PULMONARY FUNCTION TEST

- Indications
- Clinical Practice
- Spirometry Comparinson Studies

Indications

1. Diagnosis
2. Monitoring
3. Evaluation of disability or impairment
4. Public health

N Engl J med 331:25,1994

Indications

Diagnosis

- To evaluate symtoms, signs , and abnormal results of laboratory tests.
- To measure the effect of disease on pulmonary function.
- To screen persons at risk for pulmonary disease
- To assess preoperative risk.
- To assess prognosis.

Indications

Monitoring

- To assess effectiveness of therapeutic interventions (eg. Bronchodilator therapy)
- To provide information on the course of diseases affecting lung function. (eg.COPD and NMD)
- To assess current status of persons with occupational exposure to injurious substances.
- To detect adverse reactions to drugs.

Indications

Evaluation of disability or impairment

- To assess patients as part of a rehabilitation program.
- To assess risks for an insurance evaluation.
- To assess the condition of persons for legal reasons.

Indications

Public health

- Epidemiologic surveys.

Clinical Practice

1. Screening spirometry.
2. Lung volume calculation.
3. Classification of abnormal disease.
4. Interpretation.

Screening spirometry

Screening spirometry

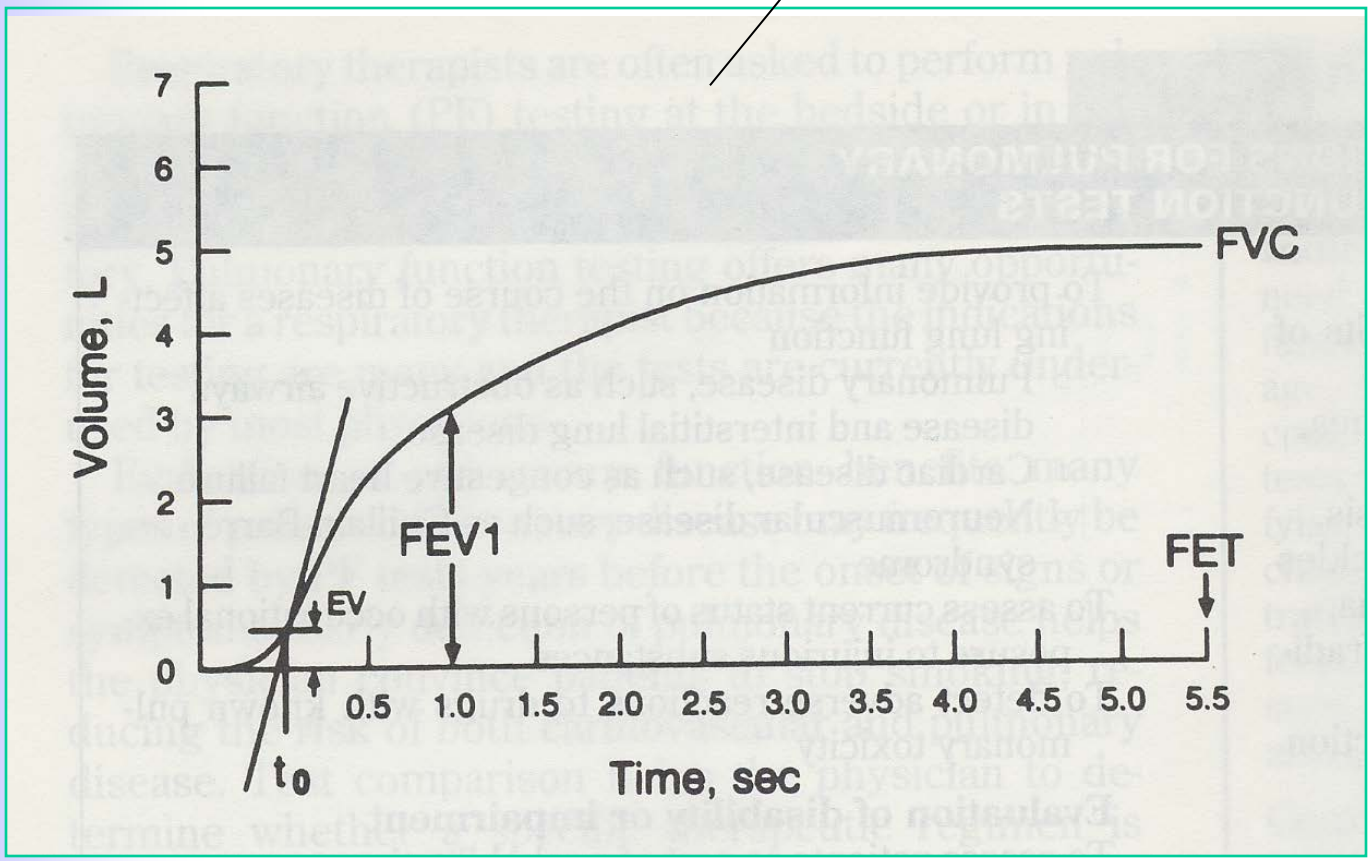
Screening spirometry

Procedure

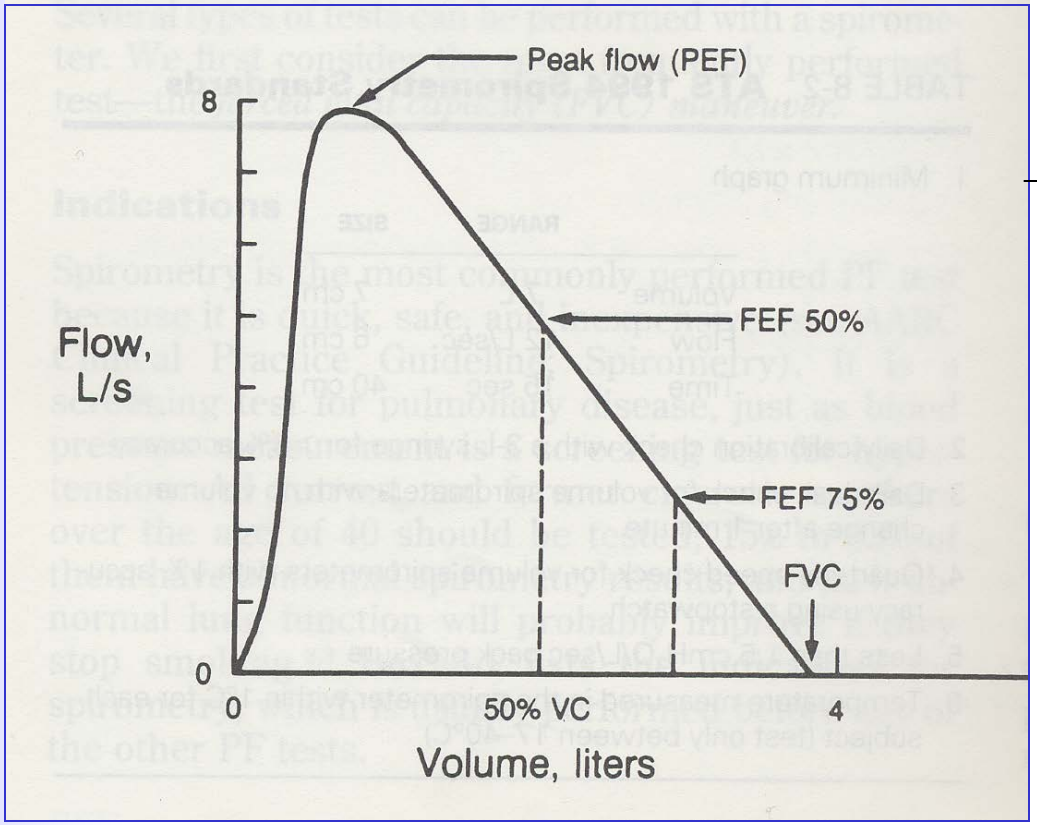
- A full inspiration to TLC, then
- A rapid, forceful maximal expiration to RV by spirometer.
- At least three acceptable and two reproducible maneuvers .(FEV1 /FVC within 0.2 liter and PEF within 10%)

