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DISTURBANCE OF ELECTRICAL SYSTOLE IN CHILDREN WITH ACUTE RHEUMATIC FEVER

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ABSTRACT
Disturbance of the electrical systole in sick children with rheumatic fever play an important role in the formation of rhythm disturbances, often leading to fatal outcomes. The study of this aspect of the disease is most appropriate for the prevention of further complications and the choice of treatment tactics.
KEYWORDS: ***electrical systole, acute rheumatic fever, children, long SUIQT syndrome.***

RELEVANCE

Relatively recently, a group of diseases and/or clinical and electrocardiographic syndromes associated with a high risk of developing life-threatening arrhythmias and sudden death (SD) in young people has been identified in cardiology. These include long QT syndrome (QT SQI), short QT interval syndrome (QT SQI), Brugada syndrome, catecholaminergic polymorphic ventricular tachycardias, and arrhythmogenic right ventricular dysplasia. All these diseases are today united in the concept of "channelopathy", since their pathogenesis is based on molecular genetic anomalies in the regulation of cardiomyocyte ion channels [1,4,6,12, 17,19].

Over the past two decades, significant progress in understanding the electrophysiological basis of sudden arrhythmic death has been largely due to intensive research on QT SIS, in which there is a high risk of SCD due to the development of life-threatening ventricular arrhythmias. This syndrome refers to primary electrical heart diseases [2,9,16] and is characterized by prolongation of the QT interval on resting ECG, attacks of loss of consciousness due to polymorphic VT, torsades de pointes, or ventricular fibrillation [7,10,14,20].

Acute rheumatic fever is a disease characterized by a systemic inflammatory lesion of the connective tissue of an autoimmune nature involving the heart and blood vessels, initiated by group A b-hemolytic streptococcus, developing in children with a genetic predisposition to it [3,5,8,15,18].

The primary detection rate of acute rheumatic fever (ARF) currently ranges from 0.06 new cases per 1000 population per year in industrialized countries (Japan, Great Britain) to 19.2 in developing countries (South Africa). In children, the incidence rate is 0.08–10.06% of children. Children 7-15 years old are sick, in 30% of cases the disease has a family character, rheumatic fever practically does not occur in children of preschool age.

The electrocardiogram in rheumatic heart disease is characterized by a slowdown in atrioventricular conduction, usually of the 1st degree. In addition, cardiac arrhythmias, prolongation of the electrical systole, and violations of ventricular repolarization can be detected [11,13].

M.G. Kontemirova et al. in order to determine the current structure and features of the clinical manifestations of acute rheumatic fever in children, an analysis of 62 case histories of 44 children aged 4.5 to 17 years with ARF (acute rheumatic fever) (82%) and BPD (subacute rheumatic fever) was analyzed (18 %). There is a tendency to a more severe course of rheumatic heart disease with the development of circulatory failure, pancarditis and / or valvulitis of both the mitral and aortic valves. All children with myocarditis had first-degree atrioventricular block with rapid normalization of the PR interval on the ECG against the background of anti-inflammatory therapy. The severity of heart damage in 25% of children with ARF was due to the development of pancarditis and/or combined valvulitis of the mitral and aortic valves, which, combined with circulatory failure in 65% of children, confirms the data on the trend towards worsening of the course of rheumatic heart disease that emerged at the beginning of the 21st century [13,15 ,sixteen]. Prolongation of the PR interval on the ECG with rapid positive dynamics during therapy was detected in 23 (52%) children. It should be noted that ECG often showed signs of sinus node dysfunction (16%), prolongation of the QT interval (16%), increased electrical activity of the left ventricle (38%) [3,5].

The duration of the electrical systole of the ventricles is of great clinical importance, since pathological lengthening and shortening of the electrical systole of the ventricles can be one of the markers of the appearance of life-threatening arrhythmias.

Studies on the possibility of identifying the frequency of QT SUI in sick children with myocarditis and congenital heart defects have not been conducted in our Republic, and we consider the study of this problem relevant.

