Bessonov I. S.[1], Sapozhnikov S. S.[1],
Shadrin A. A.[1], Kashtanov M. G.[1], Popov S. V.[2]

[1] Tyumen Cardiological Scientific Center, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia

[2] Research Institute of Cardiology, Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia

Effect of the «door-to-balloon» time on the results of treatment of patients with ST-segment elevation myocardial infarction, depending on the duration of the pre-hospital delay

Aim To analyze the effect of the door-to-balloon time on treatment outcomes in patients with acute ST-segment elevation myocardial infarction (STEMI) depending on the duration of pre-hospital delay.

Material and methods The study used data of the hospital registry of percutaneous coronary interventions (PCI) in STEMI from 2006 through 2017. The analysis included 1333 patients. All patients were divided into two groups. The first group included 574 (43.1%) patients with the time from the pain syndrome onset to admission was ≤120 min. The second group consisted of 759 (56.9%) patients with the time of pre-hospital delay exceeding 120 min. Results of the treatment were analyzed for each group depending on the door-to-balloon time, ≤60 min or >60 min.

Results In the group of patients with the prehospital delay less than 120 min and the door-to-balloon time ≤60 min vs. patients with the door-to-balloon time >60 min, the following was observed: decreased in-hospital mortality (1.3% vs. 6.8%, p=0.001), reduced incidence of major adverse cardiac effects (MACE) (3.2% vs. 8.3%, p=0.008), and reduced incidence of the no-reflow phenomenon (3.9% vs. 9.4%, p=0.007). Also, immediate angiographic success of PCI was more frequently achieved in these patents (94.5% vs. 87.5%, p=0.003). In addition, in the group with the prehospital delay ≤120 min and the door-to-balloon time ≤60 min, a higher ejection fraction was noted at discharge from the hospital (48 [43; 51] % vs. 46 [42; 51] %, p=0.038). Comparison of treatment outcomes between the groups with different door-to-balloon time (≤60 min or >60 min) and a prehospital delay >120 min did not show any significant intergroup differences. According to a multivariate analysis, the door-to-balloon time ≤60 min did not predict in-hospital mortality. There was a strong correlation between the time of prehospital delay and the total time of myocardial ischemia (r=0.87; p<0.001) while the correlation between the door-to-balloon time and the total time of myocardial ischemia was moderate (r=0.41; p<0.001). At the same time, there was no correlation between the time of prehospital delay and the door-to-balloon time.

Conclusion In STEMI patients with a prehospital delay less than 120 min from the pain syndrome onset, a decrease in the door-to-balloon time was associated with better outcome of the hospital treatment. When the duration of prehospital delay was more than 120 min, a decrease in door-to-balloon time did not influence the treatment outcome. The time of prehospital delay strongly correlated with the total time of myocardial ischemia.

Keywords Acute myocardial infarction; percutaneous coronary intervention; door-to-balloon time

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Corresponding author hadrin A.A. E-mail: Shadrin_artem_97@bk.ru

Introduction

Acute ST-segment elevation myocardial infarction (STEMI) is the most dangerous manifestation of coronary artery disease (CAD) characterized by a high rate of in-hospital mortality. STEMI incidence has varied in the European countries from 430 to 1440 cases per 1 million people per year in the past few years [1]. The incidence of STEMI in the Russian Federation is 1003

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cases per 1 million hospitalized patients per year [2]. At present, timely primary percutaneous coronary intervention (PCI) is the preferred reperfusion strategy for STEMI patients [3, 4]. The majority of STEMI-related deaths happen within the first few hours of the disease onset, which is why delaying primary PCI in STEMI patients has a major negative impact on treatment outcomes [5, 6].

Door-to-balloon time an important test parameter for primary PCI. It is calculated as the time from confirming or diagnosing acute STEMI at the PCI facility to the recanalization of the infarct-related artery [7]. However, the literature data regarding the effect of door-to-balloon time on treatment outcomes is controversial. It thus was shown that shorter door-to-balloon time is not always associated with lower in-hospital mortality [8, 9]. However, it is plain that door-to-balloon time can have a significant impact on the prognosis of STEMI patients in specific clinical situations. Given the above, the objective of our study was to analyze how the door-to-balloon time affected the treatment outcomes of patients with acute STEMI depending on the duration of prehospital delay.

