



Assistance Publique
Hôpitaux de Marseille

NAVA

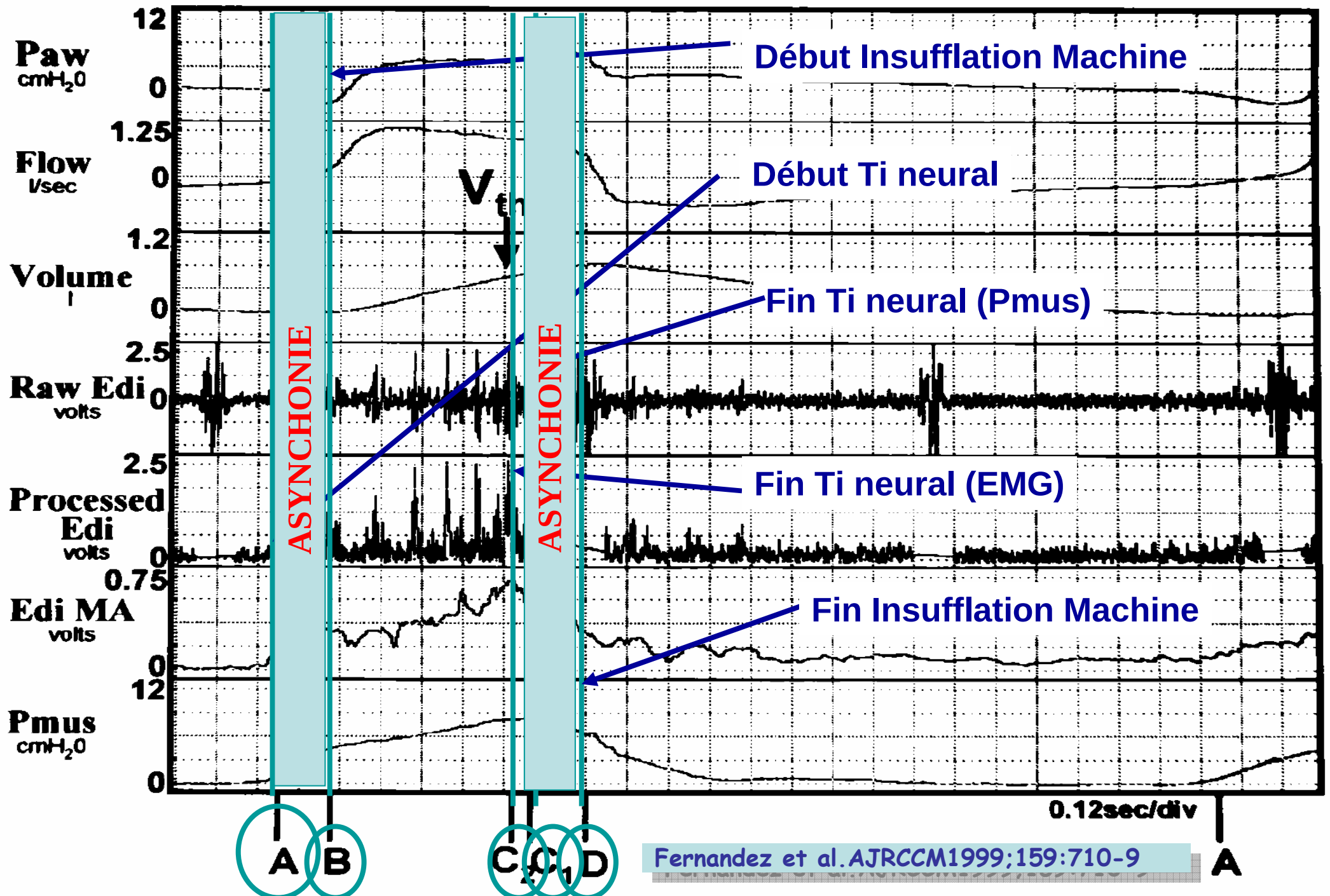


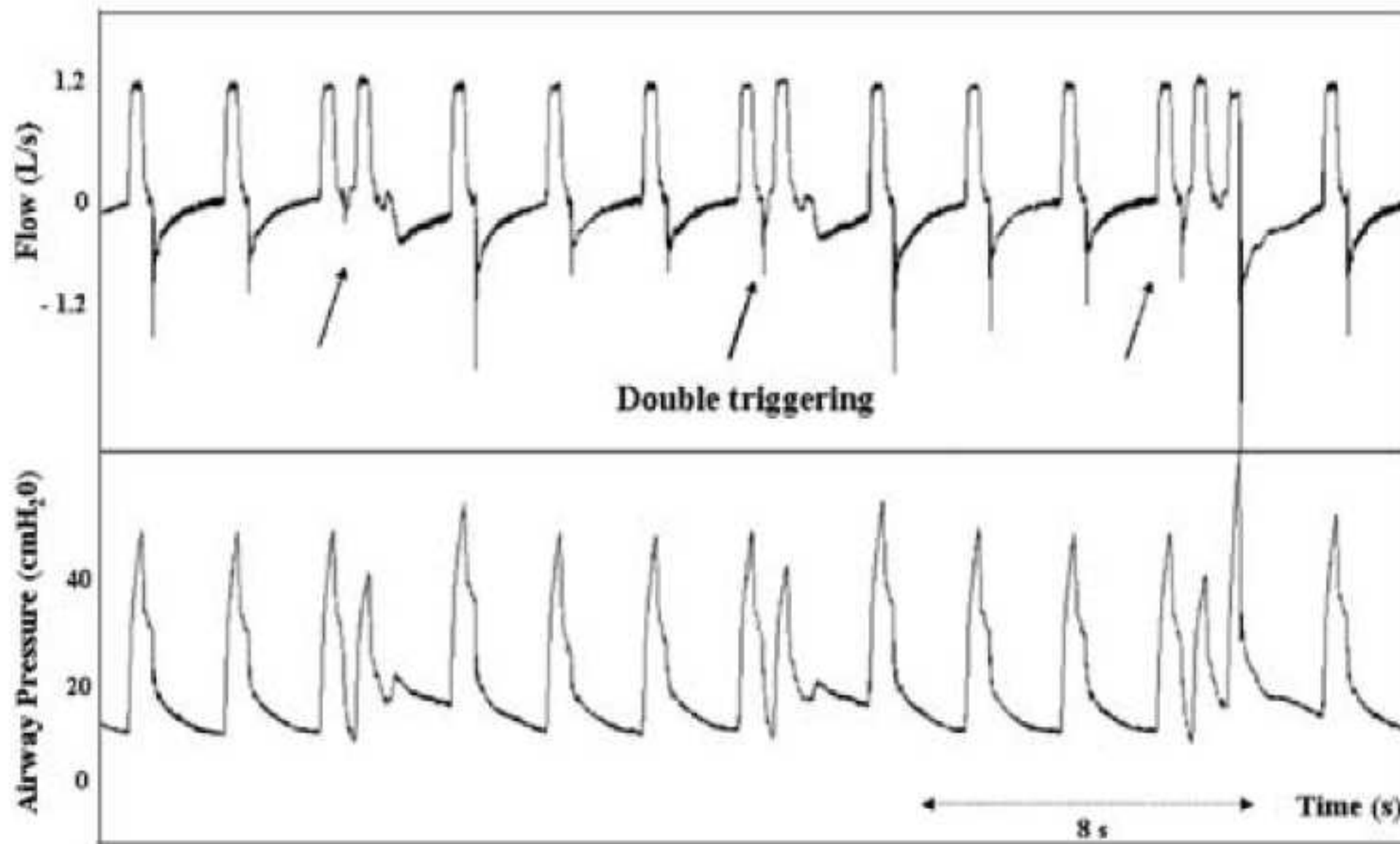
Neurally Adjusted Ventilatory Assist

Une meilleure synchronisation machine-patient ?

M. Gainnier

Marseille



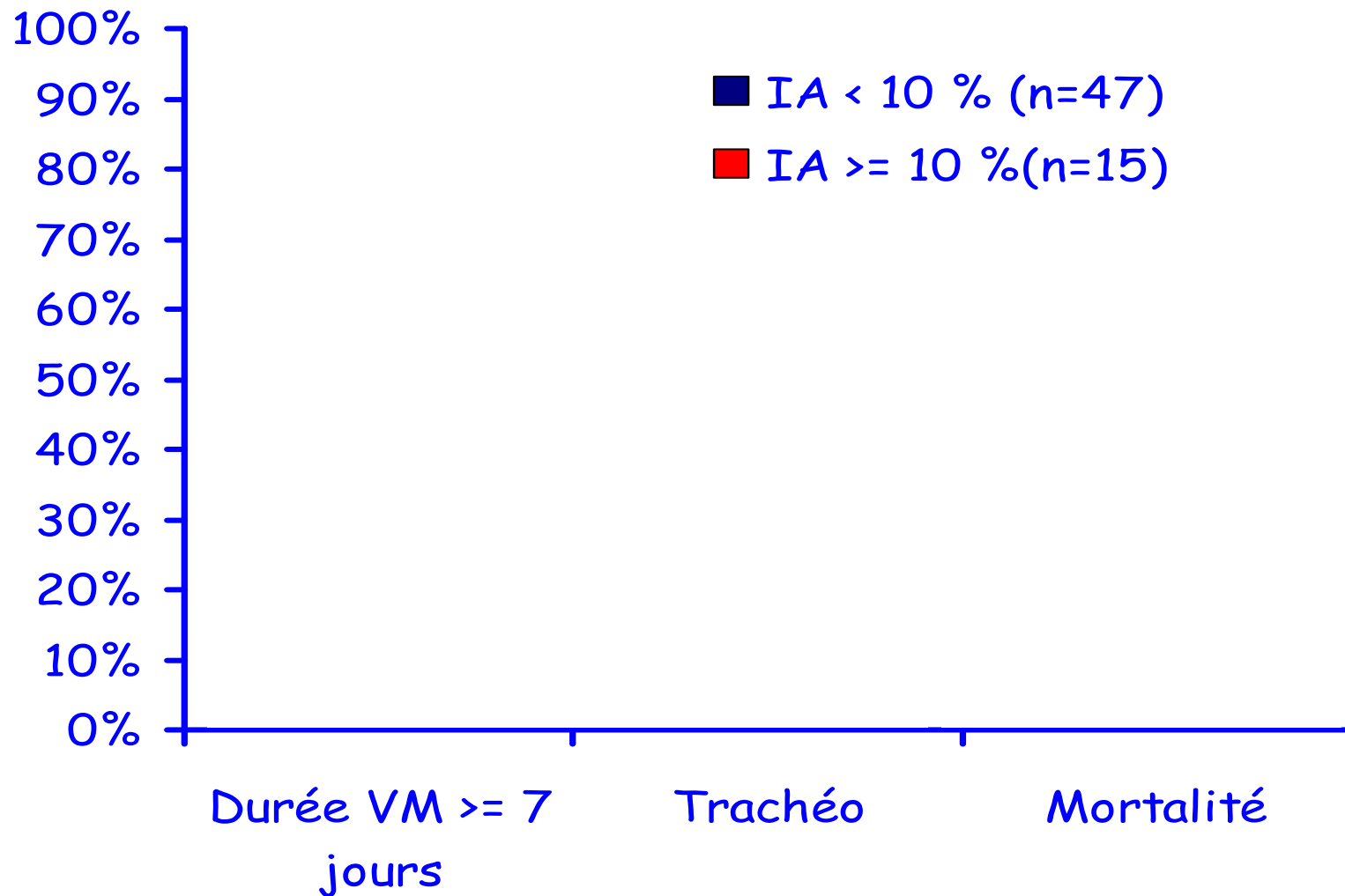


Incidences des asynchronies patient - ventilateur
VAC (ACV) vs AI (PSV)
Nombre par minute de ventilation

	ACV (<i>n</i> = 11)	PSV (<i>n</i> = 51)	<i>p</i>
Asynchronies	4.3 ± 4.8	1.9 ± 3.8	0.04
Ineffective triggering	3.0 ± 4.9	1.8 ± 3.7	0.38
Double-triggering	1.2 ± 2.3	0.1 ± 0.4	0.01

