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MORPHOMETRIC FEATURES OF THE MAIN BRANCHES OF THE RIGHT CORONARY ARTERY IN PEOPLE WITH DIFFERENT SOMATOTYPES

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МОРФОМЕТРИЧЕСКИЕ ОСОБЕННОСТИ ОСНОВНЫХ ВЕТВЕЙ ПРАВОЙ ВЕНЕЧНОЙ АРТЕРИИ У ЛЮДЕЙ РАЗНЫХ СОМАТОТИПОВ

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The right marginal and posterior interventricular branches of the right coronary artery were studied on 62 intravital angiograms with the right variant of coronary branching in elderly people. Thirty-one archival records of each somatotype were studied for asthenic and hypersthenic body types.

In people of asthenic and hypersthenic body types, the cross-sectional area of the ostium of the posterior interventricular branch prevails over the lumen of the right marginal branch ($p < 0.05$). The cross-sectional area of the initial section of the studied vessels has large values in objects with a hypersthenic somatotype ($p < 0.05$). The tortuosity coefficient in people of both somatotypes is significantly higher in the right marginal branch compared to this indicator in the posterior interventricular branch. In people of asthenic body type, the tortuosity coefficient of the right marginal and posterior interventricular branches is more excellent than that of the hypersthenic.

Keywords: right marginal branch, posterior interventricular branch, right variant of coronary branching, old age, asthenic, hypersthenic, morphometric indicators

Исследованы правая краевая и задняя межжелудочковая ветви правой венечной артерии на 62 прижизненных ангиограммах с правовенечным вариантом ветвлений венечных артерий у людей пожилого возраста. При астеническом и гиперстеническом типе телосложения изучено по 31 архивной записи каждого соматотипа.

У людей астенического и гиперстенического типов телосложения площадь поперечного сечения устьевых отделов задней межжелудочковой ветви преобладает над просветом правой краевой ветви ($p < 0,05$). Площадь поперечного сечения начального отдела изученных сосудов имеет большие значения на объектах с гиперстеническим соматотипом ($p < 0,05$). Коэффициент извитости у людей обоих соматотипов достоверно выше у правой краевой ветви по сравнению с данным показателем задней межжелудочковой ветви. У людей астенического типа телосложения коэффициент извитости правой краевой и задней межжелудочковой ветвей демонстрирует большую величину в сравнении с гиперстениками.

Ключевые слова: правая краевая ветвь, задняя межжелудочковая ветвь, правовенечный вариант ветвлений венечных артерий, пожилой возраст, астеники, гиперстеники, морфометрические показатели

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PIB – posterior interventricular branch

RMB – right marginal branch

Cardiovascular disease is now recognized as the leading cause of death for older individuals. The correlation between the development of ischemic heart disease, myocardial infarction, and type of physique [1–3] has been proved, and the somatotype is considered a prognostic factor for the emergence of several coronary tract diseases [4]. Most scientific

works consider coronary arteries under normal conditions using modern methods of heart fixation [5], characterize the relationship between subepicardial arteries and organ veins [6], and describe the venous channel [7]. The study results of anatomical features of the heart and its vessels, considering the somatotype, are presented in single publications [8, 9].

According to numerous studies, the pronounced tortuosity of coronary arteries can cause the development of ischemic heart disease [10, 11]. The authors have indicated the need to assess the tortuosity of coronary arteries of the heart before performing coronary stent [12]. In the literature, the tortuosity of internal carotid arteries and retinal vessels [13, 14], while the tortuosity of the coronary canal, is described only in some publications [15]. Therefore, consideration of morphometric features of coronary arteries in people of different somatotypes, characteristic of the tortuosity of arterial vessels of the heart, are topical problems of modern morphology.

The purpose of the study was to present the morphometric features of the main branches of the right coronary artery at asthenic and hypersthenic types of physique.

Material and Methods. The study used data on 62 coronarograms of older patients. For asthenic and hypersthenic types, 31 records of each somatotype were studied. The criteria for inclusion in the study were objects with a right coronary artery branching option and the absence of pathological changes in coronary vessels. The coronary artery branching option has been determined following A. A. Korobkeev [6] criteria. The somatotype of patients is established using the Pinje index, which was calculated based on anthropometric indicators of growth, body mass, and thorax circumference [16]. The leading derivatives of the right coronal artery – the right marginal and the posterior interventricular branch – have been investigated. Morphometric indicators are defined using a computer program, RadiAnt DICOM Viewer (Medixant, Poznan, Poland).