Screening spirometry

Volume-time spirogram

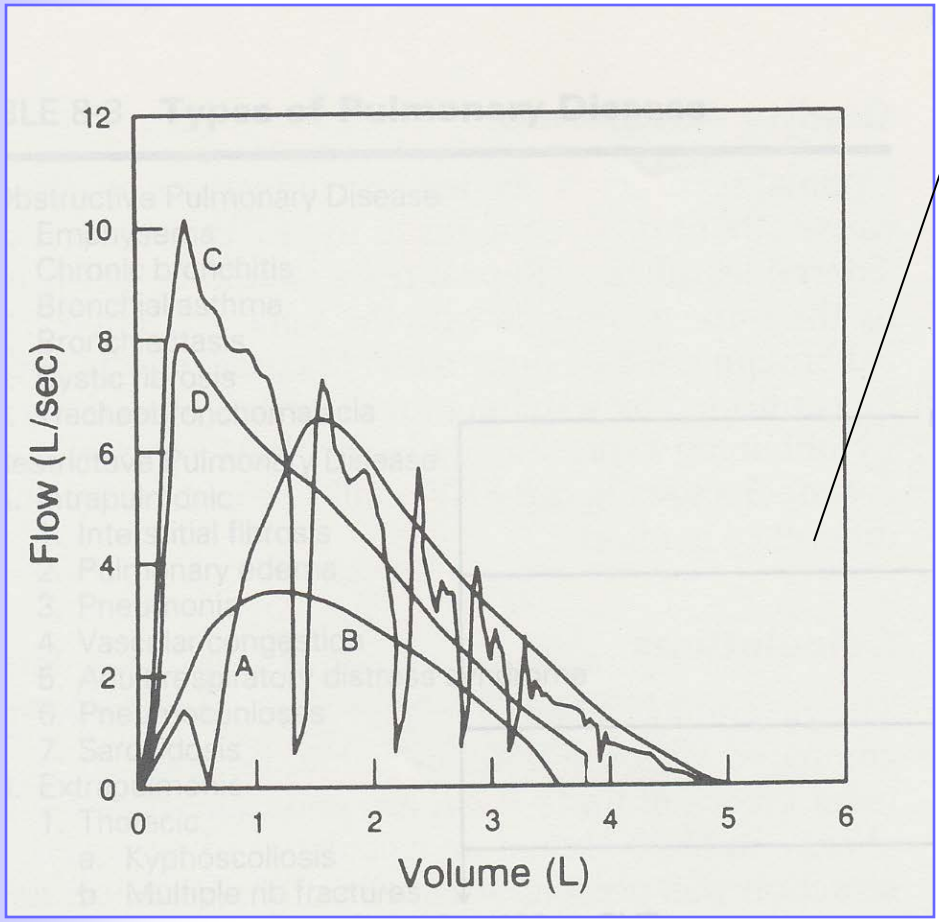


Screening spirometry



Flow volume curve

Screening spirometry



A : a hesitating start.

B : poor peak flow effort.

