



Approche Clinico-Fonctionnelle du Diagnostic de l'Asthme

Pr Habib Ghedira
Tunis



Hôpital A. Mami - Ariana



Cabinet Pneumologue – Tunis

Cas Clinique 1

- Patient âgé de 28 ans, non tabagique, agent administratif, aux antécédents de rhinite allergique traité par de la cetirizine par petites cures, et qui se plaint de toux sèche et parfois d'oppression thoracique récidivantes tous les 3 à 4 jours surtout en période automnale. Il rapporte depuis 2 ans des sifflements thoraciques lors de certains épisodes de toux.
- Il rapporte aussi la notion d'une dyspnée à l'effort mMRC 1
- L'examen physique est normal.
- Dosage Vit D : 40 ng/ml

Aller au patient pour: ID / Nom Date naissance
7/18/1994
 Patient A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Visite
CVF
CV
VVM
SpO2
Résult.
Imprimer
POST Bd
Bronc Ch
Rx Test
Cherc.
HC test

Homme - Age 28 - 179 cm - 90 kg - Caucasion

Fiche de la visite valable à 10/6/2022

10/6/2022 6 CVF-PRE ; 1 POST-BD ; 1 CV ; 1 SpO2

Risques
Symptômes

N° années

Qté/jour

P/Y

Spirométrie

PRE-POST info...

Paramètres	LLN - ULN	Théor.	PRE	%théor.		POST	%théor.	%CHG
VEMS (L)	3.68 - 5.52	4.60	4.22	92		4.25	92	1
VEMS/CVF (%)	72.0 - 94.2	83.1	81.6	98		82.7	100	1
DEP (L/s)	6.43 - 13.26	9.85	9.65	98		10.89	111	13
CVF (L)	4.49 - 6.65	5.57	5.17	93		5.14	92	-1
AgeP (Age)		28	43	154		42	150	-2
DEM25-75 (L/s)	2.96 - 6.47	4.71	4.10	87		4.36	93	6
TEF (s)		6.00	6.10	102		5.99	100	-2
VEXT (mL)			98			73		-26

SPIROMETRIE PRE

Spirométrie Normale

CONCLUSIONS

(après bronchodilatation)

Spirométrie Normale
Bronchodil° NON significative

Interprétation



CVF



VEMS



VEMS%



Conclusion / Diagnostic (Spirométrie)

Oxymétrie -10/6/22 19:12:07— Temps total—00:08:12

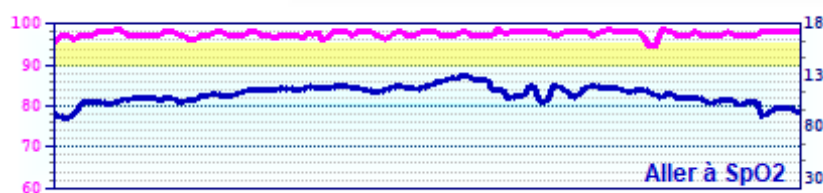
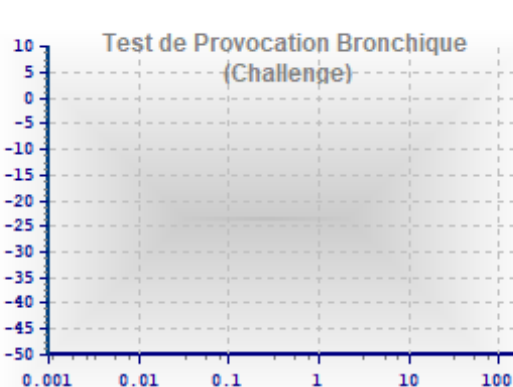
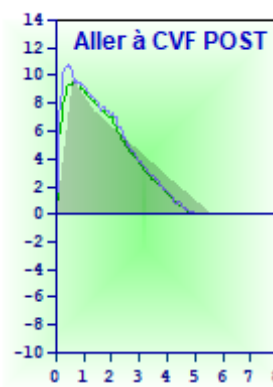
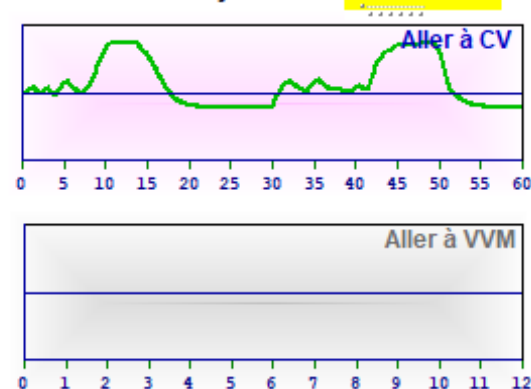
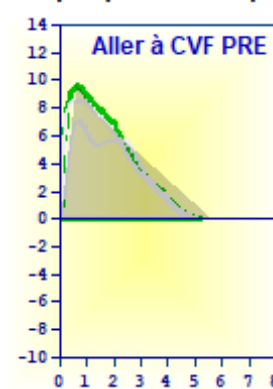
Oxymétrie (SpO2)/BPM

SpO2 Moy	97.3	BPM Moy	110.9	Δ Index	0.8
SpO2 Min	94	BPM Min	88	ODI- Index de désaturation (1/h)	--
SpO2 Max	99	BPM Max	131	Distance (m)	--
T90 (< 90%)	0%	T40 (< 40 BPM)	0%	Ligne de base dyspnée (Ech. Borg)	--
T89 (< 89%)	0%	T120 (> 120 BPM)	7.3%	Fin du test dyspnée (Echelle Borg)	--

Conclusion/ Rapport Medical (Oxymétrie)

Graphiques de la spirométrie et de l'oxymétrie

Trend



Cas Clinique 2

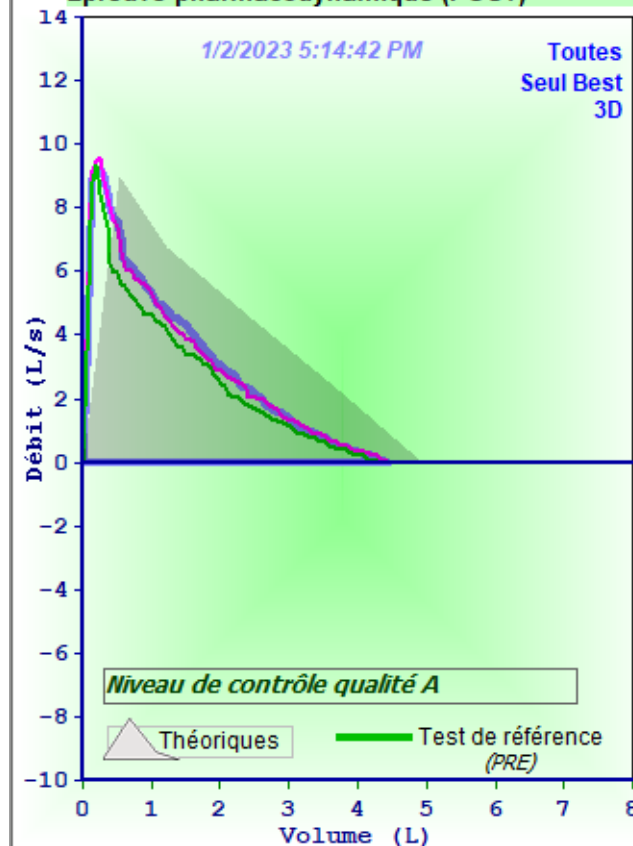
- Patient âgé de 30 ans, tabagique 5 cigarettes/j, comptable, sans antécédents particuliers, qui se plaint de toux sèche et de sifflements depuis 2 mois (au décours d'un épisode de COVID) persistants, pratiquement tous les jours.
- L'examen physique : quelques rares sibilants bilatéraux.

Aller au patient pour: ID / Nom Date naissance
 Patient 2/21/1992
 [A B C D E F G H I J K L M N O P Q R S T U V W X Y Z]

Visite CVF CV VVM SpO2 Résult. Imprimer POST Bd Bronc Ch Rx Test Cherc. HC test

Homme - Age 30 - 171 cm - 117 kg - Caucasien

Epreuve pharmacodynamique (POST)



- Sélectionner Référence
- Ref. Automatique
- Supprimer
- Exclure

Etape N° 1
Salbutamol 200 Mcg
Variation VEMS de PRE
+ 7 %

Liste des sessions CVF POST

1/2/2023 --> PRE

Conclusions / Diagnostic

 Courbe V-t Prov. Bronch. Info Test

Interprétation

SPIROMETRIE PRE

 Obstruction très légère
 WARNING: DEM25-75 PRE = 45%théor.

CONCLUSIONS (APRES BRONCHO -DILATATION)

 Obstruction très légère
 Bronchodil° NON significative
 WARNING: DEM25-75 PRE = 45%théor.

Reproductibilité

CVF reproductible, VEMS reproductible, DEP reproductible

Contrôle de la qualité



Paramètres	LLN - ULN	Théor.	PRE	%théor.	POST-BD	%théor.	%CHG	POST #1
VEMS (L)	3.26 - 4.92	4.09	2.95	72	3.17	77	7	3.17
VEMS/CVF (%)	72.2 - 94.0	83.1	67.4	81	70.0	84	4	71.4
DEP (L/s)	5.58 - 12.42	9.00	9.35	104	9.83	109	5	9.45
CVF (L)	3.98 - 5.91	4.94	4.38	89	4.53	92	3	4.44
AgeP (Age)		30	70	233	64	213	-9	64
DEM25-75 (L/s)	2.62 - 5.85	4.23	1.89	45	2.23	53	18	2.23
TEF (s)		6.00	7.13	119	5.39	90	-24	5.39
VEXT (mL)			37		9		-76	9
CVIF (L)	3.98 - 5.91	4.94	3.62	73				
VEMS/CV (%)	72.2 - 94.0	83.1						
VEM6 (L)	3.98 - 5.91	4.94	4.32	87	4.44	90	3	4.44



EUROPEAN RESPIRATORY JOURNAL
ERS OFFICIAL DOCUMENTS
S. STANOJEVIC ET AL.

ERS/ATS technical standard on interpretive strategies for routine lung function tests

Sanja Stanojevic ¹, David A. Kaminsky², Martin R. Miller ³, Bruce Thompson⁴, Andrea Aliverti⁵, Igor Barjaktarevic⁶, Brendan G. Cooper⁷, Bruce Culver⁸, Eric Derom⁹, Graham L. Hall¹⁰, Teal S. Hallstrand⁸, Joerg D. Leuppi^{11,12}, Neil MacIntyre¹³, Meredith McCormack¹⁴, Margaret Rosenfeld¹⁵ and Erik R. Swenson^{8,16}

- Eur Respir J 2022; 60: 2101499

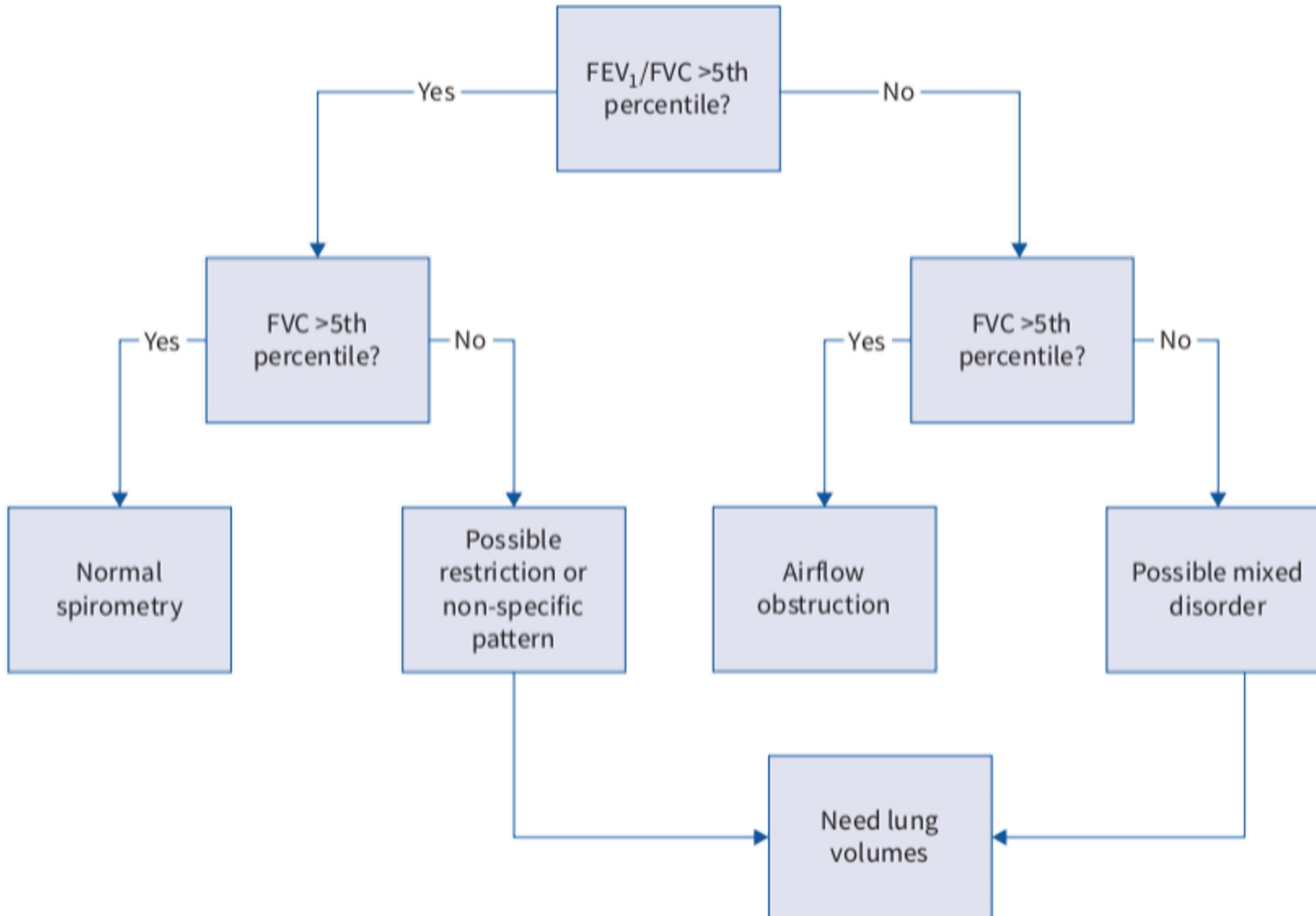
Statement ATS/ERS sur la spirométrie

2005 ATS/ERS statement

2021 ATS/ERS technical standard

Reference equations	• Use of race/ethnic-specific equations preferred over using adjustment factors	• Recommendation to use GLI reference equations for spirometry, lung volumes and D_{LCO} • Clarify that biological sex, not gender be used to interpret lung function
Defining normal range	• General use of LLN=5th percentile • Use of fixed ratio $FEV_1/FVC < 0.7$ not recommended • Use of 80% predicted to define normal not recommended	• General use of LLN=5th percentile and ULN=95th percentile • Use of fixed ratio $FEV_1/FVC < 0.7$ not recommended • Use of 80% predicted to define normal not recommended
Bronchodilator response	• $\geq 12\%$ and 200 mL in FEV_1 or FVC from baseline • 4 doses of 100 μg salbutamol; wait 15 min	• $> 10\%$ of predicted value in FEV_1 or FVC • Choice of protocol for administering bronchodilator not specified
Severity of lung function impairment	• Using FEV_1 (includes obstruction or restriction): - Mild: $FEV_1 > 70\%$ predicted - Moderate: 60–69% predicted - Moderate-to-severe: 50–59% predicted - Severe: 35–49% predicted - Very severe: $< 35\%$ predicted	• For all measures use z-score: - Mild: -1.65 to -2.5 - Moderate: -2.51 to -4.0 - Severe: < -4.1

