HÔPITAUX UNIVERSITAIRES HENRI MONDOR
ALBERT CHENEVIER - JOFFRE-DUPUYTREN
EMILE ROUX - GEORGES CLEMENCEAU

CARMAS

UNIVERSITÉ PARIS-EST CRÉTEIL
VAL DE MARNE
UPEC

JAVA 2016

Kinésithérapie respiratoire: comment régler le ventilateur?

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Conflits d’intérêt

- Medtronic
  - Présentation
- Philips Respironics
  - Contrat de recherche

La kinésithérapie respiratoire au cours de la ventilation mécanique

Faut-il en faire??

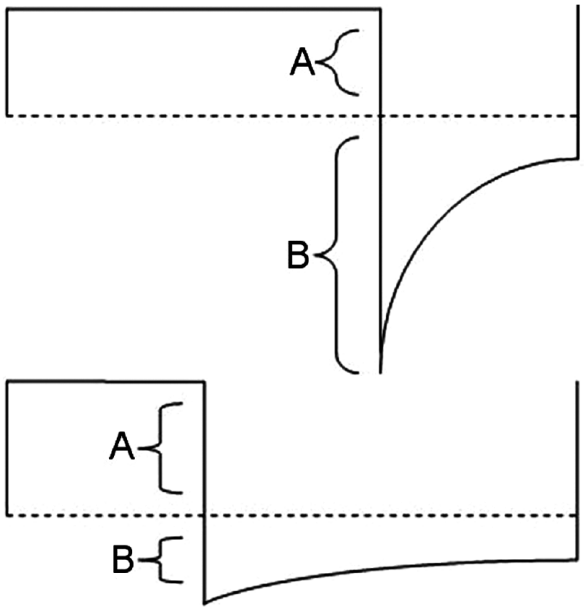
Objectifs:

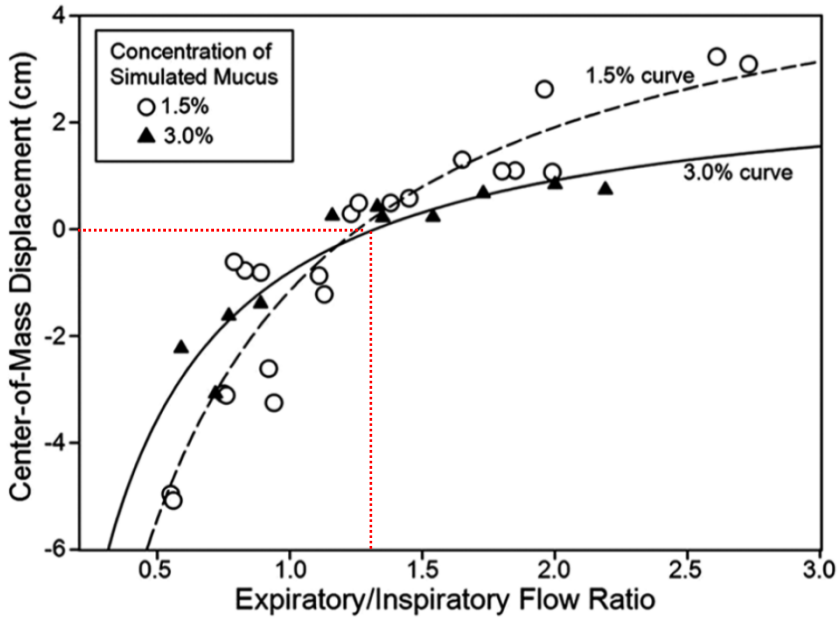
- Clairance des sécrétions bronchiques
- Levée d'atélectasie
- Recrutement alvéolaire
- Amélioration de la compliance
- Amélioration de l'hématose

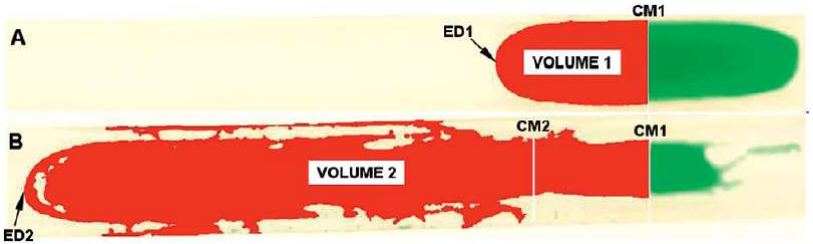
Ventilation Patterns Influence Airway Secretion Movement

Marcia S Volpe, Alexander B Adams MPH RRT FAARC,
Marcelo B P Amato MD, and John J Marini MD

Respir Care 2008;53:1287-1294







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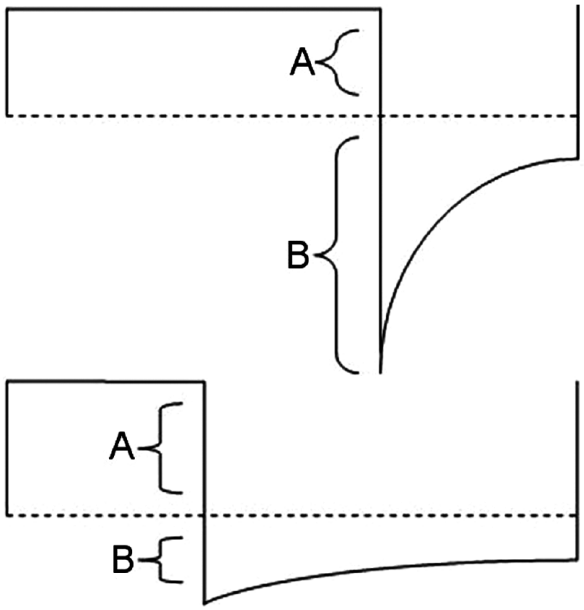
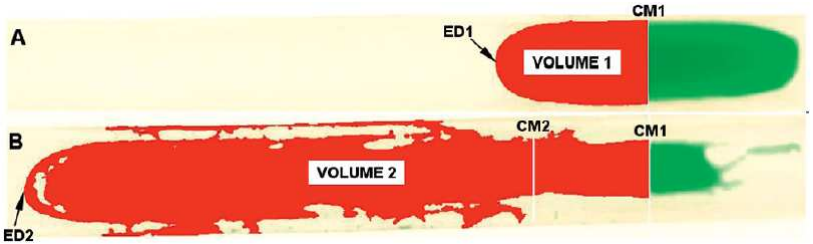
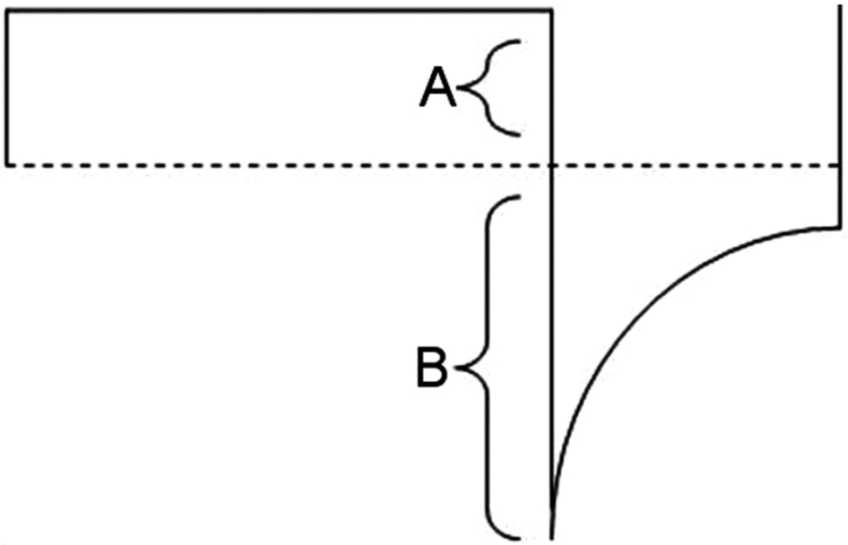


A<B: Favorise l'expulsion du mucus

B<A: Favorise la rétention du mucus





Hyper-inflation manuelle

TOUX

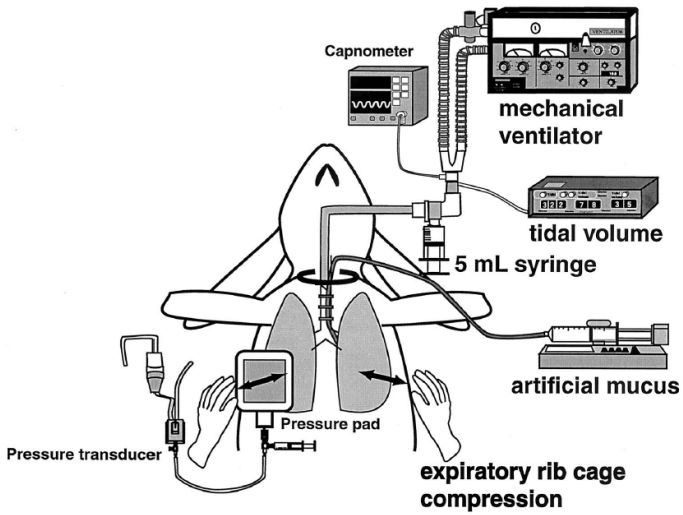
Compression expiratoire de la cage thoracique

Effects of Expiratory Rib Cage Compression and/or Prone Position on Oxygenation and Ventilation in Mechanically Ventilated Rabbits with Induced Atelectasis

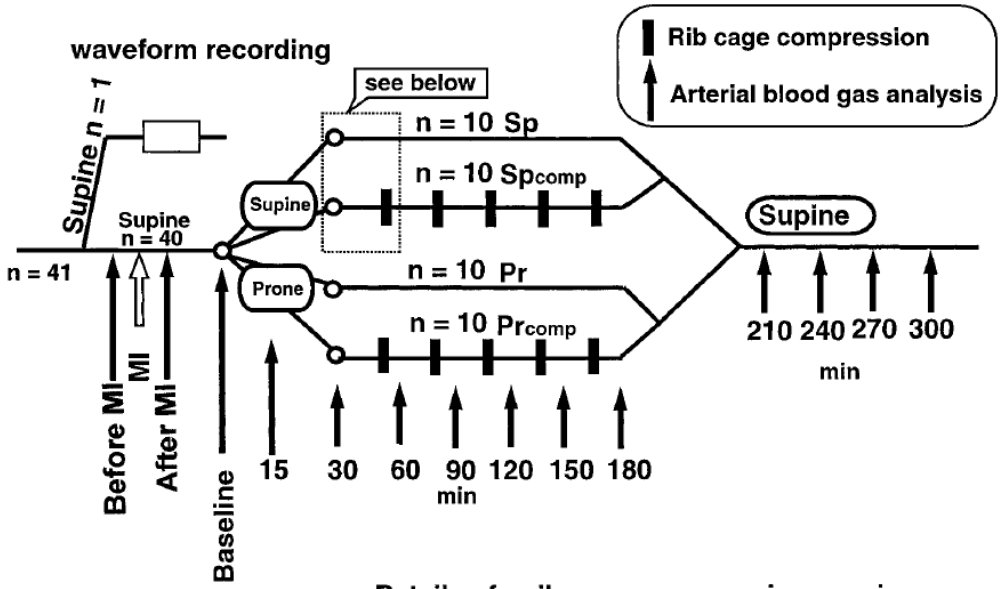
Takeshi Unoki RN MSc, Taro Mizutani MD PhD, and Hidenori Toyooka MD PhD

