



ISSN: 2277- 7695  
TPI 2015; 4(9): 53-56  
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www.thepharmajournal.com  
Received: 25-09-2015  
Accepted: 28-10-2015

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## Impact of myocardial revascularization, irregular administration of bisoprolol, perindopril and antithrombotic drugs on heart remodeling and development of complications in acute myocardial infarction during 29.5 months

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### Abstract

21 male patients with AMI with ST segment elevation treated in Vinnytsia town clinical hospital № 1 in infarction unit from 2009 to 2014 years were examined. AMI with comorbid arterial hypertension was observed in 19 (90.5%) patients. HF of I-III functional classes was determined in all examined patients. To control the performed treatment lipid blood spectrum, troponin I content ECG, EchoCG in M and V regimes, Coronarography were used. Examined patients irregularly used BAB bisoprolol in the dose of 5-10 mg/24h, ACEI perindopril- 5-10 mg/24h and antithrombotic preparations (acetylsalicylic acid and clopidogrel) during in average 29.5 months. In patients with AMI with ST segment elevation eccentric LHV and different degrees of LHV and dilation of left ventricle were determined before the treatment. After prolonged treatment accidental regress of heart remodeling and development of cardiac events (cardiac death - in 1 patient, nonfatal MI- in 2, stroke - in 2, repeated revascularization- in 1, fibrillation of ventricles- in 2 patients) occurred, that gives the evidence of ineffectiveness of performed therapy.

**Keywords:** acute myocardial infarction (AMI), heart remodeling, invasive and medical therapy

### 1. Introduction

Myocardial infarction (MI) is the greatest problem in cardiology in the world. Mortality of this disease is considerably lower in the USA and European countries. But it is still high in Ukraine where 8.6 million of population suffer from ischemic heart disease (IHD), among them 50 thousand people are afflicted with MI.

Invasive methods (stenting of coronary arteries- CA and percutaneous transluminal angioplasty), surgical methods of treatment (aortocoronary shunting) and pharmacological methods (thrombolysis) [2, 5, 6, 8] are used for AMI therapy. Specialized centers should give invasive aid during 24h. It is conclusively proved that in MI with ST segment elevation the greatest effect from reperfusion occurs in 2-3 hours [5].

It was determined that during last decade primary transcatheter intervention (TCI) became the main procedure in reperfusion therapy in Europe. Myocardial revascularization in MI proved to improve ejection fraction of left ventricle (LV) [5]. According to other investigators myocardial revascularization in AMI does not improve contractility of LV [7].

But with the help of CA stenting coronary blood flow restores but atherosclerotic process in its activity is not removed. This is conclusively proved in randomized study PROSPECT. That is why it is important to include atherosclerotic therapy (statins) and double antithrombotic therapy - acetylsalicylic acid (ASA) and clopidogrel for these patients. In recent years use of antithrombotic drugs in MI at a time and after performing myocardial revascularization is widely discussed in print media and different scientific and practical conferences. But along this the efficacy of prolonged use of beta-adrenoblockers (BAB) and angiotensin-converting enzyme inhibitors (ACEI) after performing myocardial revascularization is studied insufficiently. There are very few such crosscutting studies of patients survived AMI with ST segment elevation in males after myocardial revascularization with prolonged irregular use of BAB, ACEI and antithrombotic drugs in literature. In MI impact of such complex irregular treatment on heart remodeling, systolic-diastolic dysfunction and development of early and late complication of systemic circulation is not clear either.

**Purpose** to determine the efficacy of impact of myocardial revascularization and use of antithrombotic drugs, BAB or ACEI in ACS (acute coronary syndrome) with ST segment elevation on heart remodeling, systolic-diastolic dysfunction and development of early and late complication during 29.5months.

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**2. Materials and Methods** 21 male patients with AMI with ST segment elevation treated in Vinnytsia town clinical hospital № 1 were examined from 2009 to 2014 years. Hereafter these patients were reexamined in average in 29.5±2.83 months. Age from examined patients ranged from 42 to 64 years.

Criteria for exclusion of the study were age over 80 years, heart failure (HF) IV functional class (FC), constant form of atrial fibrillation (AF), idiopathic cardiomyopathies, myocarditis, neoplasms and severe diseases of kidney, liver and lungs.

In the examined patients HF I-II according to NYHA classification was determined in 16 (76, 2%), III FC- in 5 (23, 8%). Arterial hypertension (AH) of II FC was seen in 12 (57.1%), III FC- in 7 (33.3%) patients. History of experienced MI was found in 8 (38.1%) patients.

