

Surveillance for patients with acute coronary syndrome with st segment elevation and spontaneous reperfusion based on the experience of the Regional Vascular center of the Moscow State City University Clinic named after M.P. Konchalovskiy of Moscow health department

Vigilancia para pacientes con síndrome coronario agudo con elevación del segmento St y reperusión espontánea basada en la experiencia del Centro Vascular Regional de la Clínica de la Universidad Estatal de Moscú nombrada en honor al Dr. Konchalovskiy del Departamento de Salud de Moscú

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Abstract

To present the experience of managing patients with Spontaneous Reperfusion (SR) in the Moscow State City University Clinic named after M.P. Konchalovskiy of Moscow Health Department, with (ACS) with ST segment elevation. Spontaneous reperfusion of an infarct-related artery (IRA) is a rather rare and prognostically more favorable situation for a patient with ACS. It depends on many factors, such as: age, smoking, dyslipidemia, SUA level, and even the time until the first medical contact. The management strategy for such patients involves coronary angiography and revascularization of the target vessel. The article presents the experience of managing such patients in the Regional Vascular Center (RVC) of the Moscow State City University Clinic named after M.P. Konchalovskiy of Moscow Health Department. SR is defined in the literature as restoration of coronary blood flow in IRA TIMI 2-3 and reduction of ST segment elevation by 70% or more. Since the opening of the regional vascular center at the Moscow State City University Clinic named after M.P. Konchalovskiy of Moscow Health Department, 62 patients with SR were analyzed. The results of the strategy for the immediate implementation of IRA revascularization in this group of patients are presented.

Keywords: Coronary Syndrome, St Segment, Regional Vascular Center.

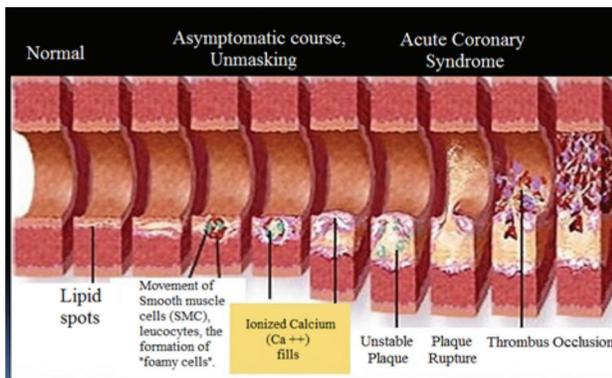
Resumen

Presentar la experiencia del manejo de pacientes con Reperusión Espontánea (SR) en la Clínica de la Universidad de la Ciudad del Estado de Moscú que lleva el nombre de M.P. Konchalovskiy del Departamento de Salud de Moscú, con (SCA) con elevación del segmento ST. La reperusión espontánea de una arteria relacionada con el infarto (IRA) es una situación bastante rara y favorable para el pronóstico de un paciente con SCA. Depende de muchos factores, tales como: edad, tabaquismo, dislipidemia, nivel de SUA e incluso el tiempo hasta el primer contacto médico. La estrategia de manejo para tales pacientes implica angiografía coronaria y revascularización del vaso diana. El artículo presenta la experiencia de manejar a estos pacientes en el Centro Vascular Regional (RVC) de la Clínica de la Universidad de la Ciudad del Estado de Moscú que lleva el nombre de M.P. Konchalovskiy del Departamento de Salud de Moscú. SR se define en la literatura como la restauración del flujo sanguíneo coronario en IRA TIMI 2-3 y la reducción de la elevación del segmento ST en un 70% o más. Desde la apertura del centro vascular regional en la Clínica de la Universidad de la Ciudad del Estado de Moscú, nombrada en honor a M.P. Konchalovskiy del Departamento de Salud de Moscú, se analizaron 62 pacientes con SR. Se presentan los resultados de la estrategia para la implementación inmediata de la revascularización de IRA en este grupo de pacientes.

Palabras clave: Síndrome coronario, segmento St, centro vascular regional.

Coronary heart disease (CHD) - a disease whose main cause is atherosclerosis of the coronary arteries (CA), for many decades is the main cause of disability and death in developed countries¹. In Moscow, over the past decades, the state healthcare system has had noticeable imbalances in the work of outpatient and inpatient facilities, which did not correspond to modern world trends in the formation of an effective and affordable healthcare mode. Therefore, mortality from CVDs in Russia is still higher than mortality in Europe and America²⁻⁵.

