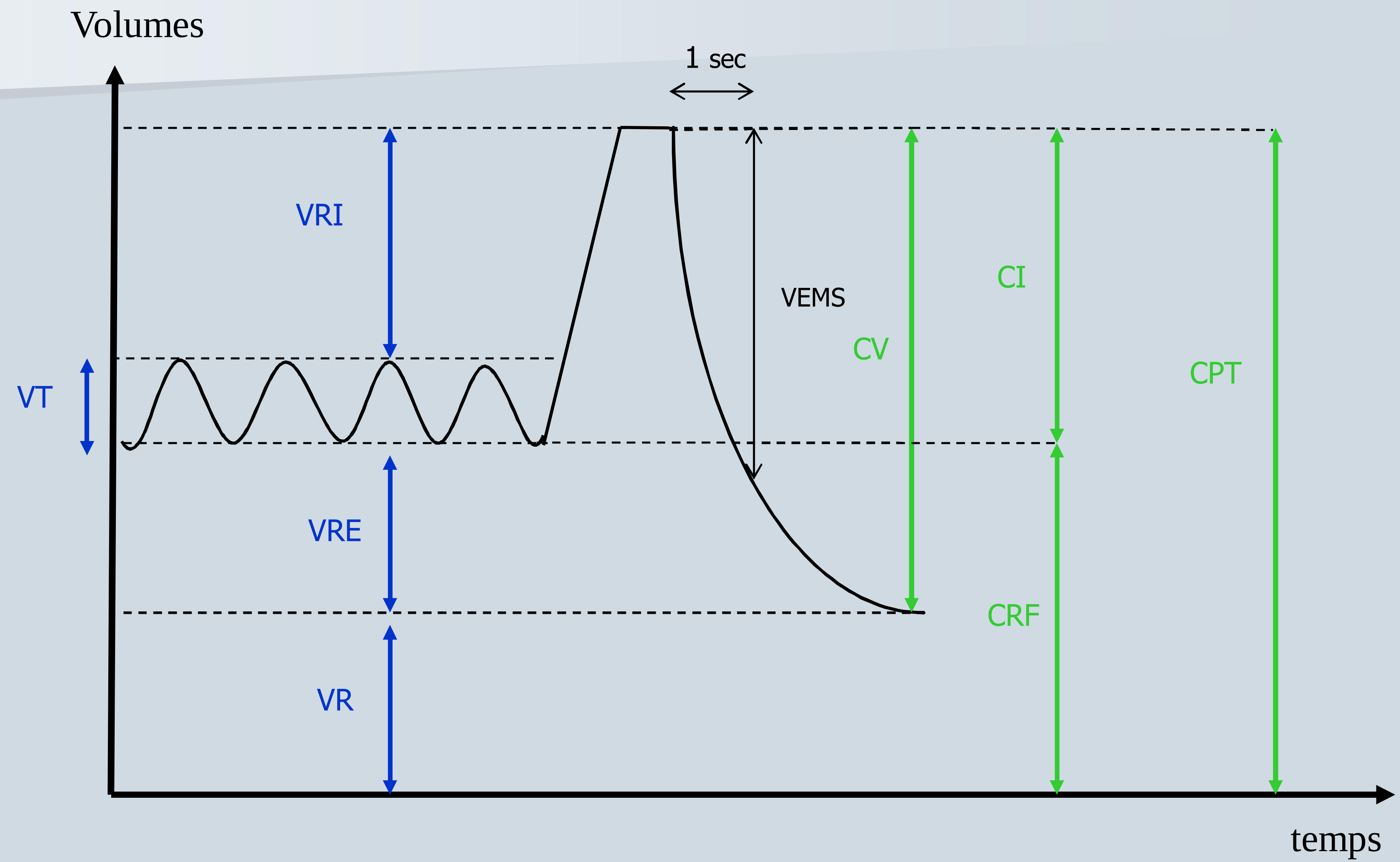
Désencombrement assisté par ordinateur

G.Reychler – M.Cabillic

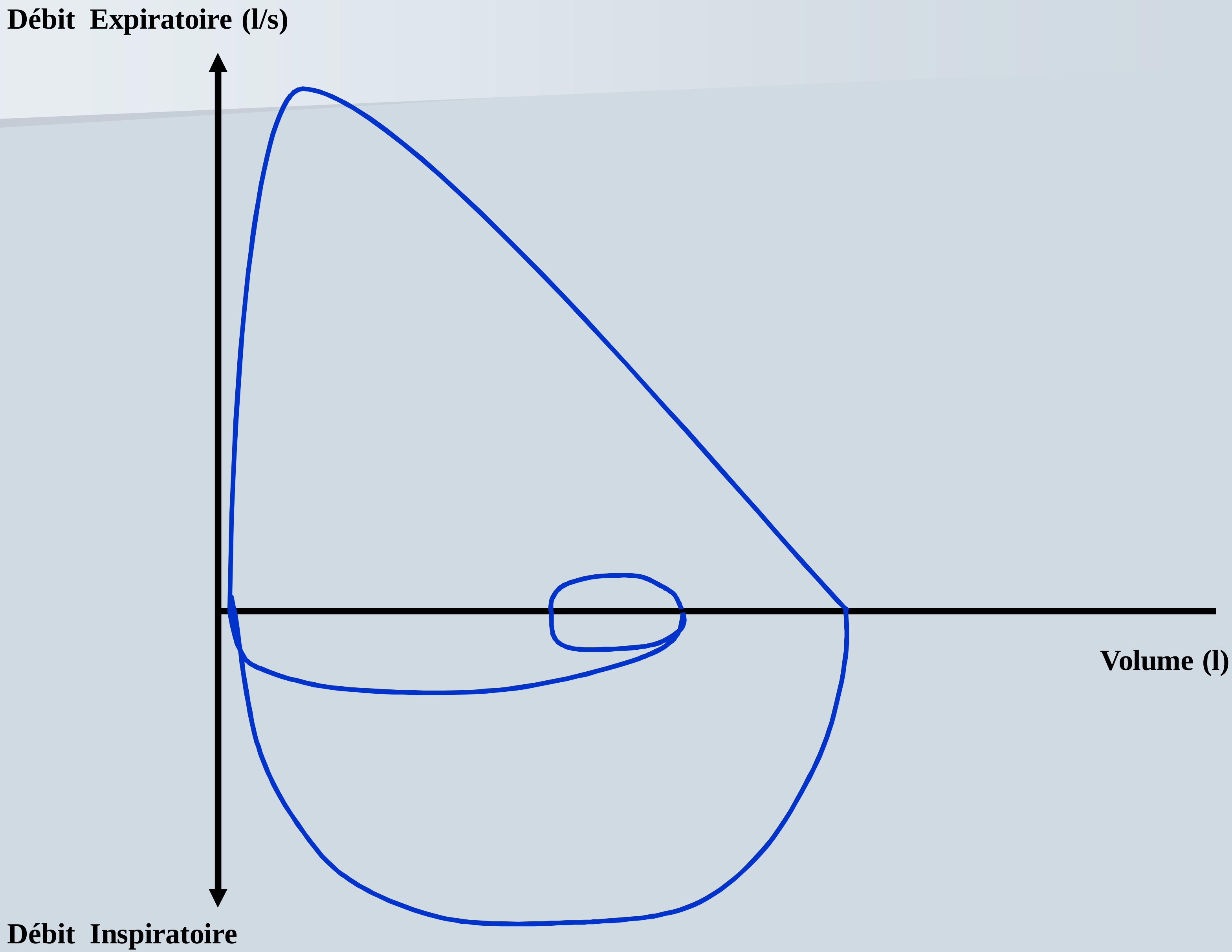
absence de conflits d'intérêts pour le sujet traité

