DYNAMIC SPIROMETRY

PHYSIOLOGY TEAM

WHY TO DO SPIROMETRY ?

 helps to diagnose some respiratory diseases.

 can help monitor the progress of disease and determine the efficiency of the treatment.

RESPIRATORY DISEASES

Obstructive Pulmonary Diseases

↑ airway resistance

Restrictive Pulmonary Diseases

↓ Lung compliance

TERMINOLOGIES

FORCED VITAL CAPACITY (FVC)

The volume of air which can be forcibly and maximally exhaled out of the lungs until no more can be expired.

FORCED EXPIRATORY VOLUME IN THE FIRST SECOND (FEV_1)

The volume of air which can be forcibly exhaled from the lungs in the first second of forced expiration.

FEV1/FVC RATIO

- **FEV1/FVC ratio or FEV_1% = 70-80%.**
- **FEV_1% less than 70 % means Obstructive Lung Disease**
- **FEV_1% in the normal range or greater than 80% means Restrictive Lung Disease.**

SPIROMETRY RESULTS

	PERFORMED	PREDICTED	% PREDICTED
FVC (Liters)	4	5	80%
FEV_1 (Liters)	3	4	75%
FEV_1%	75%	Don't worry	Don't worry

WHAT DO YOU NEED FOR SPIROMETRY?

- ☐ Vitalograph.
- ☐ Mouthpiece (disposable).
- ☐ Nose clip.

PROCEDURE

- ☐ Make a tight seal around the mouthpiece.
- ☐ Ask subject to inhale deeply.
- ☐ Then ask the subject to exhale as strong and as fast as possible.

FORCED EXPIRATORY VOLUME CURVE

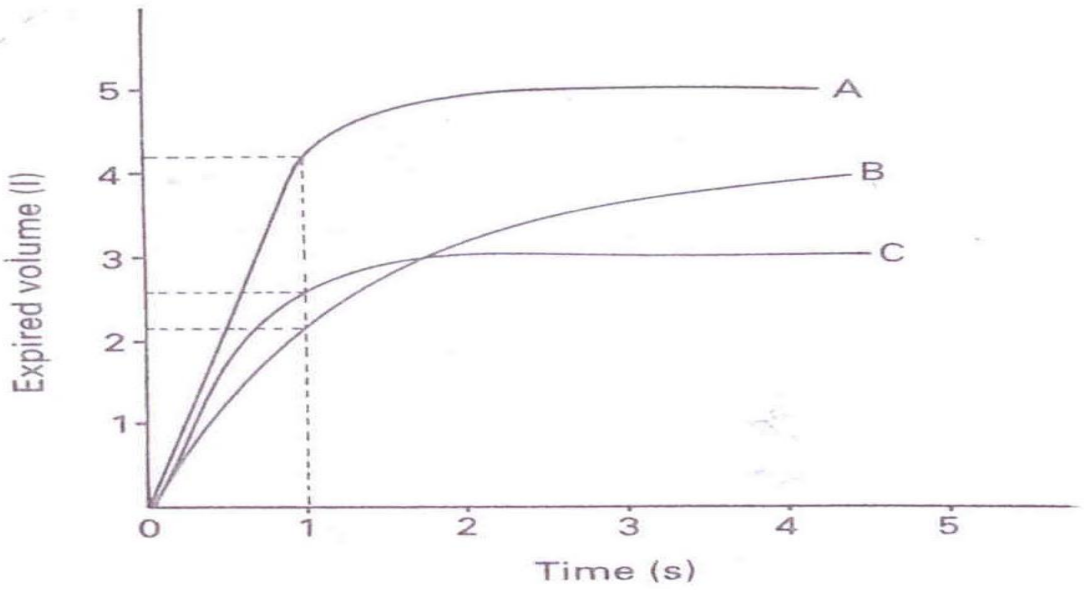


Fig. 6.24 Spirograms recorded by a 'vitalograph' for three patients. The maximum volume expired is the FVC for each patient. A: FVC = 5 litres; FEV_1 = 4.2 litres; FEV_1 = 84%—normal; B: FVC = 4 litres; FEV_1 = 2.2 litres; FEV_1 = 55%—obstructive lung disease; C: FVC = 3 litres; FEV_1 = 2.7 litres; FEV_1 = 90%—restrictive lung disease.

