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Morphofunctional Structural Features of Placenta in Women with Late Preterm Birth

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ABSTRACT

The study revealed pathomorphological changes in the placenta during preterm labor in the period from 30 weeks to 36 weeks. Premature birth is accompanied by morphostructural changes in the placental tissue, manifested by involutive-dystrophic changes, impaired maturation of chorionic villi, as well as the presence of compensatory-adaptive reactions.

KEY WORDS:premature birth, placental morphology.

INTRODUCTION

Premature birth is an urgent problem of modern obstetrics, the frequency of which in the developed countries of the world remains significant, ranging from 5 to 9%, in various regions of our republic varies from 4 to 12%, determining consistently high rates of morbidity and mortality of newborns. Over the past 15 years, there has been an increase in the total number of preterm births. The share of late preterm birth (PPI) at 30 weeks 36 weeks accounts for more than 70% of all preterm births, which is associated with a high frequency of extragenital pathology among pregnant women, premature rupture of amniotic fluid, widespread use of assisted reproductive technologies and an increase in the number of multiple pregnancies. Improvement of methods of early diagnosis, development of a personalized prognosis of unfavorable outcomes in the fetus provides the possibility of timely detection of a high risk of perinatal pathology (fetal growth retardation, malformations and anomalies of development, intrauterine hypoxia), which is also often the cause of early delivery [1-3]. Newborns born at 34 (0) - 36 (6) weeks of gestation belong to the subgroup of “late premature” high-risk infants who more often require complex intensive care. The severity of the condition in children born with late preterm birth is due to the immaturity of organs and life support systems, respiratory disorders, hyperbilirubenemia, intrauterine infections, hypoxic ischemic lesions of the central nervous system. In such newborns, mortality, morbidity, and the risk of repeated hospitalizations are higher than in full-term newborns, therefore it is necessary not to waste time and provide adequate medical care in time [4, 6].

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Given the recent trends towards an increase in the number of preterm births, many studies are devoted to findingpredictive risk factors. A promising direction isthe study of violations of the functioning of the fetoplacental complex as a key cause of preterm labor, and the identification of morphofunctional changes in the placenta will reveal the factors of the implementation of late preterm labor.

Purpose of the work is to study the morphofunctional features of the placenta in preterm labor.

MATERIALS AND METHODS

A comprehensive examination of 260 pregnant women of reproductive age with preterm birth at a gestational age of 30 weeks - 36 weeks (main group) was carried out. The comparison group consisted of 50 patients with timely delivery. The anamnestic data of women, especially the course of pregnancy, childbirth, the postpartum period and the early neonatal period were analyzed. A comparative analysis of the morphofunctional state of the placentas in late preterm and term births was carried out. After separation and isolation of the placenta, a macroscopic examination of the placenta was performed. The placenta was examined, the place of insertion of the umbilical cord was assessed. The mass of the placenta was determined. The thickness, maximum and minimum diameter of the placenta were measured. Material for histological examination was taken in the central, paracentral and marginal parts. The resulting material was fixed in 10% buffered formalin and embedded in paraffin.

Sections were made on a sled microtome from the fetal, middle, and maternal parts 5–7 μm thick. The resulting slides were stained with hematoxylin-eosin. Microscopic examination of the placenta was carried out using a Zeiss Axio Lab.A1 microscope. The micropreparations assessed the state of the basal and chorionic plates, intervillous space, vessels, chorionic epithelium, syncytial kidneys. Each microscopic indicator of the placenta was assessed on a three-point system (from 1 to 3 points).

Statistical processing of materials was carried out using parametric and non-parametric criteria (Student's t-test, Mann-Whitney U-test), to assess the relationship, the Spearman correlation coefficient was used (ro - basic, rк - control). Differences were considered significant at $p \leq 0.05$.

RESULTS AND DISCUSSION

The average age of patients in both groups was (26.9 ± 0.49) years. In the main group, 62% of pregnant women were of late reproductive age (30 years or more). When studying the obstetric and gynecological history in the main group, abortions were in the first place in 65.7%, spontaneous abortions occurred in 14.5% of patients, which were repeated in half of the cases. Almost every fifth pregnant woman has a history of premature birth. Among gynecological diseases in patients of the main group, chronic inflammatory process of the uterine appendages dominated in 74%, a violation of the vaginal biocenosis was revealed in 19% of pregnant women ($p < 0.05$).