E.F.R.
Quelques Rappels

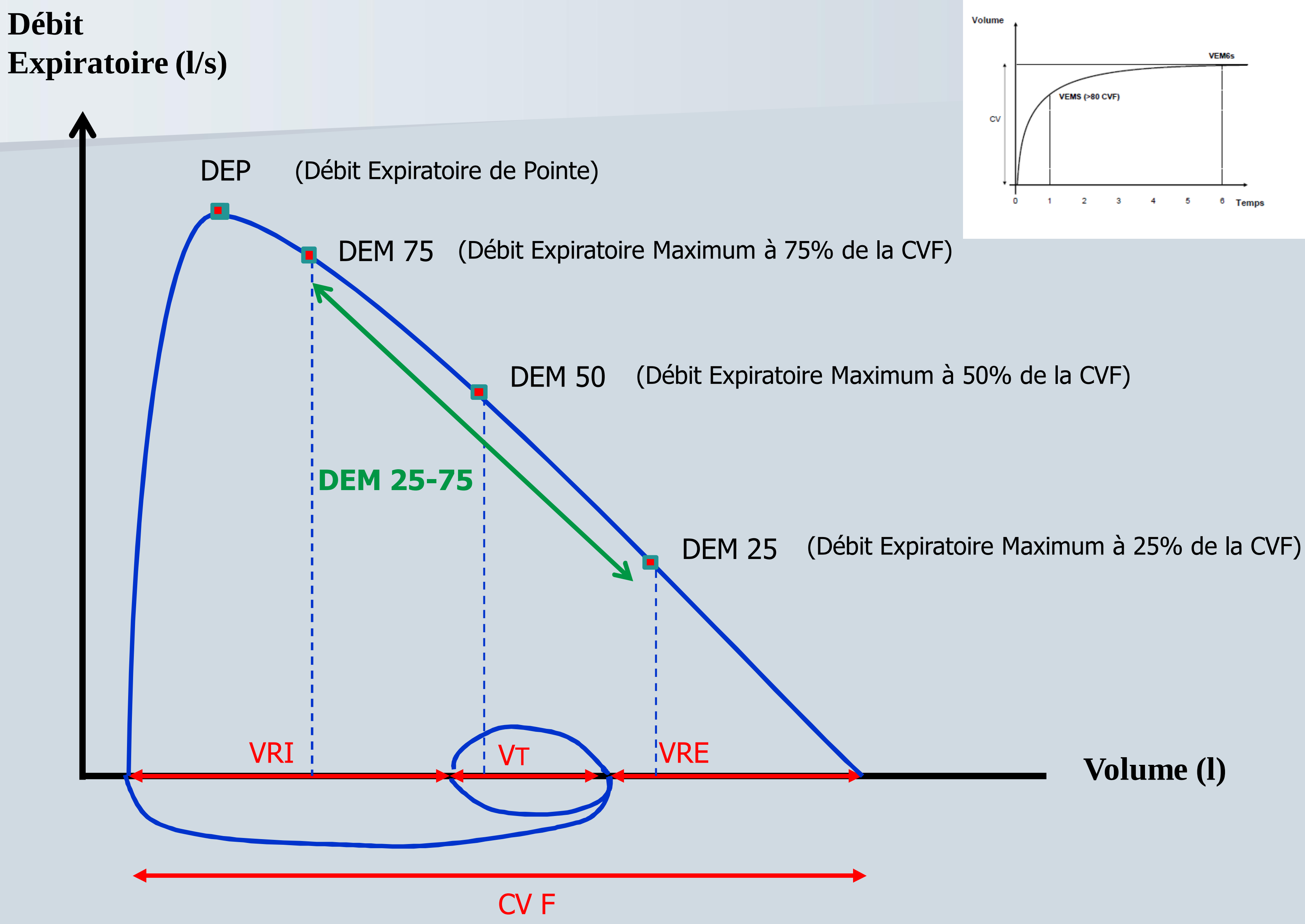
Volumes



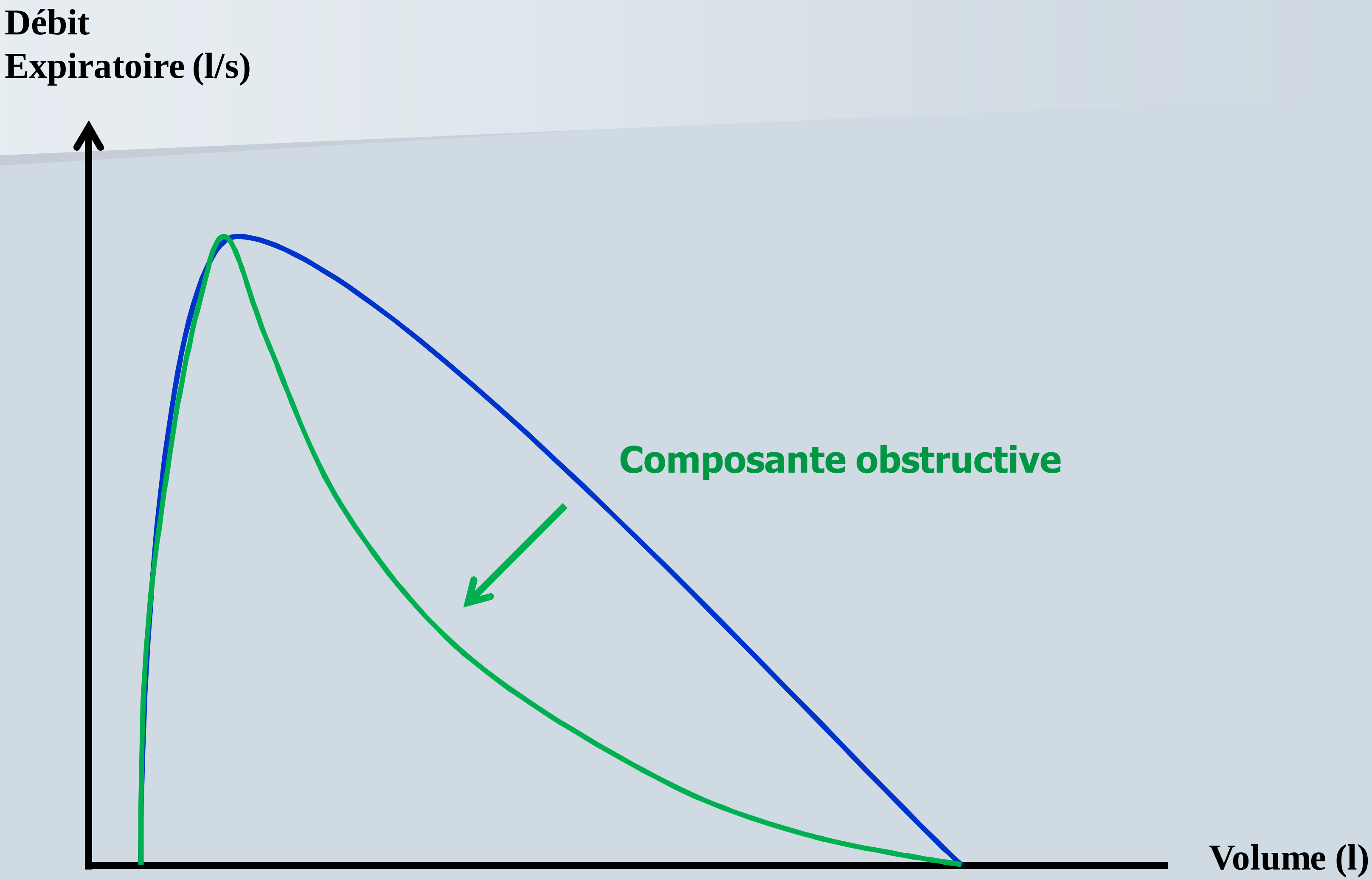
Courbe Débit-Volume



Courbe Débit-Volume



Courbe Débit-Volume



Désencombrement :

Quelles techniques ?

Lyon 94

Agence Nationale pour le Développement de l'Évaluation Médicale

- L'utilisation des techniques de flux expiratoire contrôlé fait l'unanimité. (………) Le désencombrement par contrôle du flux expiratoire est reconnu comme efficace, quelle que soit la technique employée (1)

- « Les techniques basées sur l'augmentation du flux expiratoire jouent sur la variation des débits expiratoires. La spirométrie mesure ces débits instantanés et permettrait de mieux définir les modalités de ces techniques… » (2)

(1) Conférence de consensus sur la kinésithérapie respiratoire. Lyon, 2 et 3 décembre 1994. Kinésithérapie Scientifique, n°344, avril 1995

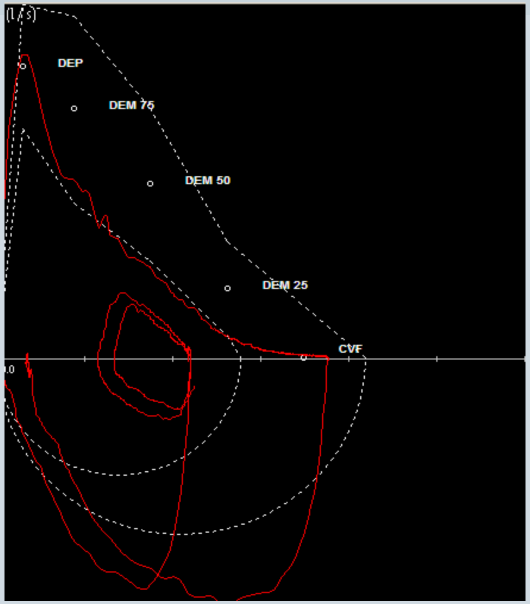
(2) H.FOURE. Arguments pour une kinésithérapie de désencombrement guidée par la courbe débit/volume. Kinesither Rev 2007 ;(70) :46-51

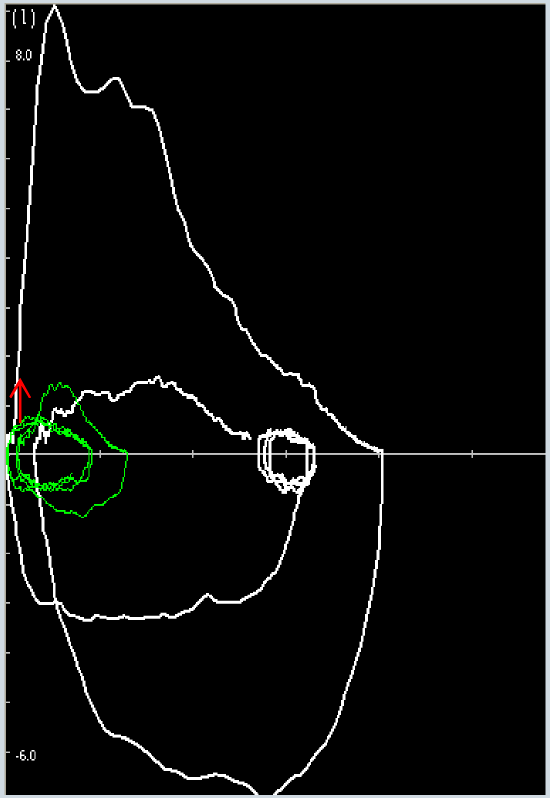
Désencombrement assisté par ordinateur :

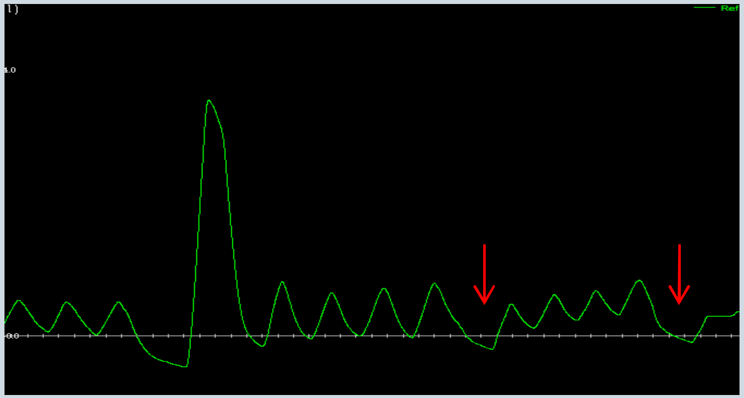
Intérêts

Aide au Bilan Diagnostic kinésithérapique

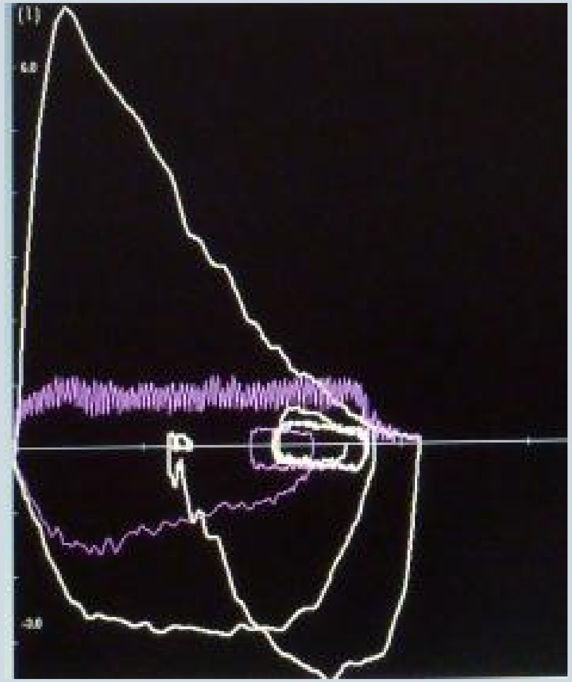
- Dépistage altérations respiratoires
- Evaluation limitation flux expiratoire



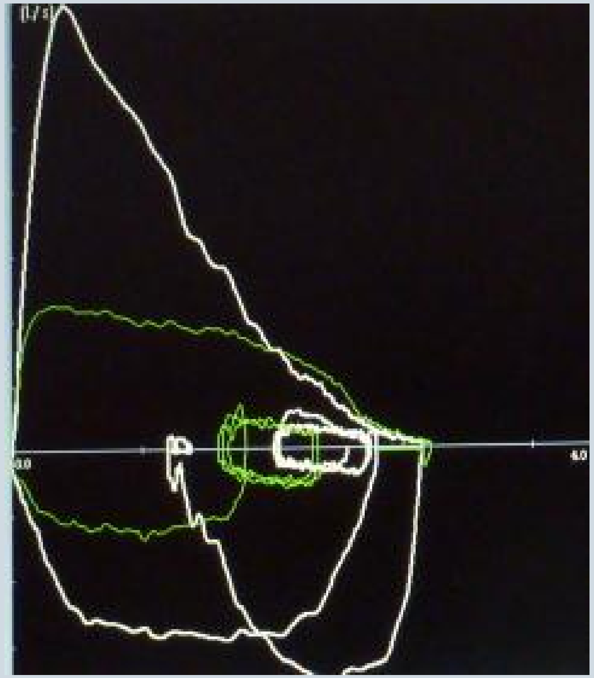




Aide au choix de la technique



Acapella

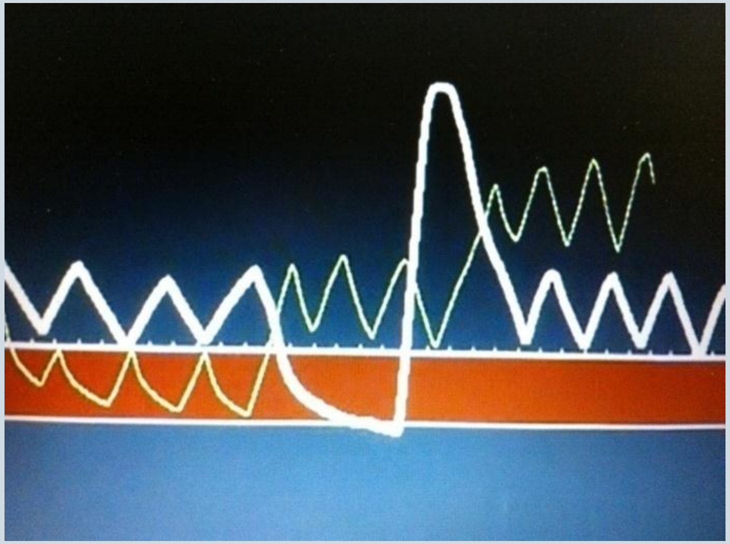


Soupir

Biofeedback et apprentissage

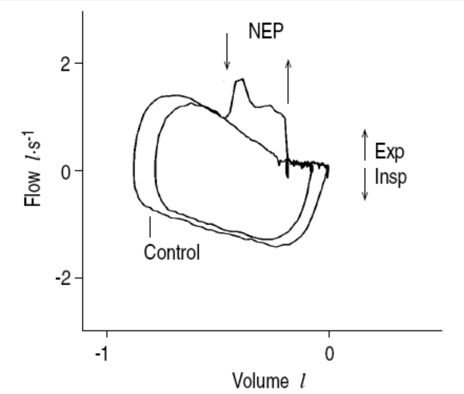
- Techniques de désencombrement

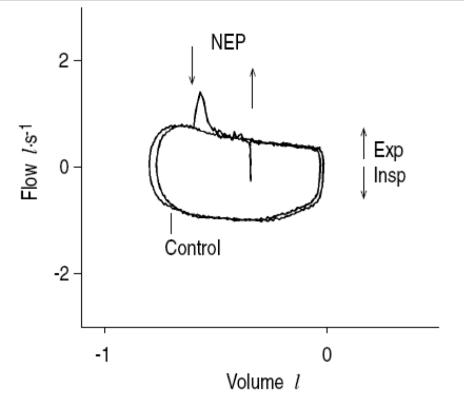
- Ventilation à différents volumes (VDAD)