L'interprétation chiffrée de la spirométrie : Recommandations ATS/ERS



Z-Score

Limites de la normale

les limites du 5ème and 95ème percentile (-1.645 and $+1.645$ z-score) de la population en bonne santé est utilisée pour identifier les individus avec des mesures inhabituellement et respectivement basses ou élevées.

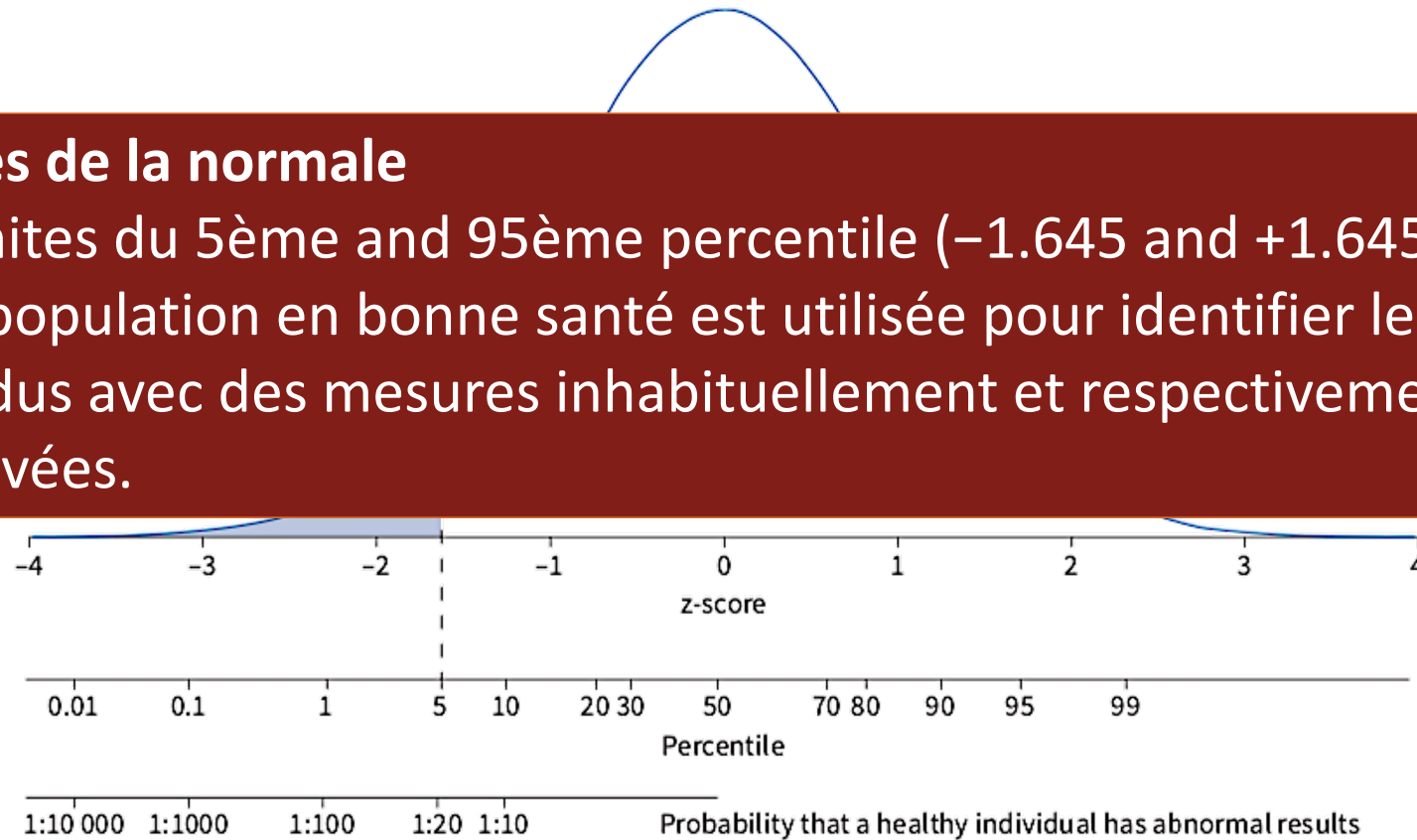


FIGURE 2 The normal distribution with z-scores and percentiles displayed. Percentile can be interpreted as the probability that a healthy individual has results inside the normal range (*i.e.* the false-positive rate).

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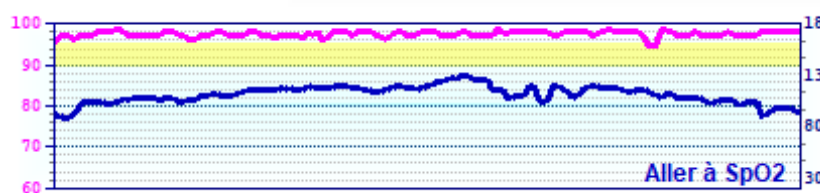
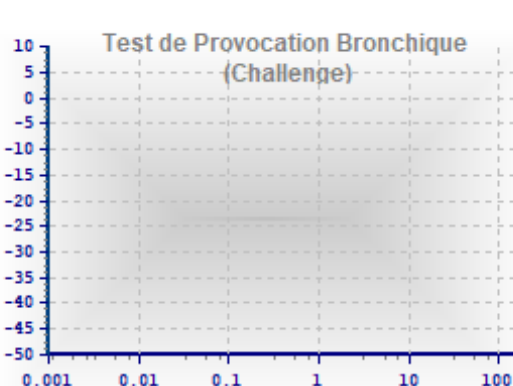
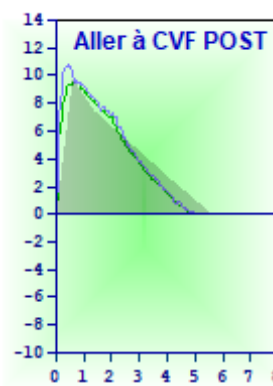
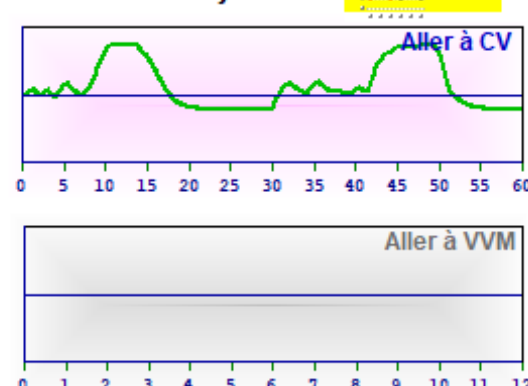
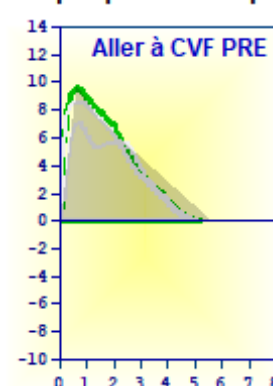
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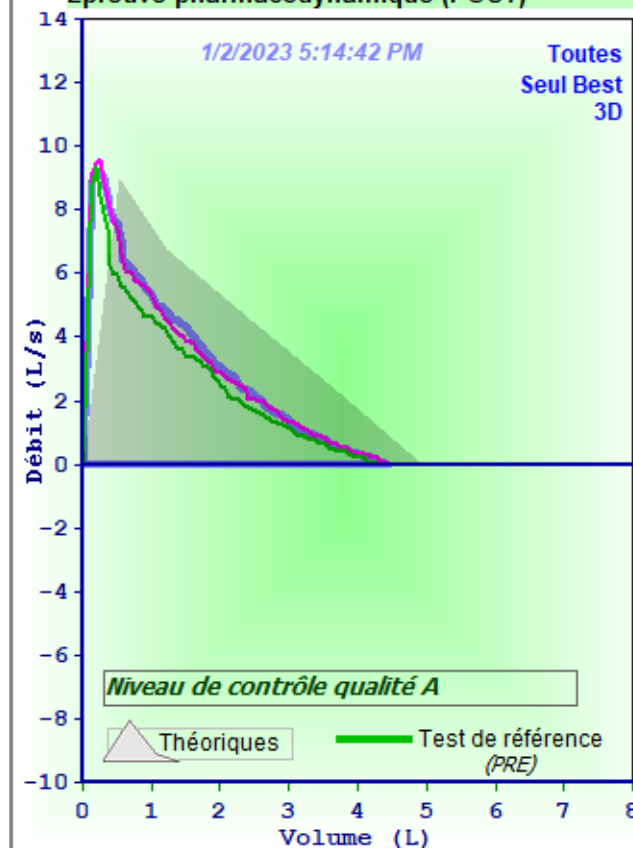


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Courbe V-t

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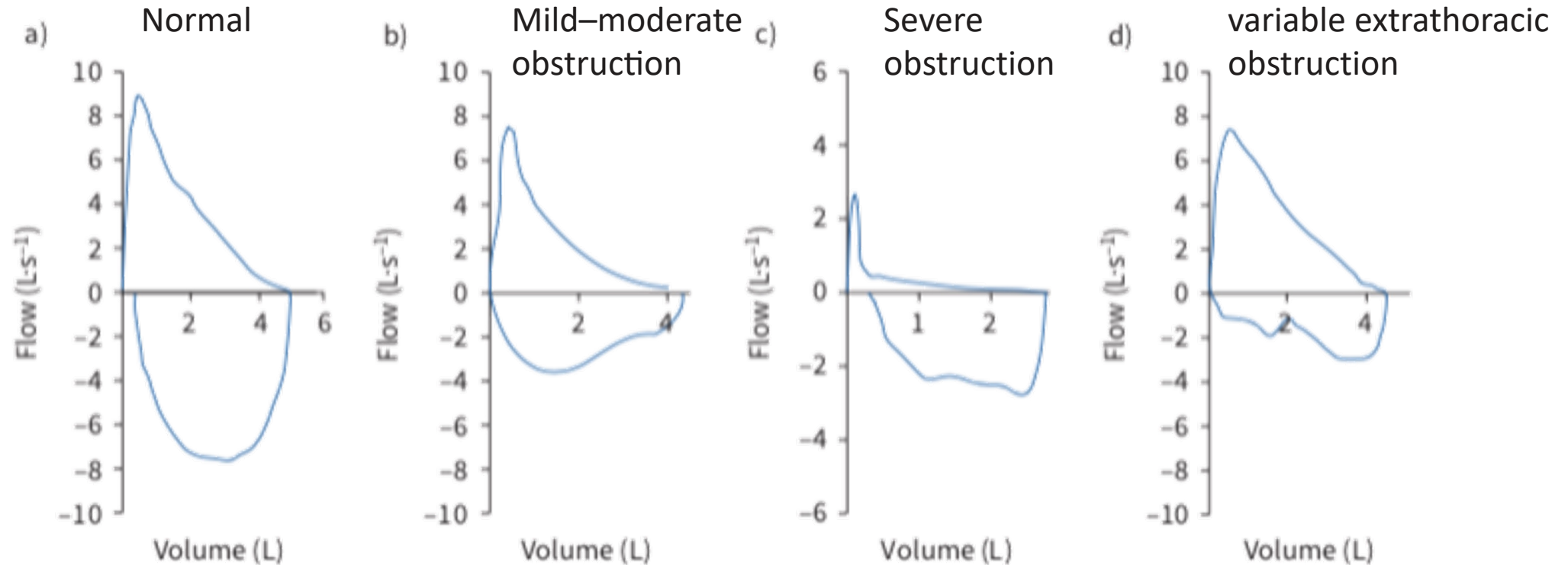
	PRE	POST		PRE	POST		PRE	POST		PRE	POST
CVF			VEMS			VEMS%					
Paramètres	LLN - ULN	Théor.	PRE	%théor.	Z-score	POST-BD	%théor.	%CHG	POST #1		
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Activa

