



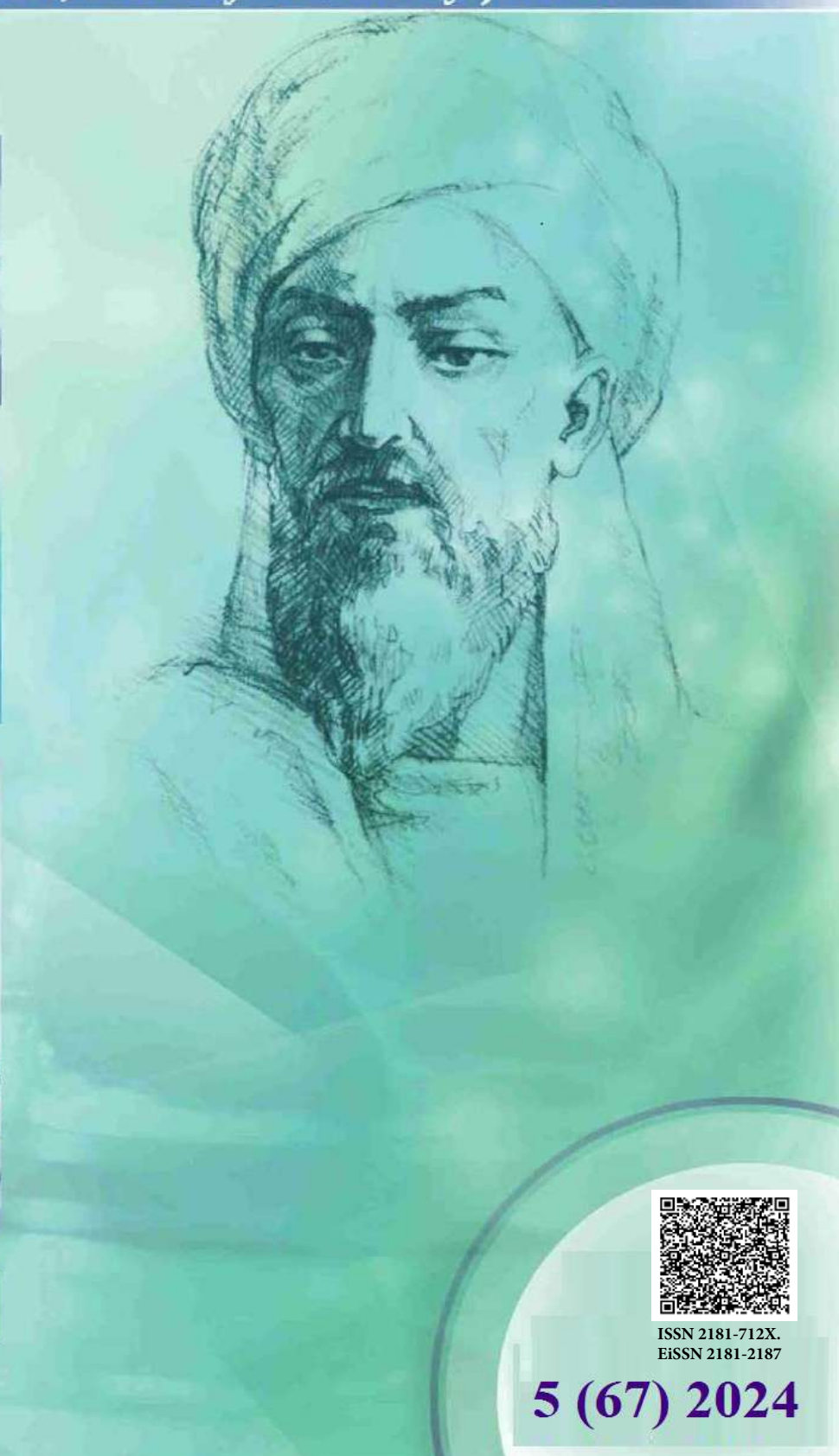
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ТИББИЁТДА ЯНГИ КУН НОВЫЙ ДЕНЬ В МЕДИЦИНЕ NEW DAY IN MEDICINE

*Илмий-рефератив, маънавий-маърифий журнал
Научно-реферативный,
духовно-просветительский журнал*

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VARIABILITY OF MYOCARDIAL MORPHOMETRIC INDICATORS IN SUDDEN CARDIAC DEATH

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✓ Resume

In the study, macroscopic changes of the heart, microscopic general morphological and histochemical staining methods were studied in autopsy and forensic medical histology materials from 20-60 and over 40 subjects with sudden cardiac death in the research and control groups. Morphometric studies of macroscopic, microscopic typical and atypical cardiomyositis in cardiac geometry, age-related changes of neurodystrophic disorders in the nervous system were revealed.