Material and methods

The analysis included 1333 patients with acute STEMI who underwent primary percutaneous coronary intervention (PCI) at the Tyumen Cardiology Research Center between 2006 and 2017. All patients were included in the Register of Percutaneous Coronary Interventions in PATIENTS with Acute ST-segment Elevation Myocardial Infarction [10]. Group 1 consisted of 574 (43.1%) patients with the time from pain onset to hospital admission not more than 120 minutes, Group 2 included 759 (56.9%) patients with prehospital delay exceeding 120 minutes. Treatment outcomes were analyzed in each group depending on the door-to-balloon time:≤60 minutes or>60 minutes, respectively.

All patients signed the informed consent to participate in the study. The study complies with the principles of the Declaration of Helsinki. The study protocol was approved by the local ethics committee (Minutes Extract #80 dated 17/10/2013).

Prehospital delay was defined as the time from the onset of pain syndrome to the patient's hospitalization. The door-to-balloon time was determined from the moment of confirmation or diagnosis of acute STEMI to the recanalization of the infarct-related artery.

Direct hospitalization referred to patient's personal encounter or arrival by ambulance. Indirect hospitalization referred to the initial hospitalization without the possibility of emergency PCI and subsequent transfer to the PCI facility. When patients were admitted to the hospital, venous blood was drawn to assess the laboratory parameters used to create the binary logistic regression model.

The technical aspects of revascularization were not specified and were determined by an interventional radiologist. All patients received standard antiplatelet therapy.

The achievement of TIMI (Thrombolysis in Myocardial Infarction) grade 3 and MBG (Myocardial Blush Grade) 3 blood flow, the absence of occlusions of large side branches (> 2 mm diameter) and complications, including dissection and residual clots, were the immediate angiographic success of the interventions. The outcome characterized by blood flow TIMI<3 or TIMI 3 and MBG<3 was determined as the development of the noreflow phenomenon [11].

The analysis of in-hospital outcomes of the interventions included of mortality, the incidences of recurrent MI and stent thrombosis. The incidence of composite endpoint MACE (mortality, recurrent MI, stent thrombosis), the incidence of MI complications, and the functional state of the left ventricular myocardium on the discharge echocardiogram were analyzed.

Statistical processing of the data was performed using SPSS version 21.0 (SPSS Inc., USA). The distribution of quantitative variables was estimated using the Kolmogorov-Smirnov test. The Student's t-test was used to compare normally distributed quantitative variables. Non-parametric Mann-Whitney test was used for non0normally distributed quantitative variables. Chi-scare (χ^2) test was used to compare qualitative variables. Spearman's rank correlation coefficient was calculated to describe the correlations between the time intervals. Multivariate analysis (binary logistic regression) was performed to determine the independent predictors of in-hospital mortality.

The mortality rate was a dichotomous dependent variable. A univariate analysis was conducted at the first stage. The multivariate binary logistic regression model included indicators associated with mortality in the univariate analysis. Linear relationship was calculated between them using Pearson correlation coefficients to eliminate the effects of collinear predictors. The absolute values of Pearson correlation coefficients of more than 0.35 were indicative of the presence of a linear relationship between the predictors. The predictor with the greatest statistical significance determined in the univariant logistic regression model was selected from the groups of linearly related predictors for the multivariate logistic regression model. Two methods were used to build a logistic regression model: forced inclusion of variables and stepwise forward inclusion. Differences were considered statistically significant with $p<0.05$.

Results

The analysis of clinical characteristics (Table 1) in the group with a prehospital delay ≤120 minutes

Table 1. Clinical characteristics of patients with different door-to-balloon times depending on the duration of prehospital delay