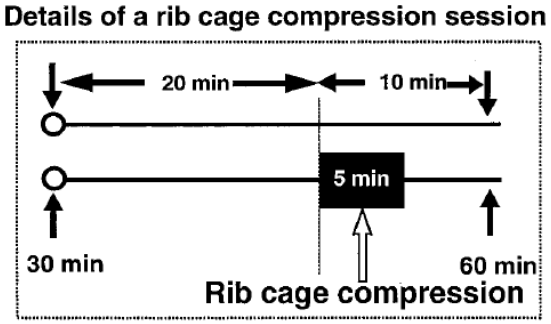
Respir Care 2003;48(8):754–762

Modèle d'atélectasie chez le rat

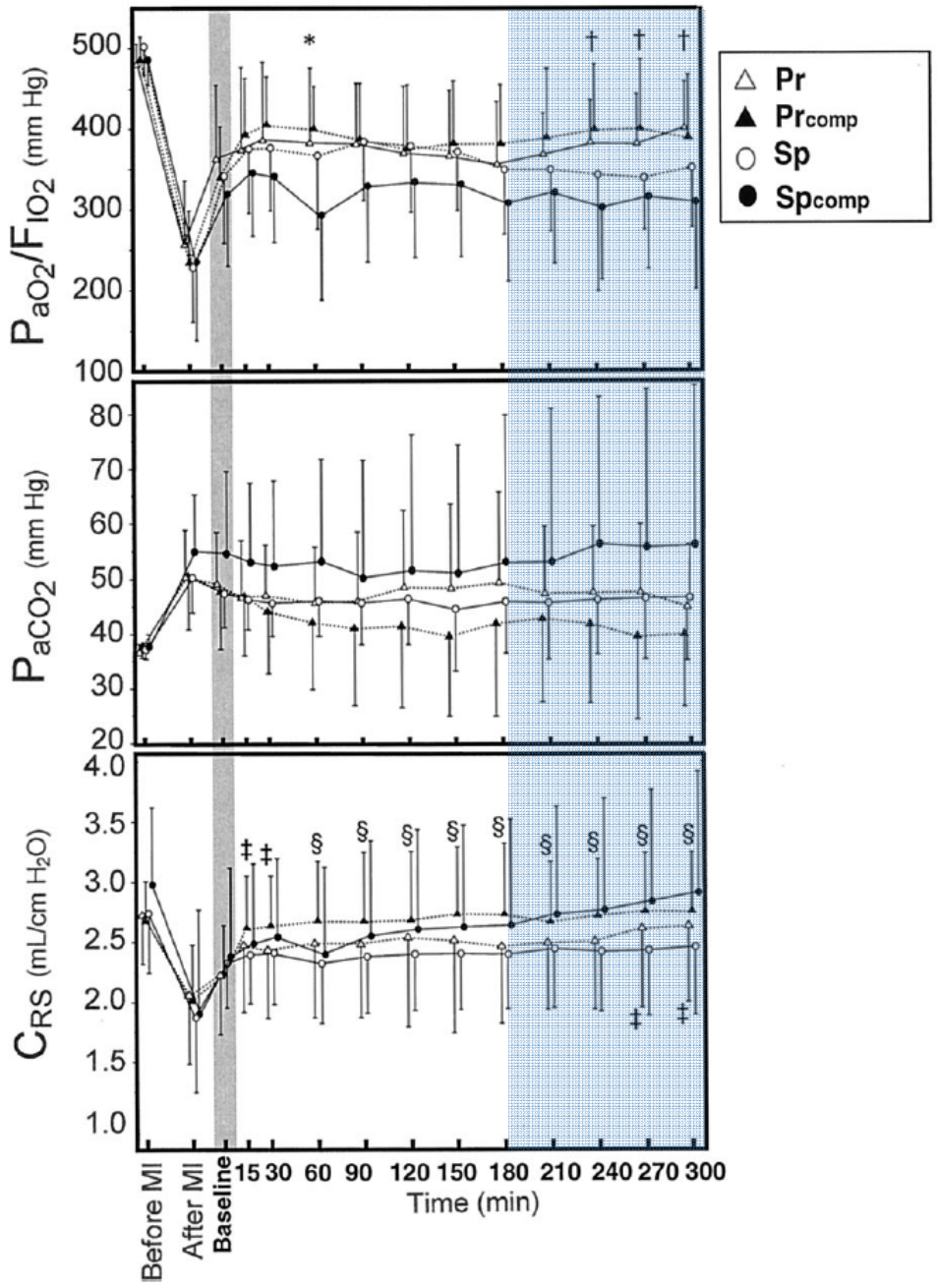


Ventilateur:
PCV
PEEP = 5 cm H_2O





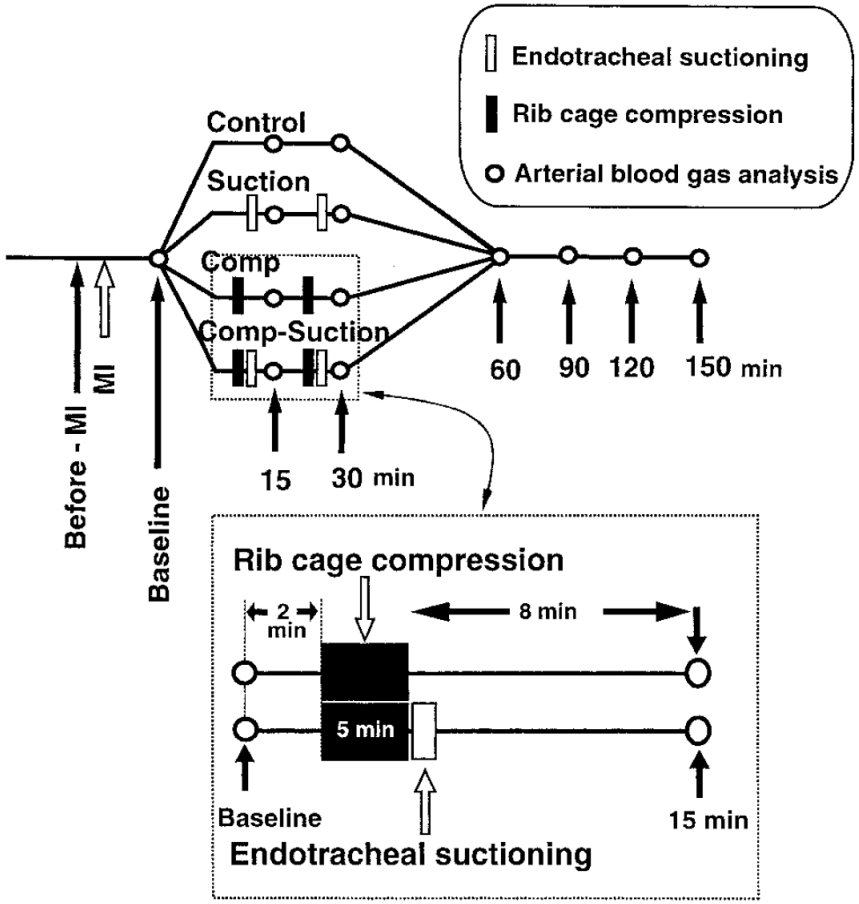
Sp = Supine
Pr = prone


P_{aO_2}/F_{IO_2} (mm Hg)
500
400
300
200
100
*
†
†
†
P_{aCO_2} (mm Hg)
80
70
60
50
40
30
20
C_{RS} (mL/cm H_2O)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
‡ ‡
§ § § § § § § § §
‡ ‡
Before MI
After MI
Baseline
15 30 60 90 120 150 180 210 240 270 300
Time (min)
Pr
Prcomp
Sp
Spcomp

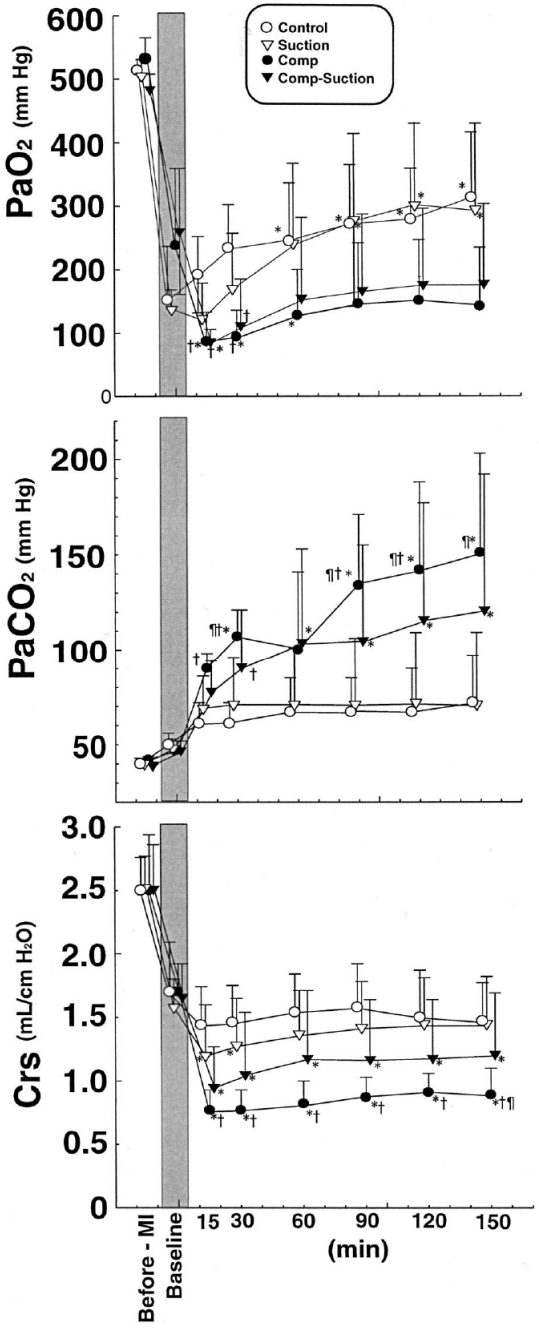
Effects of Expiratory Rib Cage Compression Combined With Endotracheal Suctioning on Gas Exchange in Mechanically Ventilated Rabbits With Induced Atelectasis

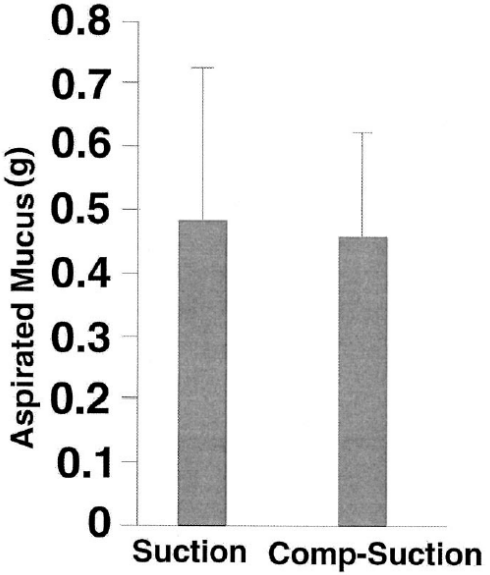
Takeshi Unoki RN MSc, Taro Mizutani MD PhD, and Hidenori Toyooka MD PhD

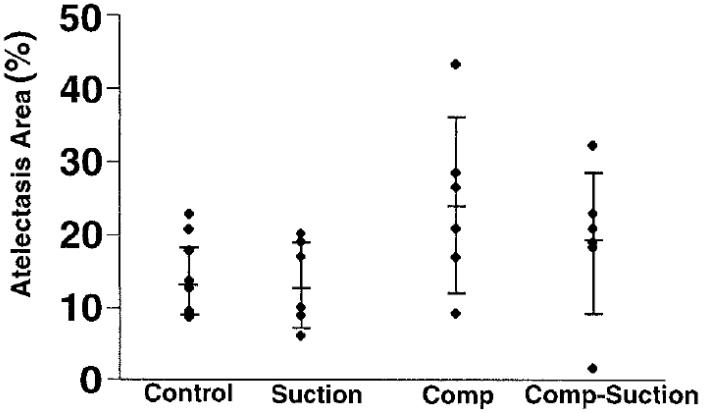
Respir Care 2004;49(8):896–901



Ventilateur:
VAC
ZEEP


Control
Suction
Comp
Comp-Suction
PaO2 (mm Hg)
PaCO2 (mm Hg)
Crs (mL/cm H2O)
Before - MI
Baseline
15 30 60 90 120 150
(min)

