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HEART RHYTHM DISORDERS AND INTERVAL CHANGES Q-T FOR MITRAL VALVE PROLABATION SYNDROME

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Abstract:
Mitral valve prolapse syndrome is a common heart condition characterized by the improper closing of the mitral valve, leading to various symptoms such as palpitations, chest pain, and fatigue. In patients with this syndrome, there is an increased risk of developing heart rhythm disorders and changes in the QT interval on electrocardiogram (EKG). These abnormalities can further exacerbate symptoms and increase the risk of complications such as arrhythmias and sudden cardiac death. Therefore, close monitoring of the heart rhythm and QT interval is essential in patients with mitral valve prolapse syndrome to ensure early detection and appropriate management of any abnormalities.

Keywords mitral valve prolapse syndrome, heart condition, improper closing, symptoms, palpitations, chest pain, fatigue

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In recent years, the features of the clinical manifestations of mitral valve prolapse syndrome (MVP) have been the subject of study by many clinicians [2, 7, 8, 11, 15].

In particular, the frequency and nature of arrhythmias, which largely determine the complaints and performance of patients with this pathology, require further study. Along with this, a number of authors [6, 8, 10, 14] point to the combination of MVP with prolongation of the QT interval, but its relationship with the development of cardiac arrhythmias in this syndrome has not been sufficiently studied.

Material and methods

60 patients (28 men and 32 women) with idiopathic MVP aged from 17 to 48 years (average age 28.53.5 years) were examined. In all patients, auscultation revealed a late systolic murmur or a systolic click, which was also recorded during a phonocardiographic study. Echocardiography revealed prolapse of one or both mitral valve leaflets into the cavity of the left atrium by at least 2 mm in all patients. To exclude concomitant diseases, all patients underwent a thorough general clinical and laboratory and instrumental examination.

Heart rhythm disturbances were detected using the following methods: resting ECG, leg isometric exercise, 24-hour ECG monitoring.

24-hour ECG monitoring using the domestic Lenta-MT complex. Analysis of ventricular cardiac arrhythmias was carried out according to the Lown and Wolf classification [13]. Depending on the type and quantitative indicators, ventricular arrhythmias of grades I and II were classified as low, and grades III-V as high. The corrected interval index (Q-T) was determined using the Bazett formula. The interval was considered extended if its value exceeded 440 ms.

Statistical processing of data was carried out using Student's t-test.

Results and discussion

According to resting ECG data, various types of heart rhythm disturbances were detected in 18 (30%) patients: supraventricular arrhythmia in 12 (paroxysms of supraventricular tachycardia in 2, isolated supraventricular extrasystoles in 10), monotopic ventricular extrasystoles in 6.

With foot isometric load at its height, rhythm disturbances were observed in 28 (46.6%) patients: supraventricular in 16, ventricular in 12 . Among 16 patients with supraventricular arrhythmias, 3 had episodes of paroxysmal supraventricular tachycardia, 2 had atrial fibrillation, and 11 had isolated supraventricular extrasystoles. Of the 12 patients with ventricular arrhythmias, low gradations were observed in 5, high gradations in 7 (2 polytopic, 2 paired, 2 running ventricular tachycardia and 1 early ventricular extrasystoles).

Daily ECG monitoring carried out in 48 patients revealed heart rhythm disturbances in 33 (68.8%). At the same time, supraventricular arrhythmias were observed in 18 patients, and in 8 of them it was possible to identify paroxysmal forms of rhythm disturbances. 6 of these patients had episodes of supraventricular paroxysmal tachycardia, and 2 had atrial fibrillation.

In the remaining 10 patients, isolated supraventricular extrasystoles were recorded. Ventricular heart rhythm disturbances were detected in 15 patients during daily ECG monitoring. Of these, 6 had low and 9 had high gradations of ventricular arrhythmias. Among patients with high gradations, 3 had polytopic, 2 had paired, 3 had running ventricular tachycardia and 1 had early extrasystoles.

In addition, in 2 cases with a resting ECG, in 4 with a leg isometric load and in 5 with 24-hour ECG monitoring, combinations of supraventricular and ventricular arrhythmias of the heart were noted. In 1 patient, a latent Wolff-Parkinson-White syndrome was detected on a resting ECG, in 3 during leg isometric exercise, and in 5 during 24-hour ECG monitoring. It should be noted that among patients with MVP, 21 (35%) were diagnosed with early ventricular repolarization syndrome, and in 18 it was not combined with cardiac arrhythmias at rest and during exercise.

The value of the Q-Tcor interval in ms in patients with MVP using various research methods, depending on the nature of the detected cardiac arrhythmia (M+m)

Group examined	ECG at rest	Daily ECG monitoring	Leg isometric load (peak)

No rhythm disturbances ECG at rest	411.3±5.1	425.9±4.0**	422.8±3,2 **
With supraventricular arrhythmias	427.5±7.2	456.5±3.1	435.8±6.1 *
Low grade ventricular arrhythmias high"	441.5±5.5 464.2±4.4***	438.9±4.5 470.2±3.6 ***	471.3±1.4 493.2±2.8 ***

Note. Asterisks are significant differences ($p < < 0.05$): one with a group of patients without rhythm disturbances and with supraventricular arrhythmias, two with data obtained on a resting ECG, three with a group of patients with low grade ventricular arrhythmias.

