

# Dynamic Spirometry

Dynamic spirometry is used to determine the flow of air moving in and out of the lungs.

# How is the Test Performed?

- **Equipment:**

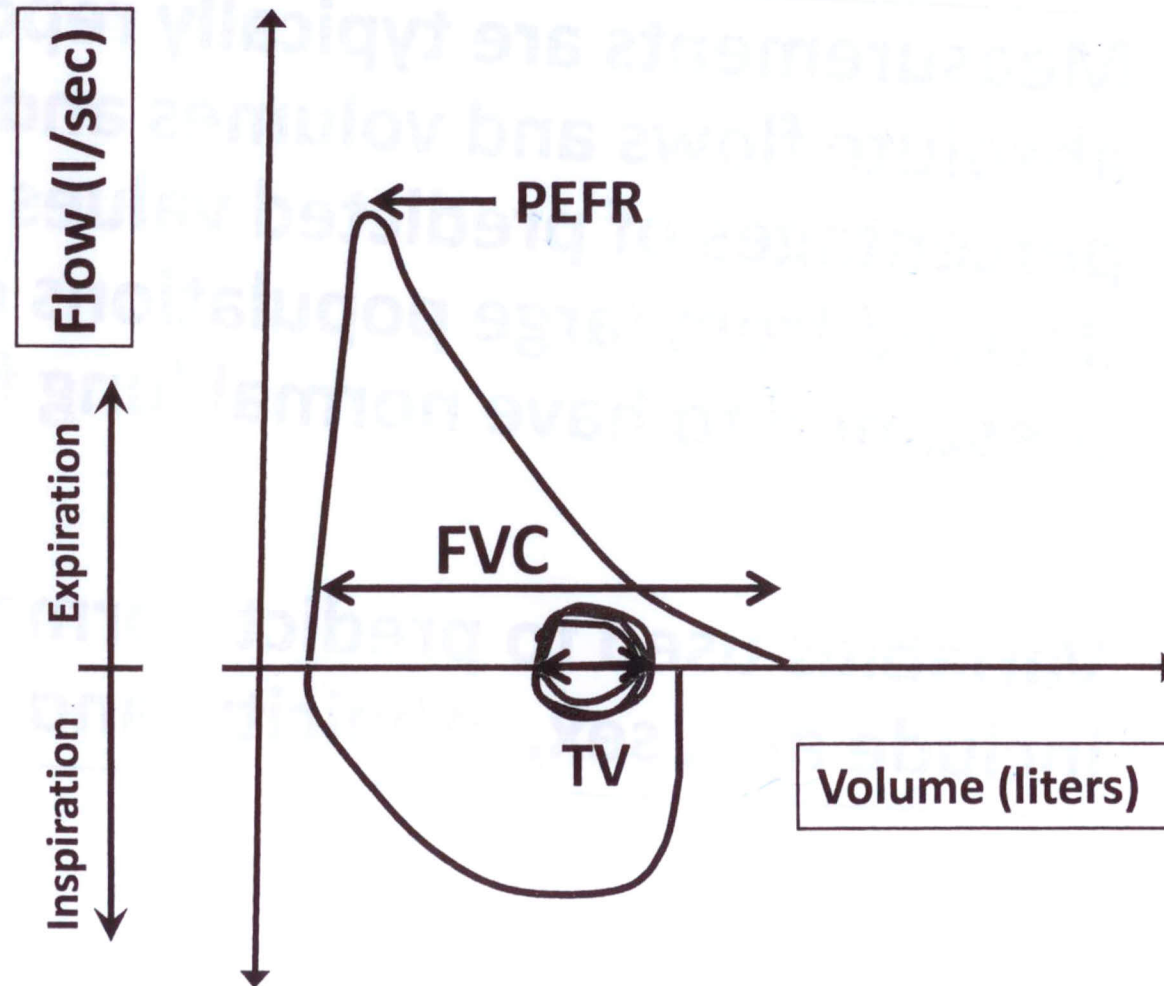
- Spirometer.
- Nose clips.
- Disposable mouth piece.

- **Method:**

- Enter subject data.
- Apply nose clip to avoid air escaping through nose.
- Perform the test.

## Cont. Performing test

- First, the subject takes a series of 3-4 normal breaths.
- Then, the subject takes a maximal deep inspiration followed immediately by a forceful complete expiration.
- No hesitation for approximately 6 seconds.



