Ventricular arrhythmias in a pregnant female – clinical implications

Komorowe zaburzenia rytmu serca u kobiety w ciąży – implikacje kliniczne

Ewelina Nowak[1], Marianna Janion[1,2], Agnieszka Wencel-Wawrzeńczyk[3], Marek Sikorski[4], Izabela Wojarska[5]

[1]Department of Internal Diseases, Cardiology and Medicine Nursing, Institute of Nursing and Midwifery, Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce, Poland
Head of the Department: Prof. Marianna Janion MD, PhD
[2]2nd Department of Cardiology, Świętokrzyskie Cardiology Centre, Regional Hospital, Kielce, Poland
Head of the Department: Prof. Marianna Janion MD, PhD
[3]Department of Midwifery, Gynecology and Midwifery-Gynecological Nursing, Institute of Nursing and Midwifery, Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce, Poland
Head of the Department: Prof. Mariusz Bidziński MD, PhD
[4]Department of Perinatology and Gynecological – Midwifery Nursing, Institute of Nursing and Midwifery, Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce, Poland
Head of the Department: Prof. Marek Sikorski MD, PhD
[5]Doctoral Studies, Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce, Poland
Head of the Department: Prof. Marianna Janion MD, PhD

Medical Studies/Studia Medyczne 2017; 33 (2): 133–136
DOI: https://doi.org/10.5114/ms.2017.68708

Key words: pregnancy, pharmacotherapy, ventricular arrythmias.

Słowa kluczowe: ciąża, farmakoterapia, komorowe zaburzenia rytmu serca.

Abstract

Physiological changes occurring during pregnancy, at the time of childbirth, and in the postpartum period may influence the occurrence, and increase in intensity of, heart rhythm abnormalities. There is insufficient data on the safety and effectiveness of pharmacological treatment in the group of pregnant women. Cardiac arrhythmia induced by pregnancy rarely requires introduction of pharmaceuticals. It should be noted that most antiarrhythmic agents are not recommended for use during pregnancy and the breastfeeding period. In cases where a drug use is necessary, the most popular choice is β-blockers or a calcium channel blocker – verapamil, which does not have teratogenic effects, but does get transferred to the mothers' milk. The presented case study concerns a woman with no structural heart defects in her third pregnancy, with very ill-tolerated ventricular arrhythmia.

Streszczenie

Fizjologiczne zmiany zachodzące w ciąży, w czasie porodu oraz połogu mogą się przyczyniać do występowania oraz nasilenia zaburzeń rytmu serca. Nie ma wystarczających danych dotyczących bezpieczeństwa i skuteczności postępowania farmakologicznego u kobiet w ciąży. Arytmie wywołane ciążą rzadko wymagają wdrożenia farmakoterapii. Należy zwrócić uwagę na fakt, że leki antyarytmiczne w większości są przeciwwskazane w ciąży. Gdy konieczne jest leczenie, najczęściej wykorzystywane są β-adrenolityki lub antagoniści wapnia – werapamil, który nie ma działania teratogennego, jednak przenika do mleka matki. W pracy przedstawiono przypadek kobiety bez strukturalnej choroby serca, w trzeciej ciąży z łagodną arytmią komorową, bardzo źle tolerowaną klinicznie.

Introduction

Physiological changes occurring in the female body during pregnancy, the childbirth process, and the postpartum period may influence the first-time occurrence, and the intensity, of cardiac arrhythmias [1].

The changes taking place in the circulatory system begin in the first trimester of pregnancy, reach their peak in the second trimester, and undergo a slight regression in the third trimester. An increase in the volume of blood in circulation, an increase in cardiac minute output by 40–50%, and an increase in heart rate by approximately 10–15 beats/min may predispose to cardiac arrhythmia. Especially the increase in myocardial contractility and myocardial sensitivity to endogenous catecholamine, with the simultaneous change in vegetative system and change in electrophysiological sensitivity of cardio myocytes, may increase the risk of arrhythmia occurrences [1, 2]. Moreover, the arrhythmia induction mechanism is

