



PRINCIPALES ASYNCHRONIES en VENTILATION ASSISTÉE

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Déclaration de conflits d'intérêts

Mon intervention ne présente aucun
conflit d'intérêt

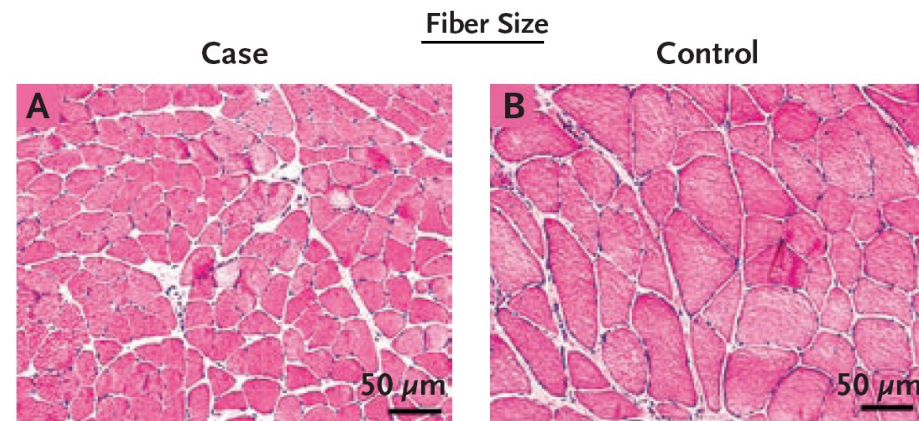
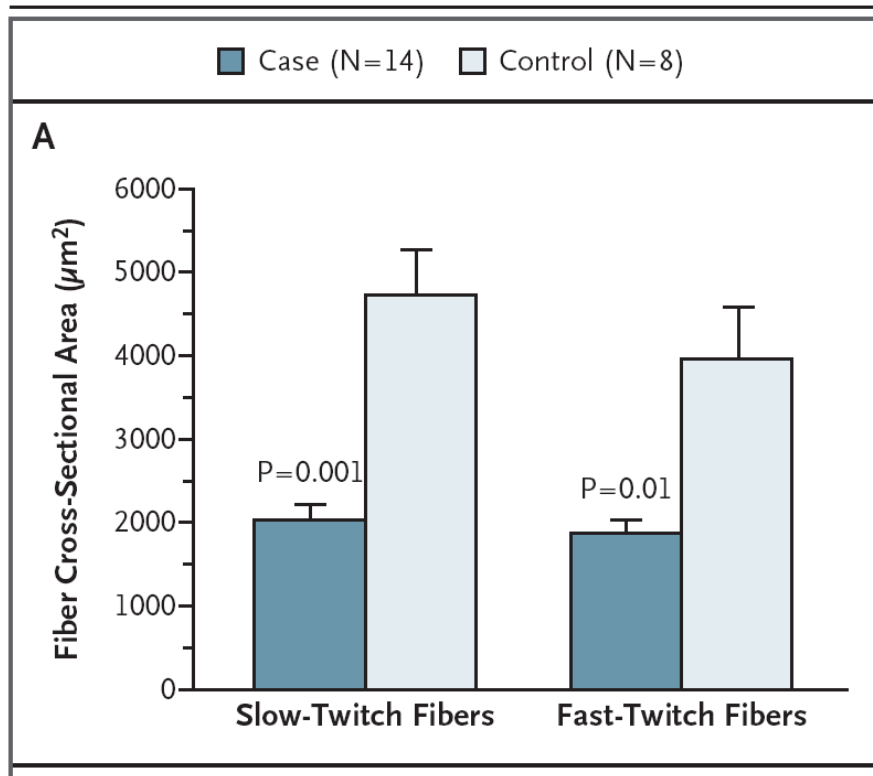
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

MARCH 27, 2008

VOL. 358 NO. 13

Rapid Disuse Atrophy of Diaphragm Fibers in Mechanically Ventilated Humans



Levine et al., New England J Med 2008; 358:1327-35

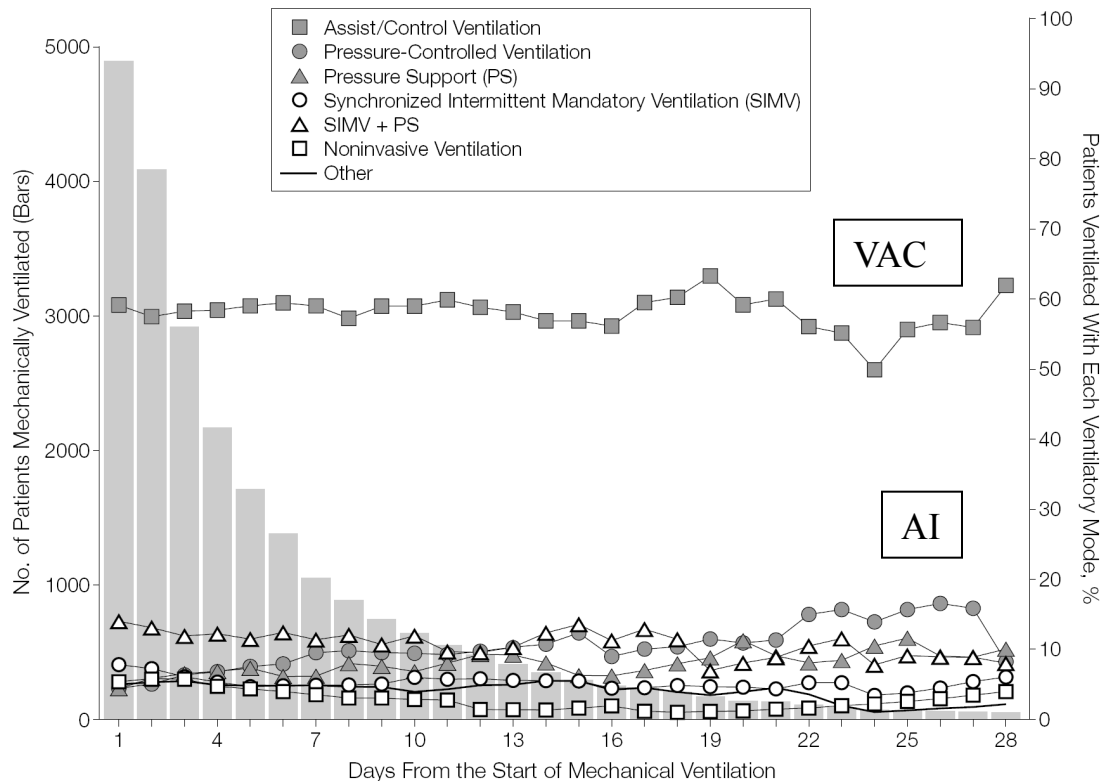
Evolution of Mechanical Ventilation in Response to Clinical Research

Am J Respir Crit Care Med Vol 177. pp 170–177, 2008

Andrés Esteban¹, Niall D. Ferguson², Maureen O. Meade³, Fernando Frutos-Vivar¹, Carlos Apezteguia⁴, Laurent Brochard⁵, Konstantinos Raymondos⁶, Nicolas Nin¹, Javier Hurtado⁷, Vinko Tomicic⁸, Marco González⁹, José Elizalde¹⁰, Peter Nightingale¹¹, Fekri Abroug¹², Paolo Pelosi¹³, Yaseen Arabi¹⁴, Rui Moreno¹⁵, Manuel Jibaja¹⁶, Gabriel D'Empaire¹⁷, Fredi Sandi¹⁸, Dimitros Matamis¹⁹, Ana María Montañez²⁰, and Antonio Anzueto²¹, for the VENTILA Group*

JAMA, January 16, 2002—Vol 287, No. 3 **345**

Figure 1. Ventilator Modes Used Each Day During the Course of Mechanical Ventilation



De 1998 à 2004:
AI en progression
> 50% après échec
d'une épreuve de VS



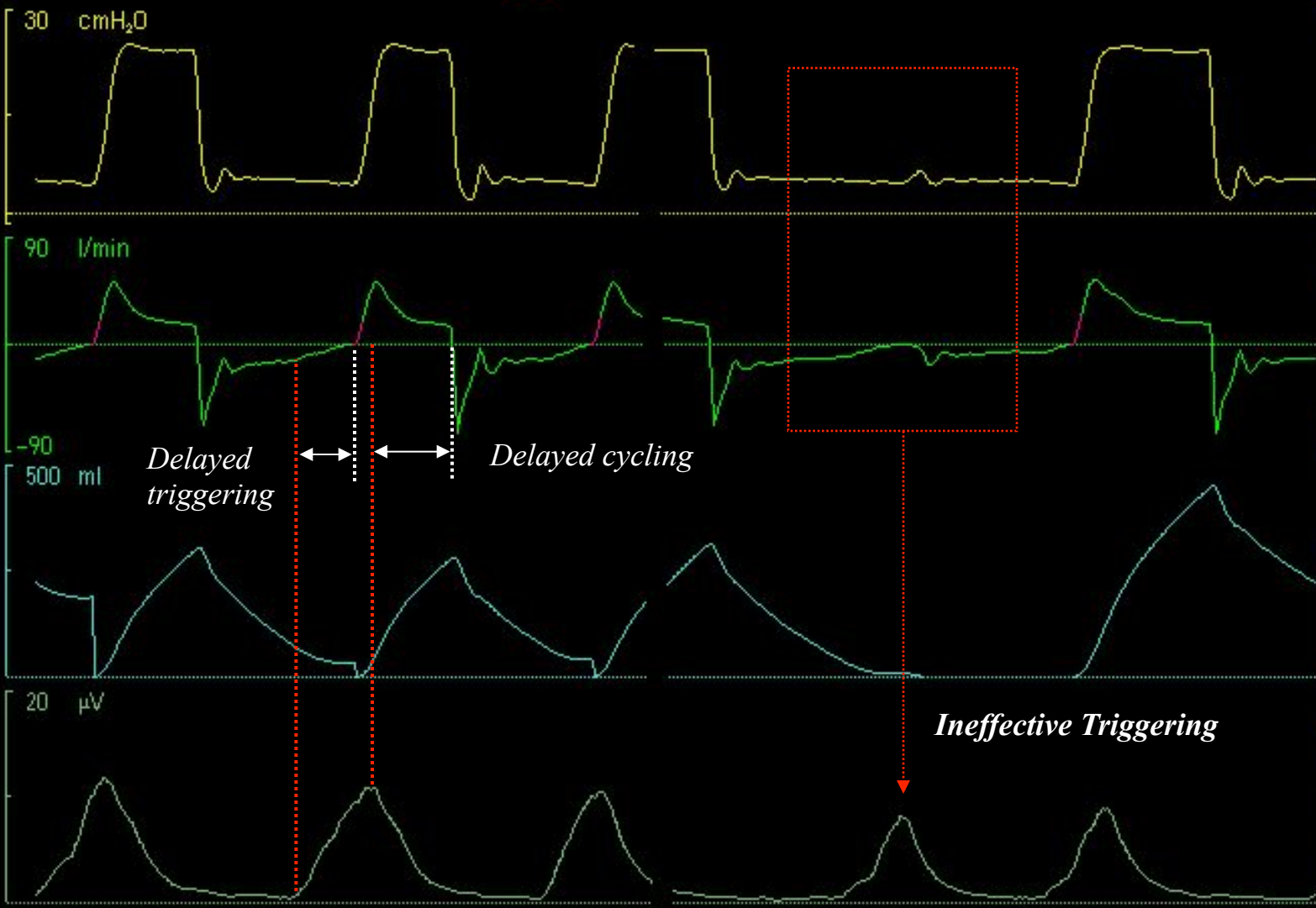
Aide inspiratoire/VS PEP

Admettre patient

Nébuliseur

Etat

1:01



Pcrête (cmH ₂ O)	25	60
Pmoyen. (cmH ₂ O)	12	
PEP (cmH ₂ O)	5	
F resp. (resp./min)	20	40
O ₂ (%)	50	5
Ti/Ttot	0.40	
VMe (l/min)	6.5	40.0
Vc insp. (ml)	282	4.0
Vc exp. (ml)	270	
Edi max (µV)	11	
Edi min (µV)	0.4	

Autres réglages

Conc. d'O₂
50
 21 % 100 0

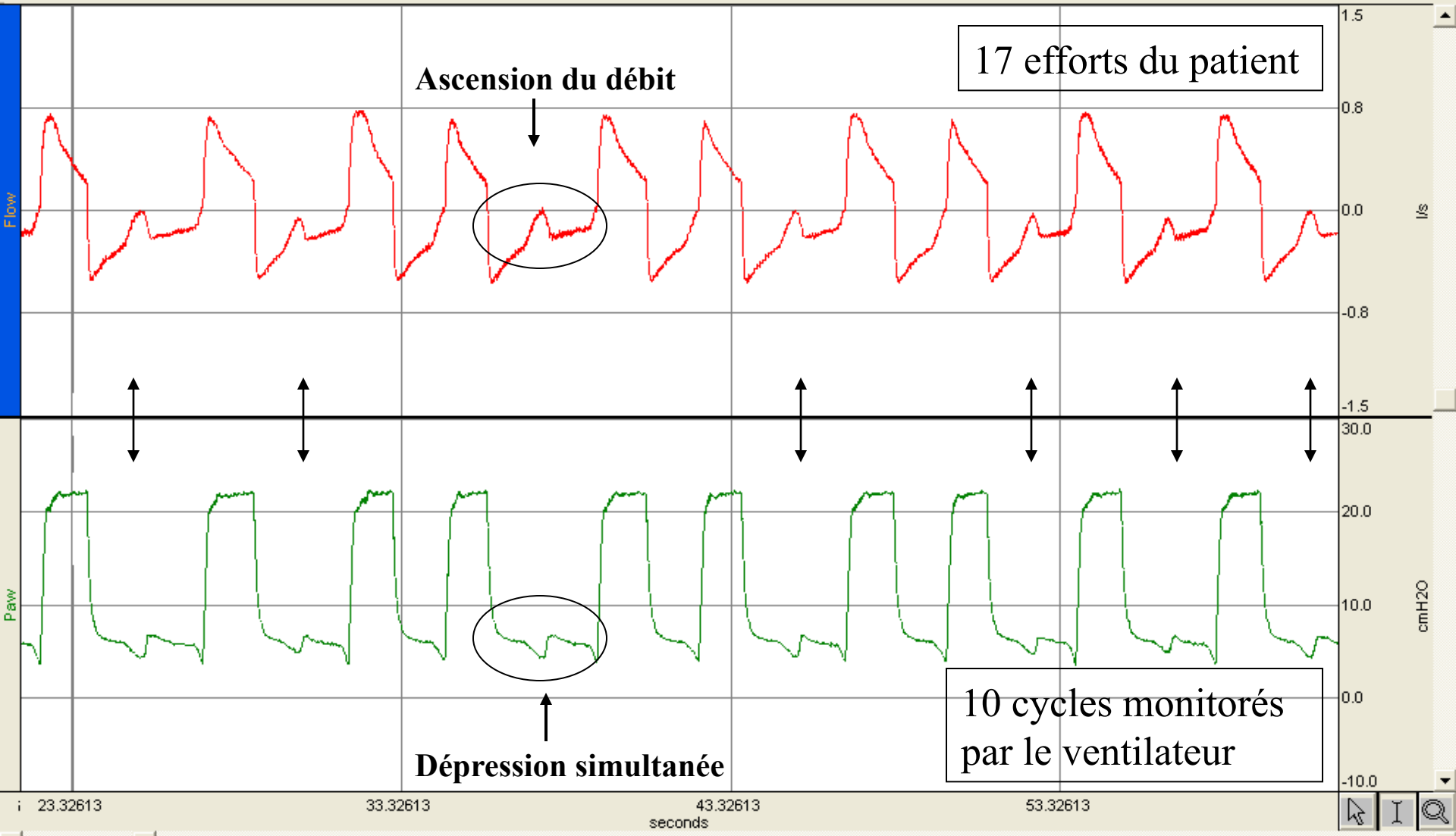
PEP
5
 cmH₂O 50

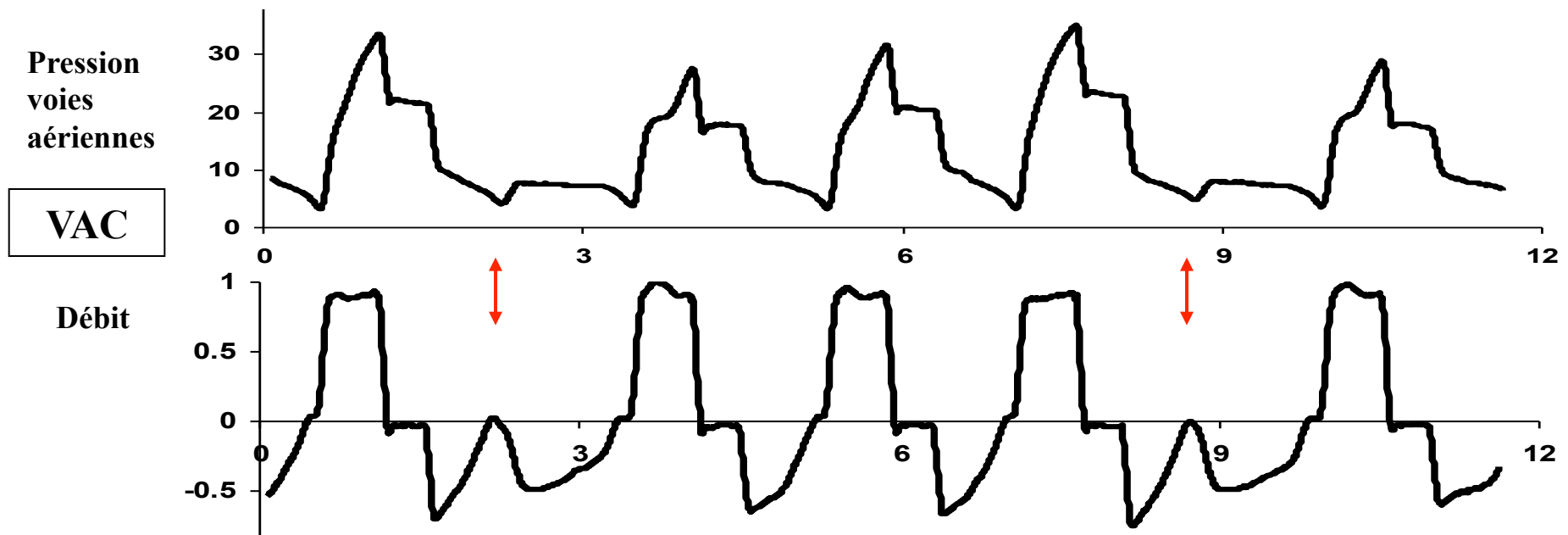
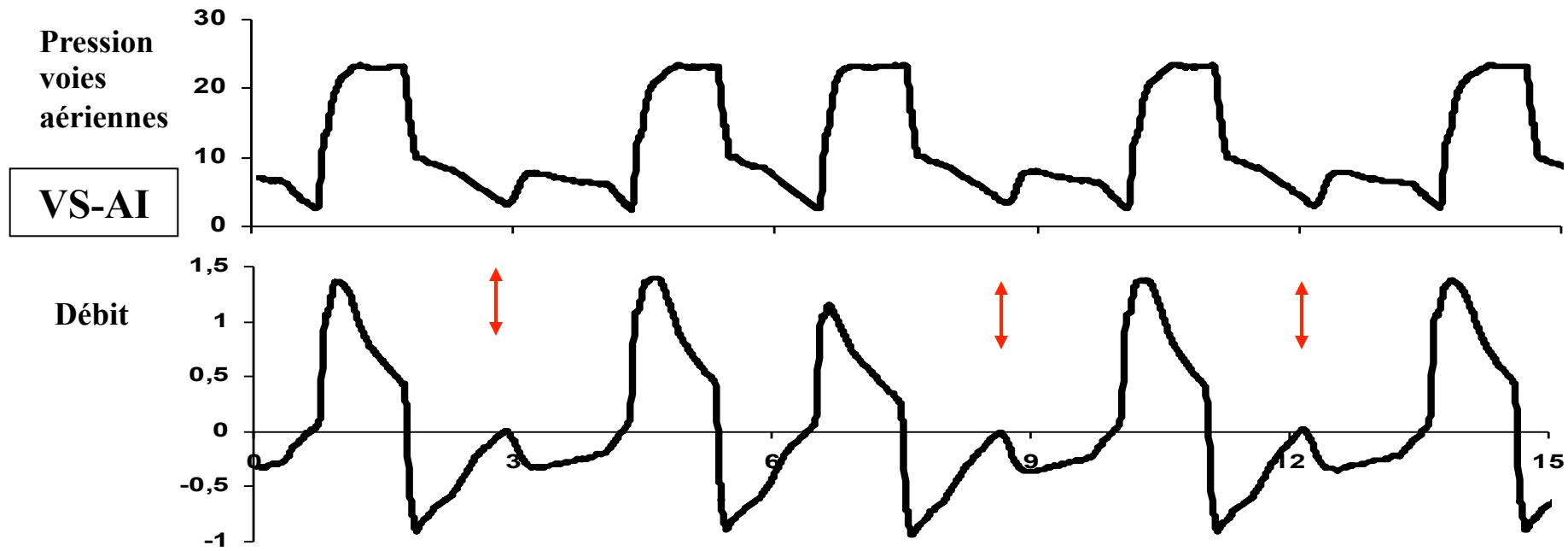
Niv. AI sur PEP
20
 cmH₂O 120

Autres valeurs



1 3 Flow





Patient-Ventilator Trigger Asynchrony in Prolonged Mechanical Ventilation*

David C. Chao, MD, FCCP; David J. Scheinhorn, MD, FCCP; and
Meg Stearn-Hassenpflug, MS, RD

(*CHEST* 1997; 112:1592-99)

- Plus de 10% des patients admis dans un centre de sevrage ventilatoire présentaient des efforts inefficaces
- Plus de 80% étaient BPCO.

Table 2—Outcome of Weaning Attempts in 19 Patients With TA on Admission to the RWC

Outcome Group	n	Remark
Weaned	3	Time ventilated at BRH=83±21 d
Failed to Wean	9	BRH length of stay=127±48 d
Died	7	BRH length of stay=77±60 d

Effects of Different Ventilator Settings on Sleep and Inspiratory Effort in Patients with Neuromuscular Disease

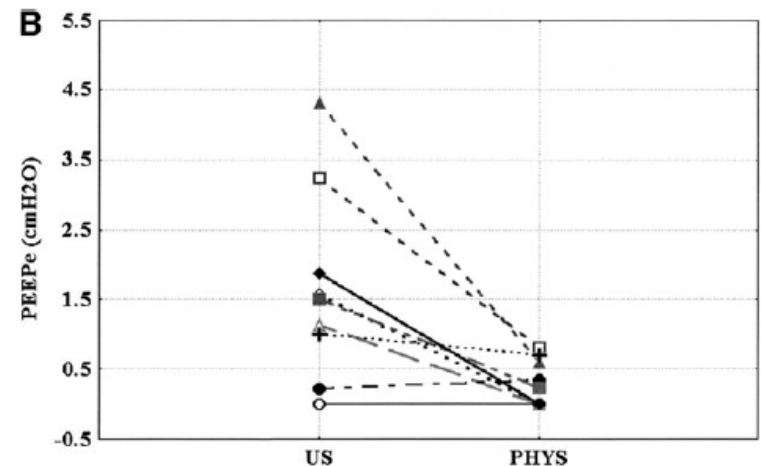
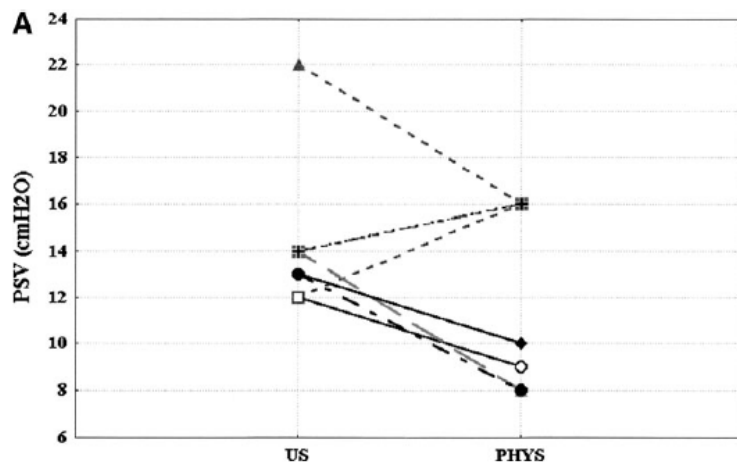
Am J Respir Crit Care Med Vol 172. pp 619–624, 2005

Francesco Fanfulla, Monica Delmastro, Angela Berardinelli, Nadia D'Artavilla Lupo, and Stefano Nava

Pulmonary Division, Istituto Scientifico di Montescano and Pavia, Fondazione S. Maugeri, IRCCS; and Department of Clinical Neurology and Child Psychiatry, IRCCS C. Mondino, Pavia, Italy

TABLE 3. SLEEP DATA DURING MECHANICAL VENTILATION WITH THE TWO SETTINGS

	US	PHYS	p Value
TST, min	281.1 ± 41.6	346.4 ± 99.9	n.s.
SE, % of TST	66.5 ± 22.4	80.7 ± 9.6	0.01
SWS, % of TST	17.7 ± 9.81	25.1 ± 10.8	n.s.
REM, % of TST	8.9 ± 7.4	17.3 ± 5.4	< 0.05
Arousal index, events/h	29.9 ± 17.2	16 ± 12.6	0.01
ODI, events/h	27.5 ± 25.2	8.2 ± 8.5	< 0.05
Sa _o ₂ nadir, %	67.8 ± 14.3	85.5 ± 4.5	0.0009
TST ₉₀ , %	31.3 ± 29.8	7.2 ± 9	< 0.05
NREM ineffective efforts, events/h	62.5 ± 75.1	15 ± 20	< 0.05



Conséquences cliniques des efforts inefficaces ?

