

Evaluation of Heart Rate in Patients with Myocardial Infarction in Different Periods

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Abstract

The social significance of myocardial infarction (MI) is determined not only by the high mortality of patients, but also by the fact that a significant part of them subsequently develop heart failure (HF), heart rhythm disturbances (HRD), which worsen the quality of life and limit the ability of patients to work. Holter ECG monitoring (HMECG) is one of the most promising approaches for identifying a group at increased risk of developing coronary artery disease and AMI, predicting the course of the pathological process, and developing complications.

The purpose of the study was to study the prevalence of cardiac arrhythmias in patients with Q-wave myocardial infarction. The study included 80 male patients with primary Q-wave MI aged 29 to 60 years (mean age 50.8 ± 0.98 years), not more than 10 days old. All patients underwent HMECG. The analyzed HMECG parameters included average hourly and average daily heart rate, circadian index (CI); the location of the S-T segment of the relative isoline and its configuration; structure of cardiac arrhythmias.

Results: In the vast majority of cases (98.6%), cardiac arrhythmias were detected in patients, including PVA were recorded in 38.8% of cases, in this group, the anterior localization of the process prevailed (71% vs. 49%; $\chi^2=2.911$, $P < 0.01$), the presence of signs of aneurysm (42% versus 10.2%; $\chi^2=10.955$, $P < 0.001$) and the detection of 2 or more complications in the acute period of MI (35.5% and 10.2%, respectively; $\chi^2=6.086$, $p=0.014$).

Conclusion. According to the results of HMECG, 98.6% of the examined patients had cardiac arrhythmias, including PAD in 38.8% of cases. In the group of patients with potentially dangerous ventricular arrhythmias (PVA), cases of development of 2 or more complications in the acute period of MI prevailed. In the PVA group, the anterior localization of the process prevailed, the presence of aneurysm signs and the detection of 2 or more complications in the most acute period of MI.

1. Introduction.

According to the WHO, cardiovascular diseases (CVD) rank first among other diseases of organs and systems. The problem of myocardial infarction (MI) has been and remains one of the most acute social problems [1], which dictates the need to develop effective measures for its secondary prevention, the success of which largely depends on the doctor's ability not only to timely identify and eliminate existing complications of the disease, but also to anticipate their development in the future. The latter determines the relevance of the search for bisocial factors that have an adverse effect on the course of the disease and the life prognosis of patients who have had MI.

At the same time, despite the large number of studies devoted to the study of the prognosis after MI, there

are still no systematized data from a comprehensive analysis of a number of different clinical and instrumental indicators, and little is paid to compare their prognostic significance [2].

In addition, the issue of the prognostic significance of a number of indicators of the premorbid and current clinical status of patients with MI, as well as data from Holter ECG monitoring (HMECG), exercise tests, blood lipid spectrum, and the mental profile of the patient continues to be discussed in the literature [3].

It should be emphasized that the social significance of MI is determined not only by the high mortality of patients, but also by the fact that a significant part of them subsequently develop heart failure (HF), cardiac arrhythmias (HRD), repeated MI, angina attacks resume, which worsen the quality of life. life and limit the ability of patients to work.

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HMECG is one of the most promising approaches for identifying an increased risk group for developing coronary artery disease and AMI, predicting the course of the pathological process, and developing complications. The most important advantage of HMECG is the possibility of long-term ECG recording in a patient who is in free movement, under the influence of changing physical and psycho-emotional efforts, which significantly increases the ability to document transient electrophysiological changes and, first of all, NRS. The latter mainly determines the value of the method for long-term prediction of MI outcomes.

HMECG is considered the best method for detecting electrical myocardial instability, the presence of which is associated with the likelihood of developing fatal arrhythmias and VS in patients after MI [4, 5, 6]. When analyzing the effect of ventricular arrhythmia (VA) on postinfarction prognosis, it was found that the presence of frequent and complex VA had a significant relationship not only with mortality, but also with a high probability of developing or progressing in subsequent HF (8.0 vs. 1.9% in patients without VA, $\chi^2 - 4.62$, $P < 0.05$). Moreover, if, when patients with high-grade ventricular extrasystole (PV) were excluded from the analysis, the frequency of deaths sharply decreased, then the probability of occurrence or progression of HF remained at a significantly higher level than in patients without VA (15.4 vs. 1.9%, $\chi^2 - 8.66$, $P < 0.05$).

