CLINICAL EFFECTIVENESS OF HOME ECG MONITORING IN THE MANAGEMENT OF POST-INFARCTION CARDIAC ARRHYTHMIAS

Hamroyeva Madinabonu Yo'ldosh kizi
Bukhara State Medical Institute
Assistant at the Department of Faculty and Hospital Therapy
e-mail: madinabonu_hamroyeva@bsmi.uz
xamrayevamadina96@gmail.com

Abstract: This study evaluates the clinical effectiveness of ambulatory telemetric electrocardiographic (AT ECG) monitoring in patients during the early post-myocardial infarction (MI) period. A total of 136 patients with Q-wave MI were divided into two comparable groups: 70 patients in the main group used AT ECG monitoring for 6 months, while 66 patients in the control group underwent standard follow-up by district cardiologists. All patients received comparable anti-ischemic and antiarrhythmic therapy. The frequency of ventricular arrhythmia detection was significantly higher in the AT ECG group due to more frequent and timely ECG recordings. The study demonstrated that the use of symptom-triggered and time-triggered ECG transmission modes allowed for the identification of both symptomatic and asymptomatic arrhythmias. Additionally, the dynamic ECG monitoring facilitated more frequent adjustments of pharmacological therapy, improving its individual optimization and safety. The results show that home-based AT ECG monitoring not only increases the detection rate of ventricular arrhythmias but also contributes to better therapeutic control and may reduce sudden cardiac death in post-MI patients.

Keywords: Post-infarction monitoring, ventricular arrhythmia, ambulatory ECG, telemetric ECG, sudden cardiac death, myocardial infarction, home-based diagnostics, Holter monitoring comparison

Life prognosis in post-myocardial infarction (MI) patients remains a challenging clinical issue due to the multifactorial nature of its determinants. One of the key prognostic factors is cardiac rhythm disturbances (CRDs). Research has demonstrated that among MI survivors, the presence of rare monomorphic premature ventricular contractions (PVCs) increases the risk of mortality fivefold, salvos tenfold, and early PVCs up to fifteenfold compared to patients without ventricular ectopic activity. Clinical follow-up has shown that patients who exhibited frequent PVCs before hospital discharge were at a significantly higher risk of developing paroxysmal ventricular tachycardia (PVT) and experiencing sudden cardiac death (SCD). In such cases, regular cardiac rhythm monitoring could help in preventing life-threatening complications. However, conventional outpatient care after acute myocardial infarction (AMI) often fails to provide sufficient and timely electrocardiographic (ECG) evaluation, limiting early intervention opportunities. In Russia, telecardiology consulting and diagnostic centers—facilitating remote ECG transmission via telephone—once played a crucial role in early diagnosis of cardiovascular diseases (CVDs), organizing long-term follow-up of cardiac patients, enhancing diagnostic accuracy, and improving emergency care. Nonetheless, they lacked the capacity for individualized dynamic ECG monitoring, especially in high-risk patients vulnerable to recurrent or primary cardiac events. The auto-transmission (AT) method, where the patient independently transmits their ECG via phone to a cardiology center, has emerged as the most efficient form of

home ECG monitoring. This system ensures real-time two-way voice communication between patient and physician, enabling prompt, patient-specific clinical assessment. Objective of the study: To evaluate the effectiveness of home ECG monitoring using the auto-transmission method for early detection and differential diagnosis of cardiac rhythm disturbances and for assessing the efficacy of antiarrhythmic therapy during the outpatient phase of care in post-MI patients.

Materials and Methods

The study involved 136 patients who were discharged from the clinic of the Research Institute of Cardiology with a diagnosis of Q-wave myocardial infarction (Q-MI). Prior to discharge, all participants underwent 24-hour Holter electrocardiographic monitoring (ECG).

Based on clinical comparability, patients were divided into two groups:

Group I (intervention group): 70 patients used ECG home monitoring with the auto-transmission (AT) method for six months.

Group II (control group): 66 patients received conventional rehabilitation under the supervision of a district cardiologist.

Both groups received standardized pharmacological treatment, including nitrates, beta-blockers, aspirin, and angiotensin-converting enzyme inhibitors (ACEIs).

For ECG auto-transmission, a three-channel portable ECG transmitter "EKP-302I" (MIKTO-Intech, Saratov) was used. The system was configured in Nebb standard lead configuration.