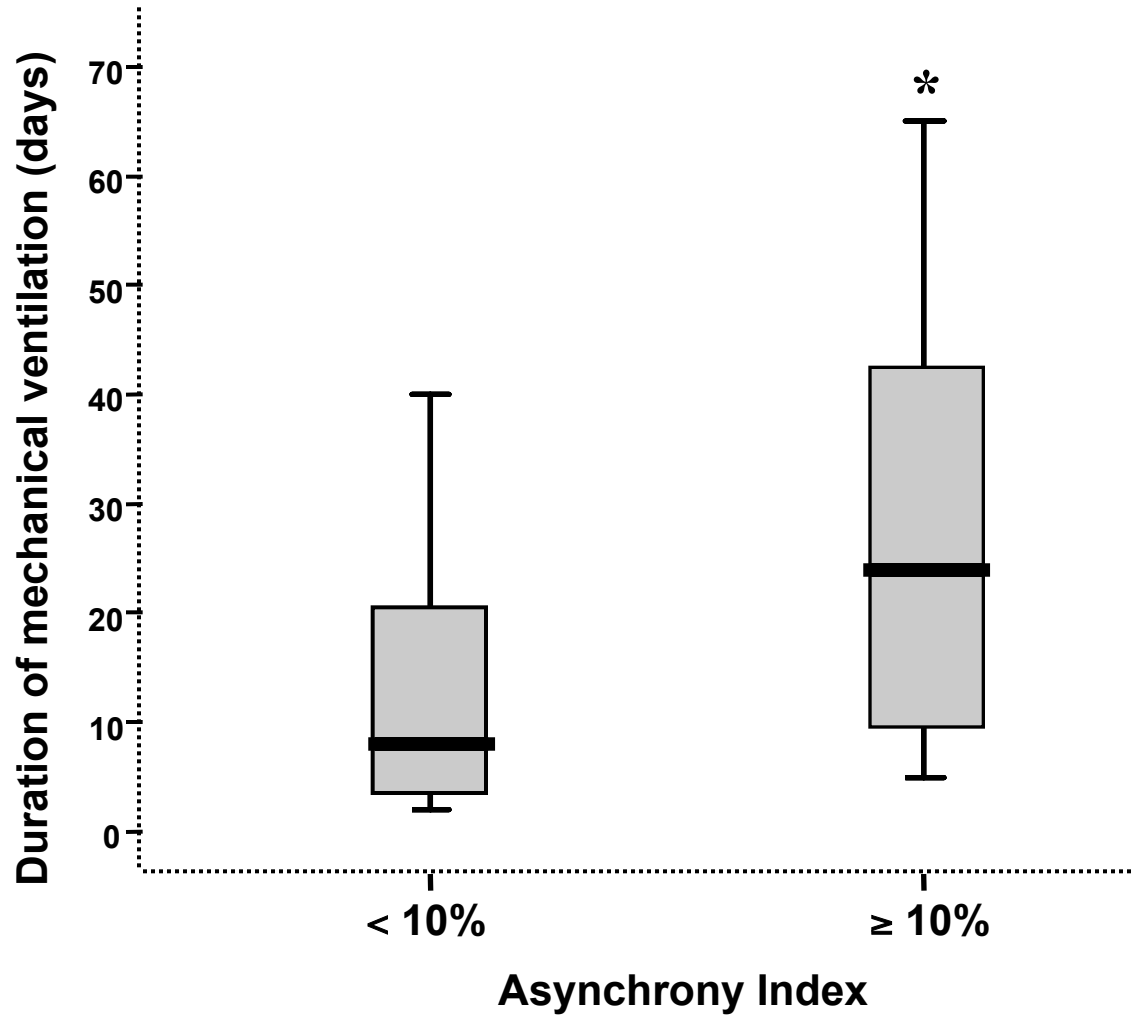
- Erreur de jugement pour le sevrage ventilatoire:
FR ventilateur \neq FR patient
- Travail respiratoire inefficace: dépense énergétique perdue
- Altération de la qualité du sommeil
- Durée de ventilation mécanique prolongée
- Sevrage ventilatoire plus difficile

Arnaud W. Thille
Pablo Rodriguez
Belen Cabello
François Lellouche
Laurent Brochard

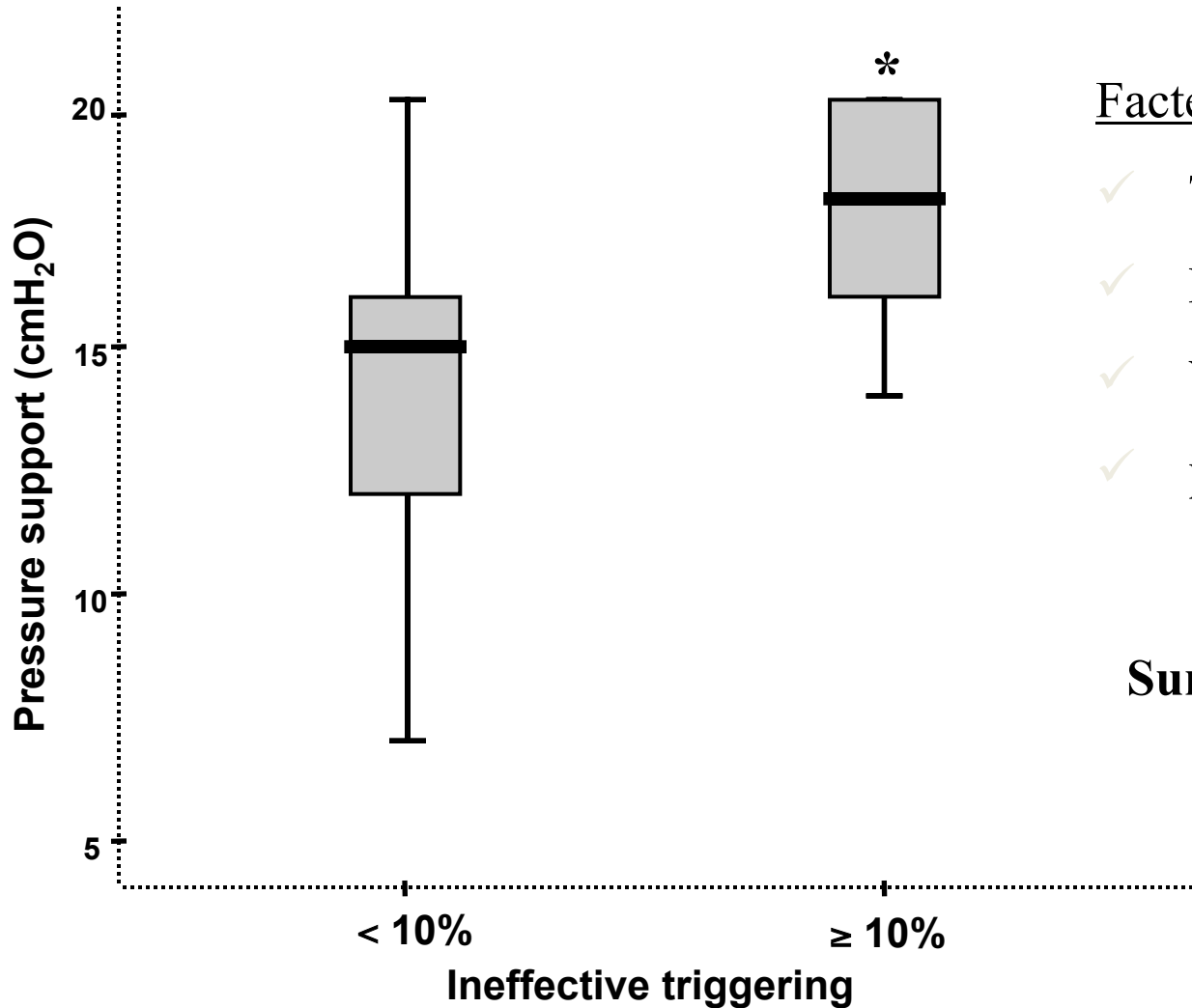
Patient-ventilator asynchrony during assisted mechanical ventilation

- Un quart des patients présentaient des asynchronies fréquentes (15/62)
- Efforts inefficaces (85%) et double-déclenchements
- Les efforts inefficaces survenaient aussi bien en AI qu'en VAC
- 55 % des patients qui présentaient des efforts inefficaces étaient BPCO

Influence des asynchronies sur le pronostic ?



Efforts inefficaces



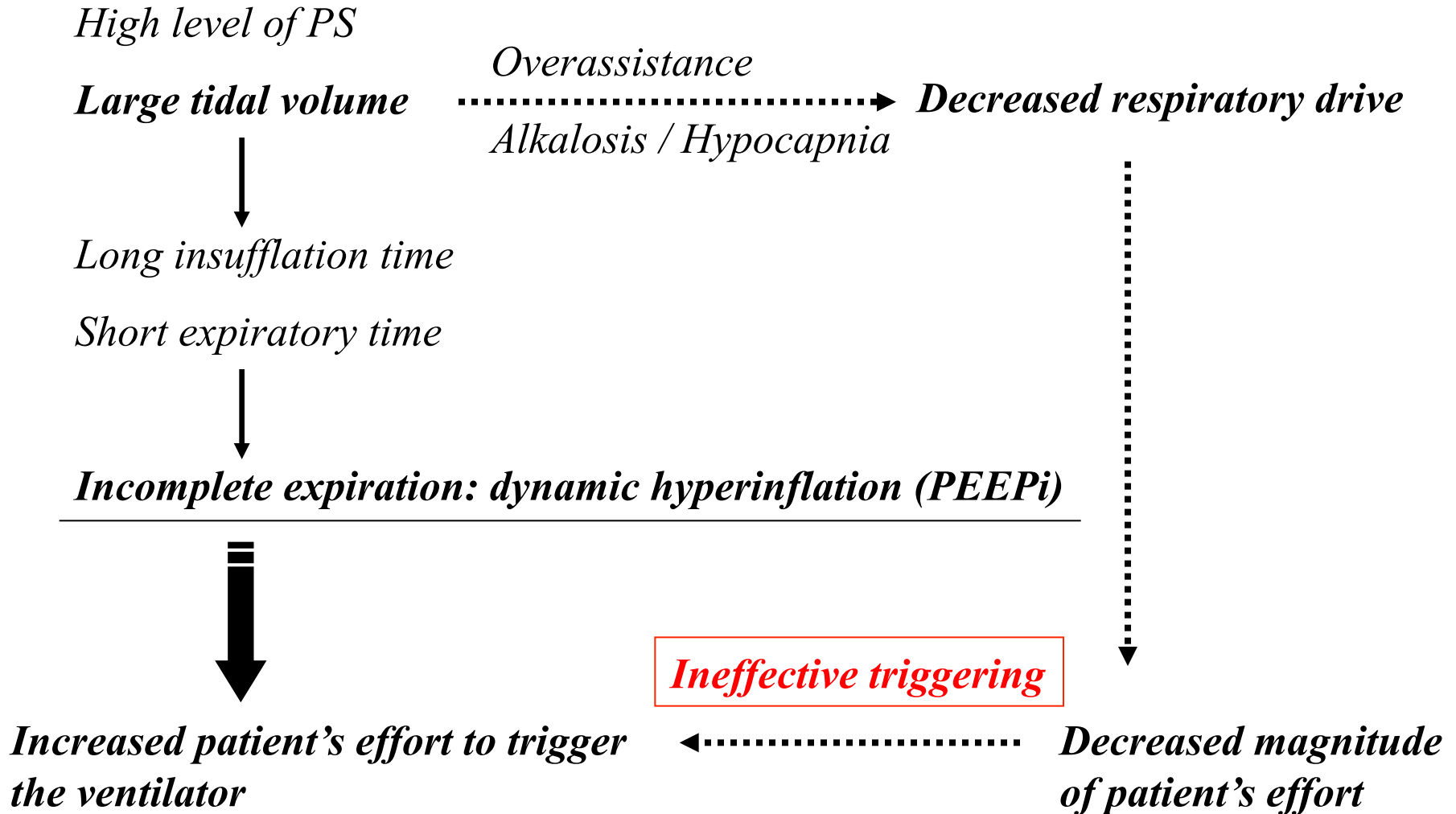
Facteurs associés

- ✓ Trigger moins sensible
- ✓ Niveau d'AI plus élevé
- ✓ V_T plus grand
- ✓ pH plus alcalin



Surassistance ventilatoire ?

Hyperinflation dynamique: PEP intrinsèque



Quand et pourquoi l'effort est inefficace ?

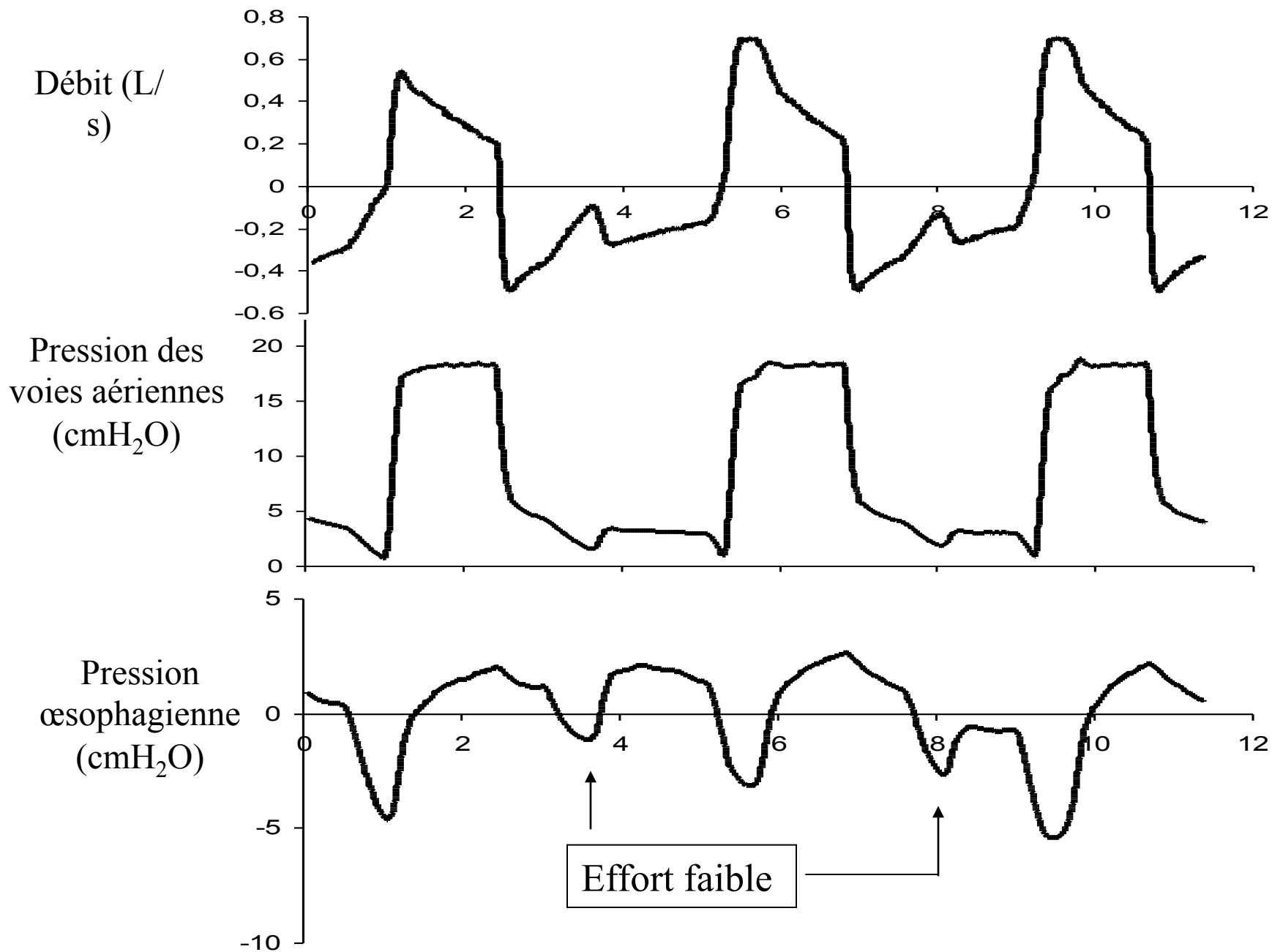
1. Augmentation de l'effort nécessaire pour déclencher le ventilateur

- ✓ PEP intrinsèque
 - *Grand volume courant*
 - *Temps expiratoire court*
- ✓ Trigger inspiratoire

2. Réduction de l'effort inspiratoire

- ✓ Diminution de la commande respiratoire centrale ✓ *Surassistance*
- ✓ Faiblesse diaphragmatique
 - ✓ *Paralysie diaphragmatique*
 - ✓ *Myopathie de réanimation*
- ✓ *Hypocapnie*
- ✓ *Alcalose*
- ✓ *Sédation*

Diminution de la commande centrale ? Faiblesse diaphragmatique ?



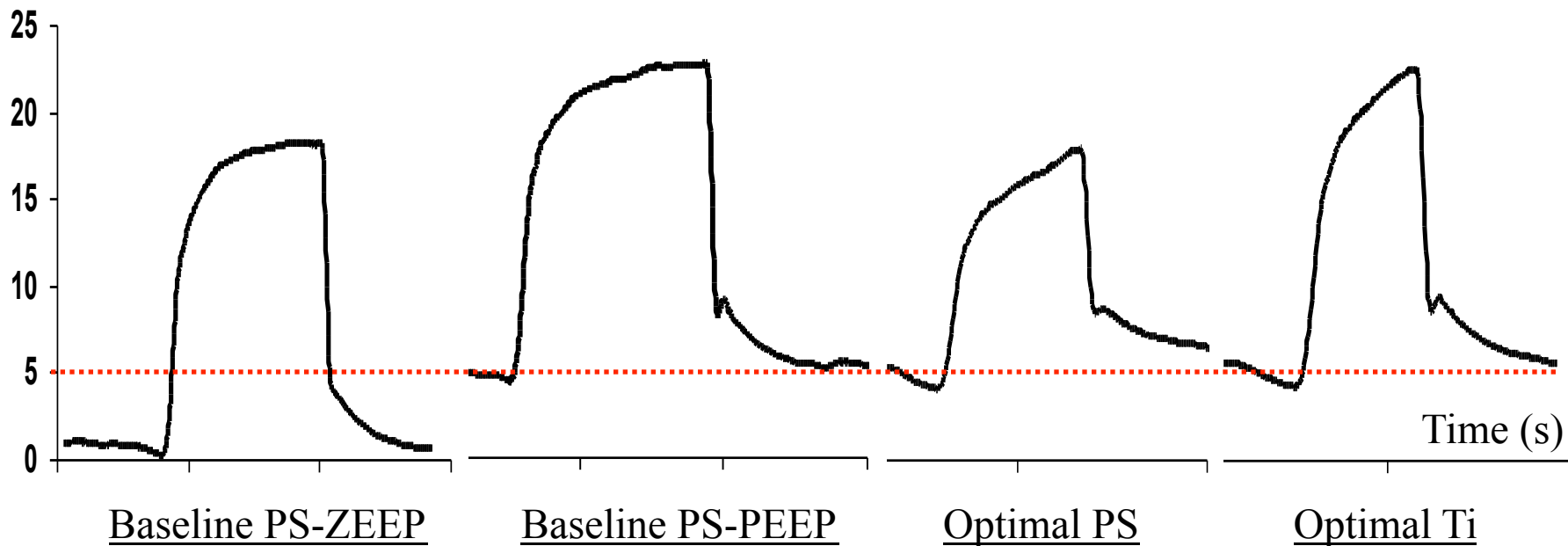
Conclusions

1. Les macro-asynchronies patient-ventilateur sont fréquentes au cours de la ventilation assistée
2. Les efforts inefficaces sont les asynchronies les plus fréquentes et semblent favorisés par une ventilation excessive / BPCO
3. Les asynchronies fréquentes sont associées à une durée de ventilation prolongée et un sevrage plus difficile

Arnaud W. Thille
Belen Cabello
Fabrice Galia
Aissam Lyazidi
Laurent Brochard

Reduction of patient-ventilator asynchrony by reducing tidal volume during pressure-support ventilation

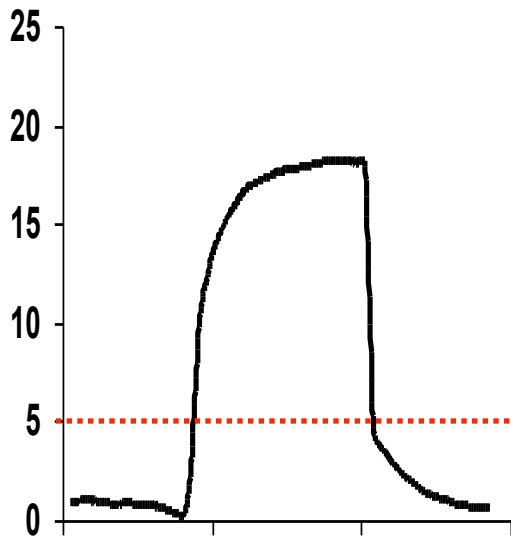
Airway Pressure (cmH₂O)



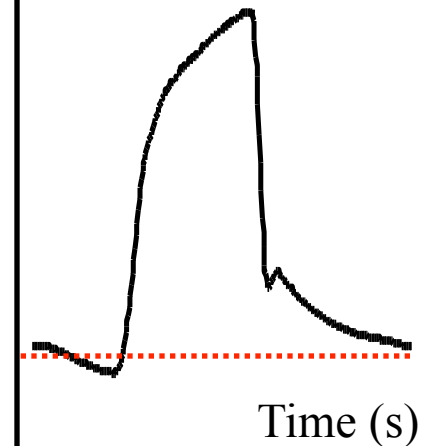
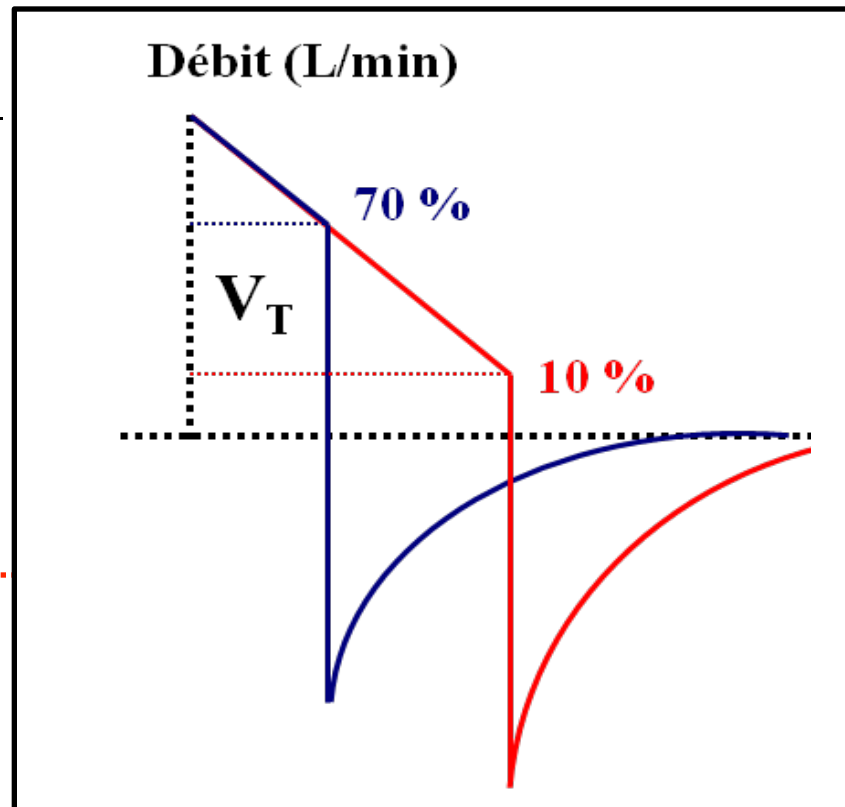
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Reduction of patient-ventilator asynchrony by reducing tidal volume during pressure-support ventilation

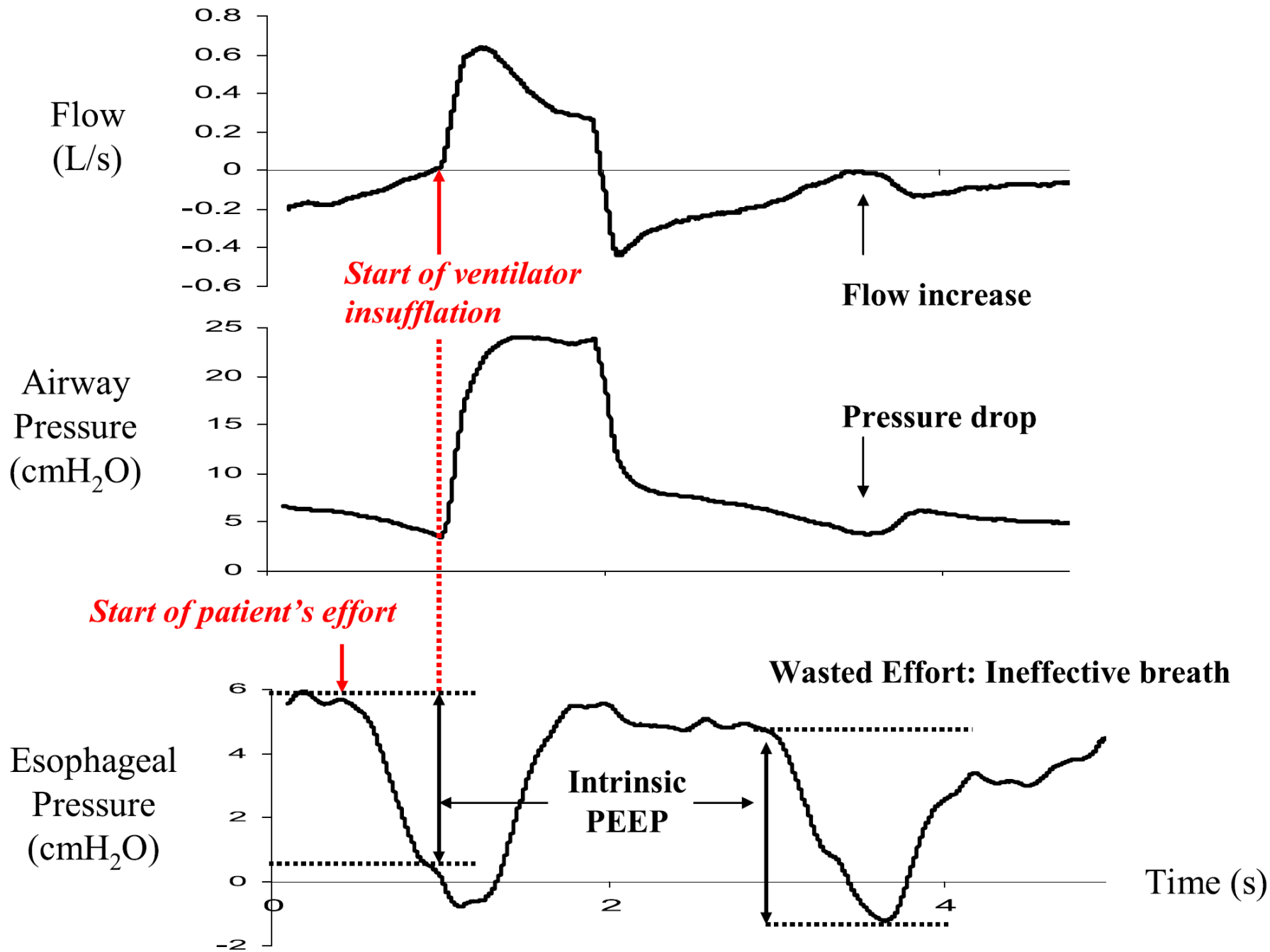
Airway Pressure (cmH₂O)

