

## ENDOTHELIUM-DEPENDENT VASODILATION DISORDERS IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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**Abstract.** *The results of the value of indicators analysis of endothelium-dependent vasodilation in patients with acute myocardial infarction (MI) (n=63) are presented in the article. Patients with acute MI were divided into 4 subgroups: patients with Q wave MI (QWMI) (n=33), patients with non-Q wave MI (NQWMI) (n=30), patients with uncomplicated MI (n=33) and patients with complicated MI (n=13).*

*Life-threatening complications: pulmonary edema and cardiogenic shock were identified in patients with complicated MI. Pharmacological test with 5% acetylcholine was used to assess the functional state of the vascular endothelium.*

*The most pronounced, statistically significant changes of endothelium-dependent vasodilation indicators among the examined patients with acute MI were observed in patients with QWMI compared to patients with NQWMI and in patients with complicated MI compared to patients with uncomplicated MI. Among patients with complicated MI, the most pronounced changes of endothelium-dependent vasodilation indicators were observed in patients with cardiogenic shock, compared to patients with pulmonary edema.*

**Keywords:** *acute myocardial infarction, endothelial dysfunction, endothelium-dependent vasodilation, cardiogenic shock, pulmonary edema*

Today, acute MI continues to occupy a leading position in the structure of morbidity and mortality in the Russian Federation [1, 2]. According to the modern medical literature, the development of vascular endothelial dysfunction is one of the early predictors of a number of cardiovascular diseases, including in patients with acute MI [3, 4].

This study is relevant because of the high prognostic significance, the prospect of exploring and lack of available research literature studies of endothelium-dependent vasodilation indicators in patients with QWMI and NQWMI, and also in patients with complicated and uncomplicated MI. Received data can help to improve the diagnosis and prediction of adverse acute MI.

The objective of this research was to study and analyse endothelium-dependent vasodilation indicators in patients with acute MI.

**The material** of the research included 63 patients with acute MI and 20 healthy control individuals of the Astrakhan region (as a con-

trol group). All the patients included in this study were taken to the intensive care unit of the regional vascular center of the Alexandro-Mariinskaya regional Hospital, Astrakhan with a diagnosis of acute coronary syndrome. Duration of the research: 2017-2019.

Patients with acute MI were divided into 4 subgroups: 30 patients with NQWMI, 33 patients with QWMI, 50 patients with uncomplicated MI and 13 patients with complicated MI.

In 18% of patients, life-threatening complications were identified: 4 patients had pulmonary edema and 7 patients - cardiogenic shock.

Median value and percentile boundaries of patient's age were 51,0 [48,0; 59,0] years.

There were 17 (27%) female and 46 (73%) male patients with acute MI.

Median value and percentile boundaries of duration in medical history of coronary heart disease were 7,8 [7,3;8,4] years. Individuals included in the control group were compara-

ble in gender and age to patients with acute MI.

Exclusion criteria included: 60 years of age and above, congenital and acquired heart defects in the medical history, concurrent chronic diseases in the acute stage, congestive heart failure functional class III – IV according to NYHA classification, the presence of previous MI in the medical history, coronary bypass surgery and percutaneous coronary intervention.

Modern clinical recommendations were used to verificate and to choose treatment of patients with acute MI. This research was approved by the Regional Independent Ethics Committee (an extract of the record № 12 from 18 January 2016).

All patients with acute MI and healthy control individuals signed the informed consent.

Pharmacological test with 5% acetylcholine was used to assess the functional state of the vascular endothelium.

We studied the following indicators of the dopplerogram: • time of maximum vasodilation development (T max of vasodilation), seconds (sec.); • time of blood flow recovery (T rec. blood flow), sec.

STATISTICA 12.0 Stat Soft, Inc. was used to statistical analyses.

The normality of the attribute distribution was checked using the Kolmogorov-Smirnov test.

Median value (Me) and percentile boundaries [5 and 95] were calculated to each indicator.

The level of statistical significance was  $p < 0.05$ .

**Results.** It was found that in patients with acute MI, the value of T max vasodilation was 245.35 [189.15; 284.44] sec., which was statistically significantly higher ( $p < 0.001$ ) than in the control group, where the value of T max vasodilation was 141.25 [92.65; 170.55] sec.

