Respiratory Block

Physiology Team 430

2st Lecture

Dynamic Spirometry

Practical

This Lecture is Done By :

Dalal Alqadi

Ali AL-Kahtani

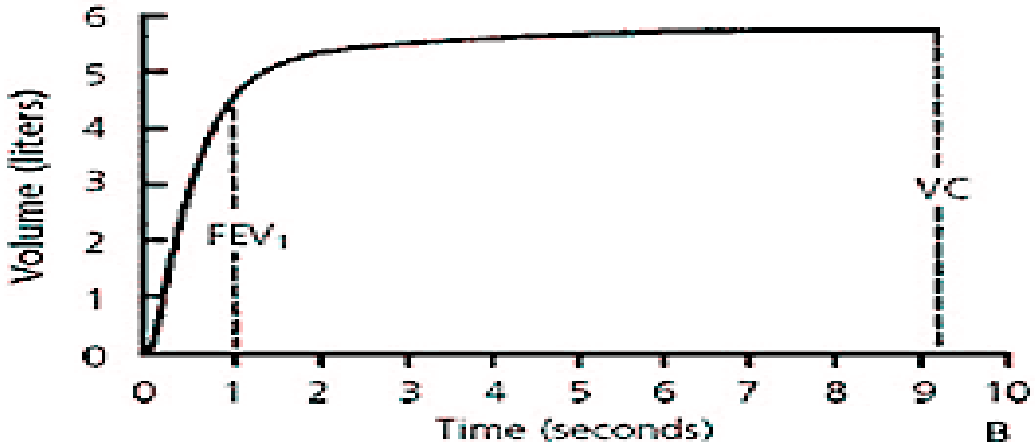
Organized By : *Layan Akkielah*

Some Definitions:

- **Forced expiratory volume in 1 sec (FEV1):** the volume of air forcefully expired during the first second after a full breath and normally accounts for > 75% of the FVC.

- **Forced Vital Capacity (FVC):** The volume of air expired with maximal force after maximal inspiratory effort.

The FEVI curve



(1) From the FEV1 produced, calculate:-

a. **FVC**: 5.5 L (estimate)
b. **FEV1:** 4.5 L (estimate)
c. **FEV1%:** FVC/FEV1 × 100 = 4.5/5.5×1= 81% (normal).

(2) The FEV1% is a good index of airway resistance while expiring.

a) What values would be expected for a normal person?

The **FEV1%** expected for a normal person is **75% - 80%**

b) How long does it take for healthy subjects to expire their vital capacities?

It takes **healthy** subjects to expire their vital capacity **3-5 seconds**. In **obstructive** lung disease, it takes **more than 5 sec** to expire the vital capacity and in **restrictive** lung disease all the vital capacity can be expired **within 3 sec**.

c) Briefly explain what happens to FEVI and FEV1 % measurements in patients with obstructive and restrictive lung diseases.

In pathologies the following effects take place:

	Obstructive	**Restrictive**
FEV1/FVC %	↓↓ (less than 70%)	Normal or ↑ (more than 80%)
FEV1	↓ ↓	↓
FVC	↓	↓↓ (can reach 3L)

NOTE:

In spirometry, the machine predicts values for all respiratory parameters (FVC, FEV_1, PEFR, MEF50 etc) for the subject according to his/her height, weight, age, sex and ethnic origin and then compares the subject's actual values after performing spirometry with the predicted values. Normally, the actual values should be **at least 75% of the predicted values** so we can say it is a normal, healthy subject with no Obstructive and Restrictive lung disease

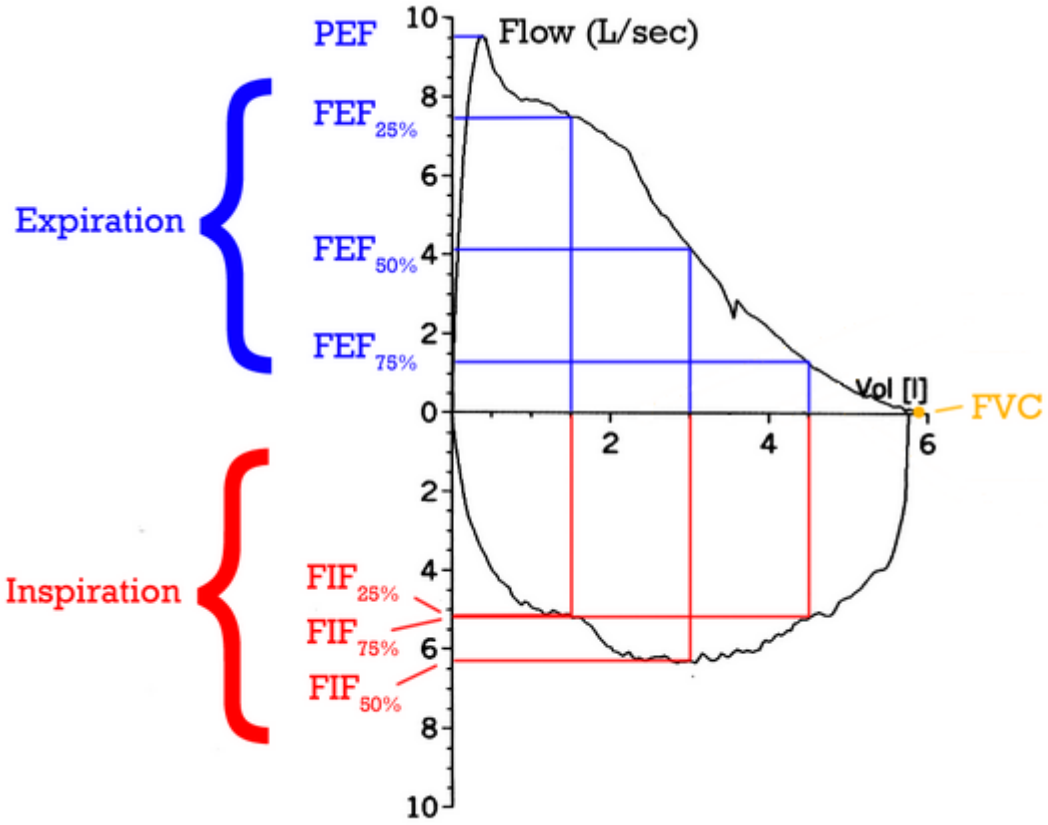
EXAMPLES OF OBSTRUCTIVE LUNG DISEASE:

Bronchial Asthma and COPD (Chronic Obstructive Pulmonary Disease)

EXAMPLES OF RESTRICTIVE LUNG DISEASE:

Pulmonary fibrosis, Collapse of lungs, neuromuscular disorders such as Myasthenia Gravis, Spine problems such as Kyphosis and Scoliosis

Flow Volume Loop



1. From the flow volume loop recorded, calculate:-

a) The Forced vital capacity (FVC)

In the above flow-volume loop, **FVC = 6 liters** as you can measure it on X-axis from left to right.

b) The peak expiratory flow rate (PEFR)

In the above flow-volume loop, **PEFR = 9.5 L/sec**

DEFINITION: Maximum airflow achieved during expiration.

NORMAL RANGE = 6- 12 L/sec

In **Obstructive** lung disease: **PEFR ↓** (Decrease slightly)
In **Restrictive** lung disease: **PEFR ↓↓** (Decrease too much)

c) The peak inspiratory flow rate (PIFR)

Not important.

d) The MEF50 (maximum expiratory flow at 50% vital capacity)

It is also called FEF50, as mentioned in the above flow-volume loop.
In the above flow-volume loop, **MEF50 or FEF50 = 4 liters**

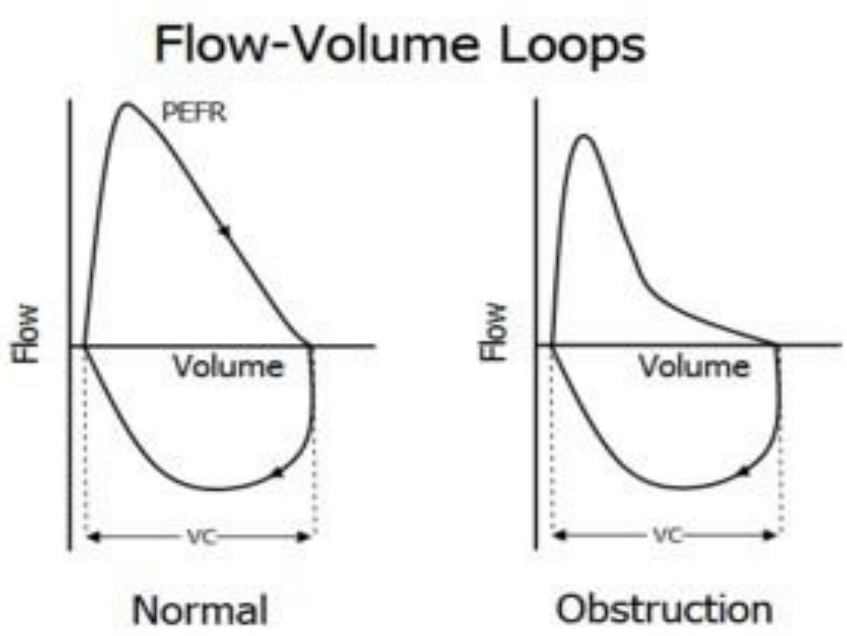
DEFINITION: It is the speed of airflow during expiration at the time when 50% of vital capacity has been expired.

NORMAL RANGE = 4- 6 L/sec

In **Obstructive** lung disease: **MEF50 ↓↓** (Decrease too much)
In **Restrictive** lung disease: **MEF50 ↓** (Decrease slightly) or normal.

e) The MIF50 (maximum inspiratory flow at 50% vital capacity)

Not important.



2- Briefly describe the important characteristics of the flow-volume curve recorded with a normal healthy person.

In a normal flow-volume loop, the upward loop is expiratory loop and downward loop is inspiratory loop. On X-axis, you can measure FVC and on Y-Axis, you can measure PEFR, MEF50 and PIFR. In a normal individual all of these parameters will be within normal ranges.

3- Why is the force-independent part of the expiratory loop curvilinear in obstructive lung disease?

Due to narrowing of the smaller airways
(The rising phase in the expiratory loop is force dependent, and the falling phase is force independent).

4- What is the clinical significance of MEF50 measurements?

The clinical significance of MEF50 measurements is to diagnose obstructive lung disease.

(↓↓ in MEF50 with slight ↓ in PEFR ➔ obstructive lung disease).