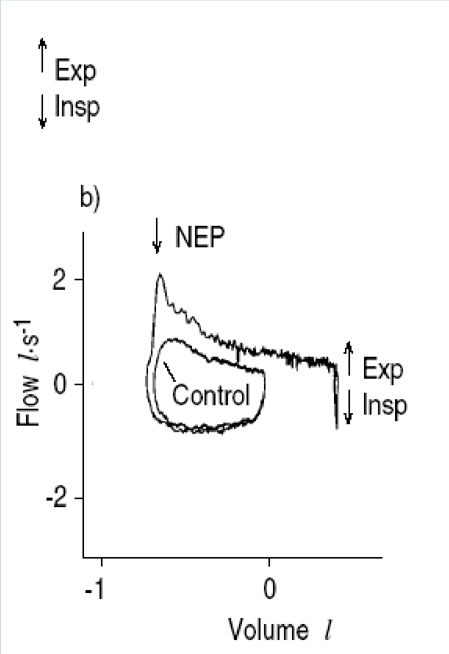


Détecter la limitation du flux expiratoire A partir de la ventilation de repos

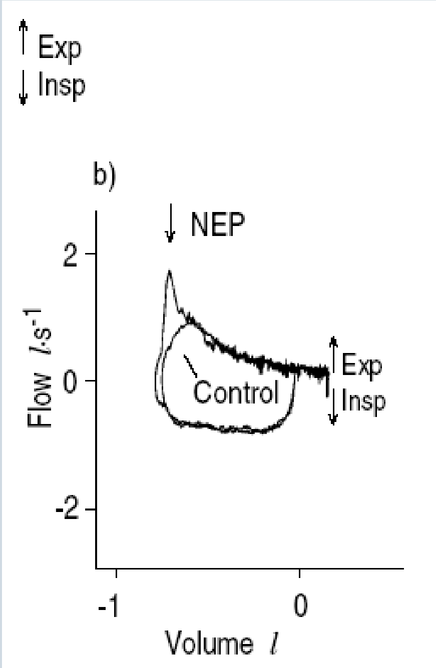
Negative Expiratory Pressure (1)







Assis



Allongé

(1) Koulouris NG. A simple method to detect expiratory flow limitation during spontaneous breathing. Eur Respir J, 1995;8:306-313

Compression Abdominale Manuelle **(2)**

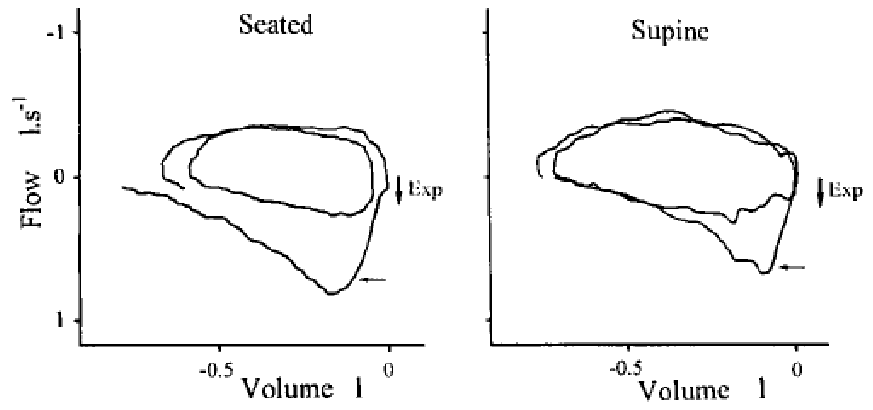


Figure 3. Record of flow–volume curves in a representative patient with COPD in the seated (*left*) or supine (*right*) position. The *horizontal arrow* indicates the test flow–volume curves. MCA failed to increase expiratory flow in this patient in the supine position only; this limitation was confined to the lower part of tidal breath.

- Technique simple
- Orientation MK :
  - Choix des techniques
  - Choix positionnel

(2) Ninane V . Detection of expiratory flow limitation by manual compression of the abdominal wall. Am J Respir Crit Care Med, 2001; 163:1326-1330

Spirométrie

- Intérêt
  - Suivi des patients avec pathologie respiratoire
  - Outil diagnostic
  - Recherche

… et pour le kinésithérapeute?

Spirométrie : un bon outil d'évaluation pour le kinésithérapeute?

- Pourquoi chercher un outil d'évaluation?
  - EBP
  - Comprendre ce que l'ont fait
  - Déterminer l'effet du traitement
  - Adapter son traitement

EBP

Mucus clearance by two-phase gas-liquid flow mechanism: asymmetric periodic flow model

CHONG S. KIM, ANTONIO J. IGLESIAS, AND MARVIN A. SACKNER
Pulmonary Division, University of Miami School of Medicine at Mount Sinai Medical Center, Miami Beach, Florida 33140

TABLE 5. *Critical mucus layer thickness required for mucus transport in horizontal tube*

PEIFR: / $\dot{V}_{E_p}$:	3.0 / 60	2.0 / 40	1.5 / 30
Mucus simulants			
A1	0.47±0.01 (89)	0.70±0.02 (92)	0.87±0.02 (86)
A2	0.66±0.02 (76)	0.91±0.02 (76)	1.08±0.03 (77)
A3	0.52±0.01 (60)	0.74±0.03 (69)	0.94±0.02 (71)
B1	0.71±0.01 (87)	1.02±0.03 (94)	1.23±0.04 (93)
B2	0.80±0.02 (64)	0.97±0.03 (64)	1.14±0.02 (64)
B3	0.58±0.01 (51)	0.81±0.02 (61)	0.99±0.07 (62)
C1	1.08±0.03 (92)	1.24±0.04 (90)	1.38±0.04 (88)
[illegible]	[illegible]	[illegible]	1.33±0.05 (68)
[illegible]	[illegible]	[illegible]	1.07±0.04 (55)

two phases. The greater the difference in airflow velocity, the faster the liquid movement. However, our results indicate that LLTS is mainly governed by the absolute value of the higher airflow, not by the difference between the expiratory and inspiratory flow rate. Our results further show that when the expiratory flow rate is kept constant above the inspiratory flow rate, LLTS remains unaffected regardless of the magnitude of the inspiratory flow rate until the inspiratory flow rate approaches within 10% difference from the expiratory flow rate.

DISCUSSION

Liquid layer transport speed. Theoretically, the shear stress on the liquid layer is directly proportional to the inertia force of airflow which is represented by the prod-

characteristics in the two-phase flow model are closely analyzed.

In two-phase gas-liquid flow models, particularly in annular or stratified flow situation, the interfacial shear

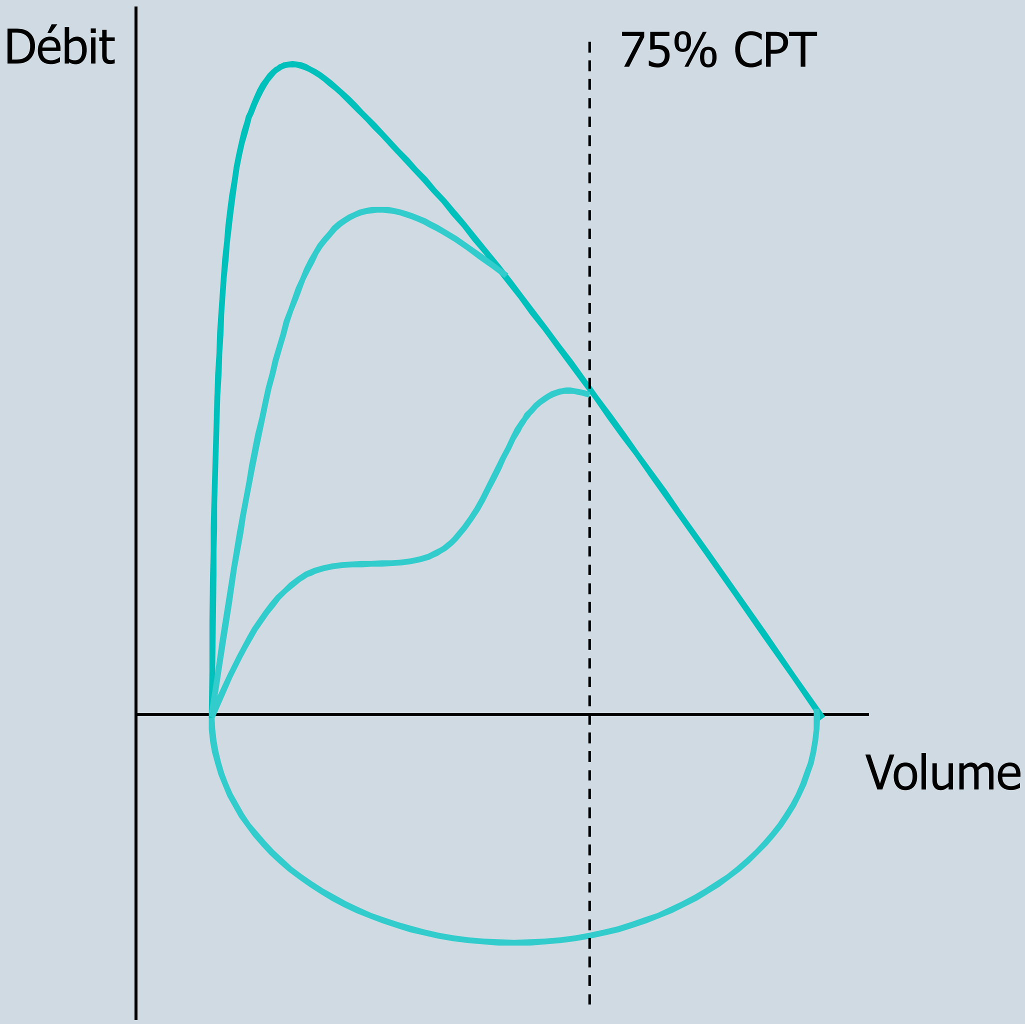
Comment s'y retrouver dans la jungle des techniques de désencombrement ?

