median (IQR)	25 (20-28)	26 (23-28)	0.38
Coagulation failure, median (IQR)	28 (28-28)	28 (28-28)	0.57
Renal failure, median (IQR)	28 (18.5-28)	28 (28-28)	0.41
Hepatic failure, median (IQR)	28 (27-28)	28 (28-28)	0.36

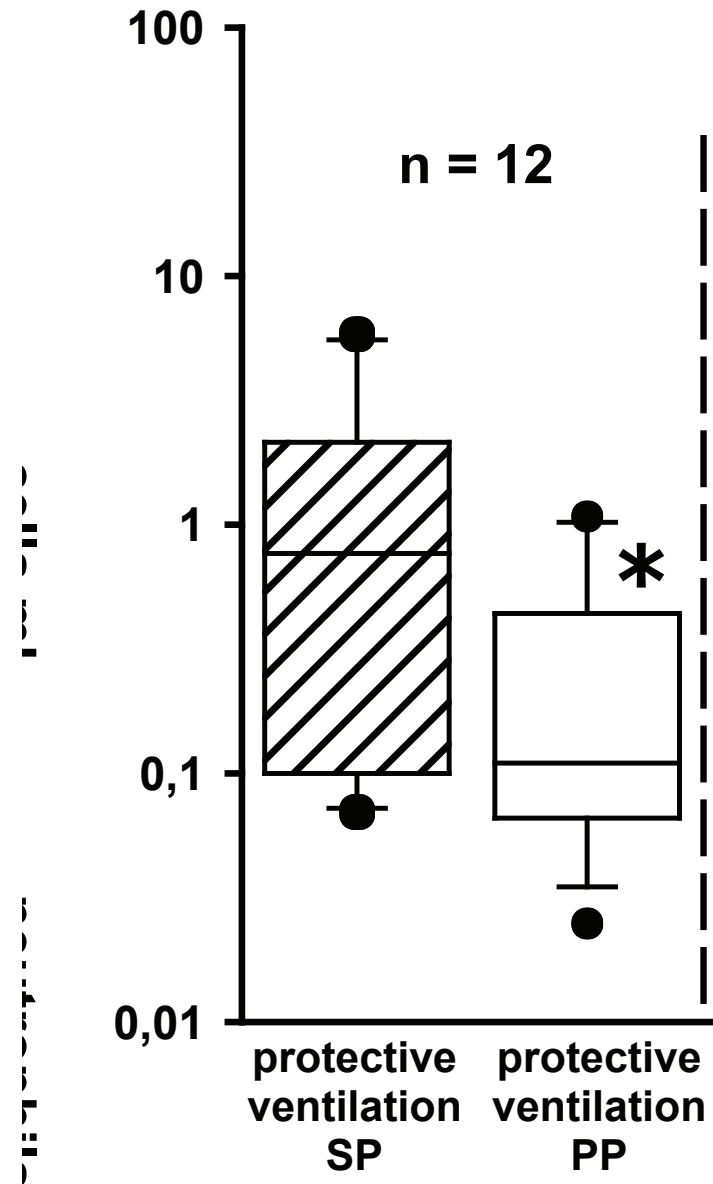
Technique écologique

DV et VALI...

Papazian *et al.* CCM 2006



DV et VALI...