Keywords: sudden cardiac death, morphometric indicators, cardiomyositis, morphometry.

ВАРИАБЕЛЬНОСТЬ МОРФОМЕТРИЧЕСКИХ ПОКАЗАТЕЛЕЙ МИОКАРДА ПРИ ВНЕЗАПНОЙ СЕРДЕЧНОЙ СМЕРТИ

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✓ Резюме

В ходе исследования были изучены макроскопические изменения сердца, микроскопические общие морфологические и гистохимические методы окрашивания материалов аутопсии и судебно-медицинской гистологии от 20-60 и более 40 пациентов с внезапной сердечной смертью в основной и контрольной группах. При морфометрических исследованиях макроскопических, микроскопических типичных и атипичных кардиомиоцитов в геометрии сердца были выявлены возрастные изменения нейродистрофических нарушений в нервной системе.

Ключевые слова: внезапная сердечная смерть, морфометрические показатели, кардиомиозит, морфометрия

TO'SATDAN YURAKDAN O'LIMDA MIOKARDDAGI MORFOMETRIK KO'RSATKICHLARNI O'ZGARUVCHANLIGI

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Tadqiqotda to'satdan yurakdan o'lim kuzatilgan 20-60 va undan yuqori 40tadan tadqiqot va nazorat guruhlaridagi autopsiya va sud tibbiy gistologiya materiallarida yurakning makroskopik o'zgarishlari, mikroskopik umummorfologik va gistokimyoviy bo'yash usullarida morfometrik ko'rsatkichlari o'rganildi. YuTO'larda yurak geometriyasidagi makroskopik, mikroskopik tipik va atipik kardiomiostitlarni morfometrik o'rganishlar, nerv tizimida neyrodistrofik buzilishlarini yoshga bog'liq parallel o'zgarishlar aniqlandi.

Kalit so'zlari: to'satdan yurakdan o'lim, morfometrik ko'rsatkichlar, kardiomiostit, morfometriya.



Relevance

Every year, 17 million people worldwide die of cardiovascular diseases. Close people die, 25% of them are SCD. The incidence of SCD per year is 1.4 per 100,000 population in women and 6.7 in men, and it is 0.5-3.7 per 1000 people among young people. [2, 4, 5, 7, 8, 9].

13–15% of all deaths are sudden, and 90% are caused by sudden cardiac death [1]. According to various national registries, approximately 9 million people worldwide die of sudden death every year.

SCD is the dominant mechanism, and ventricular fibrillation is considered, various electrophysiological mechanisms are involved in the development and maintenance of tachycardia and fibrillation, including high automaticity and the mechanism of excitation wave feedback, which acute myocardium It occurs due to ischemia or fibrosis - necrotic changes, as a result of heterogeneity in its structure [3, 6].

Purpose: study of variability of morphometric indicators of myocardial structures in general morphological and histochemical staining methods in sudden cardiac death.

Materials and methods

In the study, morphological and morphometric changes of the heart were studied in autopsy and forensic medical histology materials from 20-60 and above 40 subjects with sudden cardiac death (SCD) in the study and control groups. The dimensions of the heart, its weight, wavy deformity and dissociation of cardiomyositis, contracture changes, and dystrophic changes in its nerves were studied.

In morphometric examinations, tissue sections are impregnated with silver nitrate and used in 3D multiplex morphometric examinations. A NanoZoomer (REFC13140-21.S/N000198/HAMAMATSU PHOTONICS/431-3196 JAPAN) was used for confocal 3D image acquisition, in the spatial form, the area of the cross-sectional dimensions on the X, Y, Z axes according to the relief of the points was studied. Photomicrographs obtained QuPath-0.5.0-ImageJ processed in the software and the diameter, fiber thickness, size, occupied area of atypical cardiomyosites (Purkinje fibers) located in the subendocardial area, maximum, minimum and average thickness of typical cardiomyosites, occupied area of interstitial tissue, muscle bundles in μm was measured.

The samples of the micropreparations mentioned above were photographed after scanning, the sizes of each are presented in a special table, the average statistical analysis results are presented according to the Student-t test, and the average statistical indicators of the results obtained according to the reliability level $P \leq 0.05$ received.