Examined patients were made general blood count, urinalysis, troponin I content, lipid spectrum of blood, ECJ in 12 common derivations, EchoCG in M and V regimes. Coronarography was carried on the equipment of Siemens Axiom Sensis XP (Germany). Concentric and eccentric hypertrophy of left ventricle (HLV) was determined according to Genau method. In the study we determined criteria of diagnosis of HLV degrees, dilation of left atrium, systolic LV dysfunction were published by us earlier [1]. Along this we defined diastolic LV dysfunction on the basis of transmitral blood flow damage into diastole according to generally accepted criteria.

In the resuscitation and intensive care departments patients with AMI with ST segment elevation were given diffuse

therapy including intravenous administration of analgesic means (nitrates, narcotic drugs, antithrombotic drugs (ASA) in the initial dose 325 mg with following change to maintaining dose of 75 mg/24h; klopidogrel was used in the initial dose 600 mg with the following change to dose 75 mg/24h). This double antithrombotic therapy was performed during 3 months and was changed to constant taking ASA alone. Along this BAB bisoprolol in the dose 5-10 mg/24h or ACEI perindopril in the dose 5-10 mg/24h was administered. Indicated treatment and reexamination were made in average after 29.6±2.86 months. It's worth to notice that afore mentioned patients were not inclined to perform standard therapy, that's why they used preparations irregularly and with certain intervals.

**3. Results and Discussion** First of all, one must note that in admission of patients with AMI with ST segment elevation in cardiologic department during from 30 minutes to 24 hours since the disease onset not all patients managed to be taken Echo CG study. Some patients were excluded from the study on different reasons (deaf, severe course of disease, change the place of lodging, denial from performing investigation). Therefore, Echo CG examination was made not to all patients and studying of early and late complications development following the given therapy was made to all of them. Due to this Echo CG examination was made to 16 of 21 patients. Results of heart remodeling and systole-diastolic LV dysfunction in the examined patients are presented in the table 1.

**Table1:** Dynamics of heart remodeling degrees and systolic-diastolic LV dysfunction in ACS after CA stenting and prolonged irregular ambulatory treatment with bisoprolol, perindopril and antithrombotic drugs during 29.5 months

Heart Remodeling and systolic- diastolic dysfunction	Intensity of degrees and types	Before Therapy n =16	After Therapy n=8	P
Hypertrophy of left ventricle on Genau method	Concentric	6 (37,5%)	2 (25,0%)	-
	Eccentric	10 (62,5%)	6 (75,0%)	-
	Total	16 (100,0%)	8 (100,0%)	-
Degrees of left ventricle hypertrophy	I (initial)	2 (12,5%)	3 (37,5%)	-
	II (moderate)	8 (50,0%)	5 (62,5%)	-
	III (significant)	6 (37,5%)	-	<0,01
	Total	16 (100,0%)	8 (100,0%)	-
Degrees of left atrium dilation	I (initial)	7 (43,8%)	4 (50,0%)	-
	II (moderate)	3 (18,8%)	1 (12,5%)	-
	III (significant)	1 (6,3%)	-	-
	Total	11 (68,8%)	5 (62,5%)	-
Degrees of systolic dysfunction	I (initial)	3 (18,8%)	-	-
	II (moderate)	-	2 (25,0%)	-
	III (significant)	1 (6,3%)	1 (12,5%)	-
	Total	4 (25,0%)	3 (37,5%)	-
Types of diastolic dysfunction	I (delayed relaxation)	9 (56,3%)	4 (50,0%)	-
	II (pseudonormal)	3 (18,8%)	4 (50,0%)	-
	III (restrictive)	3 (18,%)	-	-
	Total	15 (93,8%)	8 (100,0%)	-

As far as we can see from the findings of the table 1, patients with AMI with ST segment elevation before the treatment tended to the cardiac hypertrophy development of systolic-diastolic dysfunction. Eccentric HLV, according to Genau method, was seen more frequently and found in 10 (62.5 %) patients.

Determination of HLV degrees and dilation of left ventricle is of great significance. HLV II (moderate) degree was found in 8(50.0%), III (significant) degree- in 6(37.5%) patients. Dilation of left ventricle in I (initial) degree was found out in 7 (43.8%).

According to literature data, prevailing development of eccentric HLV type due to dilation of cardiac cavities [4, 8] is observed in AMI with ST segment elevation. In patients with AMI in concentric LV remodeling adaption occurs owing to hypertrophy of intact cardiomyocytes, in eccentric- resulting from dilation of cardiac cavities and increase of inotropic function of the heart [3].

