

### **Thrombolytic therapy of acute myocardial infarction in the city of Yakutsk**

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#### **The resume**

The analysis of results of application trombolitic therapies at 143 patients with acute myocardial infarction in Yakutsk is carried out. At 110 (76,9%) patients it was applied alteplase, at 33 (23,1 %) patients - tenecteplase. It is shown that their application, since a pre-hospital stage, reduces time of reperfusion and reduces a mortality at acute myocardial infarction on 12,4%.

**Key words:** Acute myocardial infarction, thrombolytic therapy, alteplase, tenectapase.

**Introduction.** Cardiovascular diseases rank first in the world population's incidence and mortality rate, and acute myocardial infarction (AMI) in particular [4, 5]. The recent decades in the Sakha Republic (Yakutia) show the same trend: cardiovascular diseases, having increased by 2.5 times, account for the largest share in the incidence and mortality rate, and lethality from AMI makes 40.4% [1]. First occurrence of cardiovascular diseases in the population has increased by 1.9 times. Clinical presentations of coronary atherosclerosis in the indigenous people of the Sakha Republic (Yakutia), contrasted with the nonindigenous population, have a number of peculiarities. They develop myocardial infarction under lower-grade coronary atherosclerosis. Indigenous patients with verified coronary atherosclerosis more often develop myocardial infarction without pre-infarct stenocardia, painless myocardial ischemia, arterial hypertension, auricular fibrillation, and left auricular thrombus [3]. The world clinical practice recognizes that the key factor of increased efficiency and lower mortality from AMI is effective anatomic restoration of blood flow in the coronary arterial occlusion area. Success then depends directly on timely initiation of well-directed treatment. Out of known methods of recanalization, the only one to meet this requirement is systemic thrombolysis as it can be started as early as possible, before inpatient treatment. A great number of the international multi-centre randomized studies prove high efficiency and the dominant role of the early systemic thrombolytic therapy (TLT) in AMI treatment (GISSI I, 1986; ISIS 2, 1988; AIMS, 1990; GUSTO I-III, 1993–1997) [7,8]. According to the European Society of Cardiology data (ESC, 2003), effect of the early thrombolytic treatment at pre-admission stage is as great as of direct angioplasty and surpasses results of inpatient treatment [10].

**The purpose of the study** – to evaluate efficiency of thrombolytic treatment of acute coronary syndrome in the city of Yakutsk.

**Materials and methods of research.** We analyzed TLT data of 143 patients with AMI, provided by the Yakutsk Emergency Station and Cardiovascular resuscitation and intensive care ward, Yakutsk city clinical hospital No. 1 for the 2007-2009 period. Over the periods studied, Q-positive myocardial infarction was found in 204 patients and 143 of them (70.1%) received TLT; 61 patients (29.9%) had some contraindications. The patients' age ranged from 46 to 70 years, making the average age  $58 \pm 1.5$  years; men accounted for 64%, women – 36%. AMI was diagnosed at pre-admission stage basing on anamnesis, clinical presentation, and ST segment elevation on ECG; later it was confirmed in hospital (ECS in dynamics, positive specific ferment tests). As a thrombolytic preparation, 110 patients (76.9%) received Alteplase (Actilyse), the II-generation recombinant plasminogen activator; 33 patients (23.1%) received Tenectaplastase (Metalyse), the III-generation preparation. The preparations were used as prescribed in the medical information leaflet. Indications for TLT included the following: cases within 12 hours after an anginous outset; ECG showing elevation of ST segment  $ST \geq 0.1$  mV at least in two adjacent chest leads or in two abductions of extremities.

As the All-Russian Scientific Society of Cardiologists recommends, introduction of clot-busting drugs proves effective within the same period with ECG indicating genuine posterior myocardial infarction (high R waves in the right precordial leads and ST segment depression in leads  $V_1 - V_4$  with positive T wave) [6].

**Study results and their discussion.** Analysis of the AMI incidence in the city of Yakutsk for the period 2004-2009 shows that the number of patients with first AMI amounts to 302 to 363 each year (Figure 1). Thus, the AMI intensive morbidity rate per one thousand people registered in 2004 makes – 0.99; 2005 – 0.87; 2006 – 1.4; 2007 r. – 1.5; 2008 – 1.4; and in 2009 – 1.75. It is established that though Q-positive (large-focal) AMI accounts for 63% of all the cases, less that third of the patients only receive clot-busting drugs (Table 1). The reason is that TLT, enabling quick lysis, results in a number of expected complications (reperfusion arrhythmia, hemorrhagic complications, bradycardia, and hypotonia), which requires a thoughtful selection of patients, taking into account all absolute and relative contraindications. However, we witness more emergency teams using TLT. Whilst in 2007 systemic thrombolysis for pre-admission AMI treatment was used in 48.8% of cases, the figure went up to 66.7% in 2008 and reached 90% in 2009. In average, an emergency team would arrive within  $10 \pm 2.3$  minutes after a call [2]. In 81% of the cases TLT was introduced within three hours from the outset (Table 2). In 2009, in 33 cases of pre-admission treatment out of 61 they used