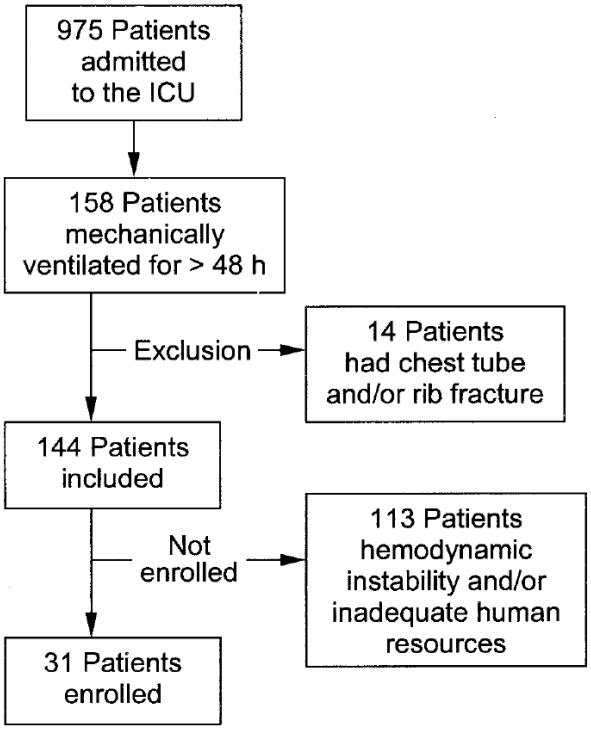

Aspirated Mucus (g)
Suction
Comp-Suction


Atelectasis Area (%)
Control
Suction
Comp
Comp-Suction

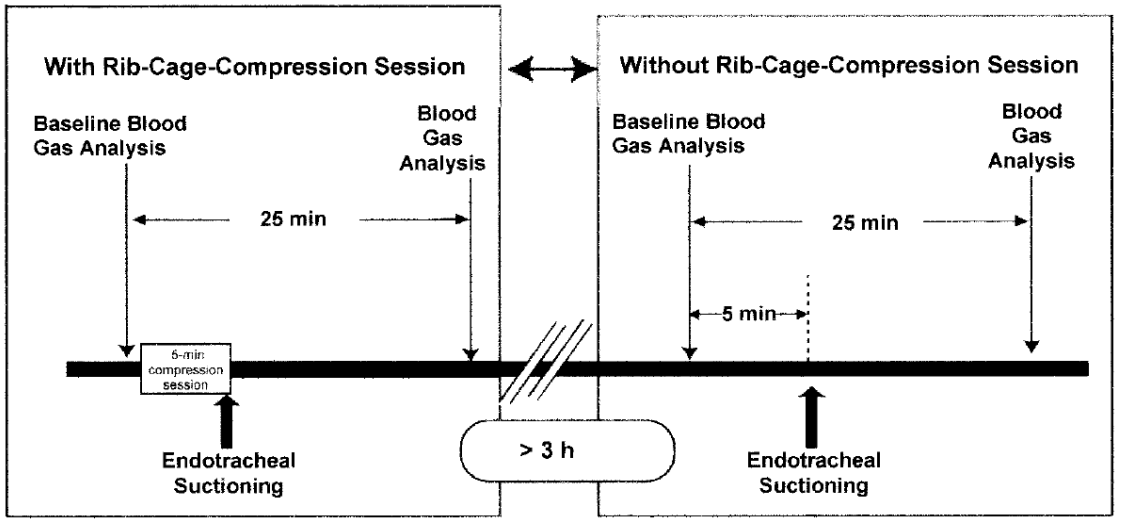
Effects of Expiratory Rib-Cage Compression on Oxygenation, Ventilation, and Airway-Secretion Removal in Patients Receiving Mechanical Ventilation

Takeshi Unoki RN PhD, Yuri Kawasaki RN, Taro Mizutani MD PhD, Yoko Fujino RN, Yaeko Yanagisawa RN, Shinichi Ishimatsu MD PhD, Fumiko Tamura RN MSN, and Hidenori Toyooka MD PhD

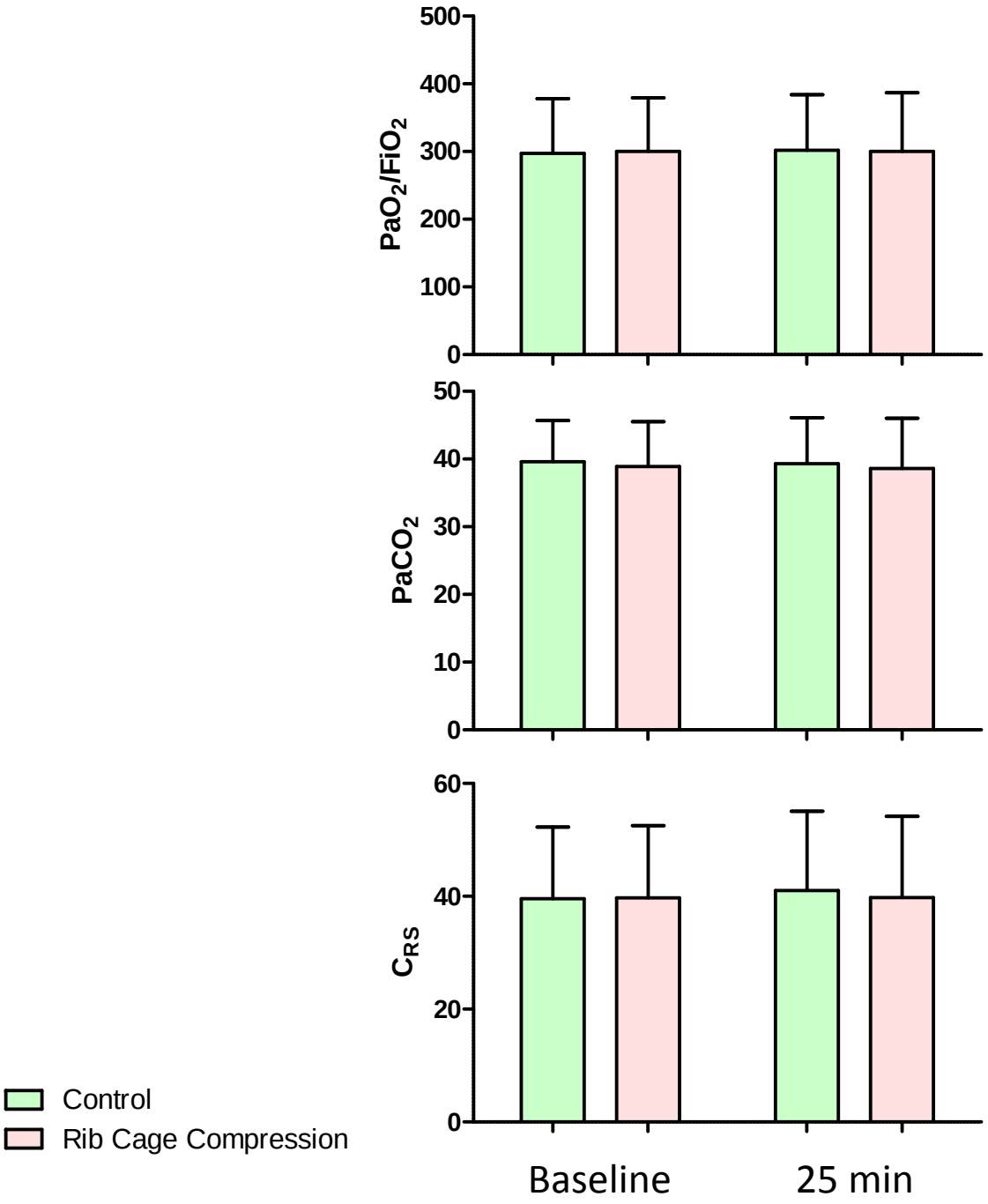
Respir Care 2005;50:1430-1437

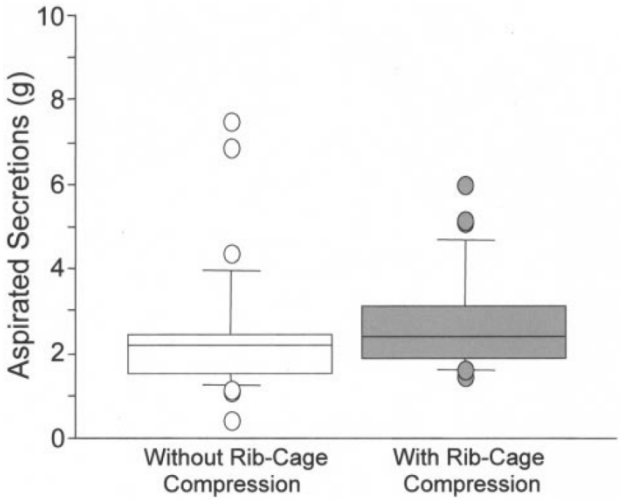


Cross over: Aspirations précédées ou pas de compression expiratoire

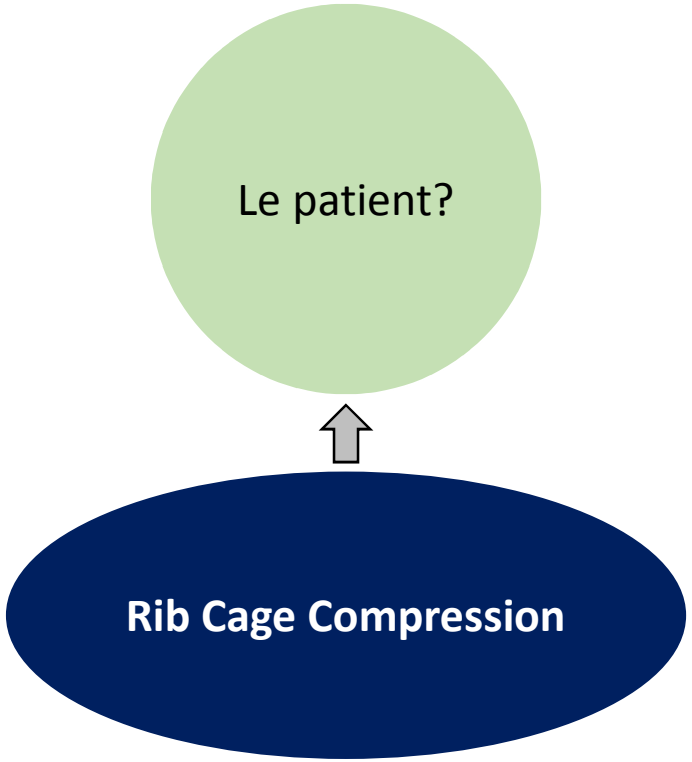


Age (mean ± SD y)	56.7 ± 17.6
Gender (number and % male)	24 (87)
Simplified Acute Physiology Score (mean ± SD)	59.4 ± 10.7
Duration of mechanical ventilation from intubation to the study enrollment (median and range d)	5 (2–27)
Duration of mechanical ventilation from the study enrollment to completion of weaning (median and range d)	11 (5–41)
Tracheostomy (number and %)	4 (13)
Diagnosis at intensive-care unit admission (number and %)	
Intracerebral hemorrhage	6 (19.4)
Cardiac arrest	6 (19.4)
Pneumonia	4 (12.9)
Cerebral infarction	4 (12.9)
Aneurysmal subarachnoid hemorrhage	3 (9.7)
Sepsis	3 (9.7)
Head injury	2 (6.5)
Others	3 (9.7)
Chest radiograph findings (number and %)	
Atelectasis	13 (42)
Infiltration	13 (42)
Other	5 (16)
Mechanical ventilation mode (number and %)	
Assist-control ventilation	1 (3)
Synchronized intermittent mandatory ventilation	28 (90)
Pressure-support ventilation	2 (6)
Pressure-control ventilation (number and %)	4 (13)
Fraction of inspired oxygen (median and range)	0.3 (0.21–0.7)
Positive end-expiratory pressure (median and range cm H_2O)	5 (0–15)


500
400
300
200
100
0
PaO_2/FiO_2
50
40
30
20
10
0
$PaCO_2$
60
40
20
0
C_{RS}
Baseline
25 min
Control
Rib Cage Compression


10
8
6
4
2
0
Aspirated Secretions (g)
Without Rib-Cage Compression
With Rib-Cage Compression

Rib Cage Compression: les intervenants d’une efficacité éventuelle?