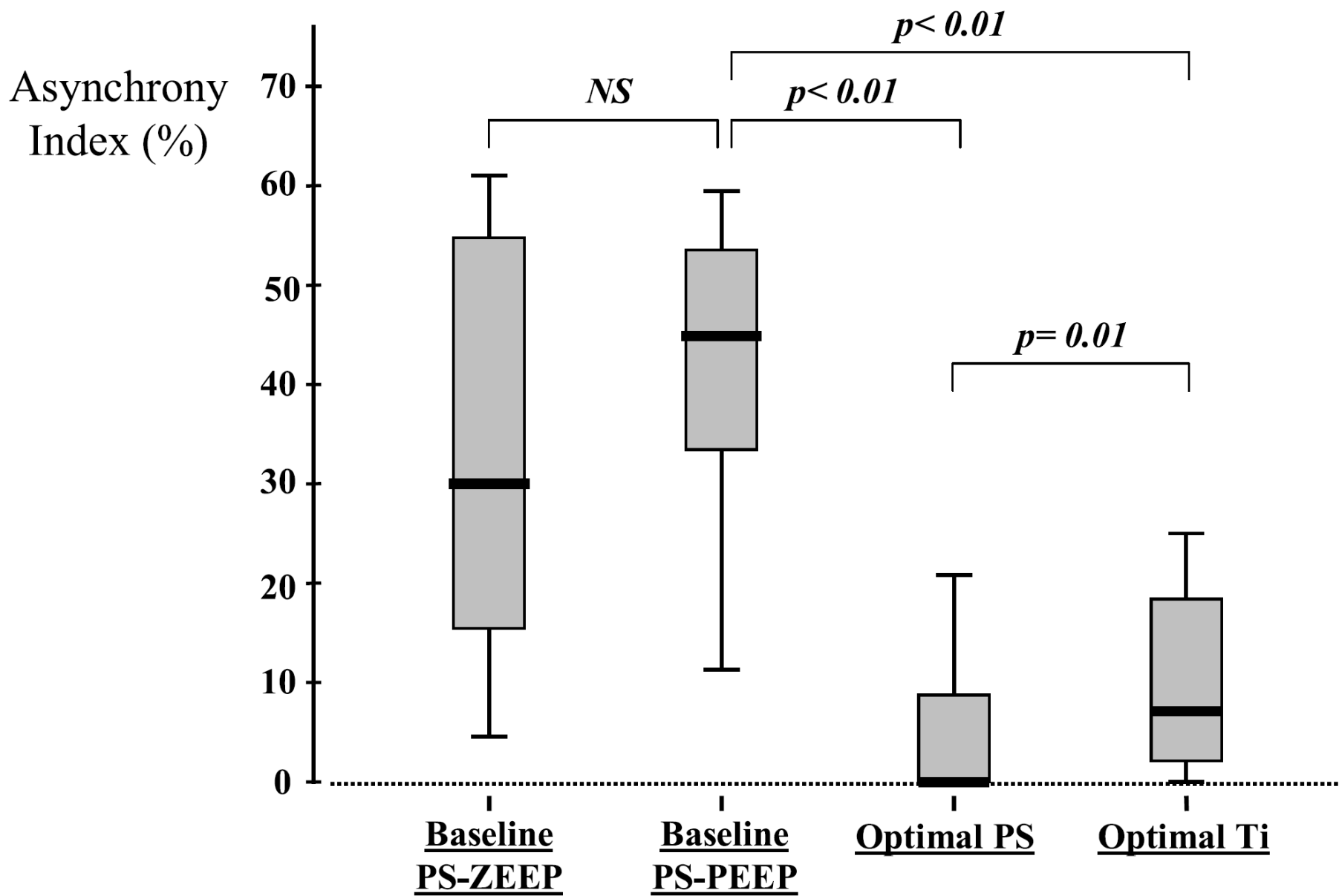


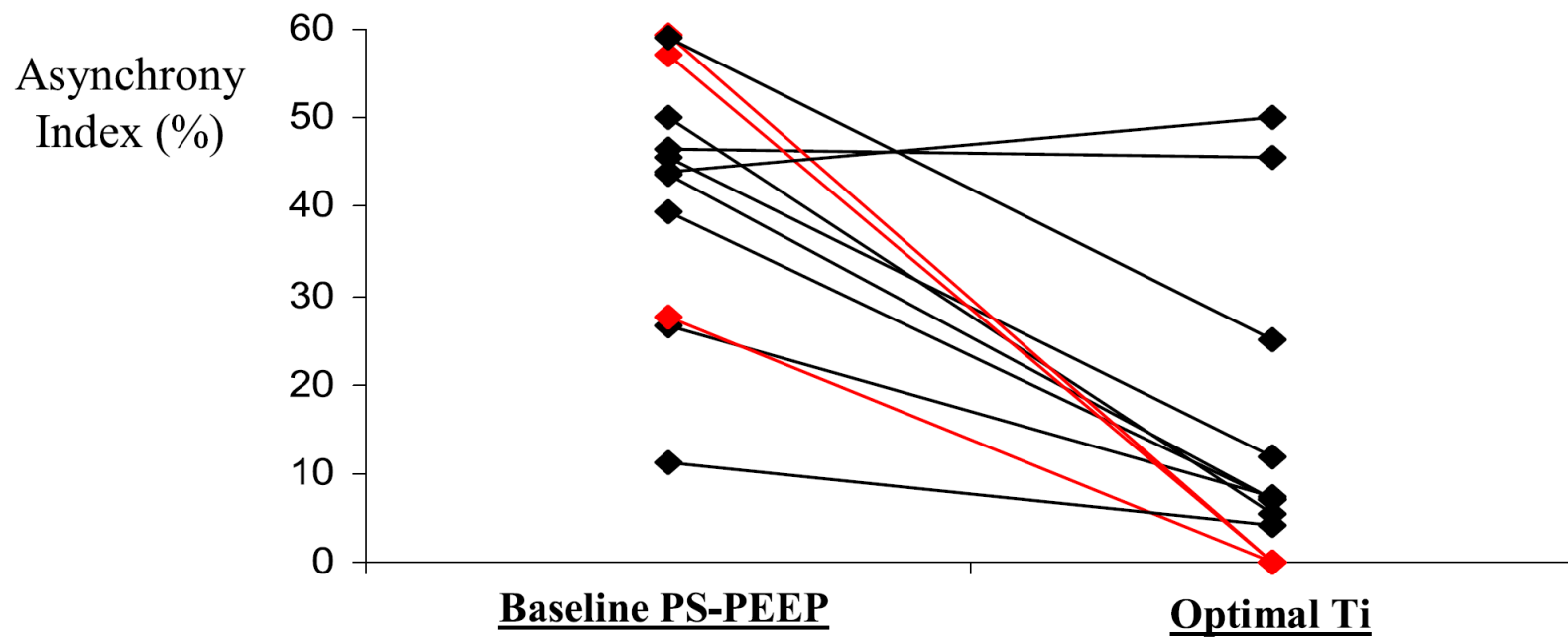
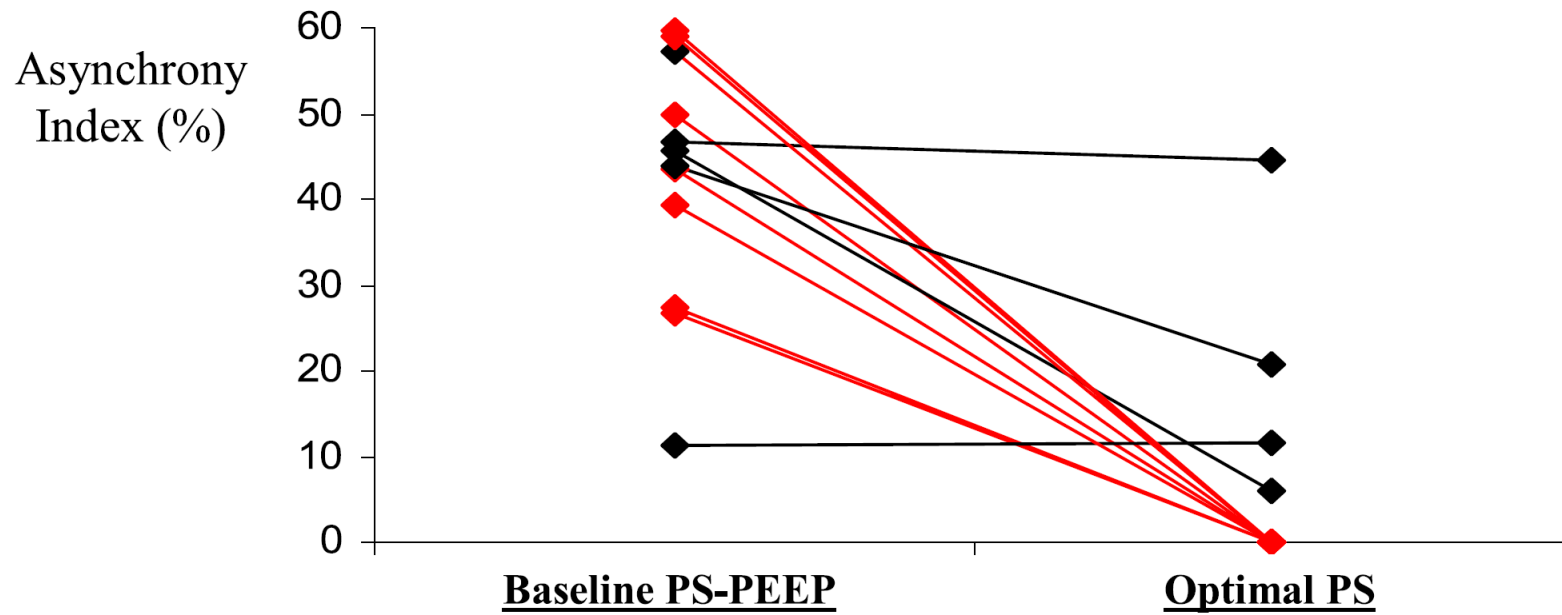
Baseline PS-ZEEP

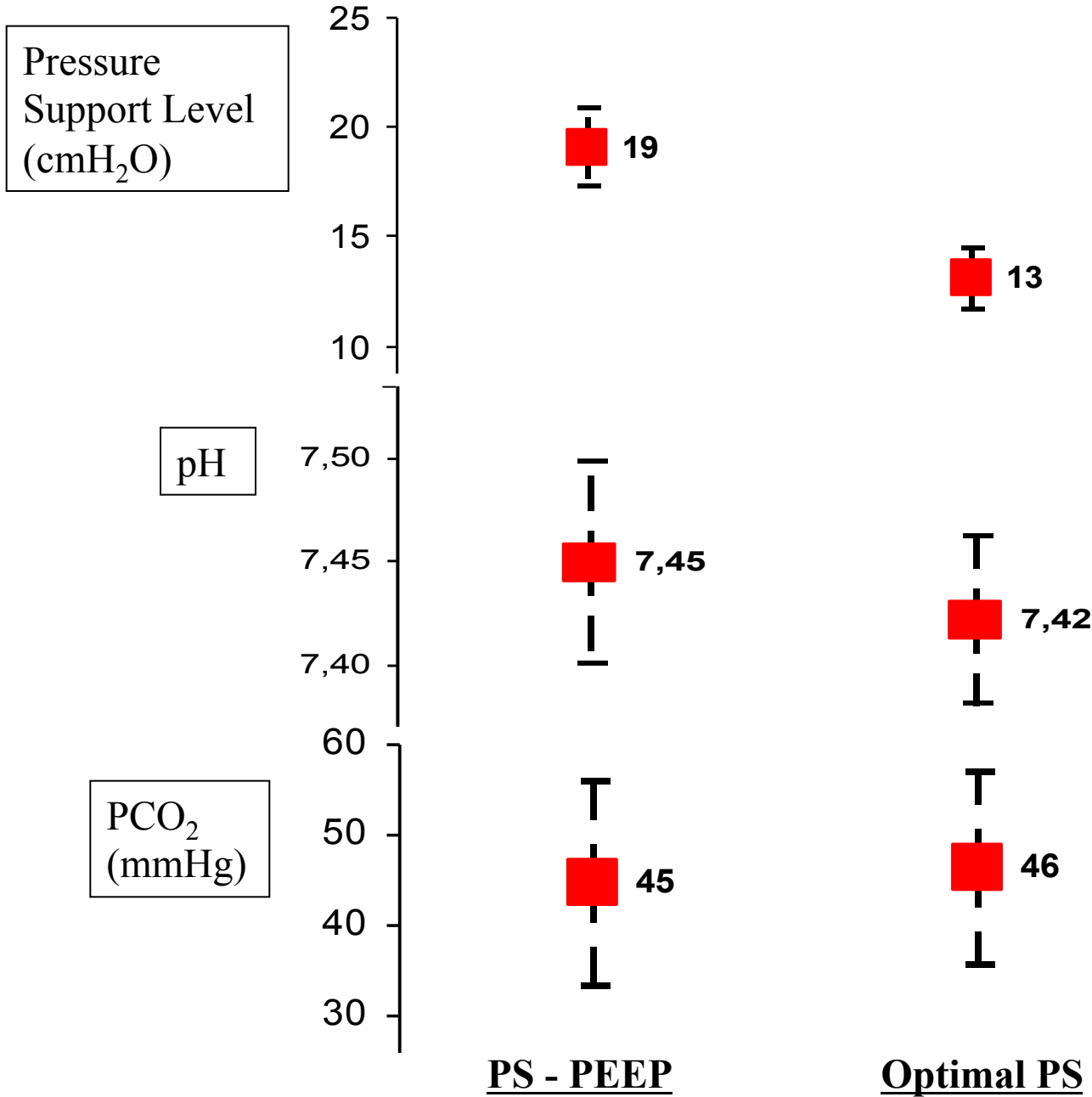


Optimal Ti

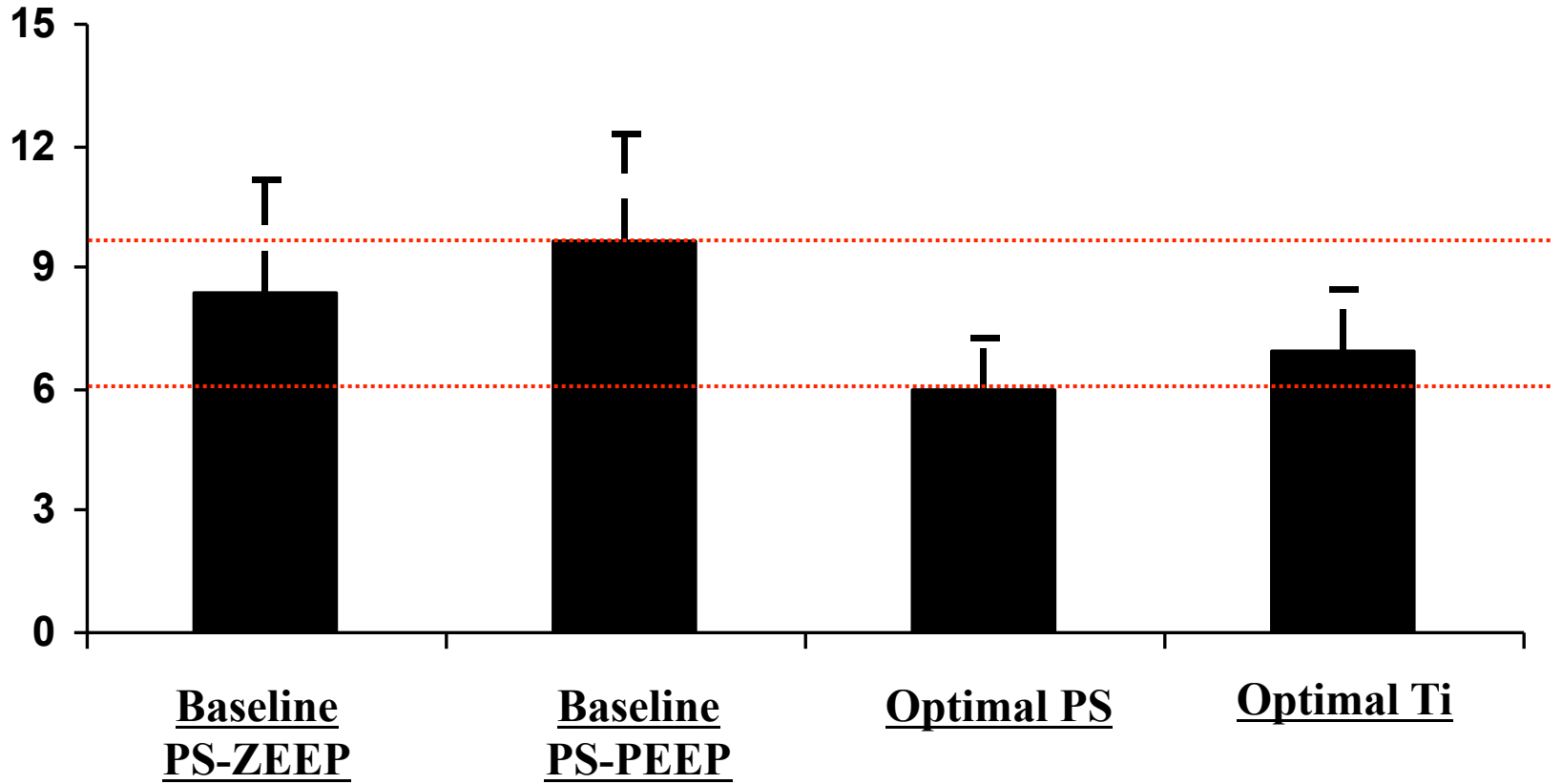




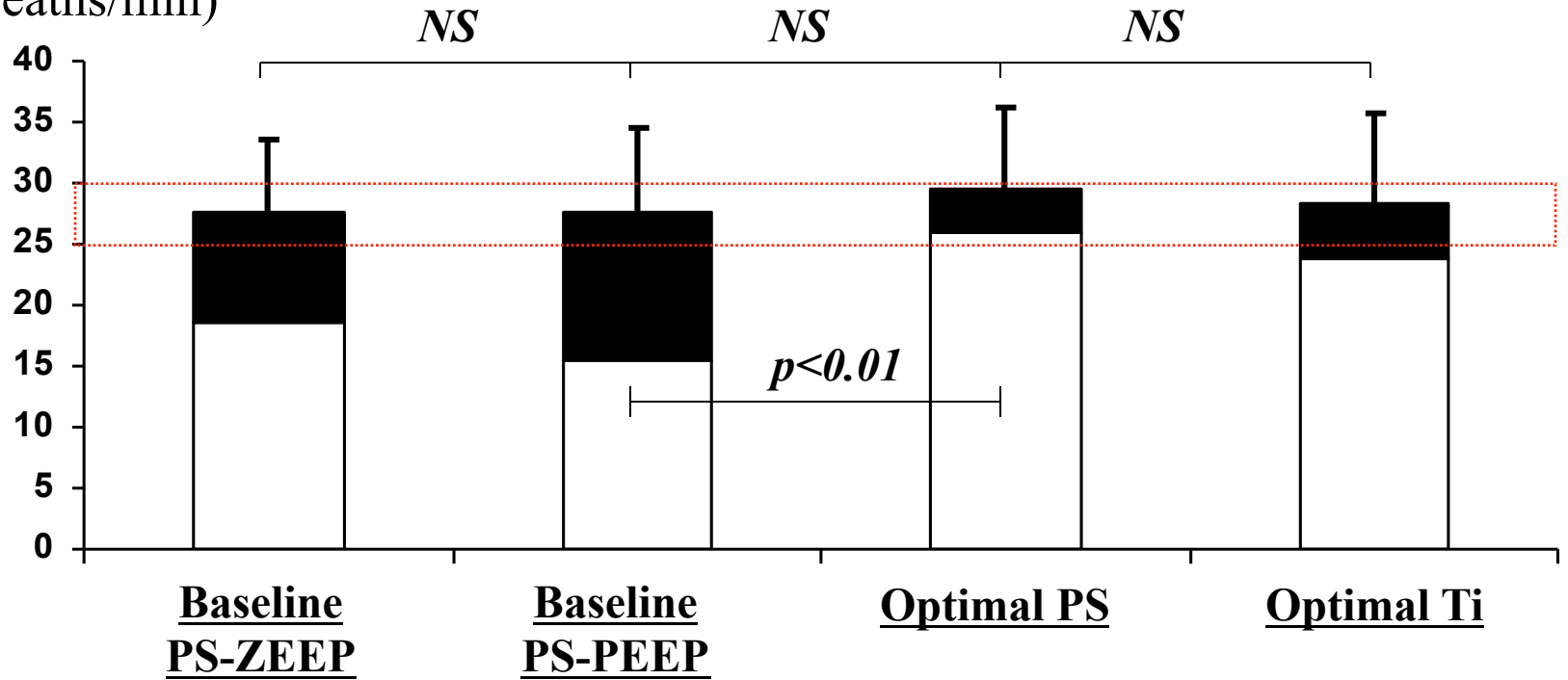






V_T (ml/kg)

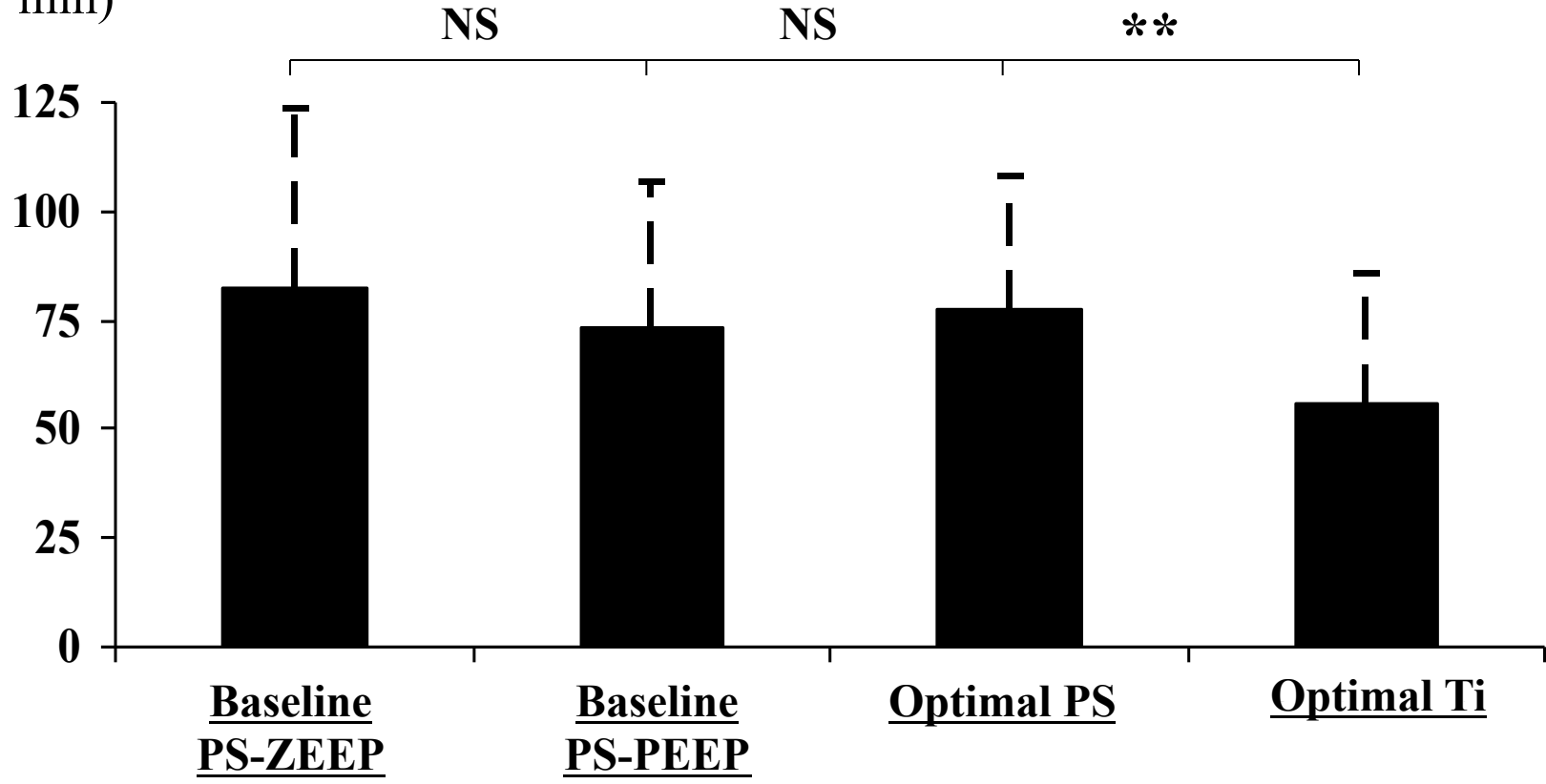


Respiratory Rate (Breaths/min)



 Respiratory rate indicated by the ventilator
 Rate of wasted efforts
] = Total patient's respiratory rate

PTP (cmH₂O.s/
min)



Airway Occlusion Pressure to Titrate Positive End-expiratory Pressure in Patients with Dynamic Hyperinflation

Jordi Mancebo, M.D.,* Pierre Albaladejo, M.D.,† Dominique Touchard,‡ Ela Bak, M.Sc.,§ Mireia Subirana, R.N.,|| François Lemaire, M.D.,# Alain Harf, M.D.,** Laurent Brochard, M.D.#

Table 2. Breathing Pattern Components and Intrinsic Positive End-expiratory Pressure (PEEP)

	PEEP 0	PEEP 5	PEEP 10	P Value
f (per min)	26.9 ± 7.1	25.5 ± 6.7	25.1 ± 8.3	0.18
V _T (ml)	399 ± 118*	432 ± 136	459 ± 137	0.003
V _E (l/min)	10.7 ± 4.3	10.8 ± 4.1	11.1 ± 4.4	0.27
Ti/Tt (%)	32 ± 6*	33 ± 5	34 ± 5	0.025
V _T /Ti (ml/s)	561 ± 170	551 ± 160	556 ± 180	0.74
PEEPi (cm H ₂ O)	5.2 ± 2.4†	3.6 ± 1.9	2.7 ± 1.9	<0.001

S. Nava
C. Bruschi
F. Rubini
A. Palo
G. Iotti
A. Braschi

Respiratory response and inspiratory effort during pressure support ventilation in COPD patients

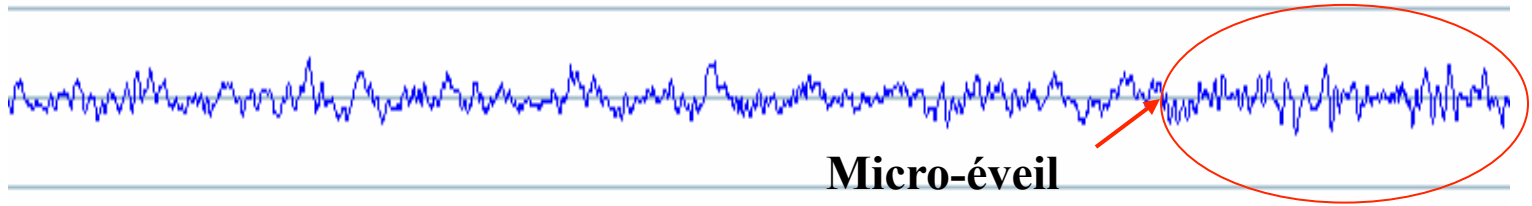
Table 4 Effect of PEEPe during PSb on PTPdi, no. of ineffective efforts, and PEEPi, dyn

