

# Pulmonary Edema

**Pulmonary edema** is a condition in which excess fluid accumulates extravasally in the lung tissue.

## Pathogenesis

The Lung has two main extravascular compartments: the **interstitium** and the **alveolar space**. The alveolar air is separated from the interstitium by the alveolar epithelium, which is practically impermeable to proteins. Proteins retained in this way in the interstitium represent a considerable **osmotic force preventing the transfer of water into the alveoli**. Flooding of the alveoli with fluid (alveolar edema) is therefore a relatively late and very serious finding.<sup>[1]</sup>

In contrast, the endothelium of pulmonary capillaries, which separates the interstitial space from the intravascular space, is not completely impermeable to proteins. The passage of fluid across this interface is therefore easier. The amount of fluid passing through the capillary endothelium is determined by the size of the endothelial surface, permeability alveolocapillary interface and the total pressure that is responsible for fluid transfer. This transmural pressure is the result of hydrostatic and colloidal osmotic pressures outside and inside the vessels. Hydrostatic pressure tends to be higher in blood vessels, thus supporting the transfer of fluid into the interstitium. Oncotic pressure tends to be lower in the interstitium, therefore it acts against the transfer of fluid from the vessels. Under normal conditions, these factors are in balance and the total fluid transfer is therefore minimal (around 10–20 ml/hr, i.e. a fraction per mille of lung flow). This small amount is easily removed by the lymphatic system. An imbalance in any of the factors determining fluid transfer (endothelial and epithelial permeability, hydrostatic pressure, oncotic pressure) can lead to pulmonary edema (if the capacity of lymphatic drainage is exceeded).<sup>[1]</sup>

### UNDERLYING CAUSES

#### NON-CARDIOGENIC

- \* PULMONARY INFECTIONS
- \* INHALATION OF TOXIC SUBSTANCE
- \* TRAUMA



Video in English, definition, pathogenesis, symptoms, complications, treatment.

## Causes

The most common causes of pulmonary edema are:

### Permeability disorder

- inflammation,
- inhalation of irritating gases,
- irradiation,
- aspiration pneumonia,
- disseminated intravascular coagulation,
- allergic reaction,
- renal failure.

### Increase in pulmonary capillary hydrostatic pressure

- valvular defects of the left heart,
- left heart failure,
- high blood flow through the lungs,
- pulmonary vein obstruction.

### Decreasing the oncotic pressure of the blood plasma

- hypoalbuminemia.

### Complex causes

- chronic hypoxia,
- neurogenic pulmonary edema,
- overdose of narcotics (heroin),
- pulmonary embolism,
- eclampsia.

### Cardiogenic causes



Chest CT - pulmonary edema in a patient with mitral stenosis

This includes all causes based on heart function disorders. The main cause is left heart failure. When the left half of the heart fails, it is unable to pump blood throughout the body. In addition, blood begins to accumulate in the space in front of the left half of the heart, i.e. in pulmonary circulation. The pressure of the blood in the pulmonary circulation increases and the fluid therefore begins to filter into the alveoli of the lungs. The causes are various - from damage to the heart muscle by heart attack, through heart valve disorders (especially mitral stenosis) and heart rhythm disorders, after complications of infusion therapy. For example, when we give the patient as much fluid in infusions as his heart cannot pump.

### Noncardiogenic causes

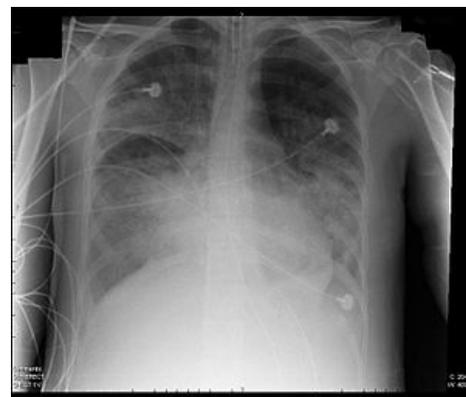
These are causes unrelated to the heart. They tend to be much rarer. This includes damage-related conditions alveolo-capillary membranes, which cause fluid to flow into the alveoli. Such damage occurs, for example, after inhalation of aggressive and toxic gases.

## Clinical picture

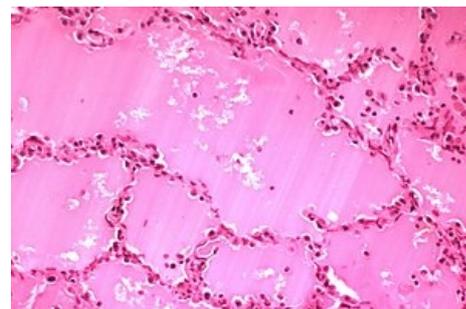
The main manifestation is **dyspnea**, which classically worsens **at night when lying down** in heart failure. The patient therefore begins to **put more pillows under his head at night** and sleeps in a semi-sitting position. In addition, a cough occurs. It will be **dry and irritating** at first. As the amount of fluid in the alveoli begins to increase, the cough will become wet and the person will cough up a **pink colored fluid**.

## Diagnostics

The diagnosis is primarily based on medical history and clinical picture. We find by auscultation moist phenomena, usually **crepitus** or **cracks** and **cracks**. On the X-ray image of the lungs, we will then see a **multiplied vascular pattern**, which informs us about blood congestion in the pulmonary vessels.



Posterior chest X-ray - non-cardiogenic pulmonary edema



Alveoli filled with edematous fluid

## Treatment

In case of cardiogenic pulmonary edema, we try to reduce the patient's total volume and thereby reduce the volume of fluid in the pulmonary basin. diuretics are used for this. Diuretics increase the excretory function of the kidneys and thereby reduce the volume of fluid in the blood vessels. In addition, the victim will be given medication to facilitate breathing and may be given oxygen inhalation. Severe conditions should be hospitalized in intensive care units and, if necessary, connected to artificial lung ventilation. In addition to these measures, it is necessary to find out why the heart failed and to further address this cause.

## Links

### Related Articles

- Pulmonary edema (preparation)
- Cor pulmonale
- Heart Failure
- Congenital heart defects in adulthood
- Lungs
- Surfactant
- RDS
- Pulmonary Edema/Repetitorium
- Pulmonary edema (preparation)

### External Links

- Template:Akutně

### Source

- ŠTEFÁNEK, Jiří. *Medicína, nemoci, studium na 1. LF UK* [online]. [cit. 2010]. <<https://www.stefajir.cz/?q=plicni-edem>>.

### Reference

1. HAMPL, Václav - HERGET, Jan. *Patologická fyziologie srdce a cév* [online]. ©2003. [cit. 2010-04-21]. <[http://fyziologie.lf2.cuni.cz/uceni/lecture\\_notes/CEVCSAC\\_skripta\\_www/index.htm](http://fyziologie.lf2.cuni.cz/uceni/lecture_notes/CEVCSAC_skripta_www/index.htm)>.