Indirect confirmation of the direct dependence of ventricular ectopic activity on the size of myocardial damage are the results of studying the frequency and nature of VA with different localization and size of myocardial infarction. So, ZHA, incl. its high gradations in repeated, anterior-inferior, and Q-MI were detected significantly more often than, respectively, in primary, anterior, inferior, and without Q-MI. Thus, the results obtained indicate a close relationship between VA and impaired myocardial contractility. From this it follows that, firstly, the appearance or persistence of frequent VA 2 months after MI is an indirect sign of pathological myocardial remodeling and associated impairment of contractility; secondly, the presence of high-grade PVCs (polytopic, paired and/or group) can be used as a marker of a high probability of death; and thirdly, it is unlikely that the life prognosis of this population can be improved only

by antiarrhythmic therapy. Thus, the results obtained indicate a close relationship between VA and impaired myocardial contractility. From this it follows that, firstly, the appearance or persistence of frequent VA 2 months after MI is an indirect sign of pathological myocardial remodeling and associated impairment of contractility; secondly, the presence of high-grade PVCs (polytopic, paired, and/or group) can be used as a marker of a high probability of death [5, 7].

When comparing the prognostic significance of the Lown-Wolf (1971) grading classification and assessing the average daily number of PVCs per hour, it turned out that with VA grade 2, the frequency of all deaths was 8 times (22.7 vs. 2.9%, $\chi - 18.0$, $P < 0.05$), and VS is 6 times higher (17.0 vs. 2.9%, $\chi - 11.4$, $P < 0.05$) than with grade 0. and 4B) was associated with a significant and significant increase in mortality (7.8 times in comparison with the group without VA).

The purpose of the study is to study the prevalence of cardiac arrhythmias in patients with Q-wave myocardial infarction.

2. Material and Research Methods.

The study included 80 male patients with primary Q-wave MI aged 29 to 60 years (mean age 50.8 ± 0.98 years), who were hospitalized for no more than 10 days in the cardiology department of the 1st clinic of the Tashkent Medical Academy and at the Republican Specialized Center of Cardiology. The diagnosis was established based on the WHO criteria in the presence of the following signs: a characteristic attack of anginal pain or its equivalent lasting at least 30 minutes; the appearance of pathological Q or QS waves in two or more ECG leads. The patients also underwent the determination of ALT, AST, LDH, MB fraction of CPK and blood troponin. All patients were familiarized with the protocol and agreed to participate in the study.

The exclusion criteria included: age over 60; violations of sinoatrial or atrioventricular conduction II-III degree; permanent form of atrial fibrillation; arterial hypotension (BP < 100/60 mm Hg); concomitant diseases that can independently influence the prognosis of life or the process of left ventricular remodeling (heart defects, severe and malignant arterial hypertension; oncological diseases; diseases of the lungs, liver, kidneys with impaired function of

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these organs; severe or decompensated diabetes mellitus; severe anemia; thyroid diseases glands with a violation of its function); consequences of acute cerebrovascular accident; symptoms of circulatory failure in history.

At the inpatient stage, the treatment of AMI was carried out in accordance with the recommendations for the management of patients with ST-segment elevation MI (ACC / AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction; 2004) and included thrombolytic therapy according to indications, early prescription of beta-blockers, antiplatelet agents, anticoagulants, as well as nitrates (including intravenously), lipid-lowering agents, ACE inhibitors, loop diuretics.

The functional state of the cardiovascular system, the qualitative and quantitative characteristics of cardiac arrhythmias were studied using Holter ECG monitoring. Long-term ECG recording was carried out in the conditions of the patient's free mode using the computer system "Cardio Sens +" (KhAI-MEDIKA, Ukraine). A 7-channel recorder was used, which made it possible to form 3 monitor leads corresponding to

leads III, V1-2, V5 of the standard ECG. During the study, patients kept a diary in which they noted the nature of the activity, their feelings, and the time of taking the drugs. The diary was used for retrospective comparison of data obtained from the interpretation of individual ECG records, and information provided by the patient.