Patient no.	PSb				PSb + PEEPe			
	i/50	iPTPdi (cmH ₂ O/s ⁻¹)	ePTPdi (cmH ₂ O/s ⁻¹)	PEEPi dyn (cmH ₂ O)	i/50	iPTPdi (cmH ₂ O/s ⁻¹)	ePTPdi (cmH ₂ O/s ⁻¹)	PEEPi dyn (cmH ₂ O)
1	17	79	152	13.4	0	0	101	6.1
2	23	333	169	5.0	12	46	175	1.8
3	21	38	101	6.9	7	9	55	2.0
4	2	6	292	3.5	0	0	61	0.9
5	6	10	390	6.3	0	0	298	1.1
6	0	0	105	2.1	0	0	76	0
7	0	0	185	3.8	0	0	75	1.4
8	13	96	274	4.0	1	6	204	0.3
9	0	0	240	4.4	0	0	153	1.5
10	11	41	144	10.5	2	14	62	3.5
\bar{x}	9.3	60	205	6.0	2.2*	7.5	126	1.8**
SD	8.9	102	92	3.4	4.2	14	80	1.7

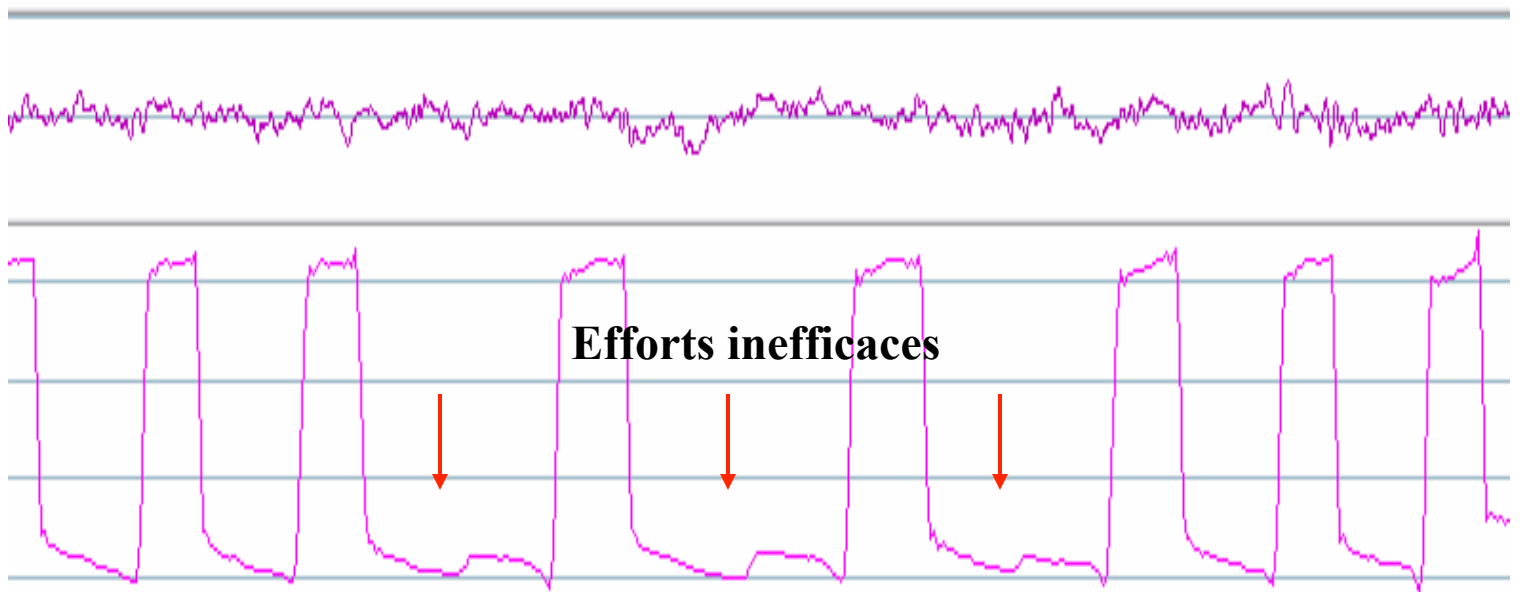
Conclusions

1. La majorité des efforts inefficaces étaient favorisés par un niveau d'AI excessif.
2. Un réglage optimal du ventilateur permettait de réduire la fréquence des efforts inefficaces sans augmenter la dépense énergétique des muscles respiratoires
3. V_T d'environ 6 ml/kg

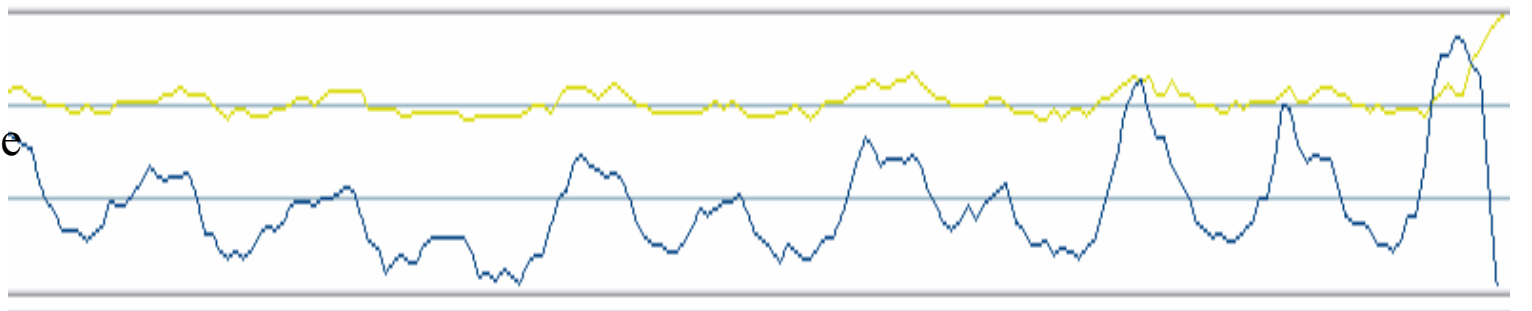
EEG

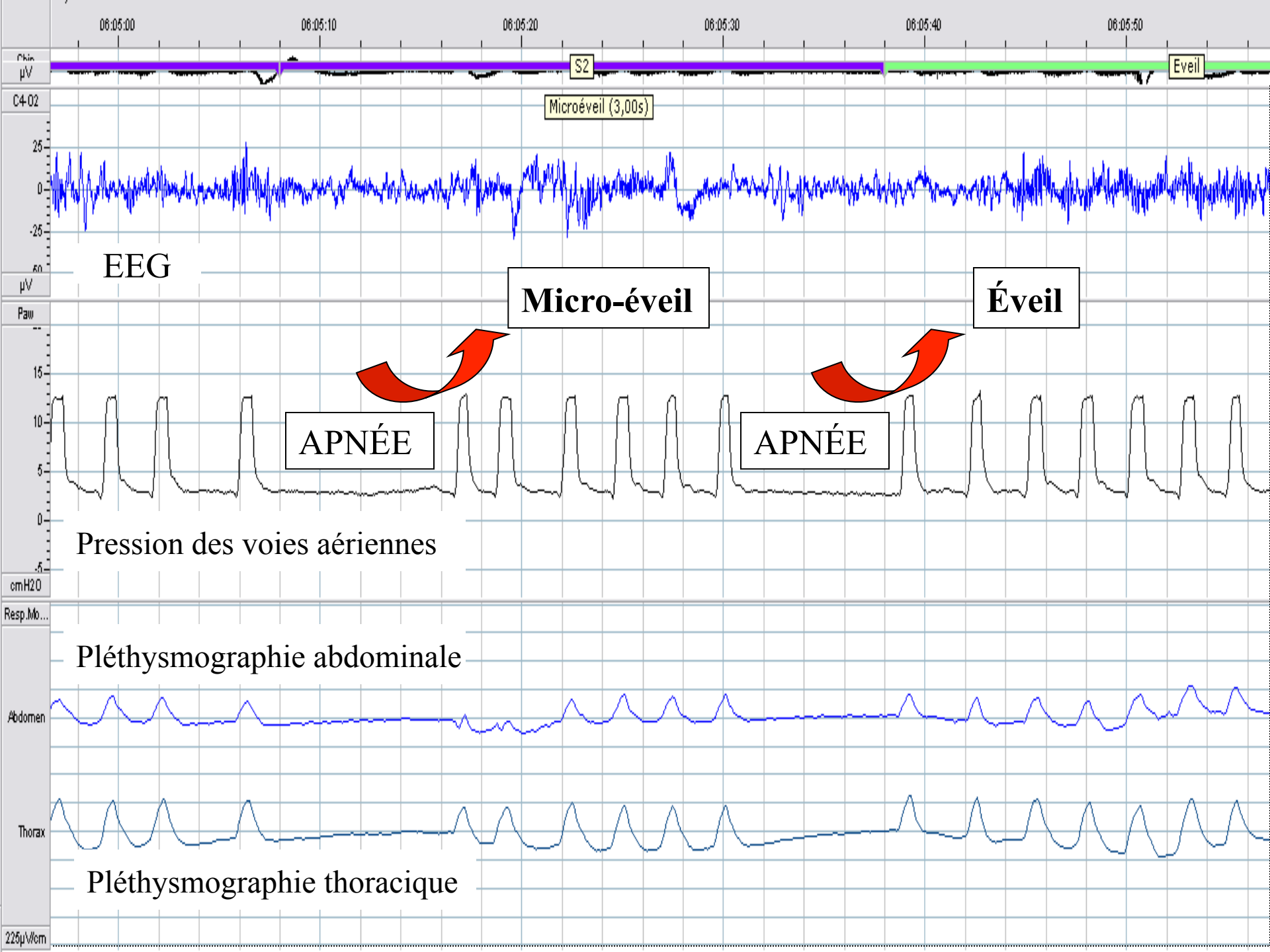


Pression des
voies aériennes

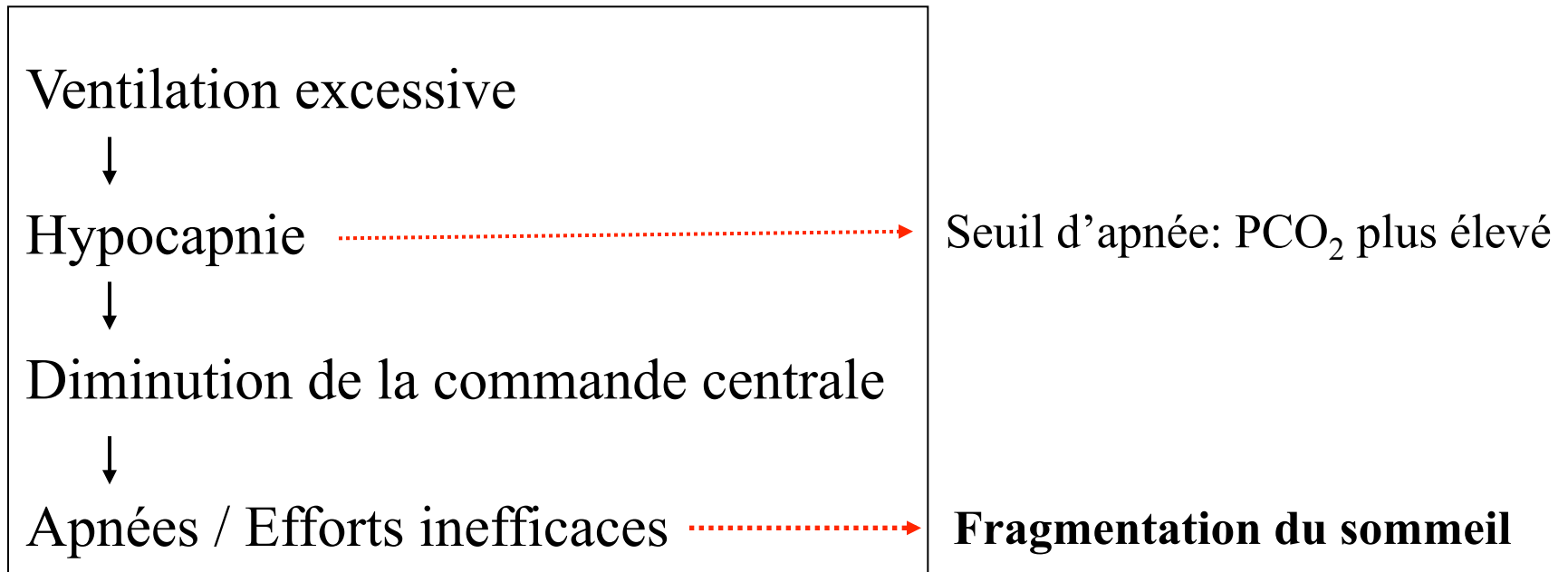


Pléthysmographie
d'inductance





Quelle dose de ventilation pendant le sommeil ?



Un niveau d'assistance adéquat peut devenir excessif pendant le sommeil...

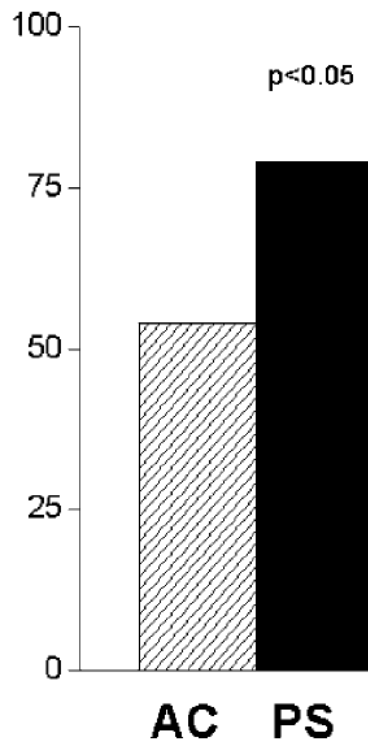
Effect of Ventilator Mode on Sleep Quality in Critically Ill Patients

Sairam Parthasarathy and Martin J. Tobin *Am J Respir Crit Care Med* Vol 166. pp 1423–1429, 2002

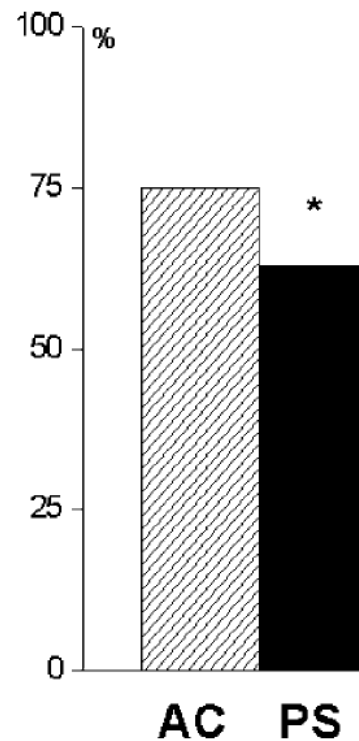
Division of Pulmonary and Critical Care Medicine, Edward Hines, Jr. Veterans Administrative Hospital, Hines, Illinois; and Loyola University of Chicago Stritch School of Medicine, Maywood, Illinois

Sleep was more fragmented during PSV than during ACV due to frequent apneas

Arousals plus Awakenings per hour



Sleep Efficiency



- 11 sedated patients
- 2 hours for each period

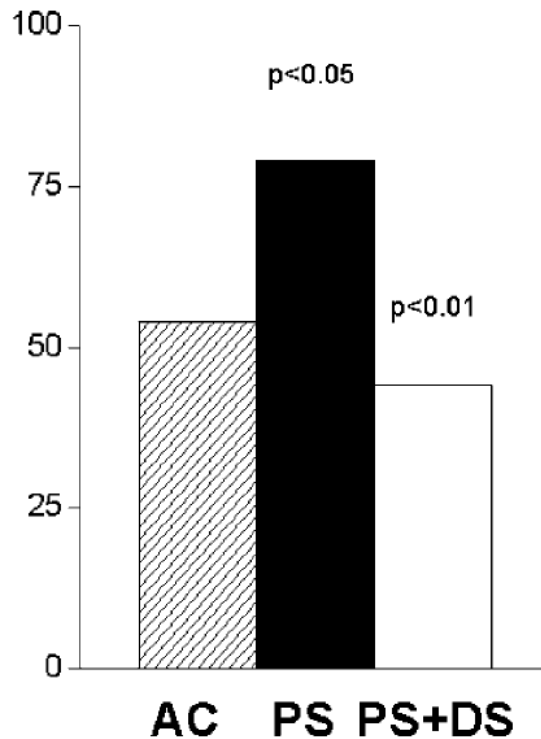
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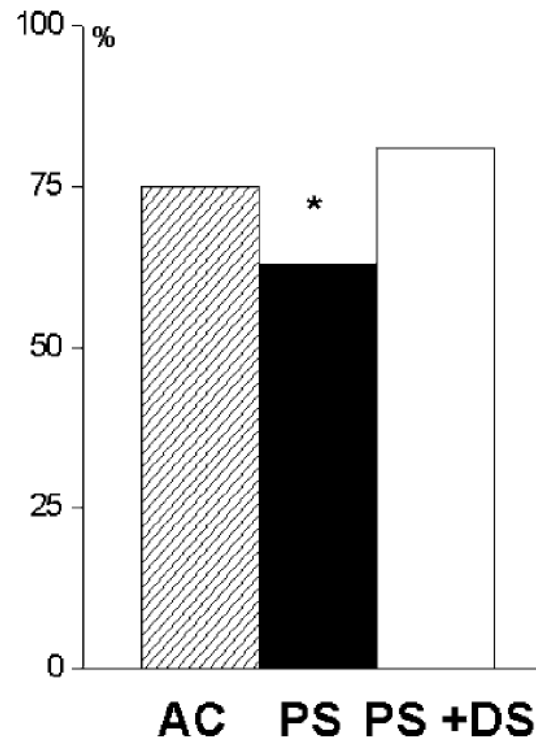
Division of Pulmonary and Critical Care Medicine, Edward Hines, Jr. Veterans Administrative Hospital, Hines, Illinois; and Loyola University of Chicago Stritch School of Medicine, Maywood, Illinois

Dead space = Lower PS level

Arousals plus Awakenings per hour



Sleep Efficiency

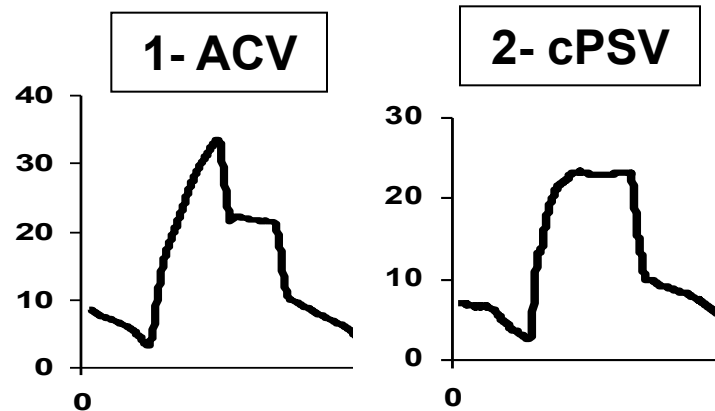


Sleep quality in mechanically ventilated patients: Comparison of three ventilatory modes

(Crit Care Med 2008; 36:1749–1755)

Belen Cabello, MD; Arnaud W. Thille, MD; Xavier Drouot, MD, PhD; Fabrice Galia, Biomed Eng Master; Jordi Mancebo, MD; Marie-Pia d'Ortho, MD, PhD; Laurent Brochard, MD

- ✓ 3 modes ventilatoires / 6 heures par période
- ✓ Patients conscient non sédatisés



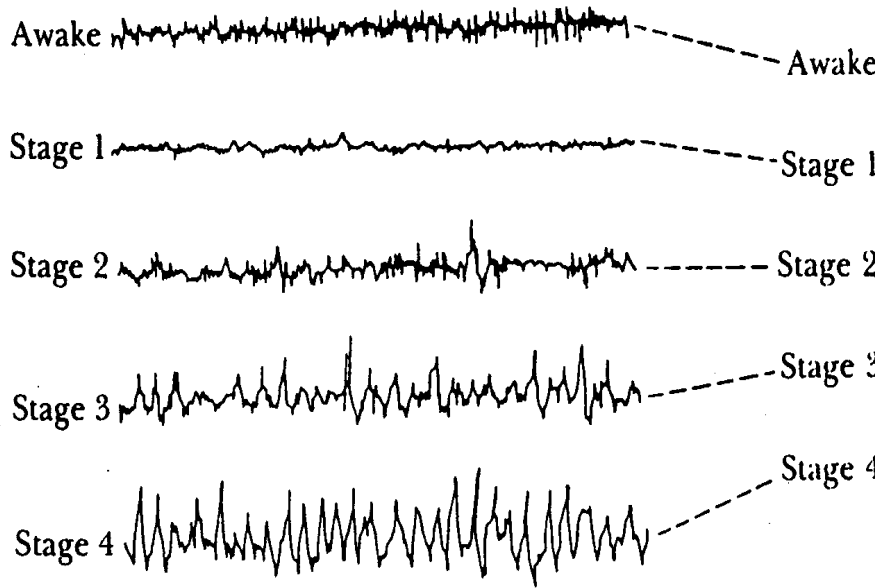
3- aPSV

Smartcare:

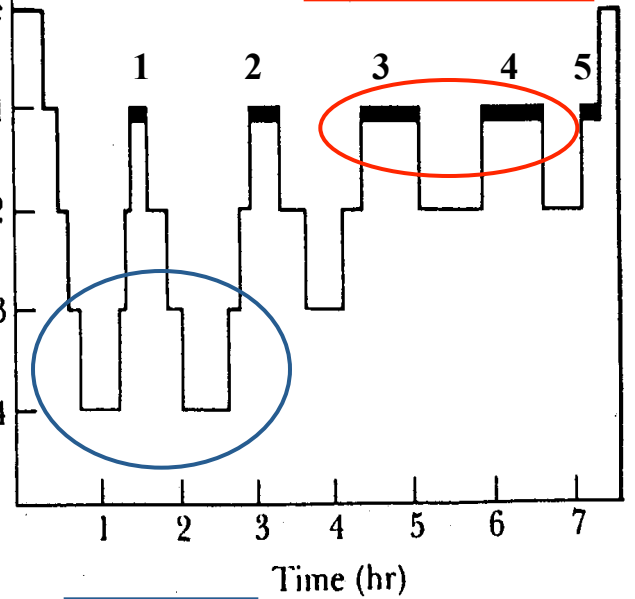
Ajustement automatique du niveau d'AI:

- $15 < FR < 30-35/\text{min}$
- $V_T > 250-300 \text{ ml}$
- $\text{EtCO}_2 < 55-65\text{mmHg}$

Non REM
sleep
[80 %]