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PURPOSE OF THE STUDY

Identification of the frequency of occurrence of long QT syndrome among patients with acute rheumatic fever and the development of the most reliable and informative clinical and electrocardiographic diagnostic criteria.

MATERIALS AND METHODS OF RESEARCH

The control group consisted of 80 healthy children of different age categories, comparable in age and sex. The study was carried out mainly in the functional diagnostics room for children in the family polyclinic No. 3 in Samarkand. Various age groups of children have been studied. There were 20 sick children under 2 years old, 20 from 2 to 7 years old, 20 from 7 to 12 years old, and 20 children over 12 years old.

On the basis of the Regional Multidisciplinary Children's Medical Center in the department of cardio-rheumatology, we examined 385 sick children, 209 (54.2%) boys and 176 (45.8%) girls, based on stationary and archival materials. There were 167 patients under 2 years of age, 82 patients from 2 to 7 years of age, 78 patients from 7 to 12 years of age, and 58 patients over 12 years of age.

In our study, according to stationary data and archival materials, 205 sick children with non-rheumatic myocarditis were identified, of which 113 were boys and 92 were girls. 103 sick children with rheumatic fever, 51 boys and 52 girls.

Electrocardiography plays an important role in the diagnosis of QT SUI. The QT interval is recommended to be assessed in sinus rhythm with a stable heart rate (HR), the absence of severe sinus arrhythmia in the II standard or chest leads. Normally, the QT interval ranges from 350 to 440 ms.

The research methodology was carried out on the basis of the electrocardiographic research method, where we, using the Eithoven ruler, manually measured the RR interval and the QT interval in various leads for at least 5 cardiac cycles using the classical method of E. Lepeshkin and V. Surawich.

RESEARCH RESULTS

Rheumatic fever in all 385 sick children examined by us was registered in 103 (26.8%) treated in SODMMTS. At the age of 0 to 2 years ARF was registered in 2 children (1.9%), at the age of 2 to 7 years in 24 (23.3%) children, from 7 to 12 years in 42 (40.8%) children , and in children older than 12 years in 35 (34.0%) children. In 74 (71.8%) children, the course of LC was acute, in 29 (28.2%) children it was subacute.

I degree of process activity in children aged 0-2 years was in 1 (1.0%) patient, 2-7 years in 18 patients (14.5%), 7-12 years in 23 (22%) patients and older 12 years in 17 (16.5%) patients. II degree of process activity in children aged 0-2 years was observed in 1 (1.0%) patient, 2-7 years in 4 patients (3.9%), 7-12 years in 17 (16.5%) patients and older than 12 years in 17 (16.5%) patients. III degree of process activity in children aged 0-2 years was observed at 2-7 years in 2 patients (1.9%), 7-12 years in 2 (1.9%) patients and older than 12 years in 1 (1, 0%) of the patient.

The disease began after suffering a sore throat (39.4%) or acute respiratory disease (23.6%), the presence of dental caries (43.8%). Patients were dominated by complaints of fever (58.7%), pain in the joints, mainly knee and ankle (79.5%). The main complaints in most children are manifestations of asthenic syndrome - lethargy, malaise, increased fatigue, irritability, emotional lability, and only 4-6% of children had subjective symptoms at the onset - pain in the heart, palpitations. When analyzing the anamnestic data, it was revealed that in children with ARF, ante and perinatal pathology and aggravated anamnesis were significantly more common than in healthy children. Often there was a combined pathology during pregnancy and childbirth (45.3% versus 16.9% in healthy people).

According to our studies, the condition of all patients in the acute period was mostly of moderate severity, in 28.9% of cases there were clinical signs of circulatory failure, pallor, shortness of breath, severe tachycardia, enlarged borders of the heart, liver, etc.

When studying the functional state of the cardiovascular system in ARF, we took into account clinical and electrocardiographic data. In all cases, varying degrees of damage were identified of cardio-vascular system. So, in 3 (2.9%) sick children at the height of the disease, the skin was sharply pale, in 11 (10.7%) the color was pale pink.

