



**FORENSIC MEDICAL EVALUATION OF PATHOMORPHOLOGICAL SIGNS IN  
THE MYOCARDIUM IN STAB WOUNDS**

**Sultonov Suxrob Baxodirovich  
Ibragimov Shaxboz Ramazanovich**  
Tashkent state medical university

**Annotation:** Pathomorphological characteristics of myocardium resulting from injuries to the heart are described with reference to their localization in different regions of the wound canal at different time periods after the injury. The studies were carried out with the use of light microscopy.

Injuries caused by sharp objects occupy one of the leading places in the structure of general mortality from various injuries, and stab and cut injuries are the leaders in this group and make up about 80% of all injuries caused by sharp objects [1]. Considering that stab and cut injuries and their complications in the overwhelming majority of cases kill people aged 20-40 years, i.e. the most able-bodied population.

It is important in mechanical trauma to determine the time of injury. The solution to this issue is based mainly on reactive changes in tissues, the reaction of the vascular bed, as well as on the development of a cellular reaction in injured tissues [2].

**Objective:** to evaluate pathomorphological signs in the myocardium in penetrating stab wounds to the chest with damage to the heart.

**Material and methods of the study.** A comparative analysis of the state of cardiomyocytes in different zones of the wound channel at different intervals of the post-traumatic period was carried out. In all cases, the time since death did not exceed 24 hours.

Material for microscopic examination was obtained from 27 corpses of individuals of both sexes aged 15 to 60 years, admitted to the morphological department of Branch No. 1 of the Tashkent Bureau of Forensic Medical Examination in 2013-2015.

Microscopic examination was performed on an MBS-10 microscope.

In accordance with the obtained data on the time elapsed from the moment of injury to death, all cases were divided into five main groups: up to 1 hour - 1st; 1-3 hours - 2nd; 3-6 hours - 3rd; 6-12 hours - 4th; 12-24 hours - 5th.

Myocardial changes were assessed in 4 zones of the wound channel:

- 1) The lumen of the wound channel;
- 2) The marginal or end zone of the wound channel (formed by areas of the myocardium that are the walls of the wound channel);
- 3) The marginal zone of the wound channel (an area of the myocardium around the circumference of the marginal zone);
- 4) The zone of intact myocardium (areas of the myocardium located outside the wound channel and areas of the myocardium adjacent to it).

The identified pathomorphological changes were assessed on a 4-point scale: 0 points – absence of a sign, up to 4 points – maximum severity of a sign [3]. The following signs were assessed: presence and volume of hemorrhages; morphofunctional state of vascular walls and their permeability; hemodynamic disorders in the vessels of the microcirculatory bed; violations of rheological properties of blood; types of degenerative-dystrophic changes in cardiomyocytes; contracture damage to cardiomyocytes. The obtained data can be used in the practical work of histological departments of the Bureau of Forensic Medicine in determining the vitality and



duration of the formation of heart damage in areas of injury with stabbing and cutting instruments.

For all time intervals in the lumen of the wound channel (the first zone) the presence of fibrin masses along with hemorrhages, as well as damaged vessels, fragments of injured cardiomyocytes and connective tissue fibers, especially in severe cardiosclerosis, was characteristic. When examining the marginal (end) zone of the wound channel, in addition to the characteristic changes in cardiomyocytes, trapezoid expansions of the distal sections of muscle fibers cut at the time of injury were observed. The maximum width of the so-called trapezium was 3-6 hours after the injury. As coagulation necrosis developed, the trapezoid sections of cardiomyocytes looked homogenized, had a bright eosinophilic color, and transverse and fibrillar striation was not determined in them. This picture was observed in periods from the moment of injury that reached 12 hours or more. Trapezoidal expansions of cardiomyocytes in the second zone of the wound channel were replaced by fragmentation, dissociation, overcontraction and wave-like deformation of cardiomyocytes that are part of the muscle fibers at the level of the third zone of the wound channel.

