ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ANATOMICAL STRUCTURE OF THE HEART AND ITS AGE-RELATED CHANGES

Diyonakhon Komilovna Qurbonova

Student of the Faculty of Medicine, Termiz Institute of Economics and Service
Scientific Advisor: **Soatmurod Shukhratovich Boyqobilov**

Lecturer, Faculty of Medicine, Termiz Institute of Economics and Service
Email: soatmurod_boyqobilov@tues.uz

Abstract: The heart is a vital organ that ensures blood circulation and supplies tissues with oxygen and nutrients. Its anatomical structure consists of four chambers, valves, and a complex vascular network. With aging, various structural and functional changes occur in the heart, affecting the health of the cardiovascular system. This article analyzes the heart's anatomy, its structural components, their physiological functions, and age-related changes. Understanding these transformations is crucial for identifying and preventing age-associated cardiovascular diseases.

Keywords: heart anatomy, cardiovascular system, aging, heart chambers, heart valves, myocardial changes, arterial stiffness.

АНАТОМИЧЕСКОЕ СТРОЕНИЕ СЕРДЦА И ЕГО ВОЗРАСТНЫЕ ИЗМЕНЕНИЯ

Аннотация: Сердце является жизненно важным органом, обеспечивающим кровообращение и снабжение тканей кислородом и питательными веществами. Его анатомическое строение включает четыре камеры, клапаны и сложную сеть кровеносных сосудов. С возрастом в сердце происходят различные структурные и функциональные изменения, что влияет на состояние сердечно-сосудистой системы. В данной статье рассматриваются анатомия сердца, его структурные компоненты, их физиологические функции, а также возрастные изменения. Понимание этих изменений играет важную роль в диагностике и профилактике сердечно-сосудистых заболеваний, связанных со старением.

Ключевые слова: анатомия сердца, сердечно-сосудистая система, старение, камеры сердца, клапаны сердца, изменения миокарда, артериальная жёсткость.

Introduction. The human heart is a muscular organ located within the thoracic cavity, between the lungs, slightly to the left of the sternum. It ensures blood circulation through rhythmic contractions. Structurally, the heart consists of four chambers, a conduction system, valves that ensure unidirectional blood flow, and a network of coronary arteries that supply it with nutrients and oxygen. With advancing age, the heart undergoes both structural and functional changes, including myocardial stiffening, arterial hardening, and calcification of the valves. These changes may contribute to the development of conditions such as hypertension, heart failure, and atherosclerosis. This article provides a comprehensive overview of the anatomical structure of the heart and its age-related changes.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

Methodology. This article is written in a scientific-analytical style and is based on modern academic sources such as *Braunwald*, *Gray's Anatomy*, *Circulation*, and other contemporary medical literature. In the selection of references, priority was given to recent publications related to cardiac anatomy, physiology, and age-related (gerontological) changes. The analyses were conducted using descriptive and comparative methods.

Results. The analysis revealed the following age-related changes in the heart: fibrosis of the myocardial tissue, calcification of the valves, reduced contractility of the cardiac muscles, fibrotic alterations in the conduction system, increased arterial stiffness, and endothelial dysfunction. These changes significantly increase the risk of cardiovascular diseases, particularly heart failure, hypertension, and arrhythmias.

Discussion and Analysis. These findings are consistent with the theories and analyses presented by Braunwald [2021], Lakatta & Levy [2003], and Fleg et al. [2005]. In particular, calcification of heart valves and the loss of aortic elasticity are among the most common issues observed in elderly patients. Fibrotic changes in the cardiac conduction system contribute to arrhythmias, emphasizing the importance of early detection and preventive measures.

MainSection. Cardiac Anatomy. The heart has a complex anatomical structure composed of essential components required for continuous function. It is enclosed in a protective sac called the pericardium and is divided into four main chambers:

1. Yurak kameralari:

Heart Chamber	Function
Right Atrium (Atrium dextrum)	Receives deoxygenated blood from the superior and inferior vena cava as well as the coronary sinus, and transfers it to the right ventricle through the tricuspid valve.
Right Ventricle (Ventriculus dexter)	Pumps deoxygenated blood into the pulmonary artery for oxygenation in the lungs. Its walls are thinner compared to the left ventricle.
Left Atrium (Atrium sinistrum)	Receives oxygen-rich blood from the pulmonary veins and transfers it to the left ventricle via the mitral valve.
Left Ventricle (Ventriculus sinister)	Pumps oxygenated blood into the aorta for systemic distribution throughout the body. It has the thickest and most powerful myocardial wall.