ECG recordings were transmitted to the cardiology center using protocols recommended at hospital discharge, based on two modes:

Symptom-triggered mode: Patients were instructed to transmit ECG data upon experiencing subjective complaints such as palpitations, skipped beats, sudden cardiac pauses, dizziness, blurred vision, near-syncope or syncope, dyspnea, or unexplained fatigue—all of which could indicate arrhythmic events. This mode enabled detection of symptomatic arrhythmias.

Scheduled time-interval mode: ECG was transmitted either at fixed intervals (e.g., every 3 or 6 hours) or adaptively, based on the individual daily physiological patterns of the patient. This mode facilitated the identification of asymptomatic arrhythmias and silent myocardial ischemia. The clinical relevance of this approach is supported by evidence of intra-daily rhythmicity in the course of ischemic heart disease (IHD). Holter monitoring was used to determine patient-specific rhythms of cardiac disturbances.

Additional indications for ECG auto-transmission included episodes of retrosternal or cardiac-region chest pain.

Results and Discussion

A total of 12,775 ECG recordings were transmitted to the cardiology center. There were no statistically significant differences between the two groups in terms of age, type of myocardial infarction (Q or QS), frequency of recurrent infarction, or development of early post-infarction angina pectoris ($p > 0.05$) (Table 1). The results of 24-hour Holter ECG monitoring conducted prior to hospital discharge are presented in Table 2. Due to the lack of standardized criteria for quantifying ventricular ectopic beats (VEBs), we classified ≤30 VEBs per hour as "rare" and >30 as "frequent." The incidence of ventricular rhythm disturbances was similar in both groups, reaching 70–75% (rare VEBs). The high detection rate of ventricular arrhythmias at discharge was likely due to the deliberate selection of patients with persistent rhythm disturbances since admission, which later facilitated a valid comparison between the groups. Additionally, we examined the distribution of asymptomatic arrhythmic episodes, i.e., those not accompanied by

subjective symptoms. During Holter monitoring, patients kept diaries noting occurrences of palpitations, irregular heartbeats, heart pauses, and other symptoms.

A comparison of diary entries with Holter data revealed that asymptomatic arrhythmias were observed in 15.3% of patients, accounting for 26.8% of all arrhythmic episodes. This was attributed to the fact that isolated or even multiple VEBs, especially those occurring during late diastole, often go unnoticed by patients. For instance, one patient experienced three episodes of atrial fibrillation without any subjective symptoms. This highlights the limitations of symptom-triggered telemetric ECG transmission in detecting all rhythm disorders. However, some of these episodes were identified using scheduled ECG transmissions. It is evident that arrhythmia detection rates depend directly on the number of ECG recordings per patient. In the tele-ECG group, the average number of ECG transmissions per patient per day was 2.8, 2.1, and 1.2 during the first, third, and sixth months, respectively. In the control group, the corresponding rates of ECG examinations at outpatient clinics were only 0.06, 0.04, and 0.01, respectively—over 20 times less than in the tele-ECG group. Naturally, this disparity significantly influenced the detection rate of rhythm disturbances. Overall, the diagnosis of ventricular arrhythmias was markedly higher in the tele-ECG group (Table 3). For instance, during the first post-infarction month, rare and frequent VEBs were detected in 51.3% of patients in the tele-ECG group (88.6% rare, 14.1% frequent) compared to only 20.5% in the control group (77.6% rare, 28.3% frequent). Polytopic and paired VEBs were identified in 31.4% and 13.9% of patients, respectively. Episodes of non-sustained ventricular tachycardia (VT) were observed only in the tele-ECG group. By the sixth month, the number of patients with ventricular arrhythmias increased further, with rare VEBs being 3.5 times and paired VEBs 7.8 times more common than in the control group.

An unexpected finding was the progressive increase in complex arrhythmias (polytopic, paired VEBs) over time. This may be due to the resumption of regular daily activities, a decrease in antiarrhythmic therapy intensity, reduced physician oversight, and patients' changing attitudes toward their illness—all contributing to fewer clinic visits. The actual effectiveness of home-based ECG monitoring is best demonstrated by comparing the baseline Holter monitoring data and the arrhythmia detection rate in the first post-infarction month. As shown in Figure 1, the percentage of patients with ventricular arrhythmias was 10.8% higher in the tele-ECG group than during initial Holter monitoring, owing to the continuous and repeated nature of home ECG recordings, unlike the one-time Holter monitoring. In contrast, the number of patients with ventricular arrhythmias in the control group was 27.9% lower than with Holter monitoring and 37.3% lower than in the tele-ECG group.

