ABSTRACT

Purpose: to study the nature of cardiac rhythm. Material and Methods: 120 patients were studied in the II-III trimesters of pregnancy, 100 of whom were found to have complex cardiac rhythm disorder. The 1st group included women with cardiac rhythm and organic changes in the cardiovascular system. The second one had patients with idiopathic arrhythmias, and the control group consisted of 20 apparently healthy women with normal sinus rhythm. Results: In pregnant women with mitral valve prolapse, auricular extrasystoles were recorded significantly less frequently than in other groups. Conclusions: complex cardiac rhythm disorder occurs in pregnant women both against the background of cardiovascular pathology and in the absence of organic changes in the internal organs and metabolic processes, which requires careful dynamic monitoring of these patients.

Key words: cardiac rhythm, arrhythmias, pregnancy, cardiovascular diseases

1. INTRODUCTION

Diseases of the cardiovascular system in pregnant women occupy a leading place among all somatic pathology. They account for more than 60% of all diseases of internal organs during pregnancy and childbirth [1]. In recent years, there has been an increase in the incidence of the pathology of vessels and cardiovascular systems (CVS) in young pregnant women. This pathology can be congenital in the form of various congenital heart defects or acquired as a result of rheumatism. However, CVS diseases can often develop for the first time during gestation in healthy women before pregnancy. Moreover, some of these patients had a history of physiological pregnancies and childbirth [2]. The most common pathology is postmyocardial cardiosclerosis, acquired heart defects, etc. The danger of these diseases is that they complicate the course of pregnancy by the development of severe obstetric complications such as severe preeclampsia, eclampsia, thrombophilic conditions, and their most formidable manifestation – pulmonary embolism. Often this pathology is combined with varicose sickness, which further complicates the course of pregnancy. There is no unified theory of the occurrence and development of severe cardiovascular pathology in pregnant women not diagnosed earlier. More often, it is associated with the use of modern informative diagnostic methods, but this is not always confirmed [3]. A woman’s history of cardiac pathology, especially congenital heart defects combined with gestation, mutually aggravates the course. Developing complications of cardiovascular activity, especially in the third trimester of pregnancy, are often an indication for surgical delivery, which leads to the birth of a premature baby, with a high risk of perinatal morbidity or mortality. The management tactics that existed so far in the world, which consisted only in monitoring a pregnant woman under the supervision of a cardiologist conducting an ECG in dynamics, has not justified themselves at present [4]. Today, there are informative diagnostic methods, with the help of which it is possible not only to determine the type of pathology, the severity of the disease but also to develop tactics for managing a pregnant woman and delivery method. Developing complications of cardiovascular activity, especially in the third trimester of pregnancy, are often an indication for surgical delivery, which leads to the birth of a premature baby, with a high risk of perinatal morbidity or mortality. Special studies devoted to studying the nature of cardiac rhythm and the determination of possible etiological factors of their development in pregnant women were not carried out, which became the purpose of this work.
II. MATERIAL AND METHODS

The study included 120 pregnant women (middle age is 26.1 ± 5.7 years) in the II and III trimesters of gestation, who signed informed consent and were treated at the department of the pathology of pregnancy in the city maternity complex No 9. All patients, in addition to routine examination methods, including blood tests for electrolytes (potassium, sodium) and thyroid hormones - triiodothyronine (T3), thyroxine (T4), thyroid-stimulating hormone (TSH), underwent echocardiography (Echo) on the machine “Vivid 7 GE”, ECG “1200”.

Statistical processing of the research results was carried out with the “SPSS” program using standard methods of variation statistics and Student's test to assess the differences in paired measurements of indicators. The difference was considered significant at p <0.05/.

III. RESULTS

Of 120 patients, 100 were diagnosed with complex cardiac rhythm disorder (main group), and 18 had normal sinus rhythm (control group). Almost half of the patients had aggravated heredity for cardiac diseases and metabolic disorders: arterial hypertension occurred in 53.7% of cases in one or both parents, myocardial infarction or cerebrovascular accident - in 7.2%, obesity - in 31.2%, diabetes mellitus - in 5.0%. Before the onset of the pregnancy, there were complaints of interruptions neither in the heart's function nor heartbeat. From about the middle of the 1st, the beginning of the 2nd trimester of pregnancy, patients with arrhythmias began to be bothered by the sensations of interruptions and “fading” in the work of the heart, palpitations, sometimes paroxysmal, weakness, increased fatigue, which was the reason for additional examination. All patients were divided into three groups depending on the presence or absence of arrhythmia and cardiovascular pathology. Group I (n = 50) consisted of women with cardiac arrhythmias and organic changes in the CVS. Group II included 50 patients with arrhythmias. During the examination, no visible organic changes in the CVS, endocrine system, organs of the gastrointestinal tract were detected, and their heart rhythm disturbances were classified as "idiopathic arrhythmia". Group III of the control (n = 18) consisted of practically healthy women with normal sinus rhythm at the same stages of pregnancy as the two main groups. According to the data of clinical and instrumental examination in group I, the following organic changes in the CVS were diagnosed: hypertrophic cardiomyopathy without the obstruction of the left ventricular outflow tract (n = 4), mitral valve insufficiency of rheumatic genesis (n = 3), patent foramen ovale (n = 2), non-operated ventricular septal defect (n = 5), dilated cardiomyopathy without signs of heart failure (n = 3), corrected tetrad of Fallot (n = 2), and post myocarditis cardioclerosis (n = 14). Mitral valve prolapse (MVP) was quite common (n = 29), of which grade I mitral regurgitation was detected in 8 cases, grade 2 - in 19 cases.

