

The Changes of Electrocardiogram in Neuroleptic Cardiomyopathy

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Summary

The data of medical records of 81 patients with schizophrenia who died (men – 58, women – 23) were retrospectively studied, almost two thirds of them were aged from 41 to 60 years. Three groups of observations were identified: group I (comparison) – 12 patients receiving antipsychotic therapy, but did not have a cardiac pathology; group II – 44 patients with NCH in the latent stage; group III – 25 patients with manifesting disease (developed and terminal clinical stages). 406 electrocardiograms were analyzed in groups 53, 282 and 71, respectively. Eight most common electrocardiographic signs are considered. Dynamics of certain characteristics was shown to be of value for early diagnostics of neuroleptic cardio toxic side effects.

Keywords: Schizophrenia, Antipsychotic Treatment, Neuroleptic Cardiomyopathy, Electrocardiographic Changes

Introduction

It is well known that all antipsychotic drugs (neuroleptic) drugs have a side cardio toxic effect [1-3, 5, 7-9]. One of the most serious vitally dangerous complications of antipsychotic therapy is a neuroleptic cardiomyopathy (NCMP) [1-7].

The disease belongs to the secondary specific toxic (metabolic) dilated cardiomyopathies and is characterized by diffuse damage of myocardium, a marked decrease in its contractile function and progression of chronic congestive heart failure [2,4,7,10-12]. In clinical development of NCMP there are three stages: I – latent, II – deployed and III – terminal [4,13].

Many aspects of the pathogenesis, morphology, clinic and diagnosis of NCMP are still almost completely unexplored. Among others, it is of practical interest to trace the dynamics of changes in the electrocardiogram (ECG) during the development of NCMP. This issue is still without due attention. However, to date, the method ECG is quite informative marker of the morph functional state of a heart, its measurement is usually not difficult, it is a routine method of examination of patients. Thus, for clinical practice, the study of ECG changes is extremely important, since they are one of the early signs of any developing heart disease [14-16].

Based on the above, the aim of this work was to study the electrocardiographic manifestations of NCMP at the stages of its morphogenesis.

Material and Methods

The data of medical records of 81 patients with schizophrenia who died (men – 49, women – 20) were retrospectively studied, almost two thirds of them were aged from 41 to 60 years.

Three groups of observations were identified: group I (comparison) – 12 patients receiving antipsychotic therapy, but did not have a cardiac pathology; group II – 44 patients with NCH in the latent stage; group III – 25 patients with manifesting disease (developed and terminal clinical stages). The presence of NCMP was verified at autopsy.

406 ECG were analyzed in groups 53, 282 and 71, respectively. In each group, eight pathological electrophysiological parameters (ECG signs) were ranked by their frequency (MX). One of them is the corrected Qt interval (QTc) calculated by the formula H. C. Bazett [14, 15, 17].

The received results were statistically processed (by the nonparametric Mann-Whitney's U-criterion) with significance level of distinctions 95% and more ($p \leq 0.05$).

Results and discussion

Cardiac remodeling and deep structural damage to the myocardium occurring at the stages of morphogenesis of NCMP corresponding to the clinical stages of the disease cause a variety of pathological changes in the parameters of ECG, reflecting the appearance of certain morpho-functional cardiac disorders [4,18-20].

The generalized results of the study of ECG signs changes in patients with schizophrenia in combination with NCMP are given in the table 1. The analysis of these data allows us to identify certain patterns.

Table 1: The frequency of ECG signs (MX) [%] in the course of morphogenesis NCMP

ECG signs Groups	Rhythm disturbances	Extension of the QTc interval	Conduction disturbances	Diffuse muscle changes	Overload of the right parts	Left ventricular hypertrophy	Reduction of myocardial electrical activity	EAH deviation to the left
I	72,3	5,7 ** ***	5,2 ** ***	2,6 ** ***	3,1 ** ***	2,2 **	1,3 ** ***	5,0 ** ***
II	64,5	8,5 * ***	21,6 * ***	26,2 *	11,7 * ***	8,9 *	8,2 *	14,2 *
III	67,6	35,2 ** **	50,7 ** **	32,4 *	31,0 ** **	7,0	8,5 *	19,7 *

Note: * - statistically significant difference with the group I;

** - statistically significant difference with the group II;

*** - statistically significant difference with the group III

So, in the comparison group of observations on the ECG recorded primarily cardiac arrhythmias – 72.3%, mainly (69.8%) only in the form of sinus tachycardia. Only 2.5% of its background revealed a variety of types of extra systole. Quite rarely there was an extension of the Qtc interval (5.7%), conduction disturbances (5.2%), mainly in the form of an incomplete blockade of the right leg of the ventriculonector, the deviation of the electric axis of the heart (EAH) to the left (5.0%). Even less common are signs of overload of the right parts of heart (3.1%), diffuse muscle changes (2.6%), left ventricular hypertrophy (2.2%) and a decrease in electrical activity of the myocardium (1.3%).