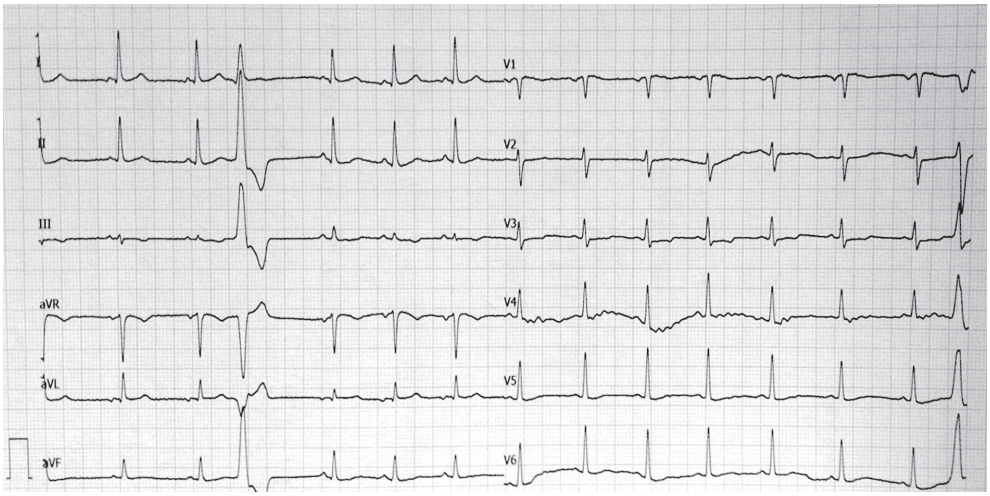

Figure 1. The ECG record on admission. The sinus rhythm with the frequency of 100/min distorted by the extra ventricular beats with the morphology of left bundle branch block. Flattened T-wave in most of the dissipations

linked with the sex hormones, the significance of which is still not fully recognised and which may shape the electrophysiology of the heart and dynamically influence its functions. The presence of specific receptors for oestrogen and progesterone in the heart is proposed. There are suggestions that oestrogens have a protective antiarrhythmic influence on the heart atriums, which is proven by less frequent occurrence of atrial fibrillation in women in general and less frequent occurrence of supraventricular tachycardia in the middle period of the menstrual cycle, while an increased progesterone level in luteal phase causes increased frequency for this type of arrhythmias [2]. Simultaneously, oestrogens have an adverse effect on the potassium channels and calcium channels, which causes QT prolonging and increases the risk of ventricular arrhythmias. This is especially dangerous for women with innate long QT syndrome (LQTS). The clinical analysis of observation of women with LQTS proves that high progesterone level during pregnancy decreases the risk of occurrence of arrhythmia. In comparison, during the puerperium period, when the level of this hormone is significantly lowered, there is a sudden rise of serious ventricular arrhythmias.

The presented case study concerns a woman with no structural heart defects, in her third pregnancy, with very ill-tolerated ventricular arrhythmia.

Case report

The patient, aged 34 years, at the 37th week (Hbd) of her third pregnancy, after caesarean section in 2009 and second pregnancy ending in miscarriage, hospitalised in the 23rd Hbd of the current pregnancy because of poorly tolerated, numerous ventricular extrasystoles (14,175/day with ventricular bigeminy and trigeminy) treated with metoprolol at a dose of 3 × 25 mg, was emergently admitted to 2nd Cardiology Clinic at the Provincial Hospital in Kielce due to the continued rapid and irregular heartbeat. During the first pregnancy no abnormalities were found; the patient did not report the circulatory system ailments.

On admission to hospital, the patient was cardiovascularly and respiratorily stable, she complained of bothersome symptoms associated with a feeling of palpitations. The patient did not use any drugs, and she not was treated because of another chronic disease. On auscultation the irregularities in heart rate (HR) approximately 86/min were revealed, while blood pressure (RR) was correct 120/75 mm Hg. The physical examination showed light swelling of the lower limbs. The patient did not report any problems with other systems. In the ECG on admission the sinus rhythm with extra ventricular beats was recorded with the morphology of left bundle branch block (Figure 1). Holter monitoring test with β-blocker (metoprolol) was performed, during which a quite fast sinus rhythm was recorded (on average HR 90/min, min. HR 72/min, max. HR 138/min), numerous single ventricular beats (VEB) – 10 928/day, and periodically arranged in bi- and trigeminy (one pair).

Echocardiography revealed no abnormalities. Due to the patient's general malaise, her concerns about the baby's health, and the revealed arrhythmias, the decision was made to quit metoprolol and introduce verapamil at a dose of 80 mg twice a day. In the control Holter monitoring test the reduced number of beats of up to 8726 was recorded.

The patient was referred for a gynaecological consultation, which showed no irregularities. In the gynaecological examination the following were found: one living foetus in cephalic longitudinal lie, normal tension of the uterus at rest, the vaginal part formed soft, the cervical canal closed, the foetal bladder preserved, the fundus