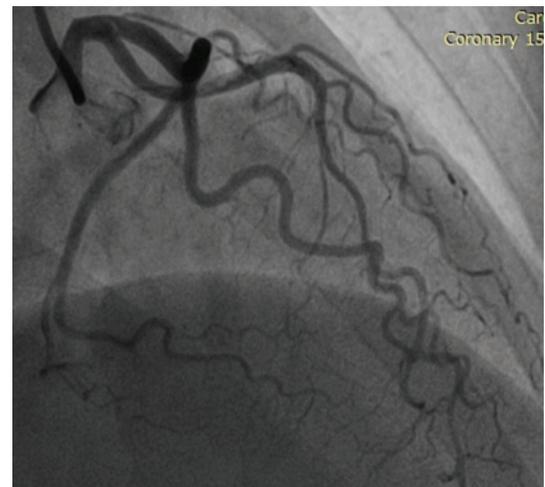
Atherosclerotic lesion is characterized by lipid infiltration of the inner lining of the arteries of the elastic and mixed type, while vascular damage progresses from intimal hyperplasia to the development of fibrous, fibrous-lipid and atheromatous plaques with their simultaneous calcification².



Morphologically separate stable and unstable atherosclerotic plaques. Stable is characterized by a strong fibrous tire, strengthened by collagen, with a large number of smooth muscle cells (SMC). In contrast, an unstable plaque has a thin fibrous lining, the amount of SMC is reduced in it, and there is a large lipid core loaded with foam cells. An unstable plaque has a high concentration of inflammatory cells. The cytokines secreted by them reduce collagen synthesis and promote apoptosis of smooth muscle cells. Tissue factor (TF) is released from the membranes of cells subjected to apoptosis, which triggers a coagulation cascade, which leads to fibrin formation. In the development of atherothrombosis, three key interrelated mechanisms are distinguished: plaque destruction of the plaque, inflammatory reactions and activation of platelets and the coagulation cascade.

The progression of atherosclerotic plaque begins with the accumulation of lipids in the places of branching vessels. Macrophages capture lipids and invade the intima of the vessels, which is facilitated by adhesive molecules, inflammatory cytokines, and enzymes from the matrix metalloproteinase family. In response to lipid

penetration and endothelial damage, platelets, SMC and lymphocytes secrete cytokines. This in turn stimulates most cells to form matrix metalloproteinases. Matrix metalloproteinase-9 causes extracellular matrix (EM) degradation, which facilitates the penetration of monocytes through the endothelium and their accumulation, and also creates opportunities for enhanced migration of SMC and activation of platelets and the coagulation cascade. Thrombosis on the surface of the damaged atheroma occurs due to the activation of platelets and the coagulation cascade on the platelet membrane. According to modern concepts, platelet activation begins with their adhesion (gluing) to the damaged deendothelized portion of the vessel, then they aggregate (stick) with the formation of the so-called primary platelet "plugs"^{6,7}. The most dangerous manifestation of CHD is acute coronary syndrome (ACS). As is known, with complete occlusion of the lumen of the coronary artery, acute myocardial infarction occurs with an increase in the ST segment (AMI_{ST}), in the case of non-occlusive thrombosis, the following options are possible: in the formation of necrosis, acute myocardial infarction without an increase in the ST segment (AMI_{wST}), in its absence, unstable angina (UA)⁸.



Despite the emergence of reperfusion therapy (thrombolysis and emergency angioplasty), mortality from acute myocardial infarction currently remains high, amounting to about 5–7% in developed countries^{4,5}. It is well known that the adequate use of DAPT can reduce the risk of early and delayed restenosis of implanted stents, as well as the incidence of recurrent myocardial infarction (MI) after ACS⁹. Although spontaneous reperfusion occurs in some patients, most patients with acute myocardial infarction have persistent thrombotic occlusion of the coronary artery during the formation of myocardial necrosis⁶. In some patients with ACS with ST segment elevation, when registering an electrocardiogram in dynamics, the ST segment drops to the isoline, or decreases by more than 70%. During coronarography, there is no occlusion of a heart attack-associated coronary artery. This phenomenon is described in the literature and is called "spontaneous reperfusion"; according to some sources, the incidence in patients with ACS reaches 35%^{7,10}. The problem of endogenous fibrinolysis is described in the

work of A. Kalinsky. et al., in 2019, where it was shown that when measuring in vitro, the process of thrombus formation and thrombus lysis proceeds more actively in patients with ACS, compared with the control group, which indicates the initial activated state of hemostasis among patients. Within the same group of patients with ACS, it turned out that the larger the existing thrombus in the lumen of the coronary artery, the more active the balance shifts towards the activation of the anticoagulant and fibrinolytic systems. Thus, in patients with ACS with ST segment elevation, the process of endogenous fibrinolysis depends on many factors, such as dyslipidemia, diabetes mellitus, uric acid level, and smoking¹¹⁻¹⁵. However, it is often difficult for a practitioner working in an emergency RVC hospital to determine the management tactics of such patients and decide on conservative or surgical treatment. The article presents the experience of managing such patients in the RVC on the basis of the Moscow State City University Clinic named after M.P. Konchalovskiy of Moscow Health Department.