Among extragenital pathologies, infectious diseases prevailed significantly ($p < 0.05$) in the main group, among which diseases of the urinary organs (pyelonephritis, cystitis) and upper respiratory tract prevailed.

Anemia of pregnant women, detected in 38% of pregnant women in the main group, contributes to a decrease in the general resistance of the body, thereby increasing the risk of

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exacerbation of existing chronic foci of infection and an increase in infectious diseases during pregnancy, which in the next is a risk factor for late preterm birth. Endocrine system pathology was observed in 17 (34%) pregnant women with late preterm birth, of which every third woman was obese. In addition, 26 (52%) pregnant women had combined (two or more diseases) extragenital pathology ($p < 0.05$).

The study revealed that all women with late preterm birth had a low health index.

When studying the complications of this pregnancy, in a significantly greater percentage ($p < 0.01$), the threat of termination of pregnancy was observed in 54% of patients, which is a risk factor for preterm birth. Isthmico-cervical insufficiency was diagnosed in 12% of pregnant women, about which correction was carried out with an obstetric pessary. Polyhydramnios, as a manifestation of intra-amniotic infection, was observed in 18% of cases. In every third patient with late preterm labor, pregnancy proceeded against the background of preeclampsia symptoms of varying severity. The course of pregnancy in 26% of women was complicated by an acute respiratory viral infection. Thus, the presence of foci of chronic infection, inflammatory gynecological diseases, a history of reproductive losses, the threat of termination of pregnancy, polyhydramnios, acute respiratory viral infections are risk factors for premature birth of a late gestational period. Analysis of the course of labor in patients with late preterm labor showed that in 54% of cases, labor ended through the vaginal birth canal, in 46% - by cesarean section. The main indications for operative delivery were progressive fetal hypoxia in 26.1% of cases, severe preeclampsia - 13%, concomitant extragenital pathology - 26.1%, fetal malposition - 13%, premature detachment of the normally located placenta - 21.8%. The choice of adequate obstetric tactics of labor management is determined by the interests of the fetus. The duration of labor in the main group in primiparous women was (7.3 ± 0.6) h ($p < 0.05$) and in multiparous women - (5.3 ± 0.8) h ($p < 0.05$).

The total blood loss during labor was (268 ± 19) ml ($p < 0.05$). Eight newborns received resuscitation care: the Apgar score in 5 newborns was (5 ± 0.3) points ($p < 0.05$), in three - (3 ± 0.2) points ($p < 0.05$). In a macroscopic examination of the placentas of the main group, central attachment of the umbilical cord is noted in 14% of cases, paracentral in 58%, and marginal in 28%. In the main group, the maximum and minimum diameters of the placenta significantly decreased in comparison with the control group by 3 and 13%, respectively. There is a decrease in the thickness of the placenta in the main group by 37%, the area of the placenta - by 16%.

The average weight of the placenta in the main group is 23.5% less than in the control group. There is also a decrease in fetal weight in the main group by 25.1%. The placental-fetal ratio in late preterm labor is 6.1% lower than in the control group. This may indicate a decrease in the specific volume of placental tissue per unit of body weight of a newborn and depletion of its adaptive potential against the background of an unfavorable premorbid background [5]. Microscopic examination of the placenta in the main group shows dissociated maturation of chorionic villi in 50% of cases, and premature maturation in 50%, which is manifested by a significant predominance of the number of terminal villi and the appearance of multiple syncytio-capillary kidneys in 73% of cases. An uneven thickness of the syncytiotrophoblast was revealed with the formation of syncytiocapillary membranes in 73% of cases.

Involutive-dystrophic changes in the placenta are statistically significantly more common (92% of cases) in the main group: calcifications - in 72% of cases, thrombosis of the intervillousspace - in 59%, single pseudoinfarctions - in 82%, which are manifestations of placenta aging.

In the main group, circulatory disorders are statistically significant in 72% of cases, fibrinoid deposition in 94%: Langhansstriae are located in the intervillous space in the form of thin stripes, surrounding villi, and in the area of the basal deciducial membrane of the placenta, deposition of Nitabukhfibrinoid is expressed.

CONCLUSION

The morphological structure of the placentas in women with late preterm labor is characterized by involutive-dystrophic changes, as well as the presence of compensatory-adaptive reactions. These morphological changes in the placenta in late preterm labor will make it possible to further provide personalized assistance to women in subsequent pregnancies to prevent preterm labor.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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