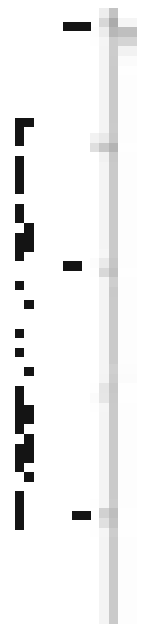
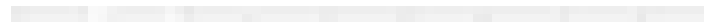
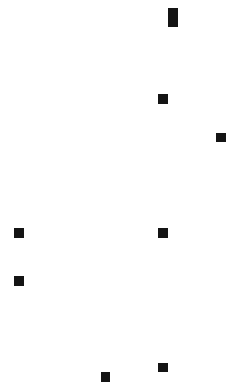
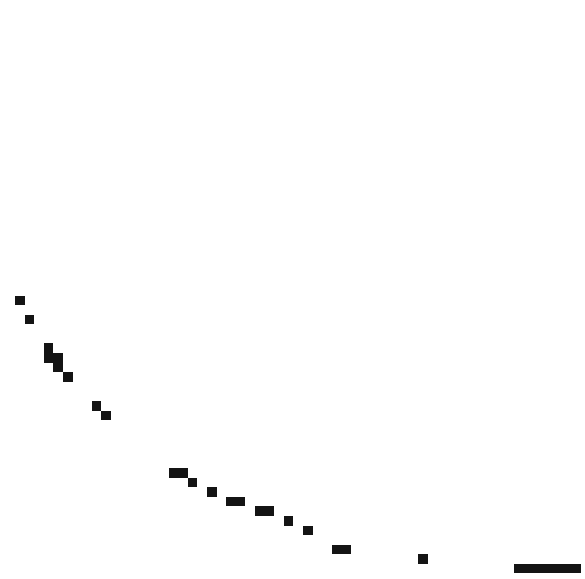




Figure 1: A woman lying on her side, wearing a dark, form-fitting top and light-colored pants. She is looking towards the camera with a slight smile.

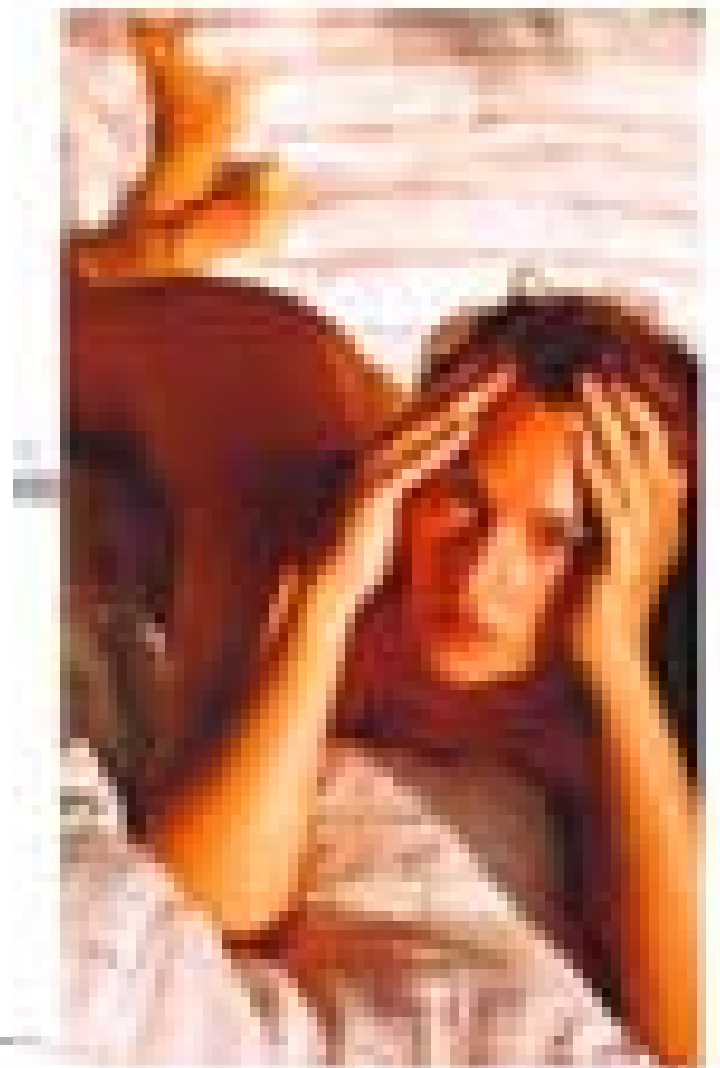


Figure 2: A woman lying on her side, wearing a dark, form-fitting top and light-colored pants. She is looking towards the camera with a slight smile.