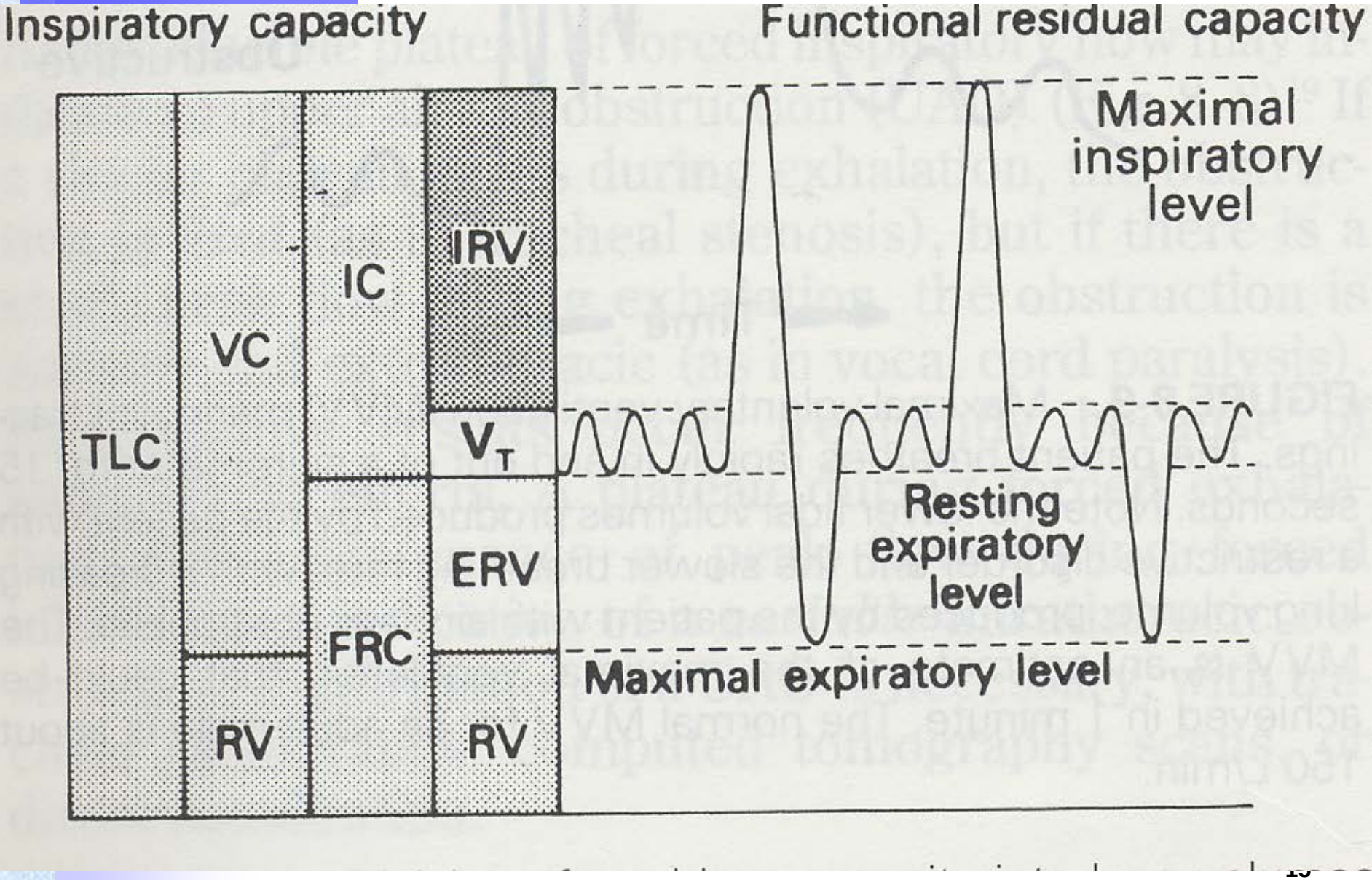
C : coughing

D : quit too soon.

Screening spirometry

Calculations

- Forced vital capacity (FVC)
- FEV1
- FEV1/FVC ratio
- FEF 25-75% (maximal mid-expiratory flow rate)
- PEF (peak expiratory flow)


Inspiratory capacity
Functional residual capacity
TLC
VC
IC
IRV
V_T
ERV
FRC
RV
RV
Maximal inspiratory level
Resting expiratory level
Maximal expiratory level

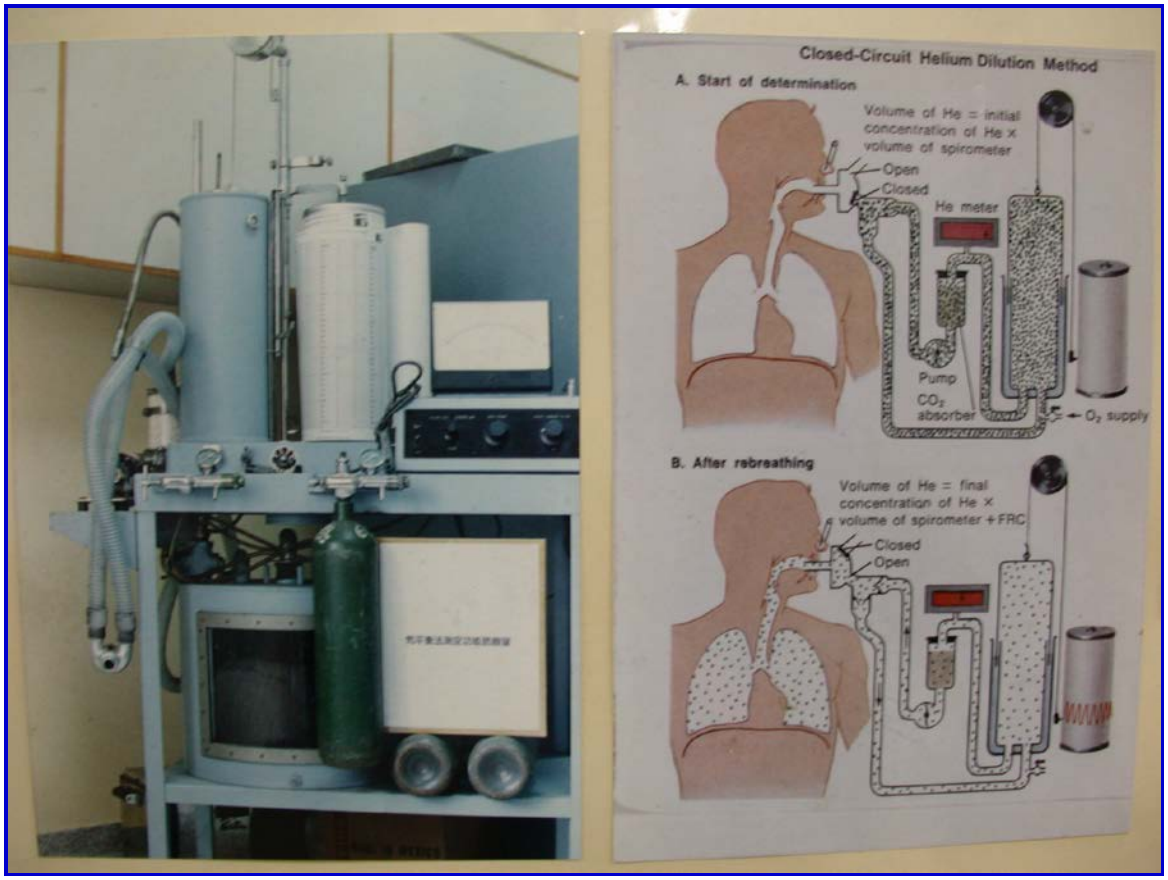
Lung volume calculation

Determinig FRC ⟹ TLC

- closed-circuit helium method
- open-circuit nitrogen washout method
- total-body plethysmography