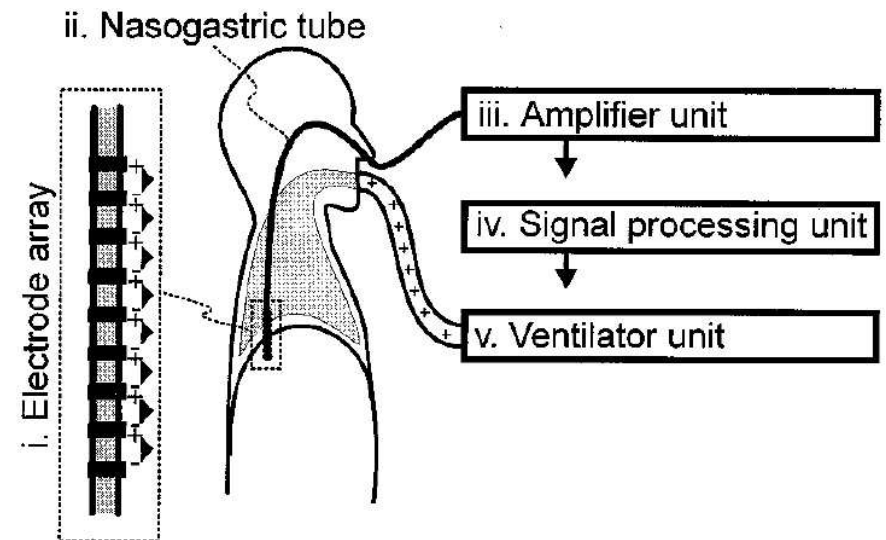
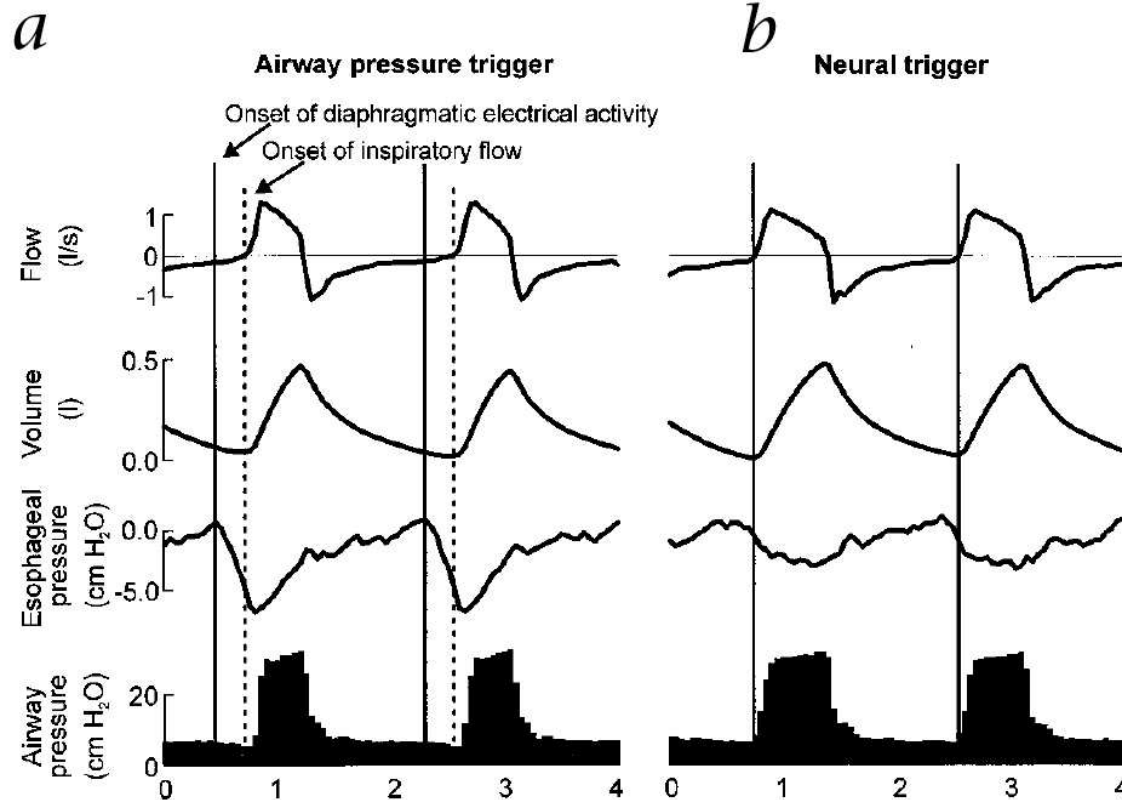
Index d'asynchronisme (%) = $N \text{ d'événements} / FR_{\text{tot}} \times 100$.

Effet des asynchronies patient - ventilateur sur Durée de VM, Risque de Trachéo, Mortalité



Neural control of mechanical ventilation in respiratory failure

CHRISTER SINDERBY^{1,2}, PAOLO NAVALES³, JENNIFER BECK⁴, YOANNA SKROBIK¹,
NORMAN COMTOIS¹, SVEN FRIBERG⁵, STEWART B. GOTTFRIED⁶ & LARS LINDSTRÖM⁵



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... *Nature Medicine* 1999; 5: 1433-1436

NEW TECHNOLOGY

Procédure de positionnement du Cathéter Edi

Accès Commande Neurologique



 Volume contrôlé Automode ☐ Admettre patient Nébuliseur Etat 

01-17 09 10

Accès commande neurologique

Mise en place cathéter Edi

Prévisual. NAVA

Outil de neuro-ventil.

Fermer

Attente

Contrôle av. util.
01-17, 08:47
Non réalisé

Test du circuit patient
01-17, 08:47
Non réalisé

Adulte 

Enfant 

Ventilation invasive

VNI

Autres réglages

Conc. d'O₂
40
21 % 100 0

PEP
5
cmH₂O 50 4

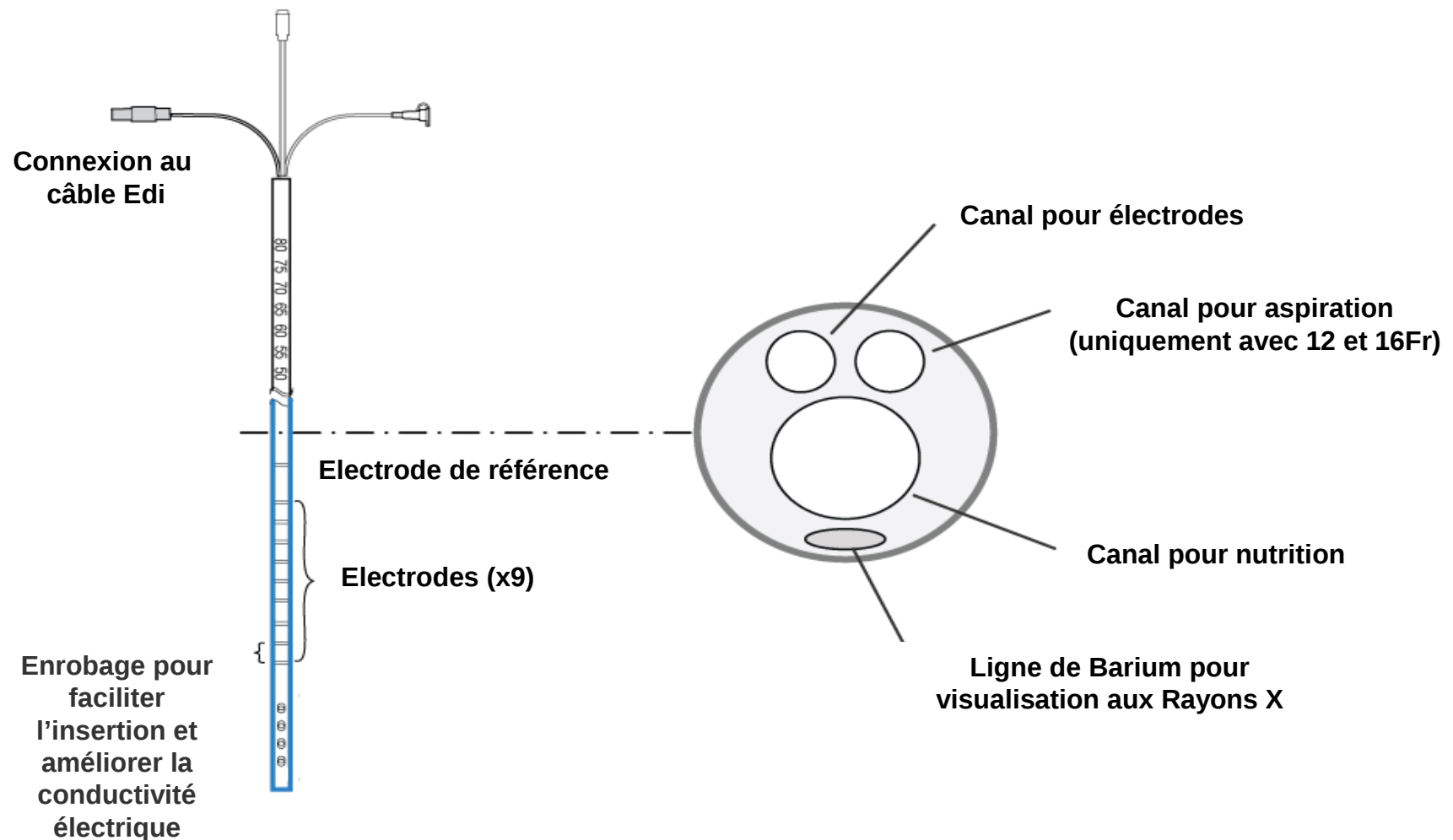
Fréquence
15
resp./min 150

Volume courant
500
ml 100 4000

Autres valeurs 

Sonde Gastrique permettant le recueil de l'activité électrique du diaphragme

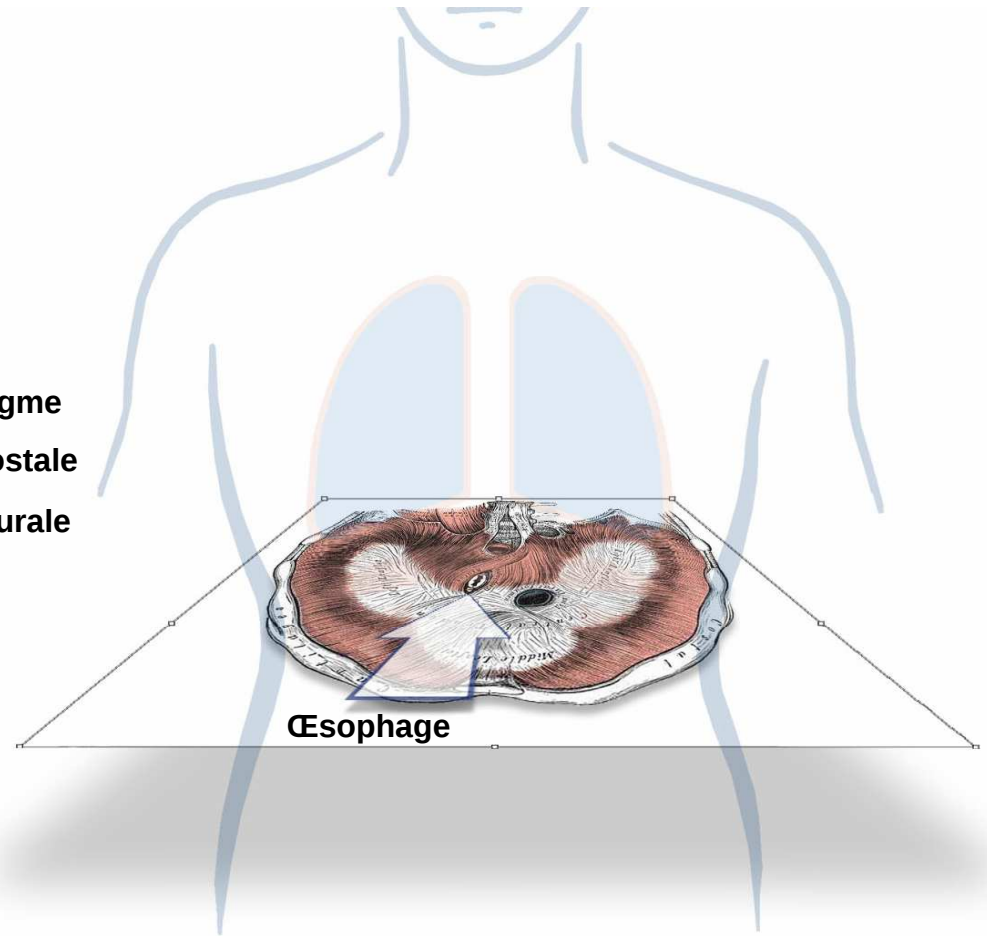
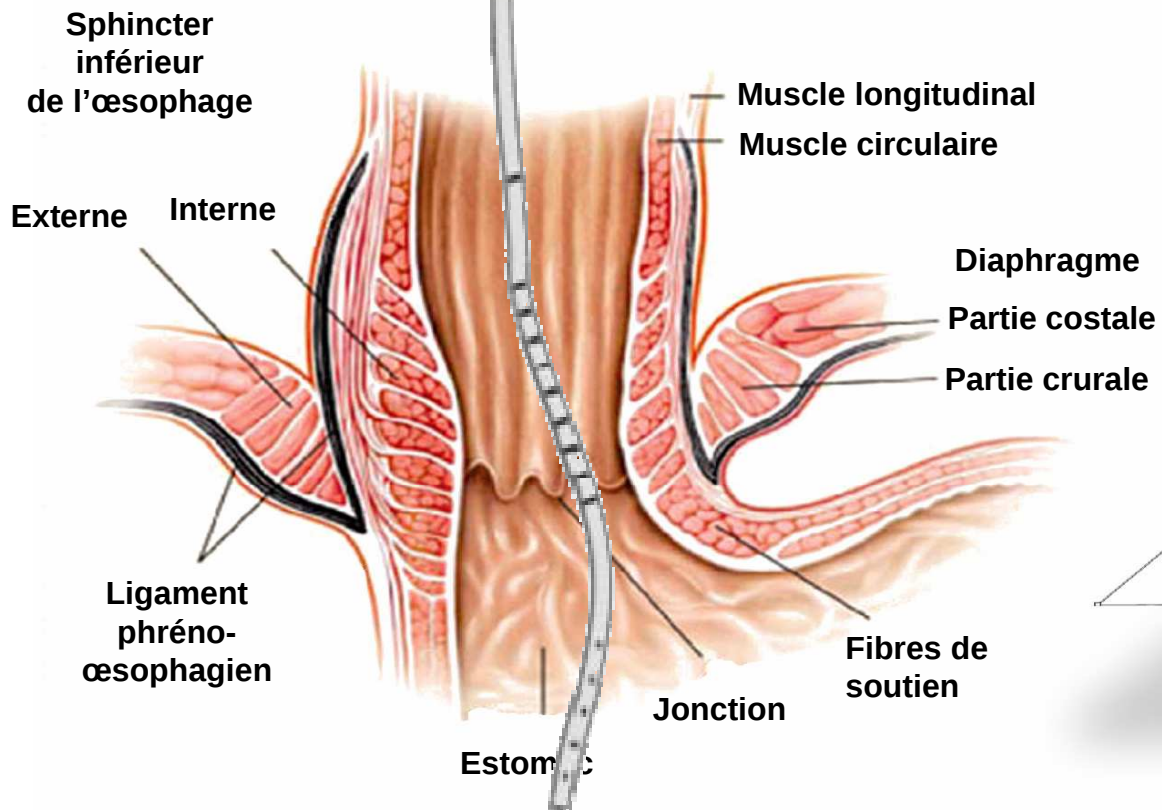
Cathéter Edi