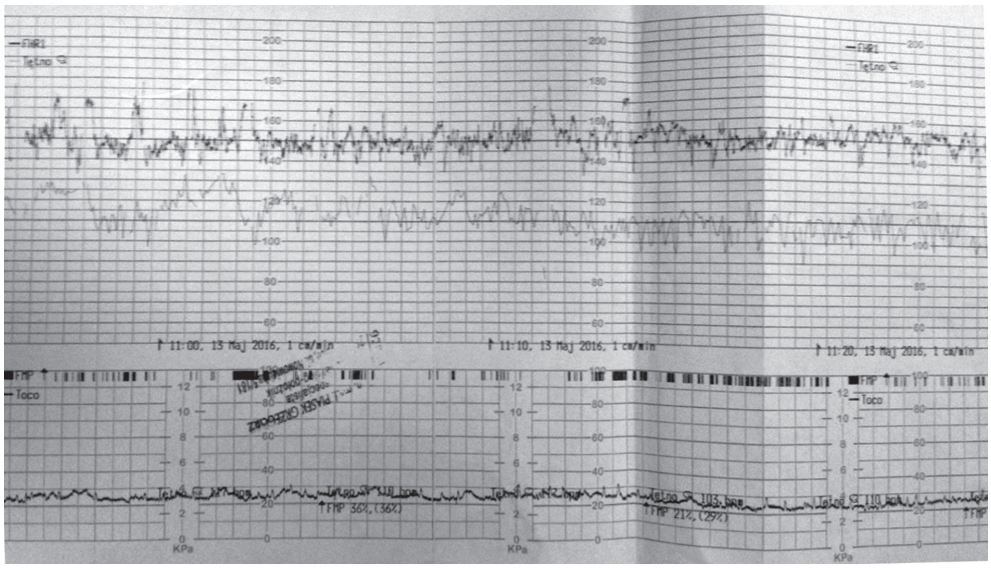

Figure 2. The CTG record of foetal heartbeat and uterine contractions

of the uterus two fingers below the xiphoid process. The ultrasonography presented a living foetus in the uterus, in the cephalic presentation, and, on the basis of biometric assessment, corresponding to the age of pregnancy. The placenta on the front wall of the correct location. The amount of amniotic fluid correct maximal vertical pocket (MVP) – 6 cm, amniotic fluid index (AFI) – 14 cm. The flow parameters in umbilical artery (UmbA) and middle cerebral artery (MCA) of the foetus correct. The estimated foetal weight (EFW) from 2600 to 2700 g. The cardiotocographic record (CTG) (Figure 2) reactive, without uterine contractions, and the foetal heart rate (FHR) approximately 140 bpm. The ultrasonogram revealed that maternal-placental flow was disturbed due to arrhythmia. The patient, who had a history of caesarean section, was qualified for birth by operation. The C-section operation was scheduled.

After 9 days of hospitalisation, the patient was discharged home in good condition. One pack of verapamil 80 mg was prescribed with the recommendation to take the drug in the morning and in the evening.

On the appointed day the patient visited the Gynaecology Clinic and was prepared for a planned caesarean section the next day. On the 39th Hbd she gave birth to a male newborn – the third pregnancy, the second delivery, in good general condition, Apgar score 10/10 with body weight of 3330 g. In the ward the child's condition was good, and the proper course of adaptation processes was observed. Pulse oximetry on the right leg showed readings within normal limits. The newborn was breastfed. Jaundice at the physiological level was diagnosed. Clinical and laboratory findings were without symptoms of infection. The mother and child were discharged home in good general condition.

Discussion

The risk of arrhythmia occurrence concerns both healthy pregnant women and those diagnosed with a structural heart defect. Extra ventricular and supraventricular beats and the atrial fibrillation are observed in more than 50% of pregnant women, while chronic arrhythmias occur rarely (2–3/1000) [1]. The increase in density of α-adrenergic receptors and hypersensitivity to endogenous catecholamine are considered to be the mechanism responsible for ventricular arrhythmias in pregnant women with no structural heart defect, as in the presented case.

About 1.3% of pregnant women are diagnosed with occurrences of ventricular tachycardia. In the group of women with occurrences of ventricular tachycardia 34% suffered the first episode during pregnancy, and in 29–44% of the cases the arrhythmias intensified during pregnancy. The mother's heart rhythm abnormalities may have a negative influence on foetal development and as a consequence on the newborn's condition (lower birth weight). The available research indicates that 20% of foetuses have suffered from negative influence of arrhythmias. The most frequent arrhythmias during childbirth are supraventricular and ventricular tachycardia. Bradycardia is usually observed in the fourth stage of labour, when the pain reduces [3, 4].

A number of scientists describing ventricular arrhythmias in pregnant women stress the need for greater knowledge and performance of tests in relation to the safety of the mother and foetus, as well as the effectiveness of pharmacotherapy and optimisation of the negative effects of treatment.

The drugs most commonly used in the treatment and prophylaxis of arrhythmia can have adverse ef-

fects on the foetus and should not be introduced for pregnant women unless absolutely necessary. There are not enough data on the safety and effectiveness of pharmacological treatment in pregnant women. Antiarrhythmic medicines are not recommended. Sotalol is considered the only relatively safe medication among all antiarrhythmic pharmaceuticals. No teratogenic effect has been proven. It is transmitted transplacentally and it gets transferred to the mother's milk. Foetal bradycardia and hypoglycaemia are the possible side effects (B category – no evident evidence of threat to pregnant women – no evidence of risk in animals but no studies in pregnant women or the risk shown in animals have not been confirmed in pregnant – Food and Drug Administration, US) [1, 5].

