

Artery development

Formation of blood vessels

Vasculogenesis

- Formation of vessels from blood islets;
- Mesoderm cells induced to transform into **hemangioblasts** under the influence of FGF2 (Fibroblast growth factor 2);
- Hemangioblasts in the center of the islets differentiate into **hemopoietic stem cells**, peripheral into **angioblasts** (precursors of endothelial cells) under the influence of VEGF (Vascular endothelial growth factor);
- The first blood islets appear in the 3rd week in the areas of:
 1. Extraembryonic splanchnopleura (yolk sac wall) first occurrence;
 2. Extraembryonic somatopleura (chorionic plate);
 3. Cardiogenic region;
 4. Germinal stem.

Angiogenesis

- Formation of new blood vessels by budding under the influence of VEGF.

Development of arteries

- Vasculogenesis results in the formation of a primary watercourse - includes the **dorsal aorta** and the **cardinal veins**;
- at first we find two dorsal aortas, which later join in the middle part of the embryo, remaining divided only in the anterior and posterior parts;
- the anterior dorsal aortas are related to the formation of the **aortic arches**;
- posterior dorsal aortas give rise to **aa. iliacae communes**.

Aortic arches

- They connect the sacculus aorticus and dorsal aortas;
- is related to the formation of **gill arches** - they form in the 4th-5th week;
- 6 pairs in total, the fifth is rudimentary;
- they arise gradually - we never find all of them at once in the embryo (by the time the third aortic arch is formed, the first one already disappears).

Derivatives of the aortic arches

1. Aortic arch;
 - For the most part it disappears, the remaining section is **a. maxillaris**;
2. Aortic arch;
 - for the most part it disappears, the remaining section is **a. stapedial** and **a. hyoidea**;
3. Aortic arch;
 - **a. carotis communis** is formed from the proximal section, from which **a. carotis externa** grows;
 - from the distal part the proximal part of the **a. carotis interna** is formed (the distal part of the internal carotid artery originates from the dorsal aorta);
4. Aortic arch;
 - the right one creates the proximal part **a. subclavia dextra** (the distal part originates from the dorsal aorta and from the 7th intersegmental artery);
 - **arcus aortae** is created from the left one;
5. Aortic arch;
 - rudimentary, in 50% of cases it is not created, in 50% it disappears immediately;
6. Aortic arch;
 - on the right proximal part **a. pulmonalis dextra** is formed, the distal part disappears;
 - **a. pulmonalis sinistra** is created from the left proximal section, from the distal part **ductus arteriosus**.

With the creation of the 6. aortic arch; the position is closely related to **n. laryngeus recurrens**, which innervates the derivatives of the 6th laryngeal arch:

- after the descent of the heart, the recurrent laryngeal nerve wraps around the 6th aortic arch and rises to the larynx;
- on the right, due to the disappearance of the 5th arch and the distal part of the 6th arch, it turns around **a. subclavia dextra**;
- on the left it turns around the **ductus arteriosus**.

Branches of the dorsal aorta

Ventral branches

- **Aa. vitellinae** – merge to form the arteries of the dorsal mesentery of the intestine:
 1. **truncus coeliacus** (supplying the distal section of the foregut);
 2. **a. mesenterica superior** (midgut supply);
 3. **a. mesenterica inferior** (hindgut supply);
- **aa. umbilicales** (later backs down from aa. iliacae communes, postnatally as aa. vesicales superiores and ligamenta umbilicalia medialis).

Dorsal branches

- **Aa. intersegmentales** (a. vertebralis, aa. intercostales, aa. lumbales, aa. sacrales laterales...);
- **a. subclavia** is formed from the 7th intersegmental artery (entirely on the left, only the distal section on the right).

Aa. coronariae

- Originating from the cells of the epicardium;
- muscle comes from the epicardium and neural crest cells.

Links

Related articles

- Embryonic septation of the heart
- Congenital heart defects
- Critical Congenital Heart Defects

Used literature

- MOORE, Keith L. *Zrození člověka : embryologie s klinickým zaměřením*. 1. edition. Praha : ISV, 2002. 564 pp. ISBN 80-85866-94-3.
- SADLER, Thomas, W. *Langmanova lékařská embryologie*. 1. české edition. Praha : Grada Publishing, a.s, 2011. 414 pp. ISBN 978-80-247-2640-3.