Go to Se

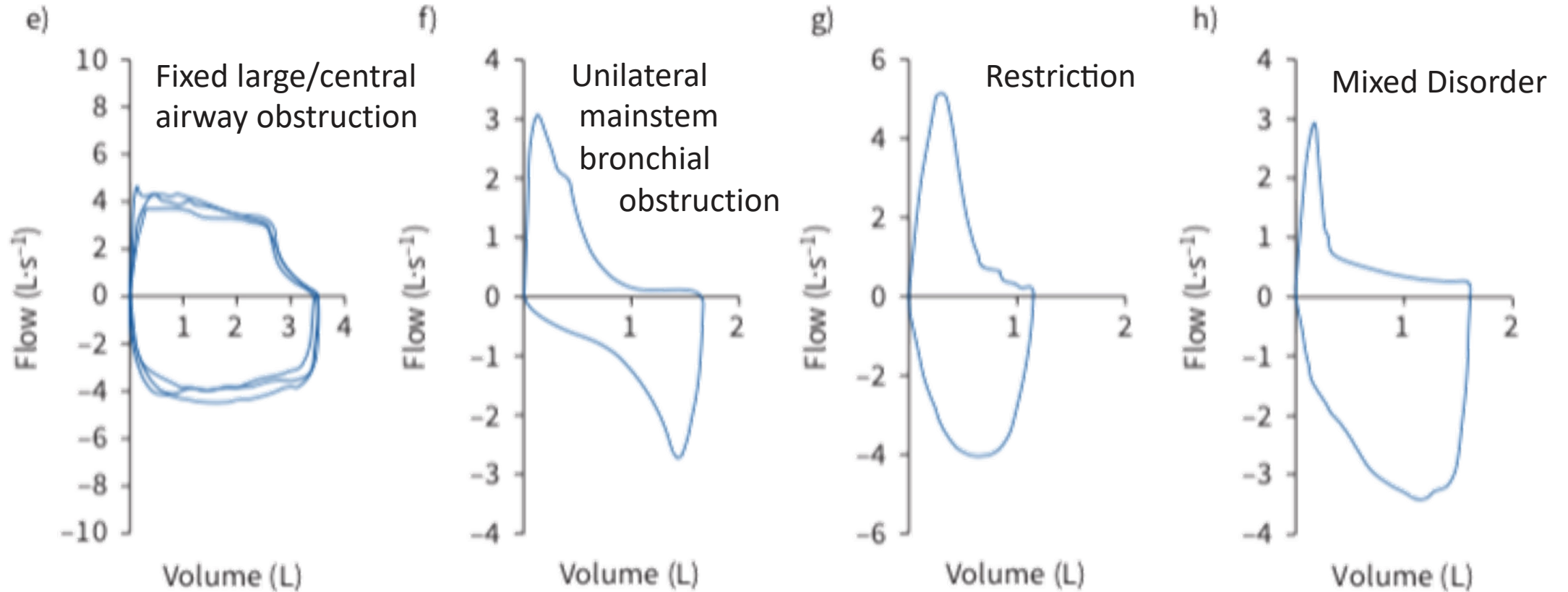
L'interprétation de la spirométrie : les aspects visuels

ERS/ATS technical standard on interpretive strategies for routine lung function tests 2021



L'interprétation de la spirométrie : les aspects visuels

ERS/ATS technical standard on interpretive strategies for routine lung function tests 2021



L'interprétation de la spirométrie : les aspects visuels

La Curvilinearité de la Courbe Débit-Volume

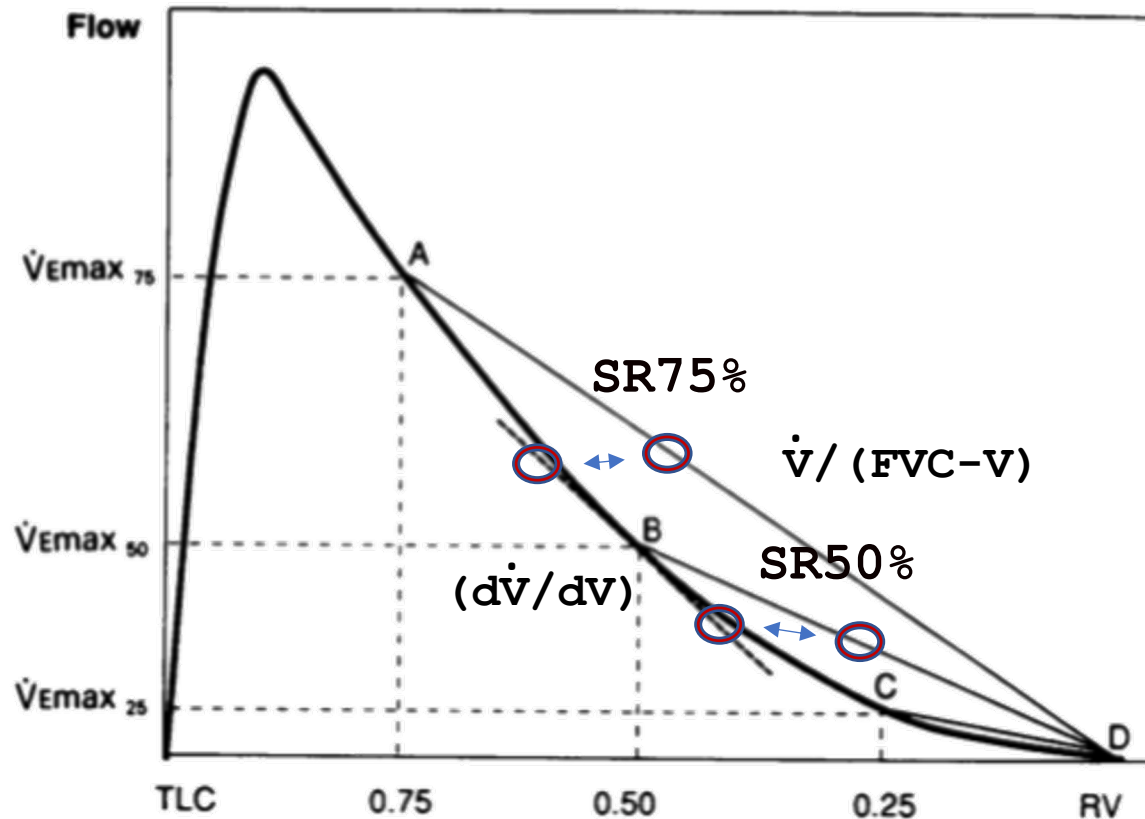
$$\text{Slope Ratio (SR)} = \frac{(\dot{dV}/dV)}{\dot{V}/(FVC-V)}$$

Shape Factor (SF) =

$$SF50 = 1/2 (\dot{V}_{E \max 50} / \dot{V}_{E \max 25})$$

$$SF75 = 1/3 (\dot{V}_{E \max 75} / \dot{V}_{E \max 25})$$

Mead J. Analysis of the configuration of maximum expiratory flow-volume curves. *J Appl Physiol* 1978; 44:156-65.



Thorax 1989;44:1015-1021

Fourteen patients (12 male and two female) with allergic asthma (mean age 26, range 18–36 years) gave their informed consent to participate in the study. The

Table 2 Mean (SEM*) maximal expiratory flow volume values (% predicted¹²) before and after treatment

	<i>Budesonide</i>			<i>Ipratropium bromide</i>		
	<i>Baseline</i>	<i>After treatment</i>	<i>p†</i>	<i>Baseline</i>	<i>After treatment</i>	<i>p†</i>
FVC	98 (2)	103 (2)	< 0.005	101 (2)	104 (2)	< 0.001
FEV ₁	86 (2)	96 (2)	< 0.001	86 (3)	95 (2)	< 0.001
PEF	91 (3)	108 (4)	< 0.01	95 (4)	108 (4)	< 0.001
$\dot{V}_E$ max ₇₅	66 (6)	80 (4)	< 0.01	67 (7)	82 (6)	< 0.001
$\dot{V}_E$ max ₅₀	58 (5)	70 (4)	< 0.005	59 (5)	72 (6)	< 0.001
$\dot{V}_E$ max ₂₅	48 (6)	69 (5)	< 0.001	51 (6)	63 (6)	< 0.001

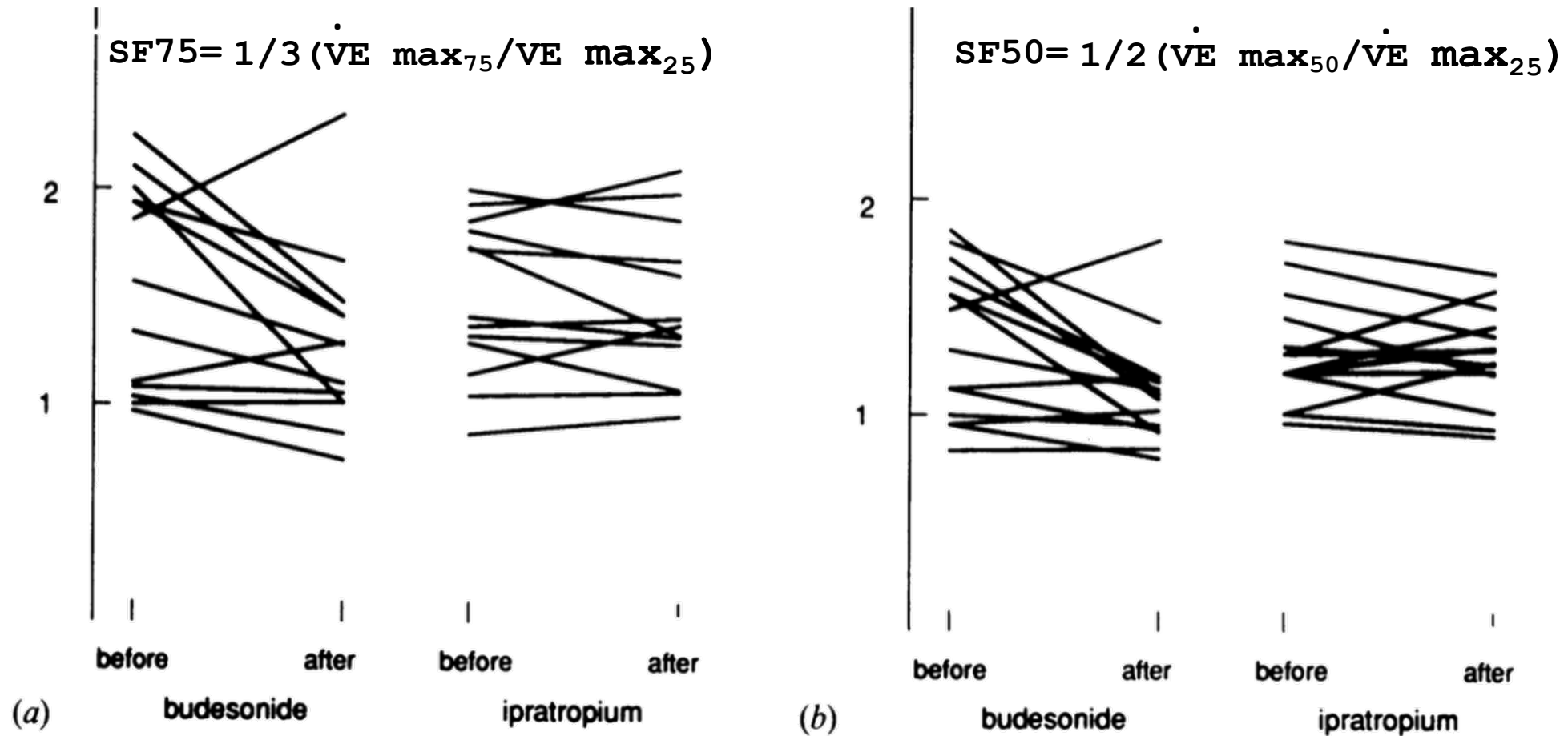
*The sample SEM.

†Significance of differences assessed by paired *t* tests.

Abbreviations as in table 1.

