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O.V. Garvasiuk, I.S. Davydenko, V.V. Ilika, A.I. Popovych*Department of Pathological Anatomy (head of dep. – prof. I.S. Davydenko) Higher State Educational Establishment of Ukraine “Bukovinian State Medical University”, Chernivtsi City***MORPHOMETRIC PARAMETERS OF PRETERM MATURING OF CHORIAL PLACENTAL TREE AGAINST IRON-DEFICIENCY ANEMIA OF GRAVIDAS IN 29-32 WEEKS OF GESTATION****МОРФОМЕТРИЧНІ ПАРАМЕТРИ ПЕРЕДЧАСНОГО ДОЗРІВАННЯ ХОРІАЛЬНОГО ДЕРЕВА ПЛАЦЕНТИ ПРИ ЗАЛІЗОДЕФІЦИТНІЙ АНЕМІЇ ВАГІТНИХ У 29-32 ТИЖНІ ВАГІТНОСТІ**

Резюме. Вивчені особливості передчасного дозрівання хоріального дерева при анемії вагітних у 29-32 тижні гестації. Отримані дані, що в термін гестації 29-32 тижнів морфометричні параметри хоріального дерева не досягають рівня фізіологічної вагітності. У термін 29-32 тижні, порівняно зі спостереженнями без анемії, є меншим сумарний відсоток термінальних та термінальних “спеціалізованих” ворсинок, але більшим відсоток проміжних незрілих ворсинок.

Ключові слова: передчасне дозрівання хоріального дерева, залізодефіцитна анемія вагітних.

Disorders of the chorial placental tree formation very often underlie pathogenesis of this organ failure [1]. The diagnostics of preterm maturing of the chorial tree is based on finding the fact of its preterm structure as compared to the parameters of a certain gestation period, which can be calculated on the percentage of various types of chorial villi [2]. Preterm maturing of the chorial tree is found in the materials after abortions and during preterm labour. In case of terminal delivery (37-40 weeks of gestation) the chorial tree possesses the signs of much more maturation than in case of physiological pregnancy, and this condition is not called preterm maturing but chorial tree hypermaturity [3]. The labour is considered to be preterm beginning from the full-time 22nd till full-time 36th week of gestation. The frequency of preterm labour according to various literary evidences constitutes 4-20% and it does not have a tendency to decrease. A considerable percentage of preterm labour is the main cause of maternal and fetal loss [4]. At present the influence of iron-deficiency anemia of the gravidas (IDAG) upon the morphology of preterm maturing of the chorial tree is not studied, but only there are observations of an opposite condition available – chorial tree immaturity in case of IDAG [5]. Placental calcification is a common pathologic condition for mature and immature placenta. Calcinoses may have varying degrees of prevalence over placenta. Exchanges of iron and calcium are closely linked. This is especially noticeable during pregnancy when the necessity for

these elements extremely increase [6]. Chorioamnionitis and basal deciduitis are the most frequent among the inflammatory processes of the placenta. According to the world medical data review the prevalence of chorioamnionitis ranges from 2,4 % to 20,5%, basal deciduitis – from 4.8 to 8.9% of gravidas and in case of premature birth the prevalence of the above-noted pathology increases by 1,5 – 3 times [7]. At the same time, the combination of preterm maturing of the chorial tree and IDAG is highly probable, as the frequency of anemia of pregnancy is rather high; it varies from 28% to 84% according to the data of the world statistics [6-8]. In Chernivtsi region, in particular, the frequency of anemia of pregnancy according to the official statistical data of 2010-2013 was within the range of 30,8-31,4%.

Objectives: to find morphometric parameters of preterm maturing of the placental chorial tree in case of iron-deficiency anemia of the gravidas differentially for 29-32 weeks, to conduct a comparative analysis of these parameters using various groups of comparison.

Material and methods. 182 placentas were examined. The design of the research assumed one main group of 29-32 weeks of gestation, and three groups of comparison. The following groups of investigation were formed:

The main group № 1- the examination of combined IDAG and preterm maturing of the chorial tree in 29-32 weeks of gestation.

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The comparison group № 1A – the examination of preterm maturing of the chorial tree without anemia in labour in 29-32 weeks of gestation.

The comparison group № 1B – the examination of IDAG in 29-32 weeks of gestation when the structure of the chorial tree corresponds to the term of gestation.

The comparison group № 1C – the examination without any anemia in 29-32 weeks of gestation when the structure of the chorial tree corresponds to the term of gestation.

In addition, morphometric parameters of physiological pregnancy are estimated. The number of observations for every group of the investigation is presented in Tables 1-2.