Expiratory Rib Cage Compression in Mechanically Ventilated Subjects: A Randomized Crossover Trial

Fernando S Guimarães PT PhD, Agnaldo J Lopes MD PhD, Sandra S Constantino PT, Juan C Lima PT, Paulo Canuto PT, and Sara Lucia Silveira de Menezes PT PhD

Respir Care 2014;59(5):678–685

20 patients avec infection pulmonaire,
« hypersécrétants »

Critères d'inclusion:

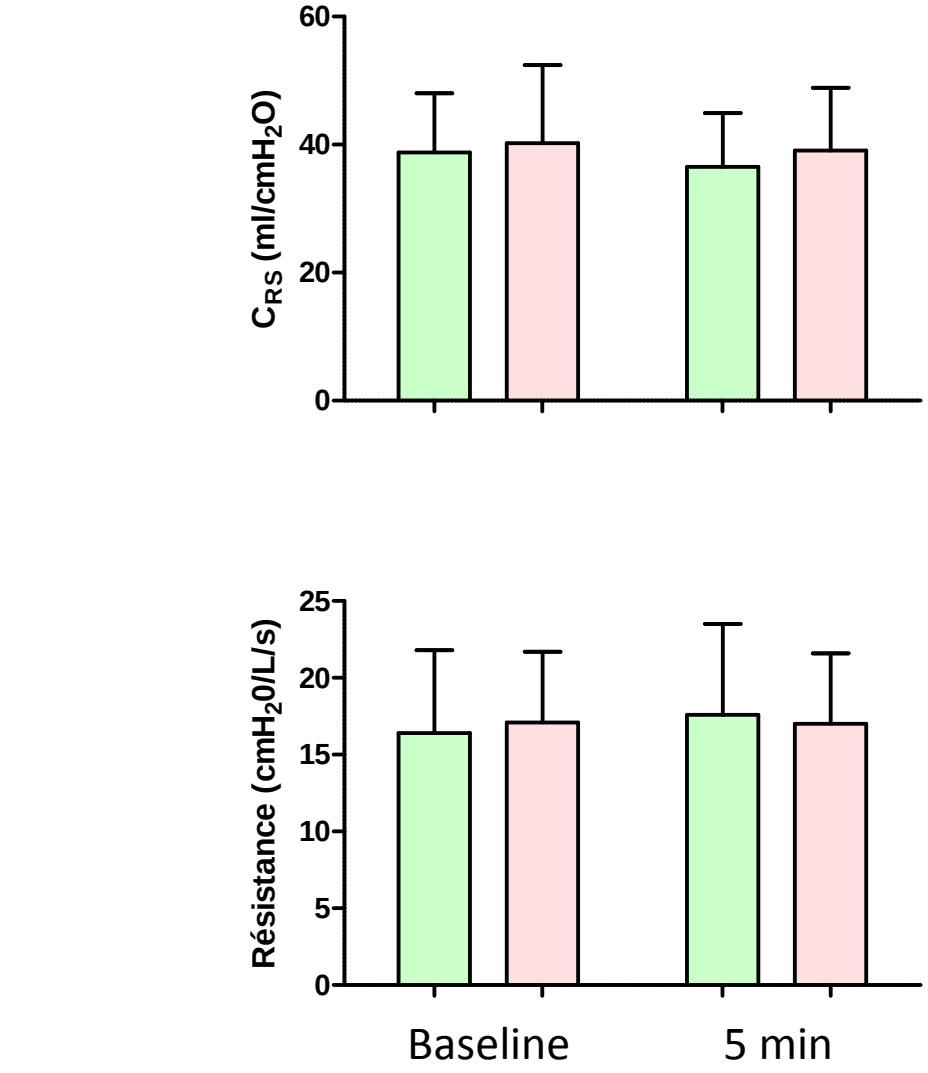
- Ventilation mécanique
- « hypersécrétion »: Aspirations/ intervalle < 2h
- Infection: CPIS ≥ 6

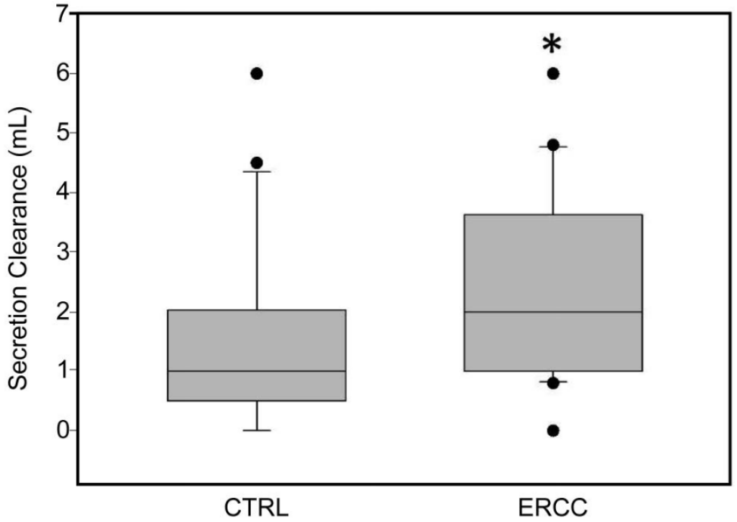
Critères d'exclusion:

- FC > 130/min, PAM < 60 mmHg, vasopresseur
- Pas de drive respiratoire
- Bronchospasme
- SDRA
- Post op de Neurochirurgie
- Pneumothorax
- Hémoptysie

Ventilateur
VAC
Vt 8 ml/kg
PEEP 5 cm H_2O

Cross over: Contrôle / Compression expiratoire


60
40
20
0
C_{RS} (ml/cmH_2O)
25
20
15
10
5
0
Résistance (cm$H_2$0/L/s)
Baseline
5 min
Control
Rib Cage Compression


7
6
5
4
3
2
1
0
Secretion Clearance (mL)
*
CTRL
ERCC

Intensive Care Med (2016) 42:295–296
DOI 10.1007/s00134-015-4117-2

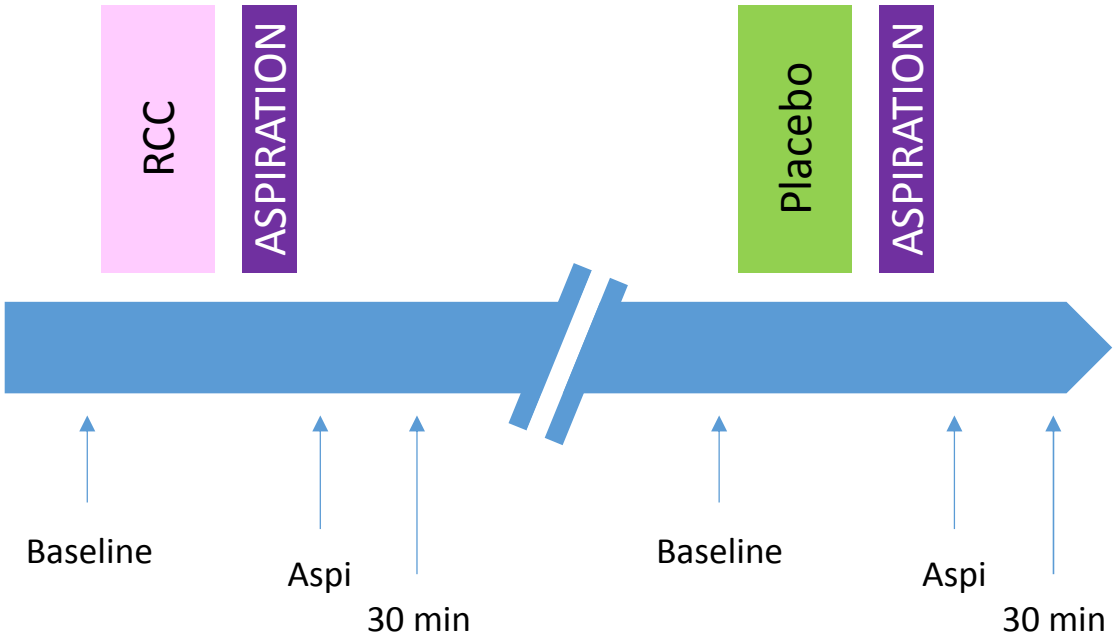
LETTER

Elaine Cristina Gonçalves
Hugo C. D. Souza
Joana Tambascio
Marcelo Barros Almeida
Anibal Basile Filho
Ada Clarice Gastaldi

Effects of chest compression on secretion removal, lung mechanics, and gas exchange in mechanically ventilated patients: a crossover, randomized study