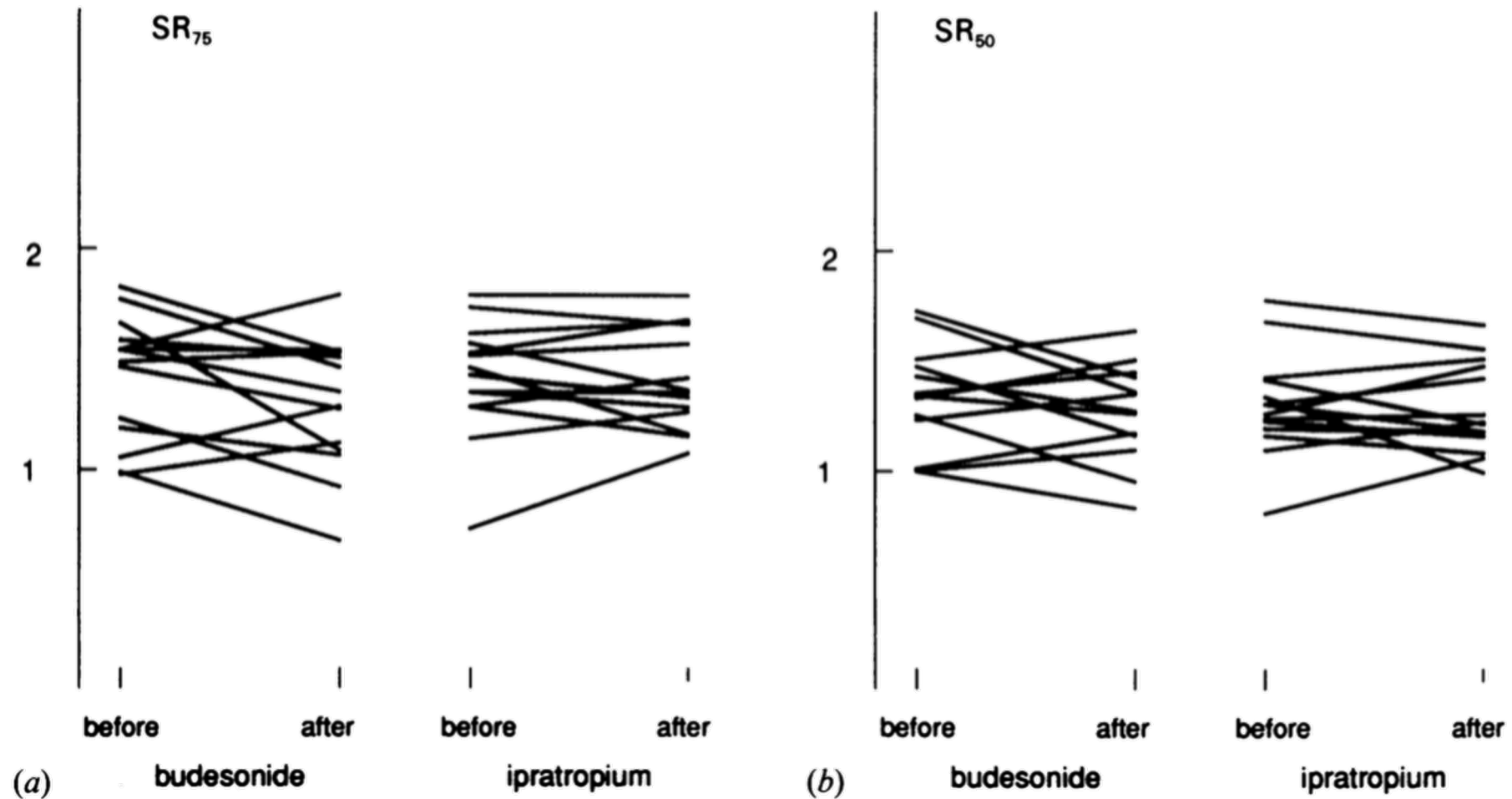
L'interprétation de la spirométrie : les aspects visuels

Modifications de la curvilinearité de la courbe débit-volume



L'interprétation de la spirométrie : les aspects visuels

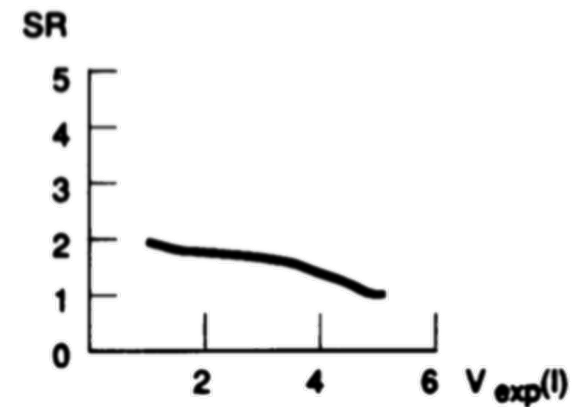
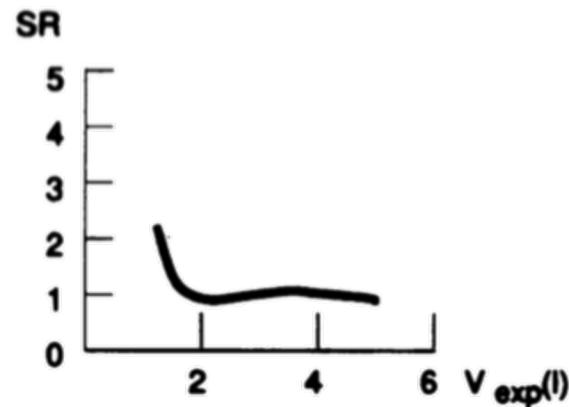
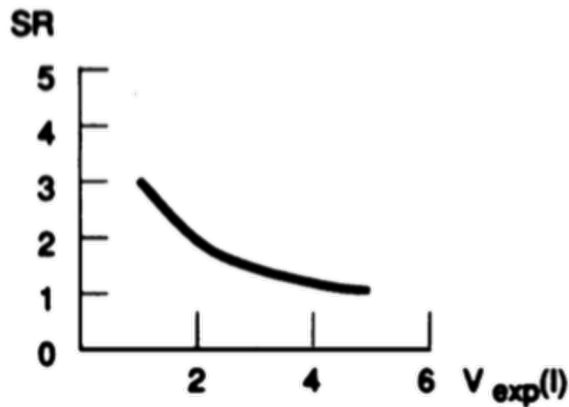
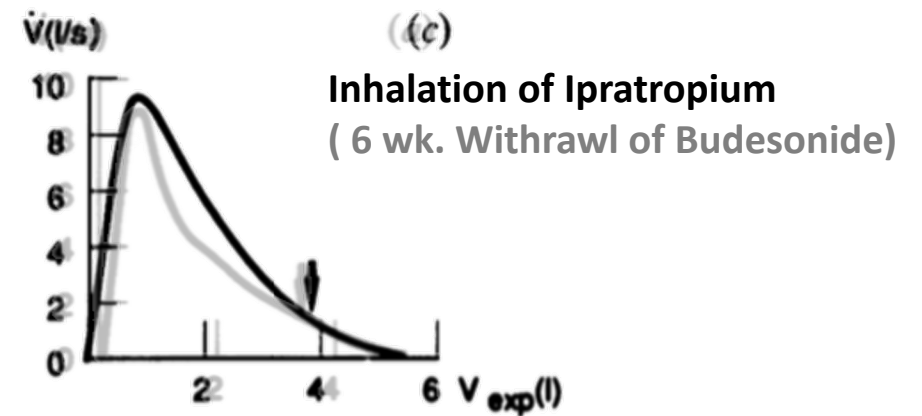
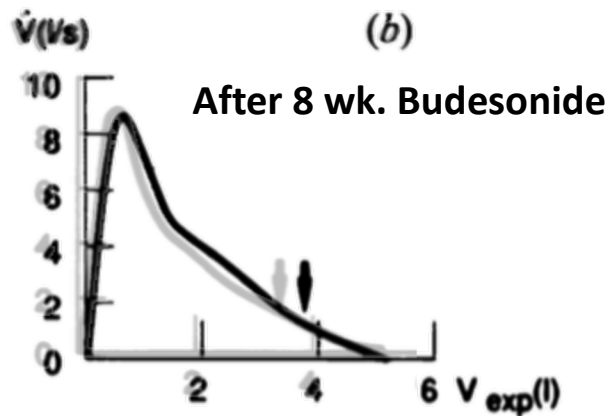
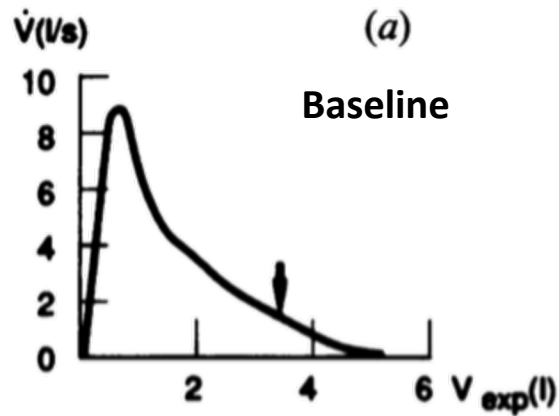
Modifications de la curvilinearité de la courbe débit-volume



L'interprétation de la spirométrie : les aspects visuels

La Curvilinéarité de la Courbe Débit-Volume

Changes in maximum expiratory flow-volume curve configuration after treatment with inhaled corticosteroids 1019



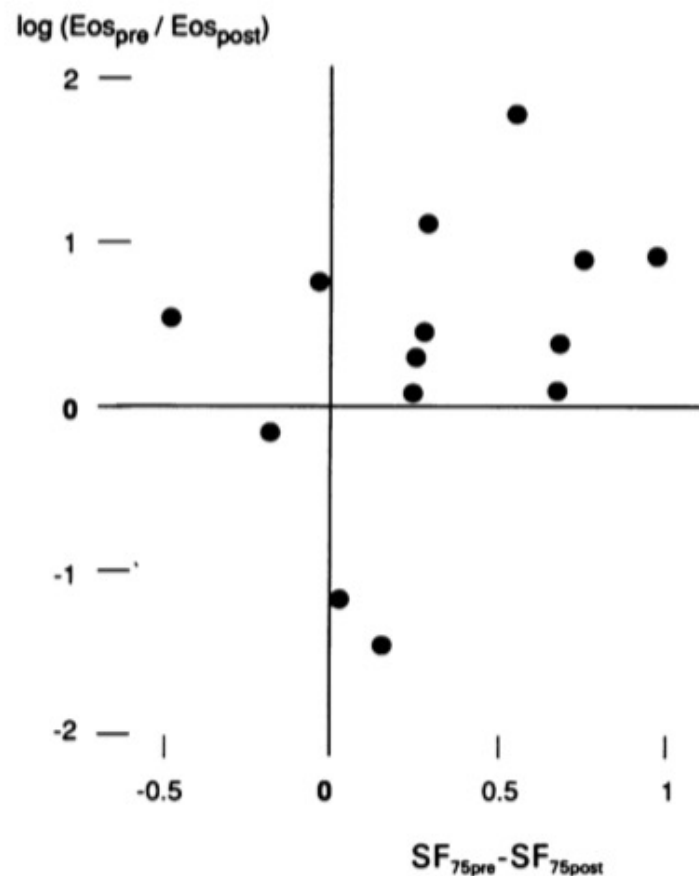
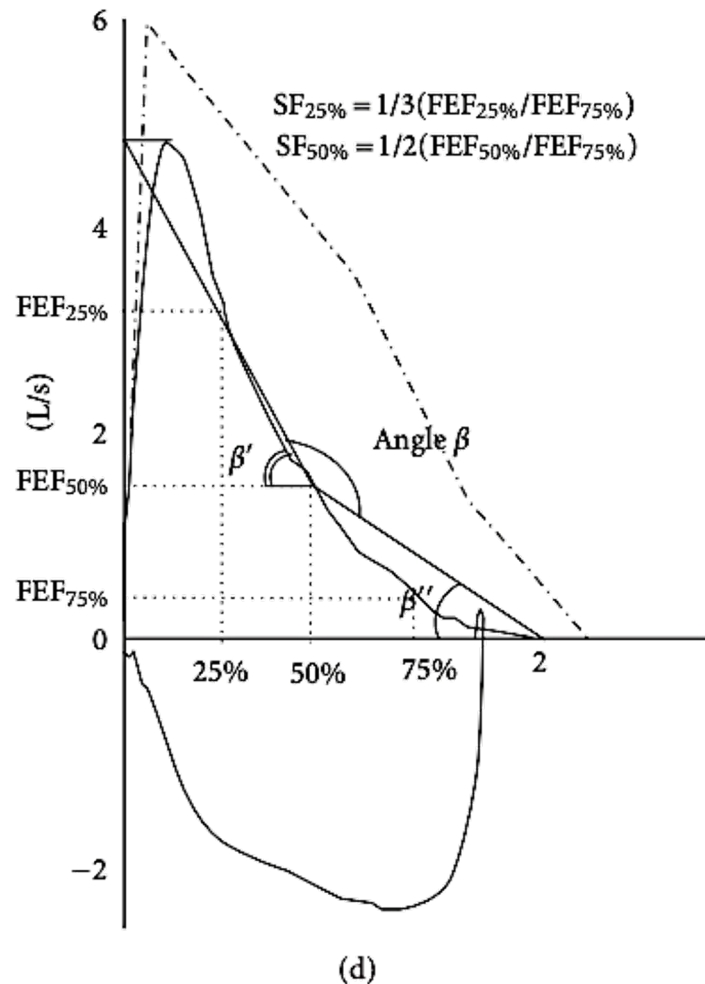


Fig 5 Scatterplot of the logarithm of the ratio of blood eosinophil cell counts (Eos) and change in the shape factor (SF_{75}) after treatment with budesonide.

We conclude that treatment with an inhaled corticosteroid causes an increase in maximal expiratory flows and a decrease in the abnormal curvilinearity of the MEFV curve in patients with allergic asthma. This effect is probably due to a decrease in inhomogeneously distributed inflammatory airway narrowing. This reduction in the curvilinearity of the MEFV curve was not seen after bronchodilatation by a single dose of ipratropium despite a similar increase in FEV_1 .

L'interprétation de la spirométrie : les aspects visuels

Visuel de la courbe débit-volume : Angle β



27 non-smoking asthmatic patients with physician-confirmed wheeze and positive bronchial reversibility after a short-acting β_2 -agonist inhalation.

