Blood supply of the heart

Arteries

Nutrition and oxygenation of the heart walls are provided by *aa. coronaria* (coronary arteries).

There are the two main arteries:

- arteria coronaria dextra,
- arteria coronaria sinistra.

They are the first branches of the aorta, coming from the *bulbus aortae (sinus aortae dexter et sinister)*. They run along the surface of the heart placed in loose connective tissue and fat. The epicardium is then covering the arteries and tightly attached to the heart surface.

General characteristics

- wavy course on the surface of the heart
- they behave as final branches (they have only non-functional anastomoses, or none at all);
- during the closure of an artery, the part of the myocardium supplied by that artery is disconnected from the supply of oxygen and nutrients;
- the branches of the coronary arteries are "attached" to the myocardium by loops (*vincula*) and myocardial bridges (*ponticula*);
- the course, branching and supply area of individual branches is highly variable.

Right coronary artery (arteria coronaria dextra)

It emerges from the sinus aortae dexter from behind the truncus pulmonalis to the sulcus coronarius, between the auricula dextra and the ventriculus dexter. It crosses the lower surface of the heart, where it turns towards the *apex cordis* into the sulcus interventricularis posterior and ends as the ramus interventriculatis posterior.

During its course, it issues the following branches:

- ramus coni arteriosi - the first branch of the right coronary artery, runs on the border of the truncus pulmonalis and ventriculus dexter, often anastomoses with a similar branch from the a. coronaria sinistra and forms the so-called Vieussensian circuit,
- ramus nodi sinuatrialis - protrudes mostly (55% right 45% left coronary artery) as the second branch running between the auricula dextra and the beginning of the aorta, then it winds around the upper vena cava (v. cava superior) towards the right atrium, where one branch (ramus cristae terminalis) enters the nodus sinuatrialis,
- rami atriales dextri anteriores - small branches for the right atrium,
- rami ventriculares dextri, anteriores et posteriores - branches supplying the right ventricle, normally 2-3 in the front and 2 in the back, more prominent of which runs along the right edge of the heart as the ramus marginalis dexter,
- rami interventriculares septales posteriores - septal branches leading from the ramus interventricularis posterior to the interior of the ventricular septum.

The artery supplies the walls of the right ventricle (except for a small part of the anterior apex cordis, which is supplied by a few branches of the arteria coronaria sinistra), a small part of the left ventricle in the posterior sulcus interventricularis, posterior third of the ventricular septum, right atrium and adjacent left atrium and the beginnings of the left and right Tawara (bundle) branches.

Left coronary artery (arteria coronaria sinistra)

It emerges from the sinus aortae sinister between the auricula sinistra and the truncus pulmonalis and after a short course it quickly divides into two main branches:

- ramus interventricularis anterior (RIA) - descends in the sulcus interventricularis anterior to the apex cordis, which may extend to the posterior (lower / diaphragmatic) surface,
- ramus circumflexus (RC) - passes to the back of the heart and may even replace the posterior interventricular ramus.

During its course, it broadcasts the following branches:

from the common beginning:

- ramus nodi sinuatrialis - appears in 35% of cases - unless it comes out of the coronary artery dextra;

from RIA:

- rami ventriculares anteriores sinistri - running obliquely to the left edge of the heart, the most prominent of these branches is called the ramus diagonalis or also the ramus lateralis,
- rami interventriculares septales anteriores - branches facing the anterior ventricular septum;

from RC:

- rami atrioventriculares - smaller branches at the interface of the left atrium and ventricle,
- ramus marginalis sinister - branch for the left edge of the heart - margo obtusus leading to the apex cordis,
- rami atriales (anteriores, laterales et posteriores) - branches for atrium sinister,
- ramus posterior ventriculi sinistri - final branch ramus circumflexus, in about 10% of cases replaces ramus posterior interventricularis of arteria coronaria dextra.

The artery supplies most of the left ventricular wall, part of the right ventricle at the apex cordis, the anterior two-thirds of the ventricular septum and most of the left atrial wall.

Veins

The main venous sinus is called the coronary sinus. It lies in the sulcus coronarius at the back of the heart, opening at the back into the right atrium. Venae cordis are divided into three groups according to the place of their opening:

- tributaries of sinus coronarius;
- veins leading to the right atrium;
- small veins opening into the cavities of the heart.

The heart veins normally do not have valves (however, they can occur variably...). Venous anastomoses are more common than arterial ones, e.g. between the sinus coronarius and venae ventriculi dextri anteriores.

1. tributaries of sinus coronarius :
   - vena cordis magna (in the sulcus interventricularis anterior and sinus coronarius, collects blood from the vena posterior ventriculi sinistri and vena obliqua atrii sinistri);
   - vena cordis media (in sulcus interventricularis posterior);
   - vena cordis parva (runs along the margo acutus, beginning at the vena marginalis ventriculi dextri);
2. venae ventriculi dextri anteriores collect blood from the front of the right ventricle;
3. venae cordis minimae are small veins that flow into all heart cavities.

Links

References

Anatomy and Function of the Coronary Arteries | Johns Hopkins Medicine. *Johns Hopkins Medicine, based in Baltimore, Maryland* [online]. Copyright © [cit. 26.03.2022]. Available from <https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-and-function-of-the-coronary-arteries>

human cardiovascular system - Blood supply to the heart | Britannica. *Encyclopedia Britannica | Britannica* [online]. Copyright © Lebedev Alexey [cit. 26.03.2022]. Available from <https://www.britannica.com/science/human-cardiovascular-system/Blood-supply-to-the-heart>

What Are Your Coronary Arteries?. *Cleveland Clinic: Every Life Deserves World Class Care* [online]. Copyright © 2022 Cleveland Clinic. All Rights Reserved. [cit. 26.03.2022]. <Available from https://my.clevelandclinic.org/health/articles/17063-coronary-arteries>