Fr (French) = circonférence du cathéter en mm

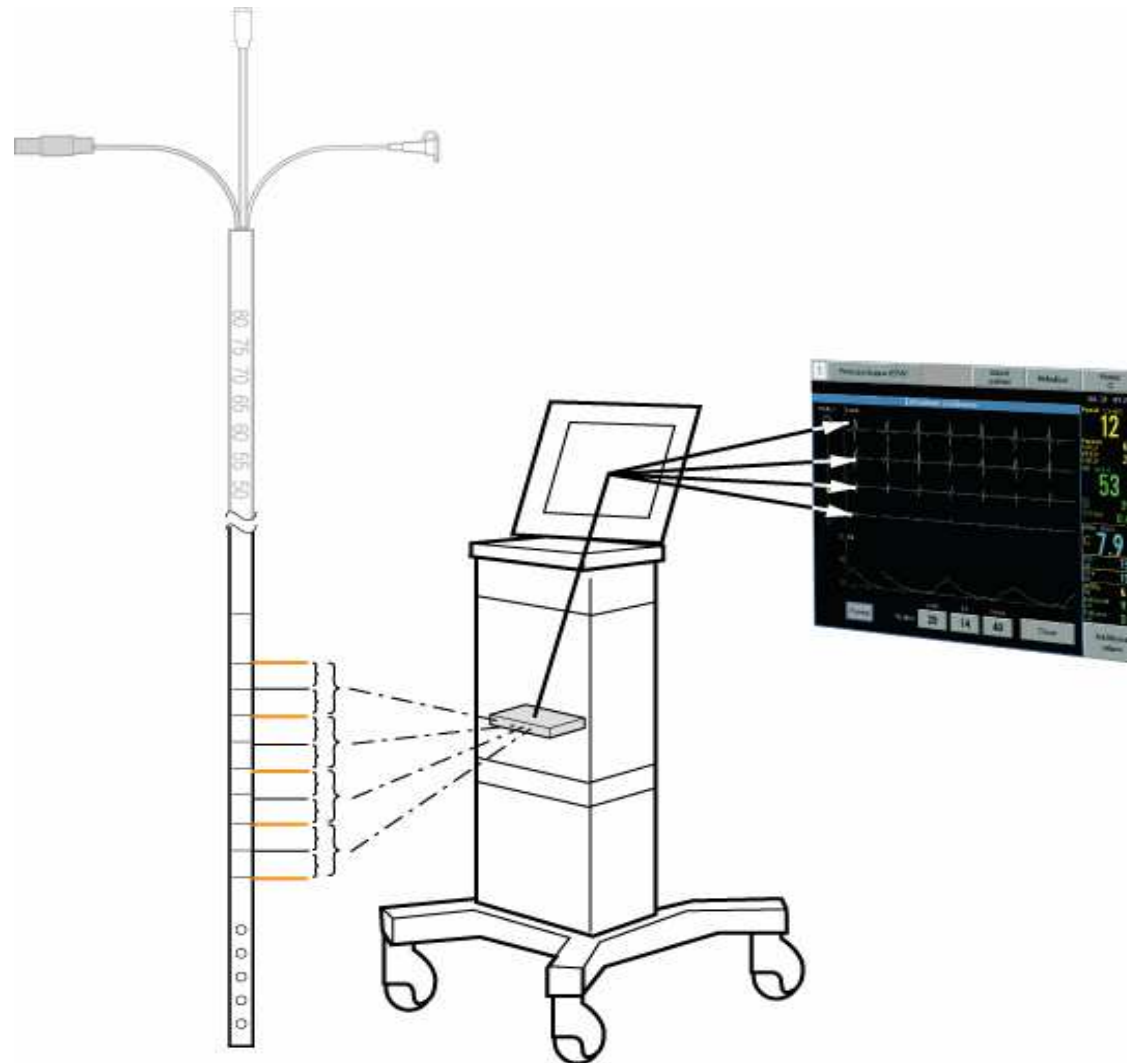
NAVA

Positionnement Sonde



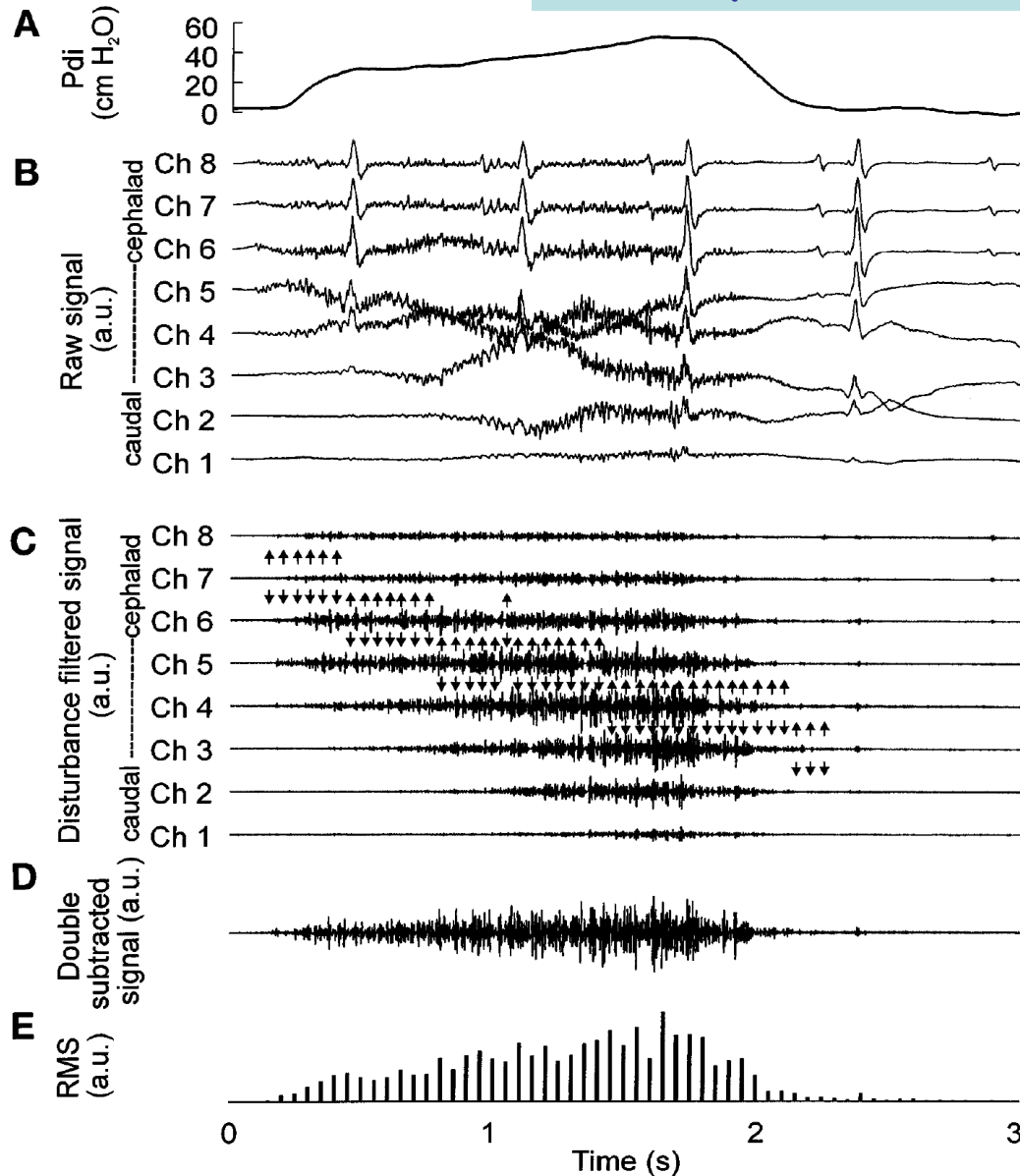
Procédure de positionnement du Cathéter Edi

Le signal Edi



Le signal EAdi

Sinderby et al. JAP 1998; 85:2146-2158



Transdiaphragmatic pressure (Pdi)

8 channels of amplified
and band-pass (10-1000 Hz)
filtered raw EMG signal.

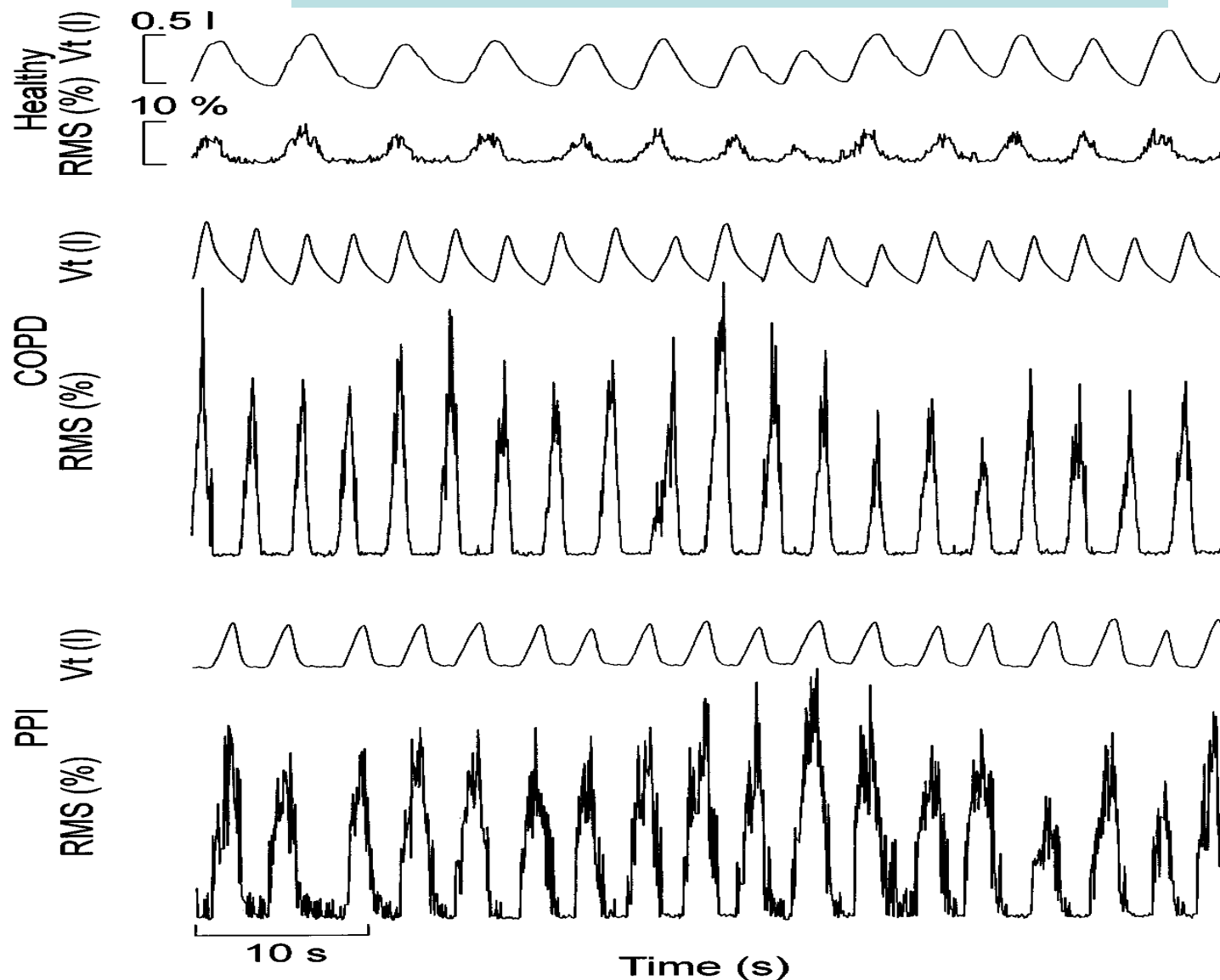
Signal EMG brut filtré
Trt par double soustraction

