4th lecture

Lung function in health and Disease: spirometry

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OBJECTIVES

- The different indications of the pulmonary function tests
- The factors that cause differences in the results
- The changes in results due to smoking
- The signs and symptoms of pulmonary diseases

CONTENTS

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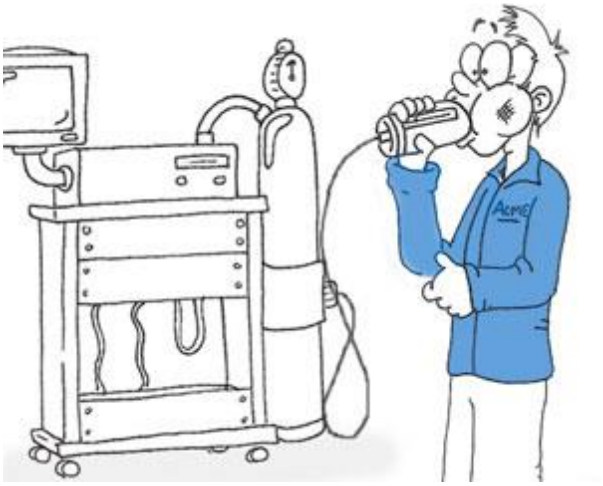
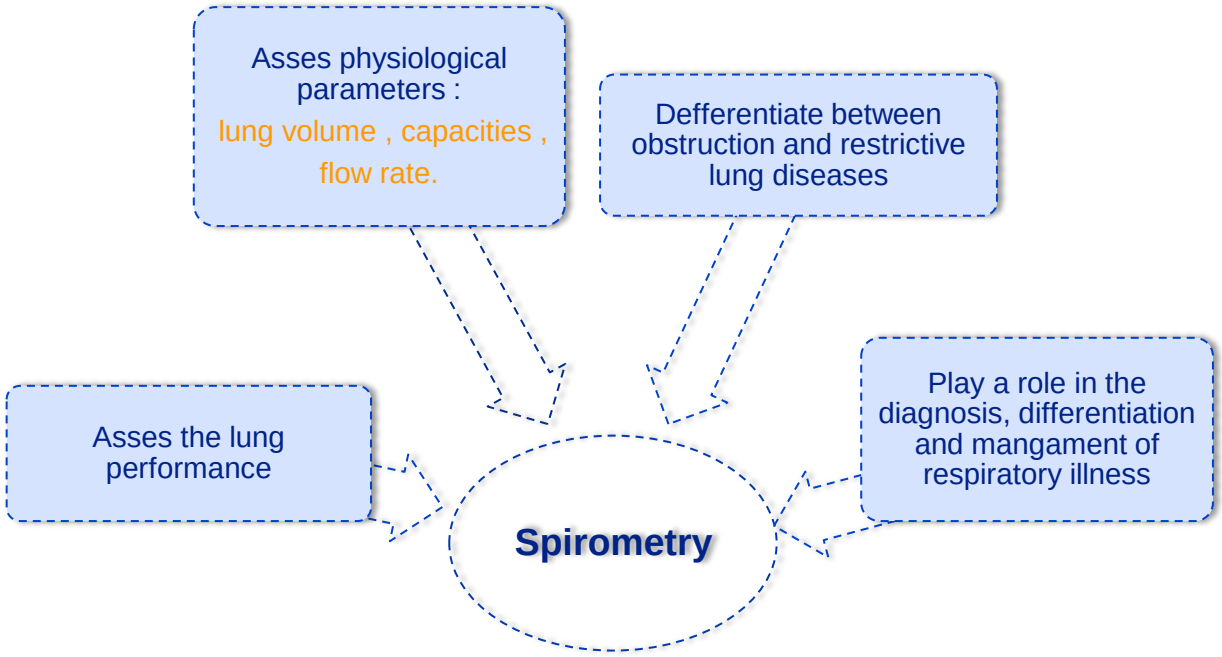
COLOR INDEX:

- Red = important
- Grey = additional notes



1-PHYSIOLOGICAL CONDITIONS AND SPIROMETRY[1]:

- **Age**
- **Gender**
- **Height**
- **Weight**
- **Ethnic group**[2]
- **Pregnancy**



[1] The result of this test depend on these conditions
[2] Characteristic of a people, especially a group sharing a common and distinctive culture, religion, language.

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2-INDICATION OF SPIROMETRY[3]:

We use spirometry based on clinical features (signs) and symptoms :

Symptoms

- Dyspnea
- cough
- sputum production
- chest pain

Signs

- Cyanosis.
- Cubbing.
- Chest deformity.
- Diminished chest expansion.
- Hyperinflation.
- Diminished breath sounds.
- Prolongation of expiratory phase.
- Hypoxemia.
- hypercapnia.

Abnormal X-ray

In addition to :

→ **Monitoring indication[4]: ((To assess the therapeutic interventions))**

1. Bronchodilator therapy.
2. Steroid treatment for asthma.
3. Chronic obstructive lung disease.
4. Interstitial lung disease.

→ **Pre-operative indication:**

To determine the suitability and management during and after anesthesia + assess the risk for surgical procedures known to affect lung function

**** There are some diseases that affect PFTs[5] here is their course:**

Neuromuscular diseases: Gillian Barre Syndrome, Myasthenia gravis.

Pulmonary diseases: Obstructive airway diseases, Interstitial lung diseases

Adverse reactions: Drugs with known pulmonary toxicity [Pulmonary fibrosis].

