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Investigation of the Effectiveness of Cortexin in the Treatment of Cardiac Arrhythmias in Children

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In this article, a new look at cardiac rhythm and conduction disorders in children is outlined. These deviations, along with congenital malformations, have taken one of the first places in the structure of cardiovascular pathologies. This is one of the most serious problems that stands at the intersection of cardiology and pediatrics. The frequency of occurrence of severe forms of arrhythmias reaches 1:5000 of the child population, and life-threatening arrhythmias – 1:7000. Treatment of cardiac arrhythmias and conduction disorders is one of the most difficult sections of clinical pediatrics. There are medicinal and non-medicinal methods. According to experimental new data, nootropics, in particular the drug Cortexin, along with cardiotrophic drugs, form the basis of neuro-metabolic therapy and correction of children's arrhythmias.

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Keywords: Cortexin; congenital heart defects; cardiac arrhythmias; children.

1. INTRODUCTION

Currently, cardiac rhythm and conduction disorders, along with congenital heart defects, have taken one of the first places in the structure of cardiovascular pathology in children [1-3]. The frequency of occurrence of severe forms of arrhythmias reaches 1:5000 of the child population, and life-threatening arrhythmias – 1:7000. In childhood, it is advisable to identify the following most common rhythm disorders: supraventricular tachyarrhythmias. ventricular tachyarrhythmias, sinus node weakness syndrome, supraventricular extrasystole, ventricular extrasystole [4]. Life-threatening arrhythmias in children include: long QT syndrome, paroxysmal tachycardia, high-grade ventricular extrasystole and high-grade blockades. According to Holter monitoring data, from 50 to 90% of conditionally healthy children have some kind of heart rhythm disorders [5]. In healthy children, the most common are: migration of the cardiac pacemaker (13.5%), bradycardia (3.5%), accelerated atrial rhythm (2.7%), extrasystole (1.9%), WPW phenomenon (0.5%), grade I AVB (0.5%) and prolongation of the QT interval (0,3%) [4,6]. At the same time, they occupy a leading place in the structure of pediatric cardiological morbidity and causes of mortality from cardiac arrhythmias (60-70%) [2,5]. These pathologies are most often based on organic heart lesions of congenital and acquired genesis [7]. Their cause may be myocardiodystrophy and myocardiofibrosis, developing with prolonged infectious and toxic myocardial damage. These pathologies occur in diseases of the endocrine system, the genesis of which is associated with both hormonal imbalance and secondary myocardial dystrophy [3,7].

According to experimental data, the complex of low-molecular water-soluble polypeptide fractions of the drug Cortexin has nootropic, neurotrophic, neuroprotective and antioxidant effects on brain tissue in traumatic, ischemic or toxic lesions of the central nervous system [8,9]. In preclinical studies on models of traumatic brain injuries, toxic neuropathy and total cerebral ischemia against the background of the use of this drug, a decrease in neurocyte death, a decrease in oxidative stress indicators, as well as rapid recovery of reflexes, coordination and cognitive functions have been shown [10,11].

The mechanism of action of the drug Cortexin at the molecular level has not been studied in detail, however, in vitro studies have shown a decrease in the death of neurocytes, both with oxidative stress and with glutamate poisoning against the background of the use of this drug [12]. In the model of traumatic brain injury, the use of the drug prevented microcirculation disorders and reduces swelling of the brain and subcortical structures. A positive effect on the tone of the main and peripheral cerebral arteries in the post-occlusive period was shown on the model of cerebral circulatory disorders [10-14].

Against the background of treatment with Cortexin, a decrease in the pathological level of lactic acid and an increase in the concentration of glucose and ATP in brain tissues were shown, which indicates the activation of intracellular metabolism of neurons and activation of reparative processes by this drug [15].Also, against the background of the use of the drug Cortexin, there is an increase in the intensity of tissue respiration and activation of the aerobic pathway of energy formation, which also confirms the activating metabolic effect of the drug. Thus, the peptide complex of the drug Cortexin activates intracellular processes of regulation and antioxidant protection [14-16].