An example of spontaneous reperfusion in the anterior interventricular artery. Complicated proximal plaque and stent placing result.

On the basis of the Moscow State City University Clinic named after M.P. Konchalovskiy of Moscow Health Department in 2016 was opened the RVC. Its activity is regulated by orders of the Ministry of Health of the Russian Federation 918N and 928N, as well as nosocomial reference documents (orders). The basis of emergency care for patients with ACS is the standards of medical care of the Ministry of Health of the Russian Federation, as well as the recommendations of the Russian, European and American societies of cardiology. Since 2016, 62 patients with signs of SR have been treated in the hospital since 2016. The characteristics of the patients are presented in Table 1. All patients were hospitalized in an ambulance with a referral diagnosis of "ACS with ST segment elevation" and had a typical clinic of anginal pain at the prehospital stage; ST segment elevation was noted in the prehospital ECG.

On admission, the ECG pattern in all patients varied from ST segment reduction of 70% or more to the return of the ST segment to the isoline. The pain syndrome was stopped prehospital with both narcotic and non-narcotic analgesics in all cases. At admission, each patient underwent a bedside Echocardiogram, no mechanical complications were noted, and various zones of violation of local contractility were identified (table 2).

Table 1

	N	Hypercholesteremia	Diabetes mellitus	CKD 3 & more	>60 l.	<60 l.	Smoking	Killip 1-2	Killip 3-4	More than 6 h.
Female	29(100%)	15 (51.7%)	10 (34.5%)	12 (41.4%)	15(51.7%)	14(48.3%)	12(41.4%)	29(100%)	0 (0%)	12 (41.4%)
Male	33(100%)	29 (87.9%)	14 (42.4%)	18 (54.5%)	24(72.7%)	9(27.3%)	31(93.9%)	30(90.9%)	3(9.9%)	18 (54.5%)

Table 2

	N	Left ventricular ejection fraction		Zone of regional contractility violation			Hemodynamically relevant	
		EF>40	EF<40	Bottom	Front	Side	Valves corporal	Mechan. Complic.
Female	29(100%)	21(72.4%)	8(27.6%)	9(31%)	13(44.8%)	7(24.1%)	9(31%)	0(0%)
Male	33(100%)	27(81.8%)	6(18.1%)	10(30.3%)	19(57.6%)	4(12.1%)	4(12.1%)	0(0%)

According to the recommendations of the European Society of Cardiology from 2008 and 2017, patients with myocardial infarction with ST-segment elevation are shown immediate revascularization. 42 patients underwent emergency coronary angiography, in which blood flow in the IRA at the level of TIMI 2-3 was detected, indirect signs of complicated atheromatous plaque (ASP)

with the phenomena of parietal thrombosis. In all cases, ad hoc stenting of the target vessel was performed. As a component of DAPT, ticagrelor or prasugrel was prescribed in the dosage recommended for use. After PCI, the follow-up period for the cardiopulmonary resection ranged from 6 to 36 hours. The average follow-up period in the hospital was 3.6 days.

Figure 1. An example of an ECG with a difference of 40 minutes with spontaneous reperfusion. ST segment elevation reduction with V1-V3