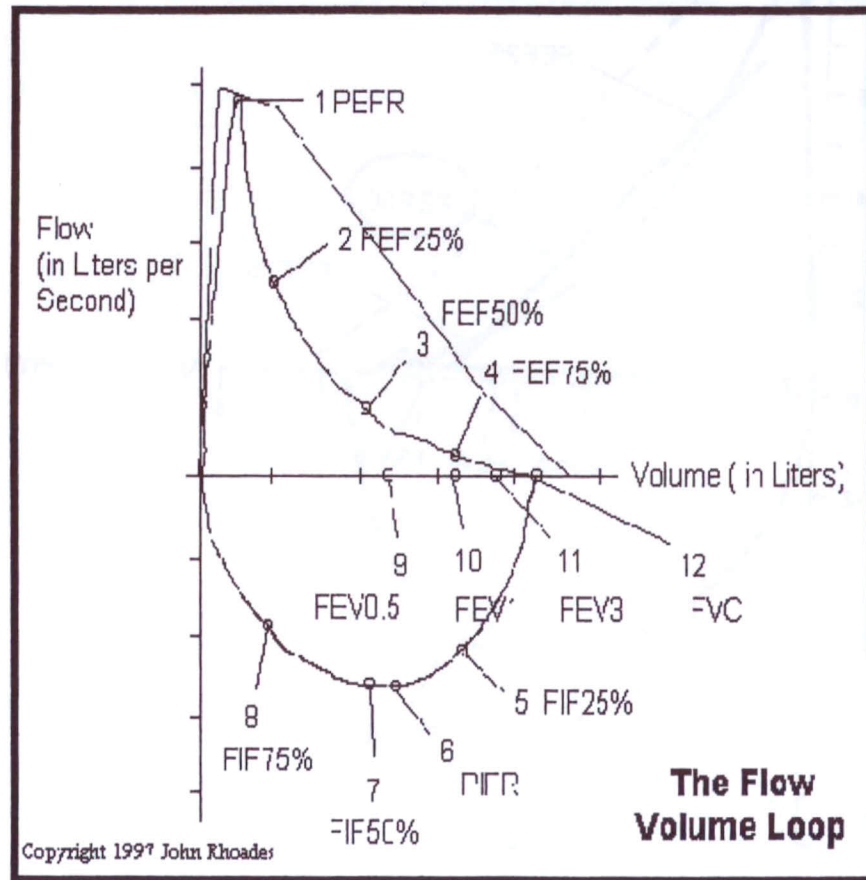


# Results

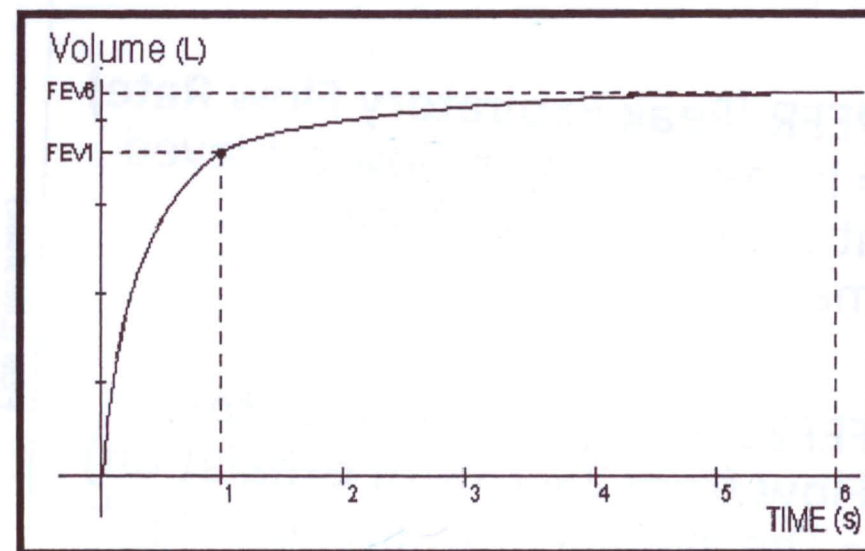
- **Measurements are typically reported as absolute flows and volumes and as percentages of predicted values using data derived from large populations of people presumed to have normal lung function.**
- **Variables used to predict normal values include age, sex, ethnicity, and height.**