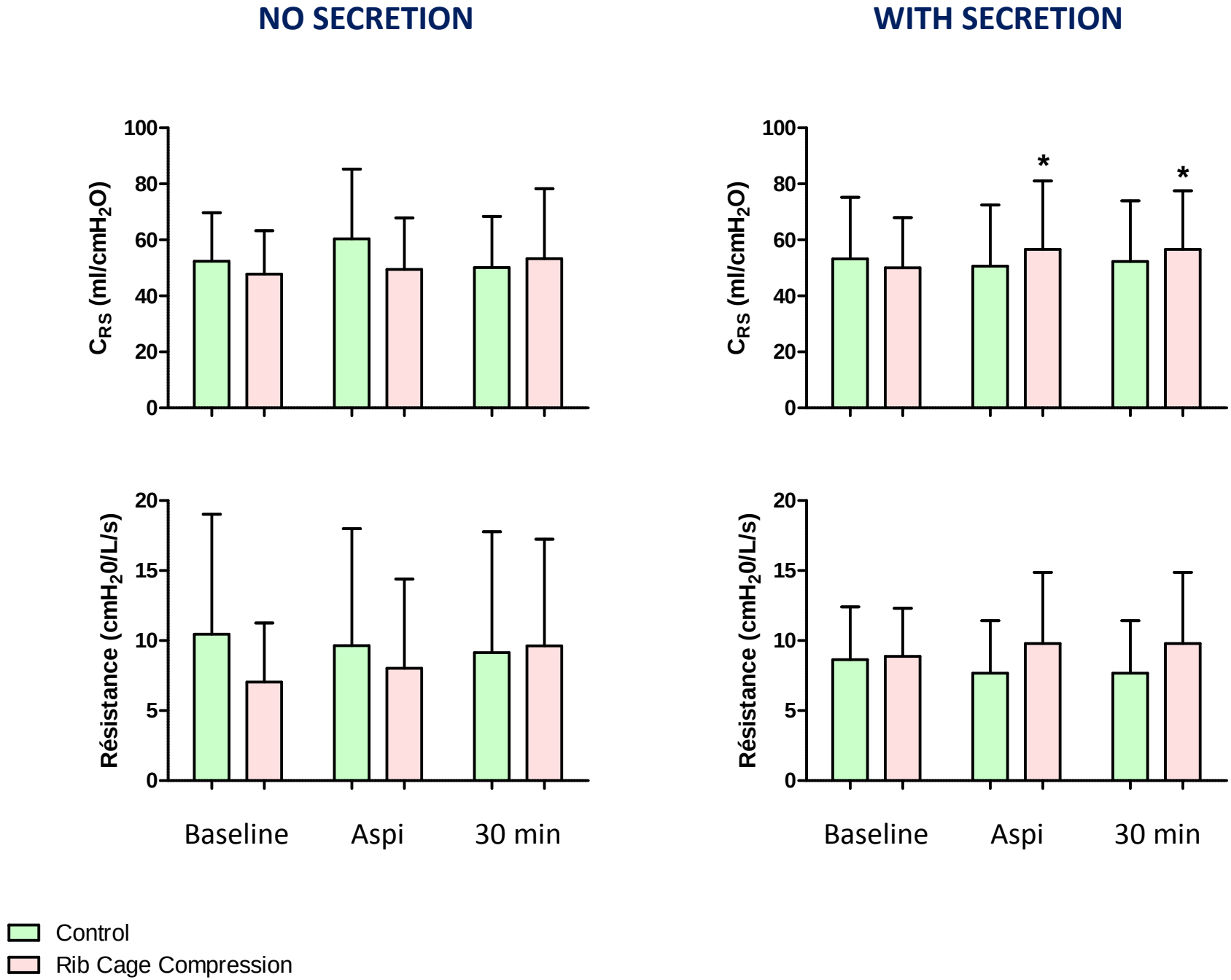
30 Patients

Cross over

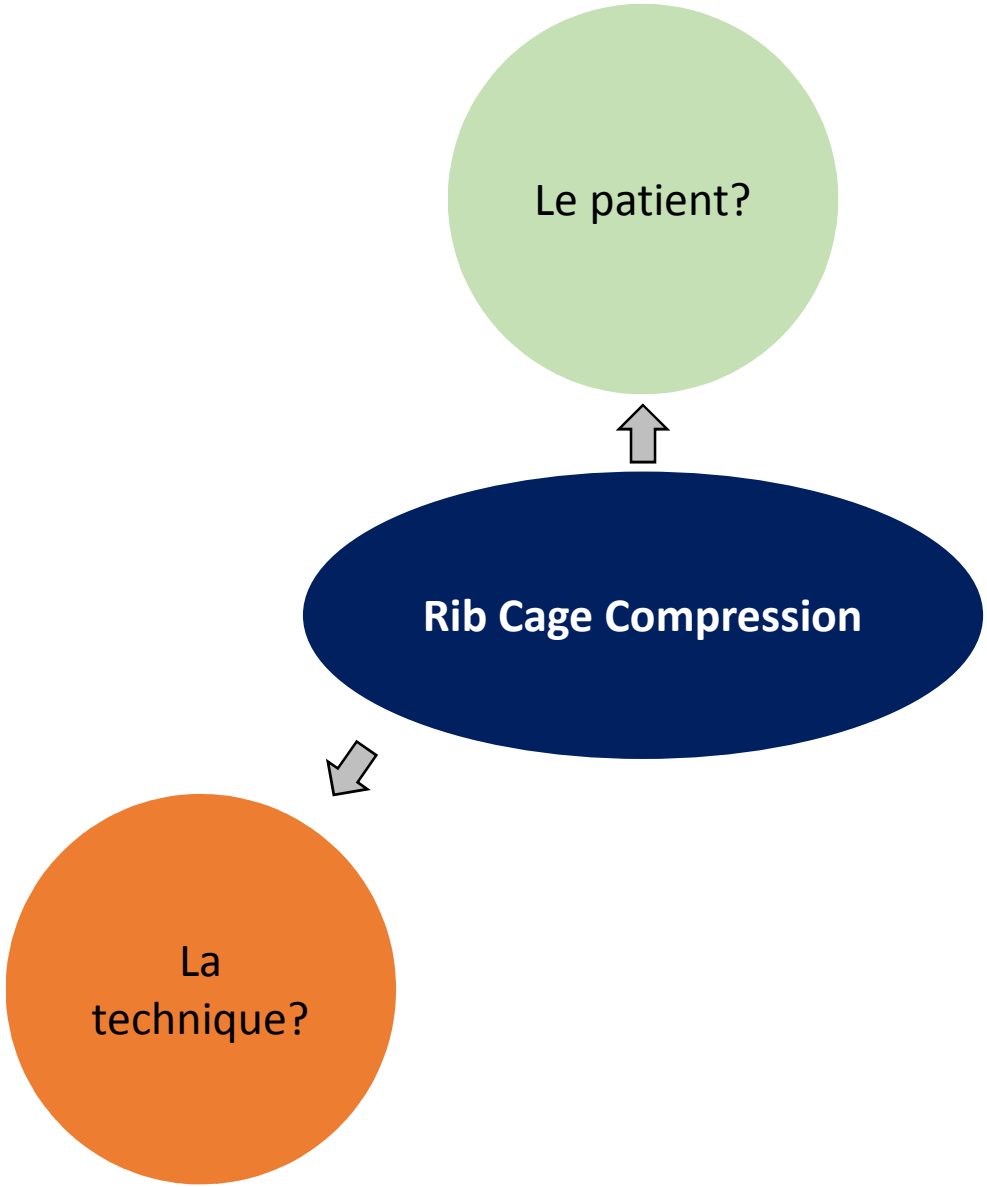


Ventilateur
VAC
PEEP 10 cm H_2O

2 groupes: No Secretion (≤2g) et With Secretion (>2g)


NO SECRETION
WITH SECRETION
C_{RS} (ml/cmH_2O)
Résistance (cm$H_2$0/L/s)
100
80
60
40
20
0
20
15
10
5
0
*
*
Baseline
Aspi
30 min
Control
Rib Cage Compression

Rib Cage Compression: les intervenants d'une efficacité éventuelle?



Effects of Manual Rib Cage Compressions on Expiratory Flow and Mucus Clearance During Mechanical Ventilation*

Joan Daniel Martí, RPT[1]; Gianluigi Li Bassi, MD[1,2,3]; Montserrat Rigol, DVM, PhD[1,2,4]; Lina Saucedo, MD[1]; Otavio Tavares Ranzani, MD[1,5]; Mariano Esperatti, MD[1]; Nestor Luque, MD[1]; Miquel Ferrer, MD, PhD[1,2,3]; Jordi Vilaro, RPT, PhD[6]; Theodor Kolobow, MD[7]; Antoni Torres, MD, PhD[1,2,4,8]