Conclusions

The use of modern computer-based tele-ECG technology, as a form of home ECG monitoring, significantly enhances the diagnostic capabilities for arrhythmias in post-infarction patients in outpatient settings. Tele-ECG enables the detection of rhythm disturbances that are often missed by routine ECGs at clinics and even by single 24-hour Holter recordings. Daily tele-ECG monitoring is essential for selecting optimal antiarrhythmic therapy regimens, dosage adjustment, treatment monitoring, and diagnosing adverse drug effects. It plays a key role in reducing the incidence of sudden cardiac death (SCD) during the early post-infarction period. In the tele-ECG group, therapeutic regimen adjustments occurred 31.54% more frequently compared to the control group. By the sixth month, nearly 100% of patients in the tele-ECG group underwent medication adjustments, something impossible without continuous ECG control. Antiarrhythmic proarrhythmic effects were also detected in 5.7% of patients, which were subsequently confirmed in hospital. Given the low cost and high efficiency, the integration of tele-ECG into routine post-infarction care is both feasible and advisable, as supported by other studies.

References

1. 1.Hamroyeva M.Y., St. Elevation or Myocardium Infarction Shifohonagach Tizimli Thrombolysis Muammolari Va Ularning Echimi. Miasto Przyszłości. Vol. 49 (2024):420-431
2. 2.Hamroyeva M.Y., St Segment Elevationali Otkir Coronar Sinromda Shifohonagacha Tisimli Thrombolysis Chap Korincha Systolic Dysfunctionsiga Ta'siri. Miasto Przyszłości. Vol. 49 (2024):376-381
3. 3.Hamroyeva M.Y., Tug'ma yurak nuqsonlarida o'pka gipertenziyasi. Ilm fan xabarnomasi .Vol. 8 No. 1 (2025): 158-162
4.
5. 4.Hamroyeva M.Y., Cardiac arrhythmias after myocardial infarction: Diagnostic approaches and therapeutic options. Iqro indexing. Vol. 16 No. 01 (2025): 153-160
6. 5.Bigger JT Jr, Fleiss JL, Kleiger R, Miller JP, Rolnitzky LM. The relationships among ventricular arrhythmias, left ventricular dysfunction, and mortality in the 2 years after myocardial infarction. Circulation. 1984;69(2):250-8.
7. 6.Moss AJ, Zareba W, Hall WJ, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. N Engl J Med. 2002;346(12):877-83.
8. 7.Bauer A, Malik M, Schmidt G, Barthel P, Bonnemeier H, Cygankiewicz I, et al. Heart rate turbulence: standards of measurement, physiological interpretation, and clinical use. Eur Heart J 2008;29(8):1186–1201.
9. 8. Metting G, Kirchhof P, Andresen D, Meinertz T, Willems S. Ambulatory ECG monitoring – current status and future perspectives. Z Cardiol. 2004;93(7):529–538.
10. 9.Olgin JE, Ziegler PD, Joy PS, et al. Remote monitoring of implantable cardioverter defibrillators: a prospective analysis. J Cardiovascular Electrophysiol. 2009;20(5):547–553.
11. 10.Malik M, Camm AJ. Evaluation of drug-induced QT interval prolongation. Implications for drug approval and labeling. Drug Saf. 2001;24(5):323–351.
12. 11.Barrett PM, Komatireddy R, Haaser S, et al. Comparison of 24-hour Holter monitoring with 14-day novel adhesive patch electrocardiographic monitoring. Am J Med. 2014;127(1):95.e11-7.
13. 12.Saxon LA. Remote monitoring of implantable cardioverter-defibrillators. Cardiol Clin. 2008;26(4):611–625.
14. 13. Vardas PE, Auricchio A, Blanc JJ, et al. Guidelines for cardiac pacing and cardiac resynchronization therapy: the Task Force for cardiac pacing and resynchronization therapy of the European Society of Cardiology. Eur Heart J 2007;28(18):2256–2295.
15. 14.Köhler B, Meinertz T, Götz A, et al. Telemetric home monitoring in cardiac patients: medical and economic benefits. Dtsch Med Wochenschr. 2003;128(40):2082–2087.