The introduction of a given drug for pregnant women is possible in most cases when their potential negative influence on the physiological development of the foetus is considered [6, 7].

B-blockers are often used in pregnant women, especially for supraventricular arrhythmia, ventricular heart rhythm abnormalities, hypertrophic cardiomyopathy, thyrotoxicosis, and foetal tachycardia. They are transmitted transplacentally and are transferred to the mother's milk. The concentration in the mother's milk is higher than in blood, so breastfed children are at risk of negative effects of these drugs. All β-blockers cause foetal bradycardia and hypoglycaemia. Propranolol and metoprolol have the widest clinical experience (category C – Risk not ruled out – animal reproduction studies have shown an adverse effect on the foetus, and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks). Some authors also suggest their harmful influence on foetal growth [8, 9].

In the presented case, after the diagnosis and assessment of the clinical state due to poor clinical tolerability of sinus tachycardia and ventricular arrhythmias, the patient was qualified for treatment with a β-blocker. Metoprolol 3 × 25 mg was applied, which the patient took from the 23rd week of pregnancy, i.e. 114 days.

The problem of respiratory disorders in the newborn child as a result of the use of β-blockers by the mother is raised in literature. In view of the persisting poor tolerance of arrhythmias by the patient and the upcoming date of the labour, it was decided to discontinue the β-blocker treatment and apply verapamil.

Verapamil is the oldest and most widely used calcium channel blocker in pregnant women, used particularly in supraventricular arrhythmias as well as for the delay in delivery and in eclampsia. Verapamil is not teratogenic; it passes through the breast milk. Its concentration in breast milk is from 23% to 94% of the level that is found in the mother's plasma [10].

Conclusions

The lack of arrhythmic incidents during the first pregnancy does not suggest its absence in subsequent pregnancies. In the analysed case, there was no significant adverse impact action of β-blockers and calcium channel blockers used during pregnancy on the overall health of the newborn.

Conflict of interest

The authors declare no conflict of interest.

References

1. Grupa Robocza Europejskiego Towarzystwa Kardiologicznego (ESC) do spraw postępowania w chorobach sercowo-naczyniowych u kobiet w ciąży. Wytyczne ESC dotyczące postępowania w chorobach sercowo-naczyniowych u kobiet w ciąży. Kardiol Pol 2011; 69 (Suppl. 7): 341-400.
2. Janion M, Janion-Sadowska A. Nadkomorowe i komorowe zaburzenia rytmu – skala problemu u kobiet. Przegl Lek 2014; 71: 142-6.
3. Rytlewski K. Zmiany fizjologiczne w organizmie kobiety ciężarnej i ich znaczenie w praktyce lekarza ogólnego. Przegl Lek 2008; 65: 195-201.
4. Świątecka G. Zaburzenia rytmu serca u kobiet w ciąży. In: Choroby serca u kobiet w ciąży. Świątecka G, Kornacewicz-Jach Z. Via Medica, Gdańsk 2006; 136-54.
5. Suliga E. Eating habits and nutritional status of pregnant women and the course and outcomes of pregnancy. Studia Medyczne 2015; 31: 60-5.
6. Kaźmierczak J, Kiedrowicz R. Zaburzenia rytmu serca – odrębności epidemiologii klinicznej u kobiet. In: Choroby serca u kobiet. Kornacewicz-Jach Z, Janion M. Via Medica, Gdańsk 2015; 479-95.
7. Koźluk E, Tokarczyk M, Kozłowski D, Opolski G. Przezskórna ablacja prądem o częstotliwości radiowej podłoża arytmii u kobiet w ciąży. Folia Cardiologica 2005; 12: 338-42.
8. Janion M, Janion-Sadowska A. Zawał serca u kobiet w ciąży. Przegl Lek 2015; 72: 184-8.
9. Krzemińska-Pakuła M, Kurpeska M. Leki antyarytmiczne stosowane u kobiet w ciąży. In: Choroby serca u kobiet w ciąży. Świątecka G, Kornacewicz-Jach Z (eds). Via Medica, Gdańsk 2006; 159-75.
10. Kornacewicz-Jach Z, Peregud-Pogorzelska M. Zaburzenia rytmu serca u kobiet w ciąży. Przegl Lek 2014; 71: 177-80.

Address for correspondence:

Ewelina Nowak
Department of Internal Diseases, Cardiology and Medicine Nursing
Institute of Nursing and Midwifery
Faculty of Medicine and Health Sciences
Jan Kochanowski University
ul. Żeromskiego 5, 25-369 Kielce, Poland
Phone: +48 788 778 945
E-mail: ewelinanowakkielce@gmail.com