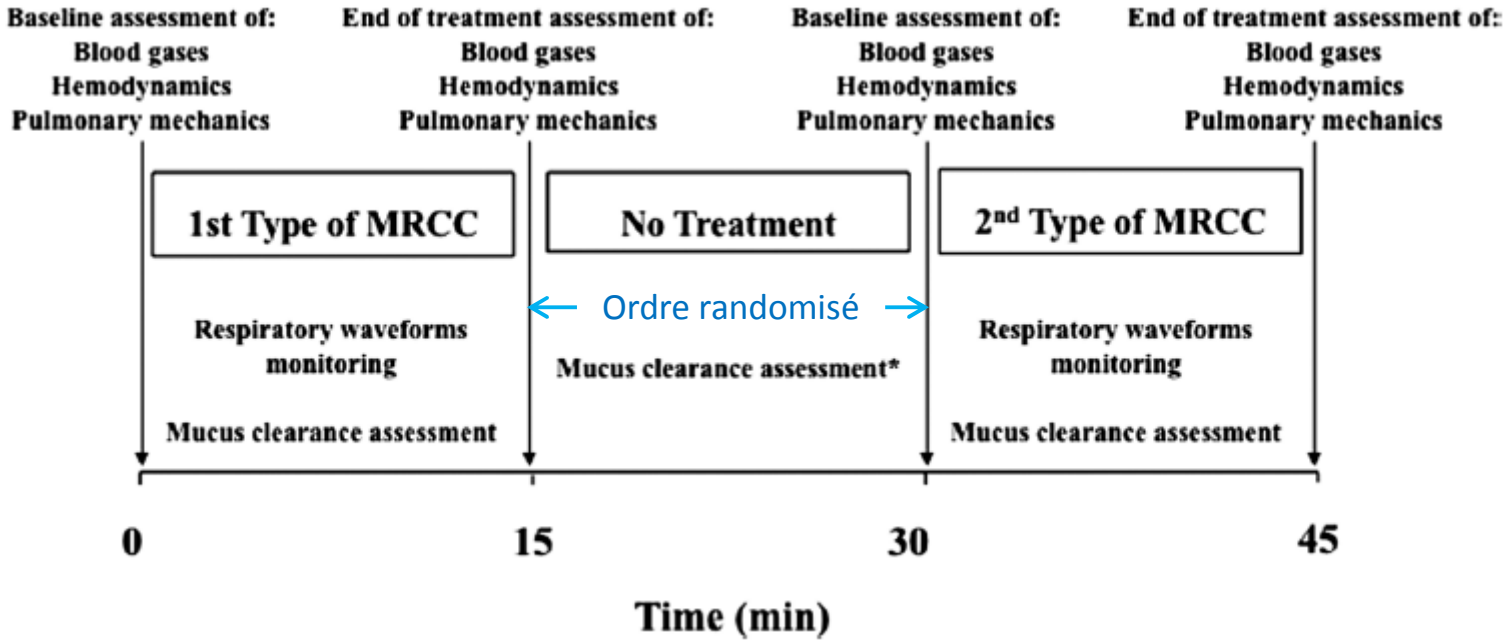
Crit Care Med 2013; 41:850–856

9 porcs ventilés

Suivi des mouvements intratrachéaux de mucus par fluoroscopie

SOFT vs HARD MRCC

Ventilateur
VAC
Vt 10 ml/kg
PEEP 5 cm H_2O



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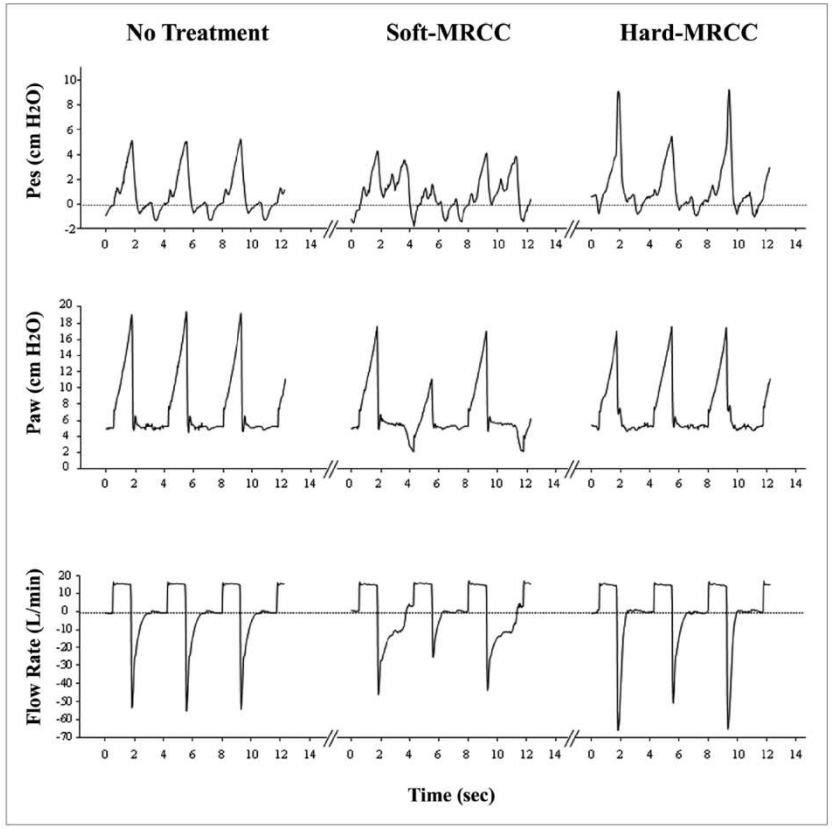
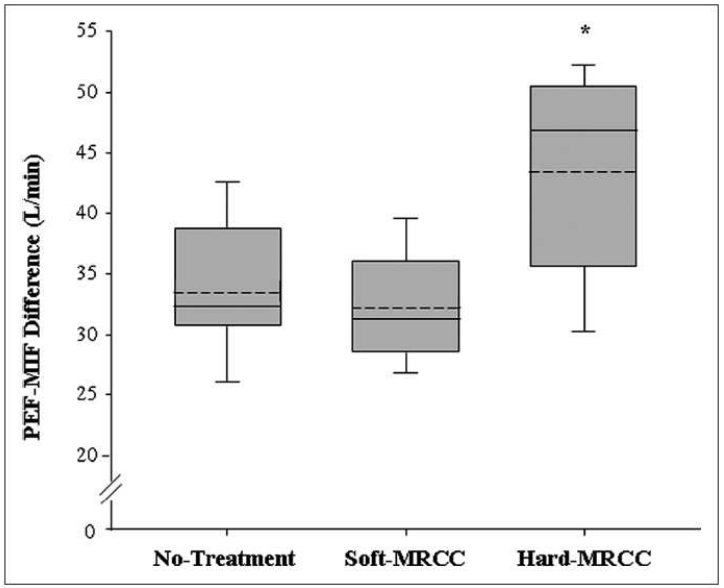
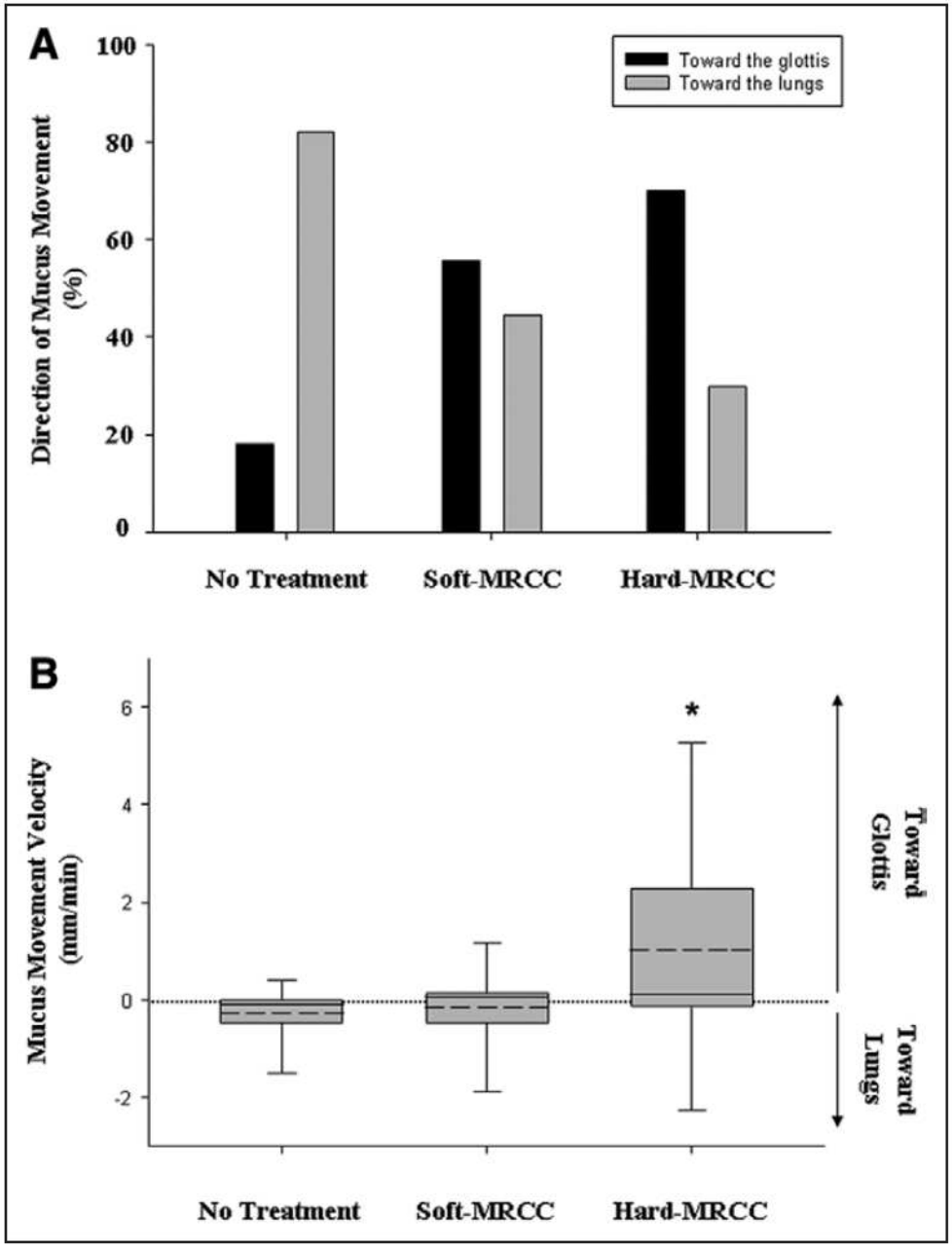
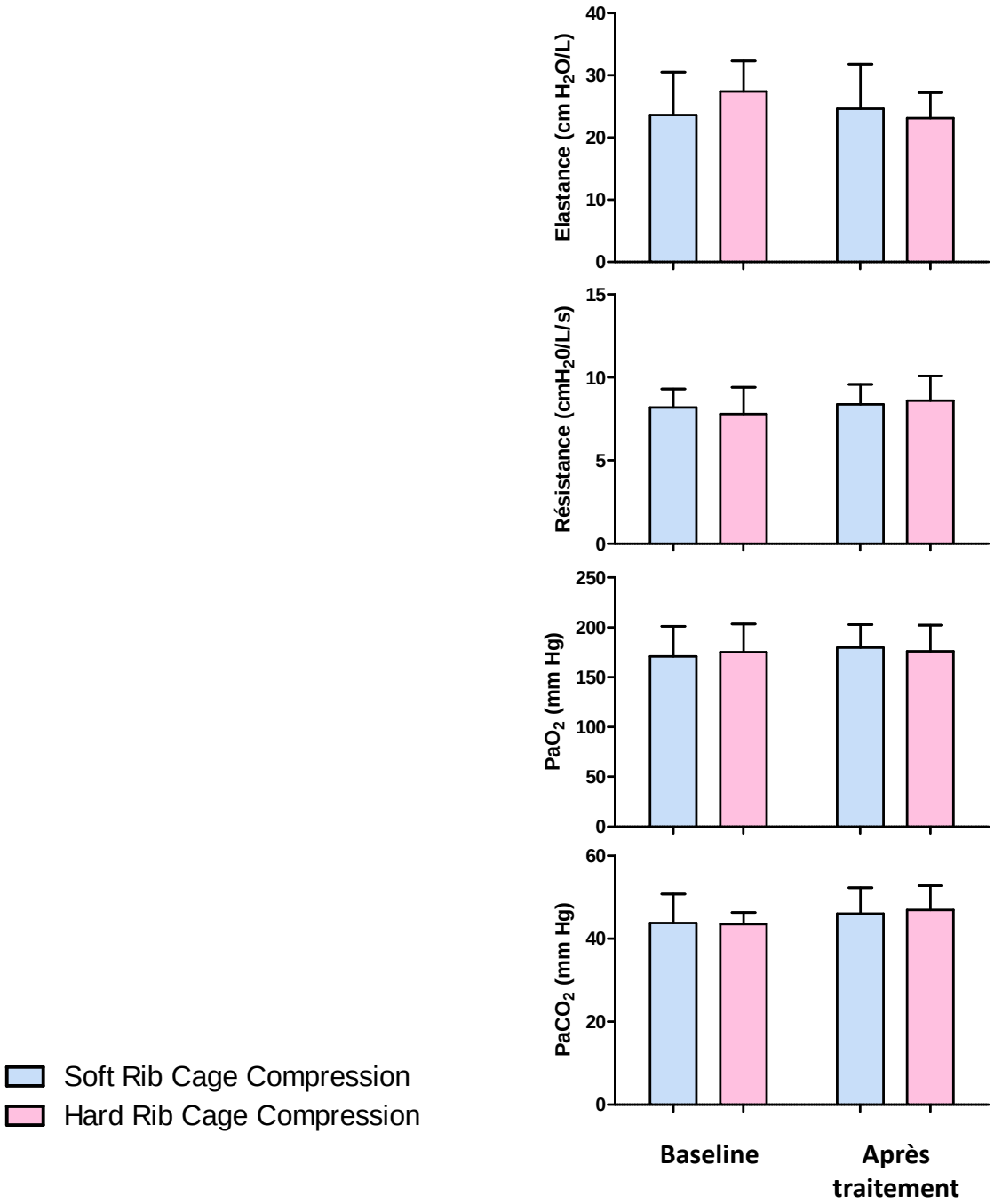
Crit Care Med 2013; 41:850–856