Henri Fouré

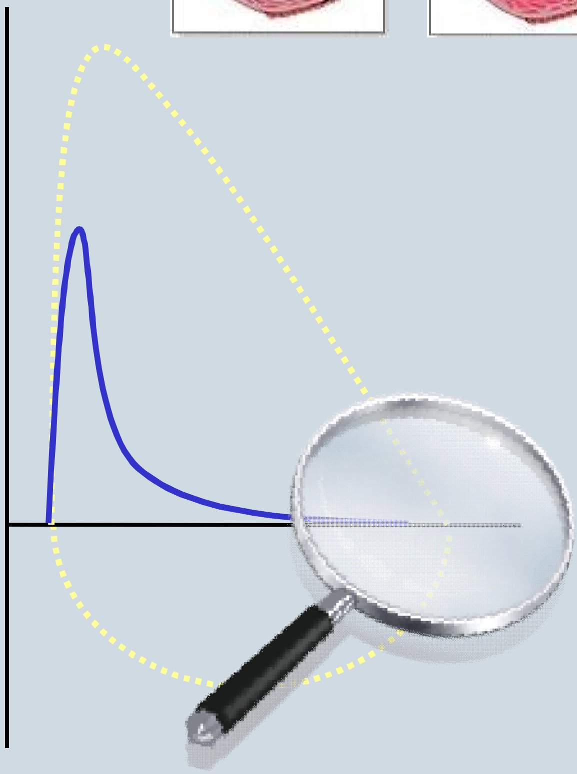
THERAPIE RESPIRATOIRE .COM
LE LIEN ENTRE CEUX QUI FONT ET CEUX QUI SAVENT

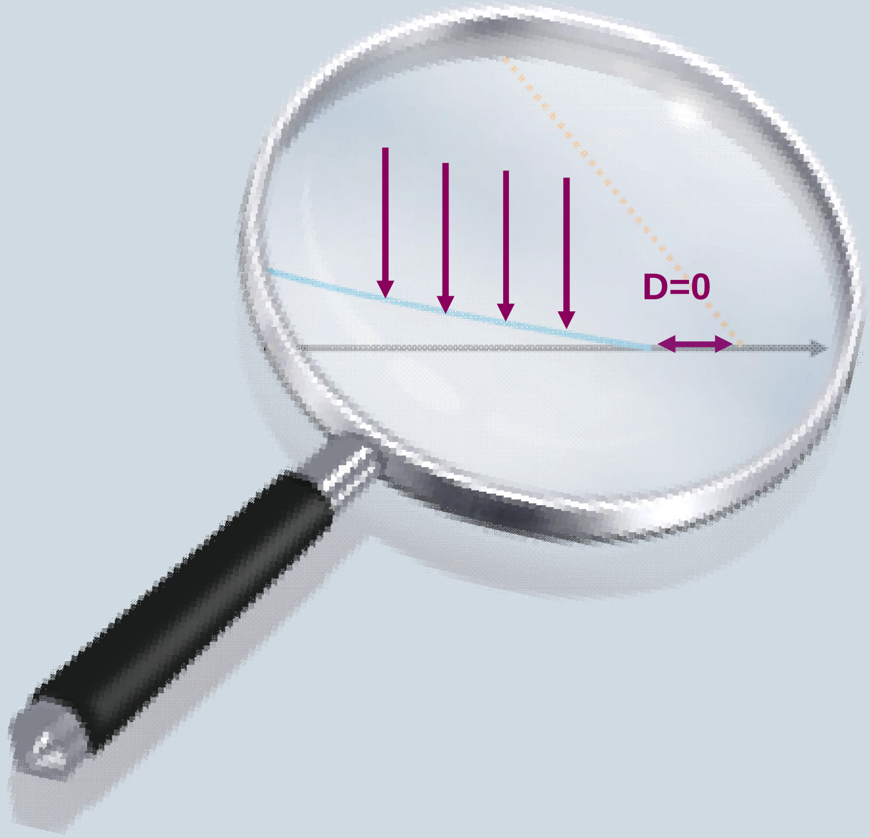
D.U kiné respiratoire Lyon

Comprendre ce que l’on fait

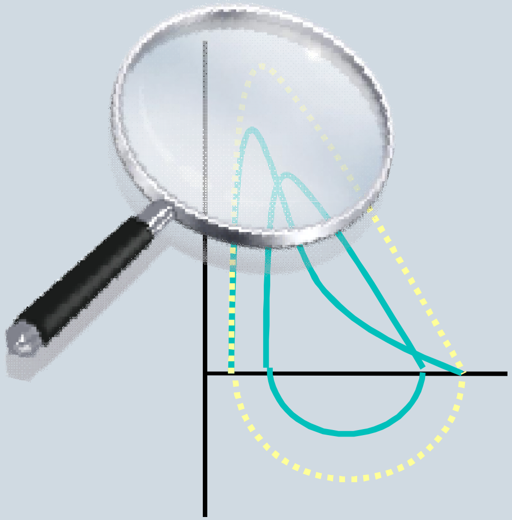


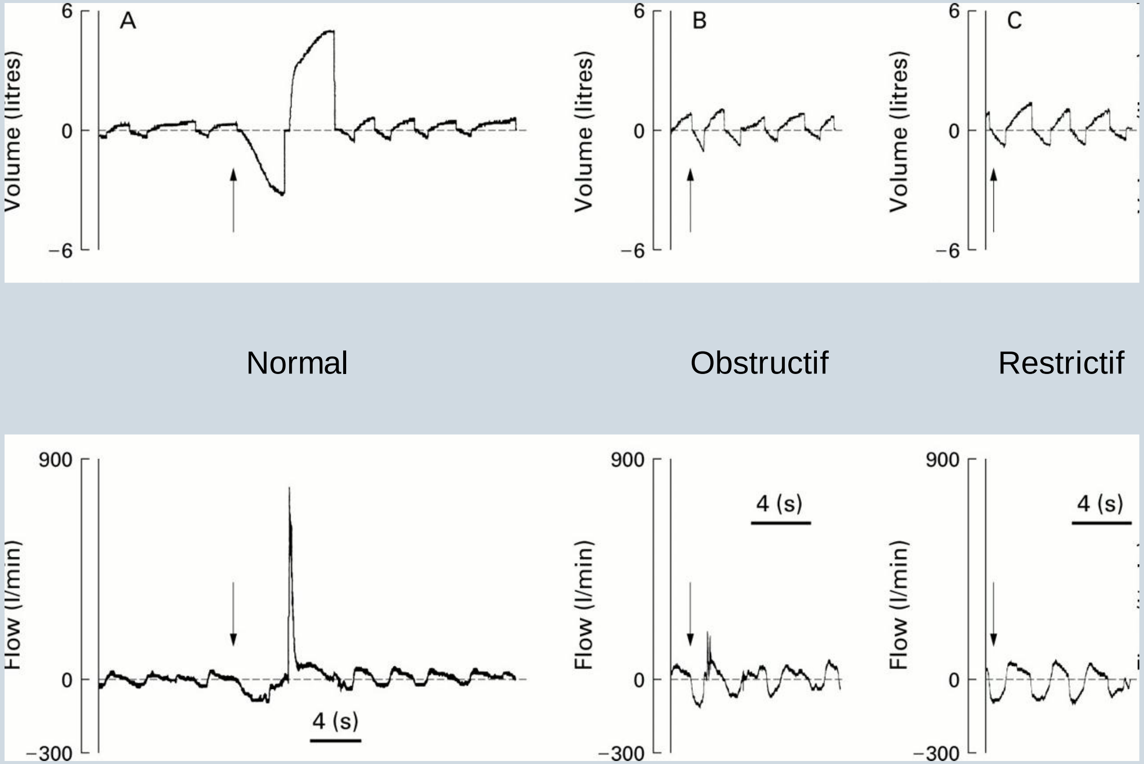
Obstruction et débit





Evacuation





Sivasothy et al. Thorax 2001

Déterminer l'effet du traitement

250* **Can physiological parameters determine the optimal method of airway clearance for the individual patient with cystic fibosis?**

P.M. McIlwaine[1,2], A.G. Davidson[1], Y. Lillquist[1], D. Peacock[1]. [1]*Cystic Fibrosis, BC Children's Hospital, Vancouver, BC, Canada;* [2]*Physiotherapy, BC Children's Hospital, Vancouver, BC, Canada*

Introduction: CF patients frequently express preferences for one airway clearance technique (ACT) over another and may be able to clear more secretions with that technique. Expiratory airflow is utilized by modern ACT's to mobilize secretions, yet only one study has examined the effect of various ACTs on Peak expiratory flow rates (PEFR).

Aim: The purpose of this study was to determine whether there exists different individual responses to ACTs as measured by PEFR which are dependent on the individual's underlying lung pathology.

Method: Maximum expiratory flow volume maneuvers were obtained from CF patients and categorized according to type and severity of lung disease. In addition to measuring FVC, FEV_1 and $FEF_{25/75}$, PEFR, PIFR, FIV_1 were examined to determine the degree of airway compression and flow rates. Patients then repeated their flow volume loops while performing a component of an ACT. The ACT components used were a forceful huff, a gentle huff, and autogenic drainage breathing.

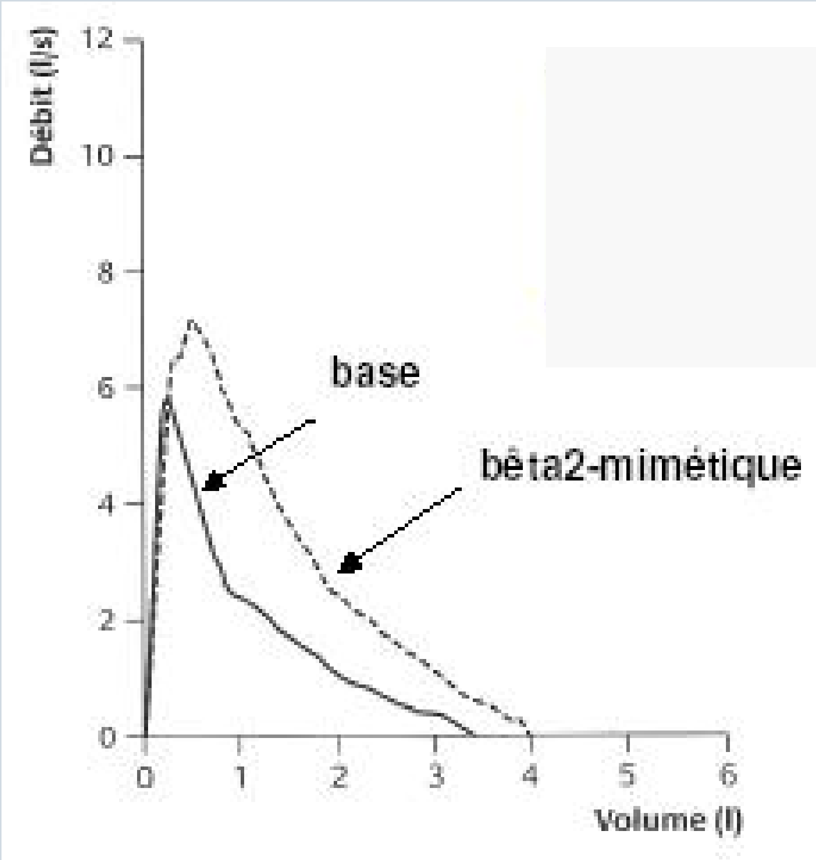
Results varied greatly among patients. In patients whose PFTs suggested compressible large airways PEFR was greatest with AD > gentle huff > forceful huff. Only AD had a PEFR/PIFR greater than 1.1 which is needed for secretion clearance by annular flow. AD produced the greatest amount of sputum in these patients.

In patients with mild lung disease, PEFR was greatest with a forceful huff > gentle huff > AD.

Conclusions: No one ACT produced consistently greater PEFRs, instead they were dependent on the underlying lung pathology. In prescribing an ACT, it may be useful to use pulmonary function flow volume maneuvers to assist in determining the most effective technique for the individual patient

- Paramètres physiologiques aident à déterminer le choix des techniques
- Paramètres physiologiques influencés par la pathologie respiratoire

Réversibilité?