Result and discussions

Structural changes associated with myocardial injury are characteristic for SCD, which are heart geometry – size, cavity shape, muscle mass and configuration led to a change in.

In the control group, the macroscopic morphometric examination of the heart revealed the following average parameters: heart volume - $280 \pm 3.0\text{g}$, length $9.5 \pm 0.2\text{cm}$, width $9 \pm 0.3\text{cm}$, thickness 4.8 ± 0.4 , left the thickness of the wall of the ventricle - $1.3 \pm 0.1\text{cm}$, the thickness of the wall of the right ventricle - $0.4 \pm 0.1\text{cm}$.

In the control group, wavy deformity of cardiomyositis was equal to $57.5 \pm 2.8\%$, and dysstasia of cardiomyositis was equal to $64.4 \pm 3.7\%$. The amount of contractures in the left ventricle was $64.2 \pm 5.8\%$. In the control group, contracture injuries of cardiomyositis of the 3rd degree were observed in both ventricles.

When the contractile coefficient of left ventricular cardiomyositis was studied in relation to age, it was observed that the indicators in the control group were significantly higher than the indicators in the research group.

In case of sudden cardiac death, macroscopic signs of ischemia in the myocardium, small sclerosis foci, hypercontractile state of cardiomyositis, undulating folds, fuchsinophilia, fragmentastia were observed.

Decreased contractile function of the left ventricular myocardium due to sclerotic changes and conduction disorders was considered the main risk factor of SCD.

Heart morphometric parameters in the study group: heart weight - $330 \pm 3.3\text{g}$ ($P < 0.001$), length $10.1 \pm 0.2\text{cm}$ ($P < 0.001$), width $9.4 \pm 0.3\text{cm}$ ($P < 0.01$), thickness $5.2 \pm 0.4\text{cm}$ ($P < 0.05$), left ventricular wall thickness - $1.6 \pm 0.1\text{cm}$ ($P < 0.001$), right ventricular wall thickness - $0.6 \pm 0.1\text{cm}$ ($P < 0.001$). When these indicators were compared, it was higher in sudden cardiac death compared to the control group. During

the histological examination of both ventricles, the predominance of 2-3 degree contracture damage of cardiomyositis was observed (Fig. 1, 2).

The amount of contractures in the left ventricle was $53.4 \pm 2.0\%$ ($P < 0.001$). The location of contractures was most often found in the anterior, lateral and posterior walls of the left ventricle, mainly in the subendocardial and intramural sections of the myocardium.

Sudden death from the heart was expressed in all areas of the myocardium in the signs of wave deformity, as well as cardiomyostitis dissostia in the area of inserted discs, which occupy a full area or 2/3 of vision. The amount of cardiomyostitis with signs of undulating deformity was $44.2 \pm 5.6\%$ ($P < 0.001$), and the amount of cardiomyostitis with symptoms of dissostia - $58.7 \pm 2.8\%$ ($P < 0.001$).

At autopsies, uneven filling was observed in 1/3 cases as a sign of macroscopic ischemia in the myocardium. Macroscopically, small sclerotic foci were manifested with atrophy of cardiomyositis

Parallel changes were observed in the myocardium, coronary vessels, and reflexogenic sinocarotid areas. It was noted that the above-mentioned changes "rejuvenate" them when compared with the information in the literature.

In sudden cardiac death, large focal cardiosclerosis was often observed in the interventricular septum, which testified to the involvement of the conductive system in the pathological process.

In the histochemical examination, massive discompletion of subendocardial and intramural myocardial bundles, massive stylolysis of Purkin fibers, severe swelling of cardiomyostites, and stylolysis of some of them were observed (Fig. 1, 3).