# Results

## Flow-Volume Loop



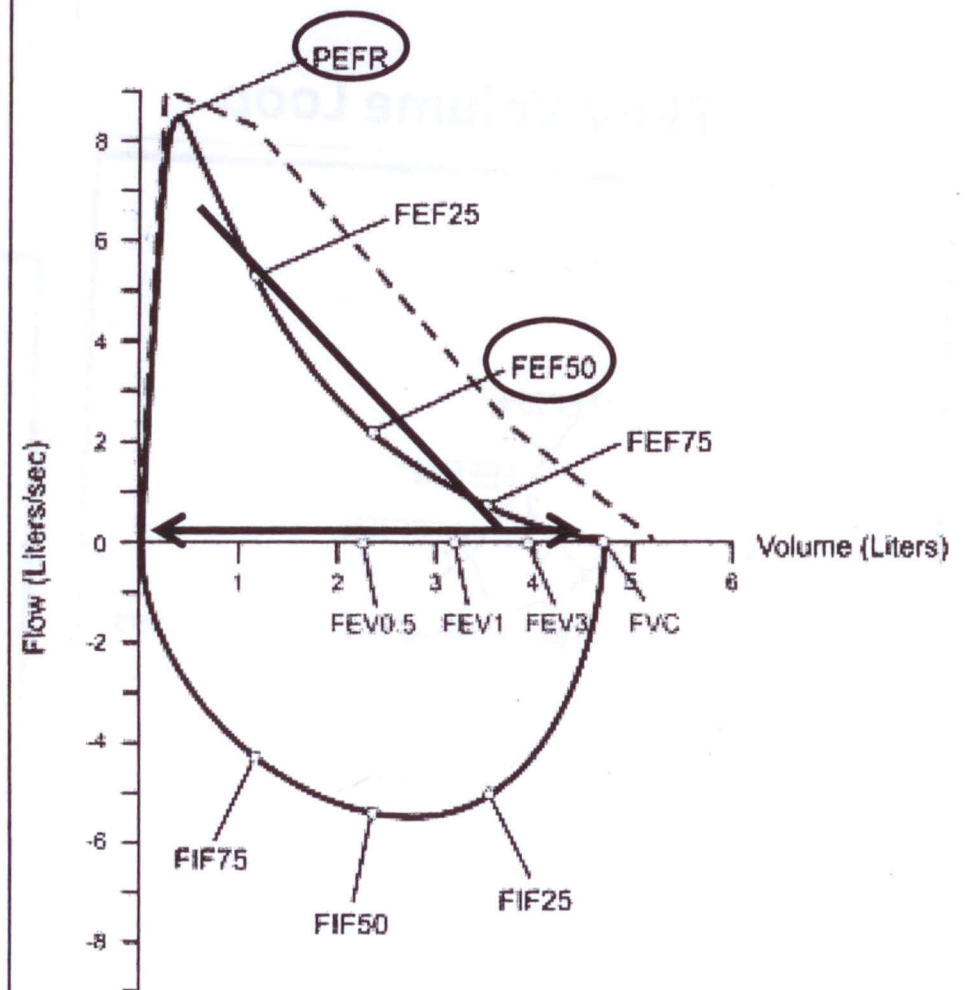
## Volume-Time Curve



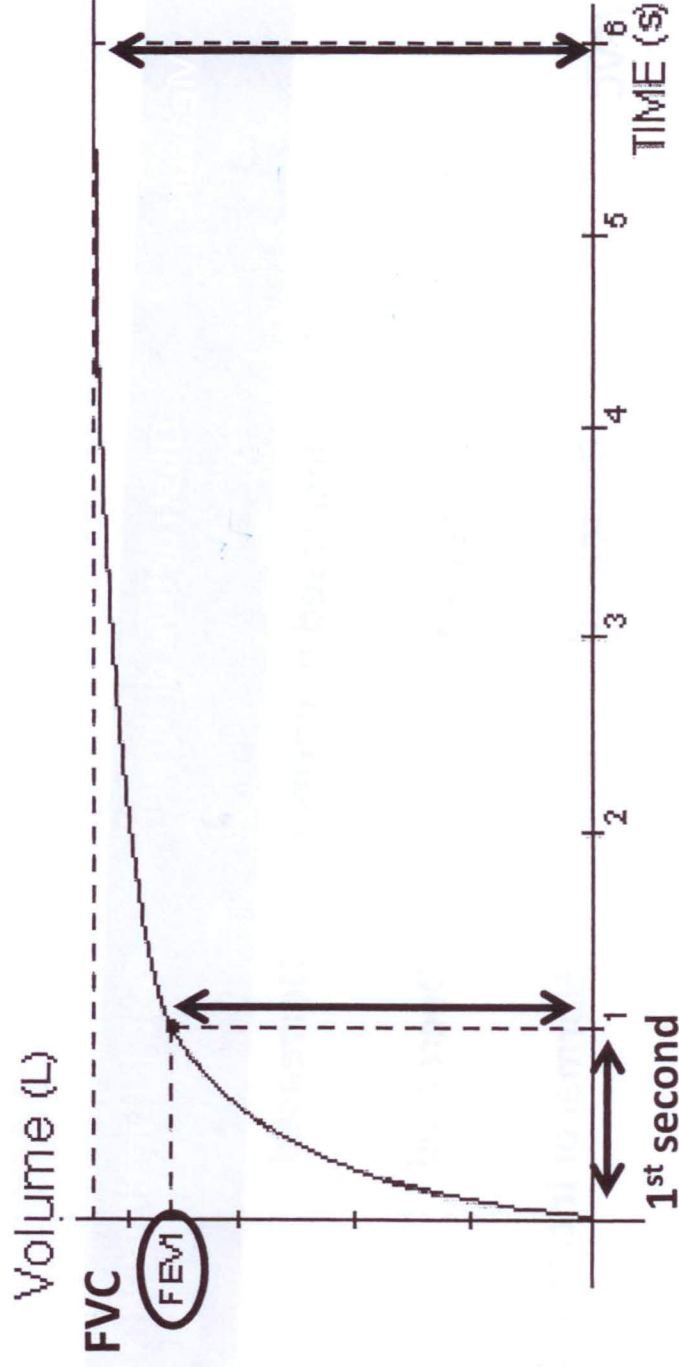


# Flow-Volume Loop

- **FVC (Forced Vital Capacity)** = the largest amount of air that can be forcefully exhaled after maximal inspiration.
- **PEFR (Peak Expiratory Flow Rate)** = is the maximum flow achieved at the beginning of the FVC maneuver.
- **FEF25-75% (Forced Expiratory Flow from 25-75% of exhalation)** = The average flow rate during the middle half of the FVC.
- **FEF50% (MEF50%)** = Forced expiratory flow at 50% FVC.