IV. DISCUSSION

Extensive experience in clinical cardiology and obstetrics shows that the reasons for changes in heart rate can be diverse and not fully studied. Women with changes in hemodynamic and hormonal status, general metabolism, water-salt metabolism, and also with an increased load on the cardiovascular systems during pregnancy have a high risk of developing arrhythmias [5]. In the woman’s cardiovascular system, pregnancy causes significant changes, which are of an adaptive nature and aimed at ensuring its optimal outcome for both the mother and the fetus. Despite numerous domestic and foreign studies concerning the characteristics of the hemodynamics of the mother and the fetus during pregnancy of high perinatal risk, the problem is far from its final solution [6].

A significant role in the processes of adaptation of a woman to the new conditions of the functioning of the mother-placenta-fetus system is assigned to the sympathoadrenal system. The regulation of the beginning, strength and duration of adaptive mechanisms is under the control of the vegetative centres. The mother’s nervous system plays an important role in the perception of numerous impulses from the fetus. In the central nervous system, a focus of increased excitability is formed - a gestational dominant, around which an inhibition field is created. Clinically, this is manifested by lethargy, the predominance of the woman's interests related to the birth and health of the unborn child, while other interests become of secondary importance [7]. During pregnancy, the synthesis of thyroid-stimulating hormone and thyroid hormones increases, for the production of which a sufficient amount of iodine is needed. The function of the parathyroid glands is often reduced, which can contribute to impaired calcium metabolism and cause cramps in the calf and other muscles. The respiratory system reacts to pregnancy by increasing the respiratory volume of the lungs, which by the end of the gestational period increases by 25–35%, and the respiratory rate increases by 12%. During pregnancy, physiological tachycardia develops - the heart rate by the end of pregnancy is 12–20 beats per minute higher than the heart rate before pregnancy. There is a decrease in general peripheral vascular resistance (PVR) by an average of 10–35%, and as the stroke volume increases, the
cardiac output rises, which reaches a maximum of 30–52% of the initial level, at the 25–33rd week of pregnancy [8]. During gestation, the myocardium's physiological hypertrophy develops - the mass of the myocardium increases by the end of the third trimester by 8–30% and after childbirth quickly returns to the initial level [9]. By the period of delivery with a singleton pregnancy, the work of the left ventricle approaches normal conditions. With multiple pregnancies, it remains elevated. An increase in SV (stroke volume), the rate of expulsion of blood from the heart and a decrease in peripheral vascular resistance are the main signs of a hyperkinetic type of blood circulation [10]. According to researchers, the heart works in the least economical mode with this type of blood circulation, and the compensatory capabilities of the cardiovascular systems are sharply limited, especially in pathological conditions.

Hemodynamic factors in patients with organic changes in CVS can lead to cardiac arrhythmias, noted in this study. In addition, an important factor in the adaptation of CVS to pregnancy is systemic vasodilation, in the development of which not only increased secretion of nitric oxide and other vasodilating factors plays a role but also an increase in the level of female hormones, which increase the sensitivity of adrenergic receptors to hormones of the sympathoadrenal system [11]. At the beginning of pregnancy and before childbirth, β-adrenoreactivity increases and α-adrenoreactivity decreases, which is an important condition for reducing the contractile activity of the myometrium in order to carry a fetus. The density of β-adrenergic receptors under the action of progesterone in the myometrium increases. By itself, the activation of β-adrenergic receptors can contribute to the development of arrhythmia. Apparently, the so-called "idiopathic arrhythmias", according to scientists, are largely due to the proarrhythmic effect of the sympathoadrenal system, the functional state of which increases under the influence of female sex hormones [12]. An increase in ectopic activity in patients with MVP is also associated with autonomic dysfunction, which is traditionally, especially without hemodynamically significant mitral regurgitation, is perceived by cardiologists as a normal variant and rarely requires therapy [13, 14]. It is known that with MVP, there is a genetically determined defect in collagen synthesis, a decrease in the interstitial level of magnesium, in conditions of which deficiency fibroblasts produce defective collagen of the mitral valve leaflets [15]. Clinically, MVP is often manifested by disorders of autonomic regulation of the heart rhythm, recorded with a frequency exceeding 68%. At the same time, it was noted that it is necessary to follow the principles of an individual approach to the choice of drug therapy with an assessment of the expected benefits and risks of complications, as well as to monitor the condition of the pregnant woman in case of prescribing therapy to assess the safety and effectiveness of the treatment [16]. Complex heart rhythm disturbances occur in pregnant women both against the background of cardiovascular pathology and in the absence of organic changes in the internal organs and metabolic processes [17, 18].

V. CONCLUSION

To sum up, the study results indicate that complex cardiac rhythm occurs in pregnant women against the background of cardiovascular pathology, including heart defects, post myocarditis cardiiosclerosis, MVP with minor mitral regurgitation. Moreover, patients without organic changes in the internal organs and metabolic processes experience it. They require careful dynamic monitoring of these patients and, in the case of hemodynamic instability or the development of life-threatening arrhythmias, timely adequate therapy.

Conflict of interests and contribution of authors

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