OBSTRUCTIVE PULMONARY DISEASES

- ☐ **FEV1 ↓↓↓↓**
- ☐ **FVC ↓ or ↔**
- ☐ **FEV1/FVC ↓ (less than 70%)**

Examples:

Bronchial Asthma

COPD (Emphysema / Chronic Bronchitis)

RESTRICTIVE PULMONARY DISEASES

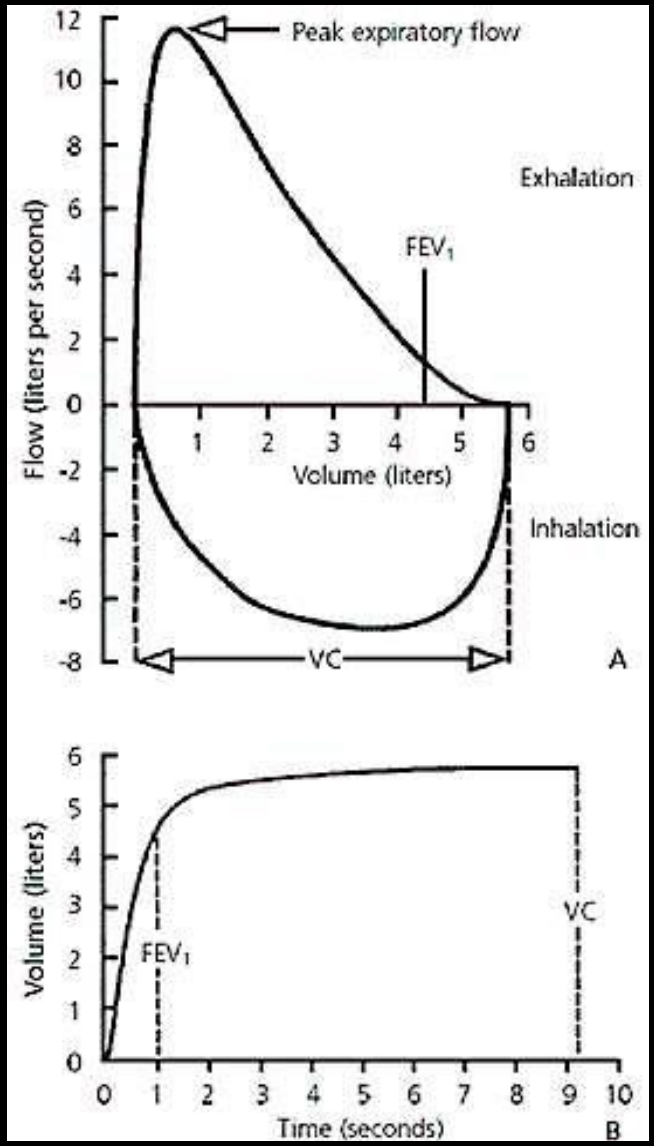
- ☐ **FEV1 ↓↓**
- ☐ **FVC ↓↓↓**
- ☐ **FEV1/ FVC ↔ or ↑**

Examples:

Pulmonary fibrosis
Chest wall deformities (Scoliosis or Kyphosis)
Respiratory muscles weakness (Myasthenia Gravis)

TWO TYPES OF CURVES CAN BE OBTAINED

- Flow-volume Loop.
- Forced expiratory volume curve (FEV_1 curve).