# Volume-Time Curve



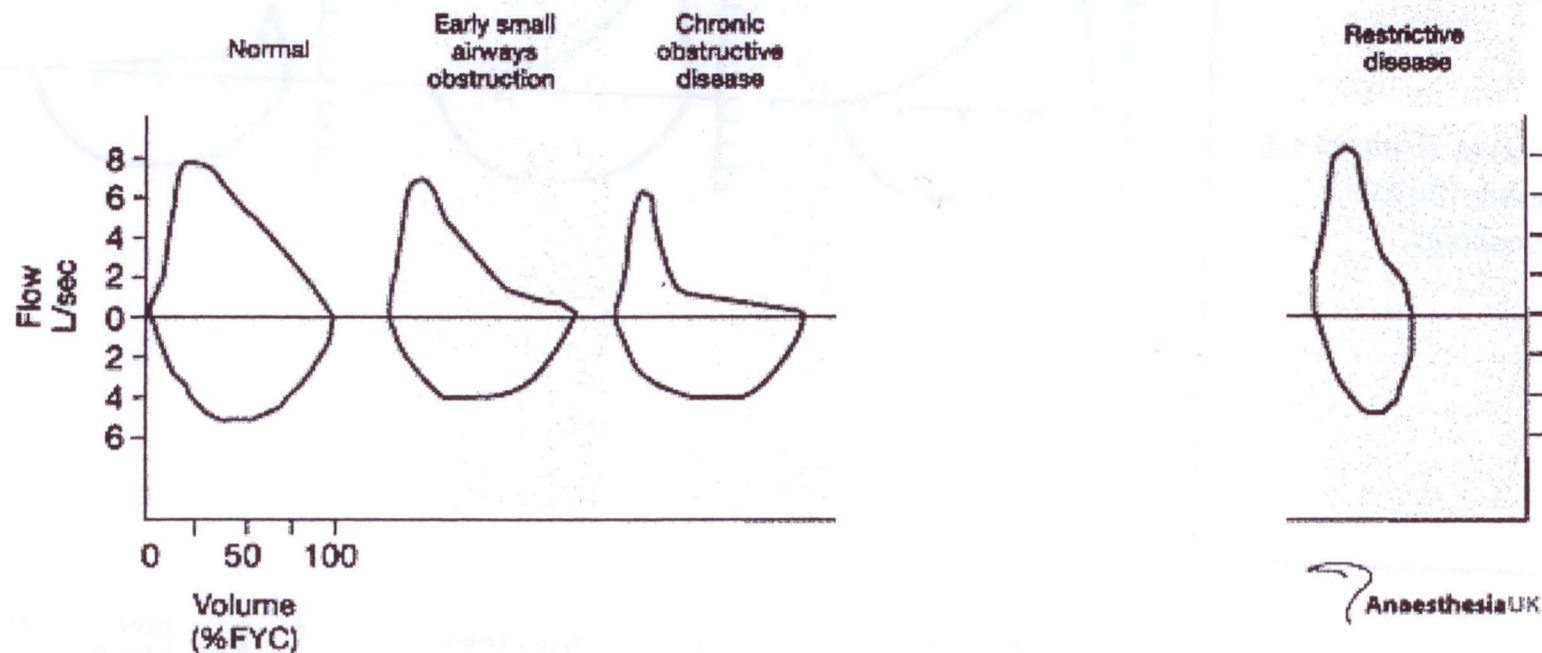
- **FVC.**
- **FEV1 = Forced expiratory volume in the 1<sup>st</sup> second.**
- **$FEV1/FVC \geq 80\%$ .**

# Changes seen in Different Pulmonary Diseases

Measure	Obstructive disorders	Restrictive disorders
FVC	Decreased or normal	Decreased
FEV1	Decreased	Decreased
FEV1/FVC	Decreased	Normal or Increased