The described changes seem to reflect the response of the myocardium to the cardiotoxic effect of antipsychotic drugs. Profound morphological reorganization of the myocardium at this stage, neuroleptic therapy is not yet happening, and the identified violations perhaps are reversible.

With the formed morphological picture of the NCMP, but the latent course of the disease (group II), ECG changes look quite clearly. Sinus tachycardia remains the leading ECG finding (64.5%), including in combination with extra systole (5.8%). The second most frequent phenomenon is diffuse muscle changes (26.2%), which is an electrophysiological reflection of the growing dystrophic and degenerative myocardial damage, developing under the influence of neuroleptics.

The third place (21.6%) is occupied by various types of conduction disturbance, mainly a complete blockade of the left (11.6%) and an incomplete blockade of the right legs of the ventriculonector (6.7%), the frequency of which is statistically significantly increased compared to the group I. And at this stage for the first time appears such a phenomenon as a variety of options for the blockade of the left leg of the bundle of the ventriculonector, which indicates the organic lesion of the left ventricular myocardium. In particular, the noticeable involvement in this process of the anterior-upper branch of the left leg of the bundle of the ventriculonector, which occurred in 4.6% of cases, also indicates a serious diffuse lesion of the left ventricular myocardium. The frequency of incomplete blockade of the right leg remains almost at the same level.

Significantly more often than the control in the second group of patients revealed EAH deviation to the left (14.2%), which indirectly reflects the progression of interstitial fibrosis and deterioration of

the functional state of the myocardium.

At the same time, there is a significant increase in such indicators as overload of the right parts (11.7%), left ventricular hypertrophy (8.9%), and a decrease in electrical activity of the myocardium (8.2%). Along with this, some increase in the frequency of extension of the Qtc interval (8.5%) is statistically insignificant.

In case of progressive congestive heart failure due to NCMP (group III of observations), the most pronounced ECG changes are recorded, reflecting deep myocardial damage.

As in the two previous groups, the predominant symptom on ECG remains abnormal heart rhythm (67.6%), mainly in the form tachycardia (57, 4%) and extra systole (10.2%). Sharply and statistically significantly conduction disturbances are becoming more frequent (50.7%), among which are dominated by different types of blockade of the left leg of the bundle of the ventriculonector (31.7%), what is a poor prognostic sign in patients with chronic heart failure.

The frequency of signs of overload of the right parts of heart also continues to increase significantly (31.0%), and there is a trend, although statistically unconfirmed, to an increase in the frequency of diffuse muscle changes (32.4%) and deviation of EAH to the left (19.7%).

As a whole, ECG changes revealed in the group III of observations reflect the processes of severe damage of cardiac muscle, which is accompanied by increasing myocardial dysfunction and progressive heart failure.

It should be particularly focus on the change of interval QTc identified during development NCMP. It is known that this indicator has a certain prognostic value and is subject to shifts under the influence of neuroleptic drugs [2].

As it turned out, the Qtc interval in the three studied groups of observations was 0.39, 0.41 and 0.44, respectively. At the same time, the value of this indicator in the group III was significantly higher than in the previous ones, while the difference between the groups I and II is insignificant.

These data indicate that the value of the Qtc interval is not so much related to the presence of NCMP as such, as the development of chronic heart failure caused by this disease.

Conclusion

The pathological changes in ECG, found in patients with schizophrenia, for a long time receiving antipsychotic therapy, reflect the processes of deep tissue changes, unfolding in the heart muscle during the formation of clinical and morphological picture of the NCMP.

The described dynamics of ECG signs changes can significantly help in the detection of early preclinical signs of diffuse myocardial damage, which is extremely important for the timely diagnosis, secondary prevention and treatment of NCMP in patients with schizophrenia.

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