Figure 3: A woman lying on her side, wearing a dark, form-fitting top and light-colored pants. She is looking towards the camera with a slight smile.

Figure 4: A woman lying on her side, wearing a dark, form-fitting top and light-colored pants. She is looking towards the camera with a slight smile.

	September 1993 M. 2000	October 2004	November 2004
N	304	791	136
Type	SOBA on ALI & PDP 10	Programmer's Instruments - 300	SOBA
Circle number DV	May 76	May 84	May 76
Circle DV	47 (over 10)	4 (2-4)	20 (1-10)
Normal CPU	51/48	43/43 (PDP)	50/48
Circle V8	?	14 (1/13/7)	?
Cross-over	12/12	8/16	4/0
Algorithm C2	Yes	Yes	On
Algorithm Pilot	Yes	Yes	On
Pic storage	Yes	On	On
V7 inclusion	10.1	8.3	8.3
PDP inclusion	10.8	7.8	12.3
PIC	73	69	84
Pilot	+ 10	?	10

Table 2. Frequency of Complications During the 28 Days after Hospitalization

Complication	First Patient			Second Patient		
	No. of Patients	No. of Episodes		No. of Patients	No. of Episodes	
		First	Second		First	Second
Delirium	10	10	10	10	10	10
UTI	10	10	10	10	10	10
Pressure ulcer	10	10	10	10	10	10
Other	10	10	10	10	10	10
Total	40	40	40	40	40	40

ORIGINAL ARTICLE

Comparison of Two Fluid-Management Strategies in Acute Lung Injury

The National Heart, Lung, and Blood Institute Acute Respiratory Distress Syndrome (ARDS) Clinical Trials Network*

Detailed description of work activity				How often is the task performed?	All relevant safety hazards from the work activity			
Step 1		Step 2			Step 1		Step 2	
				Frequency of work activity	Identify Hazards	Identify Hazards	Identify Hazards	Identify Hazards
					Identify the nature of the hazard	Identify the nature of the hazard	Identify the nature of the hazard	Identify the nature of the hazard
					Identify the location of the hazard	Identify the location of the hazard	Identify the location of the hazard	Identify the location of the hazard
					Identify the person(s) at risk	Identify the person(s) at risk	Identify the person(s) at risk	Identify the person(s) at risk
					Identify the potential consequences	Identify the potential consequences	Identify the potential consequences	Identify the potential consequences
					Identify the contributing factors	Identify the contributing factors	Identify the contributing factors	Identify the contributing factors
					Identify the control measures	Identify the control measures	Identify the control measures	Identify the control measures
					Identify the responsible person(s)	Identify the responsible person(s)	Identify the responsible person(s)	Identify the responsible person(s)
					Identify the time period	Identify the time period	Identify the time period	Identify the time period
					Identify the location	Identify the location	Identify the location	Identify the location
					Identify the equipment	Identify the equipment	Identify the equipment	Identify the equipment
					Identify the materials	Identify the materials	Identify the materials	Identify the materials