Table 1. Heart Chambers

2. **Heart Valves.**The valves of the heart ensure unidirectional blood flow and prevent backflow:

- **Tricuspid valve**: Located between the right atrium and right ventricle.
- **Pulmonary valve**: Controls blood flow from the right ventricle into the pulmonary artery.
- **Mitral (bicuspid) valve**: Located between the left atrium and left ventricle.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

- **Aortic valve**: Regulates blood flow from the left ventricle into the aorta.

3. **ConductionSystem.** The system responsible for rhythmic contractions of the heart includes:

- **Sinoatrial (SA) node**: The heart's natural pacemaker, located in the right atrium.
- **Atrioventricular (AV) node**: Delays the electrical impulse before transmitting it to the ventricles.
- **Bundle of His and Purkinje fibers**: Transmit electrical impulses throughout the ventricles, ensuring coordinated contraction.

4. **Coronary Circulation** The heart is supplied with oxygen-rich blood through the right and left coronary arteries. This circulation is vital for maintaining normal cardiac function and preventing ischemic diseases.

Age-Related Changes in the Heart. As part of the aging process, the heart undergoes the following changes:

1. Myocardial Changes:

- **Increased fibrosis**: Accumulation of collagen in myocardial tissue leads to stiffening.
- **Reduction and hypertrophy of muscle cells**: Decrease in cardiomyocyte number and compensatory hypertrophy result in thickened ventricular walls.
- **Decreased contractility**: Altered calcium handling impairs contractile efficiency.

2. Valvular Changes:

- **Calcification**: Especially in the aortic and mitral valves, leading to restricted movement.
- **Thickening and stiffening**: Reduced elasticity diminishes overall cardiac performance.

3. Vascular and Arterial Changes:

- **Aortic stiffening**: Loss of arterial elasticity contributes to elevated blood pressure.
- **Endothelial dysfunction**: Reduced nitric oxide production in vessel walls increases the risk of hypertension and atherosclerosis.

4. Conduction System Changes:

- **Fibrosis of SA and AV nodes**: May lead to arrhythmias and conduction blocks.
- **Prolongation of the QT interval**: Reflects slower propagation of electrical impulses.

5. Reduced Cardiac Reserve:

- **Decreased maximum heart rate**: Blunted response to physical exertion and stress.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

➢ **Altered autonomic regulation**: Reduced heart rate variability due to diminished autonomic nervous system influence.

Conclusion

With advancing age, the human heart undergoes significant structural and functional changes. Myocardial stiffening, valvular calcification, and arterial rigidity contribute to the increased prevalence of cardiovascular diseases in the elderly population. Understanding these age-related changes is essential for early detection, prevention, and the development of effective therapeutic strategies.

References

1. Braunwald, E. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. Elsevier. 2021- y.

2. Standring, S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. Elsevier. 2020 - y.

3. Lakatta, E. G., & Levy, D. Arterial and Cardiac Aging: Major Shareholders in Cardiovascular Disease. Circulation. 2003-y.

4. Benjamin, E. J., & Levy, D.Aging and the Heart: The Impact of Cardiovascular Senescence on Heart Failure. Circulation Research. 2018 y.

5. Fleg, J. L., et al. Changes in Cardiovascular Structure and Function with Aging: A Review. American Journal of Geriatric Cardiology. 2005-y.

6. Nichols, W. W., & O'Rourke, M. F. Aging, Arterial Stiffness, and Hypertension. Journal of Hypertension. 2019-y.

7. Назаров, У. У., & Абдуллаев, Ш. Н. Odam anatomiyasi. Toshkent: Tibbiyot nashriyoti. 2019-y.

8. Рахимов, И. А., & Курбонов, А. С. Inson anatomiyasi va fiziologiyasi. Samarqand: Samarqand davlat tibbiyot instituti nashriyoti. 2021-y.

9. Юсупов, А. У. Yurak va qon tomir tizimi anatomiyasi: o'quv qo'llanma. Toshkent: Tibbiyot akademiyasi. 2020-y.

10. Норқобилова, Н. Т. Yurak morfologiyasining yoshga bog'liq o'zgarishlari. Ilmiy-amaliy tibbiyot jurnali, №1, 56–59-bet. 2022-y.

11. Ахмедова, М. Ш. Bolalarda yurak tuzilishining yosh xususiyatlari. O'zbekiston pediatriya jurnali, №3, 28–31-bet. 2018-y.

12. Кузибоев, А. А., & Тошматов, Б. Б. Yurak mushaklarining histologik va morfologik xususiyatlari. Tibbiy ta'lim va fan, №4, 42–45-bet. 2021-y.