Parameters		Prehospital delay ≤ 120 minutes (n=574)			Prehospital delay > 120 minutes (n=759)		
		Door-to-balloon time ≤ 60 minutes (n=309)	Door-to-balloon time > 60 minutes (n=265)	p	Door-to-balloon time ≤ 60 minutes (n=333)	Door-to-balloon time > 60 min (n=426)	p
Age, years		57.9±10.3	59.3±11.7	0.144	59.9±12.2	62.2±12.2	0.020
Male		248 (80.3)	198 (74.7)	0.112	230 (69.1)	280 (65.7)	0.331
Smoking		124 (40.1)	103 (39)	0.786	102 (30.6)	134 (31.5)	0.808
Obesity		113 (36.6)	84 (31.7)	0.220	136 (40.8)	171 (40.4)	0.908
History of CAD		100 (32.4)	104 (39.2)	0.086	120 (36)	154 (36.2)	0.974
History of PCI		35 (11.3)	32 (12.1)	0.781	27 (8.1)	36 (8.5)	0.865
History of CABG		2 (0.6)	2 (0.8)	1.000	1 (0.3)	2 (0.5)	1.000
History of diabetes mellitus		50 (16.2)	40 (15.1)	0.721	66 (19.8)	88 (20.7)	0.776
Insulin therapy for diabetes mellitus		23 (7.4)	11 (4.2)	0.071	22 (6.6)	30 (7.0)	0.961
Glucose at admission (mmol/L)		8.5±3.3	8.8±3.6	0.329	8.7±3.7	8.7±4.2	0.210
History of arterial hypertension		245 (79.3)	217 (81.9)	0.433	271 (81.4)	356 (83.6)	0.430
History of chronic kidney disease		17 (5.5)	22 (8.3)	0.184	37 (11.1)	63 (14.8)	0.137
History of MI		52 (16.8)	52 (19.6)	0.386	51 (15.3)	71 (16.7)	0.615
Chronic obstructive pulmonary disease		23 (7.4)	18 (6.8)	0.763	23 (6.9)	38 (8.9)	0.311
Acute heart failure (Killip class)	I	281 (90.9)	228 (86.1)	0.065	305 (91.6)	371 (87.1)	0.049
	II	15 (4.9)	12 (4.5)	0.854	12 (3.6)	17 (4.0)	0.783
	III	4 (1.3)	5 (1.9)	0.739	8 (2.4)	21 (4.9)	0.072
	IV	9 (2.9)	20 (7.5)	0.011	8 (2.4)	17 (4.0)	0.224
Ventricular arrhythmias		37 (12)	39 (14.7)	0.334	24 (7.2)	34 (8.0)	0.690
Complete atrioventricular block		11 (3.6)	15 (5.7)	0.228	8 (2.4)	12 (2.8)	0.724
Atrial fibrillation		31 (10)	21 (7.9)	0.380	21 (6.3)	31 (7.3)	0.599
Median door-to-balloon time, minutes		50 [40; 60]	100 [80; 145]	<0.001	47 [35.5; 58.5]	100 [80; 146]	<0.001
Median time from pain onset to hospitalization, minutes		85 [60; 105]	85 [60; 100]	0.516	210 [156.3; 305]	270 [180; 360]	<0.001
Median total time of myocardial ischemia, minutes		127 [105; 150]	187 [155; 235]	<0.001	290 [213; 522.5]	520 [330.8; 1440]	<0.001
Direct hospitalization (personal encounter/ambulance)		293 (94.8)	249 (94)	0.654	289 (86.8)	360 (84.5)	0.376

The data are expressed as the absolute and relative numbers (n (%)) or the median and the interquartile range (Me [25th percentile; 75th percentile]). CAD, coronary artery disease; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; MI, myocardial infarction.

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and door-to-balloon time ≤60 minutes identified more patients with cardiogenic shock. Patients in the group with prehospital delay >120 minutes and door-to-balloon time ≤60 minutes were younger, more likely to have acute heart failure Killip class I. The groups were comparable in the incidence of diabetes, smoking, obesity, and the history of MI. There were also no differences in the history of chronic kidney disease, chronic obstructive pulmonary disease.

The analysis of angiographic characteristics (Table 2) showed that the anterior interventricular artery was the infarct-related artery in most patients of all groups. In the group with prehospital delay>120 minutes and door-to-balloon time ≤60 minutes, the right coronary artery was more likely to be infarct-related compared to patients with door-to-balloon time>60 minutes. Balloon predilation was performed more often in the group with prehospital delay ≤120 minutes and door-to-balloon time >60 minutes. There were no differences between the groups in the severity of coronary artery disease and most of the main angiographic characteristics.