Shape Factor

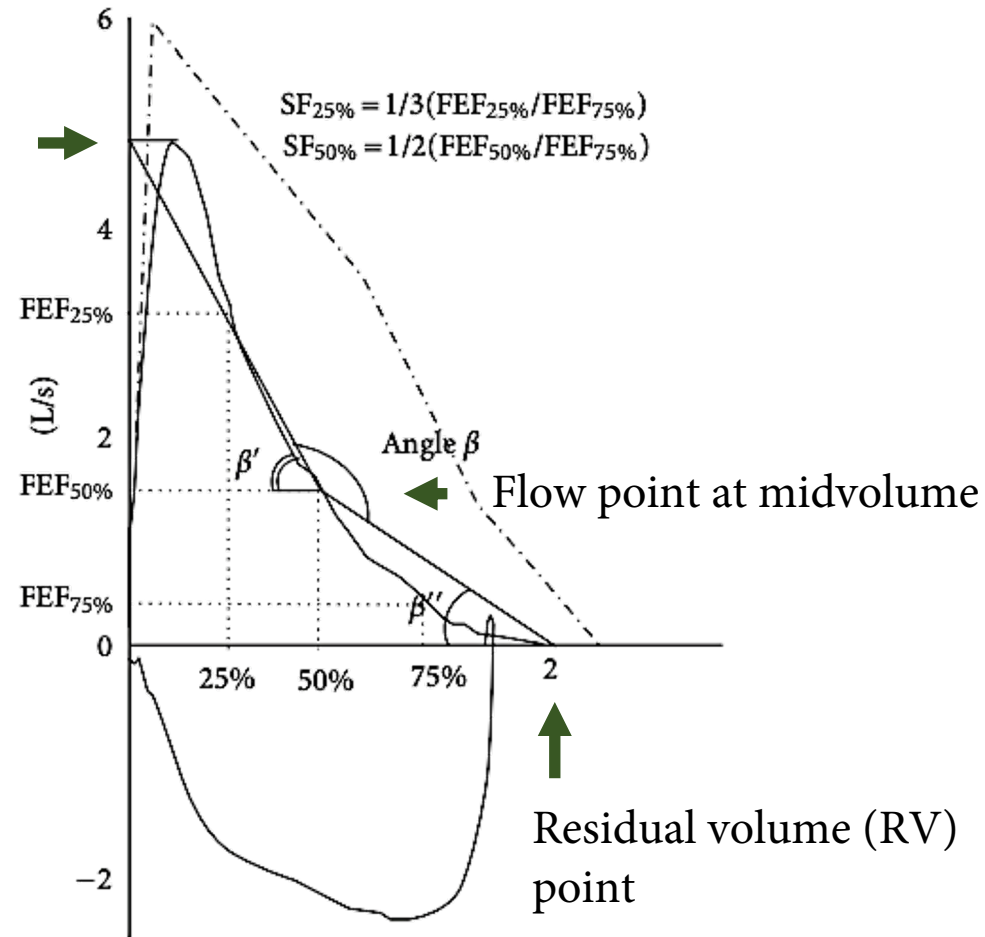
$$SF_{25\%} = 1/3(DEMM_{25\%}/DEMM_{75\%})$$

$$SF_{50\%} = 1/3(DEMM_{50\%}/DEMM_{75\%})$$

L'interprétation de la spirométrie : les aspects visuels

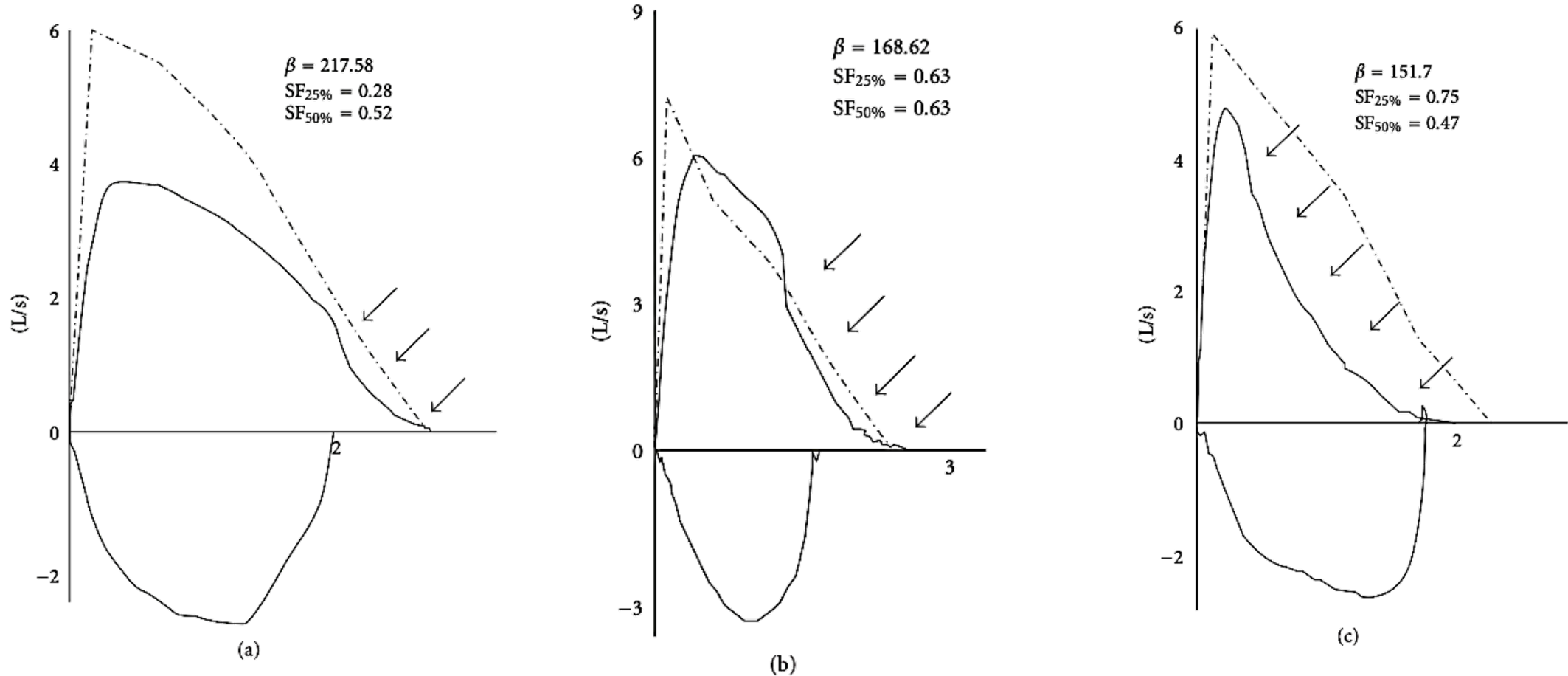
Visuel de la courbe débit-volume : Angle β

Point at the level of the total lung capacity →



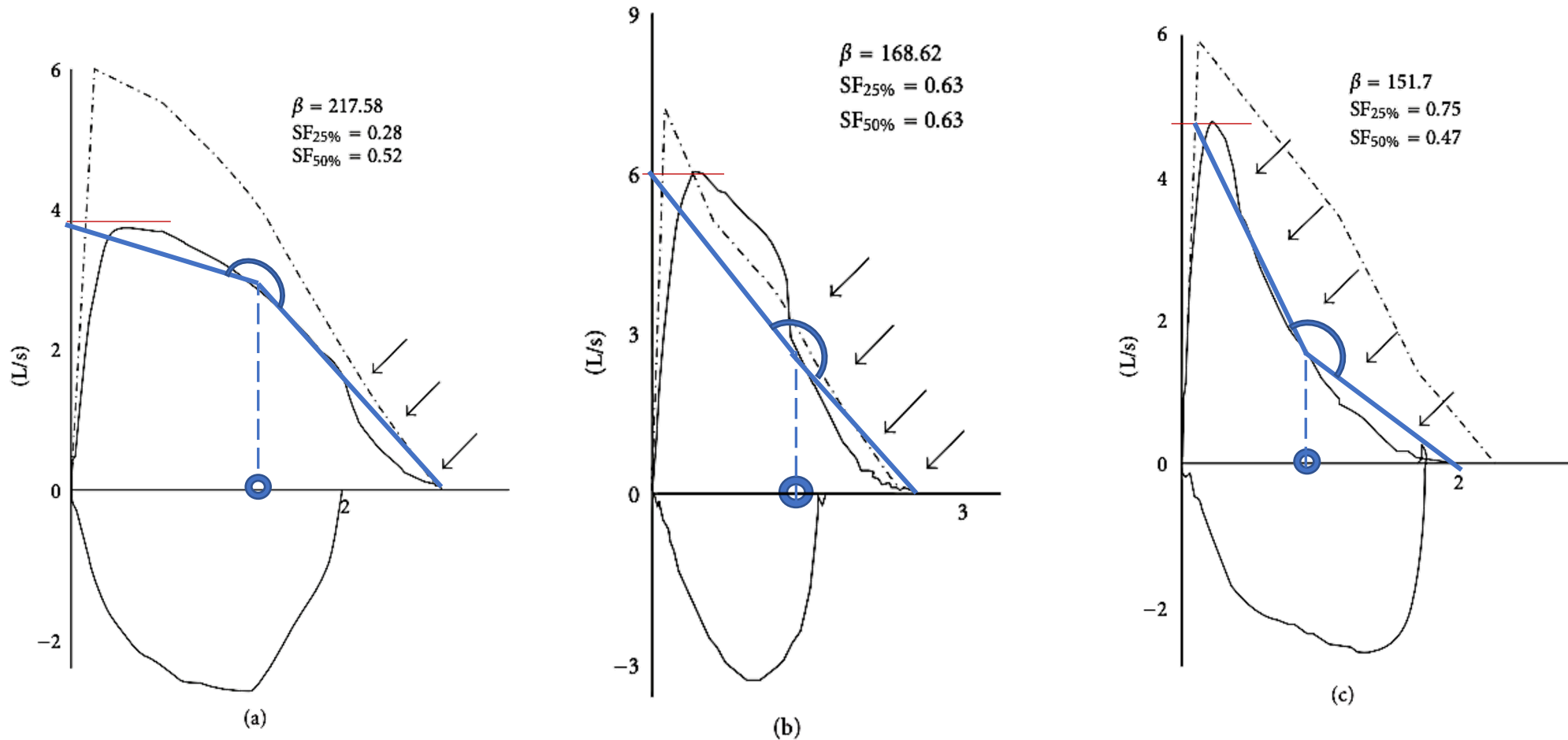
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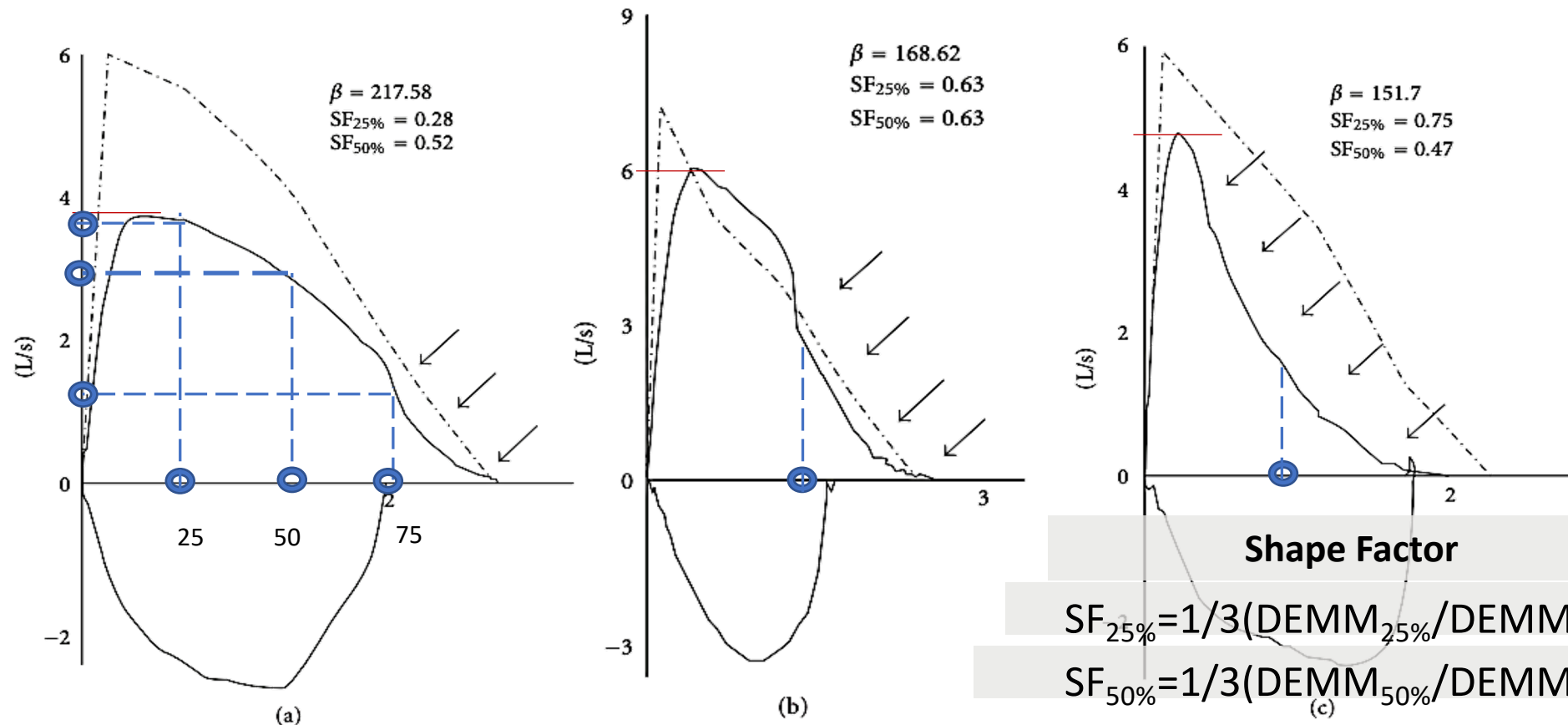
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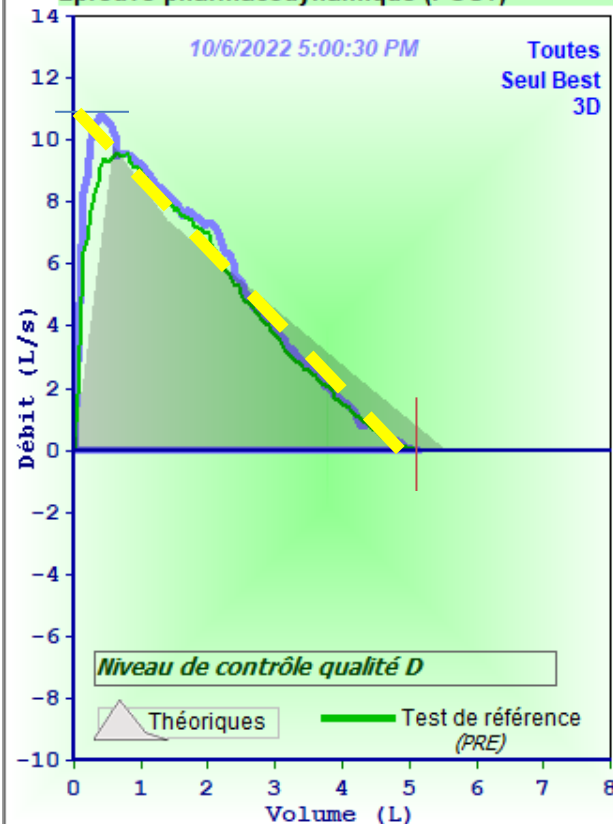
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Bronc Ch
Rx Test
Cherc.
HC test

Âge 28 - 179 cm - 90 kg - Caucasiens

Epreuve pharmacodynamique (POST)



- Sélectionner Référence
- Ref. Automatique
- Supprimer
- Exclure

Etape N° 1

Salbutamol 200 Mcg

Variation VEMS de PRE

+ 1 %

Liste des sessions CVF POST

10/6/2022

--> PRE

Conclusions / Diagnostic

Courbe V-t

Prov. Bronch.

