



# Manifestation of Disorders of the Cardiovascular System During Acute Periods of Burn Disease

**Khaitov Dilshod Khayotovich**

Bukhara State Medical Institute

**Sharopov Umarxo`ja  
Ravshanovich**

Bukhara State Medical Institute

## ABSTRACT

During the acute stage of burn injury in the burned, there were changes in the myocardial blood supply of a common focal nature. Various types of rhythm and conduction disturbance that we associate with generalized pathophysiological disorders in the acute stage of burn injury, leading to damage to the structure and function of myocardial cells.

## Keywords:

burn disease, electrocardiographic studies.

## Introduction

Thermal injury is a serious medical, social and economic problem. World Health Organization, about 180 thousand cases of deaths caused by burns are registered annually in the world [1]. In Uzbekistan, the overall frequency of thermal injuries is also quite high: 159 cases per 100,000 population. In the Russian Federation in 2018, 251,480 burns were recorded, which is 171.2 cases per 100,000 population [3]. In burn disease, significant hemodynamic disorders occur, which can contribute to the development of sepsis, multiple organ failure and cause an unfavorable outcome [1,4,6,9]. As a rule, the severity of disorders of the cardiovascular system determines the outcome of burn disease, while many studies have shown a relationship between the degree of dysfunction of the cardiovascular system and the outcome of burn disease. [3,8,10]. Physiologically, myocardial dysfunction due to thermal injury is characterized by delayed isovolemic relaxation, impaired contractility, and decreased diastolic filling of the left ventricle.

These changes are manifested, first of all, by a decrease in the minute volume of blood

circulation and metabolic rate, which leads to a compensatory increase in heart rate [2,5,7,9]. Indeed, the heart rate in burns is always increased due to the fact that a change in the heart rhythm is a universal adaptive response of the body in response to the external environment [7,9]. However, the heart rate reflects only the end result of numerous regulatory influences on the circulatory apparatus and characterizes the features of the existing homeostatic mechanism. For this reason, the study of heart rate in burned patients should be compared with the severity of thermal injury and the state of regulatory systems, which may allow a better assessment of some links in the pathogenesis of the disease. Thermal injury is accompanied by a number of deviations and disorders in the activity of the organism as a whole and in the heart in particular. With extensive burns, various morphological changes in the myocardium are observed, its contractility decreases, various rhythm and conduction disturbances occur, and heart failure (HF) develops. So, according to some data, with burn disease, signs of myocarditis are detected in 20-40%, and arrhythmias and heart block - in about 35% of

patients. Damage to the heart in case of burn disease against the background of existing diseases of the cardiovascular system can reach significant severity and cause not only severe heart failure, but also death of the victims [5].

**Target.** To study the dysfunction of the cardiovascular system (CVS) based on the analysis of clinical and electrocardiogram monitoring of cardiac activity in burn patients in a state of varying severity in the acute stage (burn shock and toxemia) of burn injury.

### Material and methods

For the period 2014-2018, there were 2136 patients in the combustiology department of the Bukhara branch of the Republican Scientific Center for Emergency Medical Care. Of these, 156 patients had a dysfunction of the cardiovascular system. Of these, 96 women (61.5), men 60 (38.5). The age of the patients ranged from 2 to 70 years. Frank index (IF) more than 60-90 units in 76 (48.7) patients, IF more than 90 units in 80 (51.3%) patients. 55% had burns with flames, 43% with boiling water, 2% with electrical injuries, and patients were admitted in the period of burn shock 50 (32%), in the period of toxemia 79 (50.6) and septicotoxemia 27 (17.4%). 38 patients had signs of cardiovascular insufficiency. The main evaluation criteria were the data of clinical and electrocardio - monitor observation. Cardiac activity was determined by blood pressure, ECG results, allowing to detect rhythm and conduction disturbances, signs of overload of various parts of the heart and signs of insufficient blood supply. To assess the severity of cardiovascular insufficiency, maintenance doses of vasopressors were taken into account in accordance with the scores. In 111 patients (71.1%) against the background of tachycardia in the acute stage of burn injury, disturbances in myocardial blood supply, rhythm, conduction, signs of stress on various parts of the heart were registered, in 45 patients - dystrophic changes in the myocardium. Signs of a decrease in blood supply or myocardial ischemia were detected in 76 patients (48.7%) aged 14 to 75 years, while patients under 45 years of age accounted for almost 2/3, over 60 years - only 1/3.