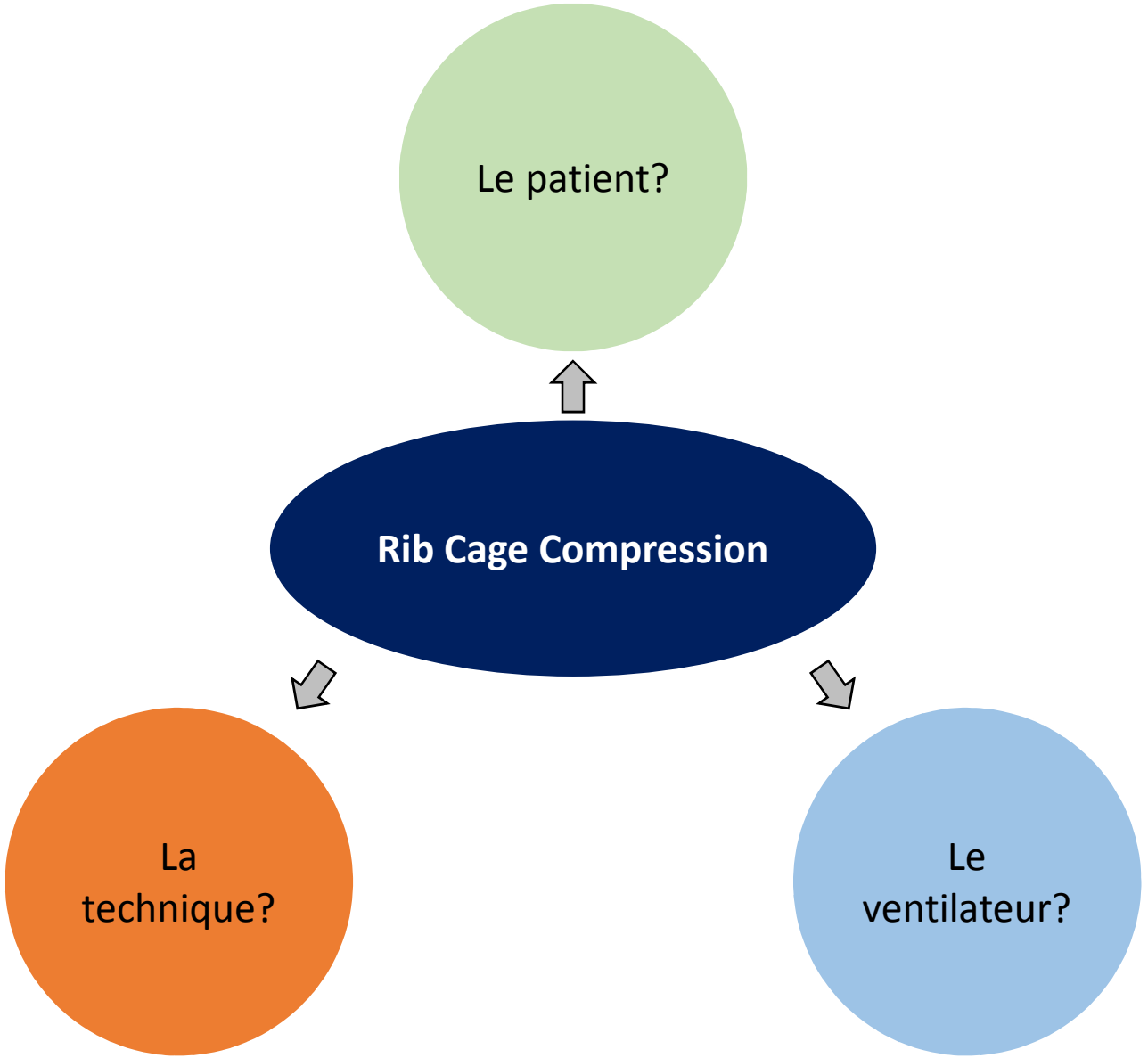





A
100
80
60
40
20
0
Direction of Mucus Movement (%)
Toward the glottis
Toward the lungs
No Treatment
Soft-MRCC
Hard-MRCC
B
6
4
2
0
-2
*
Mucus Movement Velocity (mm/min)
Toward Glottis
Toward Lungs
No Treatment
Soft-MRCC
Hard-MRCC


Soft Rib Cage Compression
Hard Rib Cage Compression
Elastance (cm H_2O/L)
40
30
20
10
0
Résistance (cm$H_2$0/L/s)
15
10
5
0
PaO_2 (mm Hg)
250
200
150
100
50
0
$PaCO_2$ (mm Hg)
60
40
20
0
Baseline
Après traitement

Rib Cage Compression: les intervenants d'une efficacité éventuelle?