Info Test

Interprétation

SPIROMETRIE PRE

Spirométrie Normale

CONCLUSIONS (APRES BRONCHO -DILATATION)

Spirométrie Normale

Bronchodil* NON significative

Reproductibilité

Contrôle de la qualité

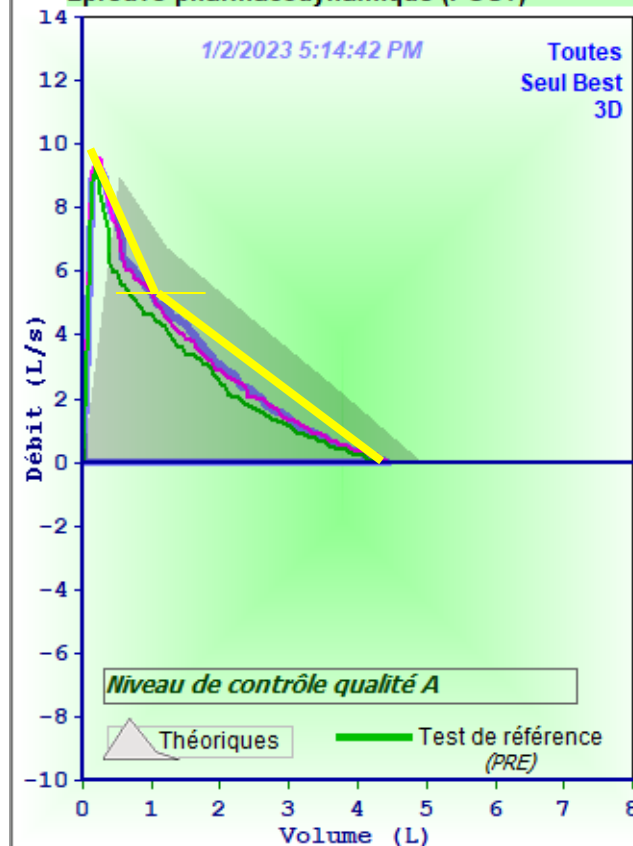
	CVF			VEMS			VEMS%		
	PRE	↓	POST	PRE	↓	POST	PRE	↓	POST
Paramètres	LLN - ULN	Théor.	PRE	%théor.	Z-score	POST-BD	%théor.	%CHG	POST #1
VEMS (L)	3.68 - 5.52	4.60	4.22	92	-0.69	4.25	92	1	4.25
VEMS/CVF (%)	72.0 - 94.2	83.1	81.6	98	-0.24	82.7	100	1	82.7
DEP (L/s)	6.43 - 13.26	9.85	9.65	98	-0.09	10.89	111	13	10.89
CVF (L)	4.49 - 6.65	5.57	5.17	93	-0.61	5.14	92	-1	5.14
AgeP (Age)		28	43	154		42	150	-2	42
DEM25-75 (L/s)	2.96 - 6.47	4.71	4.10	87	-0.53	4.36	93	6	4.36
TEF (s)		6.00	6.10	102		5.99	100	-2	5.99
VEXT (mL)			98			73		-26	73
CVIF (L)	4.49 - 6.65	5.57	3.87	69	-2.61	3.67	66	-5	3.67
VEMS/CV (%)	72.0 - 94.2	83.1	85.9	103	0.48				
VEM6 (L)	4.49 - 6.65	5.57	5.17	93	-0.61	5.14	92	-1	5.14

Aller au patient pour: ID / Nom Date naissance
 Patient 2/21/1992
 [A B C D E F G H I J K L M N O P Q R S T U V W X Y Z]

Visite CVF CV VVM SpO2 Résult. Imprimer POST Bd Bronc Ch Rx Test Cherc. HC test

Homme - Age 30 - 171 cm - 117 kg - Caucasien

Epreuve pharmacodynamique (POST)



- Sélectionner Référence
- Ref. Automatique
- Supprimer
- Exclure

Etape N° 1
Salbutamol 200 Mcg

Variation VEMS de PRE
+ 7 %

Liste des sessions CVF POST

1/2/2023 --> PRE

Conclusions / Diagnostic

Courbe V-t Prov. Bronch. Info Test

Interprétation

SPIROMETRIE PRE

Obstruction très légère
WARNING: DEM25-75 PRE = 45%théor.

CONCLUSIONS (APRES BRONCHO -DILATATION)

Obstruction très légère
Bronchodil° NON significative
WARNING: DEM25-75 PRE = 45%théor.

Reproductibilité

CVF reproductible, VEMS reproductible, DEP reproductible

Contrôle de la qualité

	PRE	POST		PRE	POST		PRE	POST		PRE	POST
CVF			VEMS			VEMS%					
Paramètres	LLN - ULN	Théor.	PRE	%théor.	Z-score	POST-BD	%théor.	%CHG	POST #1		
VEMS (L)	3.26 - 4.92	4.09	2.95	72	-2.25	3.17	77	7	3.17		
VEMS/CVF (%)	72.2 - 94.0	83.1	67.4	81	-2.25	70.0	84	4	71.4		
DEP (L/s)	5.58 - 12.42	9.00	9.35	104	0.17	9.83	109	5	9.45		
CVF (L)	3.98 - 5.91	4.94	4.38	89	-0.96	4.53	92	3	4.44		
AgeP (Age)		30	70	233		64	213	-9	64		
DEM25-75 (L/s)	2.62 - 5.85	4.23	1.89	45	-2.56	2.23	53	18	2.23		
TEF (s)		6.00	7.13	119		5.39	90	-24	5.39		
VEXT (mL)			37			9		-76	9		
CVIF (L)	3.98 - 5.91	4.94	3.62	73	-2.26						
VEMS/CV (%)	72.2 - 94.0	83.1									
VEM6 (L)	3.98 - 5.91	4.94	4.32	87	-1.06	4.44	90	3	4.44		

L'interprétation de la spirométrie : les aspects visuels

Visuel de la courbe débit-volume : Angle β

TABLE 2: Correlation between % changes of angle β , SF_{25%}, and SF_{50%} and % changes of spirometric parameters after SABA inhalation.

	Angle β versus		SF _{25%} versus		SF _{50%} versus	
	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>
FVC (% change)	0.0043	0.98	−0.085	0.57	−0.32	0.11
FEV ₁ (% change)	0.32	0.1	−0.23	0.24	−0.32	0.1
PEF (% change)	−0.15	0.47	0.096	0.63	0.0067	0.97
FEF _{25–75%} (% change)	0.57	0.0017	−0.43	0.024	−0.31	0.12
FEF _{25%} (% change)	0.075	0.71	−0.12	0.54	−0.35	0.074
FEF _{50%} (% change)	0.71	<0.0001	−0.35	0.078	−0.25	0.21
FEF _{75%} (% change)	0.47	0.013	−0.53	0.0046	−0.54	0.0041
SF _{50%} (% change)	0.12	0.54	−0.9	<0.0001	—	—
SF _{25%} (% change)	0.33	0.089	—	—	—	—
Angle β (% change)	—	—	—	—	—	—

Bold text indicates significant correlation between the parameters.

L'interprétation de la spirométrie : les aspects visuels

Visuel de la courbe débit-volume : Angle β

In our analysis, angle β proposed by Kapp et al. reflected the configuration of the MEFV curve. Based on our definition of the concave shape, direct observation of the curve is simple. Even a patient with the curve seen in Figure 1(a) has wheeze and positive bronchial reversibility. Of note, two patients (7.4%) with wheeze and positive bronchial reversibility had normal values of FEV₁, FEV₁/FVC, and PEF, but showed a concave shape in their MEFV curves.

Here, we emphasize the importance of the shape of the MEFV curve as a simple indicator of airflow limitation, even in patients with normal values of FEV₁, PEF, and FEV₁/FVC.

OPEN

The Concavity of the Maximal Expiratory Flow–Volume Curve Reflects the Extent of Emphysema in Obstructive Lung Diseases

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Scientific Reports |

(2019) 9:13159 | <https://doi.org/10.1038/s41598-019-49591-2>

The Obstructive Index

MFEV Curve

CT-Scan

COPD, ACO, and asthma (N = 65, 15, and 53, respectively).

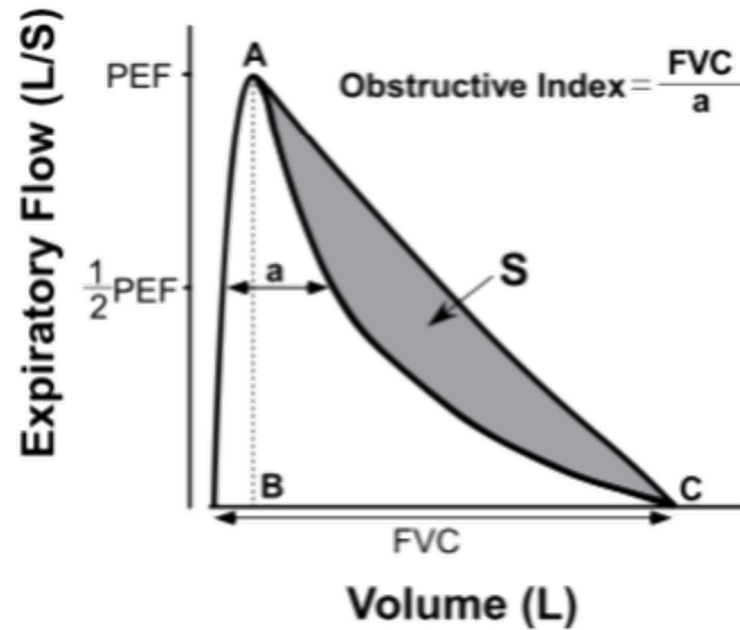
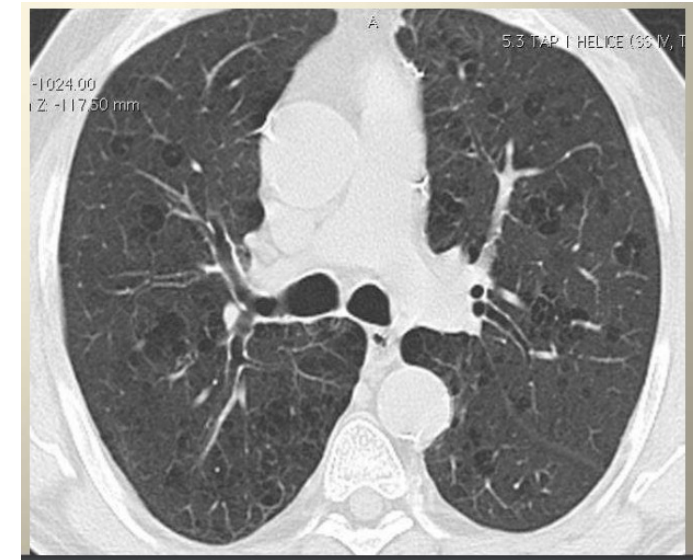


Figure 6. Schematic illustration of Obstructive Index.



