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Данное пособие является английской версией учебника профессора И. В. Гайворонского «Нормальная анатомия человека», который был издан в России 9 раз и одобрен Министерством образования Российской Федерации. Структура пособия соответствует современным стандартам медицинского образования в России и важнейшим европейским стандартам. Английская и латинская терминология приведены в соответствии с Международной анатомической номенклатурой.

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LIST OF ABBREVIATIONS

- Art., art., — articulatio
- Artt., artt., — articulationes
- For., for. — foramen
- Lig., lig. — ligamentum
- Ligg., ligg. — ligamenta
- M., m. — musculus
- Mm., mm. — musculi
- N., n. — nervus
- Nn., nn. — nervi
- R., r. — ramus
- Rr., rr. — rami
- S., s. — sulcus

PREFACE

The creation of the manual “Anatomy” in English meets the requirement of modern Russian medicine and education. Nowadays many English-speaking overseas students study in Medical Universities of Russia. Besides, many Russian school leavers have a good command of the English language so they will be able to use this manual taking into consideration the fact that many Russian specialists in medicine work abroad after graduating from the universities or take part in different international conferences and symposiums.

The English version of the manual is based on the Russian manual by professor Gayvoronskiy I. V. “Normal Human Anatomy” which has been published in Russia 9 times and is approved by the Ministry of education of Russia.

This manual introduces the main principles of Russian Anatomy School such as: detailed study of the general aspects and items of Anatomy including the development of organs and anomalies of the development. If we compare theoretical approaches to Anatomy in Russia and in other countries we'll see that our approach is based on the system descriptions of organs, i. e. we describe separately Skeletal system, Articulations, Muscular system etc. Moreover, we use Latin terminology while describing the organs and discuss clinicoanatomical and functional problems. As for the manuals in other countries many of them describe Anatomical systems in accordance with the regional and topographical principles.

The structure of our manual meets the requirements of modern standards of medical education in Russia which in their turn correspond to the major European standards. After each chapter we give test questions and clinicoanatomical problems. The English and Latin terminology is given in accordance with International Anatomical Nomenclature.

The authors strongly believe that the manual will allow future doctors to form the morphological foundation for the further study of theoretical and clinical disciplines. We also hope that it will be of great help to Anatomy teachers.

ПРЕДИСЛОВИЕ

Создание учебного пособия «Ангиология» на английском языке является требованием современной системы медицинского образования в России. В настоящее время в медицинских университетах нашей страны обучаются студенты из различных регионов дальнего зарубежья. Кроме того, многие выпускники российских школ хорошо владеют английским языком, поэтому они также смогут пользоваться данным пособием, принимая во внимание, что зачастую русские специалисты в медицине после окончания университета уезжают работать за рубеж или принимают участие в различных международных конференциях и симпозиумах.

Английская версия пособия базируется на русском учебнике профессора И. В. Гайворонского «Нормальная анатомия человека», который был издан в России 9 раз и одобрен Министерством образования Российской Федерации.

Данное пособие познакомит читателей с главными принципами Русской анатомической школы, которые заключаются в подробном изучении общих вопросов, в том числе развития органов и аномалий развития. В России преподавание анатомии ведется с функционально-клинических позиций и основано на описании органов по системам, т. е. отдельно изучается опорно-двигательная система, артросиндесмология, миология и другие системы. Также при описании строения органов акцентируется внимание на латинской терминологии. Что касается зарубежных руководств по анатомии человека, многие из них основываются на регионально-топографическом принципе без использования латинской терминологии.

Структура данного пособия соответствует современным стандартам медицинского образования в России, которые, в свою очередь, соответствуют важнейшим Европейским стандартам. После каждой главы мы приводим контрольные вопросы и ситуационные клинические задачи. Английская и латинская терминология приведена в соответствии с Международной анатомической номенклатурой.

Авторы выражают уверенность, что данное пособие позволит будущим докторам сформировать морфологический фундамент для последующего изучения теоретических и клинических дисциплин. Мы также надеемся, что оно принесет определенную пользу и преподавателям анатомии человека.