The tortuosity coefficient of the test receptacles was calculated as the ratio of the total length of the test branch to the size of the line connecting the starting and ending points of the section [17]. According to the actual tortuosity coefficient, the objects were divided into three groups: a slight (less than 1.3), a light (1.3–1.49), and a pronounced (1.5 or more) tortuosity.

The study results were analyzed using the program SPSS Statistics, version 23 (IBM, USA). Quantitative data are described as median (Me) and interquartile range (Q25; Q75). The Mann – Whitney criterion estimated the difference between the mean values between the groups. Statistically significant were the differences at $p < 0.05$.

Results and Discussion. Examination of the cross-sectional area of the branches of the right coronary artery in people of asthenic build showed that the clearance of the estuary sections of the right marginal branch (RMB) reached 1.54 [1.33; 2.00] mm². The same index of the initial portion of the posterior interventricular branch (PIB), at 2.27 [2.01; 2.54] mm², was 1.8 times the value of the RMB ($U=243.5$, $Z=-3.29$, $p=0.001$). The RMB spread along the right side of the heart for 74.40 [64.50; 82.30] mm. The PIB passed through the posterior interventricular sulcus within a range of 70.20 [60.40; 85.80] mm, slightly shorter than the RMB length without significant differences ($U=452.0$, $Z=-0.40$, $p=0.688$).

In hyperstenics, the cross-sectional area of the primary section of the RMB was 2.83 [2.27; 3.14] mm², while the clearance of the mouth of the PIB was 37.4 % higher than that of the RMB, reaching 4.52 [3.46; 5.31] mm² ($U=163$, $Z=-4.48$, $p<0.0001$). However, the length of the RMB and PIB, respectively 78.40 [71.80; 90.70] mm and 81.50 [72.70; 91.90] mm, had no significant differences ($U=461.5$, $Z=0.26$, $p=0.789$) with some predominance of the length of the PIB.

In the analysis of the value of the tortuosity coefficient, it was established that in people of asthenic type, the RMB index was 1.31 [1.26; 1.46], reliably exceeding it in

the study of PIB (1.18 [1.13; 1.27]; $U=206.5$, $Z=-3.86$, $p<0.0001$). Actual values of the tortuosity coefficient of RMB in asthenics exhibit mainly slight tortuosity in 45.2 % of cases; slightly less frequent is the form of light tortuosity – in 38.7 % of observations and only 16.1 % of objects with pronounced form. In 80.7 % of cases, objects with little tortuosity ($p<0.05$) predominated in the vascular pool, fewer vessels had a light shape (16.1 %), and minimal tortuosity was pronounced (3.2 %).

In the hearts of people of hypersthenic physique, the tortuosity coefficient of RMB again statistically significantly prevails over its PIB value, at 1.27 [1.19; 1.50] and 1.13 [1.06; 1.21] ($U=183.0$, $Z=-4.19$, $p<0.0001$). In the group of hyperstenics with slight tortuosity, RMB is determined in 54.8 % of cases ($p<0.05$), in 25.8 % of observations in pronounced form, and the smallest number (19.4 %) of objects characterized by slight tortuosity. In people with hypersthenic build, 90.3 % had a slight tortuosity ($p<0.05$), while objects with mild and pronounced shapes were found in 3.2 % and 6.5 % of observations, respectively.

A comparative analysis of morphometric indicators in people of the asthenic and hypersthenic constitutions is presented in the table.

Table

**Morphometric indicators of the main branches
of the right coronary artery in humans
of different somatotypes**

Indi- ca- tors	Branch	Somototypes		Mann – Whit- ney U-criteria	P
		Asthénics	Hypers- thénics		
S, mm ²	RMB	1,54 [1,33; 2,00]	2,83 [2,27; 3,14]	160,0	0,0001
	PIB	2,27 [2,01; 2,54]	4,52 [3,46; 5,31]	65,0	0,0001
L, mm	RMB	74,40 [64,50; 82,30]	78,40 [71,80; 90,70]	337,5	0,044
	PIB	70,20 [60,40; 85,80]	81,50 [72,70; 91,90]	314,5	0,019
TC	RMB	1,31 [1,26; 1,46]	1,27 [1,19; 1,50]	394,0	0,223
	PIB	1,18 [1,13; 1,27]	1,13 [1,06; 1,21]	299,5	0,011

Note: S – cross-sectional area; L – length; TC – tortuosity coefficient.