FLOW-VOLUME LOOP

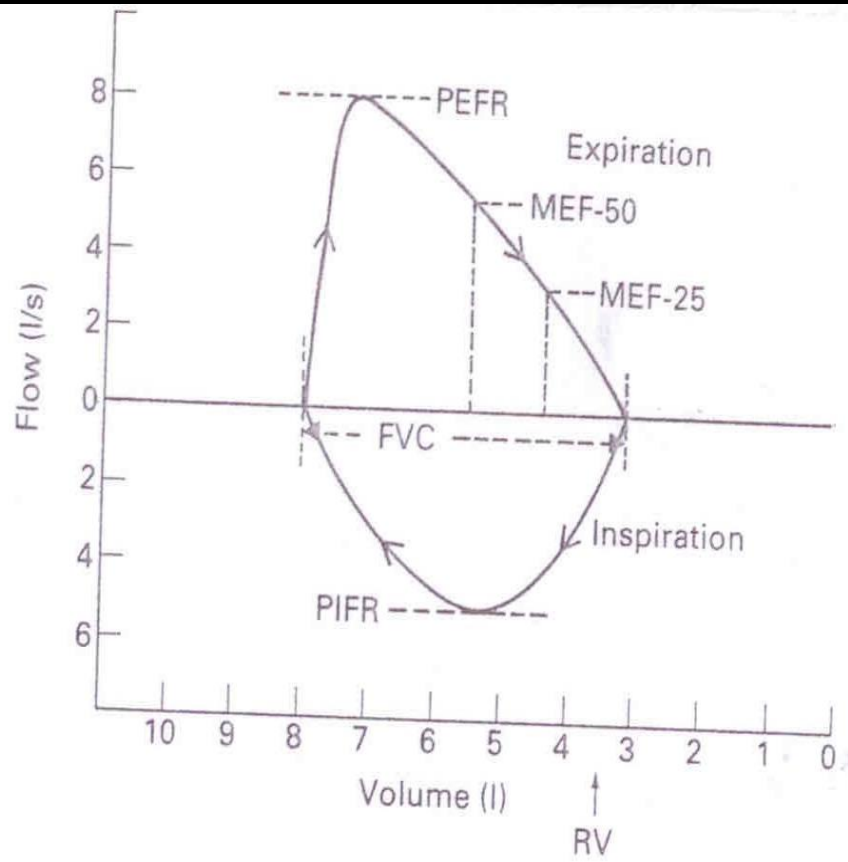


Fig. 6.27 Flow–volume loop in a normal subject. FVC, forced vital capacity; PIFR, peak inspiratory flow rate; PEFR, peak expiratory flow rate; MEF50, maximum expiratory flow at 50%

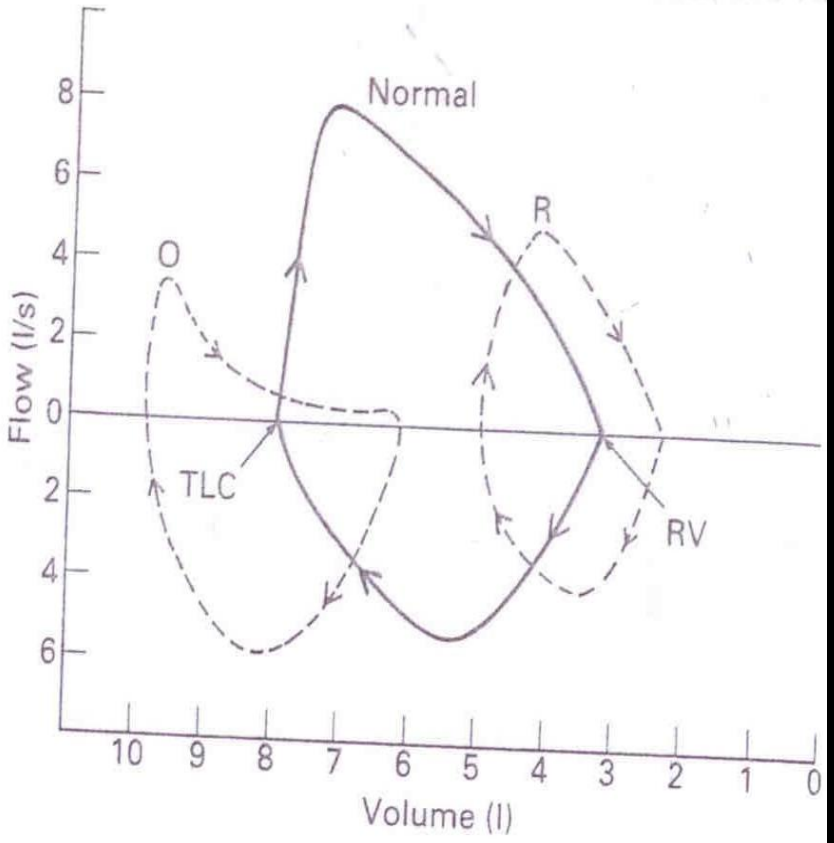


Fig. 6.28 Flow–volume loops in restrictive lung disease (R) and obstructive lung disease (O), compared with a normal subject. TLC, total lung capacity; RV, residual volume.

SPIROMETRY CASES

A 41-year-old man presents with 8-months history of cough and shortness of breath on exertion. He is a non-smoker.

	PERFORMED	PREDICTED	% PREDICTED
FVC (Liters)	2.6	4	65%
FEV_1 (Liters)	1.6	3.2	50%
FEV_1%	61%	Don't worry	Don't worry

OBSTRUCTIVE LUNG DISEASE

SPIROMETRY CASES

A 59-year-old man presents with 3 years history of progressive shortness of breath & dry cough. He is an ex-smoker for 2 years.

	PERFORMED	PREDICTED	% PREDICTED
FVC (Liters)	1.35	3	45%
FEV_1 (Liters)	1.13	2.4	47%
FEV_1%	84%	Don't worry	Don't worry

RESTRICTIVE LUNG DISEASE

Thank you