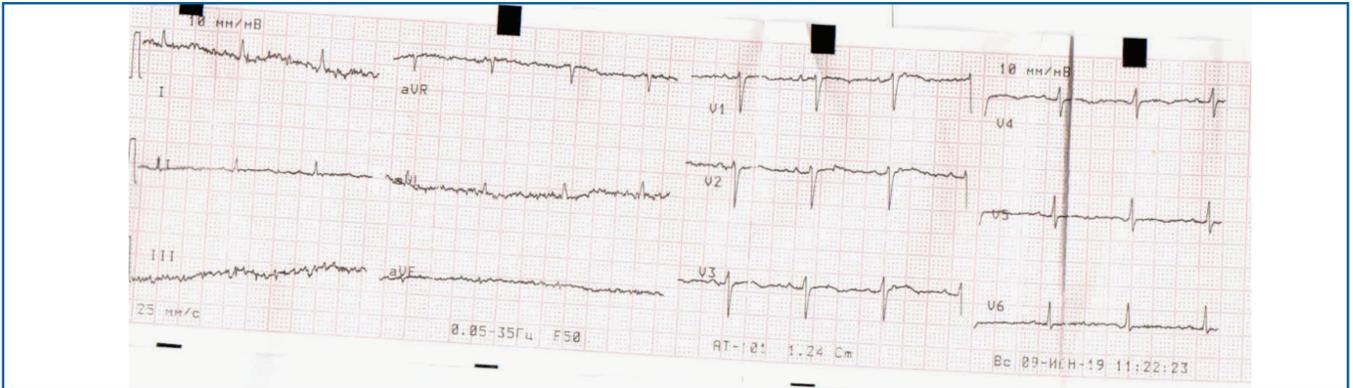
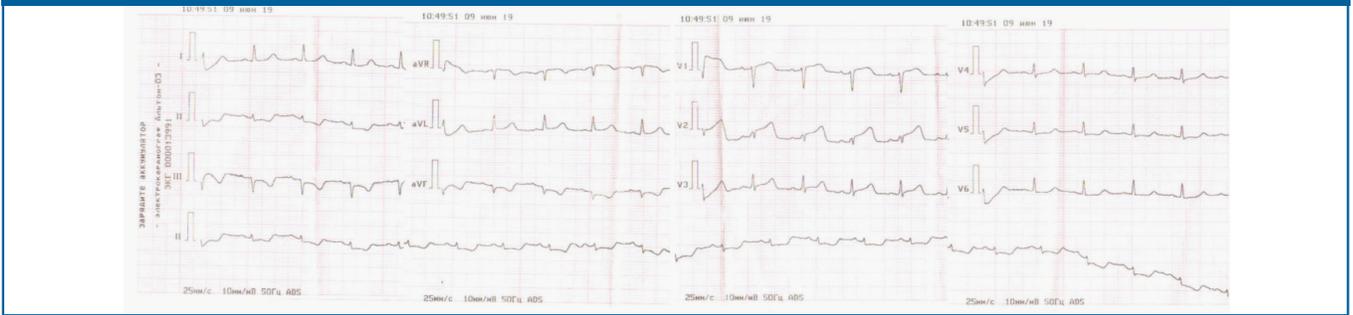


Table 3b (immediate PCI)		
	Male	Female
Number of people	28 (100%)	23 (100%)
Left ventricular ejection fraction <40%	2 (7,1%)	3 (13%)
Left ventricular ejection fraction >40%	26 (92,8%)	20 (87%)
Culprit artery:		
Anterior interventricular artery	13 (46,4%)	12 (52,2%)
Basilar artery	9 (32,1%)	7 (30,4%)
Right Coronary Artery	6 (21,4%)	4 (17,4%)
Death:		
From all causes	3 (10,7%)	1 (4,4%)
From CVD	0 (0%)	0 (0%)
Repeated Angioplasty:		
Infarct-related artery	0 (0%)	0 (0%)
Not infarct-related artery	5 (17,9%)	4 (17,4%)
Class NIHA:		
I	20 (71,4%)	19 (82,6%)
II	5 (17,9%)	2 (8,7%)
III	3 (10,7%)	1 (4,4%)
IV	0 (0%)	0 (0%)
Exercise tolerance test		
Positive	5 (17,9%)	4 (14,4%)
Negative	23 (82,1%)	19 (82,6%)
Load tolerance		
50 W	3 (10,7%)	1 (4,3%)
75 W	2 (7,1%)	3 (13%)
100 W	15 (53,6%)	14 (60,9%)
125 W	8 (28,6%)	3 (13%)
Data of daily monitoring of ECG		
Rhythm and asequence disturbance		
- atrial fibrillation	3 (10,7%)	5 (21,7%)
- ventricular tachycardia	0	0 (0%)
- supraventricular tachycardia	2 (7,1%)	1 (4,3%)
Dynamic of ST	2 (7,1%)	1 (4,3%)
Brady-arrhythmia	1 (3,6%)	0 (0%)
ICD implantation	0 (0%)	0 (0%)
Permanent cardiac pacing	1 (3,6%)	0 (0%)

