PREDICTION OF THE DEVELOPMENT OF NEONATAL ARRHYTHMIAS

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During labor and in the first days after birth the child's body undergoes activation of a number of compensatory and adaptive mechanisms, aimed at adaptation to postnatal life. Restructuration of the circulatory system plays one of the dominant roles in this process. Metabolic disorders, hypoxia, hypoglycemia, deterioration of rheological properties of blood and, as a consequence, endogenous stress development, are crucial in the pathogenesis of myocyte damage in the cardiac system and the development of various types of arrhythmias. That is why the diagnosis and determination of risk factors for the development of neonatal arrhythmias remains an important direction in the development of neonatology and neonatal cardiology.

Troponin I, copeptin, and ischemia-modified albumin (IMA) are bio-markers of myocardial infarction and are widely used in clinical practice in adult patients. However, troponins begin to be released from cardiomyocytes 4 hours after the onset of myocardial damage and reach peak values only after 12 hours, which is a natural limitation of their diagnostic value right after the birth of the baby. Copeptin is a marker of endogenous stress in various pathological conditions and is secreted after 5-20 minutes. Measurement of IMA concentration also provides a possibility to detect changes in the myocardium early in the absence of changes in the ECG, since its level increases after 6-10 minutes since the development of ischemia. Data on the use of copeptin and IMA to diagnose cardiac arrhythmias in newborn babies were not found in available literature.

Objective: To improve the early diagnosis of neonatal arrhythmias by determining the levels of biochemical markers and comparing them with the Holter monitoring of ECG (HM-ECG) and Doppler echocardiography (DPECHOCG).

Materials and methods. The study involved examination of 94 newborns, assessment of medical histories, results of biochemical study of umbilical cord blood, data of HMECG, DPECHOCG, statistical analysis. The quantitative determination of the content of biochemical analytes was carried out by immuno-enzymatic methods (Troponin I Biomerica (USA), IMA Elisa (USA), Copeptin Phoenix Pharmaceutical (USA)). HMECG was performed and assessed using the hardware and software complex of the electrocardiographic ECGpro (Holter monitor EP810), IMESC. DPECHOCG was conducted using the Esaote (Italy) ultrasound device My Lab 25 Gold. Statistical analysis was conducted using STATISTICA 10 (developed by StatSoft.Inc).

Results: According to the results of HMECG infants were divided into 2 groups: Group 1 (n = 58) included newborns with neonatal arrhythmias, Group 2 (n=36) included children without arrhythmias. The diagnosed infants were most commonly found to have heart rhythm disturbances, sinus tachyarrhythmias and supraventricular extrasystoles (p <0.05).

Assessment of biochemical markers data showed that their levels were higher in newborns with disturbances of rhythm and conductivity, the highest reliability was established for the IMA levels (Table 1)

Table 1. Levels of biochemical markers in the groups under investigation

	Troponin I	Copeptin	IMA
Group 1 n=58	1.1 (0.38; 4.75) [0.67; 1.36] p1.2=0.531235	0.23 (0.04; 1.32) [0.12;0.56] p1.2=0.53741	3117.8 (908.3; 10392.61) [2195.7; 4610.5] ***p1.2=0.000016***
Group 2 n=36	0.87 (0.35; 8.96) [0.60; 1.38]	0.16 (0.03; 1.92) [0.06; 0.33]	1691.6 (665.68; 8045.9) [1087.1; 2394.9]

The correlation between the levels of troponin I, copeptin, IMA and HMECG and DPECHOCG findings was evaluated. Biochemical markers in children of Group 1 were shown to correlate with heart rate (r = -0.3, p = 0.023), circadian index (r = -0.3, p <0.05), RR-wave length (r = 0.5, p <0.05), gradient pressure on the aortic valve

(r = 0.3, p <0.05) and pulmonary artery (r = 0.5, p <0.05), mean pressure in the pulmonary artery (r = 0.3, p <0.05), left ventricular ejection fraction (r = -0.8, p <0.05).

Conclusions. The most common types of neonatal arrhythmias were disturbances of autonomic and sinus node excitability. IMA levels were highest in the group of newborns with arrhythmia. The interconnection of DPECHOCG and HMECG findings with the indices of troponin, copeptin and IMA provides an opportunity to predict the development of cardiovascular disorders in newborns.

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