LAV% (Low-Attenuation Volume)

WA% (Wall Area)

The Obstructive Index

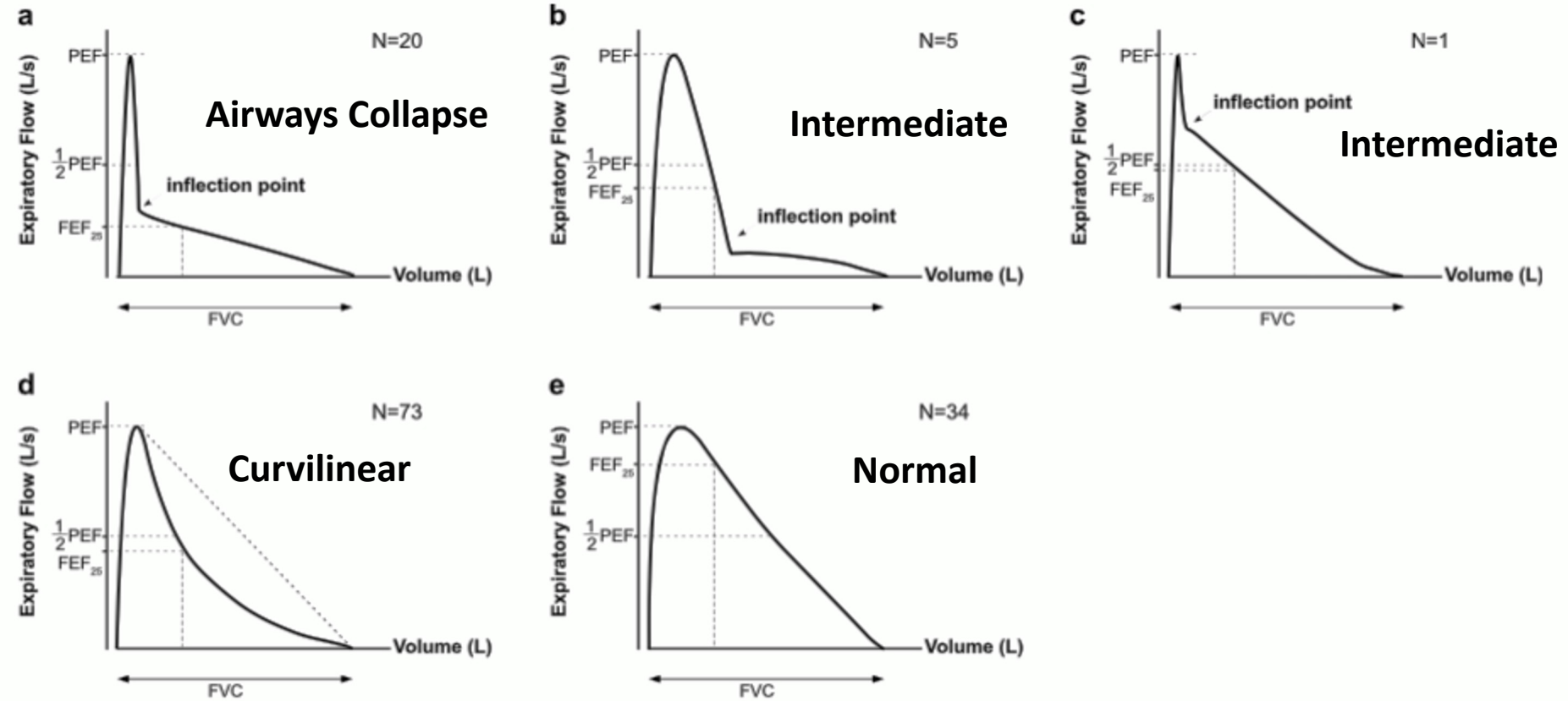
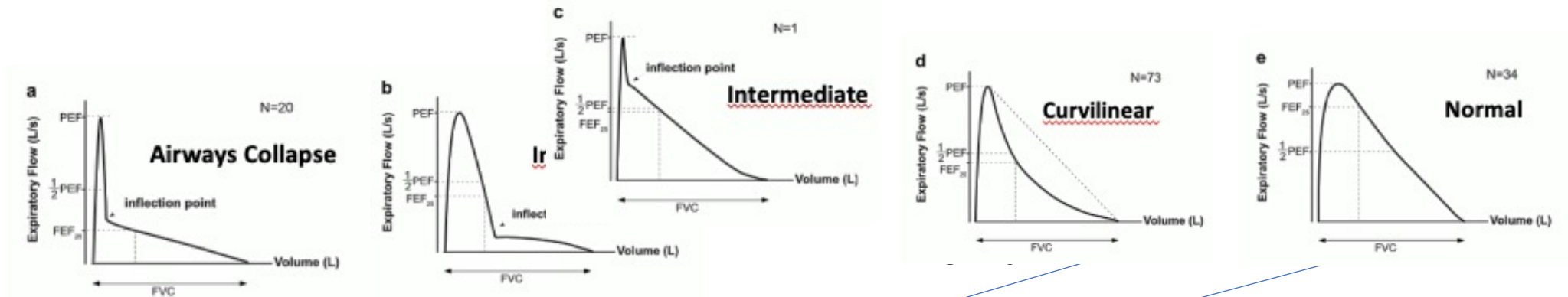


Figure 2. Schematic representation of MEFV curves. The AC (a) has an abrupt decrease in flow rate and an

The Obstructive Index

Relationship between visual assessment of the MEFV Curve and the Obstructive Index



	AC (n = 20)	Int (n = 6)	C (n = 73)	N (n = 34)	P (All Groups Omnibus Test)	P (AC vs Int)	P (AC vs C)	P (C vs N)
Obstructive Index	7.92 (6.18 to 10.90)	4.91 (3.92 to 6.33)	3.81 (2.91 to 4.95)	2.23 (1.70 to 2.49)	<0.0001	0.034	<0.0001	<0.0001
LAV%	37.3 (22.8 to 53.5)	21.0 (17.4 to 40.1)	15.6 (3.9 to 25.0)	2.1 (0.58 to 13.0)	<0.0001	0.764	0.002	0.002

The Obstructive Index

The Obstructive Index and the Obstructive Diseases

Characteristic	ALL (n = 133)	COPD (n = 65)	ACO (n = 15)	BA (n = 53)	<i>P</i> (Kruskal- Wallis test)	<i>P</i> (COPD vs ACO)	<i>P</i> (ACO vs BA)	<i>P</i> (COPD vs BA)
Obstructive Index	3.54 (2.44 to 5.68)	4.82 (3.41 to 7.69)	4.42 (3.48 to 6.13)	2.34 (1.90 to 3.10)	<0.0001	0.801	0.0001	<0.0001
LAV, ml	711.6 (91.9 to 1530.1)	1287.1 (565.7 to 2157.9)	534.2 (133.7 to 1504.1)	95.3 (13.5 to 862.0)	<0.0001	0.119	0.078	<0.0001
LAV%	15.3 (2.15 to 29.9)	23.5 (12.9 to 40.3)	11.6 (2.1 to 26.2)	2.7 (0.4 to 15.9)	<0.0001	0.113	0.068	<0.0001

De la
présumption
Clinique

À la décision



Probabilité Pré-test (Clinique) d'Asthme

Indicator	Regression coefficient	Odds ratio (95% CI)	p Value	Score points*
Indicator (I):				
Wheezing as symptom	0.42	1.52 (0.91 to 2.55)	0.14	0
Diurnal variation of symptoms	0.91	2.47 (1.67 to 3.67)	0.002	1
Recurrent episodes of symptoms	1.32	3.72 (2.11 to 6.56)	≤0.001	2
Medical history of allergic diseases	0.87	2.39 (1.61 to 3.55)	0.001	1
Family history of allergic diseases	0.17	1.19 (0.73 to 1.93)	0.46	0
Indicator (II):				
Wheeze sound	1.30	3.68 (1.78 to 7.62)	0.002	2

*Score points are assigned using consequent value of regression coefficient.

Patient âgé de 28 ans, non tabagique, agent administratif, aux antécédents de rhinite allergique traité par de la cetirizine par petites cures et qui se plaint depuis 2 mois d'une 'gène' thoracique persistante mais variable dans la journée. Il rapporte des sifflements thoraciques lors de certains épisodes de toux.

L'examen physique est normal.

Pre-test probability of asthma

High probability
Symptom-sign score = ≥ 3
(accuracy = 90%)

Intermediate probability
Symptom-sign score = 1, 2
(accuracy = 68%)

Low probability
Symptom-sign score = 0
(accuracy = 31%)

Probabilité Pré-test (Clinique) d'Asthme



Indicator	Regression coefficient	Odds ratio (95% CI)	p Value	Score points*
Indicator (I):				
Wheezing as symptom	0.42	1.52 (0.91 to 2.55)	0.14	0
Diurnal variation of symptoms	0.91	2.47 (1.67 to 3.67)	0.002	1
Recurrent episodes of symptoms	1.32	3.72 (2.11 to 6.56)	≤0.001	2
Medical history of allergic diseases	0.87	2.39 (1.61 to 3.55)	0.001	1
Family history of allergic diseases	0.17	1.19 (0.73 to 1.93)	0.46	0
Indicator (II):				
Wheeze sound	1.30	3.68 (1.78 to 7.62)	0.002	2

*Score points are assigned using consequent value of regression coefficient.

Patient âgé de 30 ans, non tabagique, agent administratif, aux antécédents de rhinite allergique traité par de la cetirizine par petites cures et qui se plaint depuis 2 mois d'une 'gène' thoracique persistante mais variable dans la journée. Il rapporte des sifflements thoraciques lors de certains épisodes de toux.

L'examen physique est normal.

2

Pre-test probability of asthma

High probability
Symptom-sign score = ≥3
(accuracy = 90%)

Intermediate probability
Symptom-sign score = 1, 2
(accuracy = 68%)

Low probability
Symptom-sign score = 0
(accuracy = 31%)

TABLE 3 General sample: diagnostic parameters of bronchodilator reversibility cut-off points for current doctor-diagnosed asthma and asthma-COPD overlap (ACO)

	Sensitivity % (95% CI)	Specificity % (95% CI)	Positive predictive value % (95% CI)	Negative predictive value % (95% CI)	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Diagnostic OR (95% CI)
Asthma							
ΔFEV ₁ (mL) ULN [#]	16 (11–23)	92 (91–93)	11 (7–16)	95 (94–96)	2.09 (1.42–3.09)	0.91 (0.85–0.98)	2.30 (1.45–3.65)
ΔFEV ₁ % of initial FEV ₁ ULN [¶]	20 (14–27)	92 (91–93)	13 (9–19)	95 (94–96)	2.58 (1.81–3.68)	0.87 (0.80–0.94)	2.97 (1.93–4.57)
ΔFEV ₁ % of predicted FEV ₁ ULN [*]	15 (10–21)	94 (93–95)	13 (8–19)	95 (94–96)	2.40 (1.58–3.63)	0.91 (0.85–0.97)	2.64 (1.63–4.27)
ΔFEV ₁ 12% of initial+200 mL	9 (6–15)	97 (96–98)	16 (9–26)	95 (94–96)	3.26 (1.89–5.65)	0.93 (0.89–0.98)	3.50 (1.92–6.37)
ΔFEV ₁ 15% of initial+400 mL	5 (2–9)	99 (99–99)	23 (10–41)	95 (94–95)	4.83 (2.12–11.02)	0.96 (0.93–1.00)	5.02 (2.13–11.85)
ACO							
ΔFEV ₁ (mL) ULN [#]	42 (28–57)	92 (91–93)	9 (5–13)	99 (98–99)	5.40 (3.70–7.88)	0.63 (0.49–0.81)	8.56 (4.59–15.98)
ΔFEV ₁ % of initial FEV ₁ ULN [¶]	60 (46–74)	92 (91–93)	12 (8–17)	99 (99–100)	7.96 (6.03–10.52)	0.43 (0.30–0.62)	18.62 (9.92–34.93)
ΔFEV ₁ % of predicted FEV ₁ ULN [*]	40 (26–54)	94 (93–95)	10 (6–16)	99 (98–99)	6.37 (4.27–9.51)	0.65 (0.51–0.82)	9.89 (5.25–18.62)
ΔFEV ₁ 12% of initial+200 mL	47 (33–61)	97 (96–98)	22 (14–32)	99 (99–99)	16.05 (10.82–23.80)	0.55 (0.42–0.73)	29.14 (15.30–55.48)
ΔFEV ₁ 15% of initial+400 mL	12 (5–24)	99 (99–99)	17 (6–36)	98 (98–99)	11.87 (4.75–29.64)	0.89 (0.80–1.00)	13.30 (4.82–36.72)

TABLE 4 Symptomatic sample: diagnostic parameters of bronchodilator reversibility cut-off points for current doctor-diagnosed asthma and asthma-COPD overlap (ACO)

	Sensitivity % (95% CI)	Specificity % (95% CI)	Positive predictive value % (95% CI)	Negative predictive value % (95% CI)	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Diagnostic OR (95% CI)
Symptomatic Patients							
Asthma							
ΔFEV ₁ (mL) ULN [#]	17 (12–24)	89 (86–91)	23 (15–32)	85 (82–88)	1.54 (1.01–2.36)	0.93 (0.86–1.01)	1.65 (1.00–2.74)
ΔFEV ₁ % of initial FEV ₁ ULN [¶]	20 (14–28)	88 (85–90)	24 (17–33)	85 (83–88)	1.68 (1.14–2.49)	0.91 (0.83–0.99)	1.85 (1.15–2.99)
ΔFEV ₁ % of predicted FEV ₁ ULN ⁺	16 (10–23)	91 (89–93)	26 (17–36)	85 (82–88)	1.82 (1.15–2.89)	0.92 (0.86–1.00)	1.97 (1.16–3.37)
ΔFEV ₁ 12% of initial+200 mL	10 (6–17)	95 (93–96)	27 (16–42)	85 (82–87)	2.00 (1.11–3.60)	0.95 (0.89–1.00)	2.12 (1.11–4.04)
ΔFEV ₁ 15% of initial+400 mL	5 (3–10)	98 (96–99)	30 (13–53)	85 (82–87)	2.32 (0.97–5.52)	0.97 (0.93–1.01)	2.39 (0.96–5.92)
ACO							
ΔFEV ₁ (mL) ULN [#]	41 (28–57)	89 (86–91)	18 (11–27)	96 (95–98)	3.72 (2.45–5.66)	0.66 (0.51–0.85)	5.65 (2.91–10.97)
ΔFEV ₁ % of initial FEV ₁ ULN [¶]	61 (46–74)	88 (85–90)	23 (15–32)	98 (96–99)	5.09 (3.71–6.98)	0.44 (0.30–0.65)	11.47 (5.89–22.35)
ΔFEV ₁ % of predicted FEV ₁ ULN ⁺	41 (28–57)	91 (89–93)	22 (13–33)	96 (95–98)	4.82 (3.12–7.45)	0.64 (0.50–0.83)	7.53 (3.83–14.77)
ΔFEV ₁ 12% of initial+200 mL	49 (34–64)	95 (93–96)	35 (23–49)	97 (95–98)	9.35 (6.00–14.57)	0.54 (0.40–0.73)	17.30 (8.62–34.70)
ΔFEV ₁ 15% of initial+400 mL	12 (5–26)	98 (96–99)	24 (8–47)	95 (93–97)	5.40 (2.08–14.02)	0.90 (0.80–1.01)	6.02 (2.09–17.34)

ΔFEV₁: change in forced expiratory volume in 1 s; ULN: upper limit of normal. [#]: 280 mL; [¶]: 9.2%; ⁺: 8.8%.