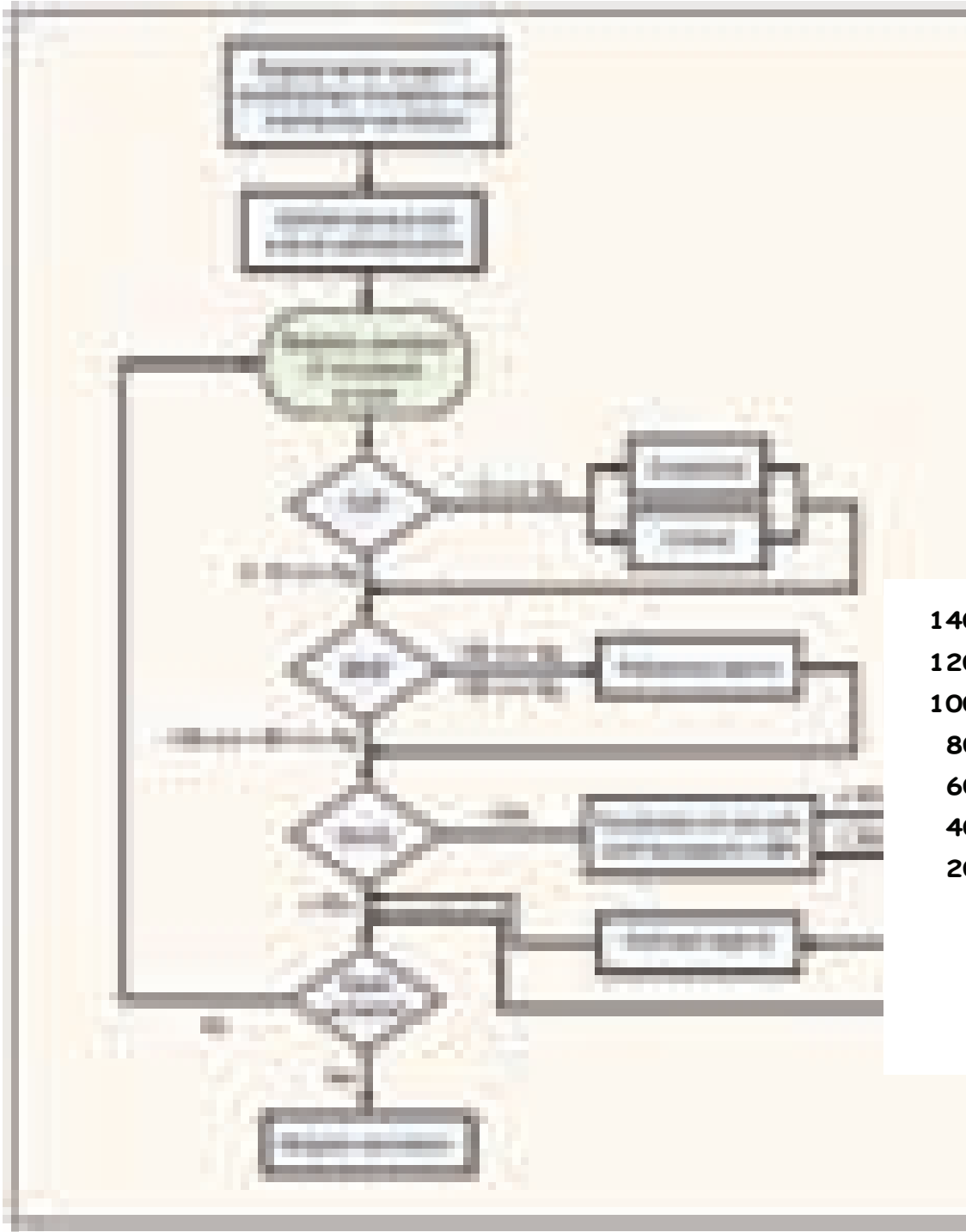
Outcome	Conservative Strategy	Liberal Strategy	P Value
Death at 90 days (%)	25.3	28.4	0.30
Ventilator-free days from day 1 to day 28†	14.6±0.3	12.1±0.3	<0.001
ICU-free days‡			
Days 1 to 7	6.9±0.1	6.6±0.1	<0.001
Days 1 to 28	11.4±0.4	11.2±0.4	<0.001
Organ-failure-free days‡			
Days 1 to 28			
Renal failure	21.3±0.3	21.2±0.3	0.99