Réversibilité si

- Amélioration du VEMS de 12% et
- Augmentation de 200mL du VEMS

EFR chez l’enfant

Age	Taux de réussite	Reproductibilité***
3 ans	59*-62**	FVC : 2,5% FEV1 : 2,7% FEF25-75 : 8,3%
4 ans	69*-69**	
5 ans	75**-76*	
6 ans	78*	

* Nystad W et al. Thorax 2002;57:1021–1027
** Vilozni D et al. Chest 2005;128:1146–1155
*** Eigen H et al. Am J Respir Crit Care Med 2001;163:619–623

$FEV_{0,5}$?

Beydon N *et al*. An official American Thoracic Society/European Respiratory Society statement: pulmonary function testing in preschool children.
Am J Respir Crit Care Med 2007

TABLE 1. SUMMARY OF PUBLISHED REFERENCE DATA (50 OR MORE SUBJECTS)

Published Normative Data	No. of Subjects	Age (yr)	Notes
Spirometric measurements			
Eigen and colleagues, 2001 (5)	214	3–7	25 < 100 cm
Nystad and colleagues, 2002 (9)	603	3–6	None < 100 cm; 158 aged 3–4 yr
Zapletal and colleagues, 2003 (10)	173	3–6	4 < 100 cm; 24 < 3 yr

Spirometry in Early Childhood in Cystic Fibrosis Patients*

Daphna Vilozni, PhD; Lea Bentur, MD; Ori Efrati, MD; Tal Minuskin, MD; Asher Barak, MD; Amir Szeinberg, MD; Hannah Blau, MD; Elie Picard, MD; Eitan Kerem, MD; Yaacov Yahav, MD; and Arie Augarten, MD

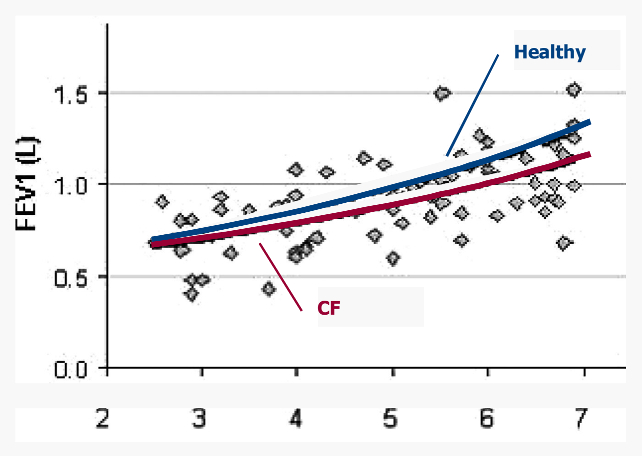
Table 2—*Individual Parameters in z Score From Healthy in Relation to Age Group**

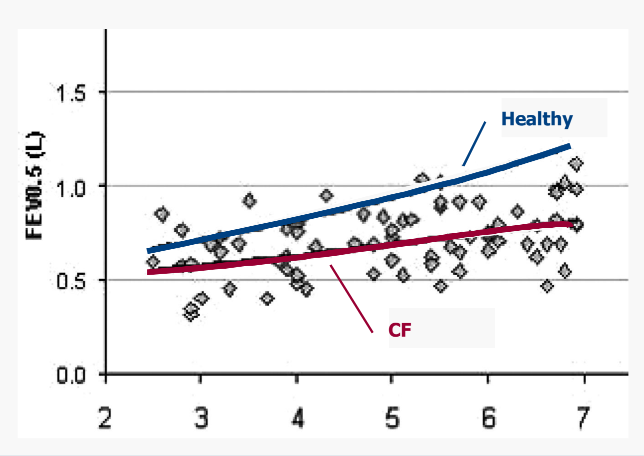
Age Group, yr	$FEV_{0.5}$	PEFR	FEF_{50}	FEF_{25-75}
3 (n = 17)	− 0.57 ± 0.67	− 0.33 ± 0.54	− 0.47 ± 1.07	− 0.70 ± 0.93
4 (n = 16)	− 0.91 ± 0.63	− 0.53 ± 0.66	− 1.31 ± 0.90	− 1.141.19
5 (n = 20)	− 1.23 ± 0.71	− 0.74 ± 1.03	− 1.85 ± 1.25	− 1.681.24
6 (n = 23)	− 1.83 ± 0.87	− 1.28 ± 0.87,	− 3.04 ± 1.33	− 2.95 ± 1.75

*Data are presented as mean ± SD; $p < 0.001$ for all parameters. z scores of FVC and FEV_1 did not change in relation to age group.

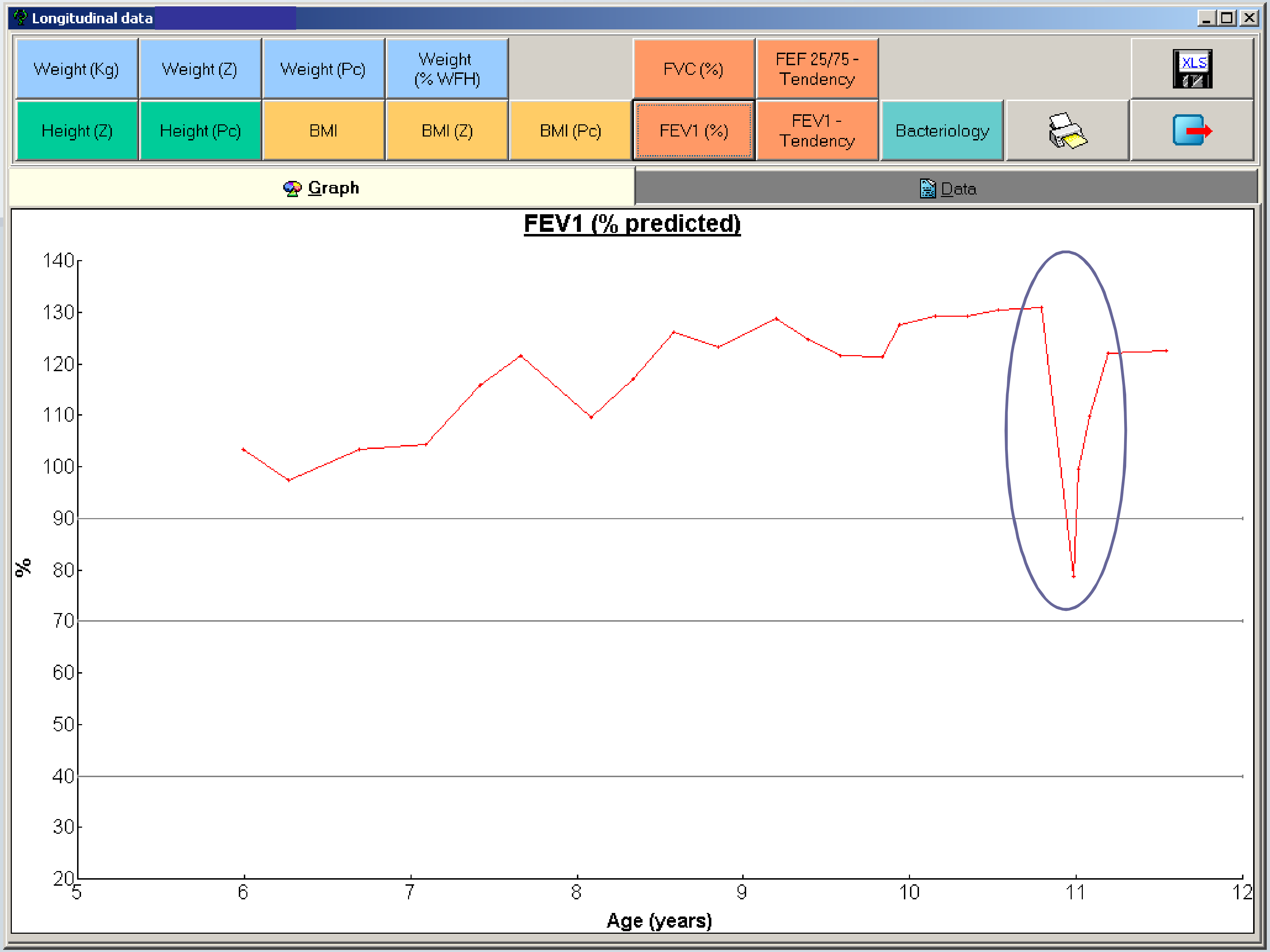
Influence de l'âge sur la détérioration des paramètres spirométriques