2. MATERIALS AND METHODS

The study included 30 children: 20 boys and 10 girls aged 3 to 18 years (average age 10.5 years) who sought medical help at the city medical center. In all children, the features of the anamnesis, the results of the examination, and the data of instrumental examinations were analyzed. Research methods were used in the work: statistical, descriptive, comparative, analytical [17,18].

3. RESULTS AND DISCUSSION

The work was carried out in the city medical center (Stavropol, Russia) in 2019. The scientific study involved 30 children: 20 boys and 10 girls. The classification adopted by the World Health Organization in 2018 was used as the basis for the distribution of children by age. According to the study: preschool children (from 3 to 7 years old) - 4 people, primary school children (7-10 years old) - 8 people, middle school children (from 11-14 years old) - 12 people, high school children (15-18 years old) – 6 people took part (Fig. 1).

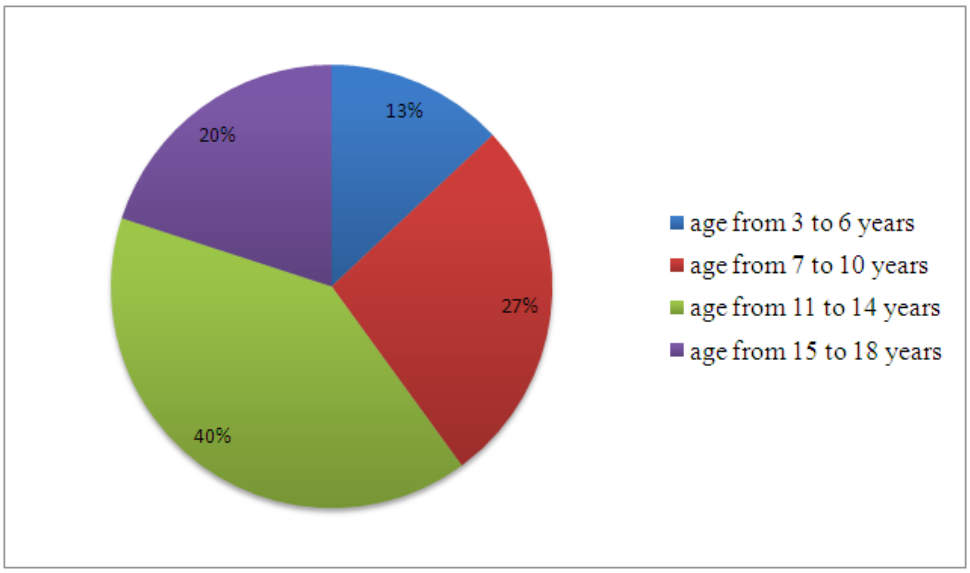

Fig. 1. Distribution of children by age

According to the analysis, out of 30 children with rhythm and conduction disorders, 18 people were diagnosed, and in the rest this pathology was observed in myocarditis - 6 people and vegetative-vascular dystonia - 6 people (Fig. 2).

At the same time, complaints before treatment were observed for heart pain in 2 people, for restless night sleep in 20 people, for hyperactivity - 10 people, for a feeling of lack of air – 2 people. After the prescribed treatment, there was an improvement in the behavior of children, improved sleep quality, absence of heart pain and shortness of breath (Fig. 3).

According to the changes on the electrocardiogram and echocardiography, such changes were revealed as: an increase in heart rate by an average of 44.5% during the day and by 62.5% at night, while in the control group the changes were not significant, by an average of 7.5% (Table 1).