# Changes in flow-volume loop

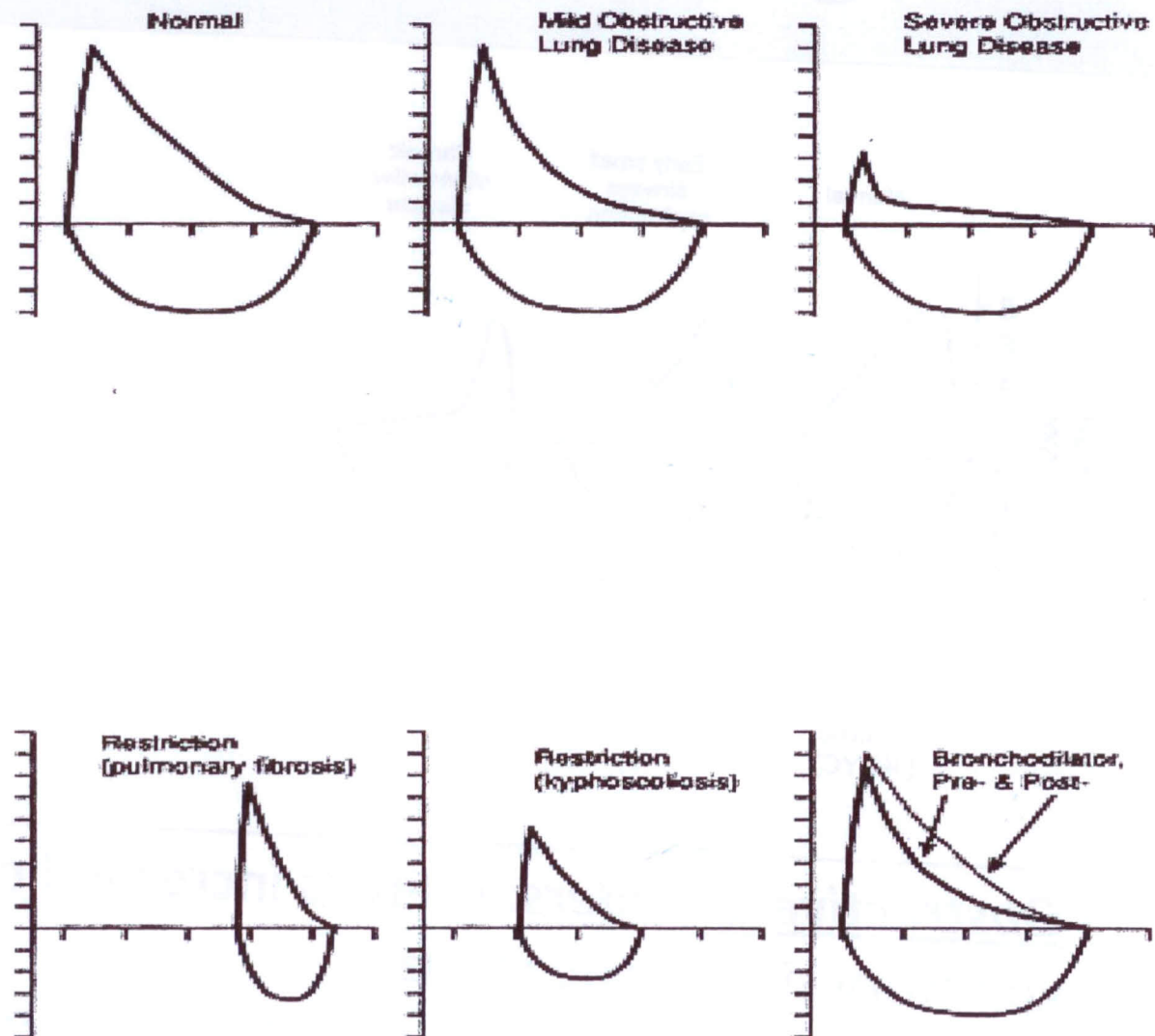


- **Obstructive disorders:** there is increased concavity on the expiratory side of the curve.
- **Restrictive disorders:** the shape is the same but smaller.

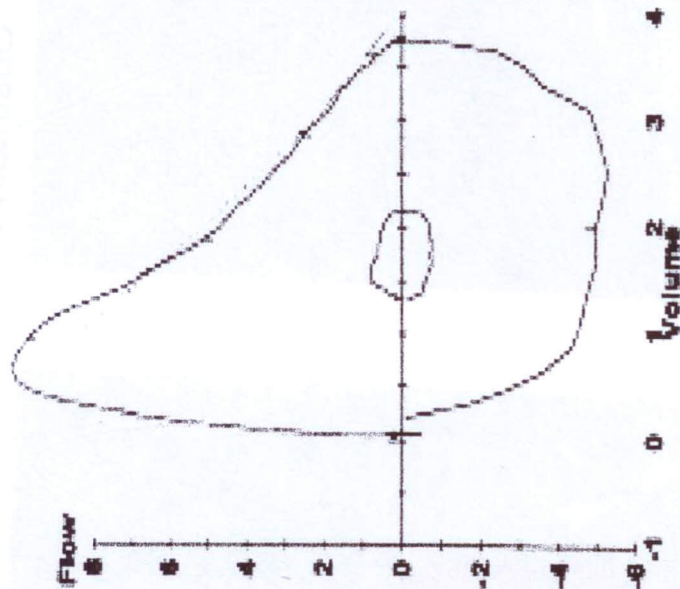
## Examples

- Obstructive diseases e.g. asthma, COPD.

- Restrictive diseases e.g. pulmonary fibrosis, kyphoscoliosis.



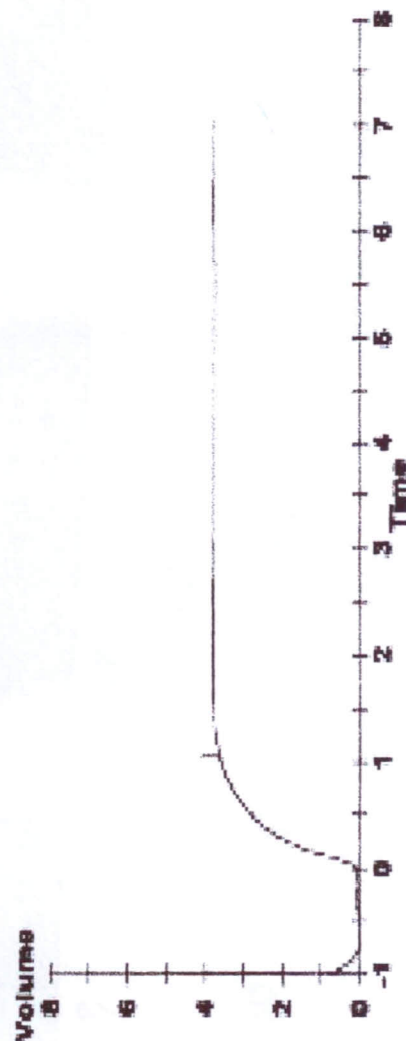
# Pulmonary Function Test



Lung mechanics:		
	Ref	Mean
PVC [liters]	4.07	3.88
REV1 [liters]	3.30	3.88
REVAFVC [%]		85
REF20% [liters]	8.24	9.73
REF50% [liters]	8.88	9.13
REF70% [liters]	9.14	9.41
PEF [liters]	9.82	98.09
REF25-75 [liters]	4.31	4.86
REF75-85 [liters]	1.44	2.09
FMV [liters]	4.07	3.58
		%