A significant difference in the cross-sectional area of the RMB with the vascular lumen of hyperstenics exceeding 1.8 times ($p<0.0001$) has been established. The cross-sectional area of the PIB is once again more significant in people with hypersthenic somatotype, with a predominance of 49.8 % over the value of the index in asthenic ($p<0.0001$).

In hyperstenics, RMB is reliably longer than in the hearts of asthenics ($p=0.044$). The lengths of the PIB are also higher on objects of hypersthenic body type compared to the hearts of asthenics ($p=0.019$).

The tortuosity coefficient of RMB asthenic is slightly higher than that of hyperstenics, at 1.31 [1.26; 1.46] and 1.27 [1.19; 1.50] ($U=394.0$, $Z=-1.21$, $p=0.223$) respectively, but has no significant differences. While the

value of the tortuosity coefficient of the PIB significantly exceeds its values on the hearts of the asthenics compared to people of hypersthenic somatotype, reaching 1.18 [1.13; 1.27] and 1.13 [1.06; 1.21] ($U=299.5$, $Z=-2.55$, $p=0.011$).

We have established a predominance of the cross-sectional area of the PIB over the RMB in both studied somatotypes, which is consistent with the data obtained in the study of the right coronal artery in the second adult age [9]. However, the results contradict the data of S. V. Devbunova obtained from the study of the right coronal artery in people aged 55 to 70 [18]. The author found that the diameter of the right marginal branch (2.6 ± 0.02 mm) was slightly larger than that of the posterior ventricular branch (2.4 ± 0.01 mm) without considering the type of build. In the past, vital anatomical-topographic studies of the subclavian vein were carried out with different body types, which showed vascular variability and asymmetry at different somatotypes [19].

In our study, the tortuosity coefficient of the branches of the right coronary artery according to the somatotype is considered, with its highest value in the RMB in the vascular pool in asthenics 1.31 [1.26; 1.46]. Other

researchers examined the morphological features of the convolutional course of coronary arteries depending on the shape and size of the heart [15]. It has been found that the most common convolution of coronary vessels occurs in the hearts of a rounded form and on preparations of an organ of medium size.

Conclusions

1. In people of asthenic and hypersthenic types of constitution, the cross-sectional area of the estuary of the posterior interventricular branch prevails over the lumen of the right marginal branch ($p<0.05$). The cross-sectional area of the initial department of studied vessels is significant for objects with hypersthenic somatotype ($p<0.05$).

2. The tortuosity coefficient in humans of both somatotypes is reliably higher in the right marginal branch compared to the posterior interventricular branch. In people of asthenic build, the tortuosity coefficient of the right marginal and posterior interventricular branches shows a greater magnitude than hyperstenics.

3. Most of the examined receptacles in both somatotypes have a slight tortuosity of less than 1.3 ($p<0.05$).

Disclosures: The authors declare no conflict of interest.

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SUBTOTAL CONGENITAL STERNAL CLEFT

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СУБТОТАЛЬНАЯ ВРОЖДЕННАЯ РАСЩЕЛИНА ГРУДИНЫ

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Sternal cleft (SC) is a severe and rare congenital anterior chest wall defect associated with impaired sternal embryogenesis. Complete and incomplete forms of SC are distinguished depending on the degree of cleavage. The clinical significance of the defect is that along with a cosmetic defect of the sternum, the heart, and great vessels are protected only by the skin. The article presents a clinical observation of patient K., who was born with a subtotal SC. The child underwent radical surgery at four months. He was examined long-term (8 years after the operation). The boy is developing harmoniously according to his age. An invisible normotrophic scar has formed in the area of the postoperative wound. No chest deformation is detected.

Keywords: congenital sternal cleft, subtotal cleft, case report, children

Расщелина грудины (РГ) представляет собой редкий и серьезный врожденный дефект передней стенки грудной клетки, связанный с нарушением эмбриогенеза грудины. В зависимости от степени расщепления выделяют полную и неполную форму РГ. Клиническое значение порока состоит в том, что, наряду с косметическим дефектом грудины, сердце и магистральные сосуды защищены лишь кожей, что представляет опасность для жизни ребенка. В статье представлено клиническое наблюдение пациента К., который родился с субтотальной РГ. Ребенок был радикально оперирован в 4 месяца. Осмотрен в отдаленном периоде (через 8 лет с момента операции). Мальчик гармонично развивается согласно возрасту. В области послеоперационной раны сформировался незаметный нормотрофический рубец. Деформации грудной клетки не определяется.

Ключевые слова: врожденный порок, субтотальная расщелина грудины, клинический случай, дети

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