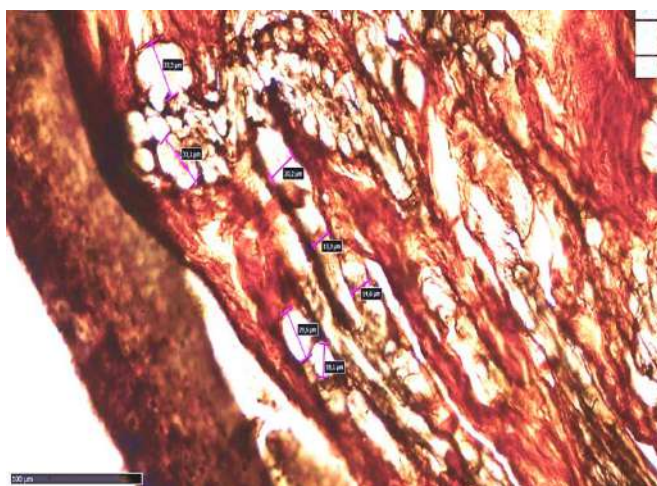


Figure 1. Massive discompletion of subendocardial and intramural myocardial bundles. Massive stylolysis in Purkin fibers and a distorted view were revealed. Cardiomyocysts with stark cytoplasm are sharply swollen and stylolyzed. NanoZoomer has a scanner. Paint silver nitrate impregnation. The size is 40x10.

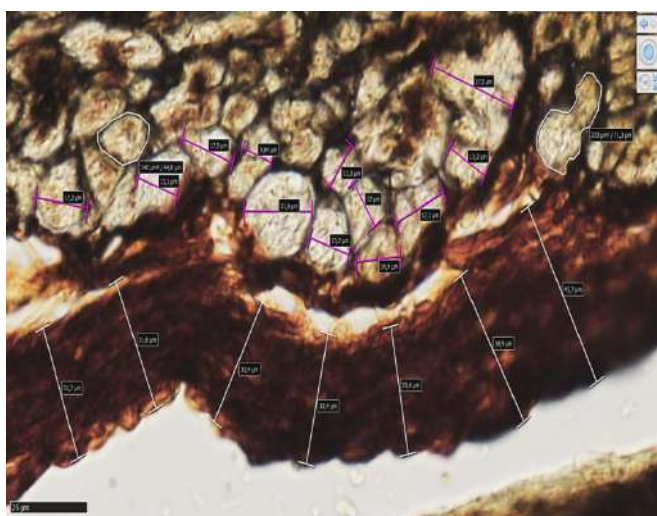


Figure 2. The diameter of the group structure of subendocardially located atypical cardiomyositis was measured. Endocardial thickness measurements are given. Cardiomyocysts with stark cytoplasm are sharply swollen and stylolyzed. NanoZoomer has a scanner. Paint silver nitrate impregnation. The size is 40x10.

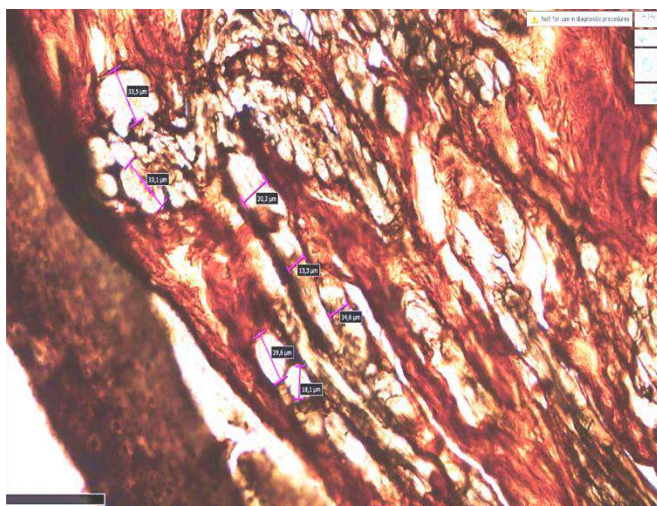


Figure 3. Appearance of Purkinje fibers between subendocardial and intramural myocardial bundles. Cardiomyocysts with stark cytoplasm are sharply swollen and undergo clastolysis. NanoZoomer has a scanner. Paint silver nitrate impregnation. The size is 40x10.

During scanning and morphometric examination, the diameter ratio of the components of the cross-section of the myocardium and the occupied area was measured, typical and atypical cardiomyositis, changes in the perimeter and relief of muscle cells located in tufts were studied (Fig. 4, 5).