The analysis of hospital treatment outcomes (Table 3) found that immediate angiographic success was more often achieved in the group with prehospital delay≤120 minutes and door-to-balloon time≤60 minutes. Moreover, the mortality and the incidence of the no-reflow phenomenon were lower in this group. LVEF was higher at discharge in the group of patients with prehospital delay ≤120 minutes and door-to-balloon time≤60 minutes. Major adverse cardiac events (MACE) were more prevalent in the group with a prehospital delay duration ≤120 and a door-to-balloon time >60 minutes. No differences in the MACE incidence and other complications depending on door-to-balloon time were found in the group with prehospital delay >120 minutes.

The treatment outcomes patients with prehospital delay ≤120 minutes who did not have cardiogenic shock at admission are presented in Table 4. It should be noted that, after excluding patients with cardiogenic shock, statistically significant differences persisted in the main indicators characterizing hospital treatment outcomes.

Table 2. Angiographic characteristics of patients with different door-to-balloon times depending on the duration of prehospital delay

Parameters		Prehospital delay ≤ 120 minutes (n=574)			Prehospital delay > 120 minutes (n=759)		
		Door-to-balloon time ≤ 60 minutes (n=309)	Door-to-balloon time > 60 minutes (n=265)	p	Door-to-balloon time ≤ 60 minutes (n=333)	Door-to-balloon time > 60 min (n=426)	p
Infarct-related artery localization	LMCA	2 (0.6)	4 (1.5)	0.422	3 (0.9)	8 (1.9)	0.261
	LAD	145 (46.9)	123 (46.6)	0.936	148 (44.4)	192 (45.3)	0.818
	LCX	28 (9.1)	37 (14)	0.062	37 (11.1)	61 (14.4)	0.183
	RCA	125 (40.5)	94 (35.6)	0.234	139 (41.7)	144 (34)	0.028
	Second-order arteries	12 (3.9)	10 (3.8)	0.953	12 (3.6)	29 (6.8)	0.051
Multi-vessel coronary disease		90 (29.1)	72 (27.3)	0.623	93 (27.9)	117 (27.6)	0.919
SYNTAX score		14.6±7.7	14.2±8.0	0.411	15.5±9.4	14.8±8.6	0.304
Direct stenting of the infarct-related artery		166 (56.1)	117 (48.3)	0.074	166 (51.4)	188 (46.5)	0.193
Balloon predilation		131 (42.5)	134 (51)	0.044	154 (46.4)	216 (51.4)	0.170
Manual thromboaspiration		19 (6.2)	18 (6.8)	0.744	26 (7.8)	28 (6.7)	0.539
Mean number of implanted stents, n		1 [1;1]	1 [1;1]	0.502	1 [1;1]	1 [1;1]	0.684
Transradial access		179 (57.9)	154 (58.1)	0.964	238 (71.5)	320 (75.1)	0.259

The data are expressed as the absolute and relative numbers (n (%)) or the median and the interquartile range (Me [25th percentile; 75th percentile]). LMCA, left main coronary artery; LAD, left anterior descending artery; LCX, left circumflex artery; RCA, right coronary artery.

Table 3. Hospital outcomes of patients with different door-to-balloon times depending on the duration of prehospital delay

Показатели	Prehospital delay ≤ 120 minutes (n=574)			Prehospital delay > 120 minutes (n=759)		
	Door-to-balloon time ≤ 60 minutes (n=309)	Door-to-balloon time > 60 minutes (n=265)	p	Door-to-balloon time ≤ 60 minutes (n=333)	Door-to-balloon time > 60 min (n=426)	p
Days in hospital	11 [10;14]	11 [10;13]	0.514	11 [10;14]	11 [10;14]	0.670
Immediate angiographic success	292 (94.5)	232 (87.5)	0.003	296 (88.9)	367 (86.2)	0.260
No-reflow phenomenon	12 (3.9)	25 (9.4)	0.007	22 (6.6)	41 (9.6)	0.135
Mortality	4 (1.3)	18 (6.8)	0.001	18 (5.4)	33 (7.7)	0.201
Stent thrombosis	2 (0.6)	2 (0.8)	1.000	6 (1.8)	5 (1.2)	0.548
MI recurrence	4 (1.3)	6 (2.3)	0.525	7 (2.1)	7 (1.6)	0.641
MACE (death, MI recurrence, stent thrombosis)	10 (3.2)	22 (8.3)	0.008	25 (7.5)	39 (9.2)	0.418
Acute post-infarction aneurysm	13 (4.2)	21 (7.9)	0.06	26 (7.8)	31 (7.3)	0.783
Myocardial rupture	-	3 (1.1)	0.098	4 (1.2)	5 (1.2)	1.000
Pericarditis	1 (0.3)	3 (1.1)	0.340	3 (0.9)	1 (0.2)	0.325
Thrombotic endocarditis	-	-	-	1 (0.3)	2 (0.5)	1.000
Complications at the puncture site	17 (5.5)	12 (4.5)	0.596	19 (5.7)	18 (4.2)	0.342
LVEF at discharge, %	48 [43;51]	46 [42;51]	0.038	46 [42;49]	46 [41;50.5]	0.601
LV asynergy	25 [20;40]	30 [20;40]	0.276	30 [20;40]	30 [20;40]	0.935