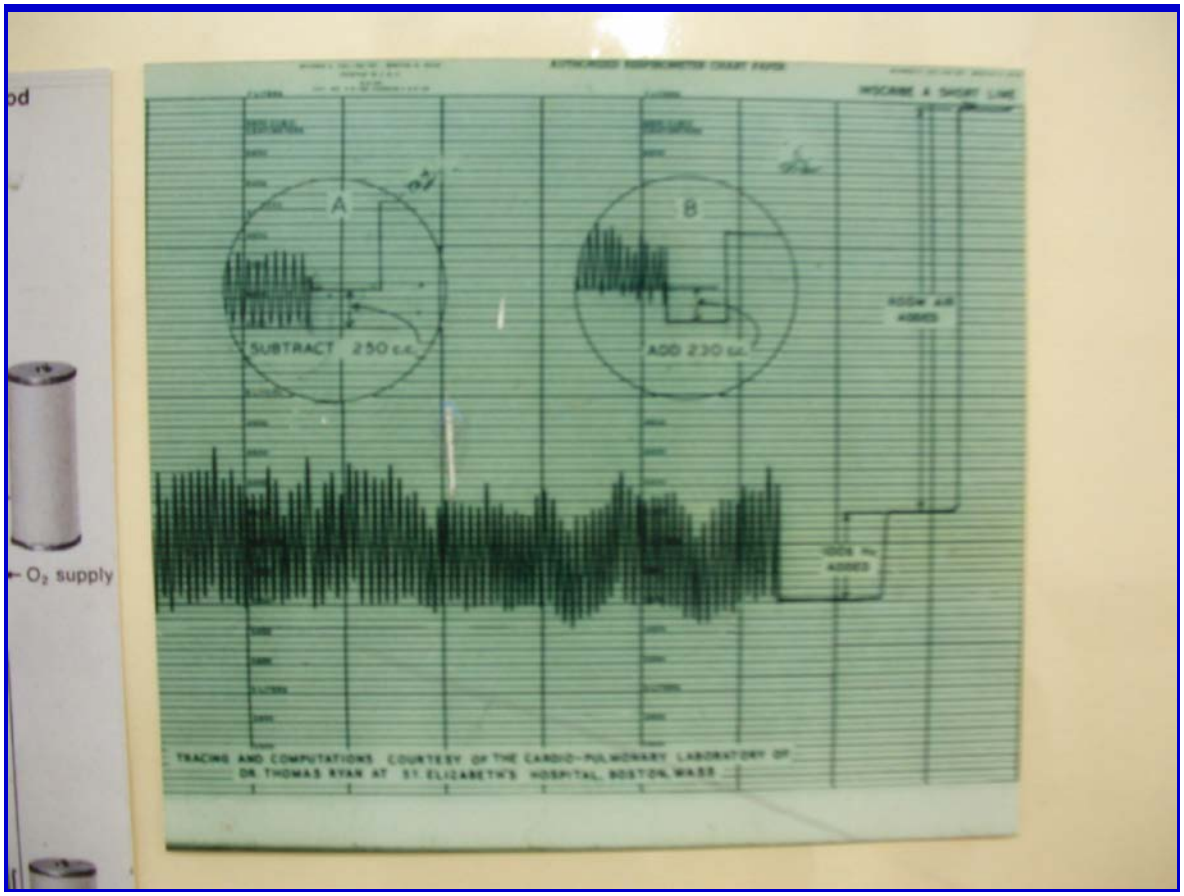
Lung volume calculation

closed-circuit helium method



Lung volume calculation

closed-circuit helium method

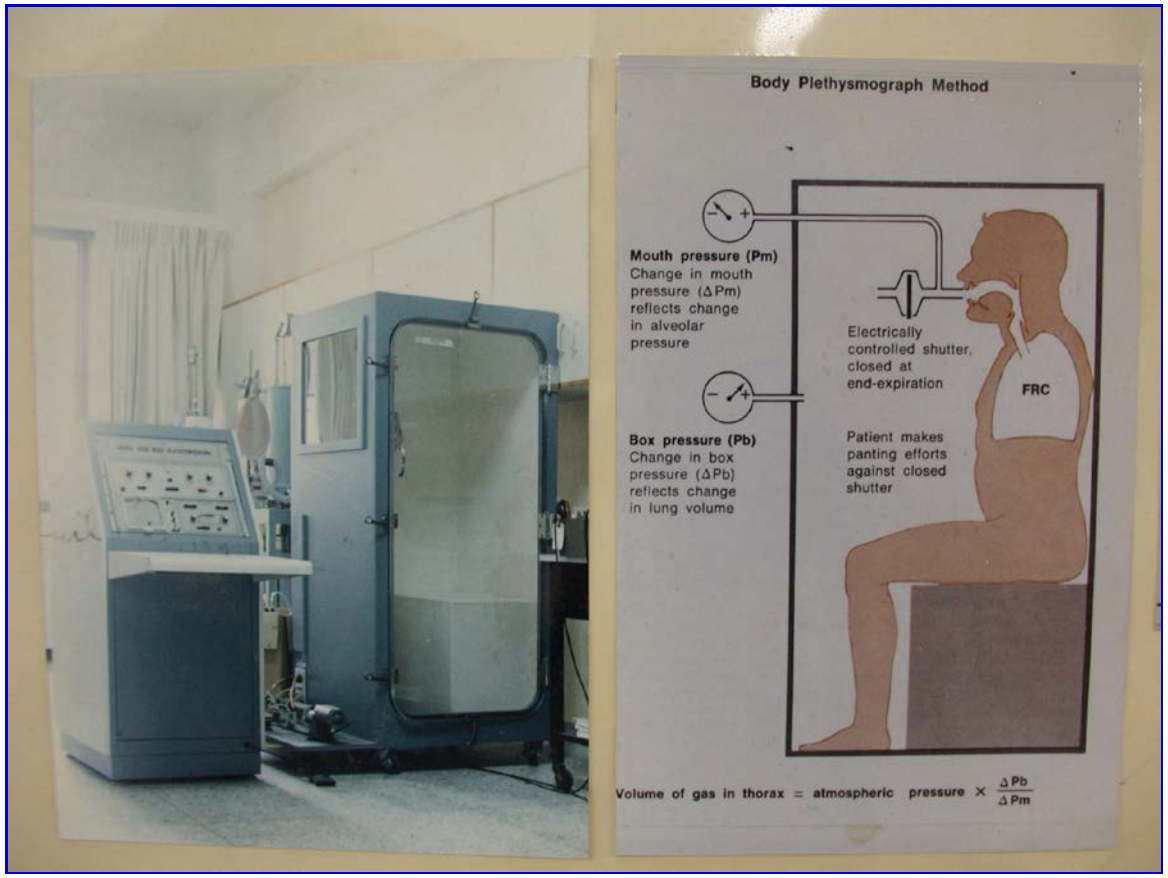


Lung volume calculation

open-circuit nitrogen washout method

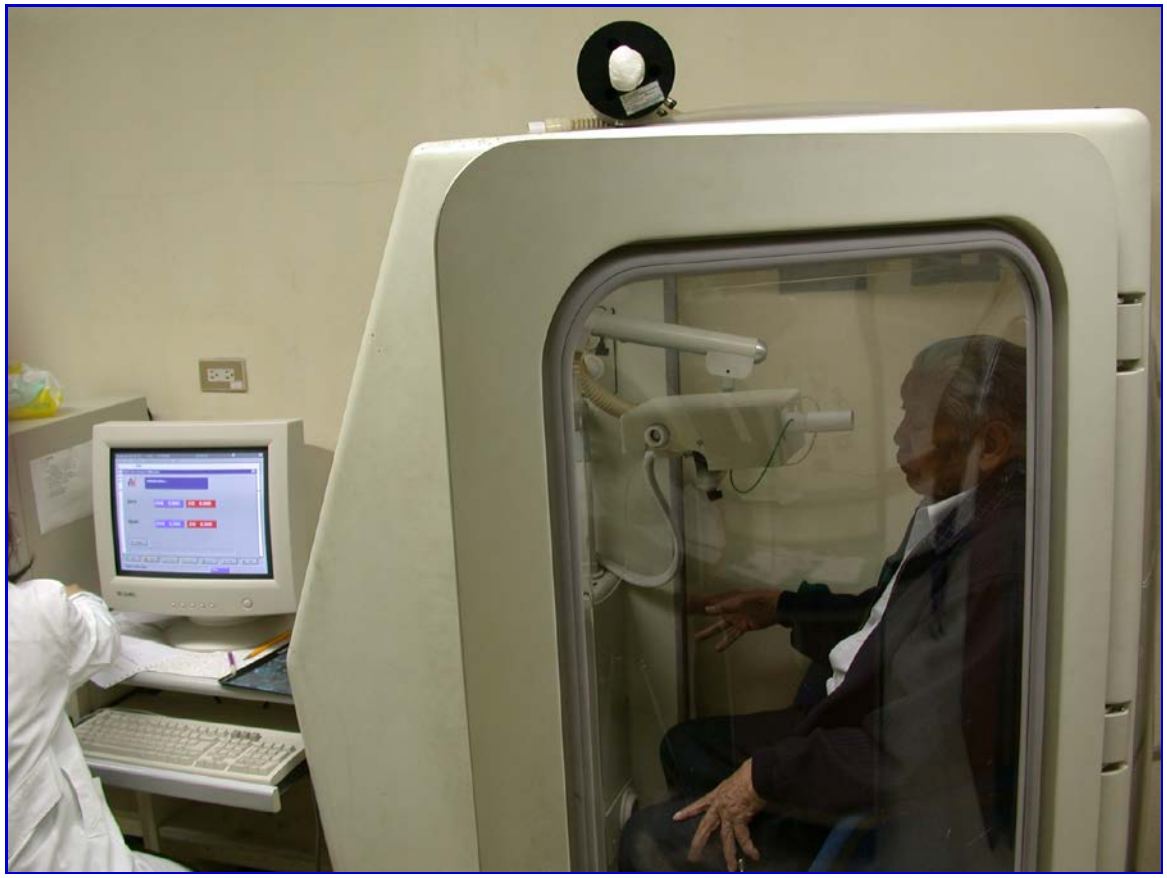
Lung volume calculation

total-body plethysmography



Lung volume calculation

total-body plethysmography

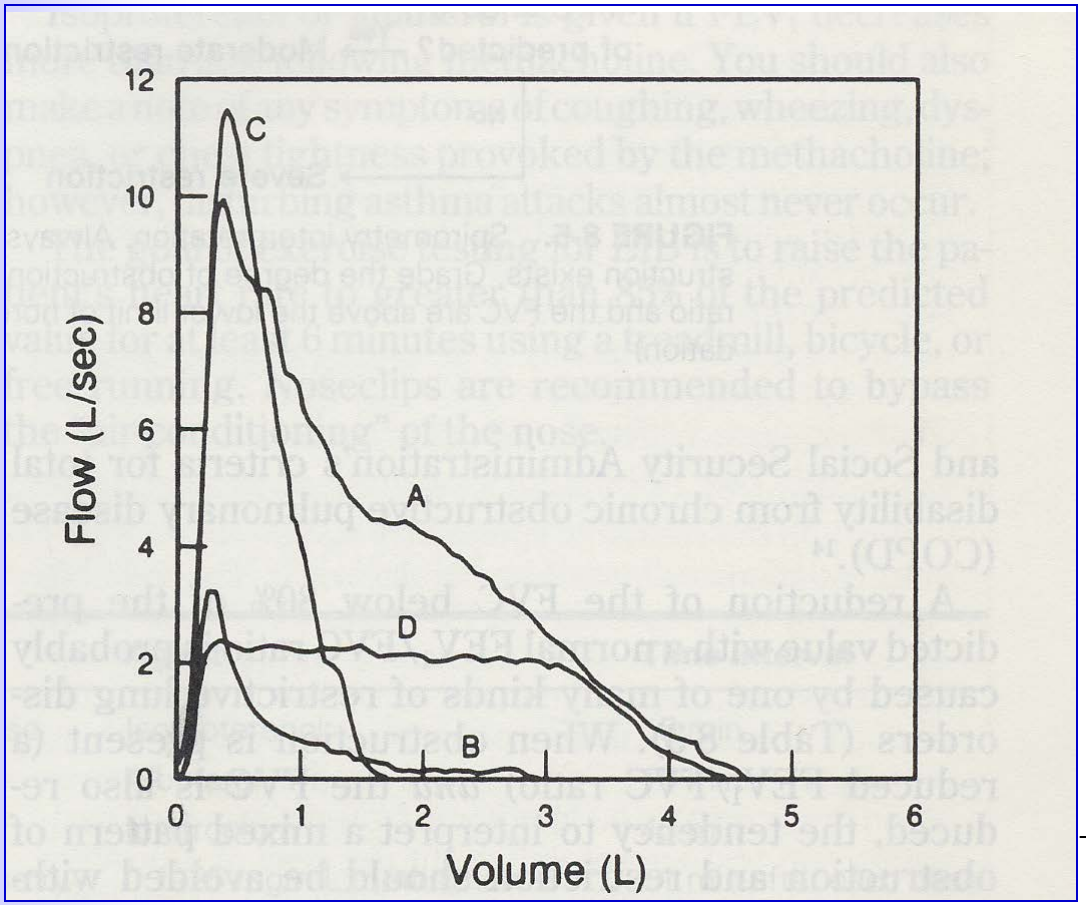


Classification of abnormal diseases

1. Obstructive pulmonary disease
2. Restrictive pulmonary disease

- Intrapulmonic
- Extrapulmonic : thoracic, abdominal, NMD, respiratory center depression.

Classification of abnormal diseases



A:normal

B:severe COPD

C:mod.Restriction

D:a fixed upper airway obs.

Interpretation (1)

FEV1/FVC < 70% : obstructive

Severity : (FEV1/FVC %) method		FEV1 % pred
Ø	Normal > 70%	>80%