The value of the T rec. blood flow in patients with acute MI was 62.8 [37.55; 93.35] sec., which was statistically significantly less ( $p < 0.001$ ) than in the control group, where the value of the T rec. blood flow was 168.70 [134.21; 197.95] sec.

Among patients with QWMI, the value of T max vasodilation was 267.53 [201.21; 284.44] sec., which was statistically significantly higher ( $p = 0.002$ ) compared to patients with NQWMI, where the value of T max vasodilation was 200.13 [189.15; 222.23] sec.

The value of the T rec. blood flow in patients with QWMI was 53.27 [37.55; 71.44] sec., that was statistically significantly less ( $p = 0.012$ ) compared to patients with NQWMI, where the value of T rec. blood flow was 60.33 [45.13; 93.35] sec.

In patients with complicated MI, the value of T max vasodilation was 270.35 [215.57; 284.44] sec., which was statistically significantly higher ( $p = 0.001$ ), compared with patients with uncomplicated MI, where the value of T max vasodilation was 217.23 [189.15; 241.37] sec.

The value of the T rec. flow in patients with complicated MI was 50.17 [37.55; 68.15] sec., that was statistically significantly less ( $p = 0.015$ ) compared to patients with uncomplicated MI, where the value of T rec. blood flow was 68.25 [48.21; 93.35] sec.

In patients with cardiogenic shock, the value of T max vasodilation was 268.82 [245.13; 284.44] sec., which was statistically significantly higher ( $p = 0.003$ ), compared with patients with pulmonary edema, where the value of T max vasodilation was 233.45 [215.57; 254.44] sec.

The value of the T rec. blood flow in patients with cardiogenic shock was 42.12 [37.55; 50.25] sec., which was statistically significantly less ( $p = 0.027$ ) compared to patients with pulmonary edema, where the value of T rec. blood flow was 59.35 [48.61; 68.15] sec.

**Conclusions.** In all patients with acute MI, a statistically significant increase of the value of T max vasodilation was observed in comparison with the control group, indicating an increase of microvascular reactivity, as well as a decrease of the value of T rec. blood flow reflecting a decrease of the duration of vasodilator production of the microvascular endothelium.

The most pronounced, statistically significant changes of endothelium-dependent vasodilation indicators, that means, deeper changes in the functional state of the vascular endo-

thelium among the examined patients with acute MI were observed in patients with QWMI compared to patients with NQWMI and in patients with complicated MI compared to patients with uncomplicated MI.

Among patients with complicated MI, the most pronounced changes of endothelium-dependent vasodilation indicators were found in patients with cardiogenic shock, compared to patients with pulmonary edema.

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### НАРУШЕНИЕ ЭНДОТЕЛИЙ-ЗАВИСИМОЙ ВАЗОДИЛАТАЦИИ У ПАЦИЕНТОВ С ОСТРЫМ ИНФАРКТМ МИОКАРДА

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***Аннотация.** В статье представлены результаты анализа значения показателей эндотелий-зависимой вазодилатации у пациентов с острым инфарктом миокарда (ИМ) (n=63). Среди пациентов с острым ИМ были пациенты с Q образующим (n=33) и не Q образующим (n=30) ИМ и пациенты с неосложненным (n=33) и осложненным ИМ (n=13). У пациентов с осложненным ИМ были выявлены жизнеугрожающие осложнения в виде отёка лёгких и кардиогенного шока. Для оценки функционального состояния сосудистого эндотелия проводили фармакологический тест с 5% ацетилхолином. Наиболее выраженные, статистически значимые изменения показателей эндотелий-зависимой вазодилатации, среди обследуемых пациентов с острым ИМ наблюдались у пациентов с Q образующим ИМ по сравнению с пациентами с не Q образующим ИМ и у пациентов с осложненным ИМ по сравнению с пациентами с неосложненным ИМ. Среди пациентов с осложненным ИМ наиболее выраженные изменения показателей эндотелий-зависимой вазодилатации были выявлены у пациентов с кардиогенным шоком, по сравнению с пациентами с отёком лёгких.*

***Ключевые слова:** острый инфаркт миокарда, эндотелиальная дисфункция, эндотелий-зависимая вазодилатация, кардиогенный шок, отёк лёгких.*