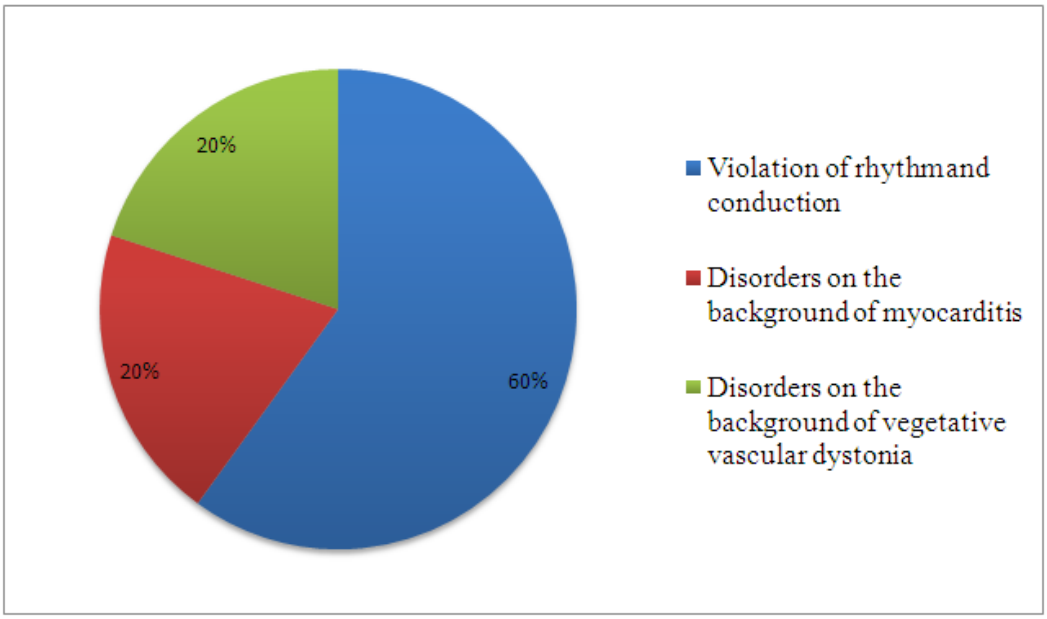

Fig. 2. Rhythm disturbance on the background of myocarditis and in combination with vegetative-vascular dystonia

Table 1. Change in heart rate before and after treatment

	Change in heart rate						
Time	Boys		Girls		Ratio in % of bradycardia		The ratio in %
	Before treatment	**After treatment**	**Before treatment**	**After treatment**	**Boys**	**Girls**	**Control group**
Day	Average of 62 beats per minute (min 58, max 125)	Average 86 beats per minute (min 52,max 125)	Average 54 beats per minute (min 48,max 115)	Average 82 beats per minute (min 45,max 114)	At 40%	At 51%	At 10%
Night	Average 55 beats per minute (min 40,max 98)	Average 78 beats per minute (min 58,max 132)	Average 39 beats per minute (min 42,max 99)	Average 72 beats per minute (min 41,max 129)	At 41%	At 84%	At 15%