Cardiomyocyte fragmentation had varying degrees of expression in different time intervals. At its initial manifestations, within 1 hour after injury, transverse cracks in cardiomyocytes were observed. With greater expression of the process, individual cardiomyocytes were found as rectangular cell fragments with narrow slit-like spaces between them. In all time periods, cardiomyocytes with deformed nuclei were found in the marginal or end zone of the wound channel. The transverse size of these nuclei could exceed the length by 2-3 times. Deformation of the nuclei was caused by pronounced overcontraction of cardiomyocytes. In all groups, single cardiomyocytes with loss of the nucleus in the structure were found. Alternation of contraction and relaxation areas caused deformation of muscle fibers. Relaxed muscle fibers were wavy, saw-toothed or had a tortuous appearance. The severity of this sign reached its maximum when the injury had been going on for at least 6 hours (group 4). In areas of intact myocardium (zone 4), fragmentation, overcontraction, and wave-like deformation of cardiomyocytes were less pronounced and mosaic in nature. When examining the vascular bed of the marginal or end zone of the wound channel in the first 3 hours from the moment of injury, the greatest number of spasmodic arteries were detected, which in the following time intervals were replaced by paresis. In the 3rd (marginal) zone of the wound channel, the maximum number of spasmodic arteries was observed during the 1st hour. This sign in the intact areas of the myocardium was moderately expressed in the period up to 6 hours. Severe anemia of the vessels of medium and small caliber of the myocardium was found in the marginal and marginal zones of the wound channel in the period from 1 hour to 6 hours. Then, due to the activation of compensatory-adaptive processes of blood redistribution from the depot, the blood filling of the vessels could be characterized as moderately anemic. In the marginal or end zone of the wound channel (zone 2), the most common type of damage to cardiomyocytes was lumpy disintegration of myofibrils - the most severe and irreversible change due to coagulation necrosis of the cell, in which case cardiomyocytes unevenly perceive the dye. In polarized light, a motley picture with the glow of dead cardiomyocytes was observed. This type of alterative damage was detected already in the first hours after the injury.

Subsegmental contractures of cardiomyocytes, representing multiple focal contractures of individual groups of cardiomyocyte sarcomeres, were detected in all groups. They became widespread in the period of 3-6 hours in the marginal and near-marginal zones of the wound channel. Along with subsegmental contractures, segmental contracture damage to



cardiomyocytes was observed. Contractures of the first and second degrees were detected already in the period of 1 hour from the moment of injury with the maximum development of the sign by 12-24 hours of the post-traumatic period. Contracture damage of the third degree was more pronounced by the end of the first day (group 5). Cardiomyocytes with such damage were most densely located in the marginal and near-marginal zones of the wound channel. In the area of intact myocardium (zone 4), all of the listed types of acute damage were less pronounced, the area of damage was minimal, and the nature of distribution was mosaic.

**Conclusions:** 1. Evaluation of pathomorphological changes in the myocardium in penetrating stab wounds to the chest with damage to the heart allows us to resolve the issue of how long ago the damage occurred.

2. During expert evaluation, characteristic pathomorphological signs can be identified for each zone of the wound channel:

- a) in the lumen of the wound channel - the presence of hemorrhages, fibrin masses, fragments of injured cardiomyocytes;
- b) in the marginal or end zone formed by areas of the myocardium that are the walls of the wound channel - shortening and thickening of cardiomyocytes in the form of "trapezes" with the greatest severity of contracture damage and lumpy disintegration;
- c) in the marginal zone - pronounced fragmentation of cardiomyocytes, accompanied by transverse deformation of the nuclei;
- d) in the zone of intact myocardium – wave-like deformation of cardiomyocytes, perivascular and stromal edema, mosaic nature of contracture damage.

#### **References:**

Hakimov, S. A., Baxriyev, I. I., Sultanov, S. B., & Gulyamov, D. E. (2022). Sud tibbiyoti amaliyotida postasfiktik holatlarni baholashning ahamiyati.

Султанов, С. Б., & Бахриев, И. И. (2022). Жировая эмболия как основная причина летальности при сочетанных травмах. *Finland International Scientific Journal of Education, Social Science & Humanities*, 10(12), 536-543.

Султанов, С. Б., Бахриев, И. И., & Ешмуратов, Б. (2025). К ВОПРОСУ ПАТОГИСТОЛОГИЧЕСКОЙ ДИАГНОСТИКИ ЖИРОВОЙ ЭМБОЛИИ ПРИ ПЕРЕЛОМАХ ДЛИННЫХ ТРУБЧАТЫХ КОСТЕЙ. *Журнал гуманитарных и естественных наук*, (18), 231-235.