Signal EMGdi final

$$\text{RMS} = \left[\left(\sum_{i=1}^{i_{\max}} s_i^2 \right) / i_{\max} \right]^{1/2}$$

Le signal EAdi en VS : sujets sains, COPD, restrictif

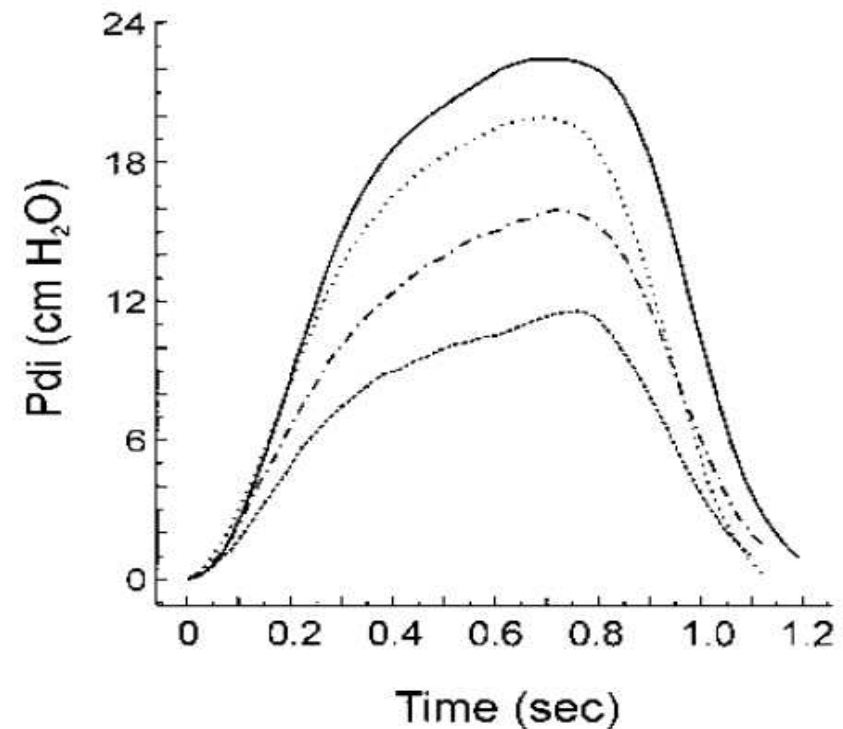
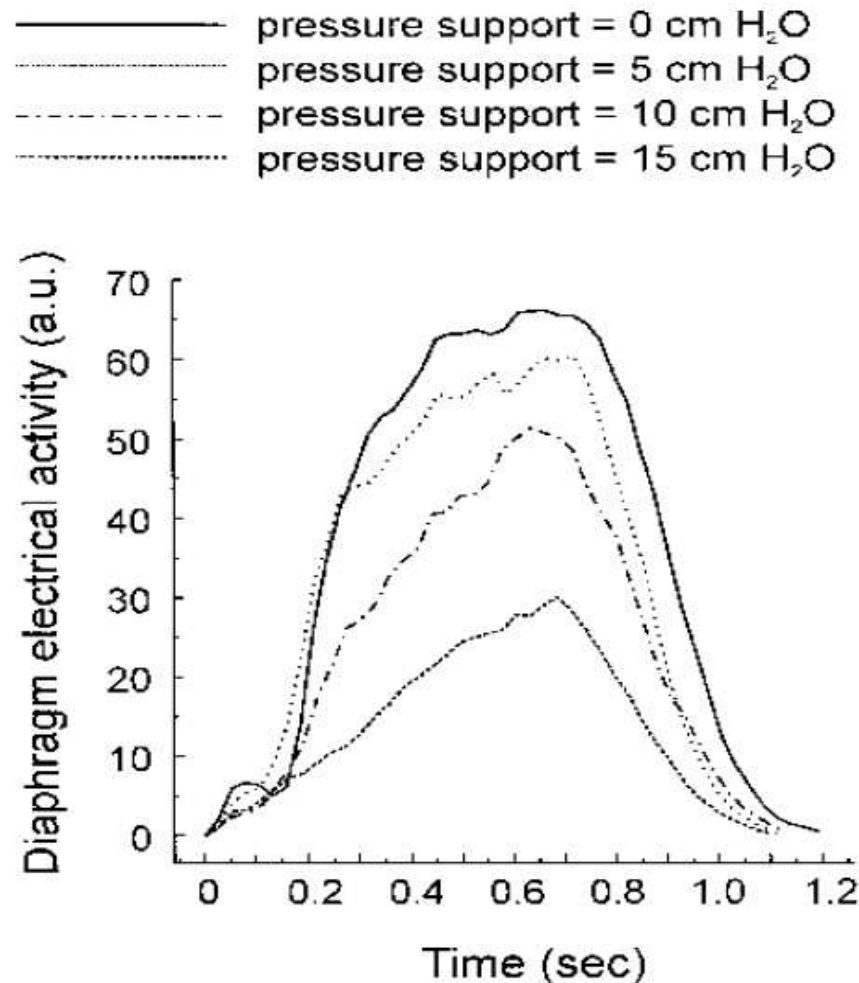
Sinderby et al. JAP 1998; 85:2146-2158



Electrical Activity of the Diaphragm during Pressure Support Ventilation in Acute Respiratory Failure

JENNIFER BECK, STEWART B. GOTTFRIED, PAOLO NAVALES, YOANNA SKROBIK, NORMAN COMTOIS, MAURO ROSSINI, and CHRISTER SINDERBY

Am J Respir Crit Care Med Vol 164. pp 419–424, 2001



Positionnement du Cathéter Edi



Réglages mode de ventilation NAVA



Mode
Pressure Support/CPAP

Admit
patient

Nebulizer

Status
G

06-26 13:57

Set Ventilation Mode

NAVA

NAVA Ppeak est. 14 cmH₂O

Basic

NAVA level
1.6
0.0 cmH₂O/ μ V 30.0

PEEP
5
0 cmH₂O 50

O₂ conc.
40
21 % 100

Trigg. Edi

Trigg. Edi
0.5
0.0 μ V 2.0

Pressure Support

Trigg. Flow
5
-20 0

Insp. cycle off
30
1 % 70

PS above PEEP
14
0 cmH₂O 60

Backup ventilation

PC above PEEP
20
5 cmH₂O 60

Ppeak (cmH₂O)
14
40

Pmean (cmH₂O)
7

PEEP (cmH₂O)
5

RR (b/min)
20
30 5

O₂ (%)
41

Ti/Ttot
0.26

MVe (l/min)
3.6
40.0 25

VTi (ml)
176

VTe (ml)
176

Edi peak (μ V)
6.0

Edi min (μ V)
0.1

Show
Previous Mode

time: 0:57

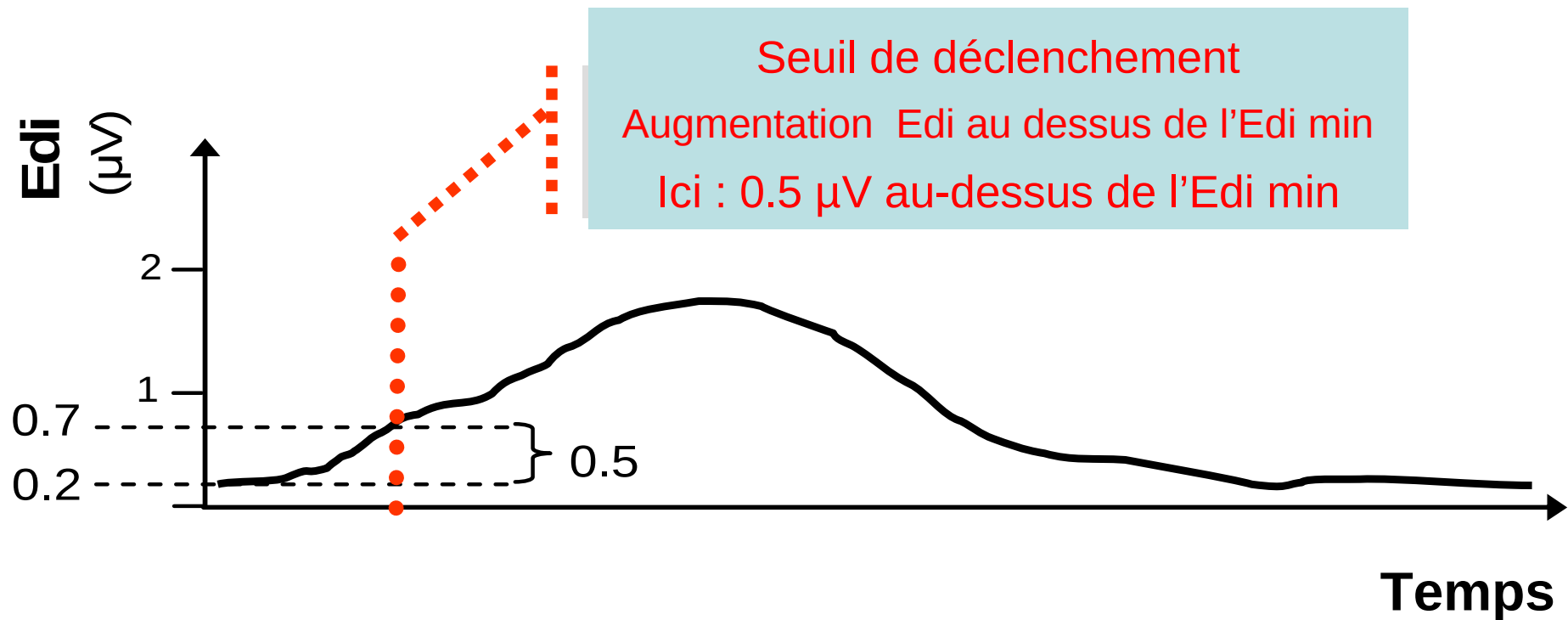
Cancel

Accept

Additional
values

NAVA

Trigger inspiratoire : EAdi du diaphragme



Réglable de 0.1 μV à 2 μvolts



NAVA

Admettre
patient

Nébuliseur

Etat
🔊

Pression

Fréquence respiratoire: Elevée



1:25

40 cmH₂OPcrête (cmH₂O)

24

40

Pmoyen.
(cmH₂O)

8

PEP
(cmH₂O)

5

F resp. (resp./min)

31

30

5

O₂
(%)

50

Ti/Ttot

0.32

VMe (l/min)

C 9.0

40.0

5.0

Vc insp.
(ml)

258

Vc exp.
(ml)

312

Edi max
(μV)

19

Edi min
(μV)