Ø	Mild 60-70 %	50% - 80%
Ø	Moderate 45-60 %	30%- 50%
Ø	Severe < 45%	<30%

Interpretation (2)

FEV1 / FVC > 70%

- FEF 25-75% / FVC < 65%

  : mild obstructive lung disease.

- FVC < 80% pred

  : imply restrictive lung disease.

Interpretation (3)

FVC < 80% pred (TLC)

- Normal : TLC >81 % pred
- Mild : TLC 66-80% pred
- Moderate : TLC 51-65% pred
- Severe : TLC <50% pred

[redacted]

Pat-Name : [redacted]
1111110-7

Pat-No : 謝秉宏

Born :29-06-81
Age :21 years
Sex :M
Height :168
Weight :70
Race : A

Normals: KNUDSON/ITS

		BEST	PRED.	%PRED.
FVC	l	4.33	3.89	111
FEV0.5	l	2.34	2.44	96
FEV1.0	l	3.08	3.34	92
FEV3.0	l	4.20		
FEV0.5/FVC	%	54.0		
FEV1.0/FVC	%	71.2	86.8	(82)
FEV3.0/FVC	%	97.0	98.5	98
FEF.2-1.2	l/s	6.56		
FEF25-75%	l/s	2.02	3.76	54
FEF75-85%	l/s	.85		
PEF	l/s	7.11	7.24	98
MEF75%	l/s	6.40		
MEF50%	l/s	2.56	4.37	59
MEF25%	l/s	1.04	1.96	53
FMFT	s	1.07		