Султанов, С. Б., Бахриев, И. И., & Шодиев, Г. Б. (2024). ДИАГНОСТИКА ЖИРОВОЙ ЭМБОЛИИ ПРИ ПЕРЕЛОМАХ ДЛИННЫХ ТРУБЧАТЫХ КОСТЕЙ. *Журнал гуманитарных и естественных наук*, (12), 165-169.

Sultanov, S. B., & Bakhriev, I. I. (2024). MORPHOLOGICAL DIAGNOSIS OF FAT EMBOLISM IN COMBINED TRAUMAS WITH FATAL OUTCOMES. *Central Asian Journal of Medicine*, (1), 113-120.

Султанов, С. Б., Бахриев, И. И., & Ешмуратов, Б. (2025). К ВОПРОСУ ПАТОГИСТОЛОГИЧЕСКОЙ ДИАГНОСТИКИ ЖИРОВОЙ ЭМБОЛИИ ПРИ ПЕРЕЛОМАХ ДЛИННЫХ ТРУБЧАТЫХ КОСТЕЙ. *Журнал гуманитарных и естественных наук*, (18), 231-235.



- Султанов, С. Б., Бахриев, И. И., Султанова, С. М., & Каримова, И. И. (2022). О характере патоморфологических изменений в легких при жировой эмболии.
- Choriev, B. A., Tursunov, X. Z., Bakhriev, I. I., Primov, X. N., Mirzamuxamedov, O. K., & Sultanov, S. B. (2021). Fat embolism in deaths as a result of combined injuries.
- Ибрагимов, Ш. Р., Шаматов, И. Я., & Исламов, Ш. Э. (2020). Особенности повреждений челюстей. Вопросы науки и образования, (30 (114)), 36-44
- Xikmatullaev, R. Z., Bakhriev, I. I., To'liqin, J. A., & Ibragimov, S. R. (2023). BO 'LAJAK SHIFOKORNI TARBIYALASHNING G 'OYAVIY-SIYOSIY BIRLIGI. Journal of Innovation, Creativity and Art, 112-115
- Ibragimov, S., Shamatov, I., & Islamov, S. (2020). Features of damage to the jaws. Issues of science and education, (30), 36.
- Ибрагимов, Ш. Р. (2024, August). ПЕРЕЛОМЫ НИЖНЕЙ ЧЕЛЮСТИ: ПРИЧИНЫ, ХАРАКТЕРИСТИКИ, СТЕПЕНЬ ТЯЖЕСТИ. In *INTERNATIONAL CONFERENCE ON INTERDISCIPLINARY SCIENCE* (Vol. 1, No. 8, pp. 47-52).
- Ибрагимов, Ш. Р., Исламов, Ш. Э., & Ганиева, Н. Х. (2023). Неогнестрельные переломы верхней челюсти. Innovation in the modern education system, 3(29), 575-580.
- Исламов, Ш. Э. (2023). ПАСТКИ ЖАҒ СУЯКЛАРИ ЖАРОХАТИНИНГ ТАХЛИЛИЙ КЎРСАТКИЧИ. PEDAGOG, 6(2), 589-592.
- Ибрагимов, Ш. Р. (2023). ЮҚОРИ ЖАҒ СУЯКЛАРИ ЖАРОХАТЛАРИНИНГ ТАХЛИЛИЙ КЎРСАТКИЧИ. Новости образования: исследование в XXI веке, 1(8), 747-752.
- Ибрагимо, Ш. Р., Исламов, Ш. Э., Нормухаматов, И. З., & Ураков, К. Н. (2022). Характер повреждений челюстей при оказании экстренной медицинской помощи. In *VolgaMedScience* (pp. 352-354).
- Исламов, Ш., Бахриев, И., Ибрагимов, Ш., & Ойдинов, А. (2021). Характер повреждений верхней челюсти. Журнал стоматологии и краниофациальных исследований, 2(1), 18-20.
- Ibragimov, S., Bakhriev, I., & Islamov, S. TYPES OF FRACTURES OF THE UPPER JAW. ТЕНДЕНЦІЇ ТА ПЕРСПЕКТИВИ РОЗВИТКУ НАУКИ І ОСВІТИ В УМОВАХ ГЛОБАЛІЗАЦІЇ, 219.
- Ibragimov, S., Bakhriev, I., Islamov, S., & Makhmatmuradova, N. Quality of life of patients with jaw fractures. Редакционная коллегия, 138.
- Ibragimov, S., Bakhriev, I., & Islamov, S. Forensic medical characteristic jaws damage. Тенденції та перспективи розвитку науки і освіти в умовах глобалізації, 222.
- Ибрагимов, Ш. Р. Ислом Якубович Шаматов, Шавкат Эрйигитович Исламов.(2020). Особенности повреждений челюстей, 30, 36-44.
- Ramazanovich, I. S., & Eriygitovich, I. S. (2024). CHARACTERISTICS OF FRACTURES OF THE UPPER JAW. World Bulletin of Public Health, 32, 127-129.
- Ибрагимов, Ш. Р., Исламов, Ш. Э., & Бахриев, И. И. (2023). СУДЕБНО-МЕДИЦИНСКАЯ ОЦЕНКА МЕХАНИЗМОВ ПЕРЕЛОМОВ НИЖНЕЙ ЧЕЛЮСТИ.
- Ибрагимов, Ш. Р., Исламов, Ш. Э., & Бахриев, И. И. (2023). ОСОБЕННОСТИ ПЕРЕЛОМОВ ВЕРХНЕЙ ЧЕЛЮСТИ. умент не содержит источников.
- Ибрагимов, Ш. Р. (2023). ЧОП ЭТТИРИЛГАН ИЛМИЙ МАҚОЛАЛАРГА ИҚТИБОС КЕЛТИРИЛИШ ТАҒЛИЛИ. INNOVATIVE DEVELOPMENTS AND RESEARCH IN