Histological examinations were conducted on the base of histological samples stained with hematoxylin and eosin. In every placenta in random fields of vision for 400 chorial villi were studied and classified according to the criteria [2], as the result a percentage ratio between various types of chorial villi was obtained. For every group of examination arithmetic mean and its error were calculated. Digital material was statistically processed by means of the bilateral odd Student criterion. The differences were considered statistically valued with $p \leq 0,05$.

Results and discussion. The Table 1 presents the results of calculation of the chorial tree morphometric parameters in case of physiological pregnancy as a percentage ratio of various types of chorial villi. These parameters are starting points to estimate preterm maturing of the chorial tree. The data obtained demonstrated that physiological pregnancy, that is the term of gestation of 37-40 weeks, is characterized by the domination of chorial villi of a mature structure (terminal, terminal “specialized”, intermediate mature, stem “late”) in the total amount of $94,8 \pm 1,18\%$. These types of the chorial villi indicated do not possess stromal canals in their stroma, Hofbauer cells, mesenchymocytes, but its contain great amounts of fibroblasts, connective tissue fibers, these villi are covered mainly with syncytiotrophoblast, cytotrophoblast are rarely found. Immature types of villi are characterized by the absence of fibroblasts and connective tissue fibers in the stroma, but the presence of stromal canals, Hofbauer cells, mesenchymocytes, the surface of immature villi is covered either with cytotrophoblast (in case of physiological pregnancy it is very rare variant), or with the two layers at the same time – cytotrophoblast and syncytiotrophoblast (the most spread variant for physiological pregnancy), or syncytiotrophoblast.

The Table 2 presents the results of calculation of the chorial tree morphometric parameters in various

Table 1

The Correlation Ratio (%) of Various Types of the Chorial Villi in Case of Physiological Pregnancy (arithmetic mean \pm arithmetic mean error)

| Types of the Chorial Villi | Physiological pregnancy (n=21) |
|-----------------------------------|--------------------------------|
| Stem “early” | 0,1 \pm 0,01 |
| Stem “late” | 4,0 \pm 0,21 |
| Trophoblastic and villous sprouts | 1,1 \pm 0,04 |
| Mesenchymal | 0,4 \pm 0,02 |
| Embryonic | 0,6 \pm 0,02 |
| Intermediate immature | 3,0 \pm 0,14 |
| Intermediate mature | 14,9 \pm 0,83 |
| Terminal | 38,4 \pm 1,14 |
| Terminal “specialized” | 37,5 \pm 1,16 |

groups of the investigation in the term of gestation of 29-32 weeks. The data in this Table shows that in none of the groups of the investigation the degree of maturity of the chorial tree does not achieve the level of physiological pregnancy. Even in case of preterm maturing the total percentage of the mature types of the chorial villi was the following: with IDAG (the main group № 1) – $86,5 \pm 0,84\%$, without anemia (the comparison group № 1A) – $91,0 \pm 0,98\%$ (statistical probability of differences with physiological pregnancy for both groups indicated is considerable, that is – $p < 0,05$). It should be noted that there is difference between the main group № 1 and the comparative group № 1A by this parameter ($p = 0,008$), that is in the term of gestation of 29-32 weeks preterm maturing with IDAG as compared to preterm maturing without anemia is characterized by less degree of maturity. Specifically it is expressed in the fact that in case of IDAG the total percentage of terminal and terminal “specialized” villi is less, but the number of intermediate immature villi is bigger. Besides, in case of IDAG the percentage of trophoblastic and villous sprouts is increased (the sources of new formation of the chorial villi), which might be connected with intensified phenomena of regeneration of the damaged villi in case of IDAG. In general, considerable increase of the total percentage of terminal and terminal “specialized” villi, decrease of the total percentage of the stem and the percentage of embryonic villi is characteristic in the first turn for preterm maturing of the chorial tree in the term of gestation of 29-32 weeks both with IDAG and without anemia. The latter is rather interesting as the embryonic villi differ from the mesenchymal ones, which are precursors of the embryonic ones, by the availability of capillaries. This fact enables to estimate positively the perspective to

Table 2

The Correlation Ratio (%) of Various Types of the Chorial Villi in the Main Group and Comparison Groups in the Term of Gestation of 29-32 Weeks (arithmetic mean \pm arithmetic mean error)