[3] Spirometry is used when a patient has one or more of these signs or symptoms.
[4] Spirometry is also used to monitor the severity of some other lung conditions, and their response to treatment.
[5] Pulmonary Function Tests

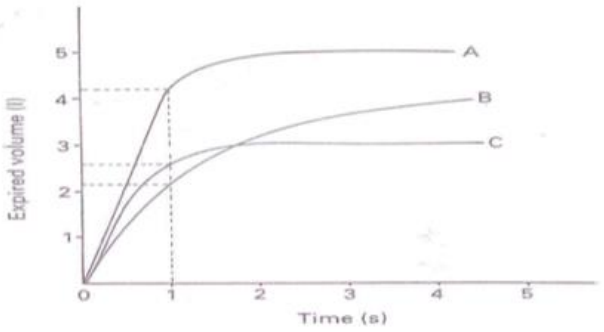
3-SPIROMETRY IN RESPIRATORY DISEASES

Obstructive lung disease :

1) Shortness of breath due to difficulty exhaling all the air from the lungs.
2) Damage of the lungs and narrowing of the airways inside the lungs.
3) Exhaled air comes out more slowly than normal.
4) At the end of a full exhalation, an abnormally high amount of air may still exist in the lungs.

The result of the spirometry test (B in the graph below indicate a obstructive lung disease)

- **The FEV1/FVC < 80%**
- **Reduced FVC**



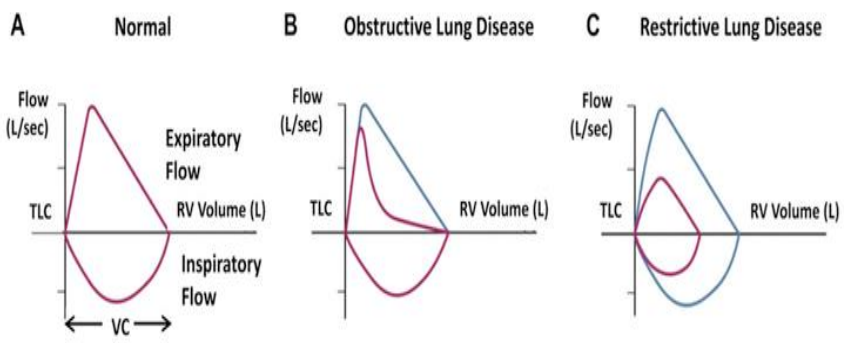
Restrictive lung disease:

People with restrictive lung disease cannot full fill their lungs with air. Their lungs are restricted from fully expanding. Causes :

1. Extrapulmonary conditions affecting movement of the chest wall
2. Intrapulmonary conditions affecting lung elasticity (like fibrosis)

The result of the spirometry test (C in the graph indicate and restrictive lung disease):

- **The FEV1/FVC is normal**
- **Reduced FVC**



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4-COPD AND DIAGNOSING IT

* COPD refers to a group of lung diseases that block airflow and make breathing difficult.
* Emphysema and chronic bronchitis are the two most common conditions that make up COPD.

Chronic bronchitis is an inflammation of the lining of your bronchial tubes, which carry air to and from your lungs.

Emphysema occurs when the air sacs (alveoli) at the end of the smallest air passages (bronchioles) in the lungs are gradually destroyed.

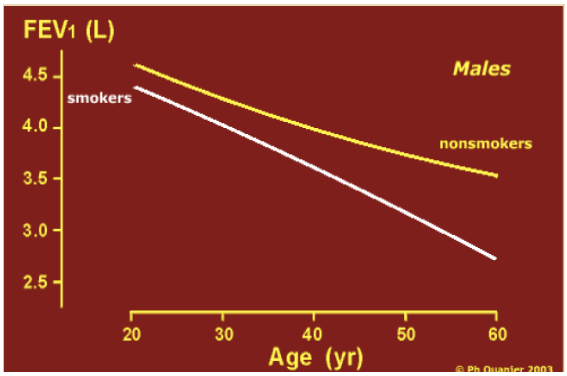
- HOW To Diagnose COPD !

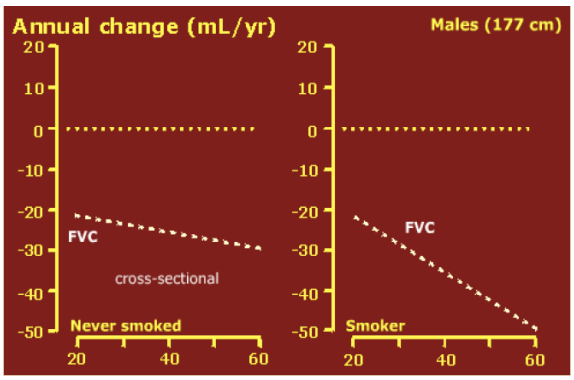
If the patient have these symptoms: Cough, Dyspnea (shortness of breath), Sputum. + He/she exposed to Risk Factors such as : Tobacco, to indoor/outdoor pollution. + Then we should PFTs (**Spirometry**) to confirm.

5-SPIROMETRY RESULT OF A SMOKER AND A NON-SMOKER

Non Smoker[6]: In normal healthy non smoker subject after the age of 30 the expected decline in Lung function parameter [FEV1] is 25–30 ml/ year.
Also, The annual change of FVC will decrease with ageing.

Smoker[7]: The average rate of decline of lung function in smokers as measured by Forced Expiratory Volume in 1 sec [FEV1] is 60-70 ml / year.
Also, The annual change of FVC has been decreasing sharply.





[6] كل سنة يقل قيمة (Forced expiratory volume in the first second or FEV١) بمقدار ٢٥ - ٣٠ مل طبيعياً .

[7] في حالة المدخن، مقدار (FEV١) تقل كل سنة تقريبا ضعف كمية الشخص الغير مدخن .

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Click here to check your understanding

Click here to watch a video about Spirometry

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