EDUCATION, 2 (18), 229–233. *INNOVATIVE DEVELOPMENTS AND RESEARCH IN EDUCATION*.

Ramazanovich, I. S., Ganiyeva, N. H., & Axmedov, Z. X. (2025). CHARACTERISTICS OF MANDIBULAR INJURIES. *AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE*, 3(1), 211-222.

Ибрагимов, Ш. Р., Исламов, Ш. Э., & Бахриев, И. И. (2024). СОВРЕМЕННЫЕ ПОДХОДЫ К СУДЕБНО-МЕДИЦИНСКОЙ ЭКСПЕРТИЗЕ ПОВРЕЖДЕНИЙ НИЖНЕЙ ЧЕЛЮСТИ. *Medical Journal of Uzbekistan*, (2), 201-214.

Ибрагимов, Ш. Р., Халилов, И., & Намозов, Л. (2025, February). ТИББИЁТ ХОДИМЛАРИНИ ТАЙЁРЛАШДА “ТИББИЁТ ХОДИМЛАРИНИНГ МАЪМУРИЙ ЖАВОБГАРЛИГИ” ФАНИНИНГ ЎРНИ. In *International conference on multidisciplinary science* (Vol. 3, No. 2, pp. 72-74).

Ибрагимов, Ш. Р., Убайдуллаев, Э., & Азамов, А. (2025, February). ТИББИЁТ ОЛИЙГОҲЛАРИДА СУД ТИББИЁТИ ФАНИНИНГ ЎРНИ. In *INTERNATIONAL CONFERENCE ON INTERDISCIPLINARY SCIENCE* (Vol. 2, No. 2, pp. 157-161).

Ибрагимов, Ш. Р. (2025). ПЕДАГОГИК ФАОЛИЯТДА МУОММОЛИ МАЪРУЗАЛАРНИНГ АХАМИЯТИ. *ACUMEN: International journal of multidisciplinary research*, 2(3), 182-188.

Ibragimov, S., Ubaydullaev, E., & Azamov, A. (2025). ROLE OF FORENSIC SCIENCE IN MEDICAL UNIVERSITIES. *Journal of universal science research*, 3(1 (Special issue)), 157-161.

Абдурауфов, З. А., Нормухоматов, И. З., & Ибрагимов, Ш. Р. (2021). Характер повреждений челюстей. In *VOLGAMEDSCIENCE* (pp. 761-763).

Ramazonovich, I. S., Islamov, S. E., & Negmatullaevna, M. N. (2022). Assessment of the nature of the jaw injury. *trauma*, 7, 10.

Ramazonovich, I. S. (2025). FORENSIC ASPECTS OF DENTAL INJURIES. *AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE*, 3(8), 78-87.