The analyzed HMECG parameters included average hourly and average daily heart rate, circadian index (CI); the location of the S-T segment of the relative isoline and its configuration; polarity and amplitude of the "T" waves; structure of cardiac arrhythmias. To characterize ventricular extrasystoles, the gradation classification of V. Lown and M. Wolf (1971) and the prognostic classification of J. Bigger (1982) were used. Hourly qualitative and quantitative assessment of PVC was carried out in accordance with the Lown-Wolf gradation: 0 - PVC is absent; 1 - rare PVC; 2 - frequent PVC; 3 - polytopic PVCs; 4a – paired PVCs; 4b – group PVCs; 5 - early PVCs. According to J.Bigger's classification, after myocardial infarction, potentially dangerous ventricular arrhythmias included PVCs >10 per hour, paired PVCs, and group PVCs.

Table 1 Clinical characteristics of patients

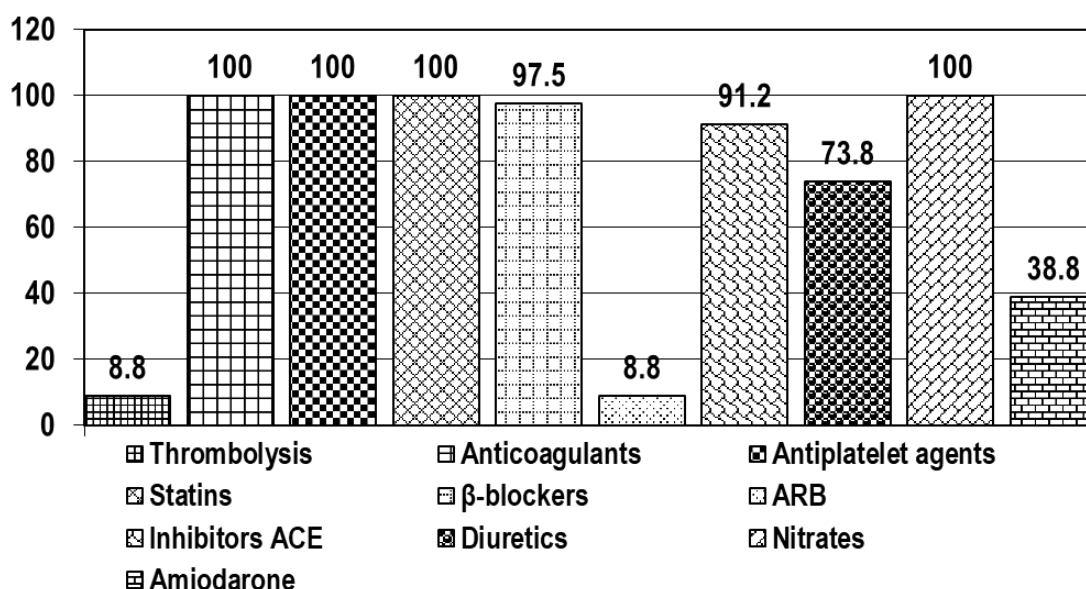
Indicators	Number of patients n=80	%
Average age (years)	50,8±0,98	
Posterior MI	34	42,5
Anterior MI	46	57,5
History of hypertension	63	78,8
History of angina pectoris	47	58,8
Acute heart failure (Killip II-IV)	13	16,3
Ventricular fibrillation in the acute stage of MI	2	2,5
RPIS	29	36,3
LV aneurysm	19	23,8

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Potentially dangerous ventricular arrhythmias (Bigger)	31	38,8
Symptoms of chronic heart failure in the subacute stage (FC NYHA II-III)	48	60,0
Thrombolysis	7	8,8

From Table 1. shows that MI of the anterior localization occurred in 46 (57.5%) patients, MI of the posterior wall was observed in 34 (42.5%) patients. 63 (78.8%) patients had a history of arterial hypertension, 47 (58.8%) patients had exertional angina. In 13 (16.3%) patients, the course of the acute period of the disease was complicated by the development of clinical signs of heart failure (Killip, class II-IV),

including class II - in 7 (53.8%), class III - in 5 (38.5%), IV class (cardiogenic shock) - in 1 (7.7%) cases. In 2 (2.5%) patients, ventricular fibrillation (VF) developed during the first 2 days of AMI. Clinical signs of circulatory failure (FC NYHA II-III) were observed in 48 (60%) patients. In 29 (36.3%) patients, early resumption of angina attacks (RPIS) was noted.