**CALLUS FORMATION OCCURS FREQUENTLY IN THE TREATMENT OF OPENED SEPTA
AND NOSE BRIDGE**

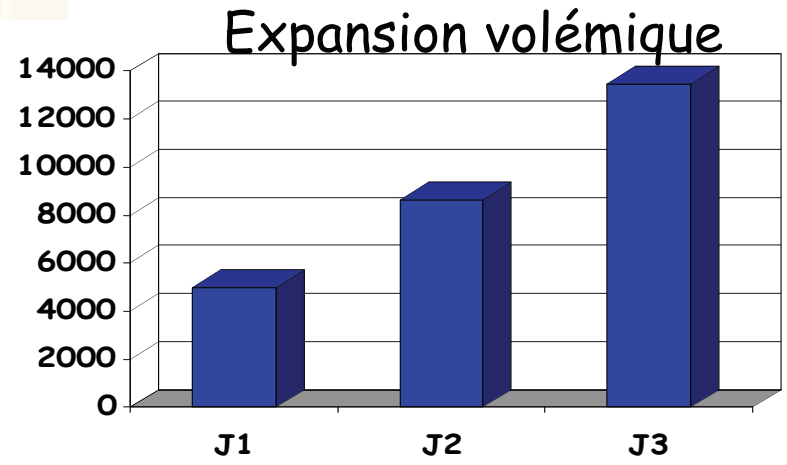
James Hwang, M.D., M.P.H., Steven Hwang, M.D., James Hwang, M.D., Jay Hwang, M.D.,
Alexander Hwang, M.D., Alexander Hwang, M.D., James Hwang, M.D., Jay Hwang, M.D.,
and the International Society for Opened Septa Treatment Group*

Callus-Related Complications in Rhinoplasty and Causes of De-Hydrated Rhinoplasty

Variable	Opened Rhinoplasty (n=100)	Septal Rhinoplasty (n=100)	Control Rhinoplasty (n=100)	P Value
(a) Septal deviation				
All patients	100 (100%)	100 (100%)	100 (100%)	0.000
Patients with severe septa	100 (100%)	10 (10%)	100 (100%)	0.000
Patients with severe deviated	100 (100%)	10 (10%)	100 (100%)	0.000
Patients with severe (symptoms)	100 (100%)	10 (10%)	100 (100%)	0.000
20 (20%) patients	100 (100%)	10 (10%)	100 (100%)	0.000
10 (10%) patients	100 (100%)	10 (10%)	100 (100%)	0.000