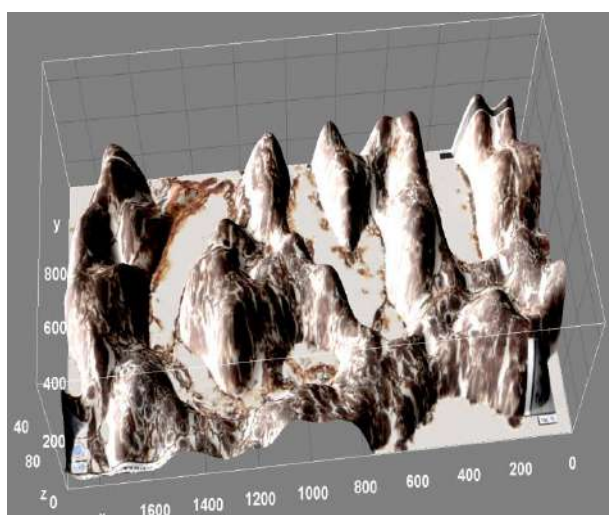


Figure 4. Relative comparative morphogram of heart tissue myocardium in X, Y, Z axes on a confocal-relief uneven surface. NanoZoomer has a scanner. QuPath-0.5.0-Image was loaded and the spatial shape was measured.

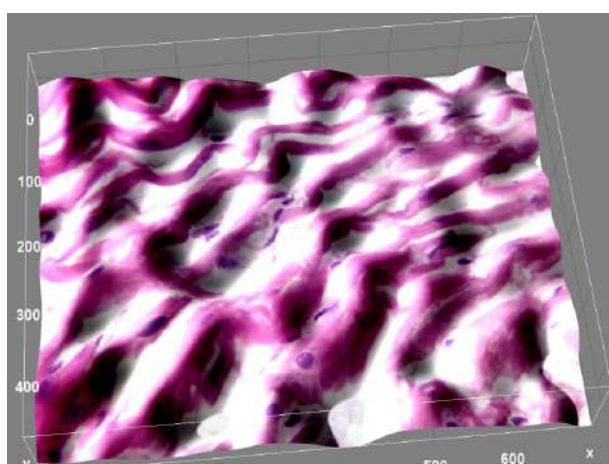


Figure 5. Relative comparative morphogram of heart tissue myocardium in X, Y, Z axes on a confocal-relief uneven surface. NanoZoomer has a scanner. QuPath-0.5.0-ImageJ was loaded and the spatial shape was measured.

Morphometric indicators of myocardial content in SCD recorded a statistical increase in them when the indicators of typical and atypical cardiomyositis of the left ventricular anterior surface, lateral surface and posterior surface longitudinal cross-sectional surface were studied in relation to the control group (table 1, 2).

Table -1

Morphometric indicators of the composition of myocardial cardiomyocysts in SCD (in μm).

№	Groups	The diameter of the structures of the composition of myocardial cardiomyositis (μm)						P≤
		On the front surface of the left ventricle		Side surface of the left ventricle		The back surface of the left ventricle		
		Typical	Atypical	Typical	Atypical	Typical	Atypical	
1	Myocardium	41.24±1.08	17.86±1.05	43.26±1.24	16.98±0.84	44.31±0.95	15.52±1.01	0.01
2	Myocardium in control group	24.56±1.12	16.21±0.86	26.01±0.12	15.12±0.65	25.89±0.69	14.22±0.92	0.01

Table -2

Morphometric indicators of myocardial cross-sectional area composition in SCD

№		Structures of myocardial cardiomyocysts (83000 μm²)						P≤
		Front surface of the left ventricle. longitudinal section surface				The posterior surface of the left ventricle is a longitudinal cross-sectional surface		
		Typical	Atypical	Typical	Atypical	Typical	Atypical	
1	Myocardium	1701.73±25.5	27012.26±321.12	1871.69±55.16	30113.31±259.13	1962.49±39.78	27012.26±328.26	0.01
2	Myocardium in control group	603.13±21.1	23457.51±412.46	676.52±35.14	28457.51±423.11	665.64±43.16	26175.51±389.51	0.01

Reactive and degenerative changes in myelin fibers and receptors in the reflexogenic sinocarotid areas of the heart were observed in the autopsies of people who died suddenly with increasing age, and it was noted that it ended with cardiac fibrillation. In these degenerative changes, the development of heart failure was observed in 8% of people under the age of 40, 24% under the age of 50, 30% under the age of 60, and 38% of people over the age of 60. Changes in cardiac tissue sympathetic nervous system concentration and denervation were seen as the cause of fibrillation.

Summary

Morphometric studies of macroscopic and typical and atypical cardiomyositis in the geometry of the heart, parallel age-related changes of neurodystrophic disorders in the nervous system - ventricular fibrillation and asystole, impact on electrical instability, development of visceral pathology - suddenly from the heart death plays an important role in thanatogenesis

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