Tenectaplast (Metalyse), which is more convenient for usage at pre-admission stage due to the possibility of a single bolus dosing. In 19 cases (31.1%) TLT was introduced to AMI patients with rhythm and conduction disturbance, in 4 cases (6.6%) – to patients with clinical presentation of cardiogenic shock. Three patients with severe condition died (c.f. 4 people in 2007 and 1 patient in 2008). According to the data from Cardiovascular resuscitation and intensive care ward, Yakutsk city clinical hospital No. 1, men at the age from 46 to 60 dominate among patients with verified large-focal AMI. Women suffer from AMI generally at the age of 51-60 and over 70 years. First AMI account for 83% of the cases, recurrent – 17%. As for infarction focus location, anterior AMI was registered in 45% of the clinical cases, interior – 19%, and interior-posterior – 13% (Figure 2). The indicators of effective coronary blood flow restoration are as follows: lower ST segment elevation; relieved anginous pain; increased ferment activity, especially of creatine phosphokinase; development of reperfusion arrhythmias; absence of Q-wave on ECG; and lethality indicators. It is worth mentioning that Metalyse bolus dosing introduced to the emergency teams practice has considerably reduced the time of calling service, so results of the pre-admission TLT were examined later, during in-patient treatment. The beginning of ST segment shift towards the isoline within 30 minutes from introduction of TLT was registered in 30.8% of the cases, within 30-60 minutes – in 32.7% (Table 3).

In 2009 recanalization after effective TLT was successful in 52 cases, which makes 85.2% (with 73.1% in 2008). In 5 cases (8.2%) out of 61, ECG showed that systemic thrombolysis actually resulted in “interrupted infarction”, in other words prevented forming of necrosis. At Cardiovascular resuscitation and intensive care ward expected complications after pre-admission thrombolysis occurred in 28 cases (45.9%) (with 14/1% of complications in 2007-2008). Reperfusion arrhythmias accounted for 20 cases (32.8%), gingival haemorrhage – 6 (9.8%) and hematuria – in 4 cases (6.6%) of all TLT introductions. Development of reperfusion arrhythmias indirectly indicates effective restoration of coronary blood flow, but in certain cases, for example, under ventricular fibrillation, there is a potential threat to a patient’s life. Out of 20 cases of reperfusion arrhythmia, AV-blocade was registered in 3 patients (15%), supraventricular tachycardia – in 4 (20%), stable ventricular tachycardia – in 3 (15%), ventricular fibrillation – in 2 (10%), and ventricular premature beats – in 8 (40%) patients. All the arrhythmia cases were successfully arrested (stable ventricular tachycardia – by cardioversion, ventricular fibrillation – by electric defibrillation). Lethality of AMI patients within 24 hours amounted to 18% in patients not receiving TLT and 5.5% in patients having received thrombolysis, thus decreasing by 12.4% with introduction of TLT.

**Conclusions:** 1. Over the period 2004-2009 Yakutsk witnessed increased number of AMI patients appealability from 0.99 to 1.75 per thousand.

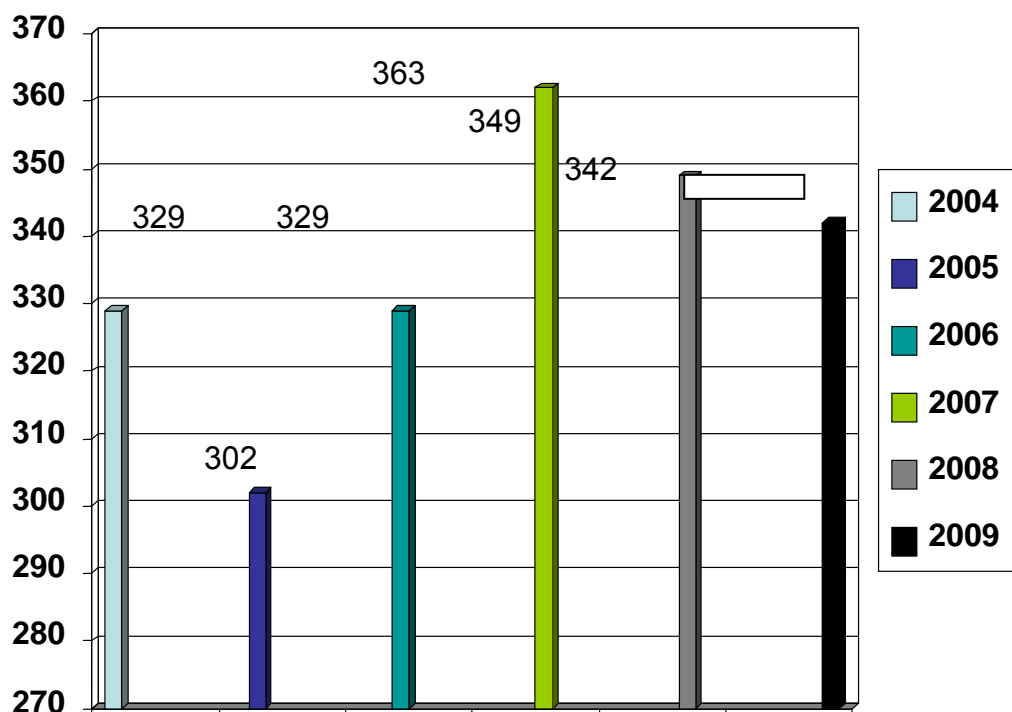
2. In the AMI pattern, 65% fall on macrofocal damage, which is an electrocargiographic indication for thrombolytic therapy.