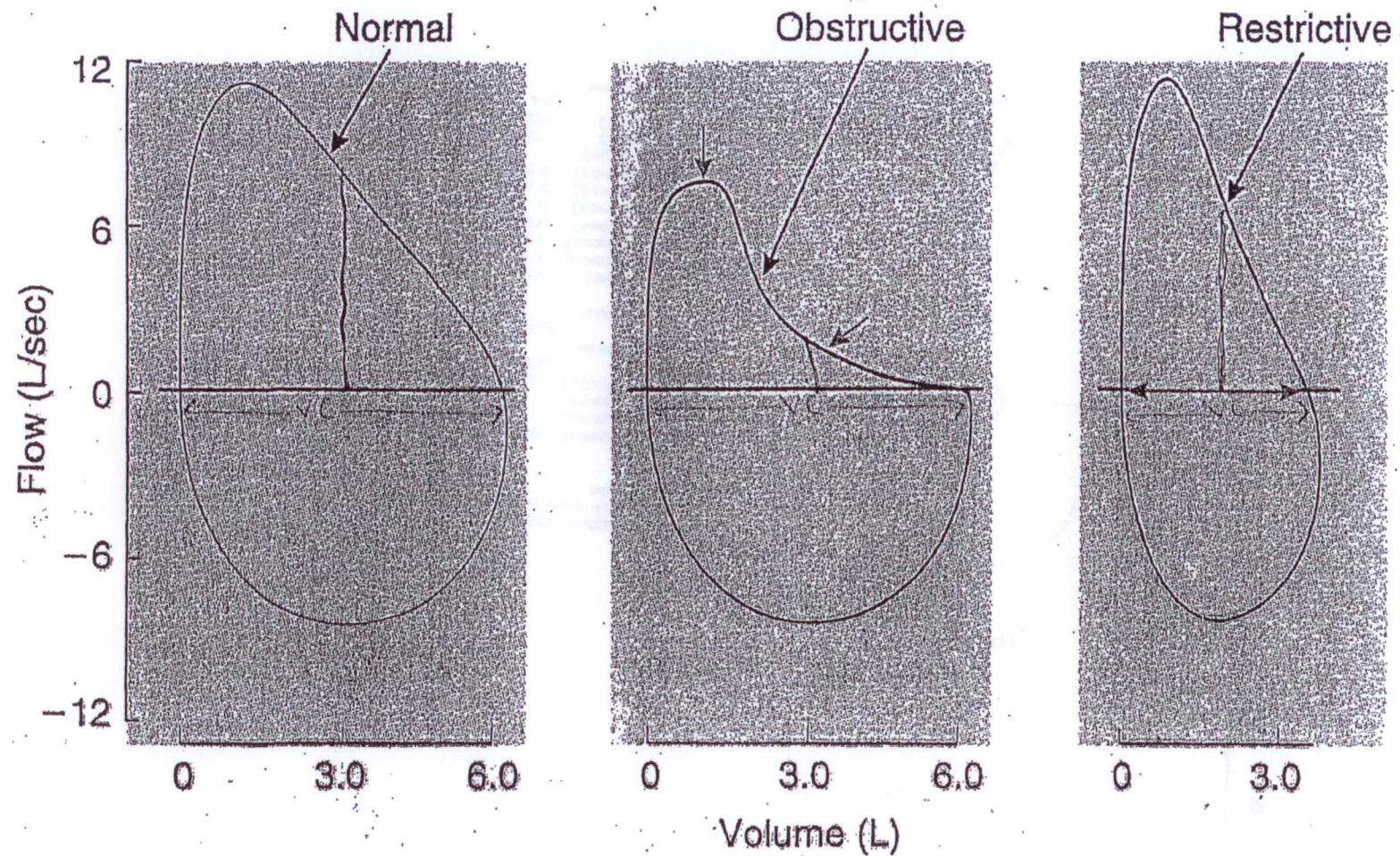
Lung volumes:		
	Ref	Mean
RF100% [liters]		4.94
REF100% [liters]	1.00	5.04
RV [liters]	1.79	
IC [liters]		
ERV [liters]		
VC [liters]	4.07	

Comments:  
Spirometry data is ACCEPTABLE  
and REPRODUCIBLE



Interpretation: Spirometry is within normal limits





**FIG. 11-20** Flow-volume loop forced vital capacity spirograms during normal, obstructive, and restrictive lung disease.

8

From the flow volume loop produced by Microlab calculate:-

- d. the vital capacity (VC)
  - e. the peak expiratory flow rate (PEFR)
  - f. the peak inspiratory flow rate (PIFR)
  - g. the MEF50 (maximum expiratory flow at 50% vital capacity)
  - h. the MIF50 (maximum inspiratory flow at 50% vital capacity)
  - i. the MEF25 (maximum expiratory flow at 25% vital capacity)
2. Briefly describe the important characteristics of the flow-volume curve with a normal healthy person.
3. Why is the force-independent part of the expiratory loop curvilinear in obstructive lung disease?
4. What is the clinical significance of MEF50 and MEF25 measurements?