0.6

90 l/min

Débit

-90

400 ml

Volume

20 μV

EaDi

Autres
réglagesConc. d'O₂

50

21

%

100

0

PEP

5

cmH₂O

50

Niveau NAVA

1.0

0.0

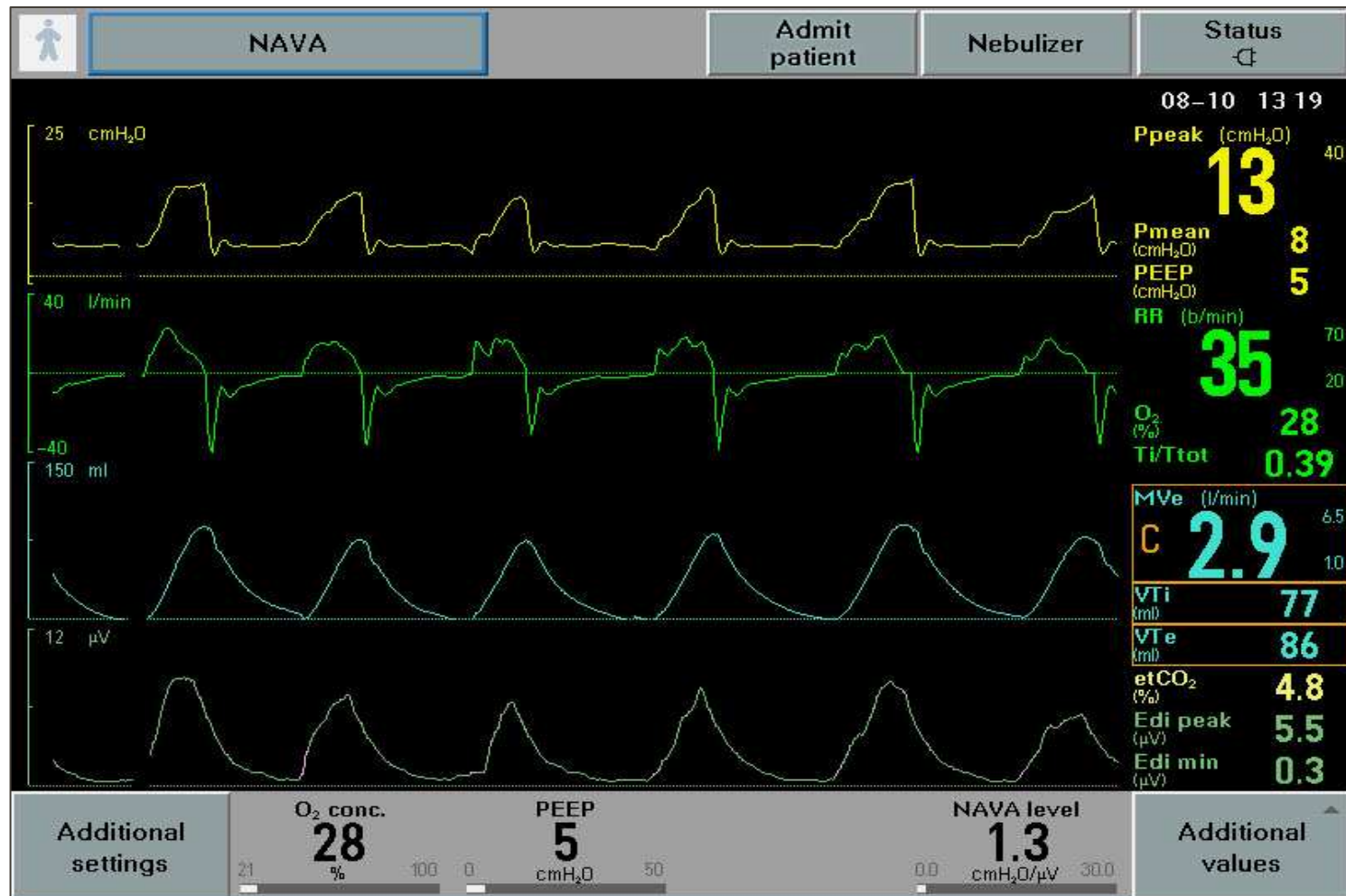
cmH₂O/μV

30.0

Autres
valeurs

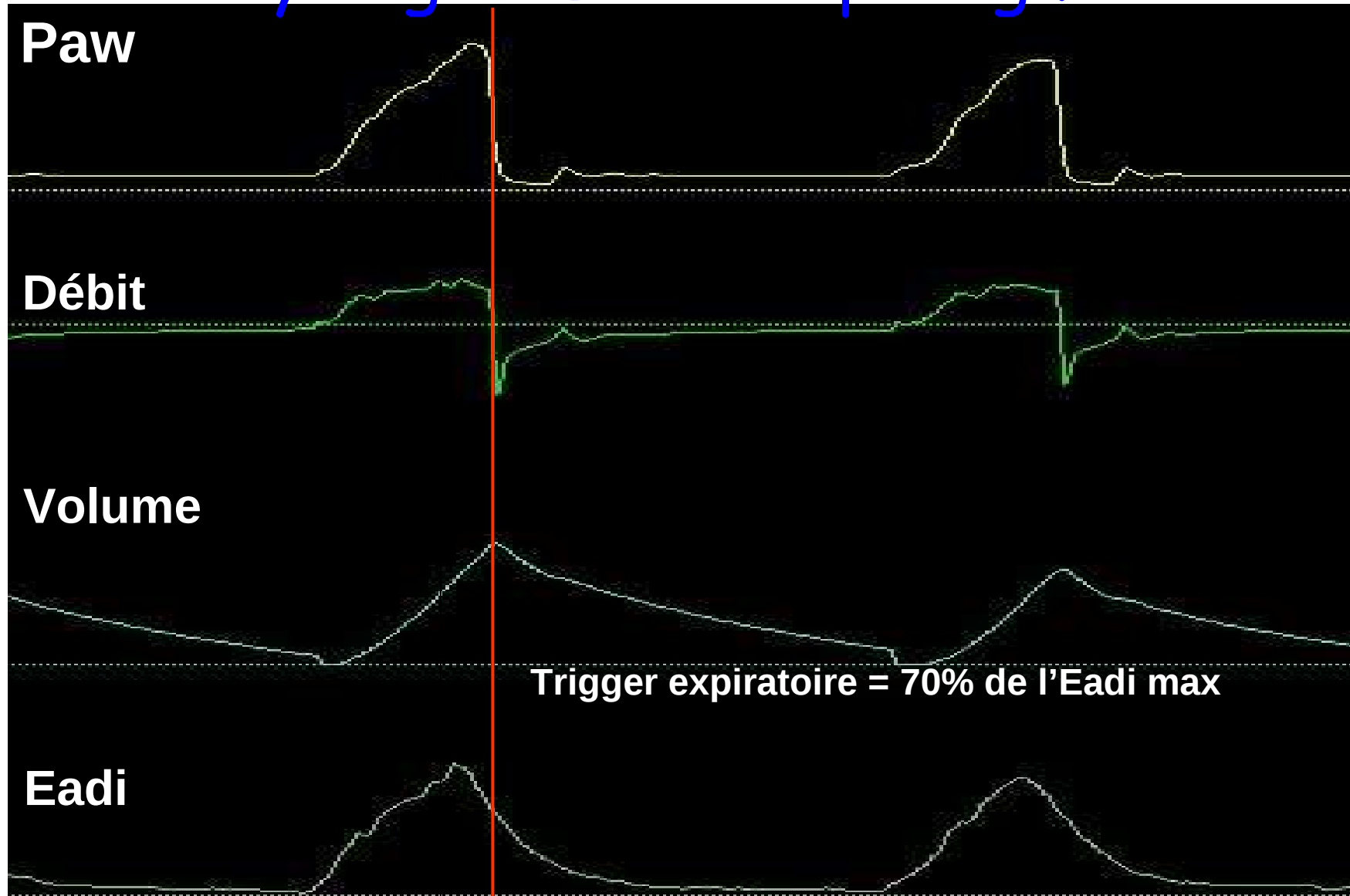
Une assistance proportionnelle à l'activité EMG du diaphragme

$$Paw = EADi \times \text{Niveau NAVA}$$



NAVA

Cyclage : EMG diaphragme



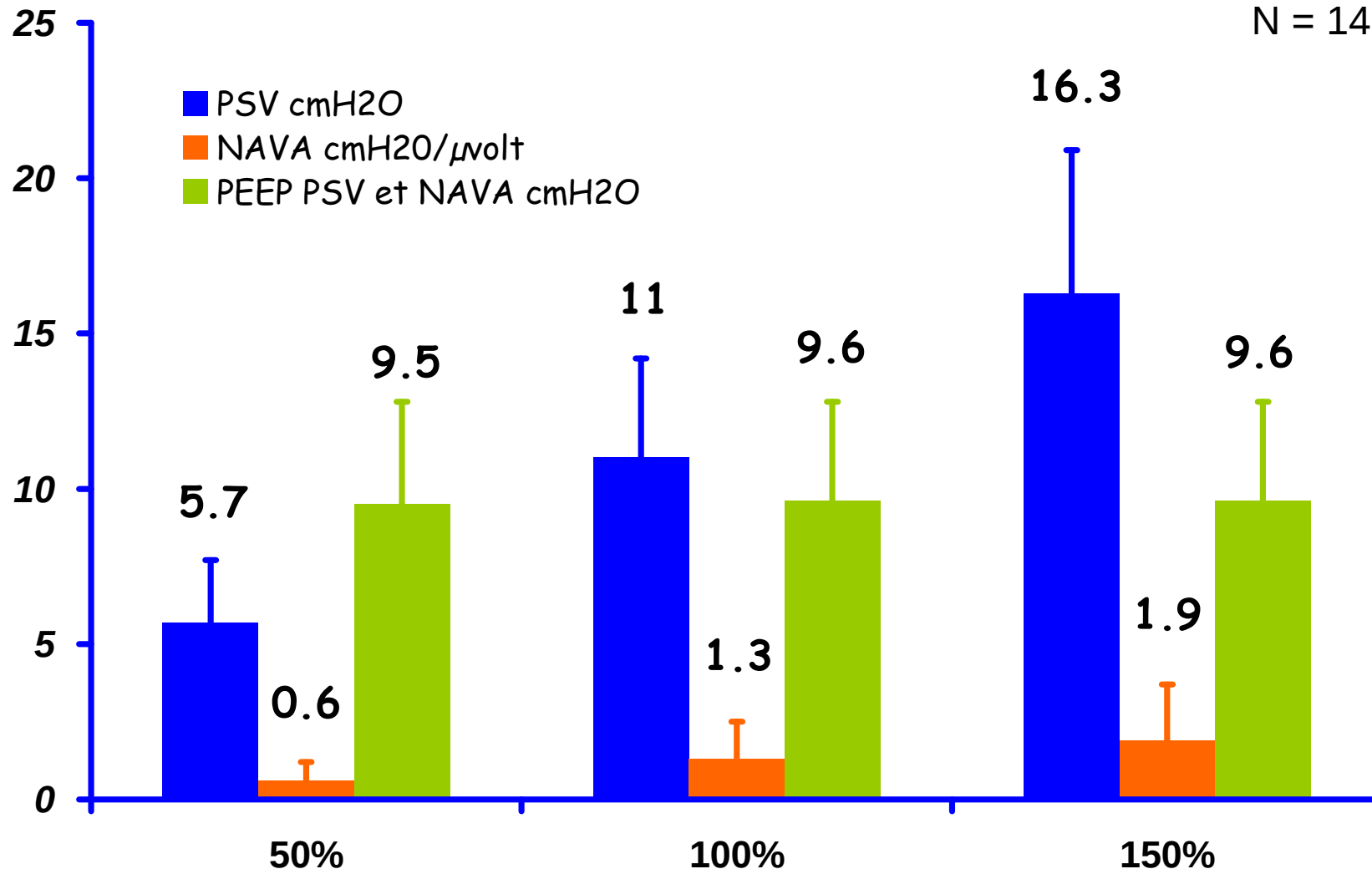
Données Publiées

HUMAINES	Sujets (N)	Type de Ventilation	Type de sujets
Colombo et al, Int Care Med 2008 Prospective, randomisée, cross over	14	Patients Intubé PSV vs NAVA 3 niveaux	2 COPDs 6 polytraumas 1 pneumopathie ALI 1 pancréatite ALI 1 Rupture AAA 2 Chocs septiques 1 TC
Sinderby et al, Chest 2007 Prospective, observationnelle	9	NAVA en VNI avec pièce buccale	Adultes sains
ANIMALES (lapins)			
Beck et al, Int Care Med 2008 Prospective, contrôlé.	10	NAVA	10 Lapins en ALI (HCL) VM puis VNI
Beck et al, Ped Research 2007 Prospective randomisée	12	PSV vs NAVA 3 niveaux	12 lapins Normaux
Allo et al, Crit Care Med 2006 Prospective	18	NAVA	ALI (HCL)
5 ABSTRACTS ESICM 2008			
Passath et al.	20	NAVA à différents niveaux de PEEP	Adulte
Saccavino et al.	10	PSV puis NAVA	Adulte
Ferreyra et al.	10	NAVA puis sevrage VM	Adulte
Ferreyra et al.	5	NAVA vs PSV	Adulte
Patroniti et al.	10	NAVA vs PSV	Adulte

Physiologic response to varying levels of PSV and NAVA in patients with ARF

Colombo et al. Int Care Med 2008; 34(11):2010-8.