Rivers et al. NEJM 2001



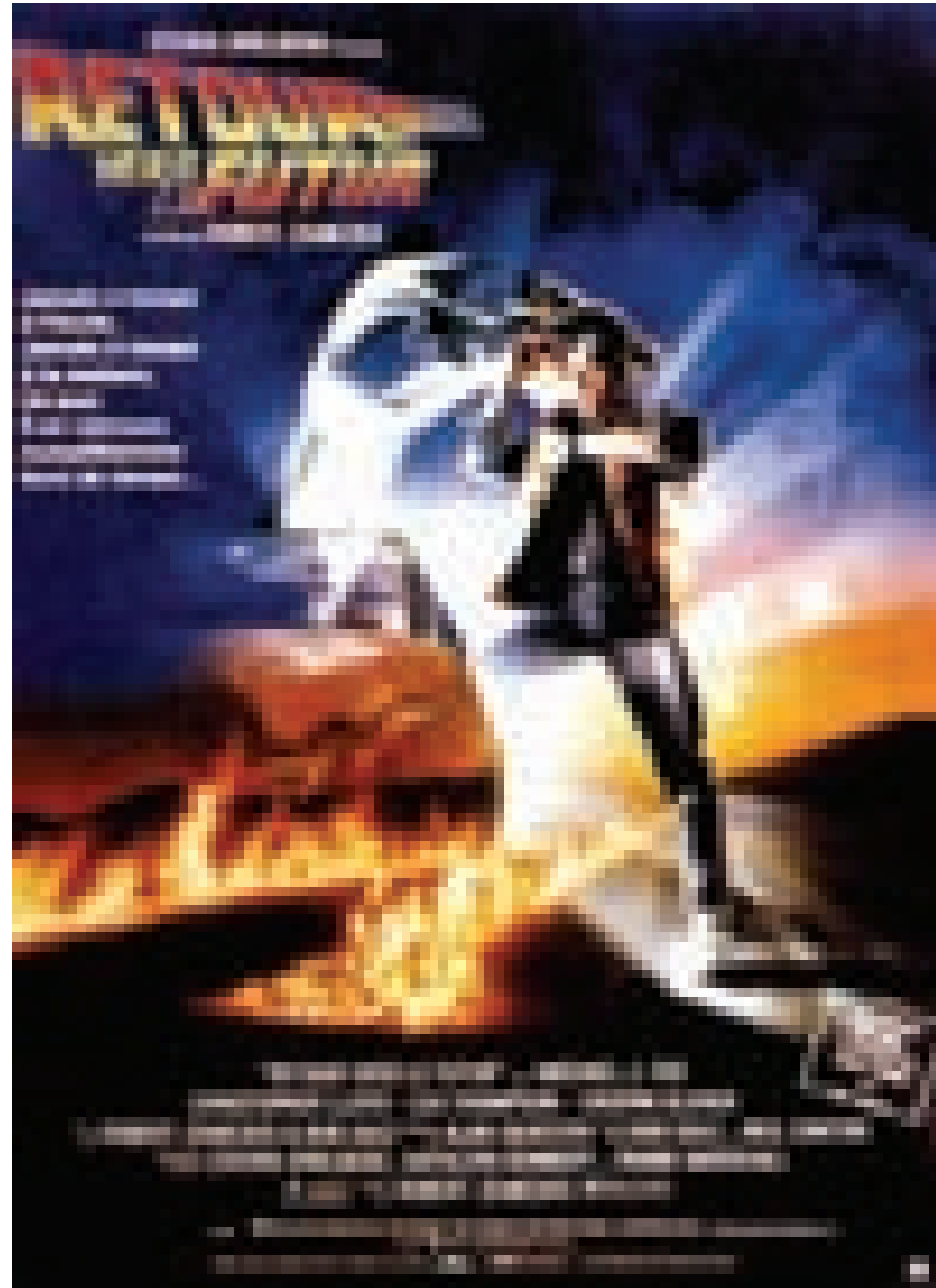
A ce stade

- Optimisation du réglage du respirateur
- Curariser
- DV
 - Hypoxémie profonde (< 100-120???)
 - Surtout si présentation lobaire
 - Au moins 12h en DV
 - En attente d'une étude
 - SDRA très hypoxémiques
 - Ventilation «protectrice»
 - Différenciation lobaires-diffus

A ce stade

- Optimisation du réglage du respirateur
- Curariser
- DV
- NO
 - Défaillance VD
 - Echech DV
 - Réévaluer dose
- Eau et sel
 - Raisonnable

BTTF



Assistance respiratoire extra-corporelle

- **Inclusion:**

- Fast entry criteria= $\text{PaO}_2 < 50 > 2\text{h}$
avec $\text{FiO}_2 1.0$ et $\text{PEEP} > 5$
- Slow entry criteria= $\text{PaO}_2 < 50 > 12\text{h}$
avec $\text{FiO}_2 > 0.6$ et $\text{PEEP} > 5$; maximal therapy