1. GENERAL ANGIOLOGY

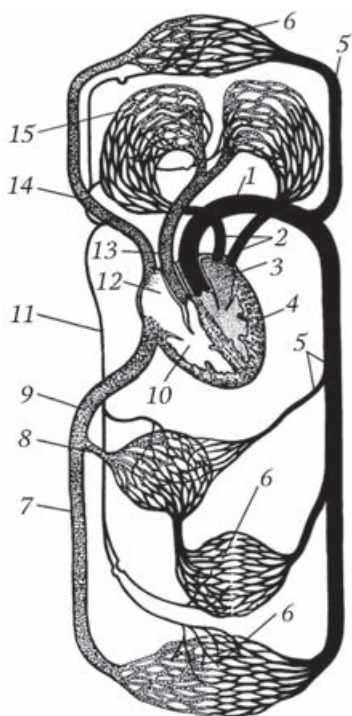


Fig. 1.1. General organization of cardiovascular system (schematically):

1 – aorta; 2 – pulmonary veins; 3 – left atrium; 4 – left ventricle; 5 – arteries of big circulation; 6 – microvessels of big circulation; 7 – veins of big circulation; 8 – portal vein; 9 – inferior vena cava; 10 – right ventricle; 11 – lymphatic system; 12 – right atrium; 13 – pulmonary trunk; 14 – superior vena cava; 15 – microvessels of small circulation

into the lymphomicrocirculatory vessels, flows through the lymphatic system and finally drains into venous system;

5) blood flows back into the atria through venous system.

The hemomicrocirculatory, lymphomicrocirculatory vessels and interstitial space filled with tissue fluid together form the microcirculatory stream. Hence, the microcirculatory stream is a collection of anatomically and functionally interconnected microvessels (their diameter is not more than 100 μm), which closely interact with surrounding tissues and serve to provide the metabolic processes and support of homeostasis.

Angiology is a science about vessels (from Greek *angion* – vessel; *logos* – study). The collection of anatomically and functionally interconnected vessels which provide the transport of the substances and metabolic processes in the body comprises the vascular system. It is intended for the circulation of the watery tissues, blood and lymph. Thus, there are two vascular systems: blood and lymphatic. But they can be united into a single system because blood and lymph repeatedly circulate in a closed circle (fig. 1.1). The circulation of blood and lymph occurs mainly due to the heart activity. The heart anatomy and blood circulations are described in the chapter “Splanchnology”.

The blood and lymphatic systems together with the heart carry out the transport, integration, metabolic, protective and immune functions. The metabolic, protective and immune functions are performed together with the haemopoietic and immune organs which produce the formed elements of blood and lymph.

The blood system comprises numerous blood vessels, different in diameter and structure of the wall. These differences are caused by certain functional purposes of the vessels. The blood system includes the arterial vessels, hemomicrocirculatory vessels and venous vessels. The interactions between the different parts of the cardiovascular system are shown in the scheme 1.

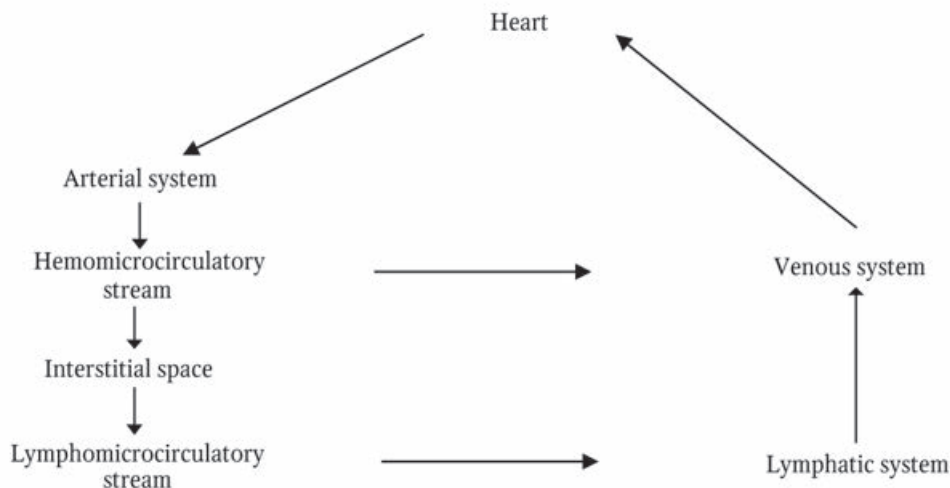
Analyzing this scheme we can note the following:

1) the cardiac ventricles pump blood into the arterial system, and through the arteries it reaches hemomicrocirculatory vessels;

2) in hemomicrocirculatory vessels the metabolism with the interstitial fluid occurs;

3) greater part of blood drains from the hemomicrocirculatory vessels into the venous system;

4) a part of the interstitial fluid is absorbed



Scheme 1. Cardiovascular system

1.1. Arterial System

The arterial vessels or arteries provide the delivery of blood from the heart to tissues of each organ. We can compare numerous arteries with numerous branching tree which forms the arterial system. The main its trunk is the aorta; it gives off the first-order branches. The latter ones, in turn, give off the subsequent branches (fig. 1.2). Each artery with its branchings supplies a certain region of the body or organ. Relatively to the organ there are extraorganic and intraorganic arteries. As usual, the extraorganic arteries have 3–5 branching orders, while the intraorganic have 5–8 orders. In general, on the way from the heart to the organ tissues, the arteries make 8, 10 and more branching orders. More often the arterial branching occurs at a right angle, less often at an acute or obtuse angle. The arterial diameter decreases with each subsequent branching order; the arterial wall becomes thinner, and its structure becomes simpler.