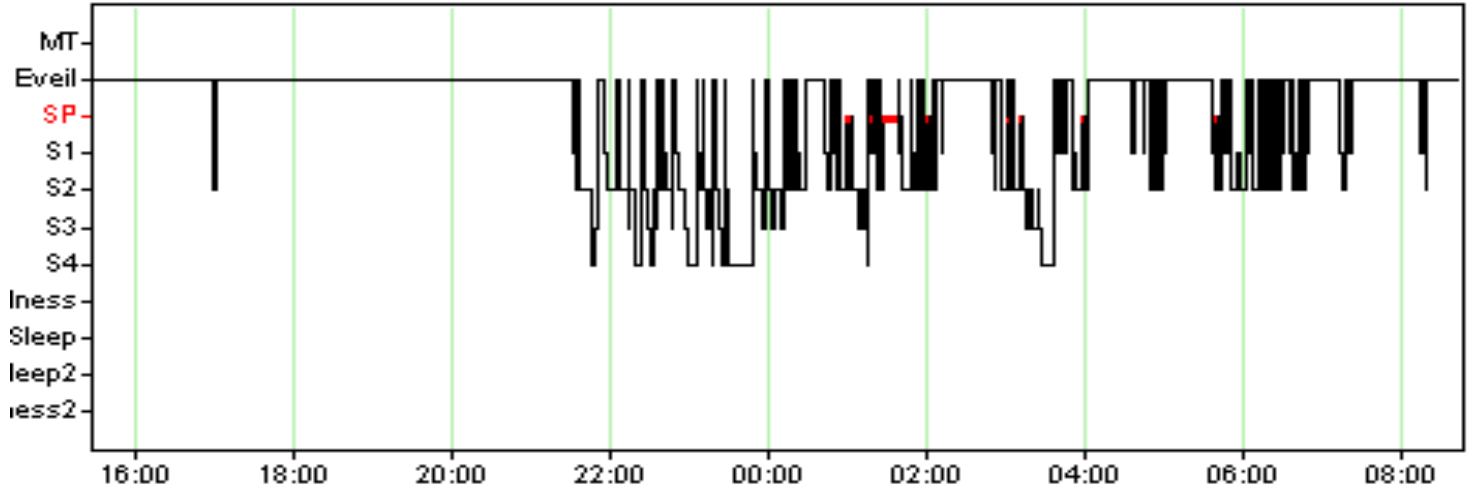


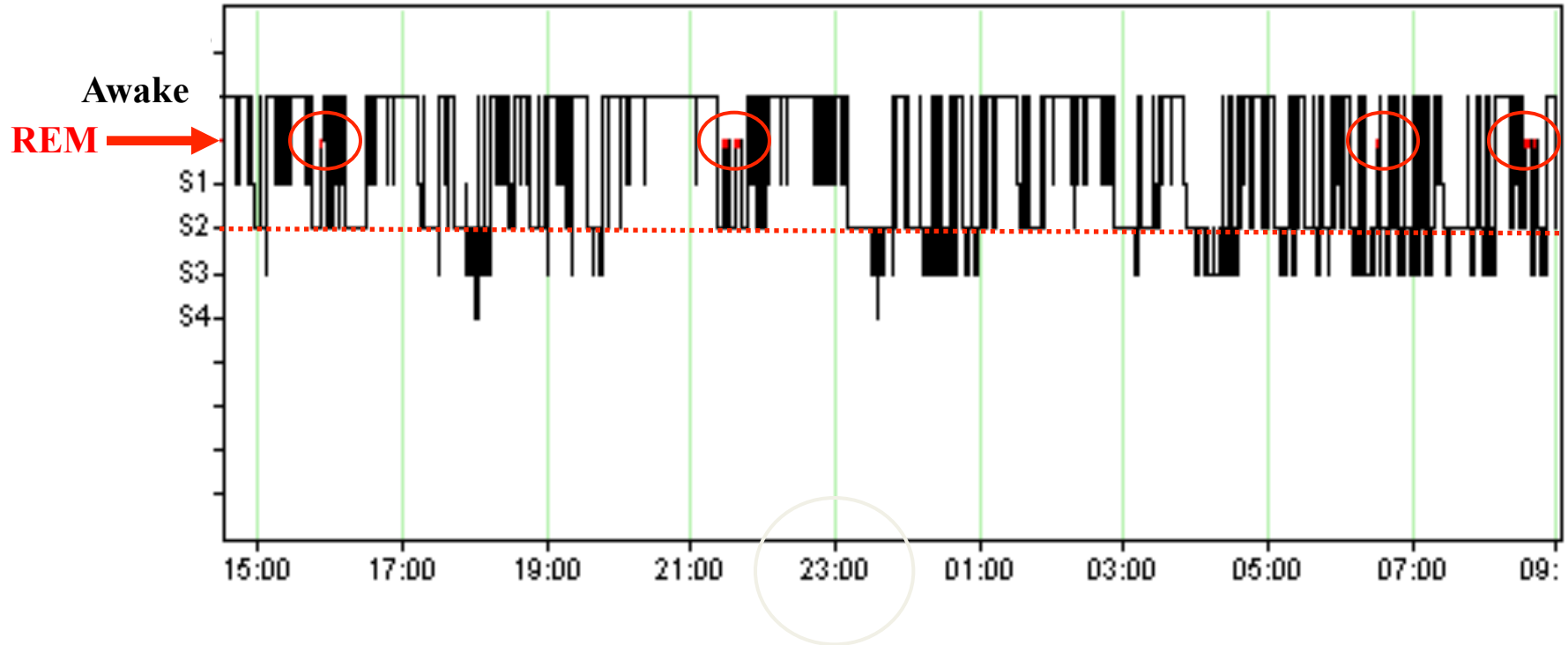
Psychological



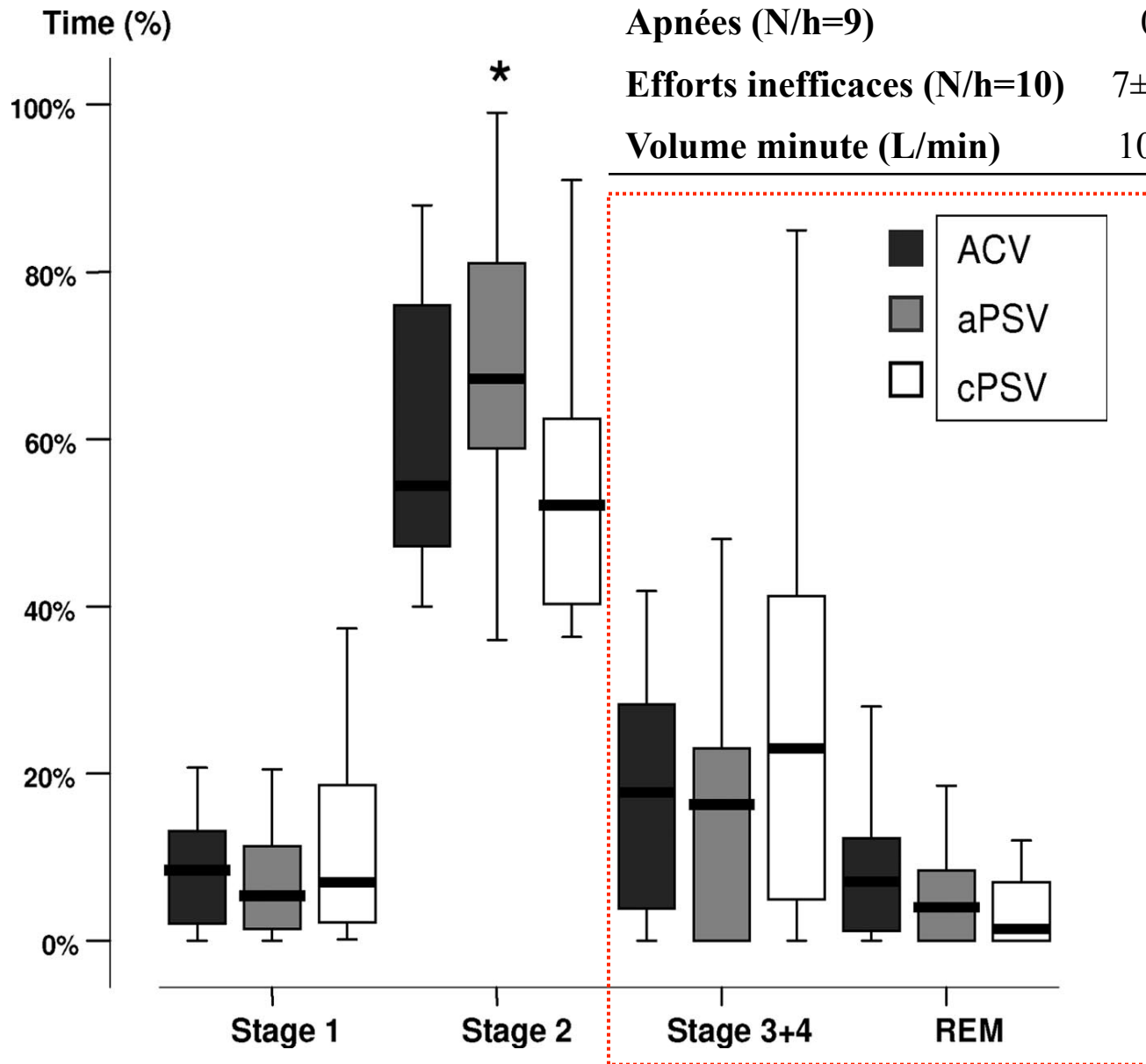
REM sleep
[20 %]

Physical





- ✓ Perte du rythme circadien
- ✓ Sommeil léger et très fragmenté
- ✓ Périodes de REM très courtes et parfois inexistantes

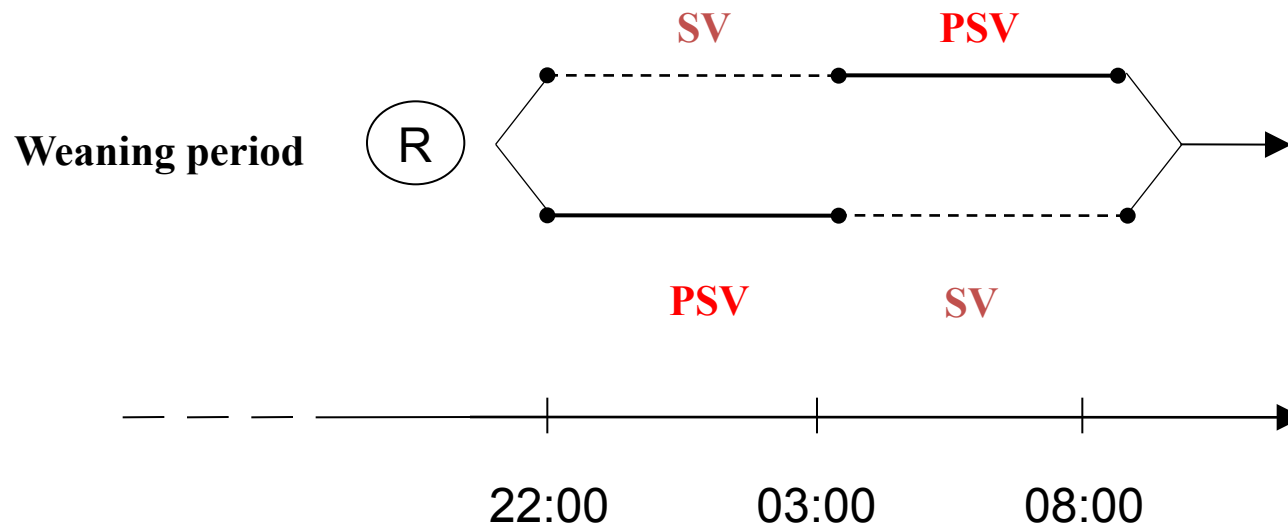


	ACV	SmartCare	cPSV
Apnées (N/h=9)	0	5±6	7±11
Efforts inefficaces (N/h=10)	7±18	16 ±45	12±23
Volume minute (L/min)	10.0	9.0	8.8

Sleep during weaning from mechanical ventilation: SV vs. PSV

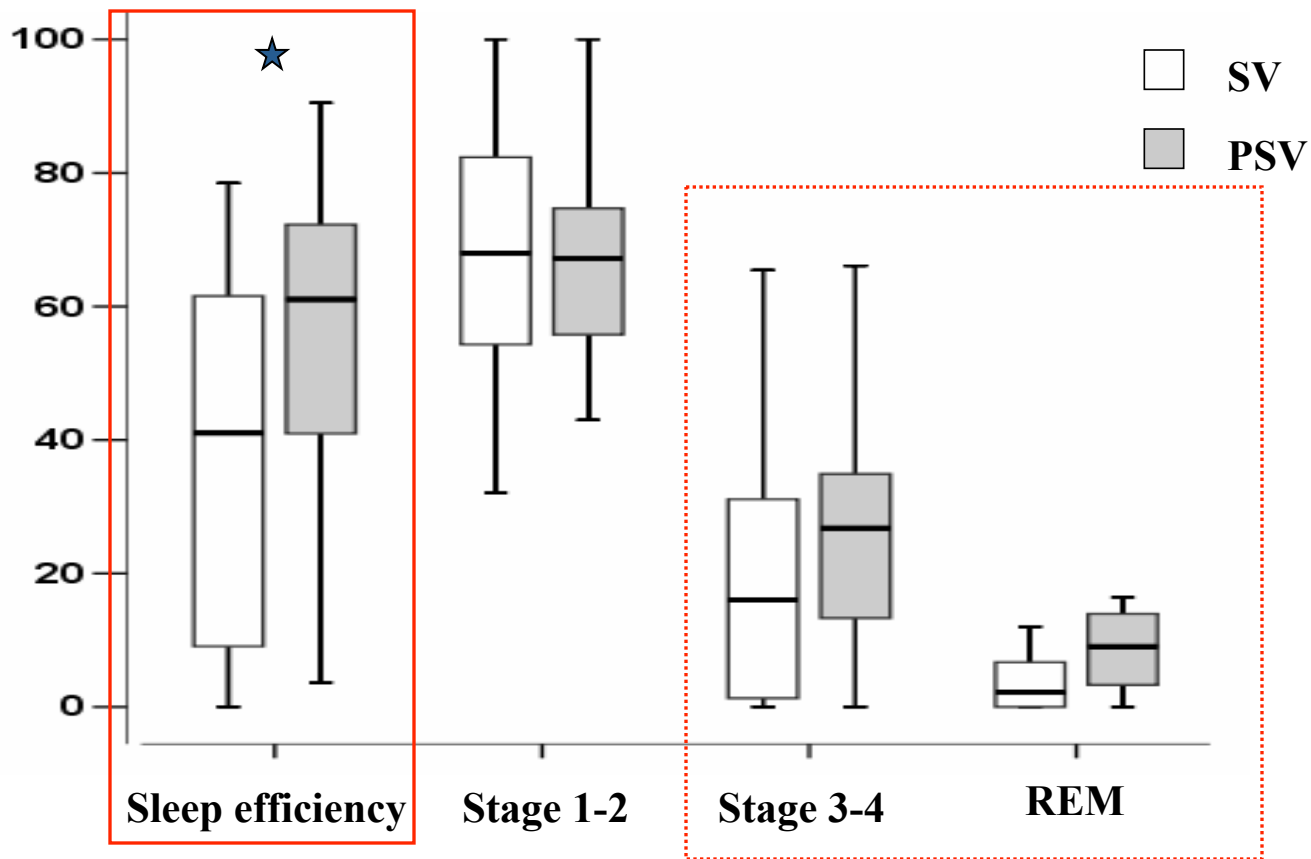


Comparison of sleep quality during spontaneous ventilation and PSV



Mechanical ventilation may improve sleep quality by decreasing WOB or alter sleep quality due to poor patient-ventilator interactions ???

Total sleep time (%)



Optimisation de la ventilation nocturne

- Les asynchronies et les apnées centrales semblent plus favorisées par les réglages du ventilateur que par le mode ventilatoire
- Pas d'indication à passer en VAC la nuit: éviter la surassistance +++
- Le sommeil survient aussi bien le jour que la nuit
- Chez les patients trachéotomisés difficiles à sevrer, il semble préférable de rebrancher les premières nuits

Auto-déclenchements

Cycle imposé par le ventilateur en plus de la FR réglée mais non déclenché par le patient

Déclenché par ?

1. Une fuite (VNI)
2. Présence d'eau dans le circuit.
3. Les battements cardiaques

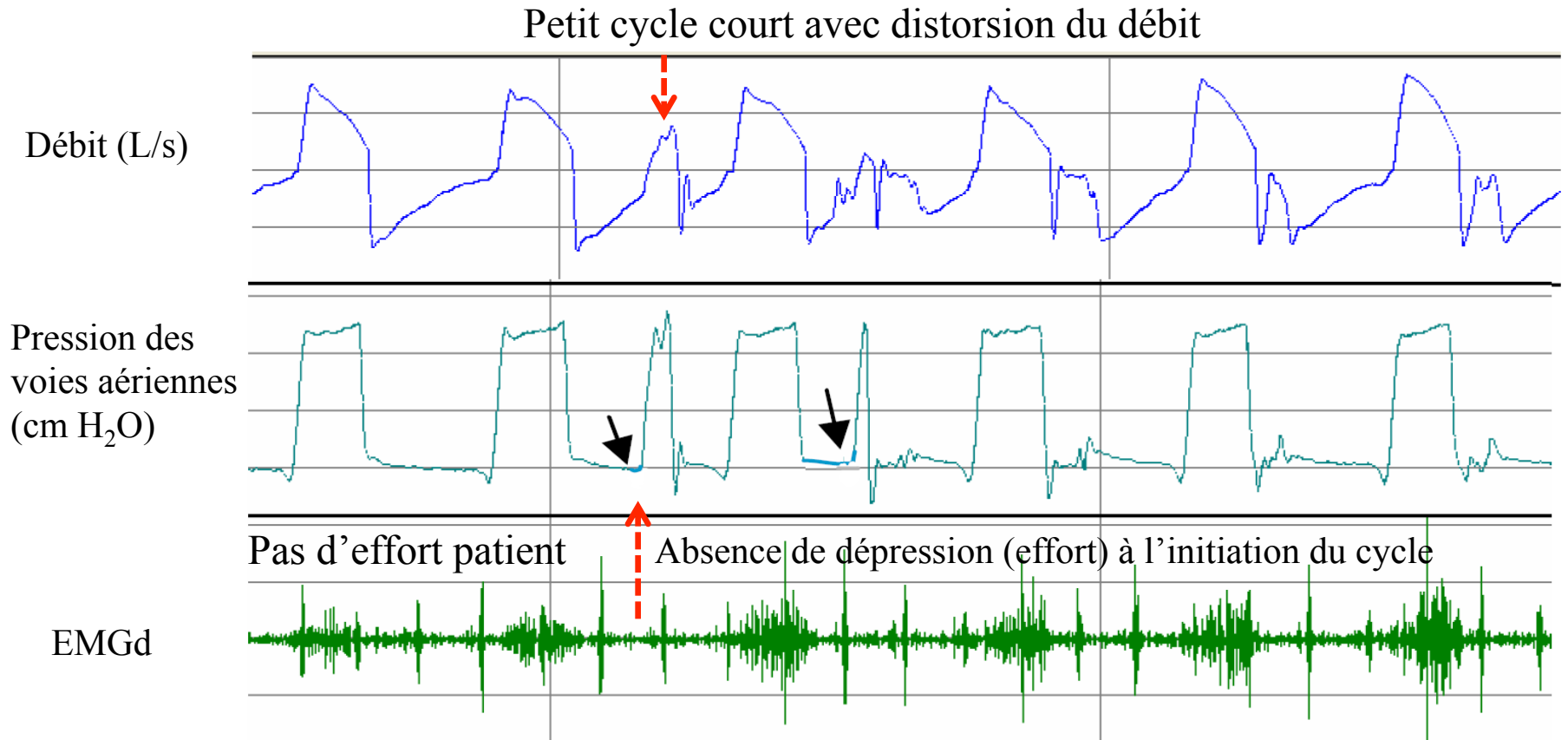
Fréquent en chir. Cardiaque : *IMANAKA et al., Critical Care Med 2000; 28:402-407*

- Trigger 1L/min: plus de 5 auto-déclenchements/min (20% des cas)
- Trigger à 3 L/min

—————→ En Ventilation Contrôlée:

- FR ventilateur > FR réglée
- Alcalose respiratoire

Comment suspecter des auto-déclenchements ?



$$P = Q \times R$$

Débit
d'insufflation

SDRA

NORMAL

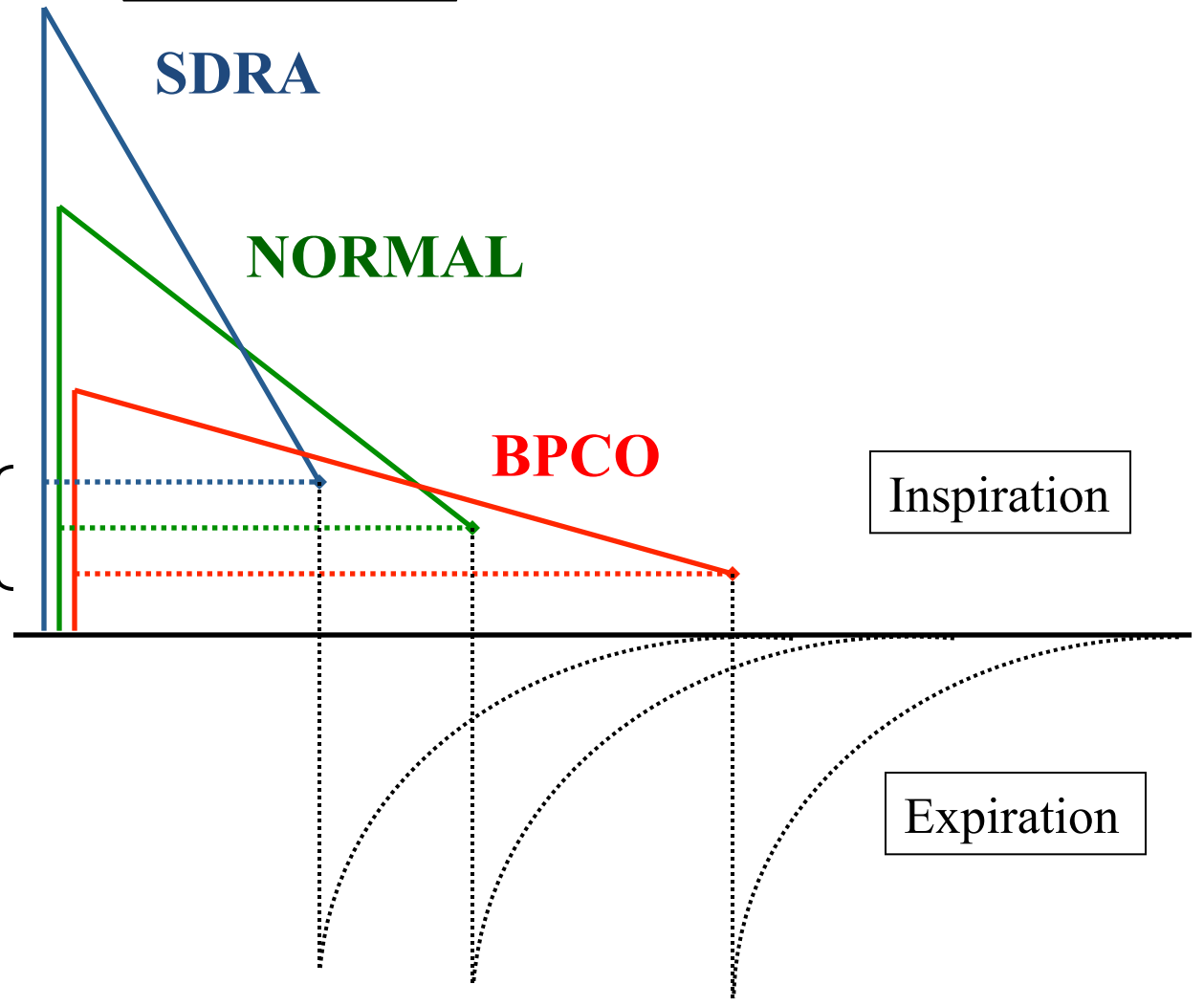
BPCO

Seuil de trigger
expiratoire 25 %

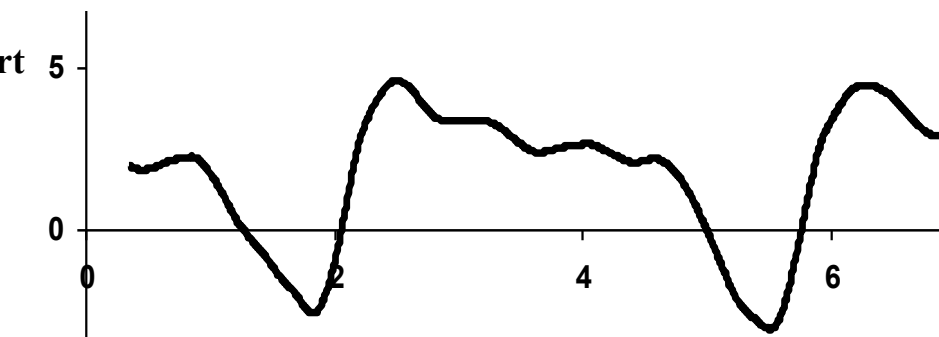
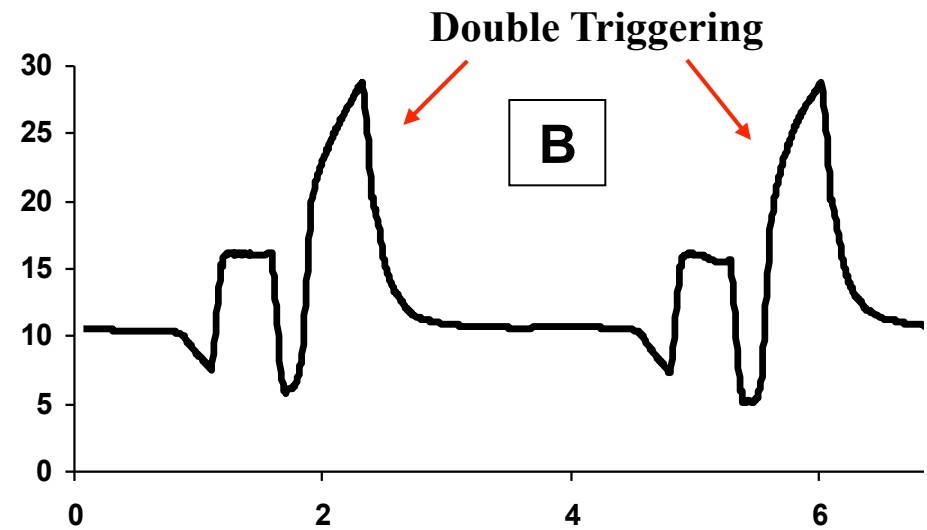
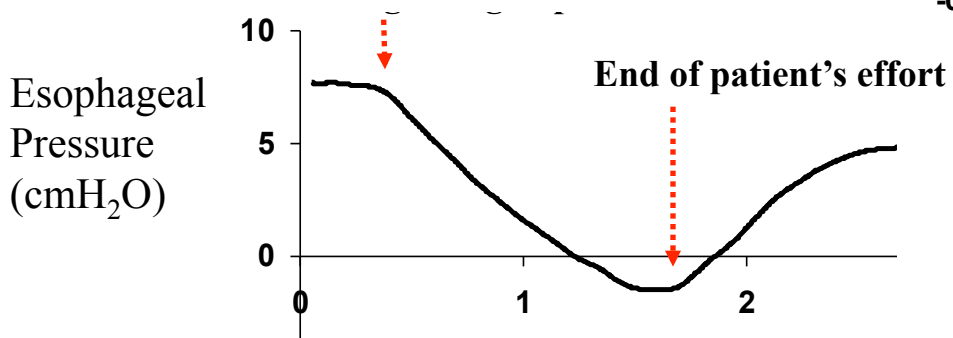
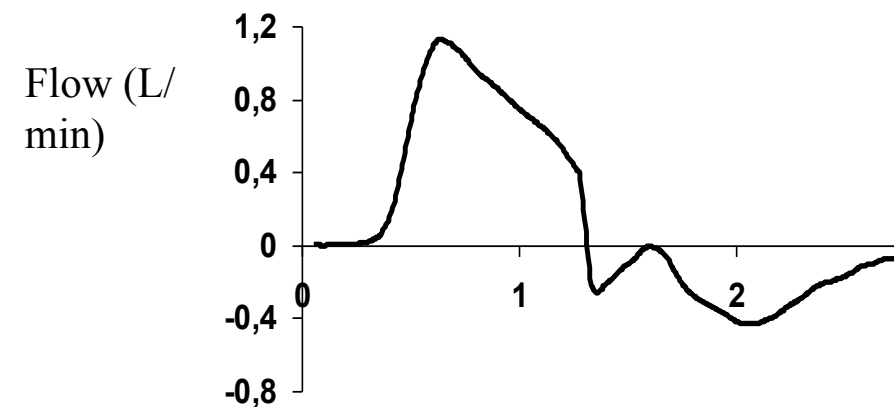
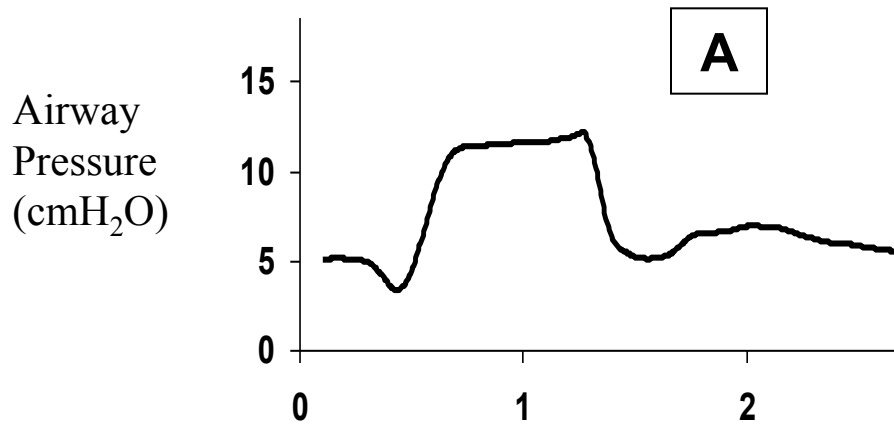
Inspiration

Expiration

Temps

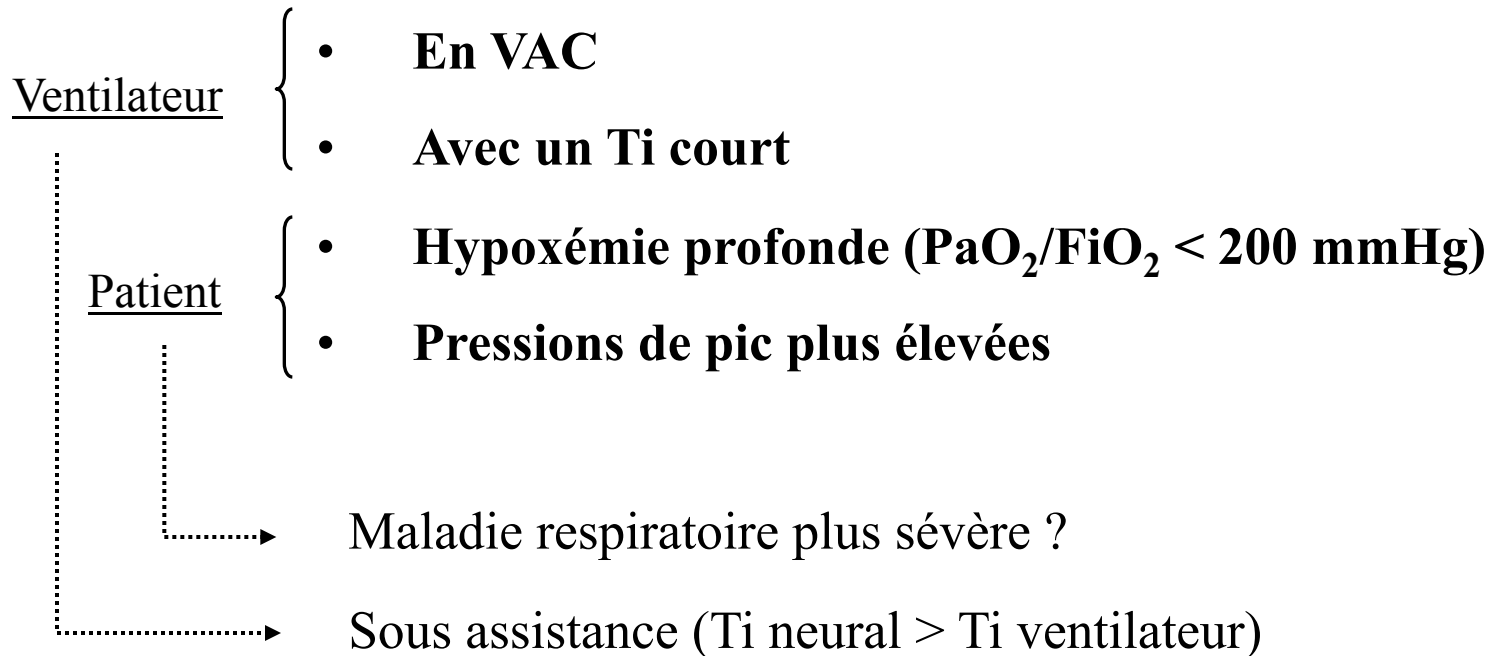


Assistance insuffisante ?