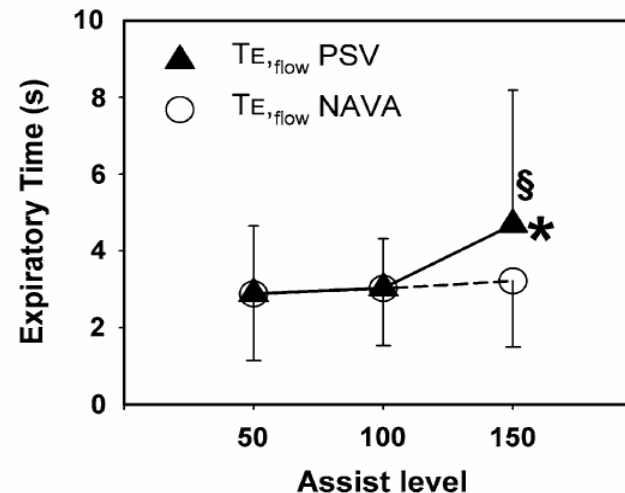
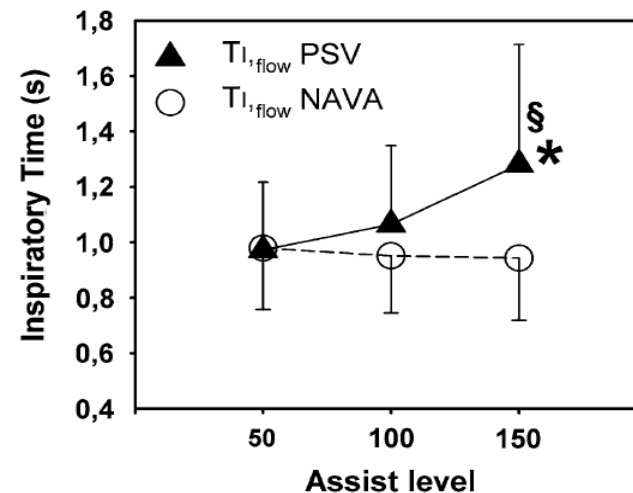
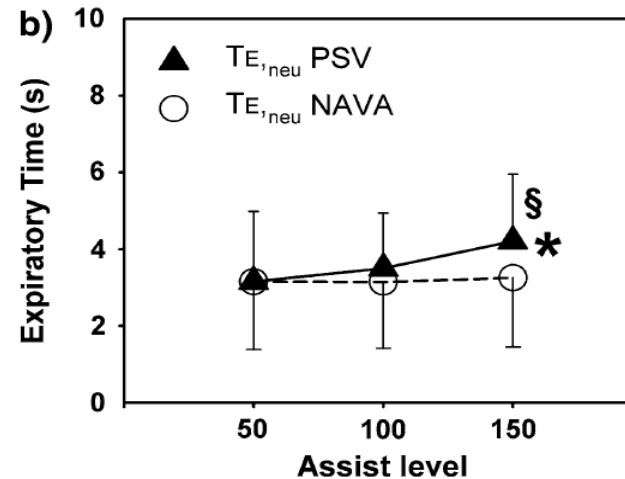
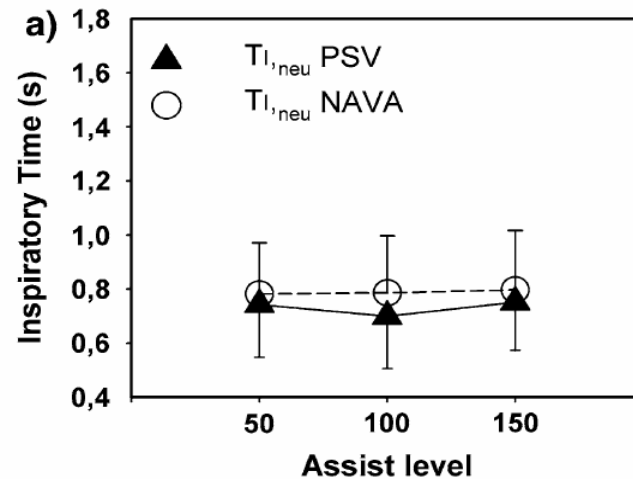
N = 14 patients



Physiologic response to varying levels of PSV and NAVA in patients with ARF

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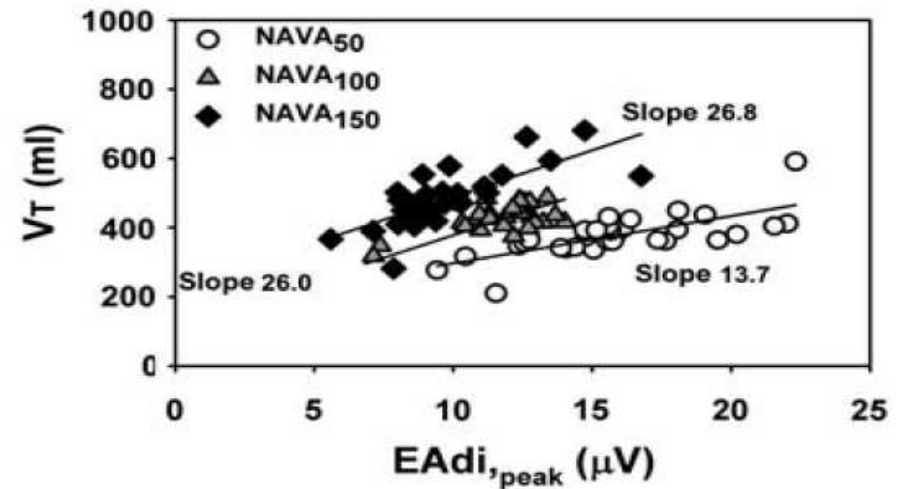
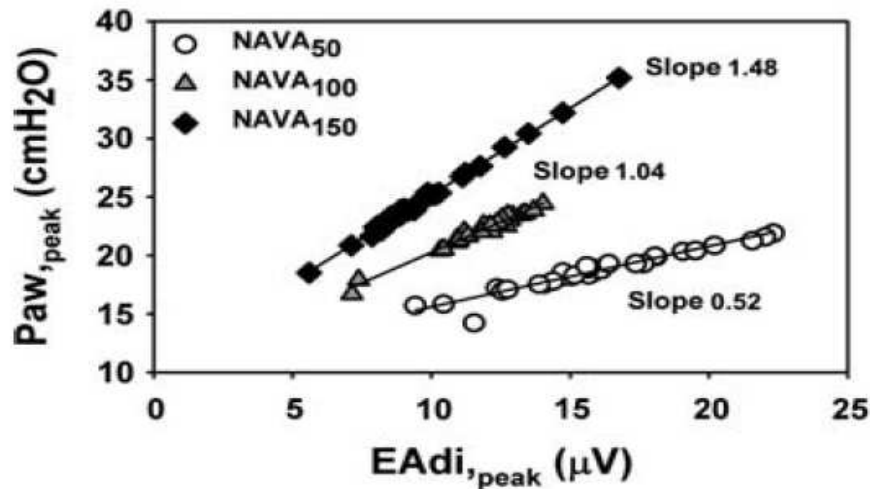
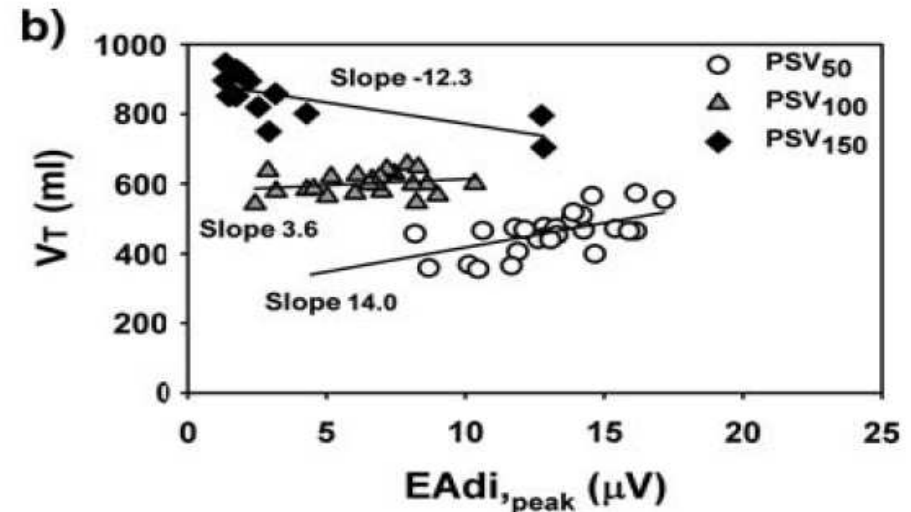
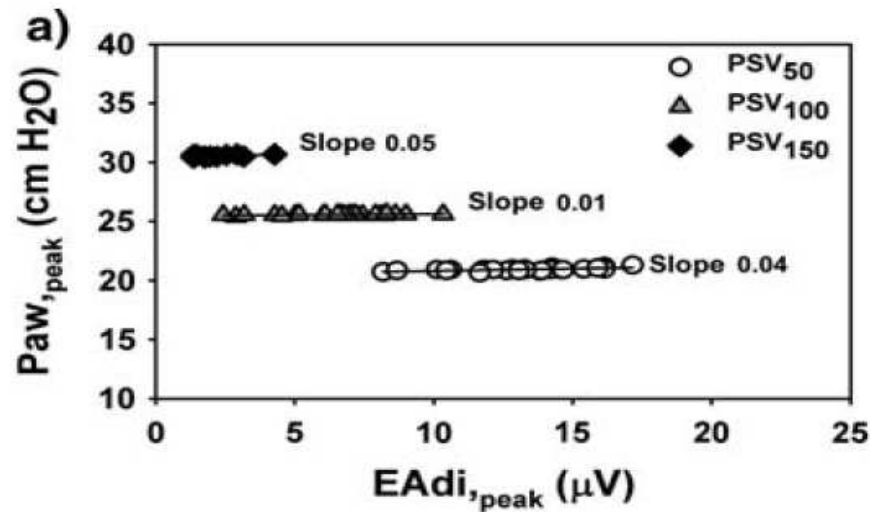
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Physiologic response to varying levels of PSV and NAVA in patients with ARF

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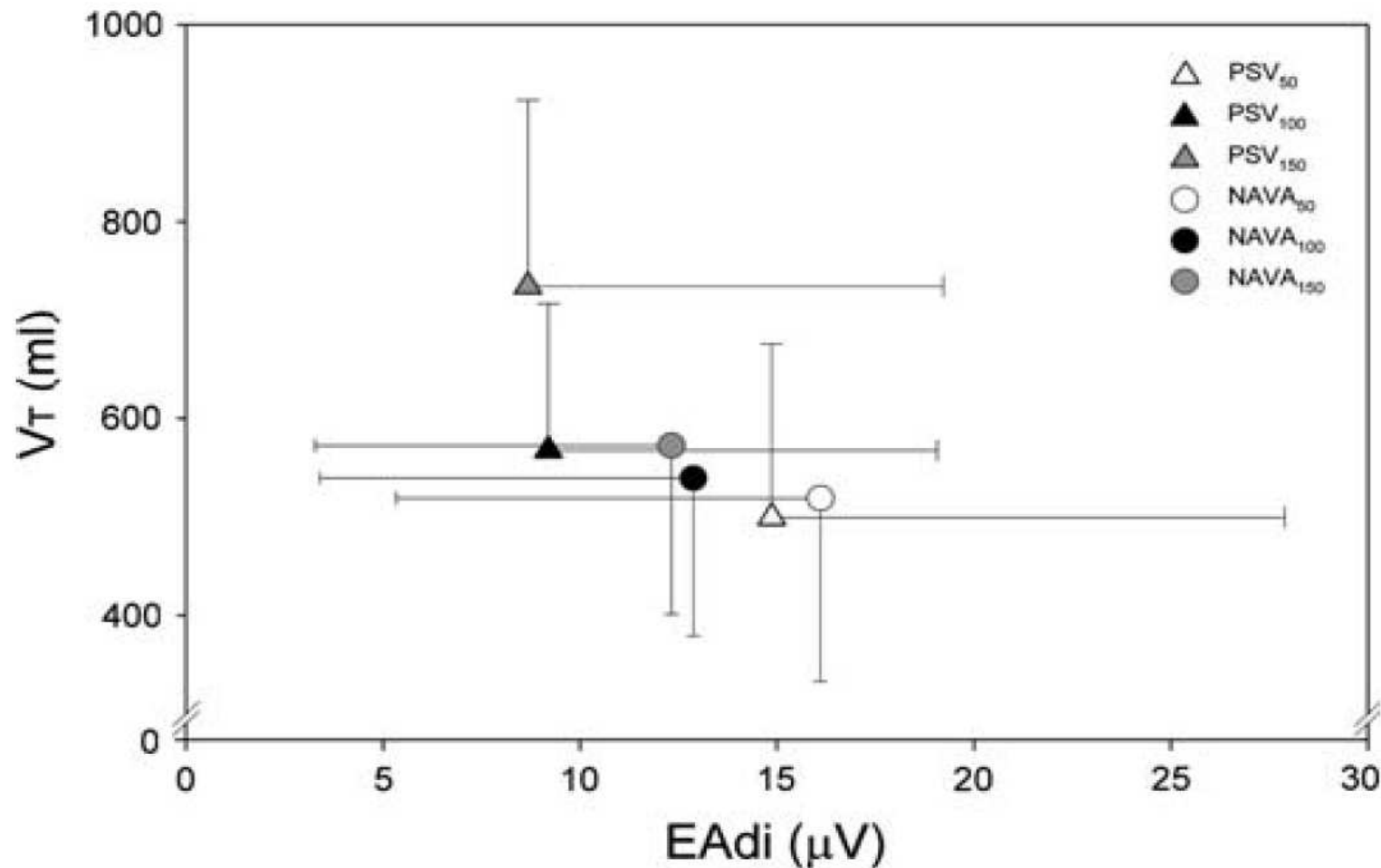
1 patient