GRAPH 1: The nature of drug treatment of patients (by drug groups) at the inpatient stage

GRAPH 1. shows the characteristics of the drugs used at the inpatient stage of treatment. Thrombolytic therapy was performed in 7 (8.8%) cases. All patients included in the study received antiplatelet agents, anticoagulants, statins, and nitrates (per os or intravenously). ACE inhibitors (enalapril - average daily dose of 7.7 mg) were received by 73 (91.2%) patients. 7 (8.8%) patients took AT-II receptor blockers due to the occurrence of side effects when using ACE inhibitors. Beta-blockers (bisoprolol -

average daily dose of 3.25 mg) were administered to all patients who had no contraindications (n=78; 97.5%) in the early stages of MI. The need for antiarrhythmic therapy was noted in 31 (38.8%) cases. Diuretics were used in 59 (73.8%) patients.

3. Results and Discussions.

All patients underwent HMECG in order to identify the frequency and complexity of NRS by 10-12 days (10.11 ± 0.04 days) of the disease.

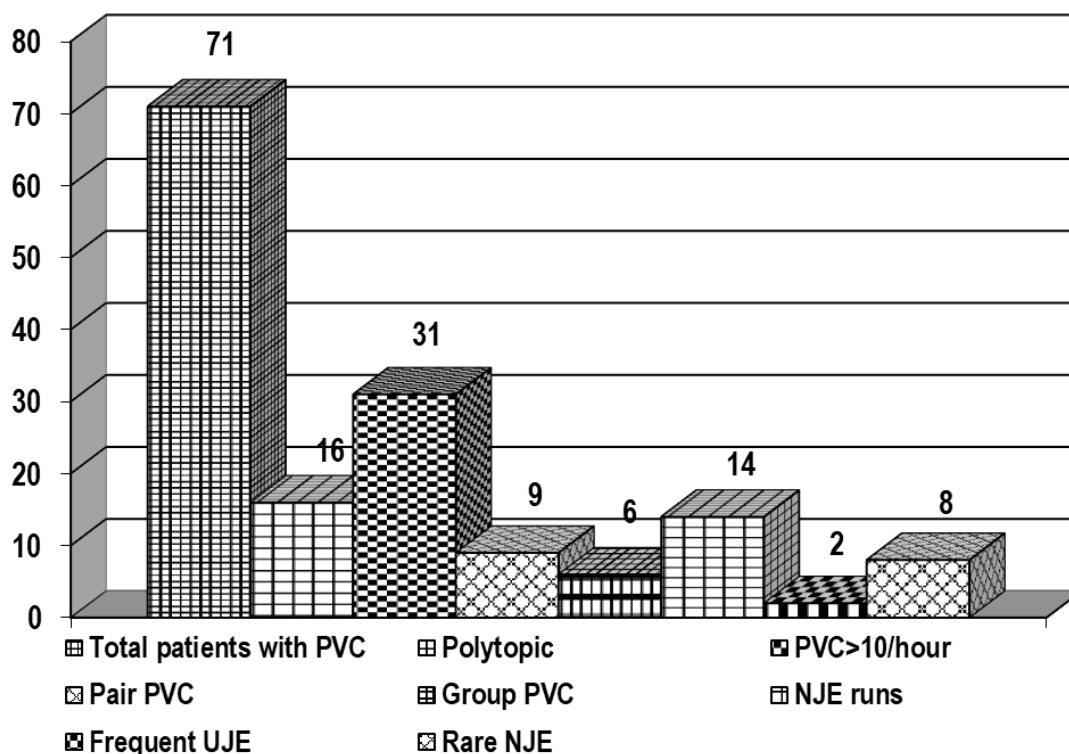
Table 2 The main parameters of heart rate and on days 10-12 Q-MI according to HMECG, n=80

Indicators	M±m
Number of hours of recording	22,13±1,01
Wed daily heart rate (bpm)	70,17±8,37
Wed night heart rate (bpm)	61,03±7,26
Circadian index (relative units)	1,12±0,08

The parameters of the basic sinus rhythm, the frequency and nature of arrhythmias in the late hospital stage of Q-MI were assessed. The duration of a high-quality recording varied from 16 to 24 hours and averaged 21.4±1.0 hours. The average daytime heart rate ranged from 53 to 87 beats/min (70.17±8.37 beats/min), and the average nighttime heart rate ranged from 47 to 77 beats/min (61.03±7.26 beats/min). The values of the circadian index (CI) varied from 1.01 to 1.40 (Table 2).

