



IDENTIFICATION OF MORPHOLOGICAL CHANGES IN THE DIFFERENTIATION PROCESSES OCCURRING IN THE OVARY IN THE EARLY POSTPARTUM PERIOD

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Abstract:

This article is devoted to the identification of morphological changes that occur in the histotopography of the ovaries in girls in the early postpartum period. As a material, the ovaries of girls whose abdomen died of asphyxia and pneumopathy were studied using methods of general histology, histochemistry and morphometry. It was noticed that in the cortical layer of the ovary of newborns, rudimentary eggs are located in a dense state, follicular structures are formed as a result of the proliferation of granulose cells in the areas bordering the stratum corneum, and between them, i.e. in the interstitium, there are pregranular and celemic cells of different densities. It was found that by the age of 3 months in infants, the primary eggs in the ovarian mucosa are thinning, most of them undergo degenerative and destructive changes, bundles of fibrous connective tissue are formed in the intermediate tissue. From the earliest postpartum period, infants experience destruction and atresia of a part of the embryonic eggs that perform a reproductive function in the ovary, granulosis and proliferation of cells of the uterine tissue in the intermediate tissue.

Keywords: infant, ovary, histology, histochemistry, histotopography, primary egg, atresia.

ERTA POSTNATAL DAVRDA TUXUMDONDA YUZ BERADIGAN DIFFERENTSIALLANISH JARAYONLARNI MORFOLOGIK O'ZGARISHLARINI ANIQLASH

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Annotatsiya. Ushbu maqolada qiz bola chaqaloqlar erta postnatal davrida tuxumdon gistotopografiyasida yuz beradigan morfologik o'zgarishlarni aniqlashga bag'ishlangan. Material sifatida qorinichi asfiksiya va pnevmopatiyalardan o'lgan qiz chaqaloqlarning tuxumdoni umumiy gistologiya, gistoximiya va morfometriya usullarida o'rganilgan. Yangi tug'ilgan chaqaloqlar tuxumdonining po'stloq qavatida zich holda primordial tuxum hujayralari joylashganligi, mag'iz qavatga chegara sohalarida granulez hujayralar proliferatsiyalanishidan follikulyar tuzilmalar paydo bo'lishi va ularning orasida, ya'ni interstitsiyasida har xil darajada zichlikdagi pregranulez va selemik hujayralar o'rin egallaganligi kuzatildi. Chaqaloqlarning 3 oylik davriga kelib tuxumdon po'stloq qavatida primordial tuxum hujayralar siyraklashib, aksariyati degenerativ va destruktiv o'zgarishlarga uchraganligi, oraliq to'qimasida tolali biriktiruvchi to'qima tutamlari paydo bo'lganligi aniqlandi. Chaqaloqlarning ilk postnatal davridan boshlab tuxumdonida reproduktiv vazifani bajaradigan



primordial tuxum hujayralarning bir qismi destruksiyanib, atreziyalanishi, oraliq to'qimasida granulez va teka to'qima hujayralarining ko'payishi kuzatildi.

Kalit so'zlar: chaqaloq, tuxumdon, gistologiya, gistoximiya, gistotopografiya, primordial tuxum hujayra, atreziya.

ВЫЯВЛЕНИЕ МОРФОЛОГИЧЕСКИХ ИЗМЕНЕНИЙ ПРОЦЕССОВ ДИФФЕРЕНЦИРОВКИ, ПРОИСХОДЯЩИХ В ЯИЧНИКЕ В РАННЕМ ПОСТНАТАЛЬНОМ ПЕРИОДЕ

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Резюме. Эта статья посвящена выявлению морфологических изменений, которые происходят в гистотопографии яичников у девочек в раннем послеродовом периоде. В качестве материала изучались яичники девочек, живот которых умер от асфиксии и пневмопатий методами общей гистологии, гистохимии и морфометрии. Было замечено, что в корковом слое яичника новорожденных в плотном состоянии располагаются зачатковые яйцеклетки, фолликулярные структуры образуются в результате пролиферации гранулезных клеток в пограничных с роговым слоем областях, а между ними, т. е. в интерстиции, находятся прегранулезные и целемические клетки различной плотности. Установлено, что к 3-месячному возрасту у младенцев первичные яйцеклетки в слизистой оболочке яичников истончаются, большинство из них претерпевает дегенеративные и деструктивные изменения, в промежуточной ткани образуются пучки фиброзной соединительной ткани. С самого раннего послеродового периода у младенцев наблюдается деструкция и атрезия части зародышевых яйцеклеток, выполняющих репродуктивную функцию в яичнике, гранулез и пролиферация клеток тековой ткани в промежуточной ткани.