Table 3a (delayed PCI)		
	Male	Female
Number of people	11 (100%)	9 (100%)
Left ventricular ejection fraction <40%	3 (27.3%)	2 (22.2%)
Left ventricular ejection fraction >40%	8 (72.7%)	7 (77.7%)
Culprit artery:		
Anterior interventricular artery	8 (72.7%)	4 (44.4%)
Basilar artery	1 (9.1%)	4 (44.4%)
Right Coronary Artery	2 (18.2%)	1 (11.1%)
Death:		
From all causes	2 (18.2%)	1 (11.1%)
From CVD	1 (stroke) (9.1%)	0 (0%)
Repeated Angioplasty:		
Infarct-related artery	0 (0%)	0 (0%)
Not infarct-related artery	4 (36.4%)	2 (22.2%)
Class NIHA:		
I	4 (36.4%)	6 (66.6%)
II	5 (45.4%)	2 (22.2%)
III	2 (18.2%)	1 (11.1%)
IV	0 (0%)	0 (0%)
Exercise tolerance test		
Positive	4 (36.4%)	2 (22.2%)
Negative	7 (63.6%)	7 (77.8%)
Load tolerance		
50 W	2 (18.2%)	1 (11.1%)
75 W	2 (18.2%)	1 (11.1%)
100 W	6 (54.5%)	6 (66.6%)
125 W	1 (9.1%)	1 (11.1%)
Data of daily monitoring of ECG		
Rhythm and asequence disturbance		
- atrial fibrillation	1 (9.1%)	2 (22.2%)
- ventricular tachycardia	1 (9.1%)	1 (11.1%)
- supraventricular tachycardia	1 (9.1%)	3 (33.3%)
Dynamic of ST	2 (18.2%)	1 (11.1%)
Brady-arrhythmia	1 (9.1%)	0 (0%)
ICD implantation	1 (9.1%)	0 (0%)
Permanent cardiac pacing	1 (9.1%)	0 (0%)

Discussion

For 20 patients, coronary angiography and revascularization of the target vessel were performed delayed. The average time was 5.6 hours. This group of CAG was performed after obtaining the results of echocardiography, analyzes, correction of anemia, the level of GFR and other correctable factors of adverse outcome. Of 20 people, three showed life-threatening rhythm disturbances -2 episodes of ventricular tachycardia and 1 episode of ventricular fibrillation, which required immediate revascularization. One patient recorded a repeated ST segment elevation, in connection with which he was also urgently submitted to an X-ray operating room. No intraoperative complications were noted. Antagonists of IIb/IIIa receptors in this subgroup were not assigned. The follow-up period in the cardiac resuscitation department in these patients ranged from 24 to 48 hours. The average follow-up in

the hospital was 4.7 days. After 6 months in two groups, the primary endpoint was evaluated - mortality from all causes and repeated myocardial infarction.

Conclusions

The provision of care for patients with ST segment elevation is regulated by the recommendations of the European Society of Cardiology for the treatment of myocardial infarction with ST segment elevation from 2017 and the recommendations for myocardial revascularization from 2018. However, in these documents, management tactics for patients with transient ST segment elevation are not clearly defined. In 2018, the results of the TRANSIENT study were presented by the European Society of Cardiology. It compared and analyzed the results of an invasive strategy, both immediate and delayed, in patients with transient ST segment elevation. In general, such patients had a more favorable prognosis and a rather small size of myocardial infarction. The average size of a heart attack did not fundamentally differ in two groups: 1.3% with immediate invasive tactics and 1.5% with delayed PCI. Thus, the tactics of delayed PCI does not affect the short-term prognosis and does not reduce the size of the myocardium involved. Other studies by a number of authors, such as Rimar et al.¹¹, Blondheim et al.¹², Meneveau et al.¹³, Badings et al.¹⁴, also did not find significant differences in the size of the involved myocardium, the risk of developing recurrent myocardial infarction, recurrent angina and death.

At the Moscow State City University Clinic named after M.P.Konchalovskiy of Moscow Health Department, patients admitted with transient elevation of the ST segment were divided into urgent invasive and delayed invasive strategies. An immediate revascularization strategy was chosen for 42 patients. The remaining 20 patients received the results of echocardiography, analyze, adjusted the factors that influence the poor prognosis - severe anemia, high levels of creatine, urea, potassium, etc. In the intraoperative and early postoperative periods, complications in two groups were not noted. In 51 patients, the long-term results presented in Table 3 (a, b) were evaluated. The primary endpoint is 6 months.

According to the observation results, the strategy for delayed revascularization does not have fundamental advantages over immediate PCI in patients with Spontaneous Reperfusion. Nevertheless, in the delayed PCI group, arrhythmogenic complications were more often observed.

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