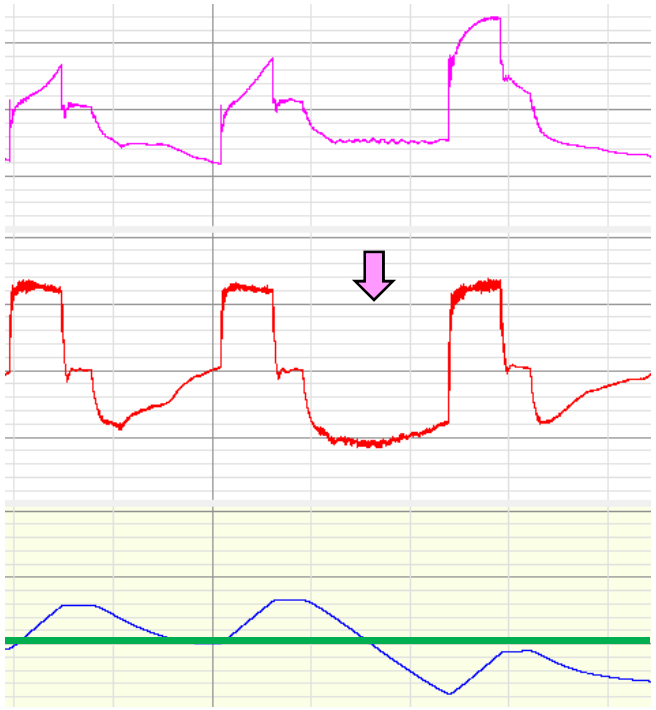
VAC

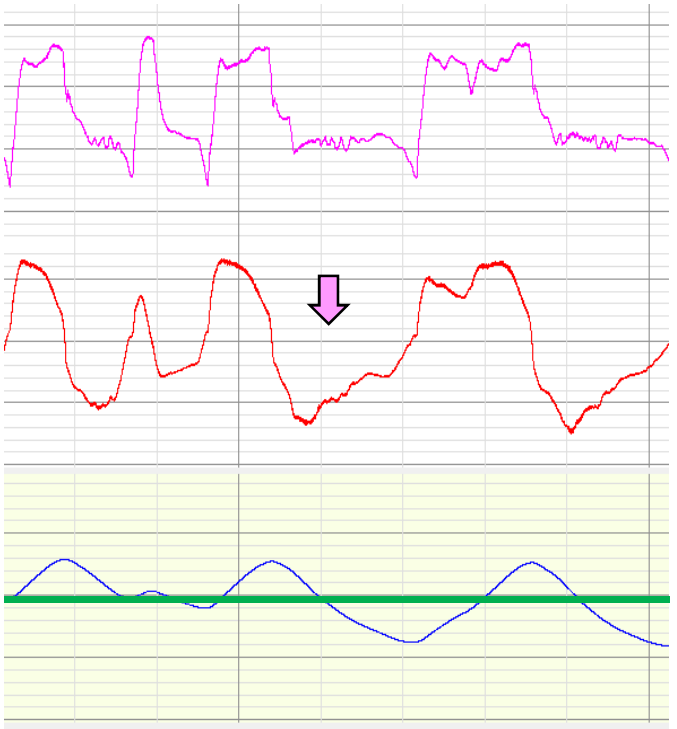
VSAI

Paw

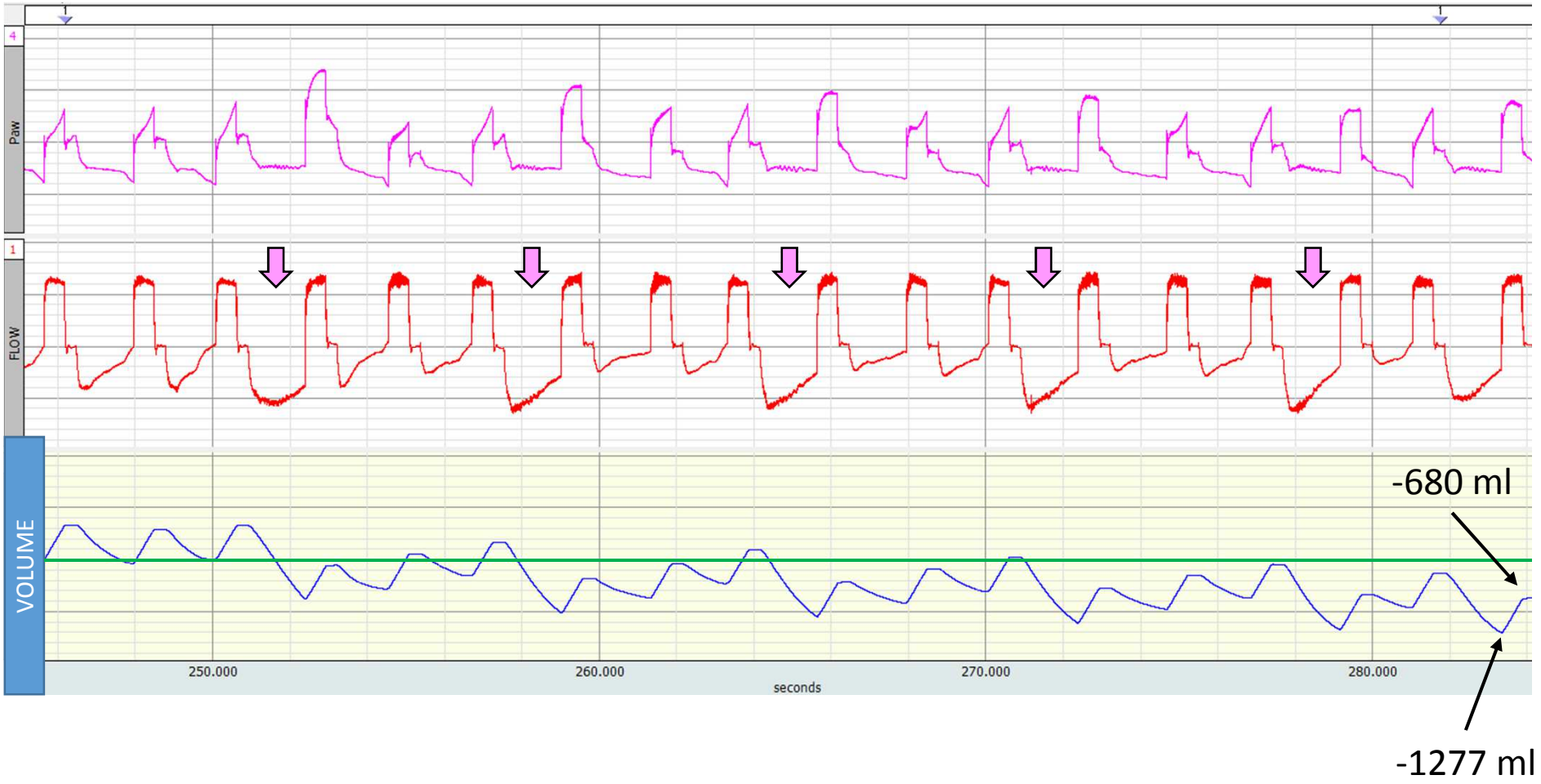
Débit

Volume

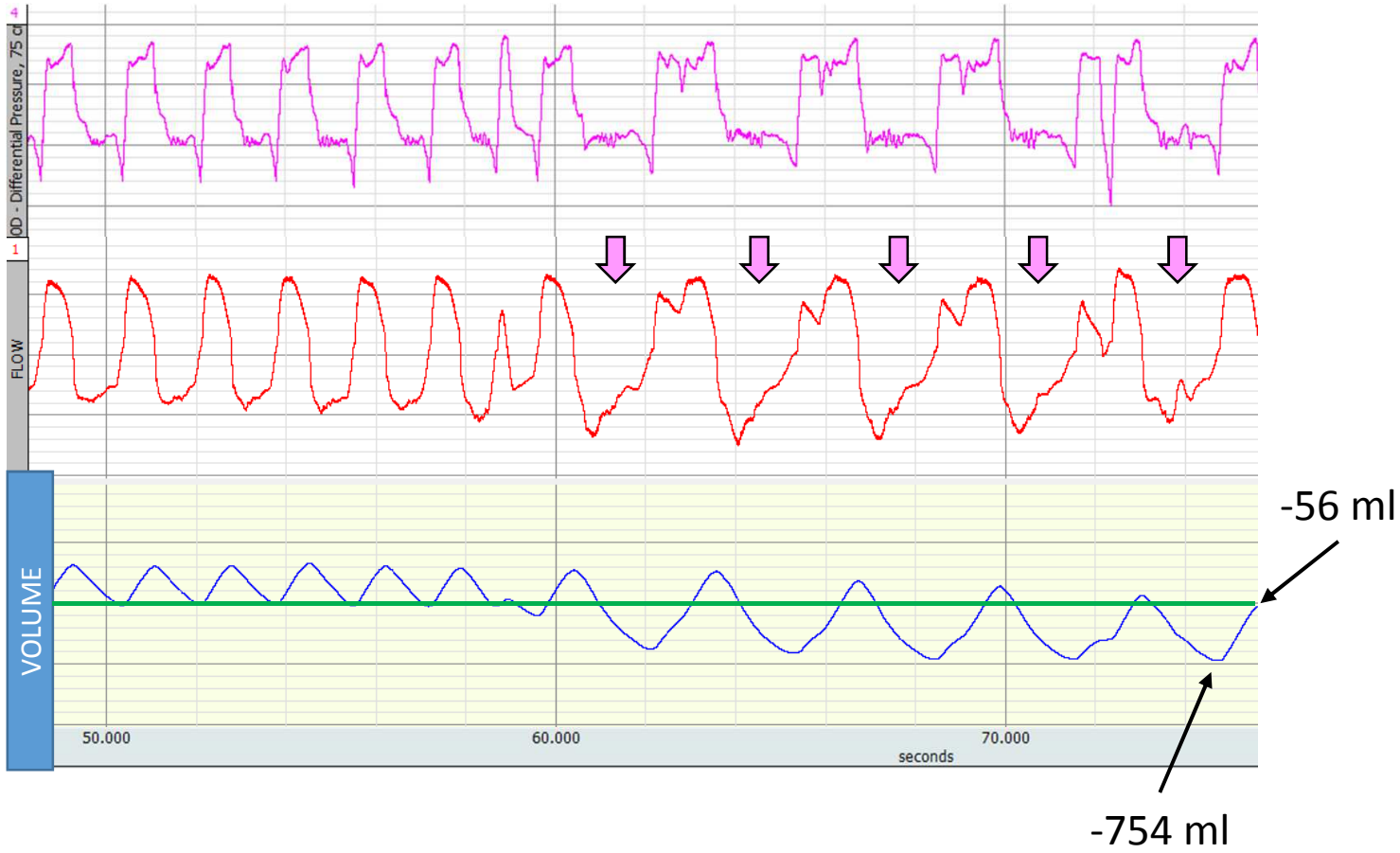




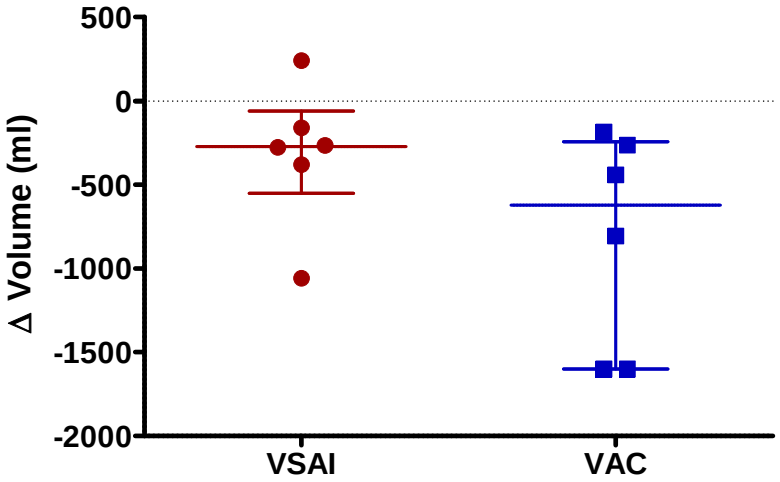
VAC

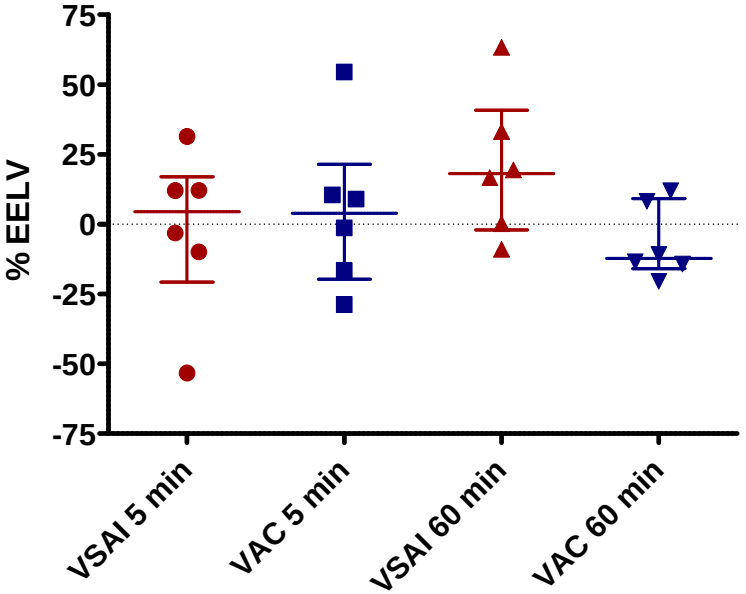

Paw
FLOW
VOLUME
-680 ml
-1277 ml
250.000
260.000
270.000
280.000
seconds

VSAI

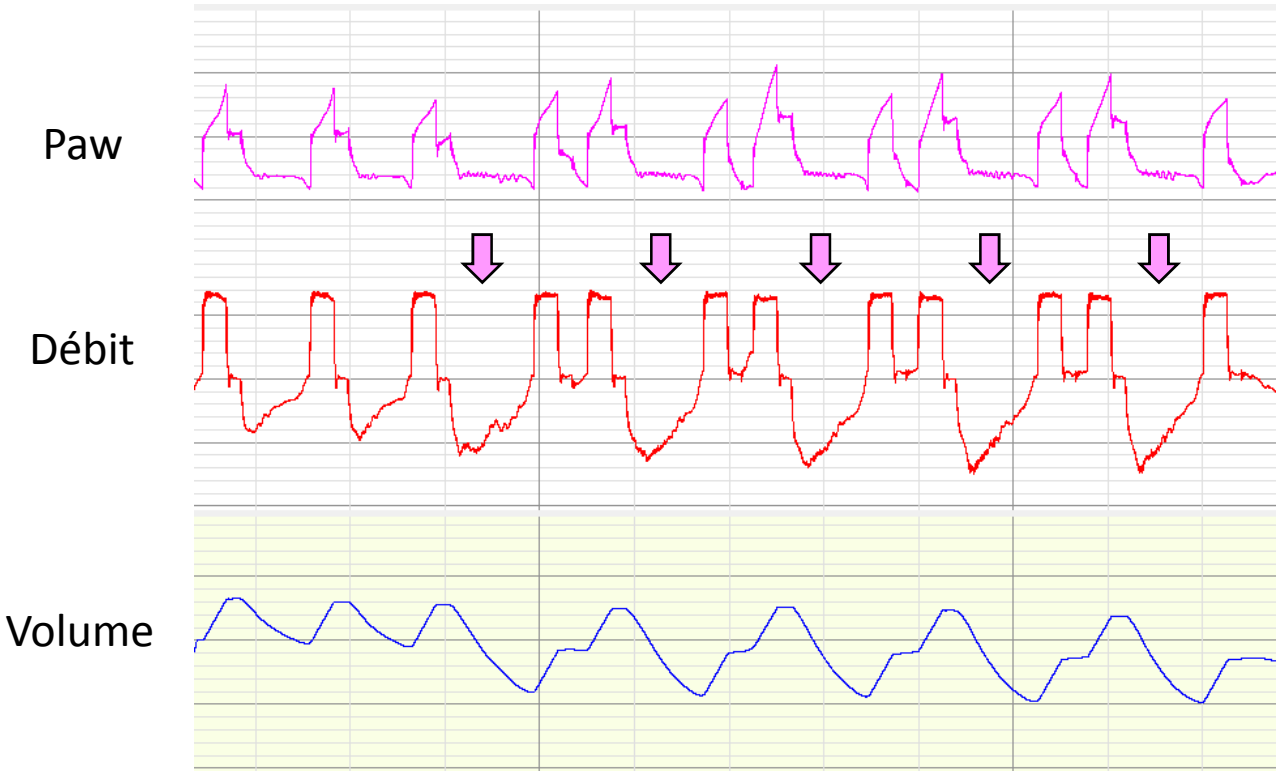

4
QD - Differential Pressure , 75 cl
1
FLOW
VOLUME
50.000
60.000
70.000
seconds
-56 ml
-754 ml

Volumes pulmonaires et « rib cage compression »

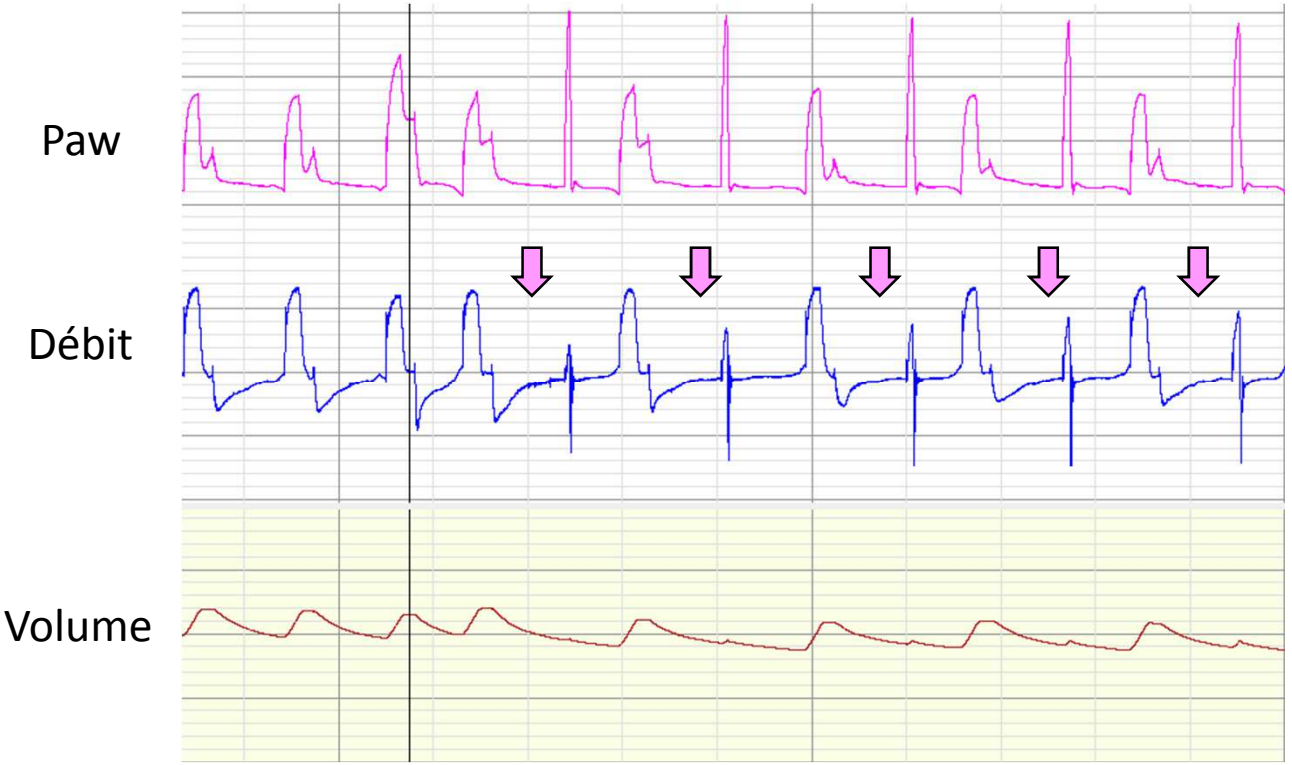




Double déclenchements



Toux



- Le mode ventilatoire influence probablement l'efficacité et la sécurité de la kinésithérapie respiratoire – Doit être évalué

- Prudence en VAC
  - Espacer les compressions

- Monitorer l'efficacité et la sécurité de la kinésithérapie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