FEF_{50} et FEF_{25-75} plus sensibles



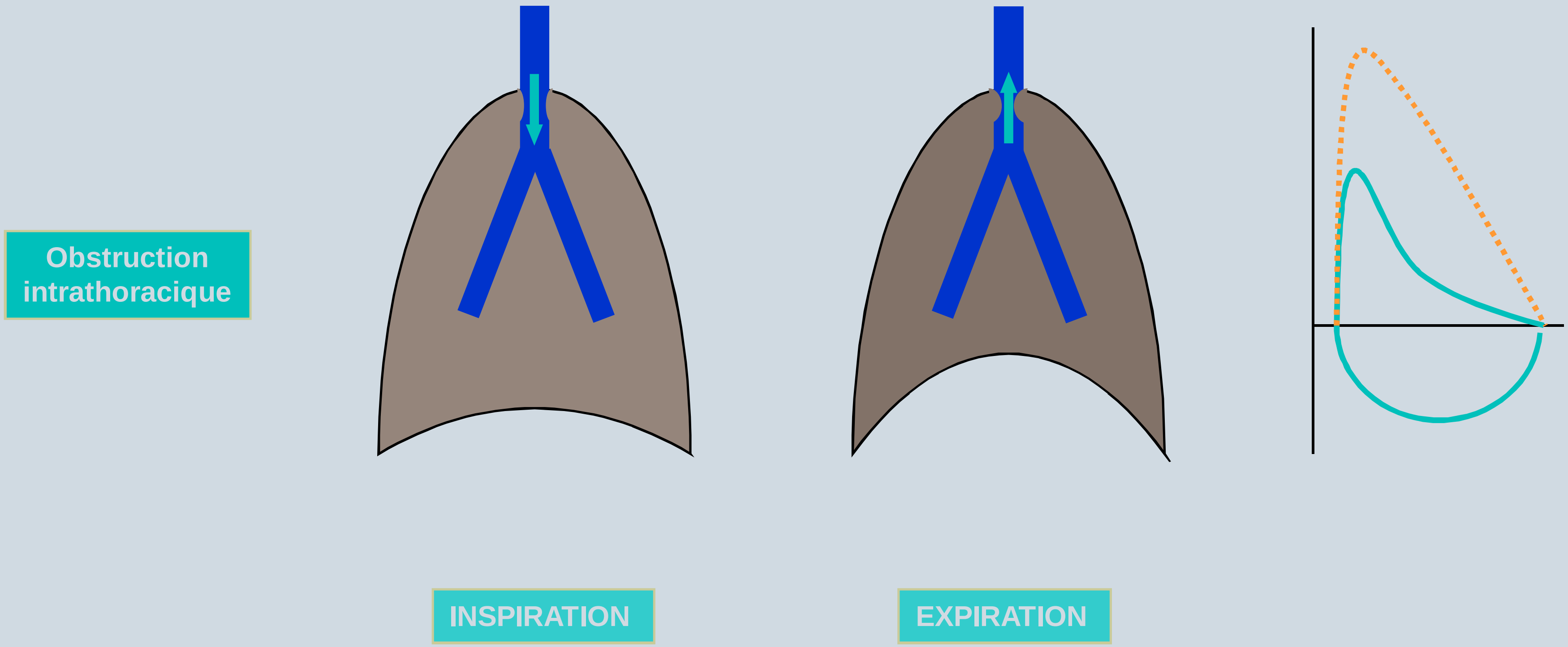


Vilozni D et al, Chest 2007;131:356-361



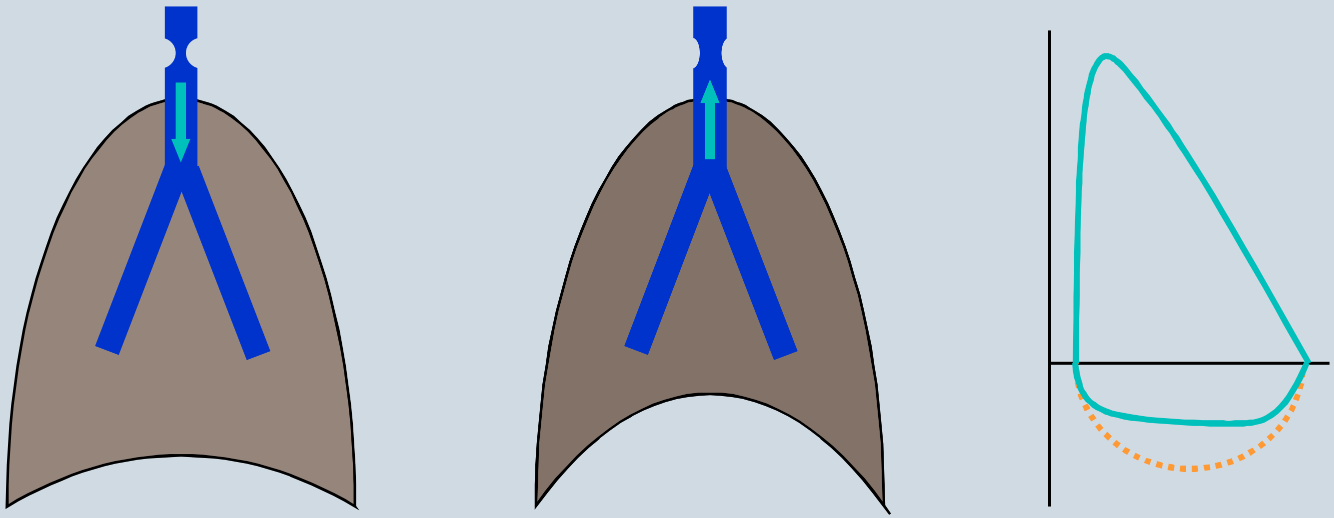
Données UCL – CF Center

Obstruction haute vs basse



Obstruction haute vs basse

Obstruction extrathoracique

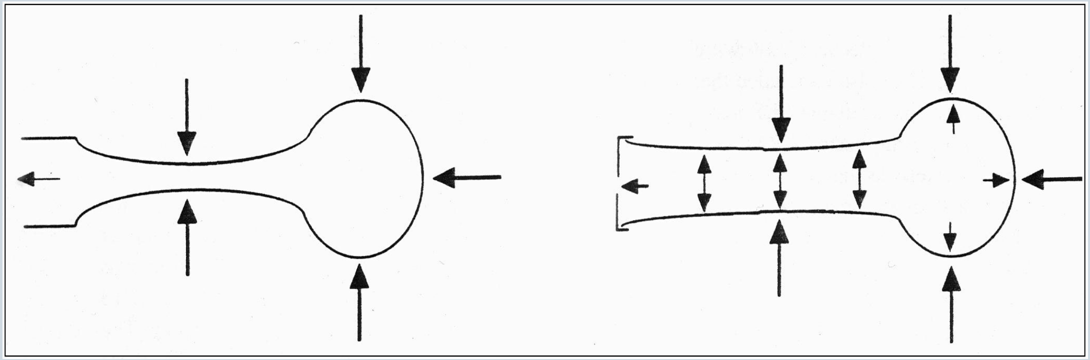


INSPIRATION

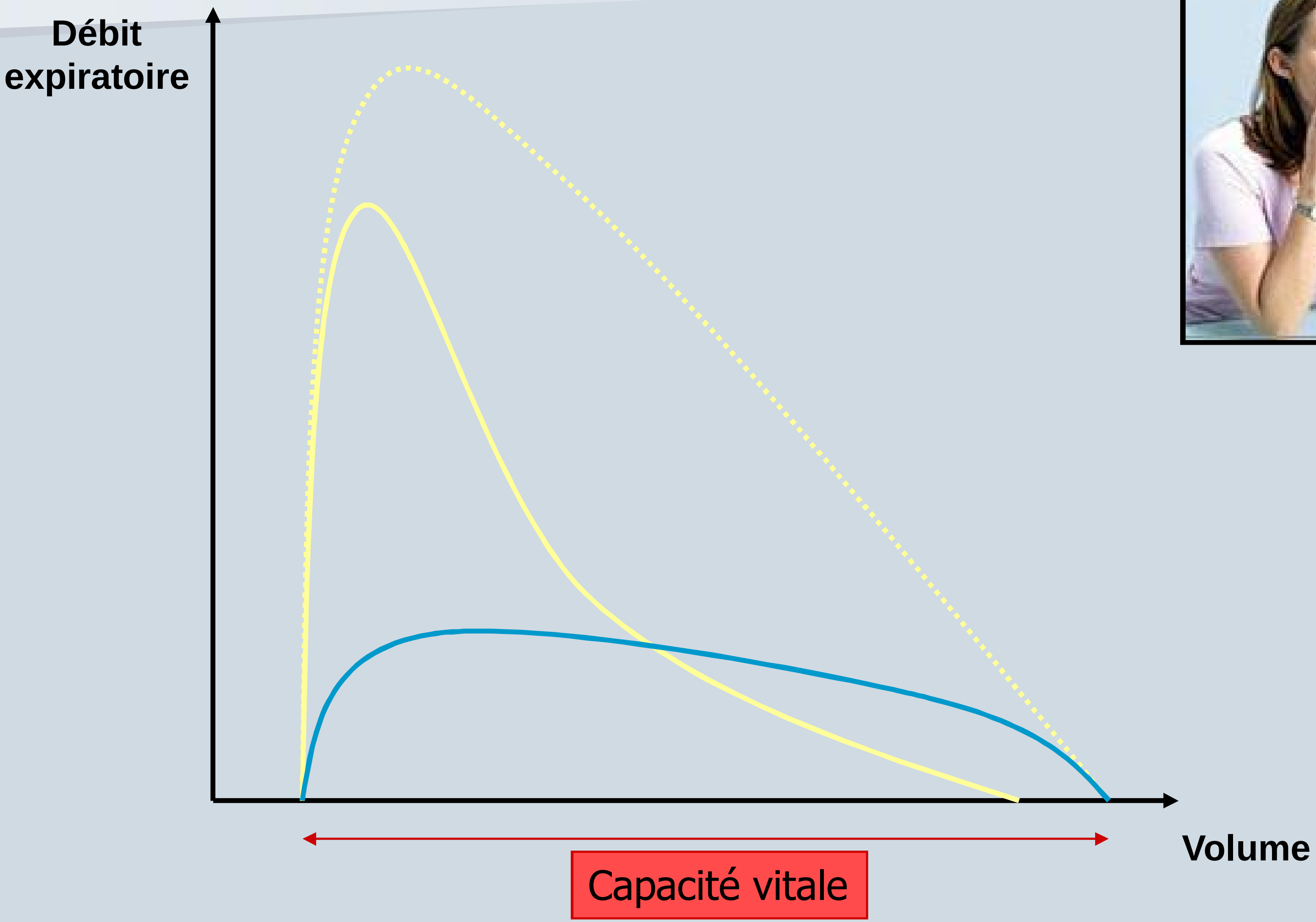
EXPIRATION

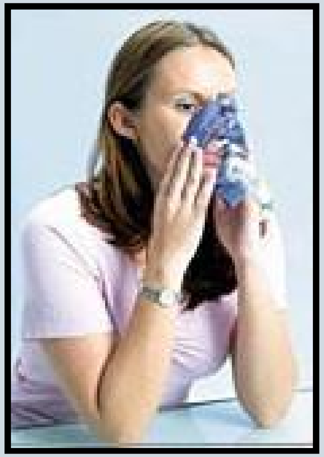
Pression expiratoire positive (PEP)

- Expiration à travers une résistance (PEP entre 10 et 20cm H_2O)
- Limitation du collapsus bronchique