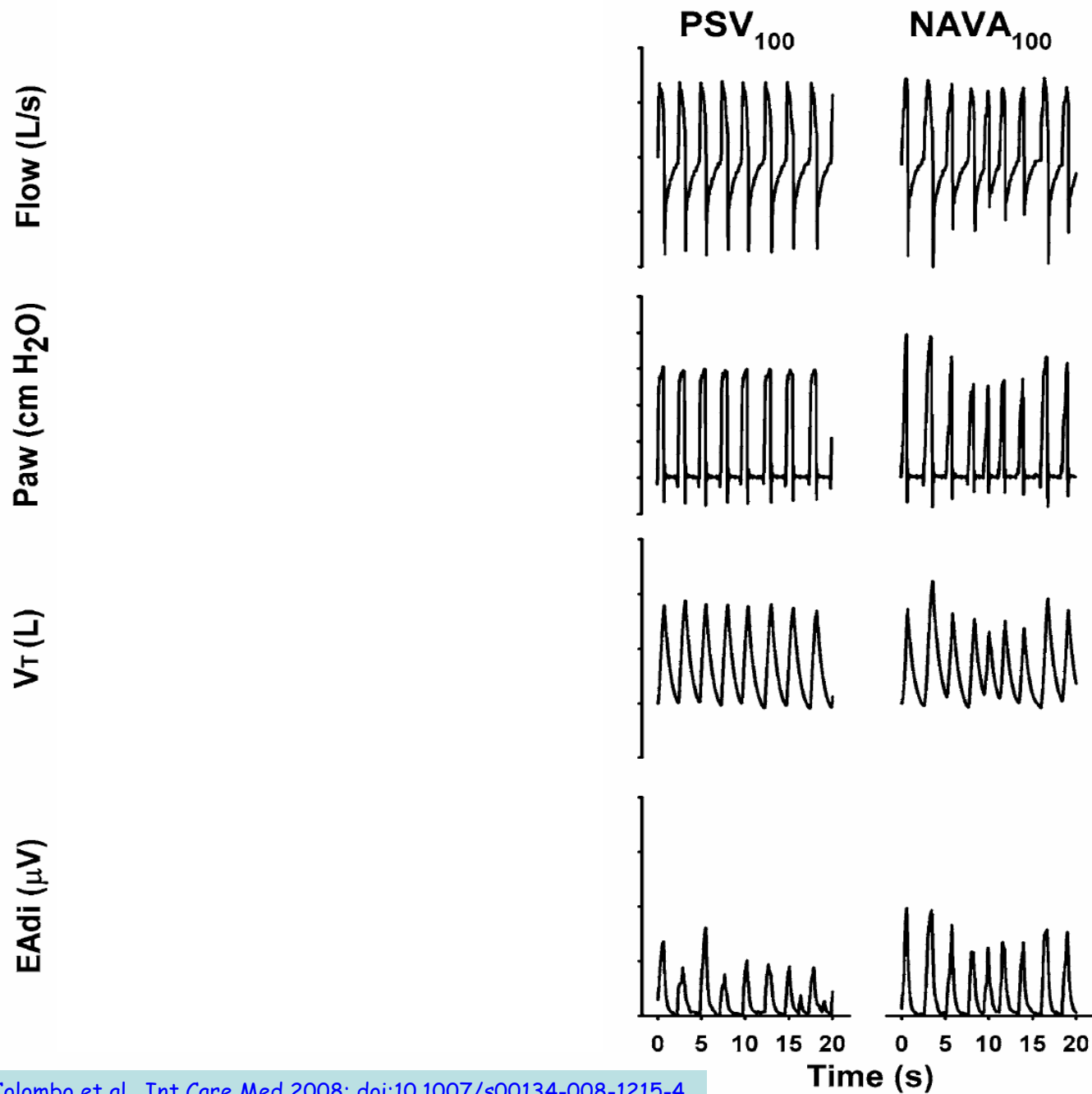


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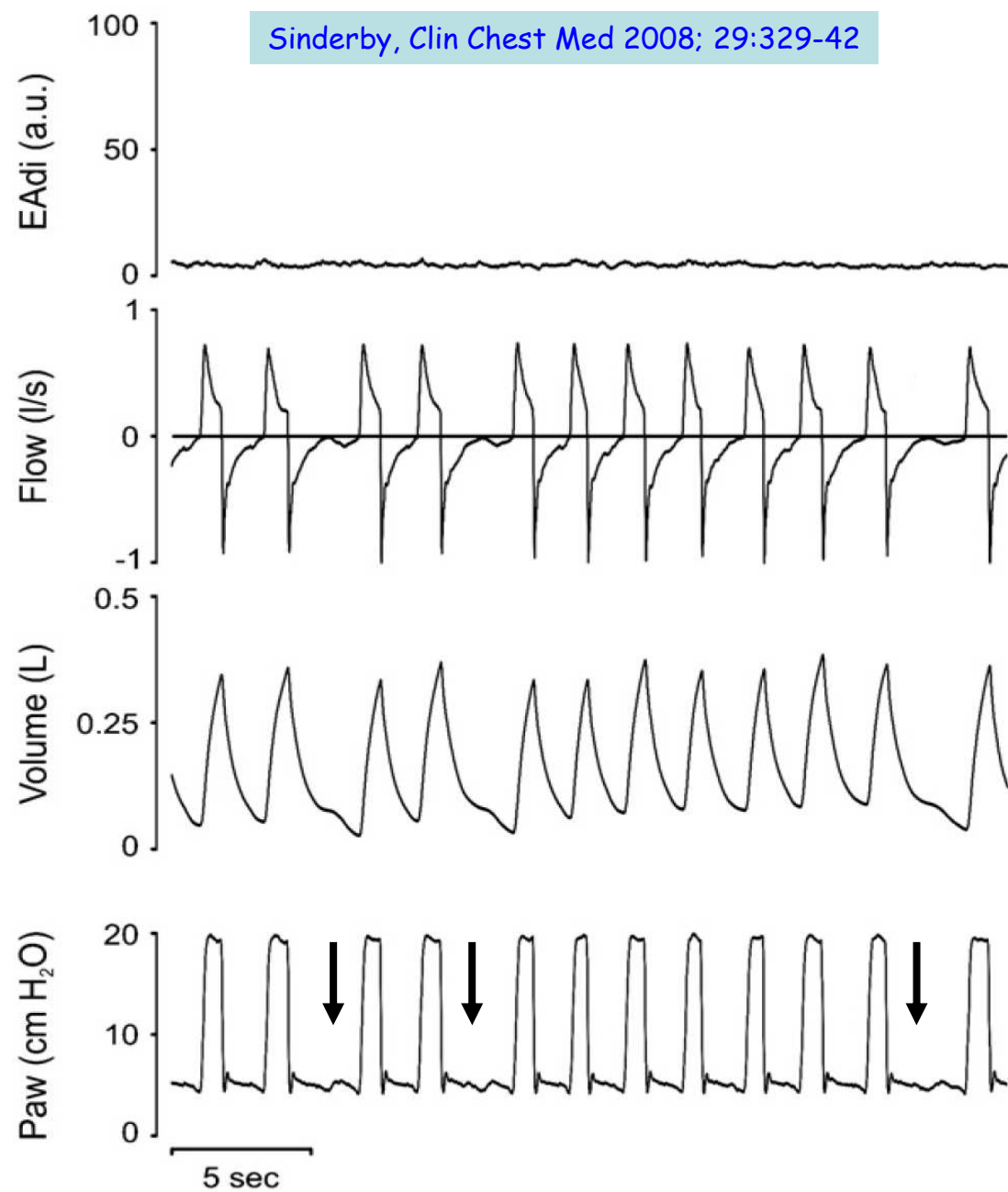
N = 14 patients