It should be noted that among patients with MVP, 21 (35%) were diagnosed with early ventricular repolarization syndrome, and in 18 it was not combined with cardiac arrhythmias at rest and during exercise.

Thus, a comparative assessment of the methods used to detect cardiac arrhythmias in patients with MVP showed that, as with other diseases, 24-hour ECG monitoring is the most informative. When analyzing the values of the Q - T core interval, the following data were obtained (see table).

In the group of patients without cardiac arrhythmias, the Q-Tcor interval on the resting ECG was within 411.3–2.5 ms ; with leg isometric exercise and daily ECG monitoring, there was a significant ($p<0.05$) increase to 422.0 ms. 3.2 and 425.9±4.0 ms, respectively.

In the group of patients with supraventricular arrhythmias, the QT interval indicators of the resting ECG and during 24-hour ECG monitoring did not differ significantly. An insignificant increase in the Q-Tcore interval was observed during leg isometric exercise.

In patients with ventricular arrhythmias, the prolongation of the Q-Tcore interval was most pronounced during leg isometric exercise, significantly exceeding the value of this indicator with a resting ECG and 24-hour ECG monitoring ($p < 0.001$).

The same trend persisted when calculating the Q-Tcore interval depending on the severity of ventricular arrhythmias: its values on the resting ECG and during 24-hour ECG monitoring also did not differ in patients with low and high gradations of ventricular arrhythmias.

At the same time, with a leg isometric load, the Q -T core interval significantly increased in patients with both low and high gradations of ventricular arrhythmias, significantly exceeding the values obtained with a resting ECG and with 24-hour ECG monitoring.

The analysis showed that with increasing severity of arrhythmias, the duration of the Q-T interval increases. During exercise in the group of patients without arrhythmias and in patients with supraventricular arrhythmias, the Q - T core interval did not go beyond the maximum limit (440). At the same time, in patients with ventricular arrhythmias it significantly exceeded the maximum permissible values and was significantly different from the values in patients without cardiac arrhythmias and with supraventricular arrhythmias ($p<0.01$).

The detection of cases of significant prolongation of the Q-Tcore interval, depending on the research method, was as follows: on a resting ECG in 16 (26.6%), with leg isometric load in 25 (41.6%), and with 24-hour ECG monitoring in 14 (29, 2%) of patients.

When analyzing the information content of exercise tests in identifying cardiac arrhythmias in patients with MVP, we did not consider dynamic load in this work, since the frequency of detection of arrhythmia during bicycle ergometry, according to our data, as in the study by E. A. Mokrievich et al. [5], does not have much diagnostic value. At the same time, the leg isometric load we applied in patients with MVP turned out to be highly informative in the diagnosis of cardiac arrhythmias (46.6%), although it was inferior to 24-hour ECG monitoring, in which arrhythmias were detected in 66.8% of cases. These data coincide with the results of studies by other authors [2, 8, 12].

In the genesis of cardiac arrhythmias in patients with MVP, according to some authors [10, 11], an increase in the activity of the sympathetic nervous system and an increase in the release of catecholamines play a certain role. Cases of sudden death of patients with MVP have been described [9, 11, 15]. The risk of sudden death is highest with prolongation of the QT interval and high grades of ventricular arrhythmias of the heart [1, 4, 5, 14].

As has been established in a number of studies, prolongation of the QT interval during MVP occurs with a frequency of 20 to 28% [7, 15], which coincides with our data obtained on the resting ECG and during 24-hour ECG monitoring. However, during leg isometric exercise, prolongation of the QT interval was detected significantly more often than on the resting ECG and during 24-hour ECG monitoring (41.6, 26.6 and 29.2%, respectively).

Analysis of our material made it possible to establish a direct relationship between the prolongation of the Q - T core interval and the nature of the detected cardiac arrhythmia. Thus, if in the group of patients without cardiac arrhythmias and with supraventricular arrhythmias of the heart, the value of the Q - T core interval did not go beyond the upper limit (440 ms), then in patients with ventricular arrhythmias, especially with their high gradations, it significantly exceeded the maximum acceptable values of this indicator.

Thus, our study confirmed the existing opinion about a fairly high incidence of heart rhythm disturbances in patients with MVP syndrome, which probably largely determine the polymorphism of complaints in this pathology.

Lengthening the Q - T core core interval during leg isometric exercise to a certain extent makes it possible to assess the degree of electrical instability of the myocardium in patients with MVP syndrome.

Conclusions

In mitral valve prolapse syndrome, cardiac arrhythmias were detected on a resting ECG in 30%, with leg isometric exercise - in 46.6%, and with 24-hour ECG monitoring - in 66.8%.

A significant increase in the corrected QT interval (more than 440 ms) in patients with mitral valve prolapse during leg isometric exercise may serve as an indicator of the possible development of cardiac arrhythmias.

There is a direct relationship between the frequency and nature of detected cardiac arrhythmia and the degree of increase in the corrected Q-T interval.

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