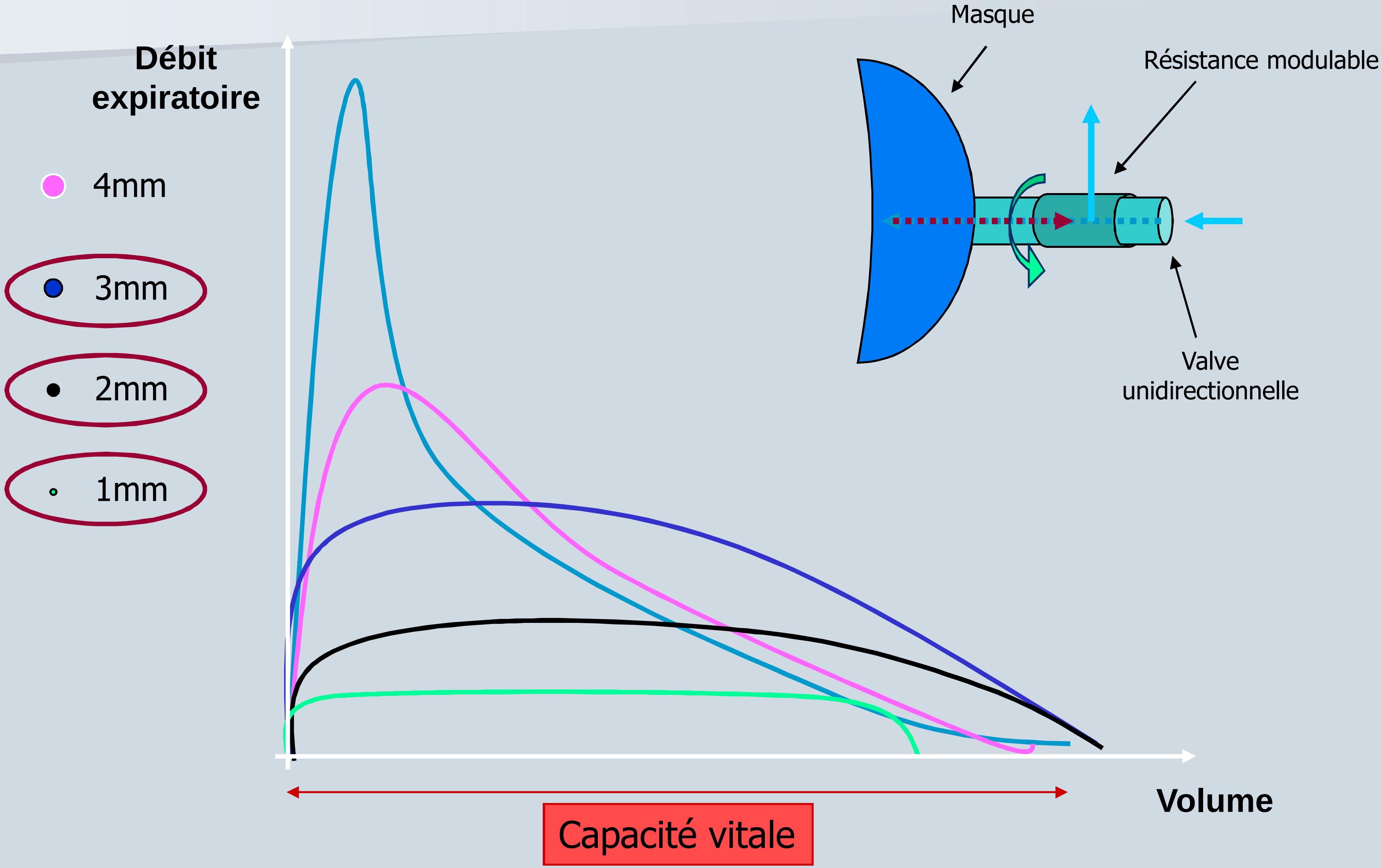


Pression expiratoire positive





Importance de la résistance

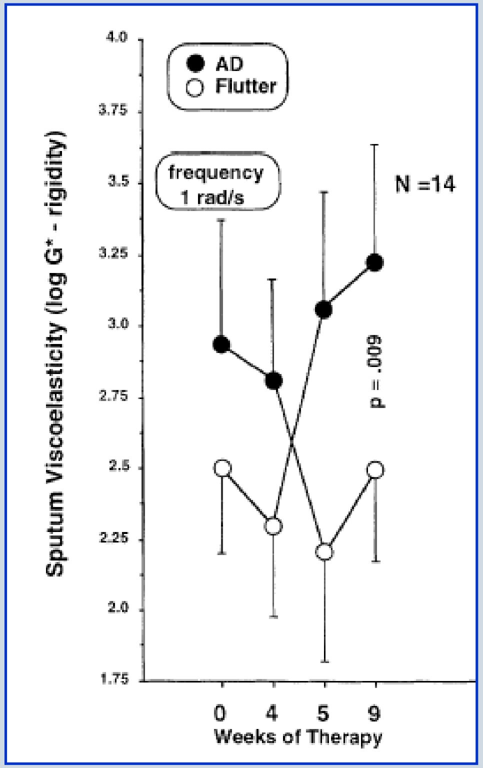


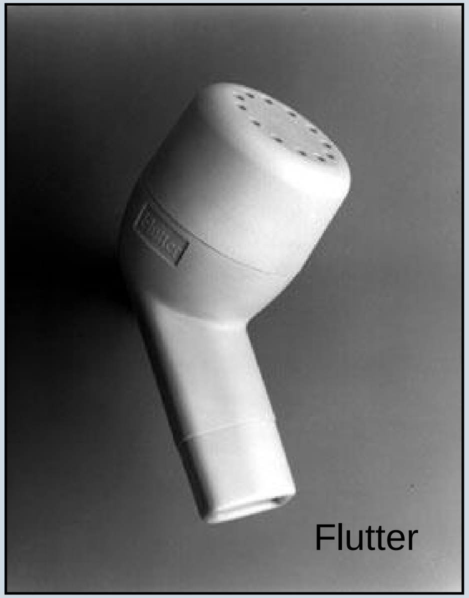
Wagener JS, Respir Care 2003;48(3):234 ï 245

PEP oscillante

- Expiration à travers une résistance oscillante
- Adjuvant pour la mobilisation et l'évacuation des sécrétions

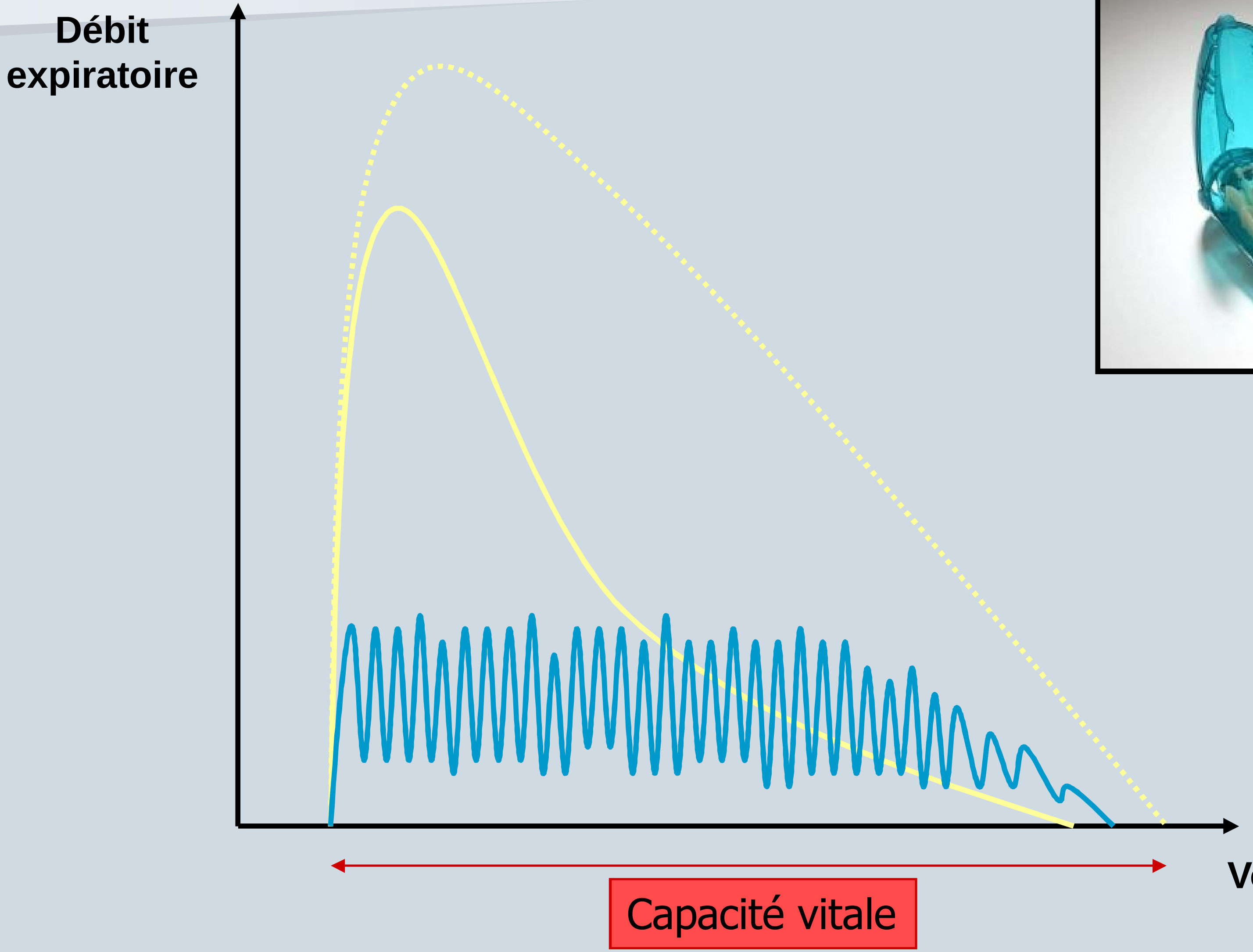
Acapella





Flutter

PEP oscillante

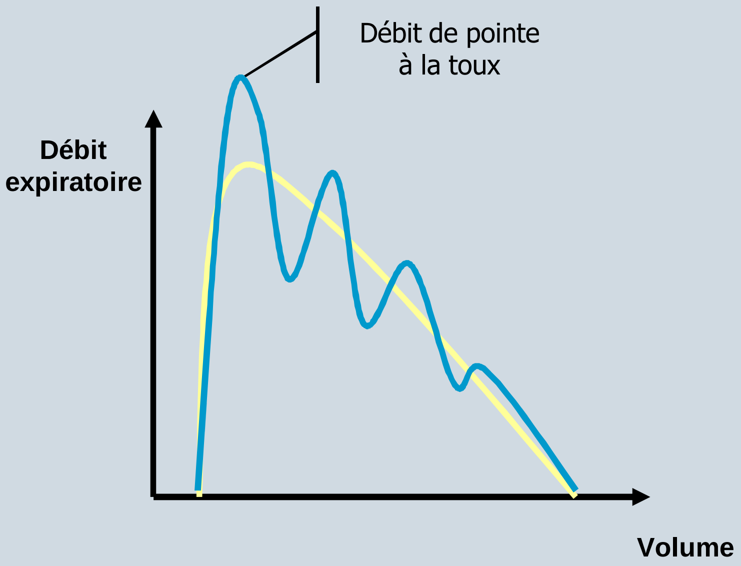


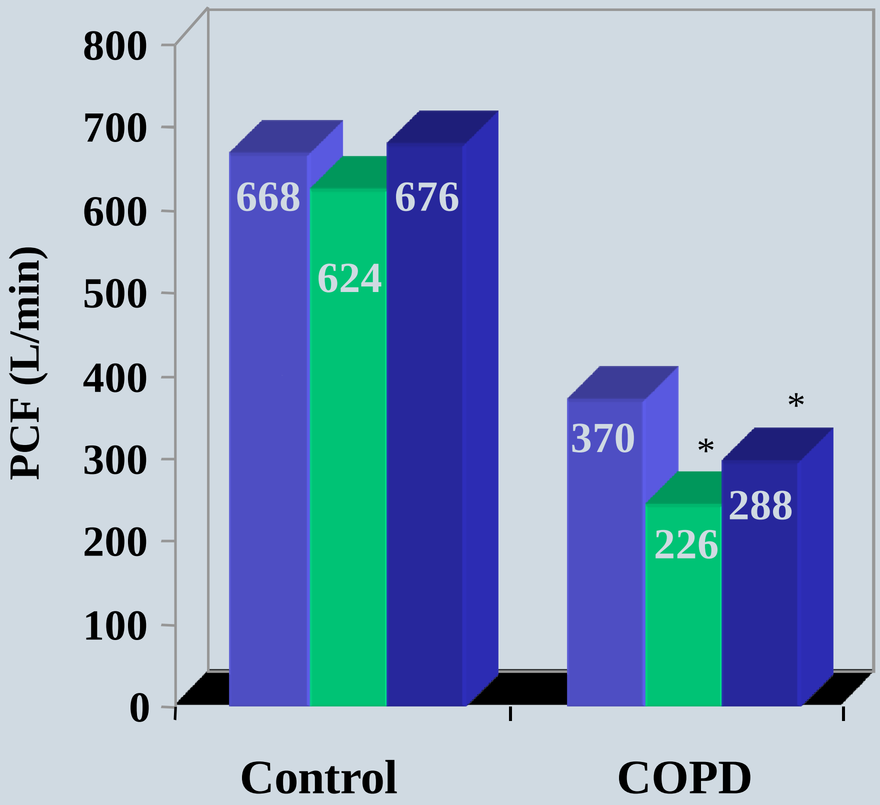
In-Exsufflator ou Cough assist

- Toux provoquée
  - Pression positive suivie d'une pression négative

Effect of manually assisted cough and mechanical insufflation on cough flow of normal subjects, patients with chronic obstructive pulmonary disease (COPD), and patients with respiratory muscle weakness

- 8 BPCO vs 9 contrôles sains



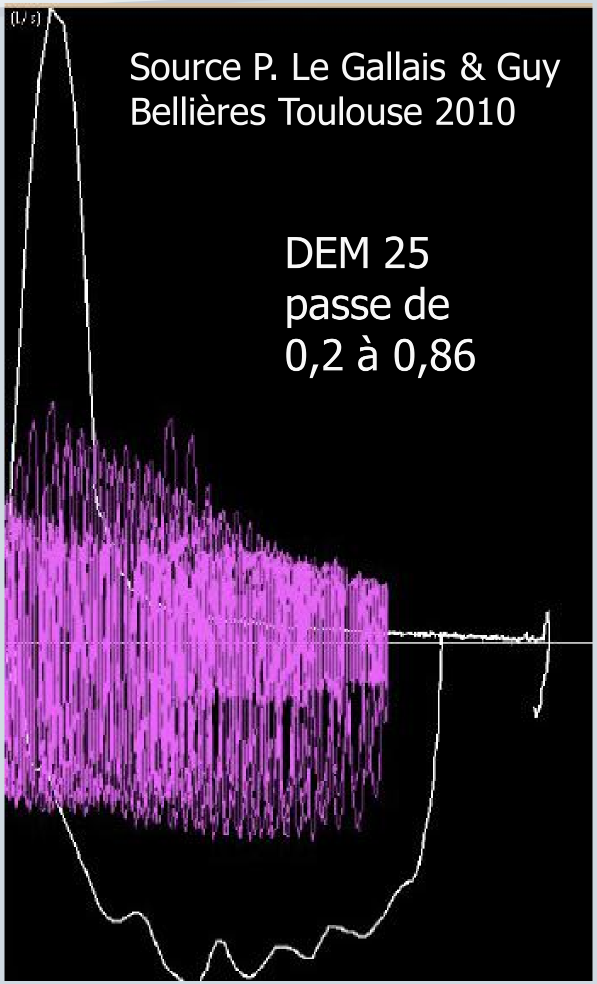


Adapté de Michel Toussaint

Sivasothy et al. Thorax 2001

Veste vibrante

(High Frequency Chest Wall Oscillation)