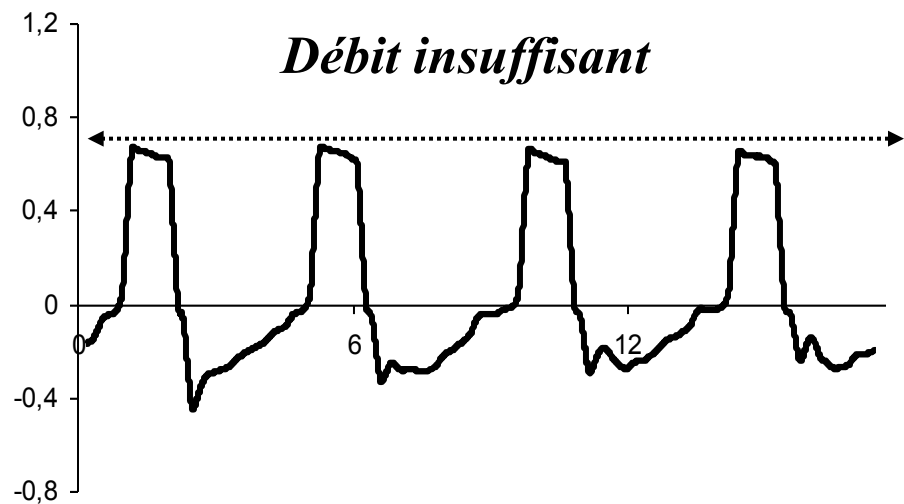


Double-Déclenchements

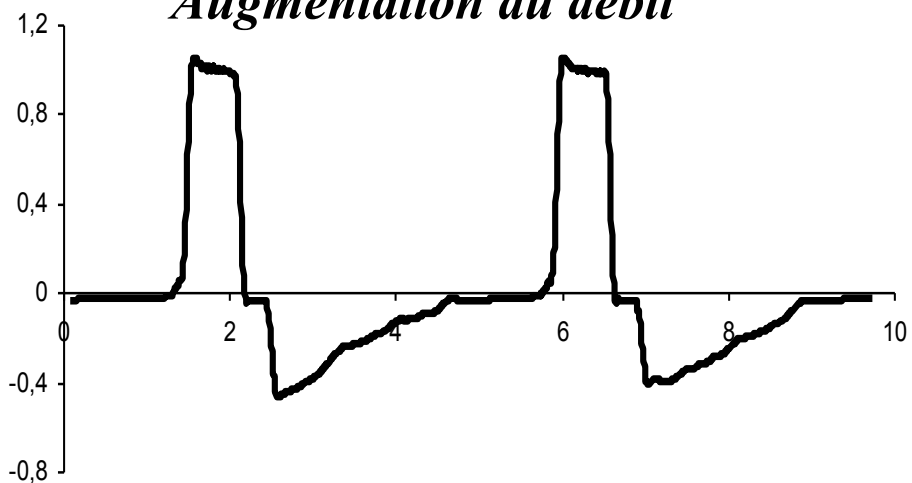
Facteurs associés



Flow (L/s)

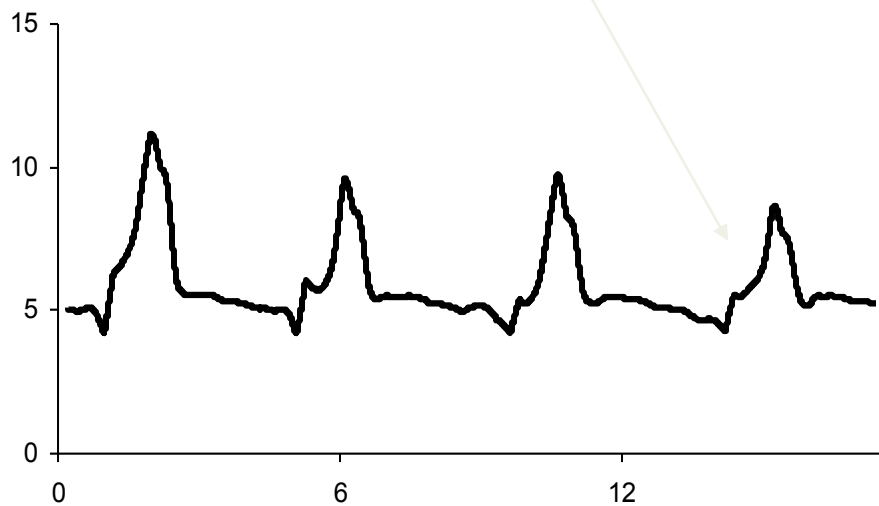


Augmentation du débit

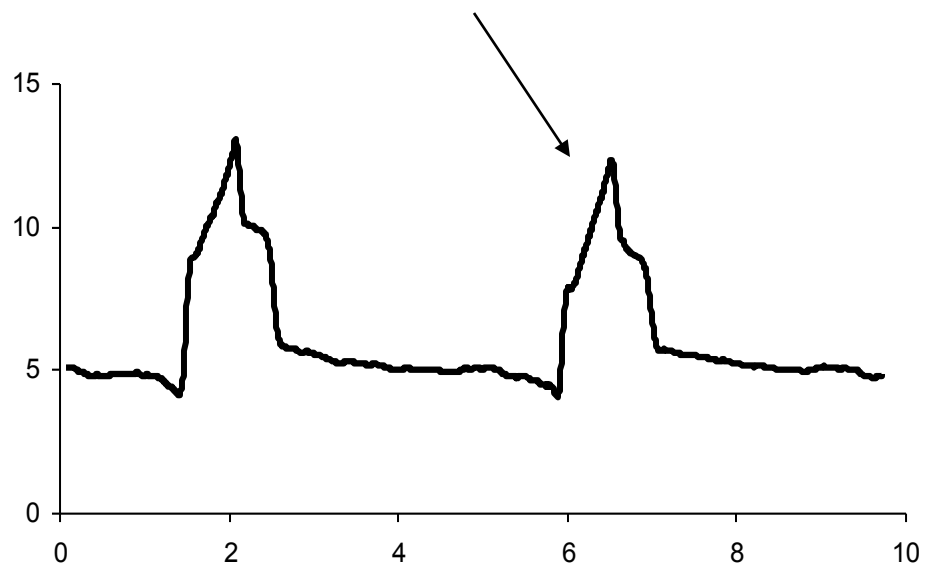


Airway Pressure
(cm H₂O)

Pressurisation insuffisante



Pressurisation adéquate



Comment éliminer les double déclenchements ?

Allonger le temps d'insufflation

- Appliquer une pause inspi. ? Tolérance
- Diminuer le débit ? Plus d'effort et Moins de confort
- Augmenter le VT ? VALI

Comment éliminer les double déclenchements ?

- **Si ARDS**

Rendormir le patient et attendre la guérison du poumon ?

Contrôle strict du V_T

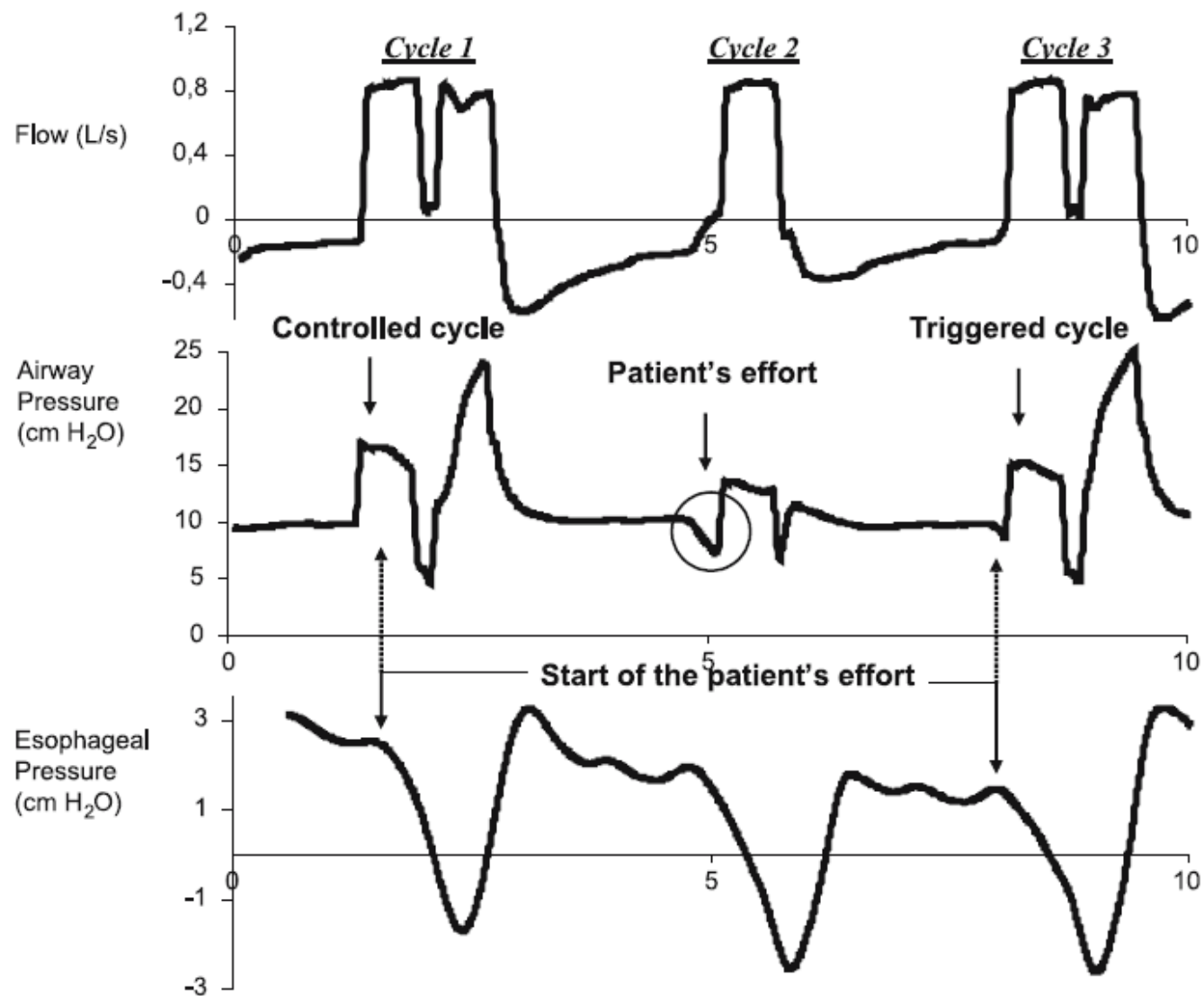
- **Patient non ARDS**

VS Aide / Pression Contrôlée

Augmentation du VT

Arnaud W. Thille
Laurent Brochard

Double triggering during assisted mechanical ventilation: Is it a control auto-triggered or patient-triggered cycle?



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Article title: Mechanical ventilation-induced reverse triggered breaths: a frequently unrecognized form of neuro-mechanical coupling.

¹Evangelia Akoumianaki, MD

^{1,2}Aissam Lyazidi, PhD

¹Nathalie Rey, MD

¹Dimitrios Matamis, MD

¹Nelly Perez-Martinez, MD

¹Raphael Giraud, MD

³Jordi Mancebo, MD

^{1,2}Laurent Brochard, MD

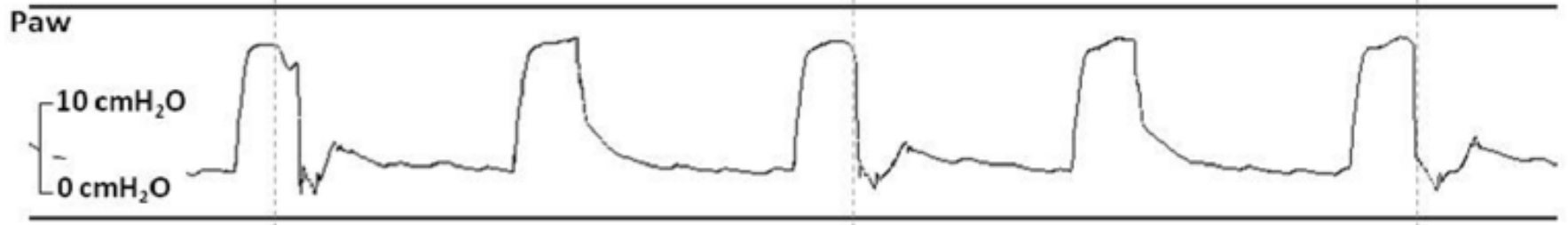
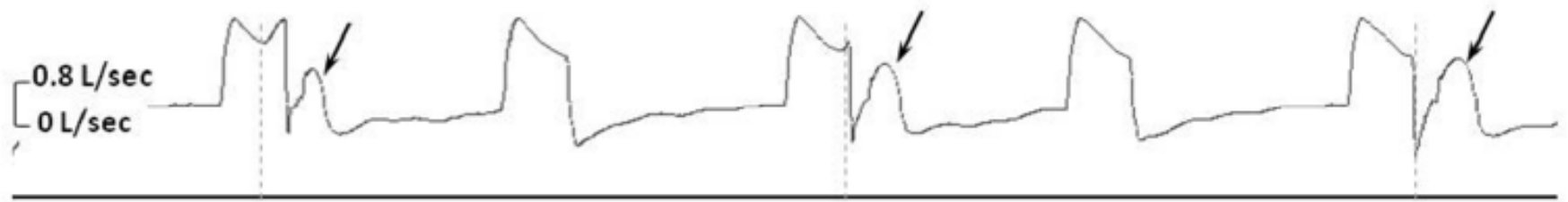
^{1,2}Jean-Christophe Marie Richard, MD, PhD



Impossible d'afficher l'image. Votre ordinateur manque peut-être de mémoire pour ouvrir l'image ou l'image est endommagée. Redémarrez l'ordinateur, puis ouvrez à nouveau le fichier. Si le x rouge est toujours affiché, vous devrez peut-être supprimer l'image avant de la réinsérer.

A

Flow



Time

B

Flow

0.8 L/sec
0 L/sec

V_T

300 ml
0 ml

Paw

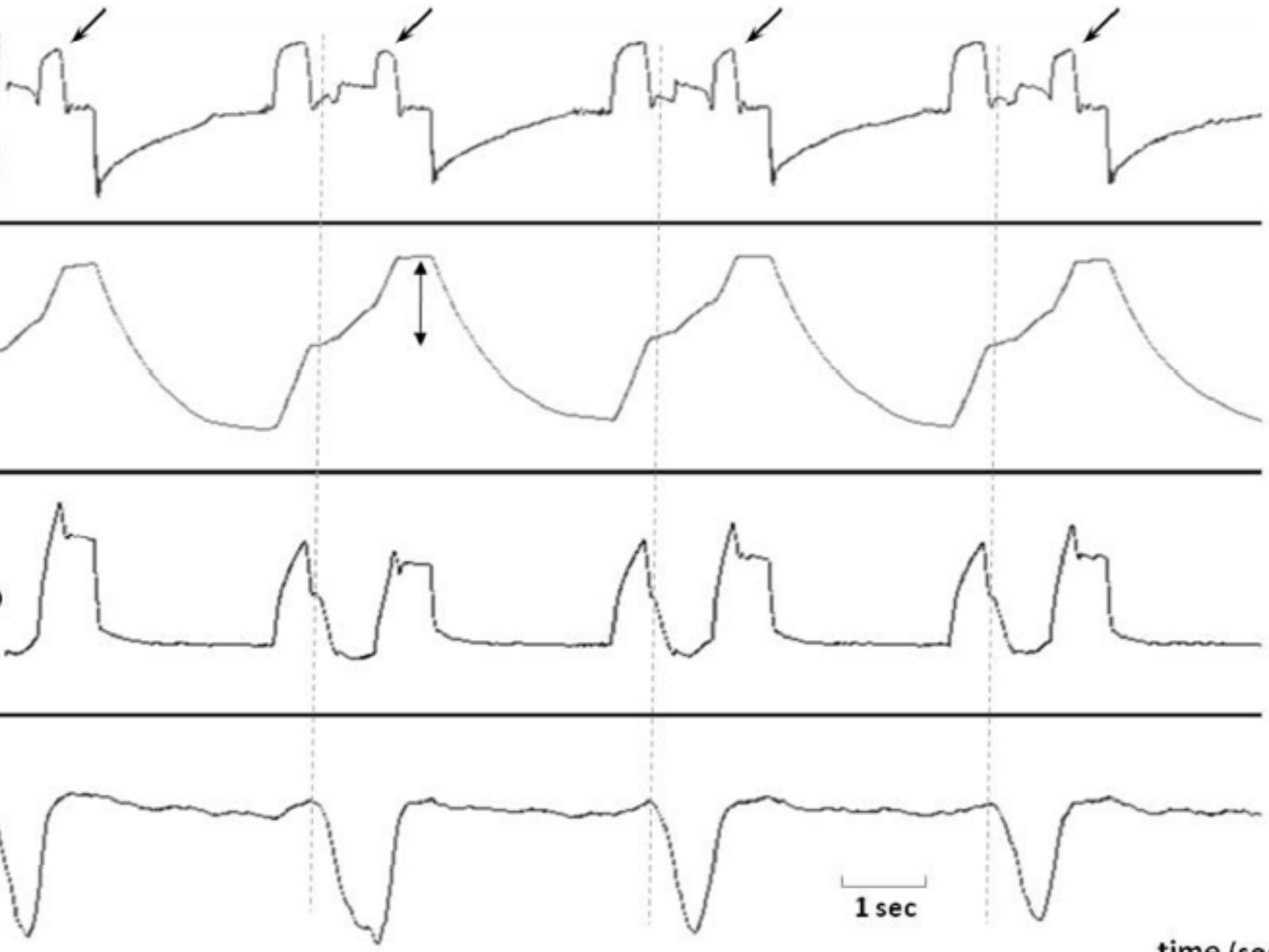
10 cmH₂O
0 cmH₂O

Pes

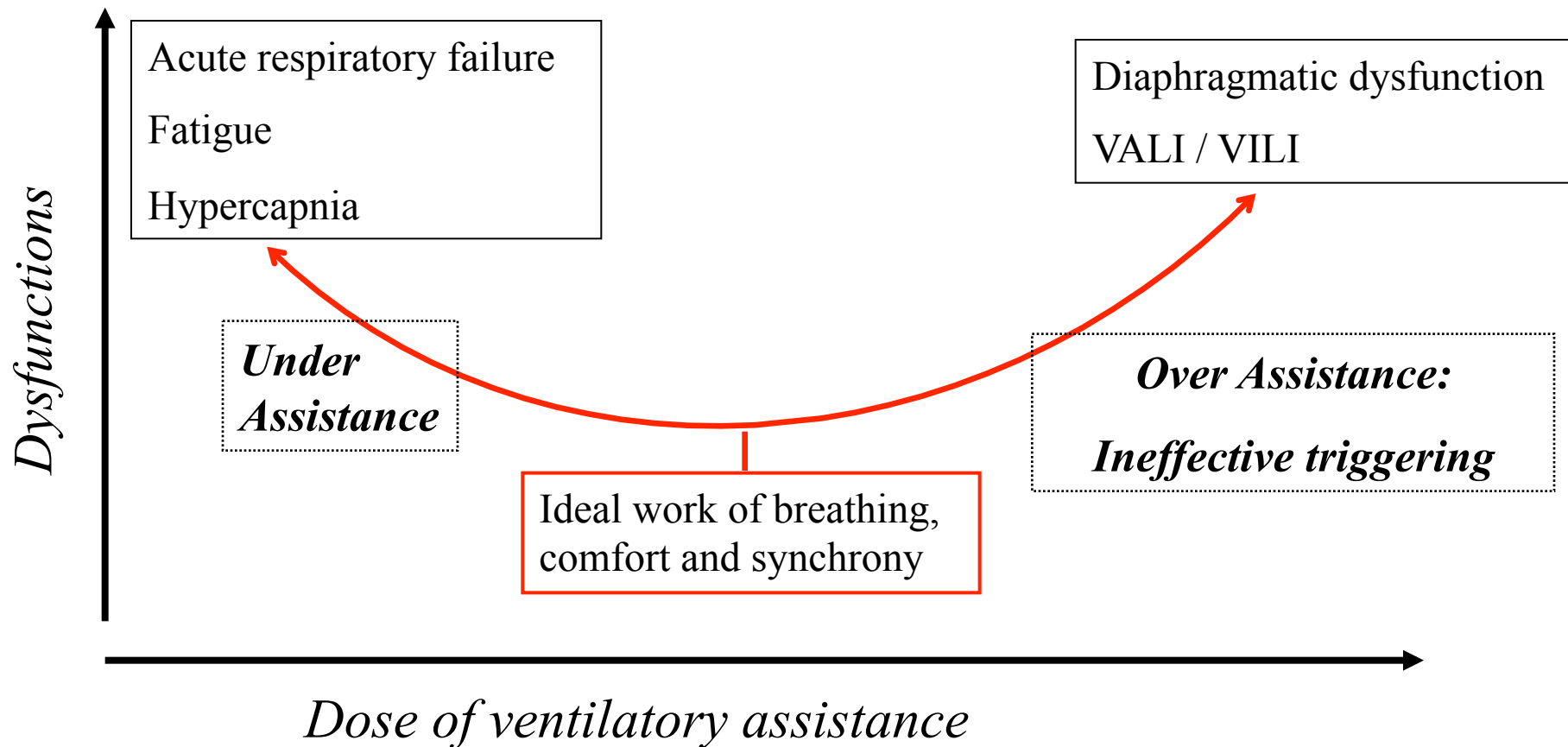
3 cmH₂O
0 cmH₂O

1 sec

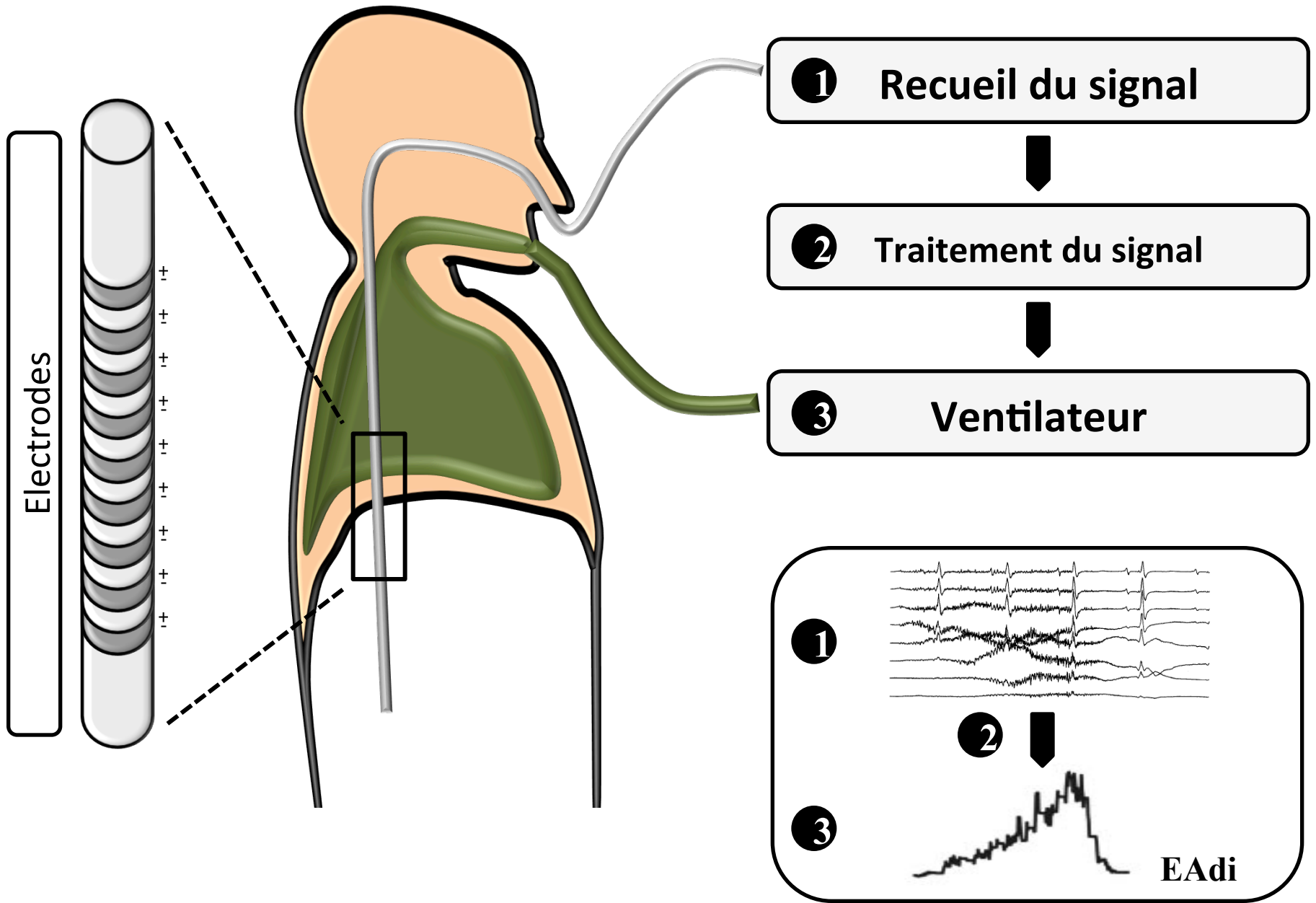
time (sec)



Dose idéale de ventilation: Ventilation proportionnelle?