Of the 80 examined (GRAPH 2) patients, only 1 (1.4%) did not have any cardiac arrhythmias. In 8 (10%) patients, a rare supraventricular extrasystole was observed. In all other cases, both ventricular and

supraventricular arrhythmias occurred, which in 23 (28.75%) patients were represented only by single extrasystoles of various topics. Ventricular extrasystole was detected in 71 (88.75%) patients. In 16 (20%) cases, PVC had a polytopic character. In 31 (38.8%) patients, the number of PVCs exceeded 10 PVCs per hour, of which 9 (11.3%) cases had paired PVCs (gradation 4a), and 6 (7.5%) had group PVCs (4b gradation) - these patients (n=31) made up the group with potentially dangerous ventricular arrhythmias (VAA). Frequent supraventricular extrasystole occurred in 2 (2.5%) patients and short runs of supraventricular tachycardia were found in 14 (17.5%) patients.



GRAPH 1: Detection of cardiac arrhythmias on days 10-12 of Q-MI according to HMECG, n=80

Thus, in the vast majority of cases (98.6%), cardiac arrhythmias were detected in patients, including PVA, which were recorded in 38.8% of cases. Taking into account the fact that PVA is an independent predictor of VS, we further analyzed the clinical characteristics of patients depending on the presence of PVA according to HMECG. To do this, the patients were divided into 2 groups: the first group consisted of 49 (61.2%) patients with no or rare up to 10 PVCs per hour, the second - 31 (38.8%) with the presence of PVA.

The results of the analysis showed that in the PVA group, the anterior localization of the process prevailed (71% vs. 49%; $\chi^2=2.911$, $P<0.01$), the presence of aneurysm signs (42% vs. 10.2%; $\chi^2=10.955$, $P<0.001$) and detectability of 2 or more complications in the most acute period of MI (35.5% and 10.2%, respectively; $\chi^2=6.086$, $p=0.014$).

The results of the ECG HM assessment showed that in the vast majority of cases in the early post-infarction period, patients develop various NRS, which is generally in line with the literature data [1,6]. In our study, only in 1 case (1.4%) were not registered LDCs. In 10% of cases, a rare NVA was observed, in all other cases, both ventricular and supraventricular NRS were recorded. Since the prognostic value of NRS depends on the localization of ectopic foci, we paid special attention to VA, which was recorded in 88.8% of cases.

It is known that VA occupy a special place among the harbingers of an unfavorable prognosis. According to HM ECG data, patients in our study were divided into 2 groups: the first group consisted of 49 (61.2%) patients with no or rare up to 10 PVCs per hour, the second - 31 (38.8%) with the presence of PVA. Comparative analysis of clinical and anamnestic data showed that the group of patients with and without PVA differed statistically significantly in the localization of AMI (anterior, posterior), the presence of two or more complications in the acute period, as well as the presence of signs of LE on the 10-12th day of observation. It is assumed that the formation of VA at different stages of MI is due to different mechanisms: VA in the early stages is caused, as suggested [21, 161], by neurohumoral changes, and at

later stages, VA is due to the processes of cardiac remodeling.

4. Conclusion.

According to the results of HMECG, 98.6% of the examined patients had cardiac arrhythmias, including PAD in 38.8% of cases. In the group of patients with POVA, cases of development of 2 or more complications in the most acute period of MI prevailed. In the PVA group, the anterior localization of the process prevailed, the presence of aneurysm signs and the detection of 2 or more complications in the most acute period of MI.

In the early postinfarction period, patients develop various NRS. The prognostic value of HPC depends on the localization of ectopic foci.

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