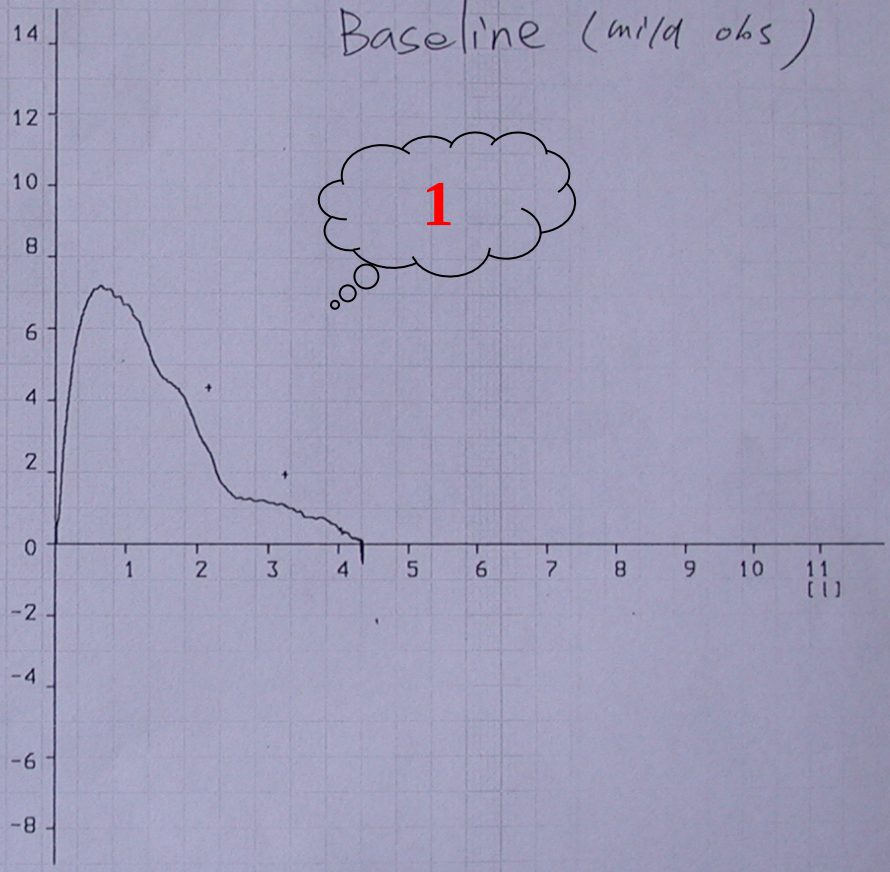
呼吸治療科 技術員 孫文娟

DIAGNOSIS: NORMAL

SpO2 98% PR 91

		MEAS1	MEAS2	MEAS3
FVC	l	4.33	4.23	
FEV1	l	2.99	3.08	
FEV1/FVC	%	69.0	72.9	
FEF25-75%	l/s	2.02	2.40	
PEF	l/s	7.11	6.15	

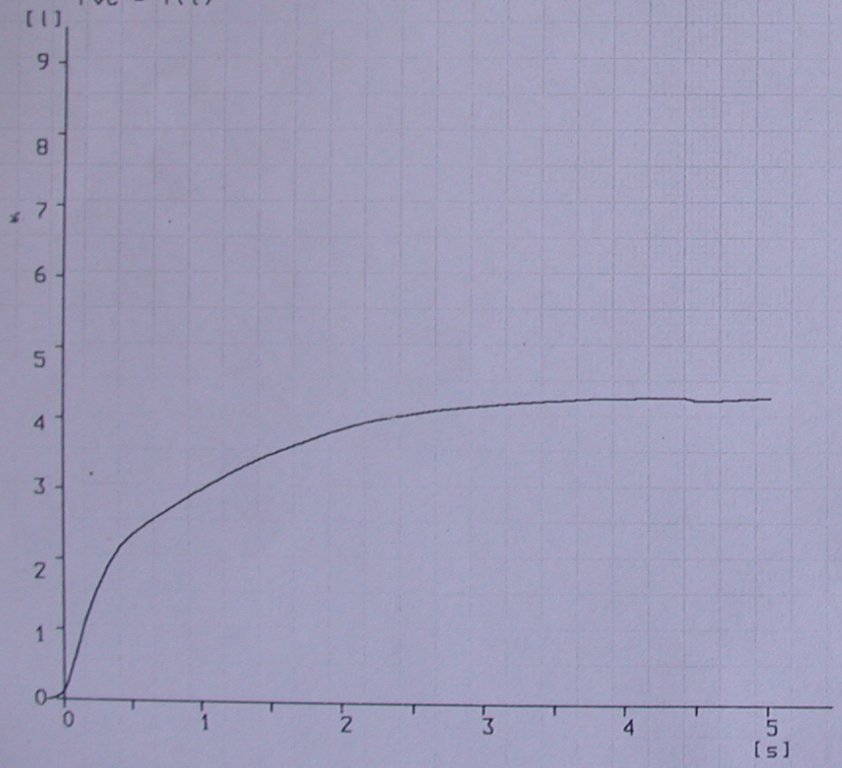
Flow = f(V)



Baseline (mild obs)

1

FVC = f(t)