The data are expressed as the absolute and relative numbers (n (%)) or the median and the interquartile range (Me [25th percentile; 75th percentile]). MI, myocardial infarction; MACE, major adverse cardiac events; LV, left ventricle.

Table 4. Hospital outcomes of patients without cardiogenic shock with different door-to-balloon times and prehospital delay≤120 minutes

Parameters	Door-to-balloon time ≤ 60 minutes (n=300)	Door-to-balloon time > 60 minutes (n=245)	p
Immediate angiographic success	287 (95,7)	220 (89,8)	0,007
No-reflow phenomenon	8 (2,7)	19 (7,8)	0,006
Mortality	2 (0,7)	14 (5,7)	0,001
MACE (death, MI recurrence, stent thrombosis)	8 (2,7)	18 (7,3)	0,011
Acute post-infarction aneurysm	13 (4,3)	20 (8,2)	0,062
LVEF at discharge, %	48 [43;51]	46 [42;51]	0,079

The data are expressed as the absolute and relative numbers (n (%)) or the median and the interquartile range (Me [25th percentile; 75th percentile]). MI, myocardial infarction; MACE, major adverse cardiac events; LV, left ventricle.

The univariate analysis was used to analyze 56 clinical, demographic, angiographic, and laboratory factors. As a result, 15 indicators were included in the complete logistic regression model (Table 5).

It should be noted that, according to the univariate analysis, door-to-balloon time>60 minutes was associated with in-hospital mortality (OR=0.45; 95% CI: 0.27–0.74; p=0.002). However, in the multivariate analysis, door-to-balloon time interval >60 minutes did not predict in-hospital mortality both with the forced inclusion (OR=0.652; 95% CI: 0.350–1.215; p=0.178), and step-by-step inclusion of variables in the model.

The results of the correlation analysis showed a strong correlation between the prehospital delay and total time of myocardial ischemia (r=0.87; p<0.001) (Figure 1) and a moderate correlation between door-to-

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Table 5. Independent predictors of in-hospital mortality

Parameter	Univariate analysis		Multivariate analysis (forced inclusion of variables)		Multivariate analysis (stepwise inclusion of variables)	
	OR (95 %CI)	**p**	**OR (95 %CI)**	**p**	**OR (95 %CI)**	**p**
Age, years	1.08 (1.06–1.1)	<0.001	1.065 (1.032–1.098)	<0.001	1.071 (1.041–1.102)	<0.001
Male	2.62 (1.63–4.22)	<0.001	0.973 (0.499–1.896)	0.936	–	–
History of CAD	2.89 (1.78–4.66)	<0.001	1.580 (0.869–2.871)	0.134	–	–
History of CKD	1.95 (1.04–3.65)	0.037	1.033 (0.472–2.260)	0.936	–	–
Blood glucose, mmol/L	1.12 (1.07–1.17)	<0.001	1.020 (0.958–1.087)	0.535	–	–
Hemoglobin, g/L	0.97 (0.96–0.98)	<0.001	0.975 (0.957–0.993)	0.006	0.972 (0.955–0.989)	0.001
Neutrophils, $\times10^9$/L	1.1 (1.03–1.17)	0.003	1.097 (1.012–1.189)	0.025	1.112 (1.029–1.203)	0.008
Time from pain onset to hospitalization,<120 minutes	0.55 (0.33–0.92)	0.024	0.703 (0.371–1.333)	0.280	–	–
Door-to-balloon time<60 minutes	0.45 (0.27–0.74)	0.002	0.652 (0.350–1.215)	0.178	–	–
Complete thrombotic occlusion of the infarct-related artery	1.87 (1.03–3.39)	0.04	1.445 (0.674–3.095)	0.344	–	–
Syntax score	1.07 (1.05–1.1)	<0.001	1.045 (1.011–1.080)	0.009	1.048 (1.015–11.082)	0.004
Infarct-related lesion of the LMCA	13.2 (4.88–35.8)	<0.001	10.074 (2.317–43.788)	0.002	10.481 (2.446–44.910)	0.002
Infarct-related lesion of the LAD	1.86 (1.15–3.02)	0.011	2.712 (1.459–5.038)	0.002	2.962 (1.602–5.478)	0.001
Acute heart failure Killip class III-IV	13.5 (7.9–22.9)	<0.001	10.462 (5.257–20.820)	<0.001	11.379 (5.826–22.225)	<0.001
PCI failure	9.53 (5.79–15.7)	<0.001	7.082 (3.810–13.163)	<0.001	7.430 (4.082–13.524)	<0.001