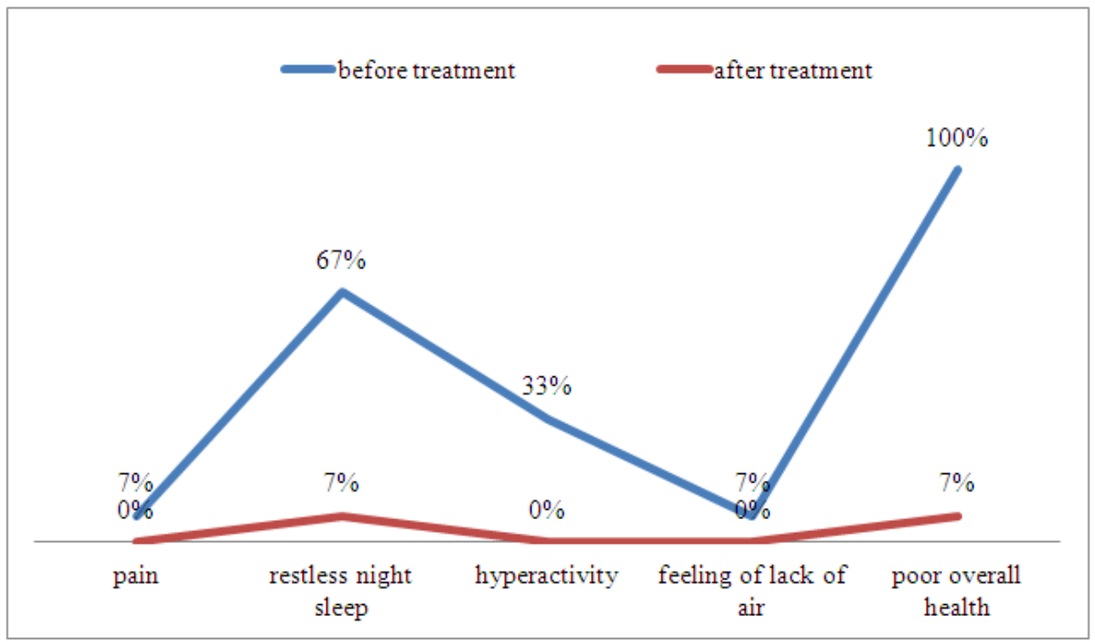

Fig. 3. Complaints of patients before and after treatment

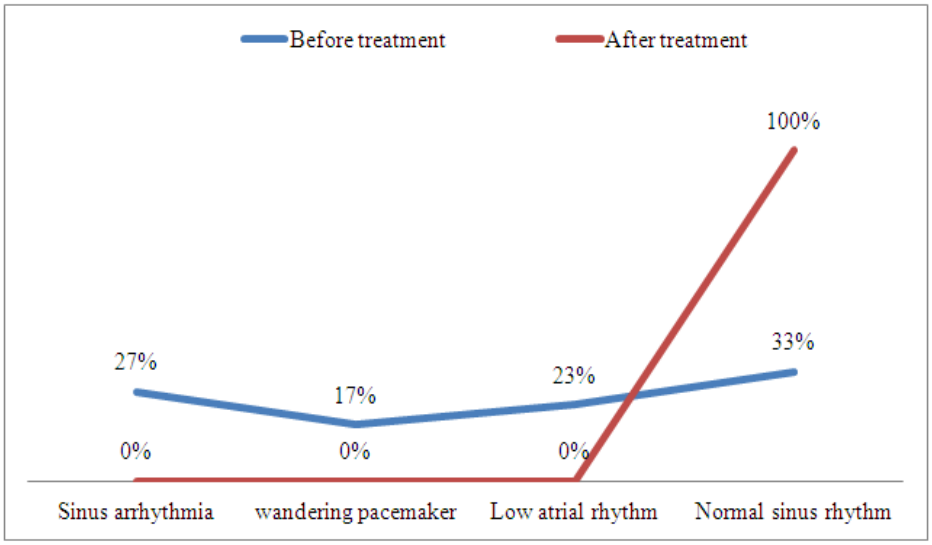

Fig. 4. Change of the cardiac pacemaker on the background of treatment

According to the study, before treatment, 8 children had sinus arrhythmia, 5 children had wandering pacemaker, 7 children had a lower atrial rhythm, the remaining 10 had a normal sinus rhythm. After the course of treatment, all children had a normal sinus rhythm. At the same time, no such results were observed in the control group (Fig. 4).

Before treatment with Cortexin, 16 children (53%) had postectopic and post-extrasystolic pauses, lasting an average of about 1.32 seconds, in the remaining 14 children (47%), no such changes were detected. After the course of treatment, the absence of pauses is noticeable in 28 children (93%) and a noticeable decrease in the number of 2 children (7%). At the same time, post-ectopic pauses decreased by an average of 48%, and post-extrasystolic pauses decreased by 45%. In the control group, the changes were insignificant: post-ectopic - by 10%, post-extrasystolic - by 6.5%.

4. CONCLUSION

A study was conducted to study the efficacy and safety of the drug Cortexin in the treatment of arrhythmias, its effect on hyperactivity and the quality of night sleep. 30 children aged from 3 to 17 years were under observation. For treatment, patients of the main group (30 people) were prescribed Cortexin - 10 mg intramuscularly No. 10 on novocaine, together with the traditional approach. The control group included the same children with early treatment (without Cortexin). The results of the studies proved that the administration of the drug Cortexin allows to achieve changes in the ECG and improve the behavior and sleep of the patient more early. Thus, nootropics, along with cardiotrophic drugs, form the basis of neuro-metabolic therapy. The drug Cortexin is therapeutically effective, and after treatment with its use, neither local nor general complications were noted in children.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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