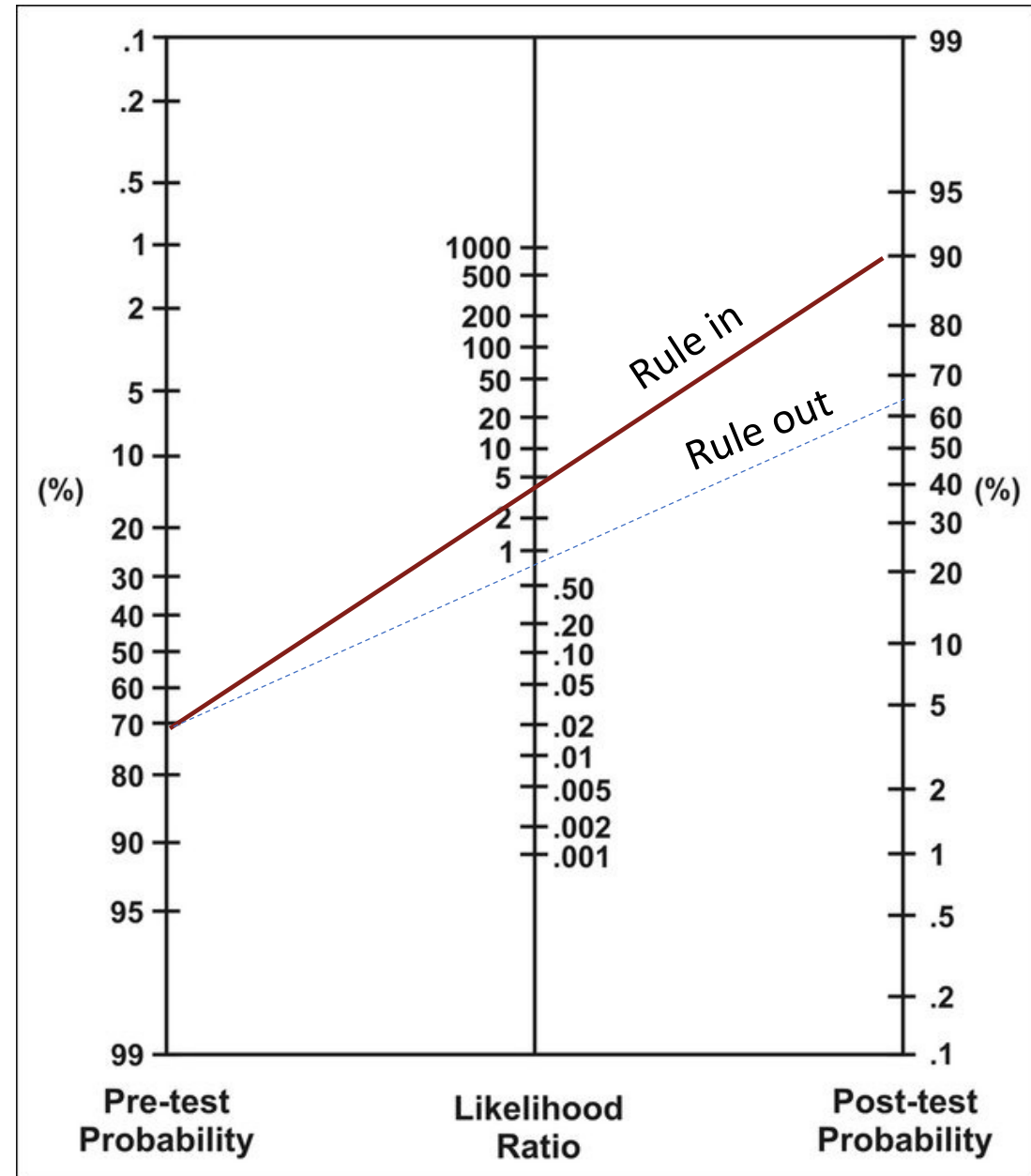
Analyse décisionnelle

History :

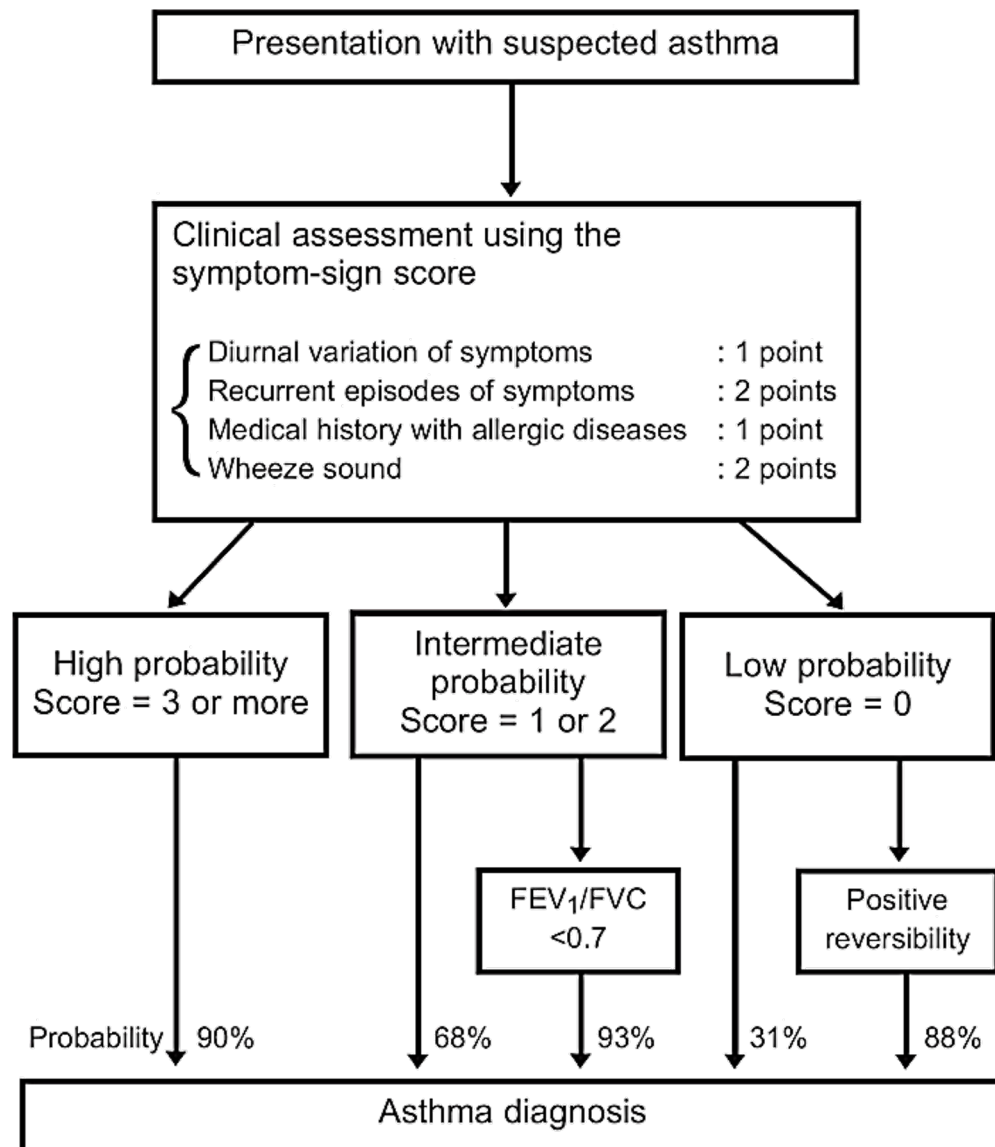
Score 2 Intermediate

ΔFEV_1 12% of initial+200 mL

Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)
3.26 (1.89–5.65)	0.93 (0.89–0.98)



Probabilité Post-test d'Asthme



Pre-test	Additional test		Post-test probability
	Test	LR+	
High probability, n=143 (accuracy = 90%)	FEV ₁ /FVC <0.7	11.4	99%
	IgE ≥120IU/mL	3.2	96%
	Positive reversibility	3.1	96%
Intermediate probability, n=297 (accuracy = 68%)	Positive reversibility	12.4	96%
	FEV ₁ /FVC <0.7	6.0	93%
	FeNO ≥35ppb	2.2	82%
Low probability, n=126 (accuracy = 31%)	Positive reversibility	15.6	88%
	FEV ₁ /FVC <0.7	3.0	57%
	FeNO ≥35ppb	2.6	54%

ORIGINAL ARTICLE
LUNG STRUCTURE AND FUNCTION

Artificial intelligence outperforms pulmonologists in the interpretation of pulmonary function tests

Marko Topalovic¹, Nilakash Das¹, Pierre-Régis Burgel ², Marc Daenen³, Eric Derom⁴, Christel Haenebalcke⁵, Rob Janssen⁶, Huib A.M. Kerstjens ⁷, Giuseppe Liistro⁸, Renaud Louis⁹, Vincent Ninane¹⁰, Christophe Pison¹¹, Marc Schlessen¹², Piet Vercauter¹³, Claus F. Vogelmeier¹⁴, Emiel Wouters¹⁵, Jokke Wynants^{16,17} and Wim Janssens¹ on behalf of the Pulmonary Function Study Investigators

Eur Respir J 2019; 53: 1801660





is a 28 years-old man with personal history of allergic rhinitis, thoracic tightness since 2 months and variable symptoms with PFT showing a FEV1 92% pred and FVC 93% predict can be considered as asthmatic



Based on the information provided, it is possible that the 28-year-old man has asthma, but further evaluation would be necessary to confirm a diagnosis.



Allergic rhinitis and thoracic tightness are both common symptoms of asthma. The fact that the symptoms have been present for two months also raises the possibility of asthma, as symptoms typically persist for at least that long in individuals with the condition.

However, PFT results alone are not enough to diagnose asthma definitively. While the FEV1 and FVC values are within the normal range, further testing such as bronchoprovocation testing or measurement of airway inflammation may be necessary to confirm the diagnosis.

It is important for the individual to discuss their symptoms and concerns with a healthcare provider, who can perform a thorough evaluation and make a proper diagnosis.



Conclusion –

Asthme :

Diagnostic Clinico-

Fonctionnel

ERS/ATS technical standard 2022

- Valeurs de référence **GLI**
- **CVF**
- **LIN** <5%, **LSN**>95% des Valeurs de reference

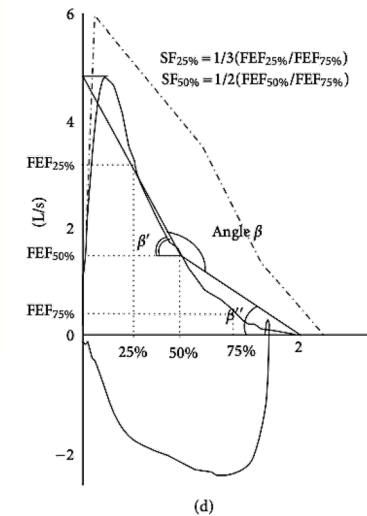
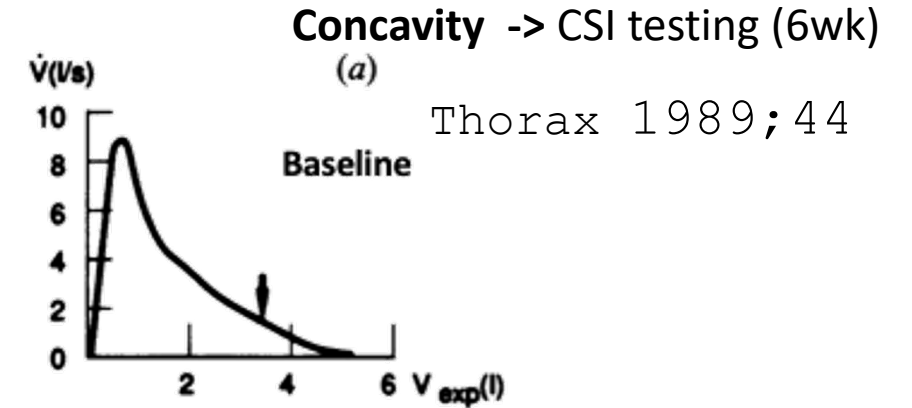
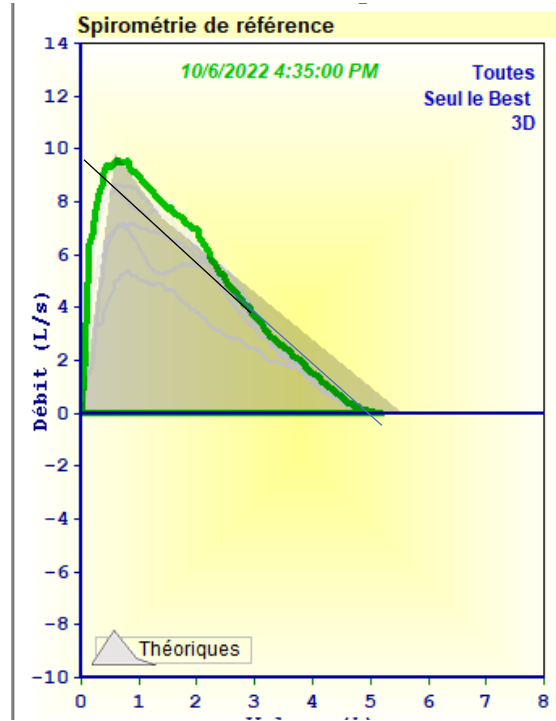
Z-Score (<1.65 ; > 1.65) : Obstruction or
Restriction

Léger: –1.65 to –2.5 ;

Modéré: –2.51 to –4.0 ; Sévère: <–4.1

Conclusion : Le chiffré, le visuel et la Clinique intégrée

Conclusion –
Asthme :
Diagnostic Clinico-
Fonctionnel



Angle $\beta > 180^\circ$

-> Airflow limitation even if FEV1,
FVC are normal