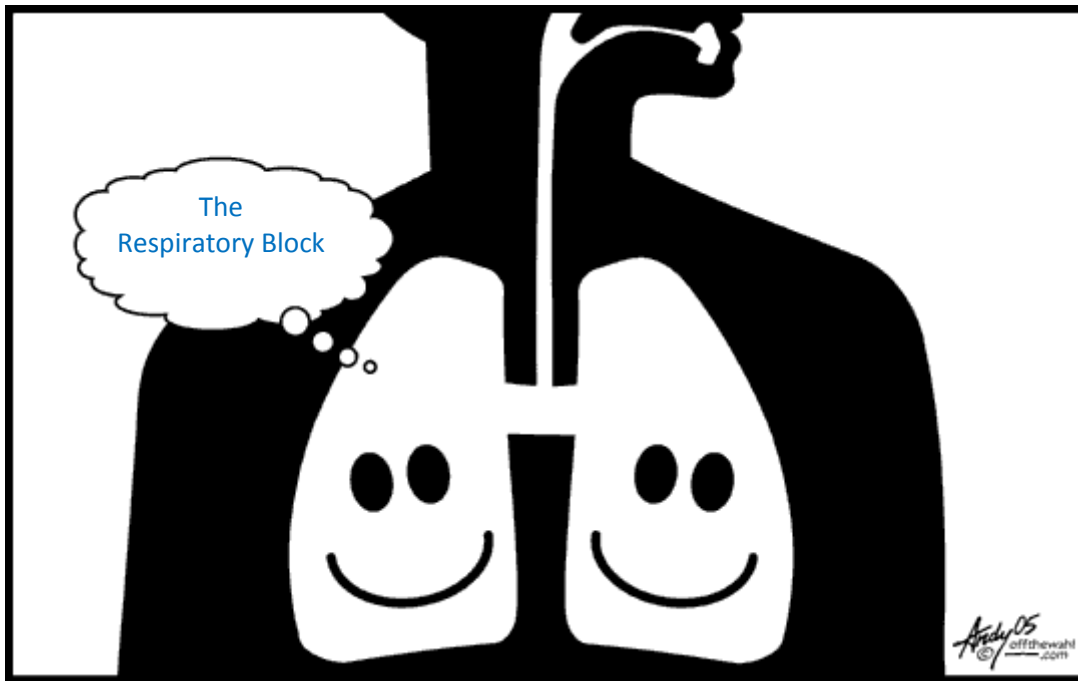


The Physiology Team



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هذه المذكرة للمذاكرة قبل الاختبار وهي تقريبا شاملة لكل شيء في المحاضرة

We did our best and I hope our best is enough

Mechanism of Breathing

- ♦ Ventilation: Known as **inward** and **outward** of air

- ♦ Phases of Breathing :

inspiration → expiration → rest

- ✓ There should be a pressure difference to allow the movement of air inside and outside the respiratory system.
- ✓ At rest the alveoli pressure = zero = atmospheric pressure = 760 mmHg

- ♦ Inspiration:

Active process → muscles contracts → increase lung volume

- ✓ diaphragm → increase longitudinal diameter
- ✓ external intercostals ms → increase the transverse diameter
- ✓ Increase volume → decrease intra alveolar pressure (0 → -1) → air goes to the alveoli
- ✓ *Boyle's law if the volume increases the pressure decrease and vice versa

((IP_p = -7.5 cm H₂O))

- ♦ Expiration:

Passive process

Muscle recoil + inward pull of surface tension of alveolar fluid → decrease lung volume → increase P_{alv} ((+1)) → air goes out of the alveoli

((IP_p = 1 cm H₂O))

♦ Deep inspiration:

Accessory ms → increase the size of thoracic cavity → decrease in IPp ((-20 - -40cm H₂O))

♦ Deep Expiration:

Abdominal ms + internal intercostals ms → decrease the thoracic cavity volume → increase IPp ((+30 cm H₂O))

♦ Pressures during breaths:

1- Intra-alveolar “intrapulmonary” Palv:

Between breaths = **zero**

Inspiration= **-1**

Expiration= **+1**

2- Intra plural “IPp” :

This is the pressure which is between the 2 layers of pleura in the pleural cavity

The space between them is called potential space. This space should be empty due to continuous suction of fluids by lymphatic.

IPp at rest = **-5**

Why it is negative?

Because there are 2 opposing forces affect it

1-the **lung elastic tissue force** → **retract**

2-the **chest wall force** → **expand**

3- Transpulmonary

It is the difference between the alveolar pressure and the pleural pressure.

$$TPp = P_{alv} - P_{pl}$$

It measures the recoil pressure which is the elastic forces in the lungs that tend to collapse it.

- ✓ Recoil tendency of the lung is highest at total lung capacity. That means the highest recoil tendency is when the lung reach its highest capacity
- ✓ When we measure its pressure we can know if we have a collapse or not.

Because **alveolar pressure** is an **internal force** and **Pleural pressure** is an **external pressure**

So when those **2 forces are equal** that means we **don't have collapse**

♦ **Pneumothorax:**

It is a condition when the plural cavity is filled with air due to puncture

♦ **Elastic force of the lung:**

1-the elastic forces of the lung tissue itself

(caused by collagen and elastin fibers)

(account for **1/3** of the total elastic forces of the lung).

2-The elastic forces caused by the surface tension of the fluid lining the alveoli

(account for 2/3 of the total elastic forces of the lungs.)

♦ **Compliance of the lung:**

The extent to which the lungs expand for each unit increase in transpulmonary pressure.

$$CL = \frac{\text{Volume change } (\Delta V)}{\text{Transpulmonary pressure change } (\Delta P)}$$

“ **how much it expands for every cm H₂O** “

- ✓ For **both lungs** in adult = **200 ml** of air /cm H₂O (**outside the body**)
- ✓ The **lungs** and **thorax** together= **110 ml**/cm H₂O (**in the body**)

- ✓ It is reduced in pulmonary fibrosis, pulmonary edema, diseases of the chest wall (kyphosis, scoliosis)
- ✓ Emphysema *increases* the compliance of the lungs because it destroys the alveolar septal tissue that normally opposes lung expansion.