3. There is a growing number of pre-admission TLT of AMI: emergency teams used thrombolysis in 48.8% of the cases in 2007; 66.7% in 2008; and in 90% of the AMI cases in 2009. In 81% of the cases TLT was introduced within first three hours from the attack outset.

4. Introduction of contemporary clot-busting drugs, like Alteplase and Tenectaplaste, at the pre-admission stage considerably decrease time from the ischemic attack outbreak to restoration of the coronary blood flow, as well as reduce the AMI lethality in the city of Yakutsk by 12.4%.

Figure 1

## Acute myocardial infarction incidence in 2004-2009



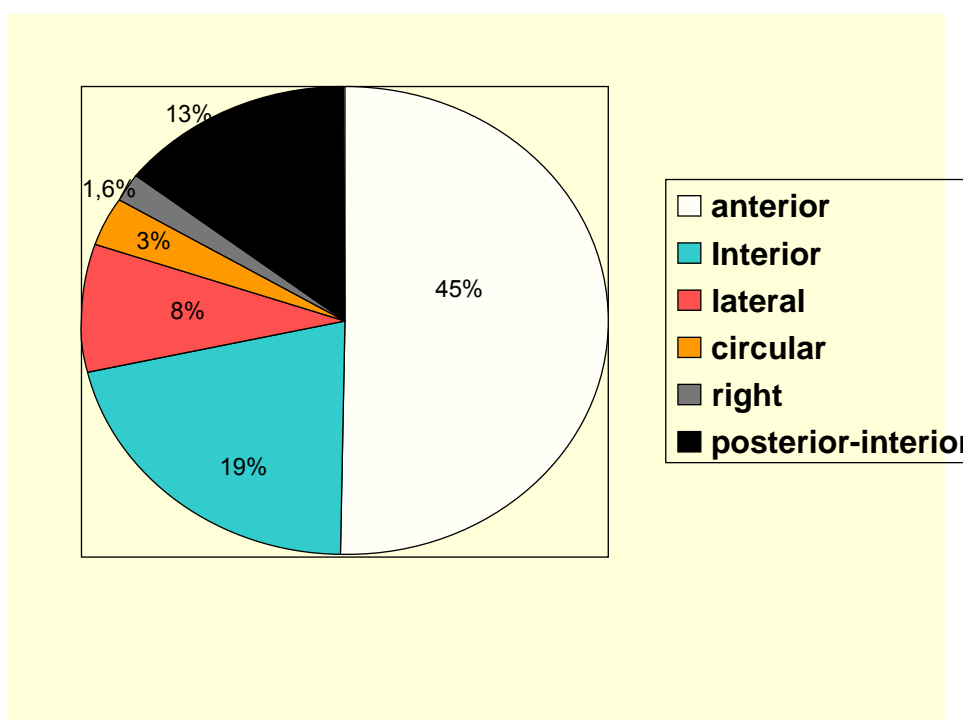
**Table 1.** Patients with Q-positive MI having received thrombolytic therapy

Period	Total AMI patients	Patients with Q-positive myocardial infarction		Patients having received thrombolytic therapy	
		Absolute number	Share	Absolute number	Share
2007	363	255	70.2	43	16.9
2008	349	209	59.9	39	18.7
2009	342	204	59.6	61	29.9
Total	1054	668		143	

**Table 2.** Duration of ischemic attack before thrombolytic therapy

Duration of ischemic attack before TLT	Share (%)
Within three hours	81.0
From 3 to 9 hours	17.0

**Figure 2.** AMI pathology location breakdown



**Table 3.** Time between introduction of clot-busting drug and beginning of ST segment shift toward the isoline

Time of ST segment shift	Number of TLT	
	Absolute number	%
Under 30 minutes	16	30.8
Within 30-60 minutes	17	32.7
Within 1-2 hours	7	13.5
Within 2-6 hours	6	11.5
Within 6-24 hours	6	11.5

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