### *Distribution of patients depending on dysfunctions of the cardiovascular system according to ECG data*

Types of violations	Number of violations
Sinus tachycardia	119
Sinus arrhythmia (rhythm instability)	37
Extrasystole	17
Paroxysmal tachycardia	4
Paroxysmal atrial fibrillation	1
Atrial flutter	1
Atrioventricular block / A-V conduction delay	4
Violation of intraventricular conduction	25
Insufficiency of blood supply, myocardial ischemia	76
Overload of the heart	35

In more than half of the patients (43), insufficiency of blood supply was detected on the 1-2 day of burn shock. Signs of insufficiency of blood supply in the stage of burn shock were recorded both before the development of tachycardia with a heart rate of 60-85 beats/min., and with tachycardia of 96-150 beats/min. In subsequent periods, in the vast majority of patients (67), a decrease in blood supply or myocardial ischemia developed against the background of tachycardia of 92-150 beats/min. Signs of a decrease in blood supply or myocardial ischemia were more common (32 patients), less often focal (24 patients) with localization both in one and several parts of the heart. In 20 patients, a dynamic ECG study revealed signs of a decrease in blood supply, both focal and widespread. The duration of hypoxic myocardial disorders was from several days to 1-2 weeks, which in some cases required the observation of a cardiologist to rule out myocardial infarction. Ischemic lesions of the focal and diffuse myocardium were also identified by other authors, and it was found that the contractility of the ventricles of the heart began to decrease from the first hours

after the injury and reached its maximum severity in the stage of toxemia.

Hypodynamia of the myocardium of the right ventricle was manifested to a greater extent, due to increased resistance to blood flow in the pulmonary artery system. During the period of burn disease in 37 patients on the background of tachycardia, we revealed instability of the heart rhythm - sinus arrhythmia according to ECG and electrocardiogram monitoring. At the same time, the heart rate during the day fluctuated within 56-136 beats/min with a change from tachycardia to "normocardia". In 9 patients with a heart rate of 56-88 beats / min, a decrease in myocardial blood supply was registered (in 6 of them - in the anterior septal region), while in some patients the recovery of tachycardia was accompanied by an improvement in myocardial blood supply. Extrasystole was observed in 17 patients from days 1 to 60 with burn shock (7 patients), DIC (2), sepsis and bacteremia (4), PE of small branches (1), and surgical interventions (3). Episodes of extrasystole in 11 patients were single, in 6 were recorded 2-3 times during ECG dynamics.

According to the place of occurrence of extrasystoles, they were supraventricular (9 patients), ventricular (4), or both (4). Extrasystoles were both single, rare, and frequent, there were complex forms of ventricular extrasystole (polytopic, like bigeminy). In 4 patients, paroxysmal supraventricular tachycardia was detected, which is based on monotypic extrasystole, with a rhythm frequency of 165-210 beats/min. Paroxysms of supraventricular tachycardia occurred in all stages of burn disease, were short-lived and stopped during pathogenetic therapy of burn disease. Attacks of paroxysmal atrial fibrillation developed in the patient against the background of sepsis and thrombendocarditis on the 30th and 68th days. Deceleration of atrioventricular conduction and atrioventricular blockade of the 1st degree were detected in 4 patients. With tachycardia 100-136 beats / min. P-Q intervals were 0.220.28 s. Like rhythm disturbances, conduction disturbances were transient, remaining with atrioventricular blockade for a maximum of 4

days. Violations of intraventricular conduction, blockade of the branches of the legs of the bundle of His, identified in 25 patients, were complete or incomplete, but always transient. In 15 patients, there were signs of blockade of the right branch of the His bundle, which could be associated with an overload of the right heart. Signs of overload of various parts of the heart were detected in 34 patients, with only the left parts - in 7 patients, only the right - in 15, both - in 12 patients.

**Discussion.** These signs indicated hemodynamic disturbances in the systemic and pulmonary circulation due to an increase in pulmonary and/or peripheral resistance. Cardiac insufficiency, but the rate of tachycardia exceeding 130 beats/min, was detected in 28 patients and was accompanied by burn shock (12 patients), gastrointestinal tract (4 patients), ARF, pulmonary embolism, as well as damage to the heart itself (myopericarditis, thrombendocarditis, heart attack). Hemodynamic instability requiring the use of vasopressors occurred in 10 burned patients.

**Conclusion.** Summing up, it should be emphasized that timely diagnosis of heart damage in burn disease, treatment and prevention of its occurrence, including the correction of electrolyte disorders, adequate antibiotic therapy, the use of drugs that affect the cardiovascular system, can improve the quality of treatment and reduce mortality in such patients. Thus, the conducted cardiogram observation and ECG study revealed that during the acute stage of burn injury, burned patients had changes in the blood supply to the myocardium, of a widespread or focal nature. Various types of rhythm and conduction disorders, which we associate with generalized pathophysiological disorders in the acute stage of burn injury, leading to damage to the structure and function of myocardial cells. It should be noted that the identified disorders proceeded dynamically depending on the characteristics of the course of burn disease, in the vast majority of patients they were transient

and did not lead to the development of acute cardiovascular failure.

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