SPIROVIT RT-24
We 31.JUL.02 09:33:08

Cal.: 22.JUN.99 14:45
1.80

Normals: KNUDSON/ITS

DIAGNOSIS: NORMAL

呼吸器科 技術員 孫文娟

SpO2 98% PR 91

2

		BEST	PRED.	%PRED
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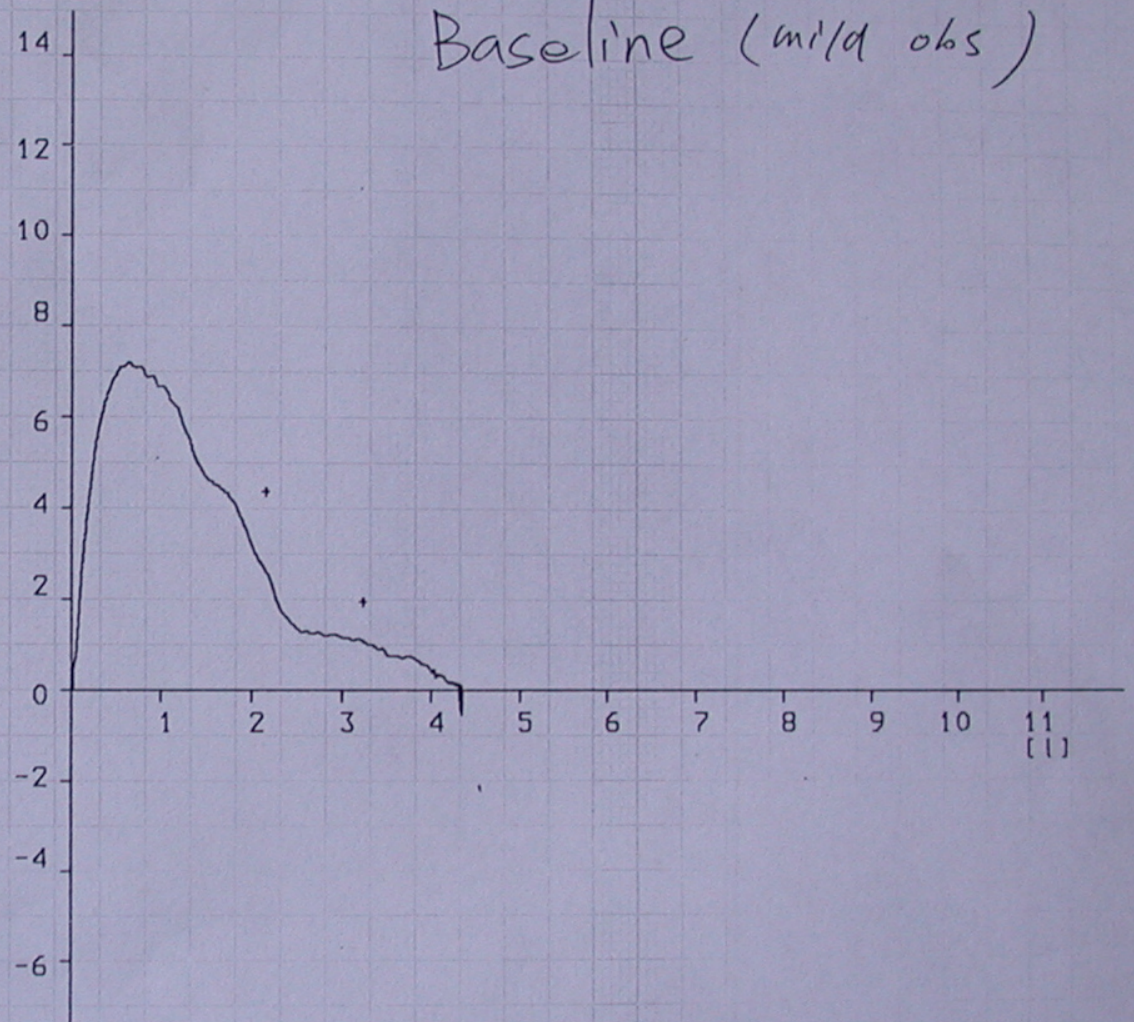
Flow = f(V)
[l/s]

Baseline (mild obs)



Pat-Name : [redacted]
1111110-7

Pat-No : 謝秉宏

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Weight :60
Race : A

3

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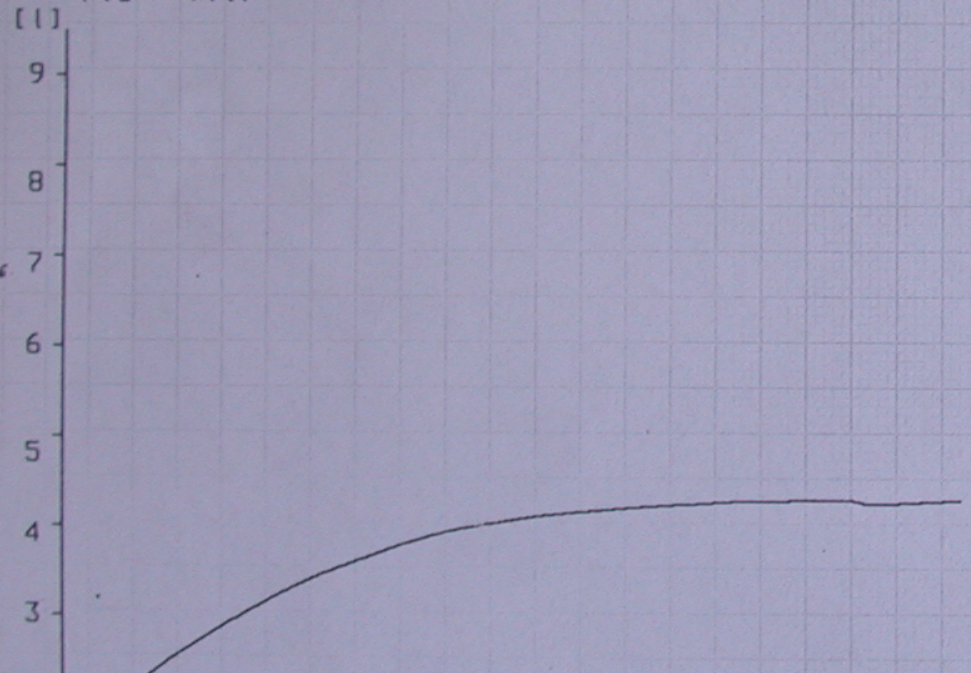
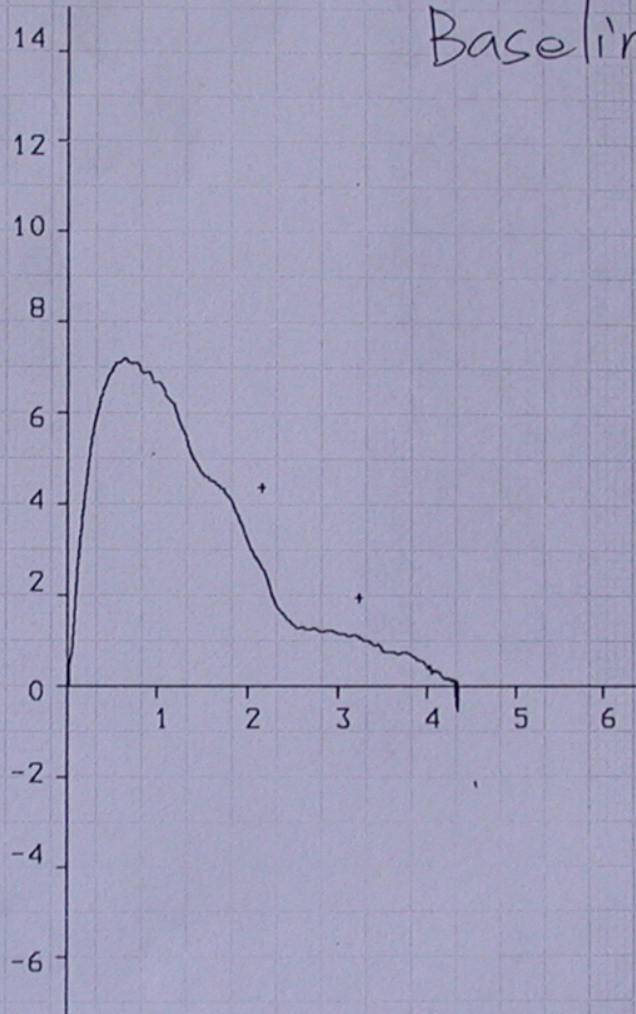
		MEAS
FVC	l	4.3
FEV1	l	2.9
FEV1/FVC	%	69.
FEF25-75%	l/s	2.0
PEF	l/s	7.1