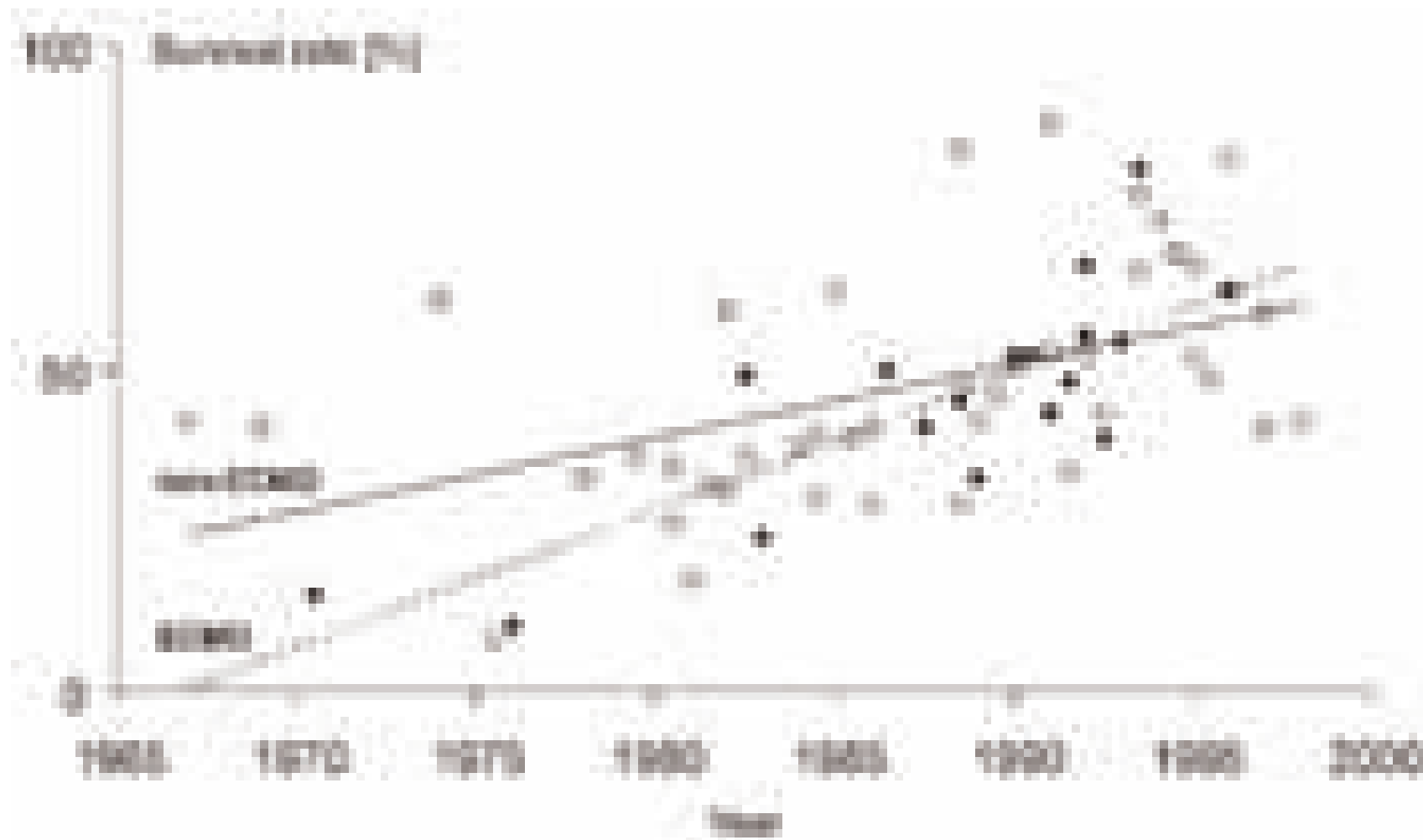
- **Exclusion:**

- durée de la VM $> 7\text{j}$
- CI aux anticoagulants,
- lésions cérébrales irréversibles,
- pathologie pulmonaire chronique sévère,
- immunosuppression,
- maladie terminale,
- défaillance multi viscérale

Zapol *et al.* JAMA 79



Survie: modification // évolutions technologiques



Le petit manuel du parfait ARDSologue

- Limiter la iatrogénie
- Réduction volume courant
- Plusieurs profils de patients
- Approche globale
 - Ajuster la PEEP en fonction de la présentation morphologique
 - Limiter pression de plateau
 - Curariser tôt mais brièvement
 - Eviter dérecrutement
 - Limiter les objectifs d'oxygénation



U'corea in Bastia - 30 & 31 / 5 / 2009