OR, odds ratio; CI, confidence interval; CAD, coronary artery disease; CKD, chronic kidney disease; LMCA, left main coronary artery; LAD, left anterior descending artery; PCI, percutaneous coronary intervention.

Figure 1. Dependence of the total time of myocardial ischemia on the time of prehospital delay (r=0.87; p<0.001)

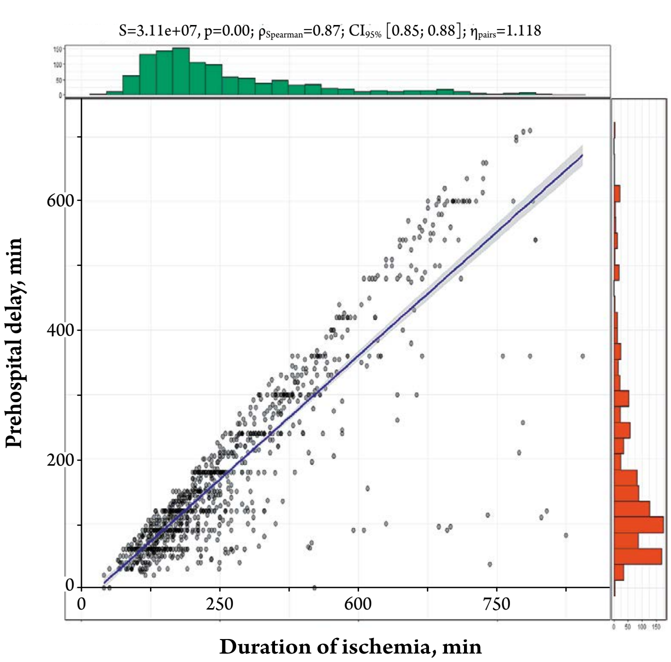
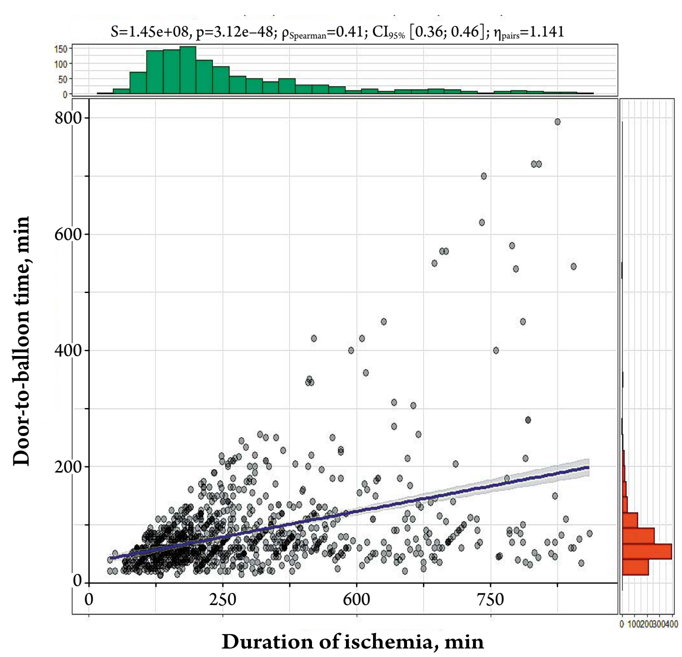


Figure 2. Dependence of the total time of myocardial ischemia on the door-to-balloon time (r=0.41; p<0.001)



balloon time and the total time of myocardial ischemia (r=0.41; p<0.001) (Figure 2). At the same time, there was no correlation between pre-hospital delay and door-to-balloon time.