| Types of the Chorial Villi | Main Group №1 (n=18) | Comparison Group №1A (n=19) | Comparison Group №1B(n=20) | Comparison Group №1C (n=21) |
|-----------------------------------|---|-----------------------------|----------------------------|-----------------------------|
| Stem “early” | 0,8 \pm 0,02 p1B<0,001 p1C<0,001 | 0,8 \pm 0,03 | 2,8 \pm 0,14 | 2,4 \pm 0,21 |
| Stem “late” | 3,8 \pm 0,11 p1A=0,011 p1B=0,002 p1C=0,003 | 3,4 \pm 0,10 | 4,8 \pm 0,16 | 5,5 \pm 0,34 |
| Trophoblastic and villous sprouts | 3,4 \pm 0,12 p1A=0,006 | 2,2 \pm 0,09 | 3,4 \pm 0,15 | 3,1 \pm 0,22 |
| Mesenchymal | 0,5 \pm 0,01 p1A<0,001 p1B<0,001 p1C=0,004 | 0,4 \pm 0,01 | 0,7 \pm 0,02 | 0,6 \pm 0,02 |
| Embryonic | 0,9 \pm 0,02 p1A=0,008 p1B<0,001 p1C=0,001 | 0,8 \pm 0,02 | 1,5 \pm 0,08 | 1,4 \pm 0,08 |
| Intermediate immature | 7,9 \pm 0,28 p1A<0,001 p1B=0,003 p1C=0,007 | 4,8 \pm 0,19 | 10,1 \pm 0,39 | 9,6 \pm 0,38 |
| Intermediate mature | 26,5 \pm 0,64 p1B<0,001 p1C=0,001 | 26,4 \pm 0,58 | 38,4 \pm 0,65 | 37,6 \pm 0,92 |
| Terminal | 53,8 \pm 0,98 p1B<0,001 p1C=0,001 | 55,4 \pm 0,97 | 34,9 \pm 0,78 | 36,0 \pm 0,90 |
| Terminal “specialized” | 2,4 \pm 0,15 p1A<0,001 p1B=0,002 p1C<0,001 | 5,8 \pm 0,29 | 3,4 \pm 0,12 | 3,8 \pm 0,14 |

Note 1. p1A – odd probability of the mean values between the main group №1 and the comparison group №1A.

Note 2. p1B – odd probability of the mean values between the main group №1 and the comparison group №1B.

Note 3. p1C – odd probability of the mean values between the main group №1 and the comparison group №1C.

Note 4. In case probability is not indicated in the Table it was more than 0,05.

study the processes of angiogenesis (new formation of the blood vessels) in the chorial tree in case of its preterm maturing.

However, the inflammatory processes of the placenta and placental calcification have not been found during the research.

Conclusion. The peculiarities of preterm maturing of the chorial tree in case of iron deficiency anemia of the gravidas in the term of gestation of 29-32 weeks are the following: in general morphometric parameters of the chorial tree do not achieve the level of physiological pregnancy; the degree of maturity of

the chorial villi is less than in case of preterm maturing of the chorial tree without anemia which is seen in the less total percentage of terminal and terminal “specialized” villi, but more percentage of intermediate immature villi.

Prospects of further investigations are to study the processes of angiogenesis (new formation of the blood vessels) and vascular genesis (rebuilding of the existed vessels) in the chorial villi by means of morphological, histochemical and immunohistochemical methods in case of preterm maturing of the chorial tree.

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МОРФОМЕТРИЧЕСКИЕ ПАРАМЕТРЫ ПРЕЖДЕВРЕМЕННОГО СОЗРЕВАНИЯ ХОРИАЛЬНОГО ДЕРЕВА ПЛАЦЕНТЫ ПРИ ЖЕЛЕЗОДЕФИЦИТНОЙ АНЕМИИ БЕРЕМЕННЫХ В 29-32 НЕДЕЛИ БЕРЕМЕННОСТИ

Резюме. Изучены особенности преждевременного созревания хоріального дерева при анемии беременных в 29-32 недели гестации. Получены данные, что в срок гестации 29-32 недели морфометрические параметры хоріального дерева не достигают уровня физиологической беременности. В срок гестации 29-32 недели, в сравнении с наблюдениями без анемии, наблюдается меньший суммарный процент терминальных и терминальных “специализированных” ворсинок, но большим процент промежуточных незрелых ворсинок.

Ключевые слова: преждевременное созревание хоріального дерева, железодефицитная анемия беременных.

MORPHOMETRIC PARAMETERS OF PRETERM MATURATION OF CHORIAL PLACENTAL TREE AGAINST IRON-DEFICIENCY ANEMIA OF GRAVIDAS IN 29-32 WEEKS OF GESTATION

Abstract. Peculiarities of preterm maturation of the chorial tree against anemia of gravidas in 29-32 period of gestation were studied. The evidence obtained is indicative of the fact that morphometric parameters of the chorial tree don't achieve the level of physiological pregnancy in both periods of gestation of 29-32 weeks. Less overall percentage of terminal and terminal “specialized” villi is observed in the term of gestation of 29-32 weeks, but the percentage of intermediate immature villi increased as compared to cases without anemia.

Key words: preterm maturation of chorial tree, iron-deficiency anemia of gravidas.

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