It should be noted that arteries do not end blindly: extraorganic and intraorganic arteries make numerous anastomoses (connections), forming arterio-arterial loops. As usual, anastomoses are formed between the arteries with equal diameter that provides the uniform blood flow to all branchings along the arterial loop. The arteries with different diameter anastomose less often. These arteries either have unequal length, or branch at the different angles. Such angioarchitectonics (the arterial distribution) contributes to the uniform and full filling of an organ with blood. The kind of the arterial branching is different: more often the lateral branches arise from an artery one by one; less often arteries branch dichotomously; sometimes they can divide even trichotomously. The type of the branching is determined by the structural and functional features of an organ.

The diameter of the extra- and intraorganic arteries is in direct proportion with the volume of an organ and the intensity of the metabolic processes in it. The number of the arteries feeding an organ can be different: rare the blood inflows only via just one artery, more often via several arteries. In the last case the sources of the blood supply can be divided into main and accessory. They can arise from one or several magistral arteries; this is an important factor to assess the potential blood supply of an organ.

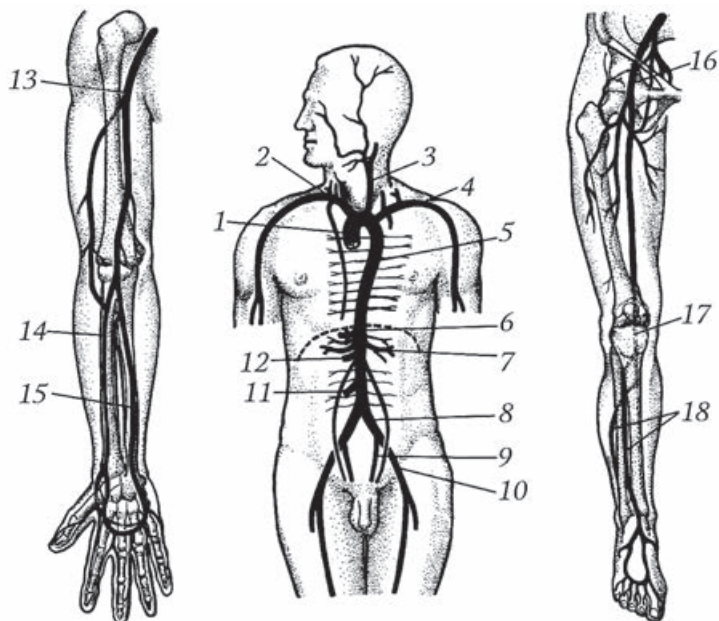


Fig. 1.2. General organization of arterial system (schematically):

1 – ascending aorta; 2 – brachiocephalic trunk; 3 – left common carotid artery; 4 – left subclavian artery; 5 – thoracic aorta; 6 – abdominal aorta; 7 – left renal artery; 8 – left common iliac artery; 9 – left internal iliac artery; 10 – left external iliac artery; 11 – superior mesenteric artery; 12 – coeliac trunk; 13 – brachial artery; 14 – radial artery; 15 – ulnar artery; 16 – femoral artery; 17 – popliteal artery; 18 – anterior and posterior tibial arteries

It is known that the anastomoses between the different blood supply sources provide collateral circulation in case of occlusion of the magistral vessels. Hence, if the blood supply sources arise from different arterial systems, the potential opportunities of the blood supply of the organ are higher.

Thus, there are two types of the anastomoses: intersystem and intrasystem. The intersystem anastomoses are the connections of the arteries arising from different magistral arterial trunks. The magistral arterial trunks are: aorta, subclavian arteries, external and internal carotid arteries, external and internal iliac arteries. It should be noted that the anastomoses between the arteries from the opposite body halves are also intersystem. The intrasystem anastomoses are the connections between the branches of the same magistral arterial trunk. The blood stream of the organs having only intrasystem anastomoses has less opportunities to collateral blood supply.

The structures of the arterial system corresponds to the general principles of the body structure which is characterized by the presence of the axial skeleton, bilateral symmetry, the presence of the paired limbs and asymmetric position of most internal organs. Because of this, the main arterial magistral artery, the aorta, passes along the vertebral column. It gives off paired branches to the head, neck and limbs. In the trunk the aortic branches ramify into parietal and visceral. The parietal branches are paired; they are symmetrical and segmental. The visceral branches can be unpaired or paired; this depends on the supplied organs.

ANGYOLOGY
АНГИОЛОГИЯ

The manual for medical students
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