

## CASE SERIES

# Intrauterine and neonatal period asphyxia; what can be hidden behind heart rhythm disturbances in asphyxiated newborns?

Ingrid Brucknerová

1st Department of Pediatrics, Medical School, Comenius University, Bratislava, Slovakia

## ABSTRACT

### Aim of the study

To investigate the underlying reasons of rhythm disturbances in a series of cases treated for intrauterine and neonatal period asphyxia.

### Case Presentation

The paper describes a series of 7 asphyxiated newborns hospitalized in the Neonatology Unit of our Pediatrics Department, with supraventricular paroxysmal tachycardia (SPT) or bradycardia diagnosed prenatally and postnatally. Reentry tachycardia was confirmed in four patients, syndrome of latent ventricular preexcitation in Wolf-Parkinson-White syndrome. Combination of SPT with adnate infection was observed in one patient. In the rest of patients we diagnosed systemic disease of the mother (Sjögren syndrome) and carnitine palmitoyltransferase II deficiency.

### Conclusions

Heart rhythm disturbances may cover or intensify the clinical signs of acute perinatal asphyxia. In the differential diagnosis it is necessary to exclude severe sepsis, metabolic disbalance, metabolic disease and heart failure in structural congenital heart disease.

**Keywords:** *asphyxia neonatorum, intensive care/neonatal, cardiac arrhythmias, tachycardia, bradycardia, carnitine palmitoyltransferase II, fetus, newborn.*

## INTRODUCTION

Heart starts to work at the end of the third week of gestational age. By its own activity heart can support and maintain the circulation in the fetal part of the placenta. The cardiovascular system in cooperation with other organ systems also supports the adaptation to extrauterine life. The consequences of asphyxia on the cardiovascular system can be manifested before or after delivery as *rhythm disturbances, syndrome of myocardial dysfunction* as well as *transient myocardial ischemia with tricuspid insufficiency*.<sup>1-3</sup>

Fetal rhythm disturbances comprise potentially life-threatening situations. Heart frequency of fetus is an indirect parameter of the fetal central nervous system activity, oxygenation status and acid balance. Basic fetal heart frequency is between 110-160 beats per minute. Normal variability is 5-10 beats per minute. One of the reversible reasons of intrauterine as well as postnatal paroxysmal tachycardia can be asphyxia and adnate infection.<sup>4</sup> *In some cases clinical symptoms during unknown paroxysm of tachycardia during intrauterine development can overlap or amplify the symptoms of acute asphyxia.* Most frequent is reentry tachycardia close to various forms of Wolf-Parkinson-White (WPW) syndrome.<sup>5-10</sup>

Reentry fetal and newborn tachycardia are categorized in one common group of tachycardias of various etiology, clinical signs and prognosis range. The basic characteristic of supraventricular paroxysmal tachycardia (SPT) is a presence of tachycardia with narrow QRS complex. An exact incidence is not known. SPT can originate from a defective impulse formation (focal mechanism), defective nervous impulse transfer (reentry mechanism) or the combination of both. According to the place of origin, reentry tachycardia can be divided into several groups. Sinus reentry tachycardia is formed when the pathological pathway is located in *nodus sinuatrialis*. If it is located in atrial myocardium, atrial flutter is formed. An impulse can circle in *nodus atrioventricularis* and cause atrioventricular nodal reentry tachycardia. Various forms of WPW syndrome are described (exact WPW syndrome, latent ventricular preexcitation, permanent junctional reciprocating tachycardia) in a presence of aberrant atrioventricular pathways in heart.

**Bradycardia** during the intrauterine development (less than 100 beats per minute during 1-2 seconds) reflects long-standing distress of the fetus, direct damage of the myocardium or systemic disease of the mother.<sup>11</sup> Postnatally, bradycardia is an indirect sign of overcome asphyxia (decreased heart frequency under 80 beats per minute). In the most severe cases a heart failure is confirmed. Fasting during first days of life can trigger disorder in  $\beta$  oxidation of fatty acids - deficiency of carnitine palmitoyltransferase II. Congenital disease of the electrical conduction system of the heart or a congenital heart disease can also be a reason of intrauterine rhythm disturbances.<sup>12</sup>

**Syndrome of myocardial dysfunction or syndrome of low systemic perfusion** can be observed in both premature newborns and full term newborns. The involvement of myocardium leads to decreased contractility of the left

**Address correspondence to:** Assoc. Prof. Ingrid Brucknerová, MD, PhD,  
1<sup>st</sup> Department of Pediatrics,  
Medical School, Comenius University,  
Limbová 1,833 40 Bratislava, Slovakia  
E-mail: osmium@centrum.sk