1. Proportional Assist Ventilation: PAV ▶ Débit-Volume
2. Neurally Adjusted Ventilatory Assist: NAVA ▶ EMGdi



$Paw \text{ (cmH}_2\text{O)} = \text{Niveau de NAVA (cmH}_2\text{O}/\mu\text{volt)} \times Eadi \text{ (}\mu\text{volt)}$



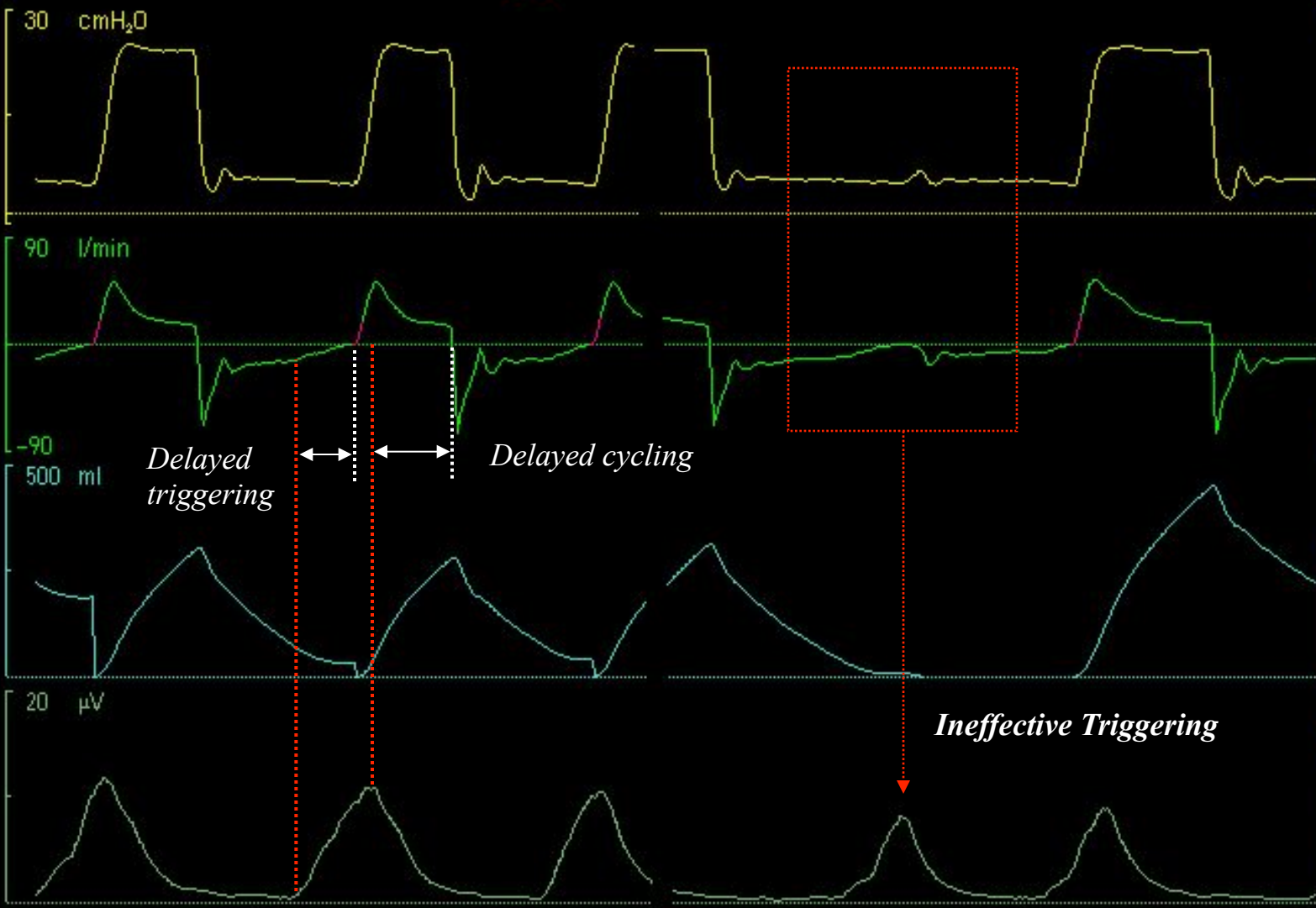
Aide inspiratoire/VS PEP

Admettre patient

Nébuliseur

Etat

1:01



Pcrête (cmH ₂ O)	25	60
Pmoyen. (cmH ₂ O)	12	
PEP (cmH ₂ O)	5	
F resp. (resp./min)	20	40
O ₂ (%)	50	5
Ti/Ttot	0.40	
VMe (l/min)	6.5	40.0
Vc insp. (ml)	282	4.0
Vc exp. (ml)	270	
Edi max (µV)	11	
Edi min (µV)	0.4	

Autres réglages

Conc. d'O₂
50
 21 % 100 0

PEP
5
 cmH₂O 50

Niv. AI sur PEP
20
 cmH₂O 120

Autres valeurs



NAVA

Admettre patient

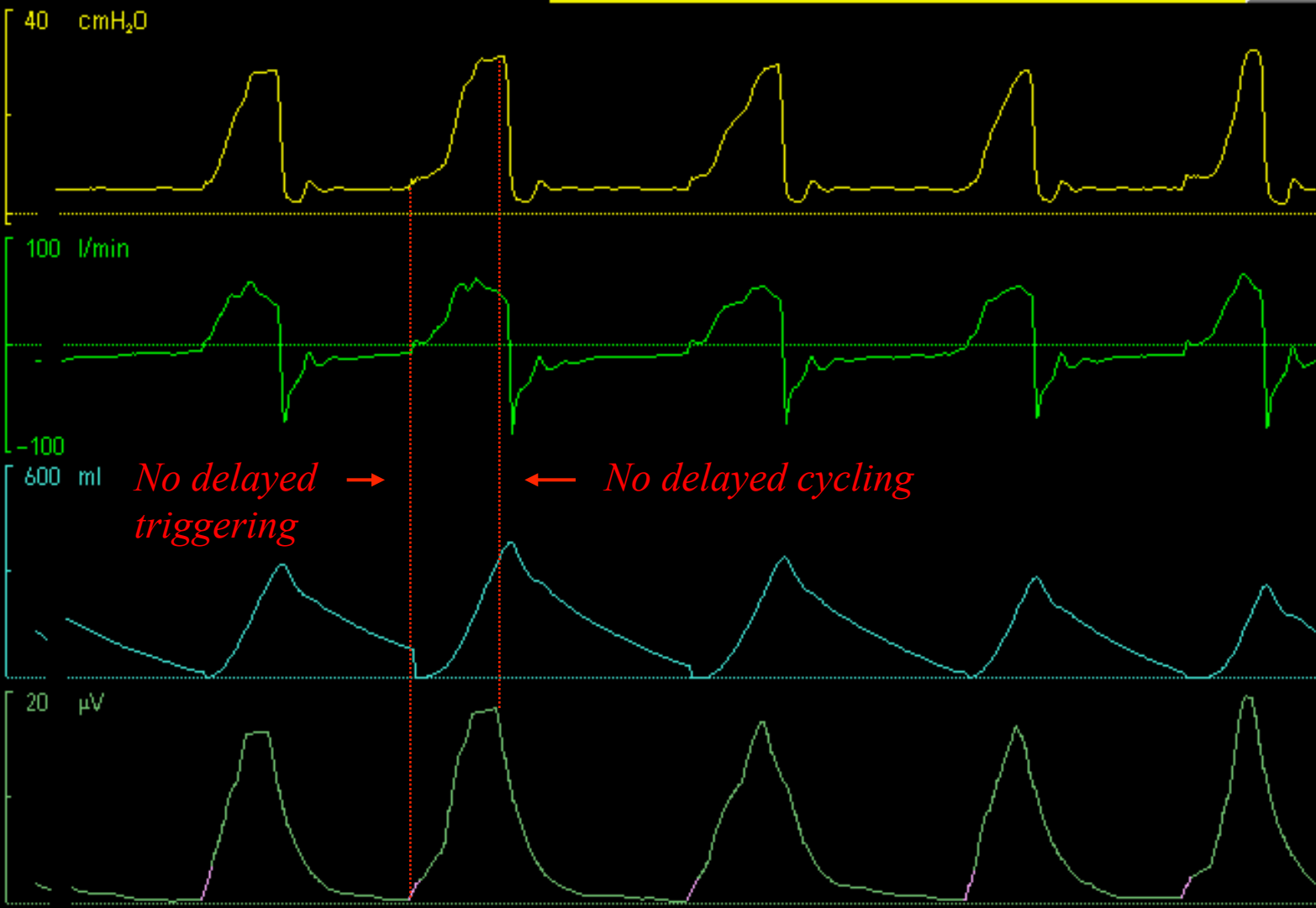
Nébuliseur

Etat

Fréquence respiratoire: Elevée



1:06



Pcrête (cmH ₂ O)	33	40
Pmoyen. (cmH ₂ O)	9	
PEP (cmH ₂ O)	5	
F resp. (resp./min)	32	30 5
O ₂ (%)	50	
Ti/Ttot	0.31	
VMe (l/min)	9.0	40.0 5.0
Vc insp. (ml)	282	
Vc exp. (ml)	269	
Edi max (μV)	17	
Edi min (μV)	0.5	

Autres réglages

Conc. d'O₂
50
21 % 100 0

PEP
5
cmH₂O 50

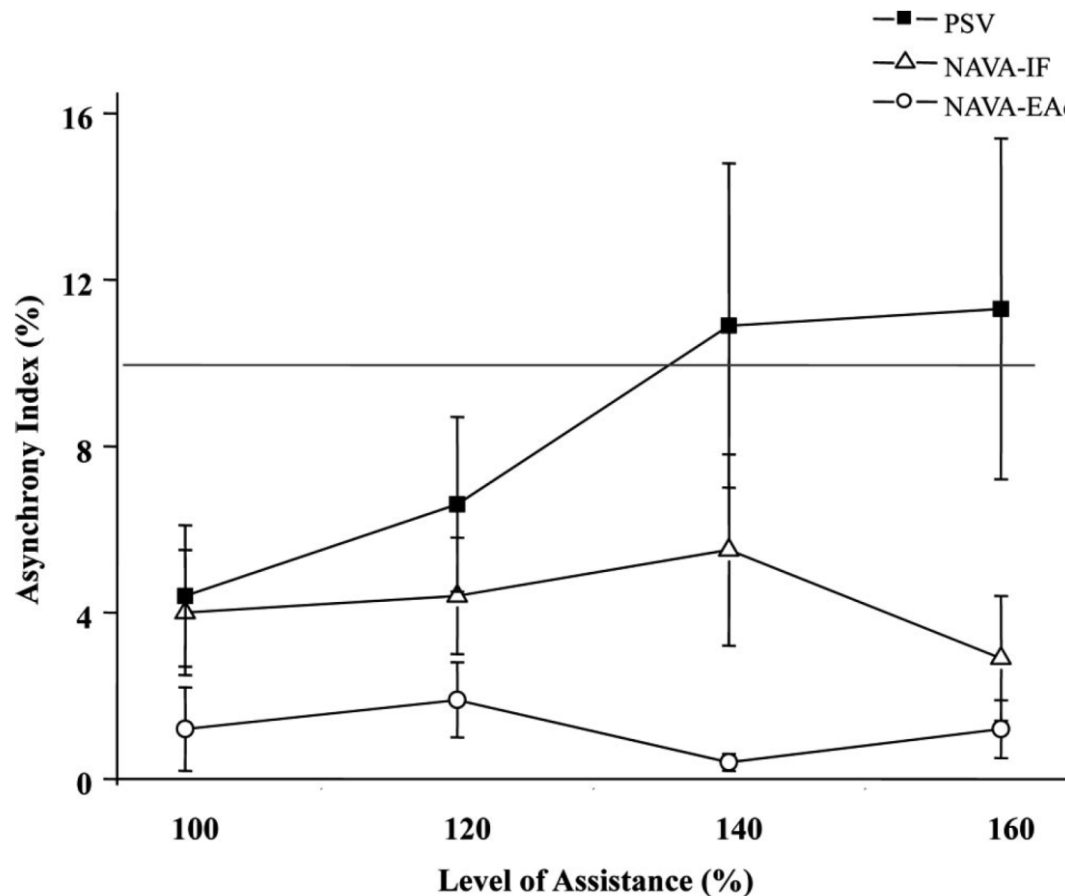
Niveau NAVA
1.5
cmH₂O/μV 0.0 30.0

Autres valeurs

Neurally adjusted ventilatory assist in patients recovering spontaneous breathing after acute respiratory distress syndrome: Physiological evaluation*

(Crit Care Med 2010; 38:1830–1837)

Nicolas Terzi, MD; Iris Pelieu, MD; Lydia Guittet, MD, PhD; Michel Ramakers, MD; Amélie Seguin, MD; Cédric Daubin, MD; Pierre Charbonneau, MD, PhD; Damien du Cheyron, MD, PhD; Frédéric Lofaso, MD, PhD



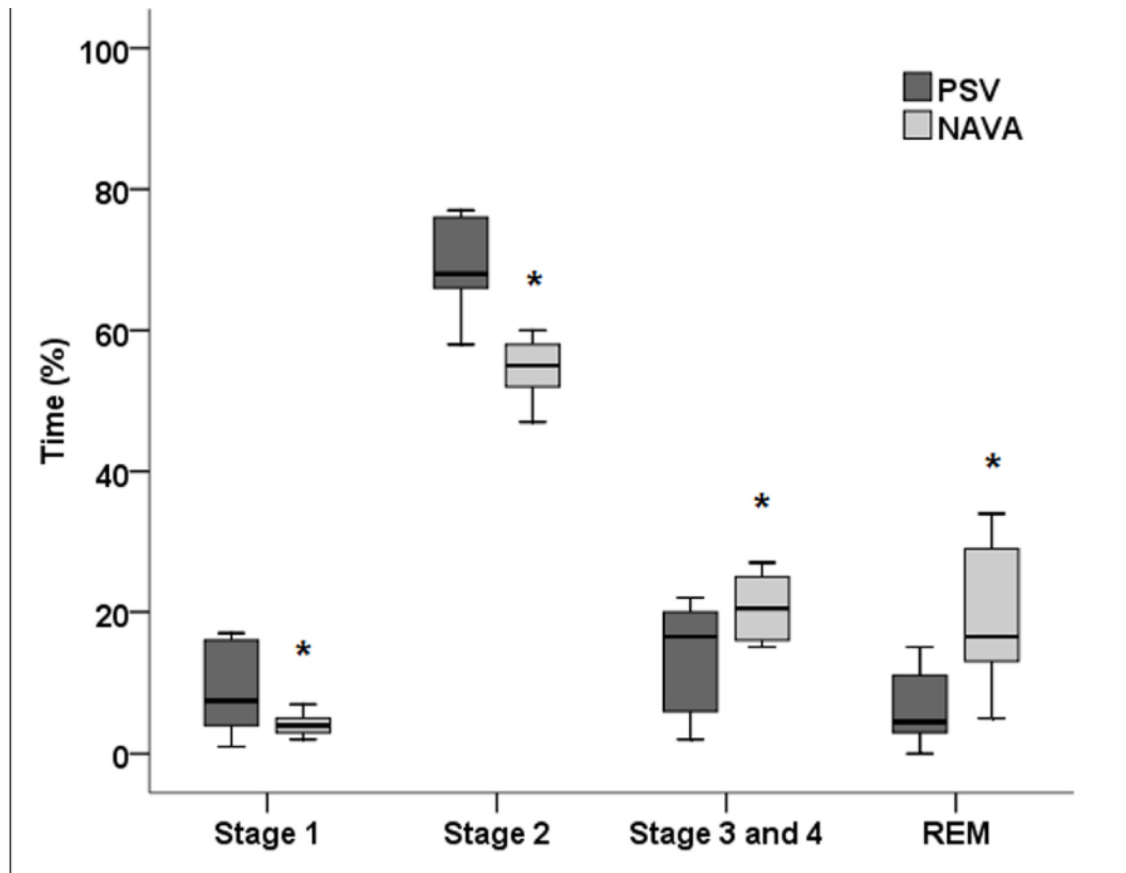
NAVA et asynchronies:
Importance du trigger neural ou
de la ventilation proportionnelle ?

RESEARCH

Open Access

Sleep quality in mechanically ventilated patients: comparison between NAVA and PSV modes

Stéphane Delisle^{1,2,3*}, Paul Ouellet^{3,4,5}, Patrick Bellemare¹, Jean-Pierre Tétrault³ and Pierre Arsenault³



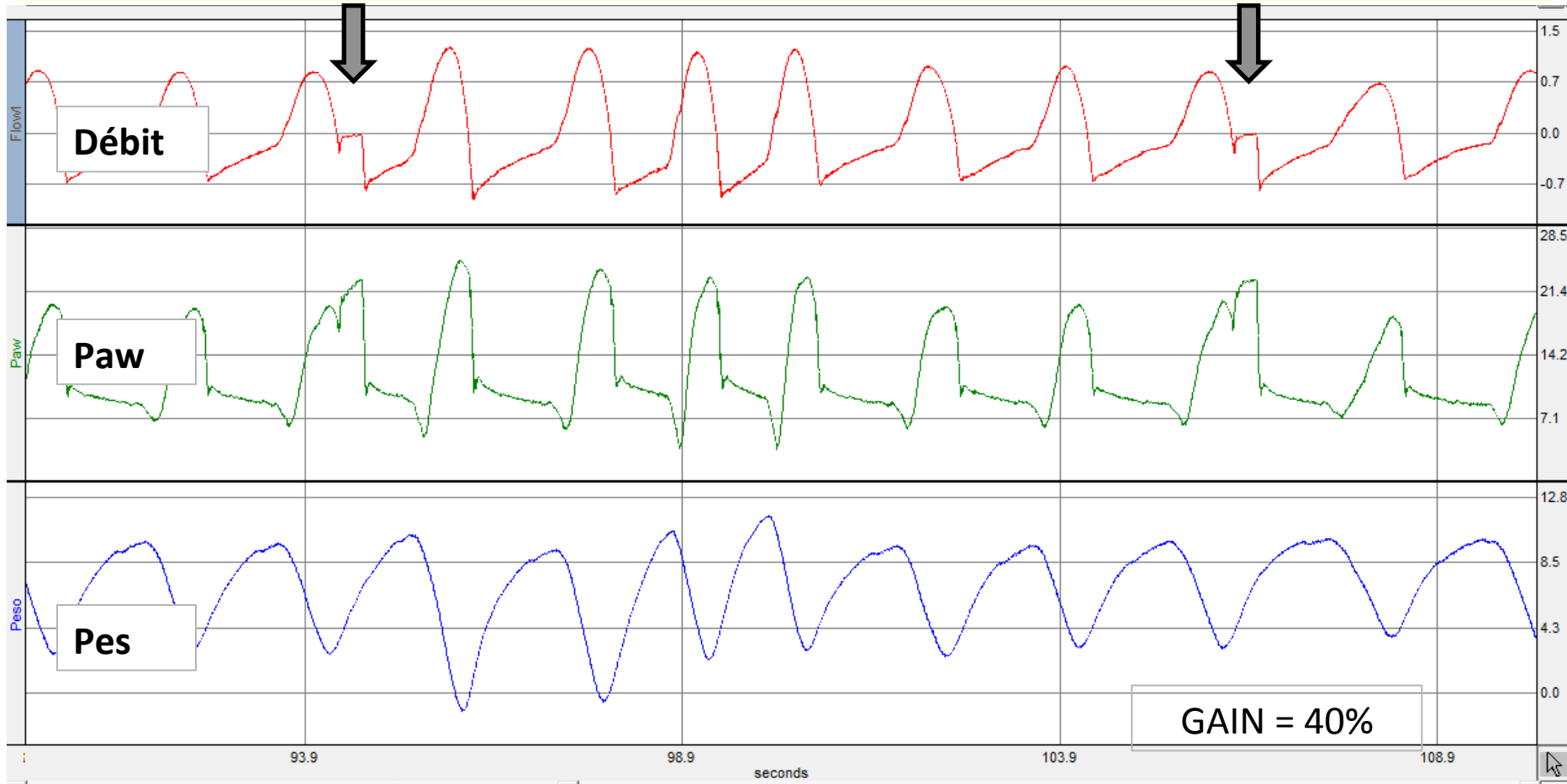
Double – déclenchement en NAVA



Impossible d'afficher l'image. Votre ordinateur manque peut-être de mémoire pour ouvrir l'image ou l'image est endommagée. Redémarrez l'ordinateur, puis ouvrez à nouveau le fichier. Si le x rouge est toujours affiché, vous devrez peut-être supprimer l'image avant de la réinsérer.

PAV

Une assistance proportionnelle à la pression musculaire du patient



Response of Ventilator-dependent Patients to Different Levels of Pressure Support and Proportional Assist

AM J RESPIR CRIT CARE MED 1999;159:1716-1725.

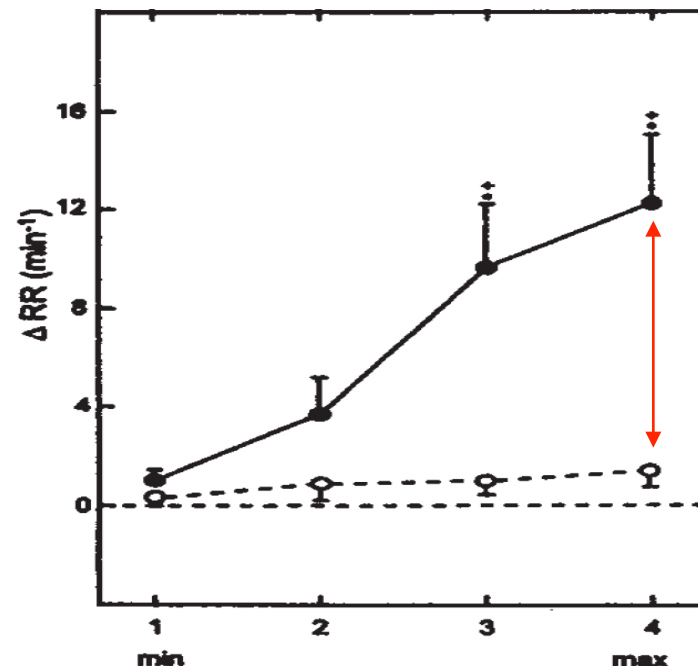
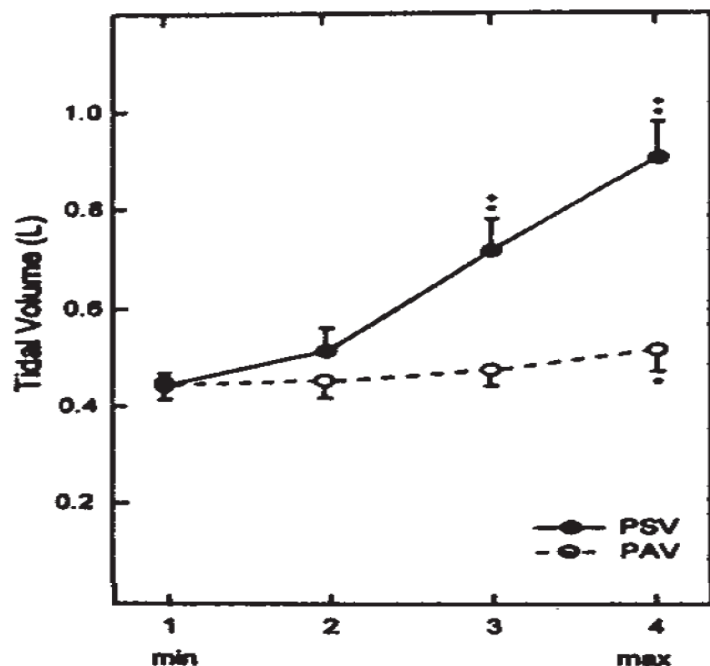
ELENI GIANNOULI, KIM WEBSTER, DAN ROBERTS, and MAGDY YOUNES

Sections of Respiratory and Critical Care Medicine, Department of Medicine, University of Manitoba, Winnipeg, Manitoba, Canada

PAV allowed to limit increase in V_T

AI vs. PAV

PAV minimized ineffective triggering

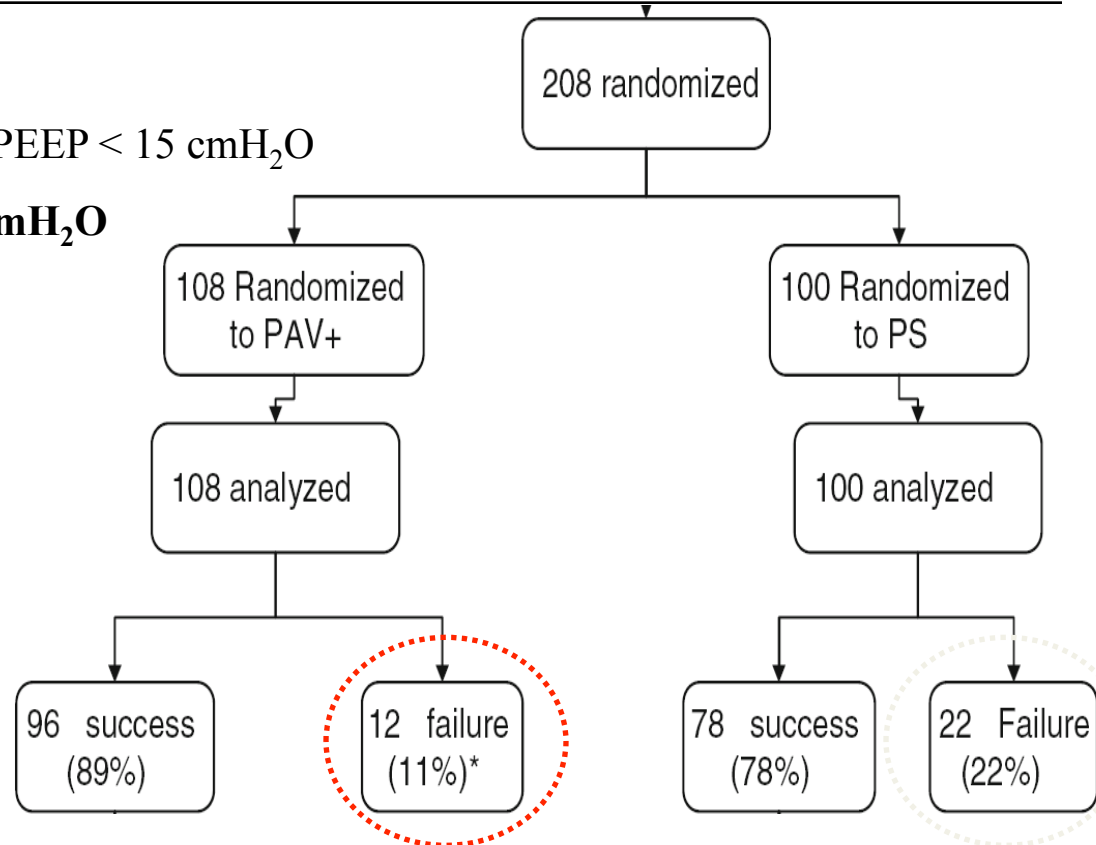


Nektaria Xirouchaki
Eumorfia Kondili
Katerina Vaporidi
George Xirouchakis
Maria Klimathianaki
George Gavriilidis
Evi Alexandropoulou
Maria Plataki
Christina Alexopoulou
Dimitris Georgopoulos