Muco
37 ans
CVF 60%
DEP 76%
VEMS 24%
DEM 50 4%
DEM 25 4%

Respiration à bas volume

Breathing at low lung volumes and chest strapping: a comparison of lung mechanics

N. J. DOUGLAS, G. B. DRUMMOND, AND M. F. SUDLOW
Departments of Medicine, Anaesthetics, and Respiratory Medicine, University of Edinburgh, Edinburgh EH3 9YW, Scotland

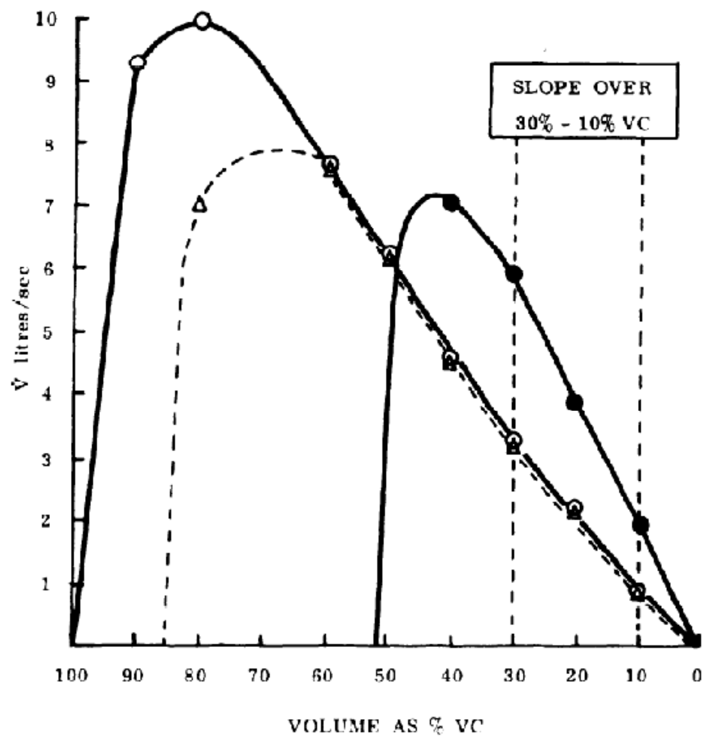
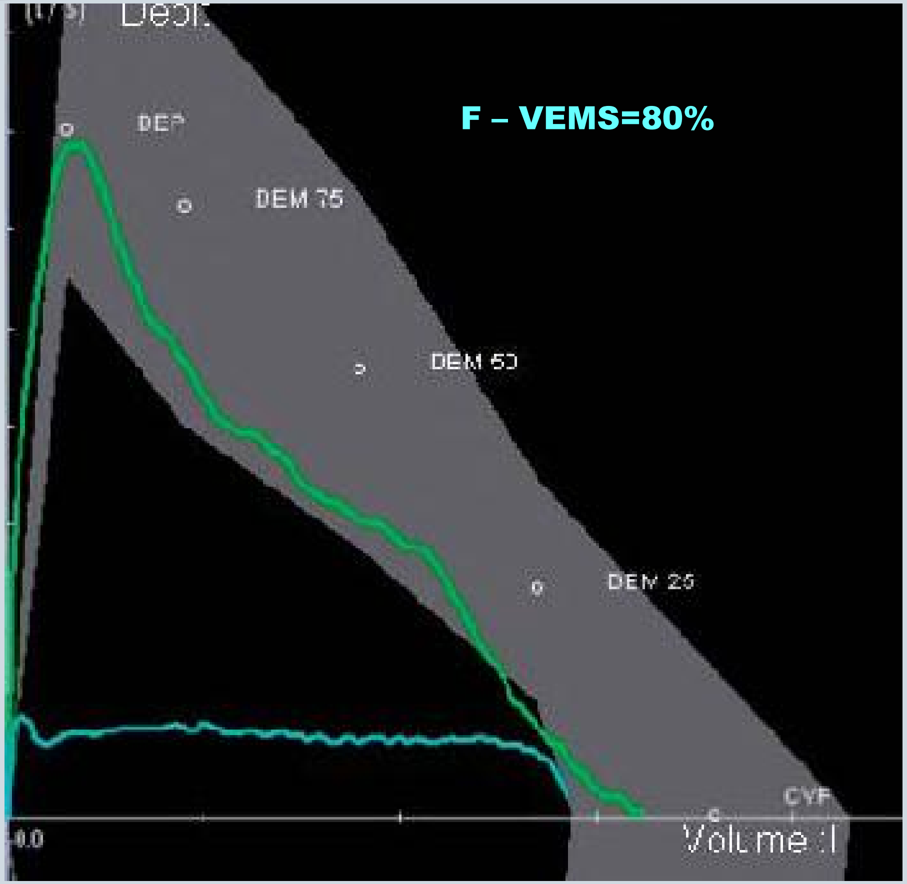


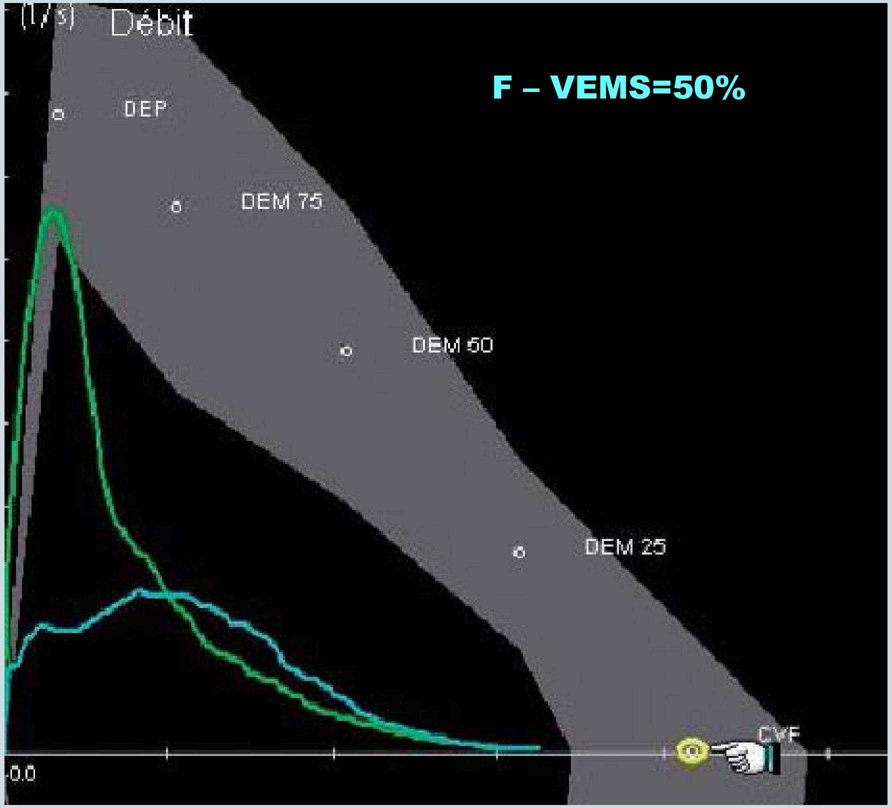
FIG. 2. Effect on forced expiratory flow rates of mild (△) and severe (●) chest strapping compared with maximal flow-volume curve (○) in *subject 2.*

- Réduction du débit de pointe
- Si restriction importante, amélioration des débit périphériques (partie débits indépendants)

J Appl Physiol 1981;50(3):650-657

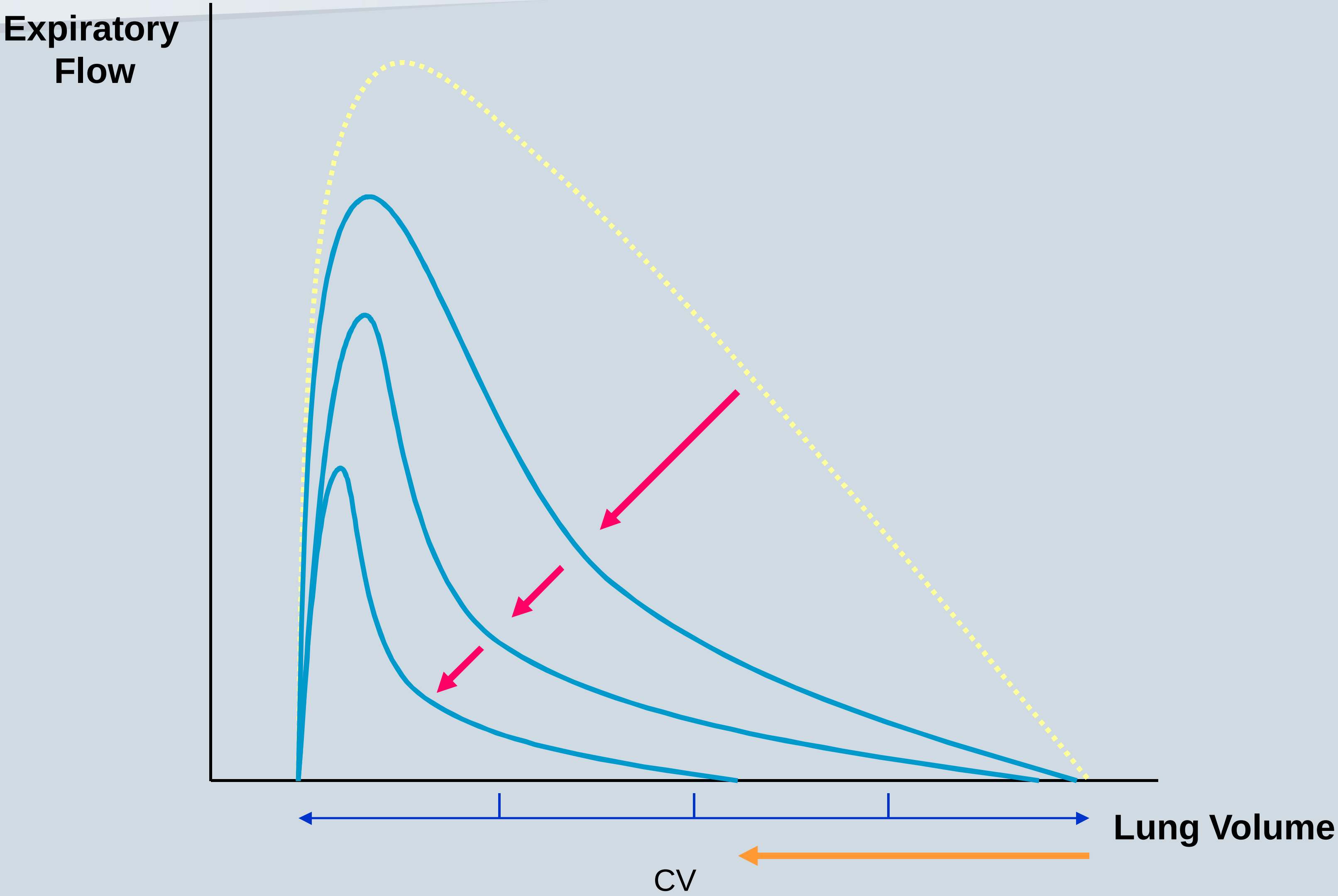
Adapter son traitement





Fouré, Kinesither Rev 2007;(70):46-51

Chaque jour est un autre jour…



Besoins

- Outil fiable
- Facile d'utilisation
- Hygiène
- Caractéristiques techniques particulières

Limitation actuelle

- Positionnement de la courbe à son niveau pulmonaire réel

Merci!