During percussion and X-ray examination in the acute period of the disease, the size of the heart in half of the children in this group was within the age norm. In 24 (23.3%) patients, some expansion of the boundaries of the heart (mainly due to the left sections) by 1.0-1.5 cm was noted, and this affected the severity of the disease. On auscultation, heart sounds were muffled in 9 (8.7%) patients, muffled in 36 (34.9%) patients.

The clinical picture of ARF in children was dominated by symptoms such as fatigue, arthralgia, subfebrile body temperature, carditis, emotional lability, and irritability. On auscultation, muffled heart sounds, the appearance of noise, percussion - expansion of the boundaries of the heart. The QT interval in the examined children (103) was 330 ± 3.0 ms, when calculated by the Bazett formula 300 ± 3.0 ms, when the modified formula Bazett 407 ± 4.0 ms, when calculated by the Fridericia formula 378 ± 3.0 ms, when calculated Sagie formula 381±2.6 ms.

We can see that in sick children with ARF, the measured QT interval differs from Bazett by 30 ms; the corrected QT interval differs from the measured interval by 77 ms, from Bazett by 107 ms, from Fridericia by 29 ms, from Sagie by 26 ms; Fridericia differs from the measured interval by 48 ms, from Bazett by 78 ms; Sagie differs from the measured interval by 51 ms, from Bazett by 81 ms, from Fridericia by 3 ms.

It should be noted that the limits of fluctuations in the QT interval varied widely. When calculating the corrected QT interval, the values exceeded 440 ms by 148, when calculated by the Sagie formula by 4 ms. This indicates higher readings when calculated with the modified Bazett corrected QT interval, which indicates that the Bazett corrected QT interval measurement has a wide margin of variation, indicating pathological shortening or lengthening of the interval, but there was no clinical symptomatology.

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The ratio of the duration of the electrical systole, calculated from the beginning of Q to the end of the T wave of the electrocardiogram, in sick children with ARF with the measured QT interval and according to the Bazett formula, data differ at the age from 0 to 2 years, from 2 to 7 years in sick and healthy children, having statistically reliable data ($P<0.05$). The corrected QT interval has differences in age and gender, with statistically significant differences, i.e. $P<0.05$. The formulas of Fridericia and Sagie differ at the age of 0 to 2 years, from 2 to 7 years and from 7 to 12 years, and over the age of 12 years, the data of healthy and sick children are almost identical.

Examination of 103 patients with ARF revealed prolongation of the QT interval according to the Bazett formula in 16 (15.5%) sick children, when calculated according to the modified Bazett formula for the corrected QT interval, prolongation in 18 (17.5%) sick children, according to the Fridericia formula in 10 (9.7%) sick children and according to the Sagie formula in 9 (8.7%) sick children. The revealed prolongation of the QT interval according to the Bazett formula is 15.7%, but not all identified patients have clinical and instrumental signs.

In a detailed clinical and instrumental examination of children, prolongation of the QT interval was found in 6 (5.8%) patients, and the diagnosis of QT SUI was detected in 3 (2.9%) children. The diagnosis was established according to P. Schwartz clinical and electrocardiographic criteria, according to which all three children received more than 4 points, i.e. the diagnosis of QT SUI is highly likely. We also worked with the QT SUI diagnostic table, according to which these children received a score of more than +18, which indicates the presence of this syndrome. All three children were diagnosed with SUI QT - Romano-Ward form. In the remaining 3 (2.9%) children, the lengthening is secondary, due to hypomagnesemia and hypokalemia (magnesium less than 0.08 mmol/l and potassium less than 2.5 mmol/l).

CONCLUSIONS

Therefore, in rheumatic fever, we found prolongation of the QT interval according to the Bazett formula in 16 (15.5%) sick children; 10 (9.7%) sick children and according to the Sagie formula in 9 (8.7%) sick children. When calculating the QTc interval, values exceeded 440 ms by 148, by the Sagie formula by 4 ms. This indicates higher readings calculated by the modified Bazett formula for the corrected QT interval than those calculated by the Fridericia and Sagie formulas. What can I say about the fact that the Fridericia formula gives the most reliable results than others.

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