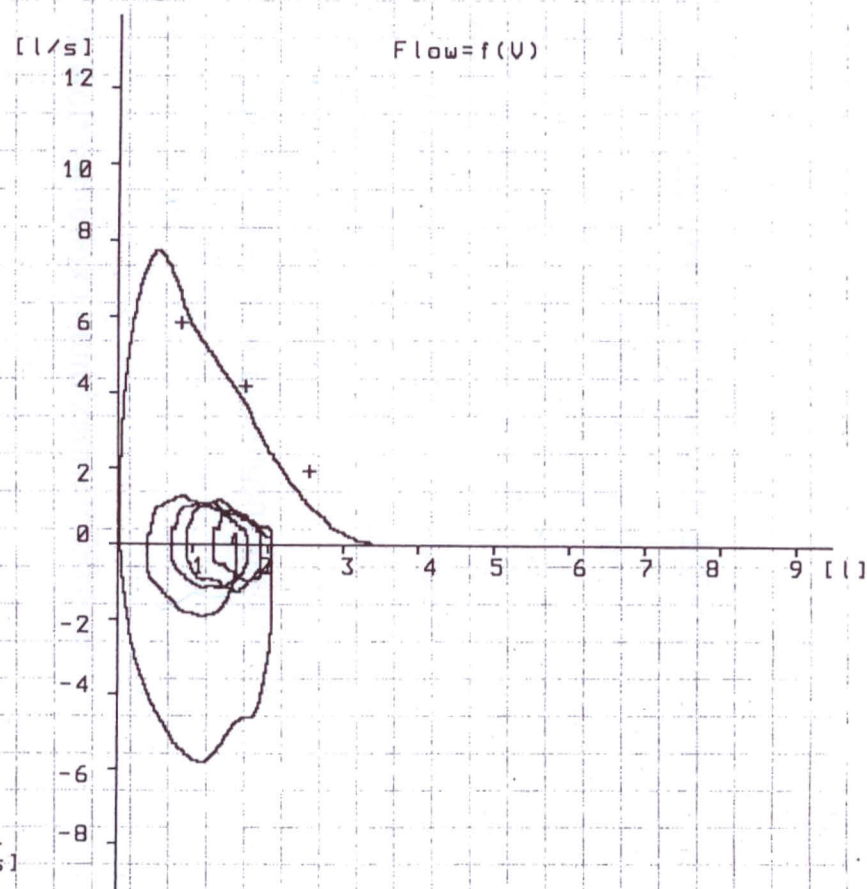
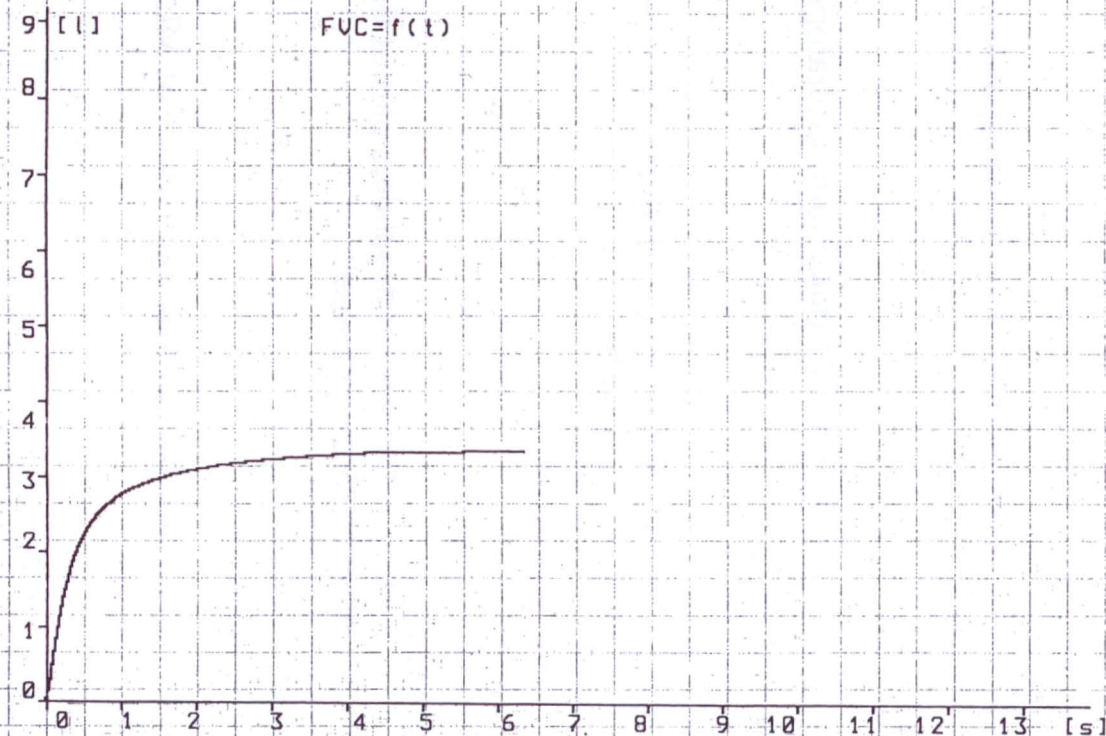
Patient:

Maia  
123  
33-year / F  
158 cm / 66 kg  
8

Normals : ECCS/Quanjer

		MEAS1	PRED.	%PRED	MEAS2	MEAS3
FVC	l	3.37	3.25	104		
FEV1	l	2.78	2.82	99		
FEV1/FVC	%	82.4	82.8	100		
FEF.2-1.2	l/s	6.67				
FEF25-75%	l/s	2.88	3.78	76		
FEF75-85%	l/s	0.73				
PEF	l/s	7.67	6.59	116		
FEF25%	l/s	6.56	5.86	112		
FEF50%	l/s	3.79	4.20	90		
FEF75%	l/s	1.10	1.94	57		

NORMAL



Cal. : 27.10.98

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■ Patient:

MEAS1 PRED. %PRED

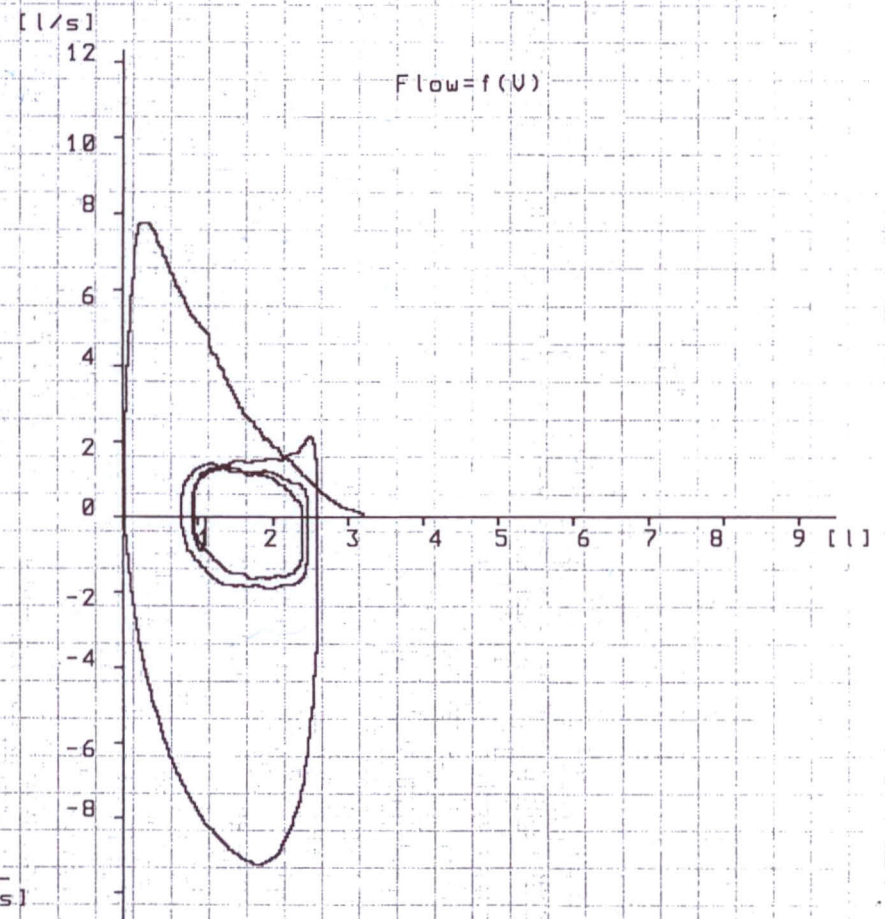
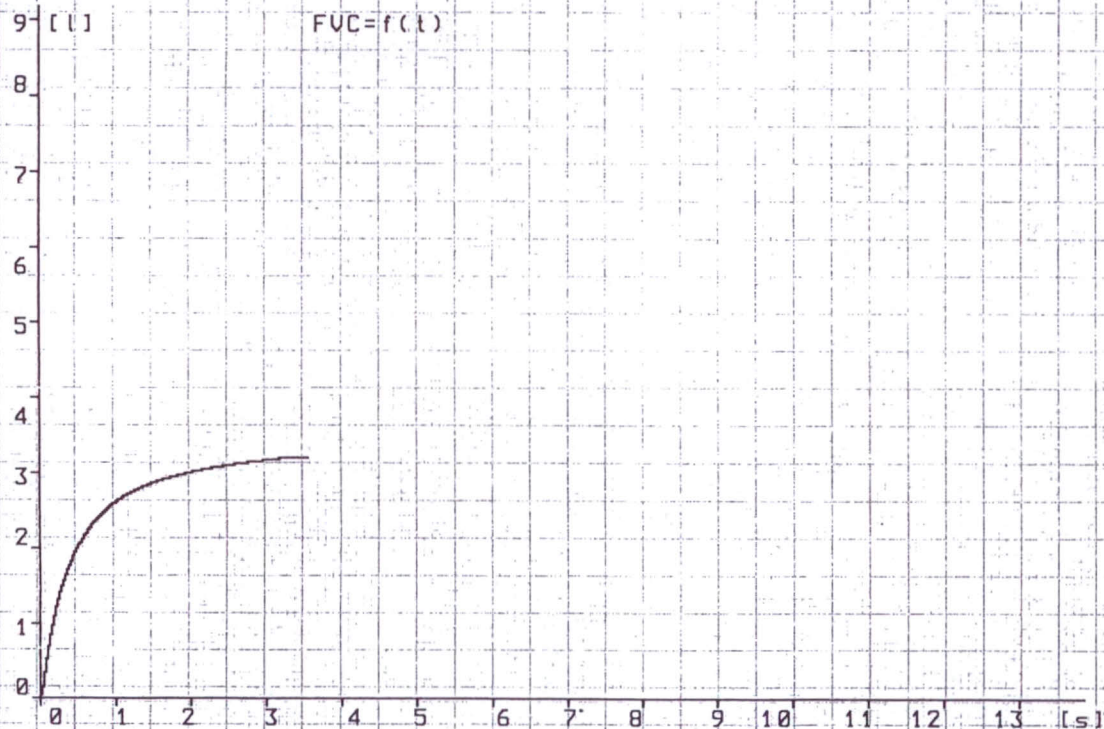
MEAS2 MEAS3

maha

FVC	l	3.20
FEV1	l	2.63
FEV1/FVC	%	82.1
FEF.2-1.2	l/s	6.15
FEF25-75%	l/s	2.54
FEF75-85%	l/s	0.79
PEF	l/s	7.72
FEF25%	l/s	5.84
FEF50%	l/s	2.87
FEF75%	l/s	1.12

.....  
32 year / F  
158 cm / 66 kg

Normals : ECCS/Quanjer



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