Discussion

The results obtained in our study demonstrated a significant effect of door-to-balloon time on treatment outcomes in STEMI when prehospital delay from the onset of pain syndrome did not exceed 120 minutes. At the same time, the effect of reduced door-to-balloon time was neutralized when prehospital delay was more than 120 minutes. These results are confirmed by several earlier studies, in which they found that the treatment prognosis is primarily influenced by the total time of myocardial ischemia [12–15]. Several earlier studies showed that the total time of myocardial ischemia was a better predictor of mortality and MACE than door-to-balloon time [16, 17]. Besides, the reduced door-to-balloon time was associated with lower mortality and MACE rate in shorter prehospital delay, which is confirmed by our findings [18].

It should be noted that, in our study, there were statistically significantly more patients with cardiogenic shock in the group with prehospital delay≤120 minutes and door-to-balloon time >60 minutes. On the one hand, this is natural, since patients with cardiogenic shock often need longer preparation before PCI, which may include in some cases the installation of mechanical circulatory support systems [19]. On the other hand, the greater number of patients with cardiogenic shock, rather than increased door-to-balloon time, was likely to be the main reason for the worse treatment outcomes in this group. We excluded patients with cardiogenic shock and conducted an additional analysis to assess this hypothesis. At the same time, there still were statistically significant differences between the compared groups in the main indicators characterizing treatment outcomes. Moreover, the results of the multivariate analysis showed that door-to-balloon time>60 minutes in the general patient group was not associated with in-hospital mortality. This proves the positive effect of reduced door-to-balloon time on treatment outcomes for STEMI patients only if prehospital delay is less than 120 minutes.

We established a strong direct correlation between prehospital delay and the total time of myocardial ischemia. At the same time, door-to-balloon time and the total time of myocardial ischemia was moderately correlated, and there was no correlation between prehospital delay and door-to-balloon time. Prehospital delay can be divided into two components – a delay caused by the patient's behavior and a delay due the health care system [1]. The latter, in turn, can also be divided into several intervals. These include the time from calling the ambulance to its arrival, the time from the ambulance arrival to the diagnosis, the time of patient transportation to the PCI facility. The current clinical guidelines of the Russian Ministry of Health define targets for these intervals [7].

Given the findings of this study, strict adherence to the recommended intervals is an important factor in reducing prehospital delay and improving treatment of this category of patients. Nevertheless, the issue of delay due to late patient encounter remains unresolved. Thus, a large Chinese register including 33,386 patients with acute MI, showed that 69.1% of patients were admitted to PCI facilities more than 120 minutes after the onset of pain syndrome [16]. The results of earlier studies show that it is very difficult to objectively affect the delay associated with the patient's behavior. The previous activities developed to inform the public about the behavior in the event of retrosternal pain were generally found to be ineffective [20, 21]. Projects aimed at training patients were also ineffective in the long term [21]. Thus, the development of targeted prevention programs for patients at high risk of myocardial infarction who do not seek medical in a timely manner seems to be a relevant clinical challenge.

It should be noted that our study has several limitations: Specifically, the retrospective nature of the study and the inclusion of long-term patient data in the analysis. At the same time, it would not be possible to conduct this study now, because the previous organizational shortcomings associated with increased door-to-balloon time have been eliminated following the current guidelines.

Conclusion

Door-to-balloon time of less than 60 minutes was associated with better hospital outcomes in STEMI patients with prehospital delay of less than 120 minutes from the onset of pain. This was manifested in lower mortality, incidence of major adverse cardiac events and the no-reflow phenomenon, greater immediate angiographic success of PCI, and better functional state of the left ventricle at discharge. Door-to-balloon time of less than 60 minutes did not affect the treatment outcomes with prehospital delay of more than 120 minutes. Prehospital delay is strongly correlated with the total time of myocardial ischemia.

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