Proportional assist ventilation with load-adjustable gain factors in critically ill patients: comparison with pressure support

Critères d'inclusion:

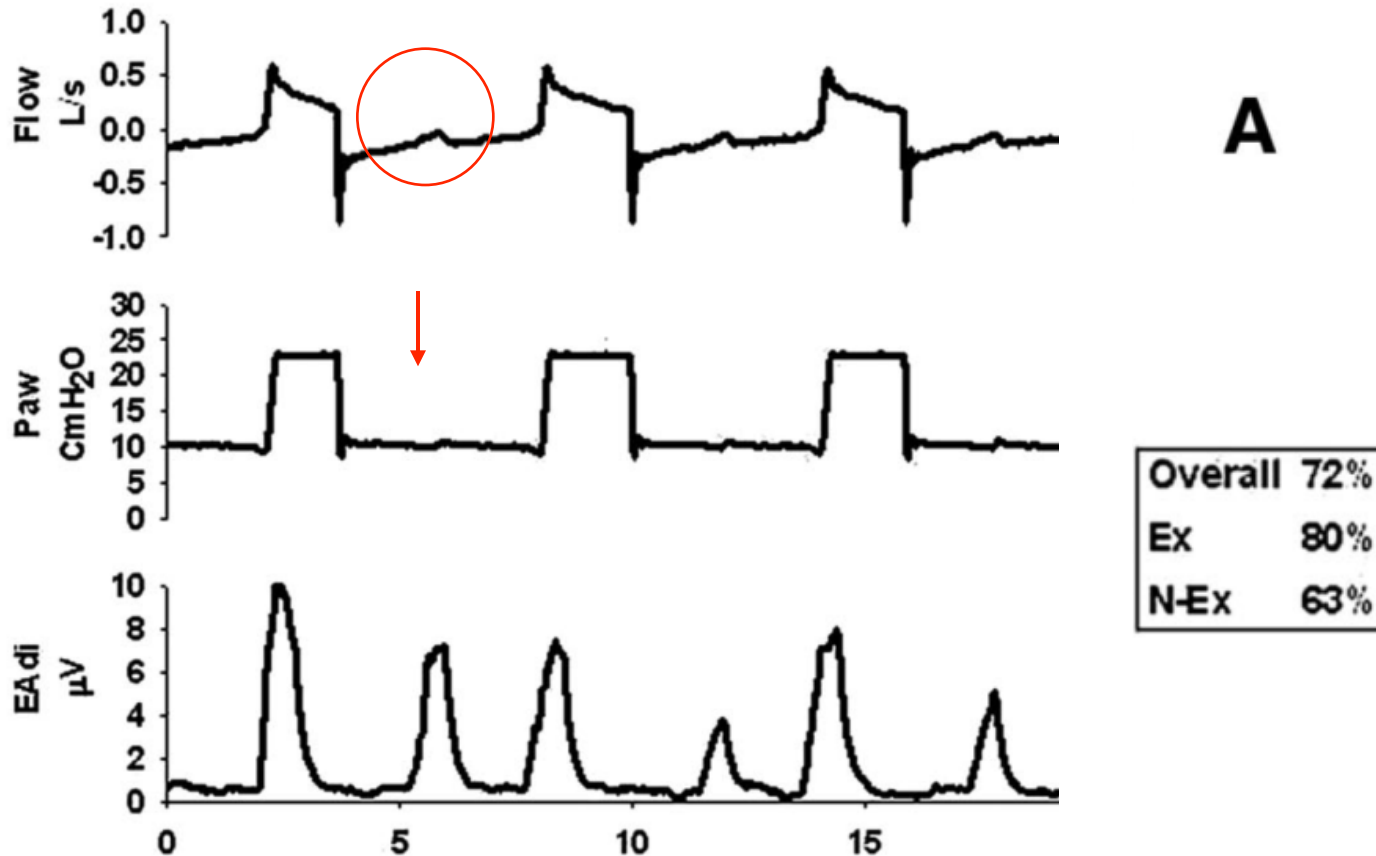
- $\text{PaO}_2 > 60 \text{ mmHg}$ avec $\text{FiO}_2 < 65\%$ et $\text{PEEP} < 15 \text{ cmH}_2\text{O}$
- Niveau d'AI à l'inclusion: $23.5 \pm 2.4 \text{ cmH}_2\text{O}$



PERSPECTIVES

Efficacy of ventilator waveforms observation in detecting patient-ventilator asynchrony* Crit Care Med 2011; 29:2452-2457

Davide Colombo, MD, PhD; Gianmaria Cammarota, MD; Moreno Alemani, MD; Luca Carenzo, MD; Federico Lorenzo Barra, MD; Rosanna Vaschetto, MD, PhD; Arthur S. Slutsky, MD; Francesco Della Corte, MD; Paolo Navalesi, MD



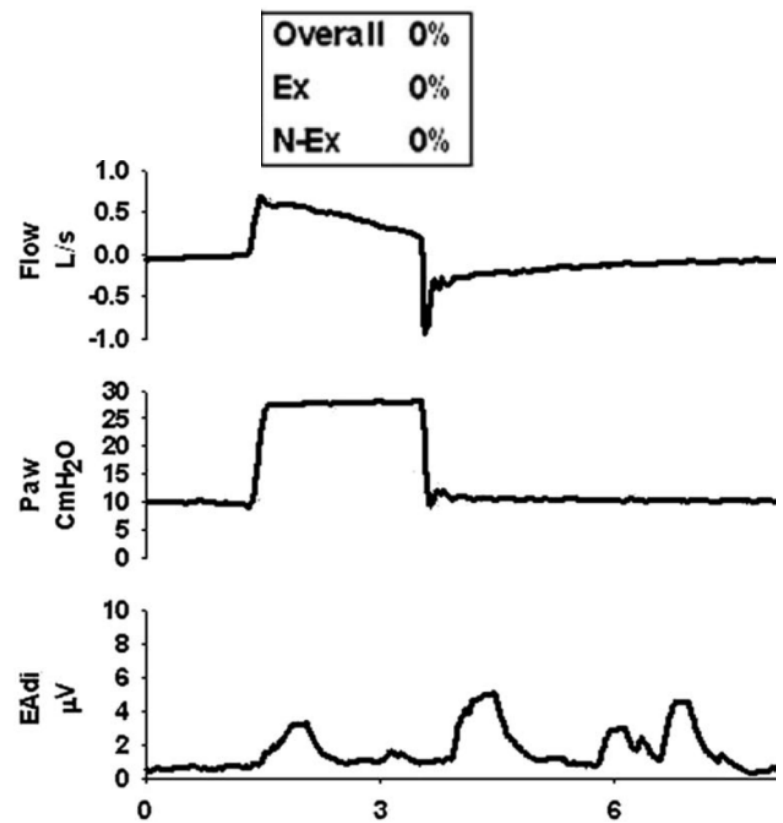
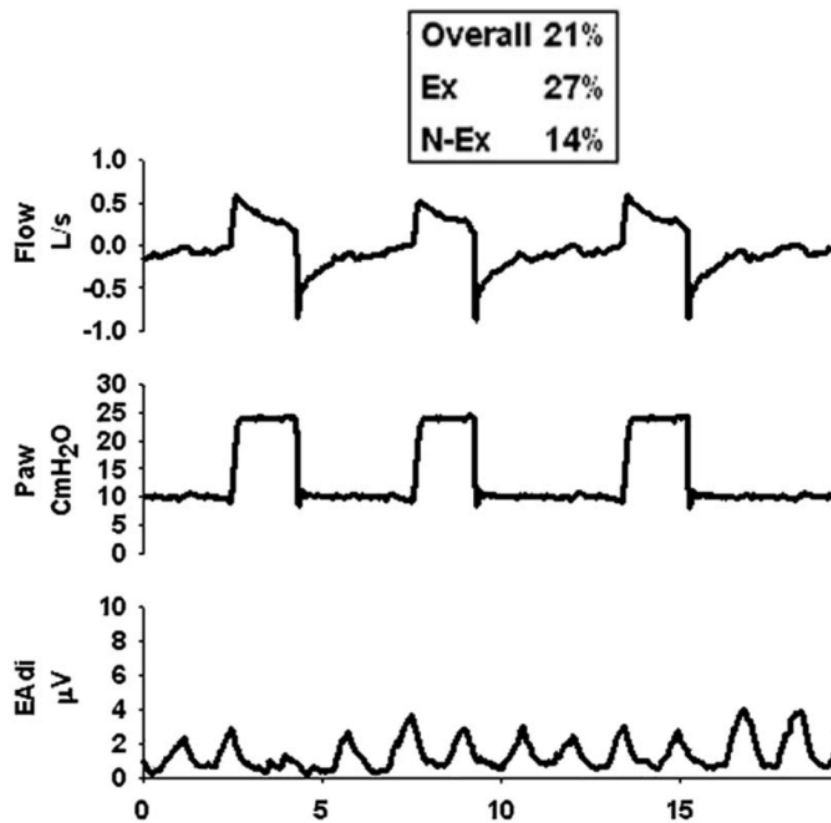
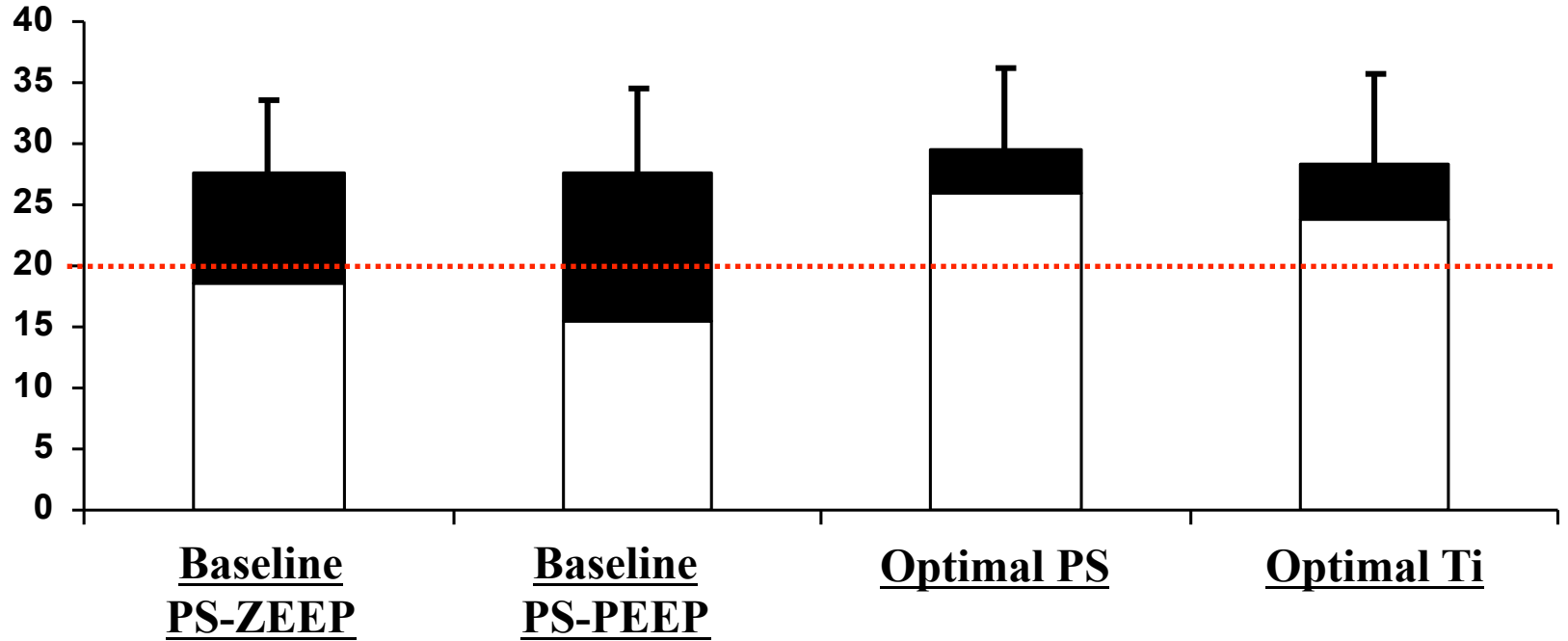




Table 2. Influence of different levels of pressure support and electrical activity of the diaphragm on sensitivity and prevalence of asynchronies

	Range	Sensitivity, %	<i>p</i>	Prevalence, %	<i>p</i>
Pressure support, cm H ₂ O	<12	25.9	<.001	4.2	<.001
	≥12	21.7		24.5	
Electrical activity of the diaphragm, µV	<7	18.5	<.001	19.0	<.001
	≥7	50.6		7.1	

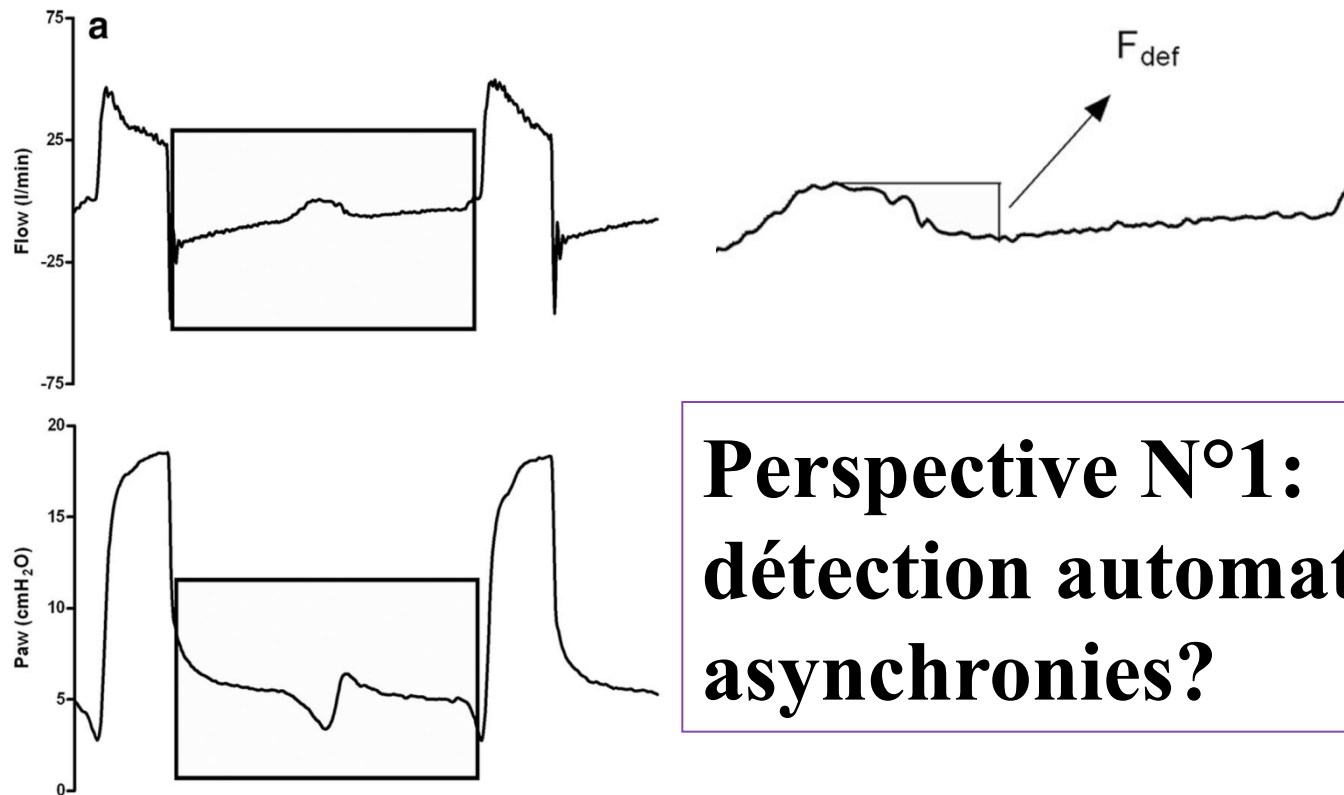
Respiratory Rate (Breaths/min)



 Respiratory rate indicated by the ventilator
 Rate of wasted efforts
] = Total patient's respiratory rate

Detecting ineffective triggering in the expiratory phase in mechanically ventilated patients based on airway flow and pressure deflection: Feasibility of using a computer algorithm*

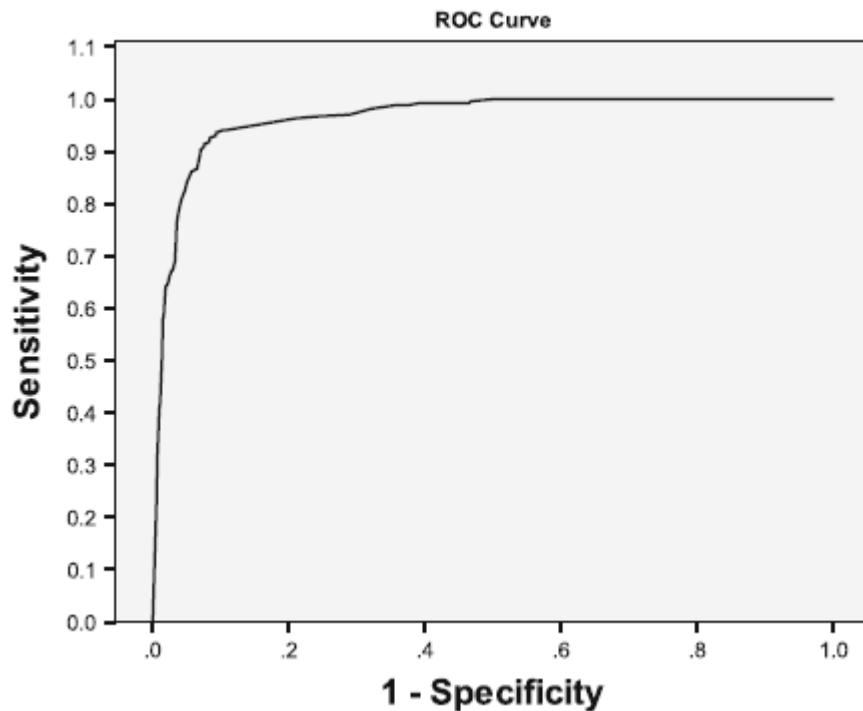
Chang-Wen Chen, MD, MS; Wei-Chieh Lin, MD; Chih-Hsin Hsu, MD; Kuo-Sheng Cheng, PhD; Chien-Shun Lo, PhD



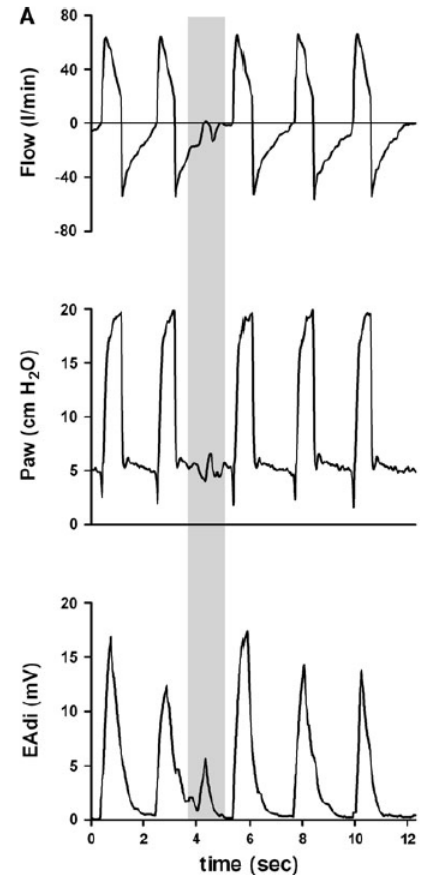
**Perspective N°1:
détection automatique des
asynchronies?**

Lluís Blanch
Bernat Sales
Jaume Montanya
Umberto Lucangelo
Oscar Garcia-Esquirol
Ana Villagra
Encarna Chacon
Anna Estruga
Massimo Borelli
Ma Jose Burgueño
Joan C. Oliva
Rafael Fernandez
Jesus Villar
Robert Kacmarek
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Validation of the Better Care[®] system to detect ineffective efforts during expiration in mechanically ventilated patients: a pilot study



Versus Edi: Sensibilité 65% / Spécificité 99%

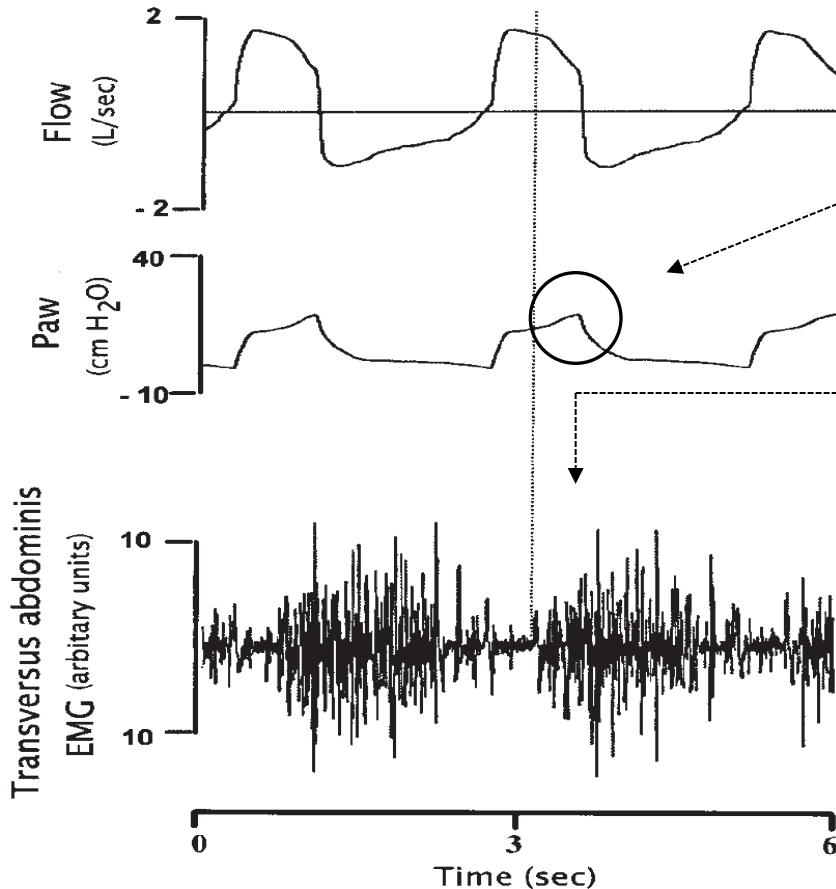


Cycling of Inspiratory and Expiratory Muscle Groups with the Ventilator in Airflow Limitation

SAIRAM PARTHASARATHY, AMAL JUBRAN, and MARTIN J. TOBIN

Division of Pulmonary and Critical Care Medicine, Edward Hines, Jr., Veterans Administration Hospital, Loyola University of Chicago Stritch School of Medicine, Hines, Illinois

AJRCCM 1998; 158:1471-1478



Brusque augmentation de pression en fin d'insufflation

contraction expiratoire des muscles abdominaux

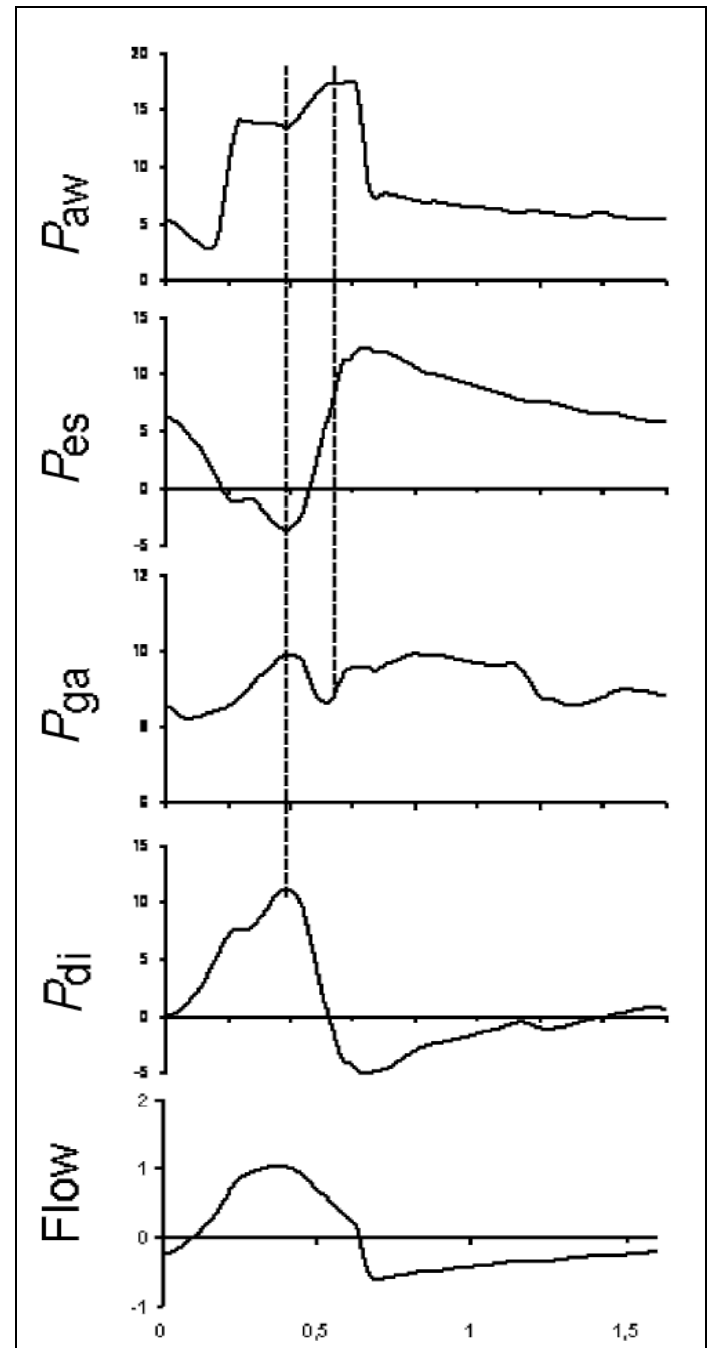
Ti ventilateur > Ti patient

George Prinianakis
Maria Plataki
Eumorfia Kondili
Maria Klimathianaki
Katerina Vaporidi
Dimitris Georgopoulos

Effects of relaxation of inspiratory muscles on ventilator pressure during pressure support

Témoin d'un effort important:
sous assistance ?

**Perspective N°2:
cyclage automatique en AI ?**



Perspective N°3:

PSV vs. NAVA ou PVS vs. PAV+

Effet bénéfique sur les asynchronies ou

Effet bénéfique de la ventilation proportionnelle

???