



## NEONATAL AND FETAL HEART RHYTHM DISORDERS

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<p><b>Received:</b> December 20<sup>th</sup> 2023  <b>Accepted:</b> January 14<sup>th</sup> 2024  <b>Published:</b> February 21<sup>st</sup> 2024</p>	<p>The article presents generalized data on the problem of heart rhythm disturbances in the fetus and newborns. The etiology, structure, classification, diagnostic methods and electrocardiographic criteria of some arrhythmias, therapeutic tactics in identifying fetal and neonatal arrhythmias are described.</p>

**Keywords:** arrhythmia, method, fetus, infants, heart.

### INTRODUCTION

One of the serious problems of modern pediatrics is perinatal pathology, on which the development of the child and the quality of his future life depend. In the postnatal period, the number of newborns whose adaptation to extrauterine life is impaired due to the presence of diseases, manifested primarily by syndromes of respiratory and cardiac dysfunction, has increased. And if respiratory disorders have been studied in sufficient detail and covered in numerous manuals, then issues of neonatal cardiology are still the privilege of pediatric cardiologists. At the same time, the success of treatment often depends on timely measures initiated by obstetricians and neonatologists, without waiting for consultation with a cardiologist [1].

### MATERIALS AND METHODS

The causes of heart rhythm disturbances in infants are very diverse and are caused by many factors. Some predisposing ones are: imbalance between sympathetic and parasympathetic innervation, prolongation of the QT interval, functionally immature conduction system [2]. Heart rhythm and conduction disturbances in fetuses and infants are in most cases associated with congenital anomalies in the development of conduction pathways, but in some cases it is possible to identify other etiological causes, which can be divided into intra- and extracardiac.

### RESULTS AND DISCUSSION

A. Sweha. T. Hacker proposed a classification of fetal arrhythmias [4] (Table 1).

Table 1 – Classification of fetal arrhythmias

By heart rate	With the flow	According to forecast
tachycardic	benign	promising
bradycardic	malignant	unpromising

Benign FA are arrhythmias that are not associated with a structural abnormality of the heart, are not caused by immunological reasons, and do not lead to the development of heart failure. Unpromising arrhythmias include tachyarrhythmias with

manifestations of heart failure, late and early bradycardia.

In infants, the classification of heart rhythm and conduction disorders according to M.S. is currently used. Kushakovsky, based on the essence of the electrophysiological process. According to this classification, there are:

*I. Arrhythmias caused by impaired impulse formation:*

1. Impaired automatism of the sinus node (sinus tachycardia, sinus bradycardia, sinus arrhythmia, sinus arrhythmia).

2. Ectopic rhythms, caused by the predominance of automatism of ectopic centers (slow replacement rhythms: atrial, from the AV junction and ventricular or accelerated ectopic rhythms, non-paroxysmal tachycardias).

3. Ectopic rhythms, predominantly associated with the re-entry mechanism (extrasystole, paroxysmal tachycardia, atrial flutter or fibrillation and ventricular flutter or fibrillation).

*II. Arrhythmias caused by conduction disturbances:*

Sinoatrial block. Atrioventricular block. Intraatrial block. Intraventricular block. Ventricular asystole. Ventricular preexcitation syndromes (CLC syndrome, Maheim type ventricular preexcitation syndrome, and WPW syndrome).

*III. Combined arrhythmias:*

*Parasystole. Ectopic rhythms with exit block. AV dissociation.*

Diagnosis of heart rhythm and conduction disorders in the fetus is carried out by auscultation of the heart, fetal echocardiography, cardiotocography, Doppler echocardiography. In newborns, arrhythmias are diagnosed by auscultation of the heart, on a resting electrocardiogram performed according to the standard method, as well as during Holter monitoring.

Sinus bradycardia Sinus bradycardia (SB) most often has a secondary origin and is observed in infants who have suffered perinatal hypoxia with



hypothyroidism. 32% of healthy infants have episodes of SB, of which 81% occur in premature infants [4].

ECG criteria for SB in infants: correct sinus rhythm; decrease in heart rate (HR) less than 100 beats per minute (on a resting ECG), less than 70 beats per minute (according to the results of Holter monitoring). If the decrease in heart rate in premature infants is less than 90-100 beats per minute, in full-term infants it is less than 80-90 beats per minute, and SB lasts for a long time, then these are manifestations of pathological bradycardia, which can cause sudden apnea, convulsions, and secondary asphyxia.

Sinus tachycardia. Sinus tachycardia (ST) occurs in 40% of newborns.

ECG criteria for TS: correct sinus rhythm, but arrhythmia is possible; an increase in heart rate by more than 15% of the age-sex norm (the 95th percentile in newborns corresponds to a heart rate of 176 beats per minute); shortening of PQ, QT intervals.

If TS persists for several hours and the heart rate in full-term newborns exceeds 190 beats per minute, in premature newborns – 195 beats per minute, then tachycardia becomes pathological. During this period, the "P on T" phenomenon is recorded on the ECG against the background of ST and normal ventricular complexes.

Sinus arrhythmia. Sinus arrhythmia (SA) is caused by reflex changes in the tone of parts of the autonomic nervous system in connection with the phases of breathing that affect the functioning of the sinus node.

ECG criteria for sinus arrhythmia: irregular intervals; the presence of sinus P before each QRS complex; the difference between the duration of the longest and shortest P-P or R-R interval exceeds 10% of the average value; connection with the phases of breathing – an increase in heart rate during inhalation and a slowdown during exhalation.

Extrasystole. Extrasystole (ES) is a premature contraction in relation to the main rhythm caused by an ectopic impulse occurring outside the sinus node. It occurs with a frequency of 8-25%. ES can be supraventricular, from the AV junction, or ventricular.

ES is the most common type of arrhythmias in newborns, especially those with low body weight. About 1/4 of all ES are ventricular. In the first day of life in healthy infants, supraventricular ES can be recorded. Neonatal ES are often transient in nature and reflect the functional state of the period of postpartum adaptation. By the fifth day of life, ES may spontaneously disappear.

ECG criteria for supraventricular (supraventricular) ES: presence of a premature narrow

QRS complex; the presence of a P wave, which differs in morphology from the sinus wave; the presence of a post-extrasystolic compensatory pause.

ECG criteria for extrasystole from the AV junction: the presence of a premature narrow QRS complex; ES with simultaneous excitation of the atria and ventricles is characterized by the absence of the P wave and the compensatory pause is incomplete; during ES with previous excitation of the ventricles, a narrow QRS complex is recorded, after which, after an interval of 60-100 ms, a negative P wave appears in leads II, III, avF, the compensatory pause is complete; in the ES from the common trunk of the His bundle, after a narrow QRS complex, a positive P wave is recorded, the compensatory pause is complete.

### **CONCLUSION**

Children with ectopic arrhythmias, AV blockades, impulse conduction blocks (bundle branch block), pre-excitation syndrome (short PR interval syndrome, WPW syndrome, Mahheim-type pre-excitation syndrome) are subject to dynamic observation in outpatient clinical settings, AV dissociation, sick sinus syndrome, long QT syndrome. These children are monitored by a cardiologist together with a local pediatrician. The purpose of observation: to prevent the development of a repeated episode of arrhythmia, to monitor the effectiveness of antiarrhythmic therapy, to identify the possible proarrhythmic effect of an antiarrhythmic drug.

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