Thus, in the examined patients the development of eccentric LHV, LHV II-III degrees as well as dilation of left ventricle I degree are the evidence of heart remodeling development resulting from structural-functional changes in the

myocardium. In ASC decrease of ATP level and creatine phosphate (transporter of energy from mitochondrial cuts elements cardiomyocytes) takes place in cardiomyocytes with the development of systolic and diastolic dysfunction. But prognosis of complications development in LV remodeling after MI has not been performed sufficiently by now [9, 11].

In the examined patients after performing SA stenting and irregular use of antithrombotic drugs and BAB bisoprolol or ACEI perindopril the tendency to decrease of concentric HLV and growth of eccentric HLV was determined. In investigation of HLV decreases and dilation of left ventricle it was established that performed treatment led tendencies to decrease III (significant) degree of HLV ( $p < 0.01$ ) by means of its transition into II and I degrees of LHV. Dilation of left atrium also had the tendency to decrease II and III degrees that moved into I (initial) degree. Therefore, the received findings attest that performed treatment resulted in ambivalent changes in LV remodeling and generally to tendency of progressing of HLV and left atrium.

In the examined patients development of early and late complications in prolonged treatment is shown in table 2.

**Table 2:** Early and late cardiac complications of ACS after CA stenting and irregular prolonged ambulatory therapy with bisoprolol, perindopril and antithrombotic drugs during 29.5 months

Cardiac complications	Early complications n=21	Late complications n=21	P
Cardiac death	-	1 (4,8%)	-
Nonfatal MI	-	2 (9,5%)	-
Stroke	-	2 (9,5%)	-
Rehospitalization to the in-patient department	-	1 (4,8%)	-
Repeated myocardial revascularization	-	1 (4,8%)	-
Onset or increase of angina attacks	-	5 (23,8%)	<0,05
Increase of HF symptoms	-	3 (14,3%)	-
Ventricular extrasystole of 3-5 gradation	1 (4,8%)	4 (19,1%)	-
Fibrillation of ventricles	-	2 (9,5%)	-
Fibrillation of atria	2 (9,5%)	-	-
AV –blocks	1 (4,8%)	-	-
His bundle block (HBB)	1 (4,8%)	-	-

Ventricular extrasystole of 3-5 gradations by Lown classification, fibrillation of atria and His bundle blocks (HBB) were seldom determined in patients with AMI with ST segment elevation before the treatment.

After performed CA stenting and irregular use of antithrombotic drugs, biprolol or perindopril during 29.5 months, the development of cardiac events (cardiac death in 1 patient, nonfatal MI- in 2, fibrillation of ventricles- in 2, stroke- in 2 patients) was determined. Along with this repeated myocardial revascularization was performed in 1patient, increase of angina attacks was determined in 5(23.8%) ( $p < 0.05$ ) patients, symptoms of HF increased by 14.3%, ventricular extrasystole - by 14.3%. But after the treatment fibrillation of atria, AV- blocks and HBB were not determine.

According to findings of other authors, LV remodeling after experienced AMI is the predictor of development of complications and important predictor of death [10, 11]. Finding received by us confirm that in-patients after experienced AMI along with increase of heart remodeling, increase of cardiac events also rises.

#### 4. Conclusions

1. In patients with AMI with ST segment elevation before the treatment, despite of insufficient number of examined patients we determine the tendency to prevailing development of eccentric HLV II (moderate) and III (significant) degree of HLV, I (initial) degree of left atrium dilation and retarded diastolic type of LV relaxation, that is the evidence of development of heart remodeling and uncommon arise of various rhythm and cardiac conductivity impairments.
2. In this pathology after performing of myocardial revascularization and irregular use of antithrombotic drug BAB bisoprolol, ACEI perindopril in optimal doses there occurs increase of eccentric HLV, decrease of III (significant) but increase of II (moderate) degree of HLV, reduction of restrictive and growth of pseudonormal type of diastolic dysfunction that indicates the ambivalent results of study and prevailing increase of heart remodeling, perhaps due to insufficient number of examined patients and absence of predisposition to performed therapy.
3. In this small number of patients after irregular medical treatment increase of heart remodeling is found out that contributed to cardiac death in 1 case, nonfatal MI – in 2, stroke - in 2, fibrillation of ventricles in 2 cases that shows the development of cardiac events.
4. Use of determining of HLV degrees and dilation of left ventricle allows to define deeper changes in heart remodeling after therapy that is of significance in practical activity of physician and scientist. But to confirm the received results it is reasonable to perform investigation in greater cohort of patients.

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