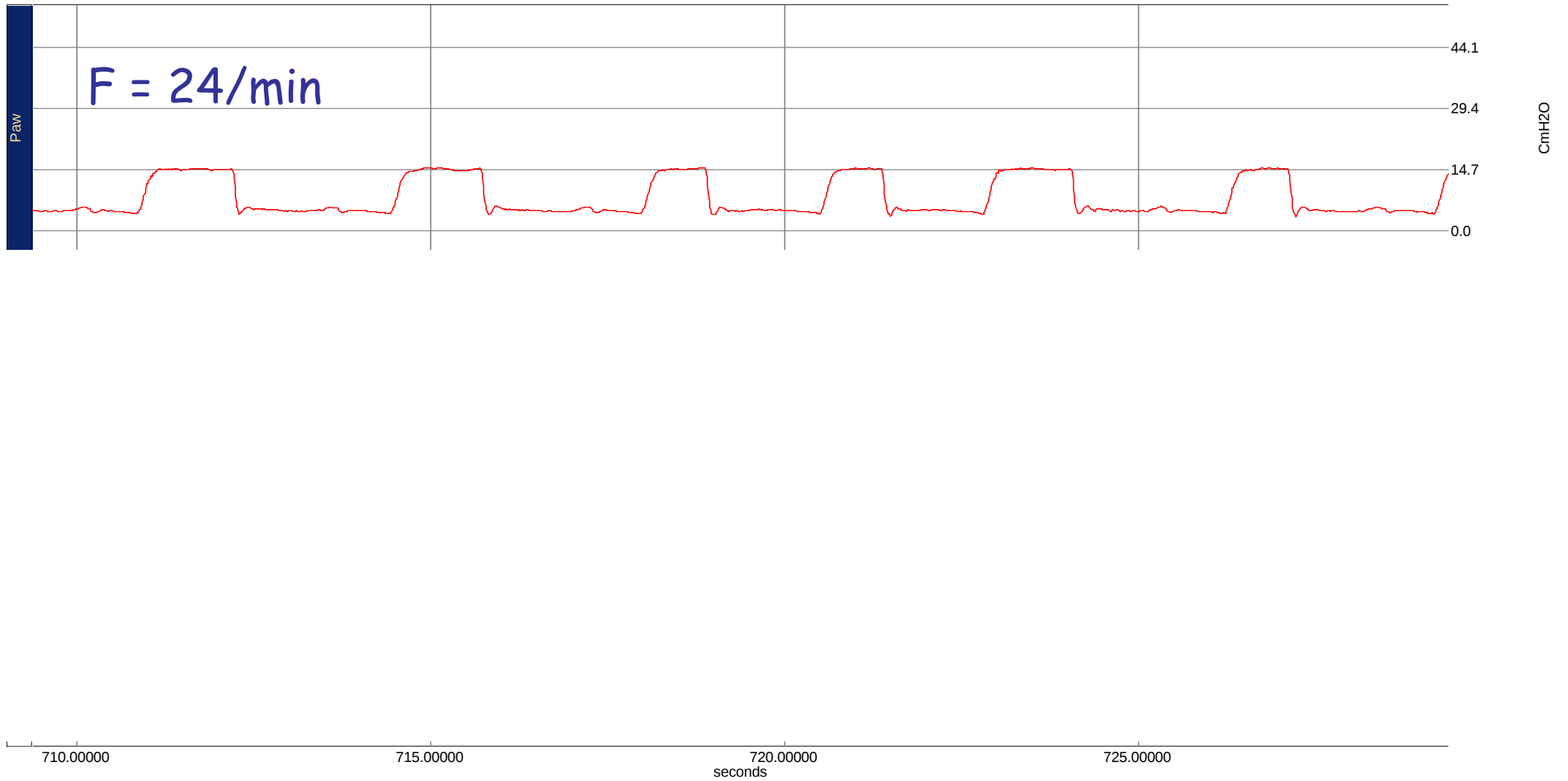
PSV

Sinderby, Clin Chest Med 2008; 29:329-42

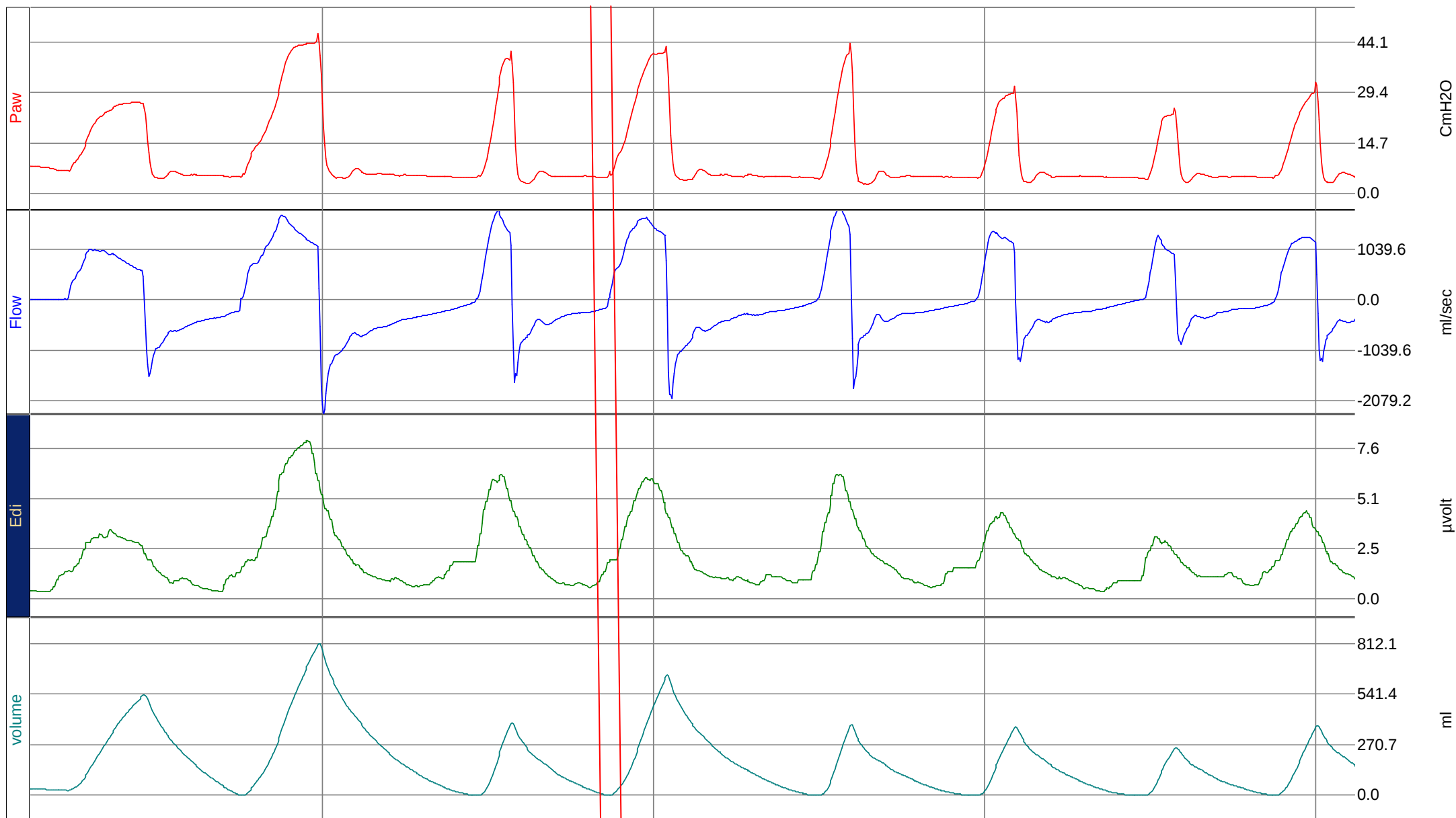


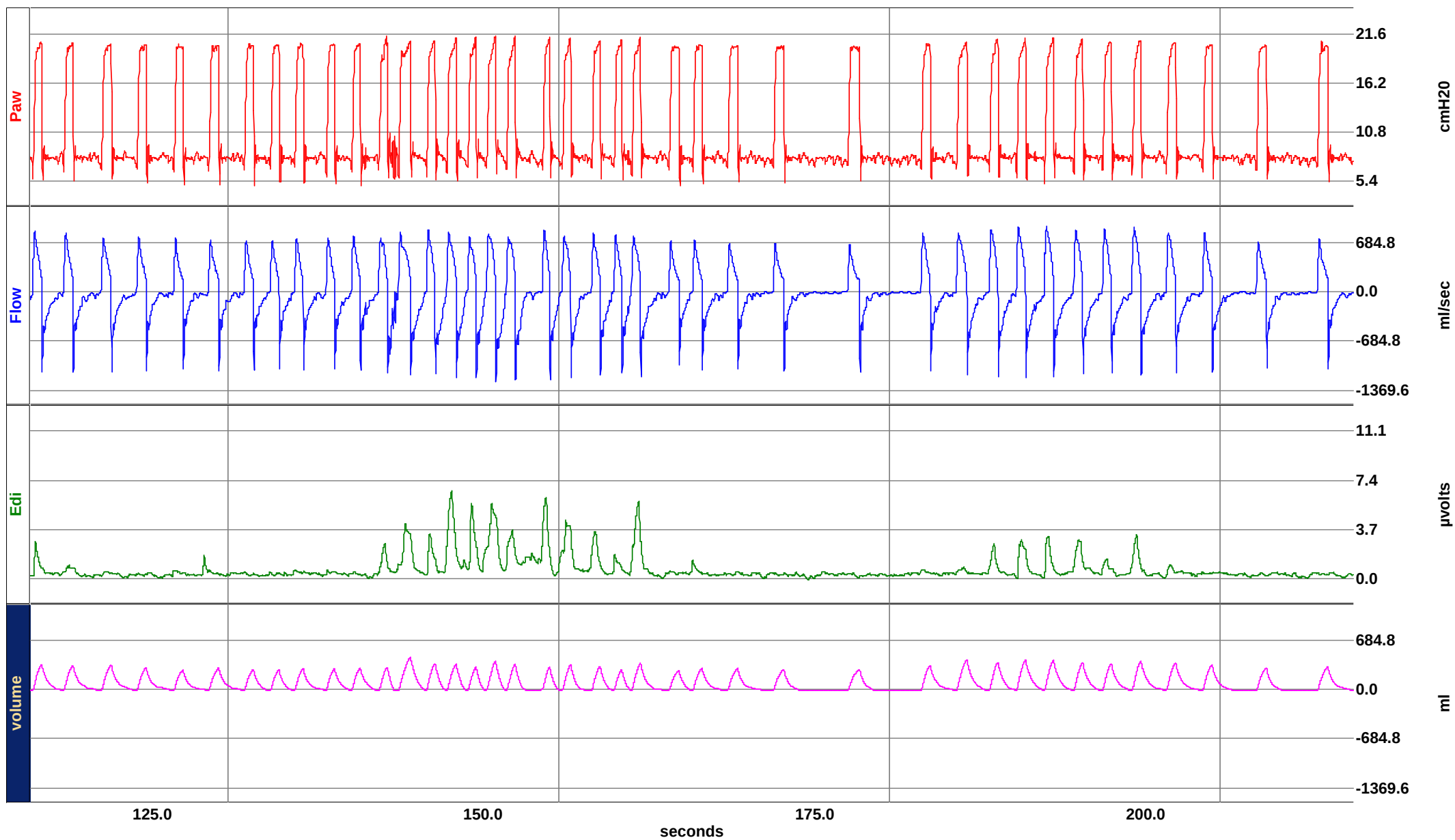
2 Cas cliniques

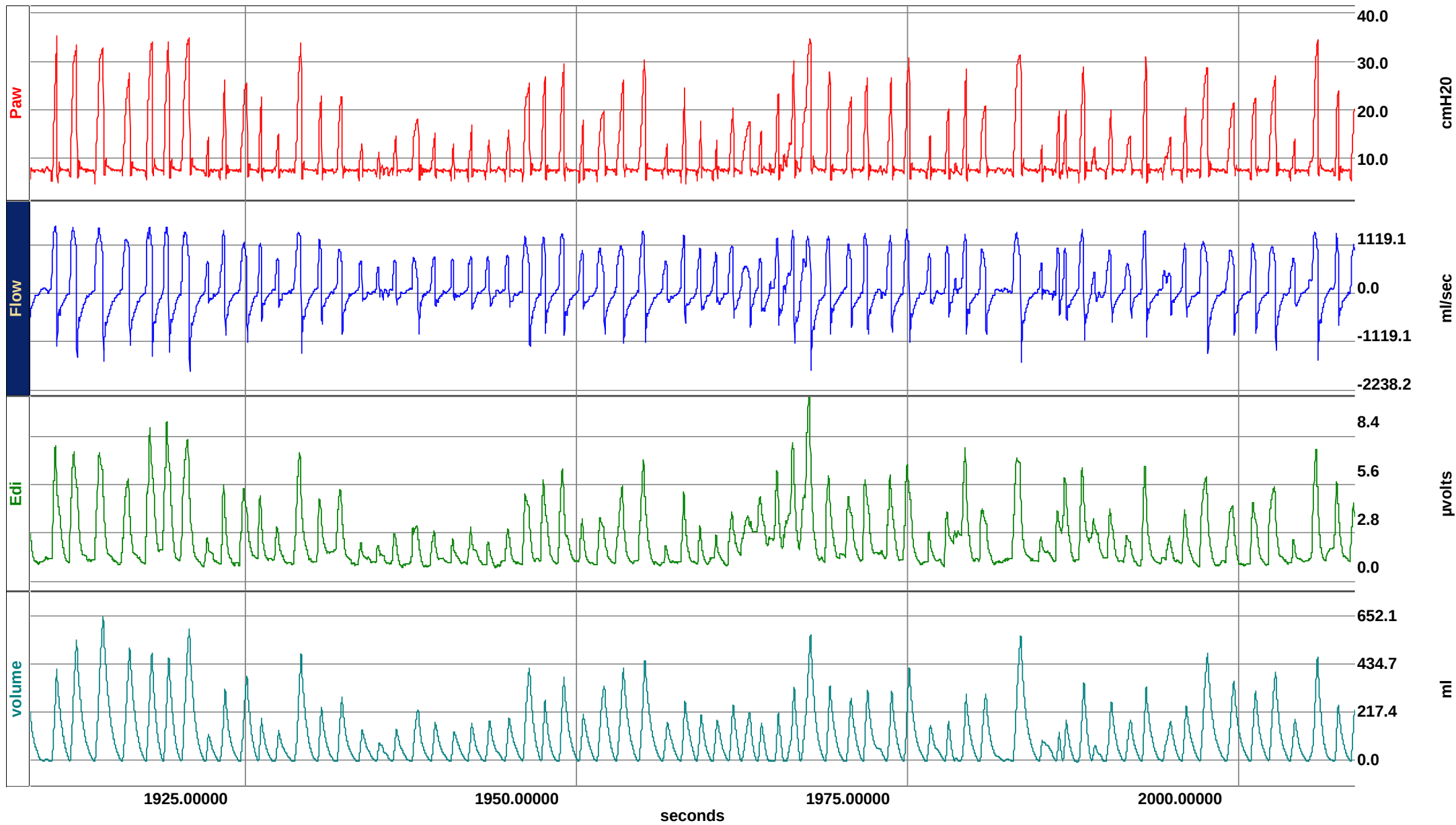
BPCO : VSAI 15 - PEEP 5



BPCO : NAVA 6 cmH2O/ μ volt- PEEP 5







Conclusions

- Excellente synchronisation patient-ventilateur
- Evite les efforts inefficaces.
- Assistance ventilatoire proportionnelle à l'effort
- Bénéfice clinique à démontrer