

Pulmonary circulation

thumb|400px|Plicní cirkulace thumb|right|Detail plicní cirkulace – alveolární cirkulace The pulmonary circulation contains three types of blood vessels.

- **Pulmonary vessels** (functional) – exit the right ventricle (truncus pulmonalis) and branch-off further. Compared to the systemic circulation, they are shorter and therefore have less resistance (resistance is, among other things, a function of length). In addition, they have a much weaker wall, so they have great pulmonary compliance and are able to hold large amounts of blood (up to 7 ml / mmHg), which is of great importance in adapting to changes in cardiac output. From the arteries, blood moves to the capillaries that surround the alveoli, and then flows to the veins that lead the blood to the left atrium.
- **Bronchial vessels** (nutritional) – branches of the aorta that carry oxygenated blood to the connective tissue of the lungs, septum and bronchi. They empty into the pulmonary veins, which carry already oxygenated blood, thereby reducing the total saturation of oxygenated blood and causing the left ventricular output to be 1-2% greater than the right ventricular output.
- **Lymphatic vessels** – drain excess fluid, which is filtered into the interstitial space (+ 1mmHg) and thus prevents pulmonary edema.

Pressure

thumb|200px|Pressure changes As in the aorta, pulse waves appear in the lungs, which are caused by systole and diastole of the right ventricle, but due to the low pressures, inhaling and exhaling are also applied on the pulse curve. The maximum pressure in the right atrium is equal to 25mmHg and the minimum pressure is 0-1 mmHg.

The pressure in the pulmonary arteries decreases more slowly than in the right atrium → the maximum pressure is 25mmHg and the minimum pressure is 8mmHg. The median arterial is 15mmHg.

The capillary pressure is approximately 7mmHg.

The pressure in the left atrium and pulmonary veins is difficult to measure because a catheter cannot be inserted from the artery through the left ventricle and further into the left atrium and pulmonary veins.

Blood volume

There is 450 ml of blood in the lungs (9% of the total blood volume), of which 70 ml is found in capillaries. The lungs can serve as a reservoir of blood, there can be half or twice the amount of blood. If the left heart fails, blood accumulates in the pulmonary circulation.

Flow

Blood flow through the lungs is the same as cardiac output. Blood distribution is important in areas where effective ventilation can take place (Pulmonary Ventilation-Perfusion Ratio). This effect is called hypoxic pulmonary vasoconstriction - a decrease in alveolar ventilation causes a decrease in the concentration of oxygen in the capillaries, leading to vasoconstriction and thus increases local resistance and the flow is shifted to another part of the circulation (reduced amount of oxygen in the blood systemic circulation).

Effect of increased cardiac output on the pulmonary circulation

thumb|200px|Influence of cardiac output on the pulmonary arterial pressure Cardiac output increases, for example, during exercise, when the volume of cardiac output increases 5-7 times. The lungs respond by three mechanisms:

Increase in the number of open capillaries (up to 3x). Vasodilation occurs. The pressure increases. The first two mechanisms reduce the resistance of the circulation, the third mechanism increases the pressure. In a healthy individual, pulmonary arterial pressure rises only minimally.

Links

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- Lungs

Resources

- HALL, Arthur C. *Textbook of medical physiology*. 11th edition. Philadelphia : Elsevier Saunders, 2006. 1116 pp. ISBN 0-8089-2317-X.