FVC = f(t)



Flow = f(V)
[l/s]

Baseline



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FVC = f(t)
[l]
9
8
7
6
5
4
3

Flow = f(V)
[l/s]
Baseline
14
12
10
8
6
4
2
0
-2
-4
-6
1 2 3 4 5 6

Pat-Name :
1111110-7

Pat-No : 5 謝秉宏

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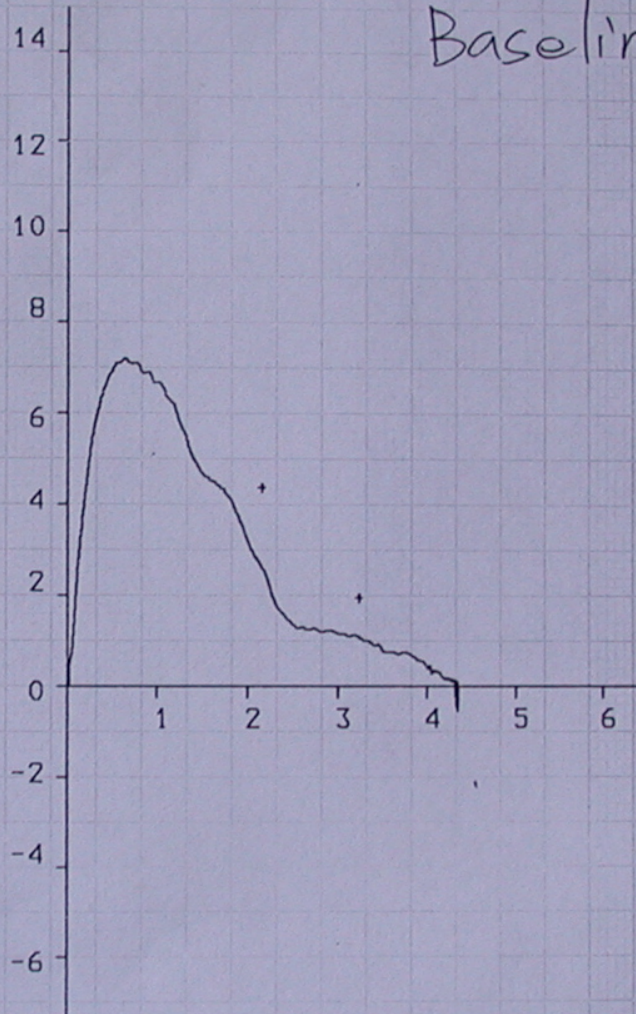
PEF	l/s	7.1

FVC = f(t)
[l]

Flow = f(V)
[l/s]

Baseline



Interpretation (4)

Abnormal gas transfer (% pred method)

- Ø Normal : 81-140 %
- Ø Mild reduction : 61-80 %
- Ø Moderate : 41-60 %
- Ø Severe : < 41 %

Spirometry comparison study

- Bronchodilator test
- Provocation test

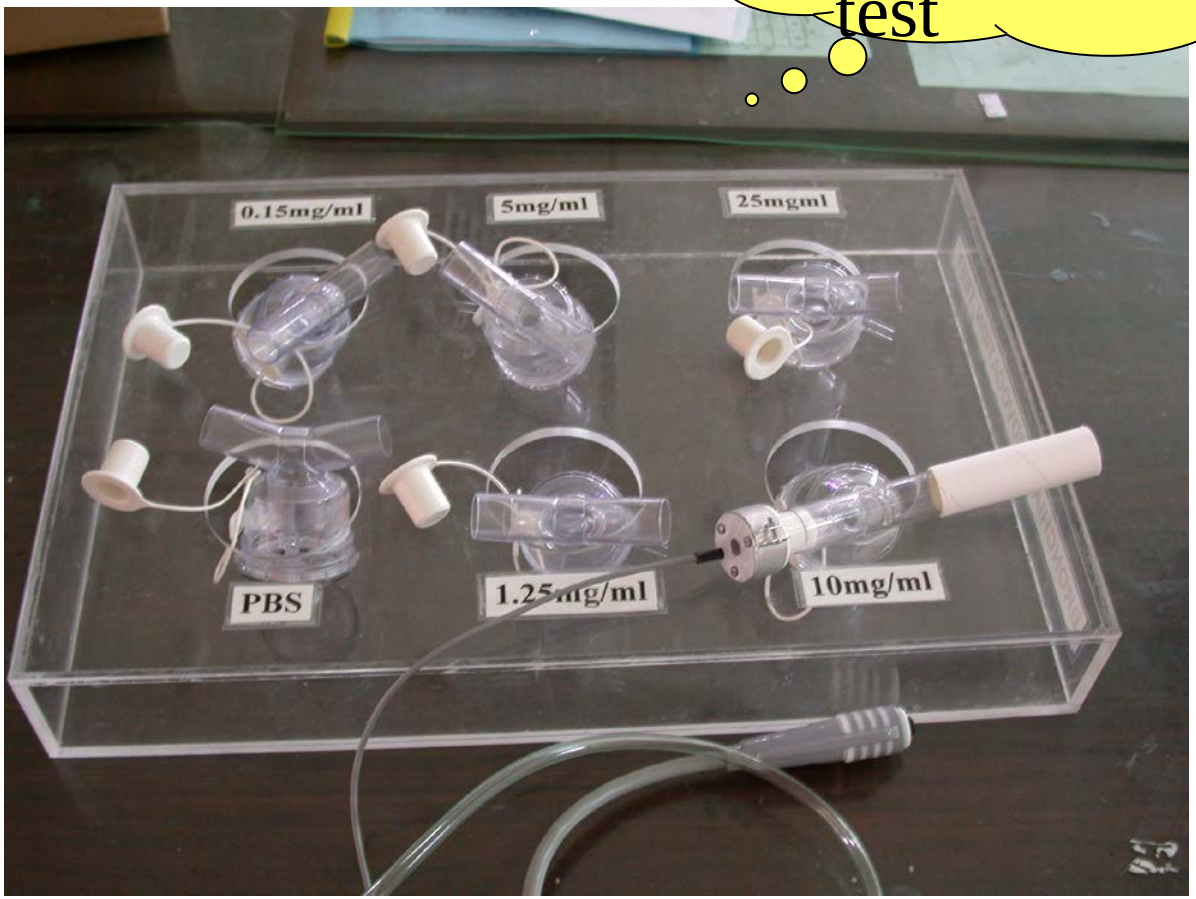
Spirometry comparison study

Bronchodilator test

:20% and 200ml improvement of FEV1 / FVC

Spirometry comparison study

Provocation test



Spirometry comparison study

Provocation test

:methacoline test PC20 < 25mg