Ключевые слова: младенец, яичник, гистология, гистохимия, гистотопография, первичная яйцеклетка, атрезия.

The ovary is a paired organ that performs two important functions: a reproductive function — the formation of female gametes, and an endocrine function — the synthesis of sex hormones. According to the scientific literature we reviewed, there is a structural-metabolic relationship between the activity of the oocyte and the follicular tissue. The endocrine function also depends on the morphofunctional state of the primary oocyte, follicular epithelium, theca tissue, and the corpus luteum.

During the 5th week of embryogenesis, the ovary begins to develop from the coelomic epithelium, mesenchyme, and gonocytes. The coelomic epithelium gives rise to the follicular epithelium and corpus luteum cells. The mesenchyme forms the connective tissue of the ovarian stroma and the theca tissue surrounding the follicles. From the gonocytes, oogonia are first differentiated, followed by primary (I) and secondary (II) oocytes [1,2,3,4,5,13,14,15].

By the 6th week of embryogenesis, primordial germ cells accumulate between the coelomic epithelium and penetrate the mesenchyme in the form of cords. By

the 7th week, the ovary exits the indifferent stage and enters the stage of female gonad formation. Starting from the 12th week, the outer layer of ovarian tissue thickens due to the proliferation of gonocytes and coelomic epithelium.

From the 12th to the 20th week, the ovarian cortex divides into sexual lobules in the form of cords composed of proliferating gonocytes and pre-granulosa cells. During this period, the ovarian interstitial tissue shows the appearance of theca cells, represented by small, oval nuclei with basophilic staining [1,2,6,7,11,13,14,15].

In the further course of ovarian development, some germ cells undergo degeneration, primordial follicles are formed, and in areas near the medulla, mature follicles appear. By the 32nd week, fully mature follicles are formed, in which granulosa cells form 6–8 layers and are surrounded by a capsule composed of inner theca tissue.

RESEARCH OBJECTIVE. The scientific literature contains virtually no data on the histotopographic changes occurring in the ovary during

different periods of postnatal ontogenesis in newborns [3,6,7,8,13,14,15]. Therefore, the aim of this study was to perform a histological examination of the ovaries of newborns and infants up to 3 months of age who died from various causes, and to clarify the histological changes occurring in the tissue structures responsible for reproductive and endocrine functions during the early postnatal period.

MATERIALS AND METHODS. The study material consisted of ovaries from 98 newborns and infants up to 3 months of age who died from intrauterine asphyxia, pneumopathy, and pneumonia. The ovaries were bisected along the midline, and the cut surfaces were fixed upward in 10% neutral buffered formalin for 48 hours. The specimens were then washed in running water for 2–4 hours, dehydrated in a series of alcohols of increasing concentration and in chloroform, embedded in paraffin, and tissue blocks were prepared.

From the paraffin blocks, histological sections 5–7 μm thick were prepared and stained with hematoxylin-eosin (H&E). Fibrous structures of connective tissue within the ovarian tissue were visualized using the Van Gieson method with picosirius red staining, and acidic glycosaminoglycans were stained with Alcian blue. The histological specimens were examined using a binocular light microscope, analyzed, and the necessary areas were photographed.

RESEARCH RESULTS. Histological examination of the ovaries of newborns revealed that the cortical substance is fully formed, while the peripheral regions of the medulla are diffusely arranged and represented by primordial primary oocytes of nearly uniform size. The outer ovarian capsule is relatively thin and consists of connective tissue fibers with an eosinophilic structure.

Beneath the outer capsule, granulosa and coelomic cells were observed, showing signs of edema and degeneration. It was found that the structures represented by primordial oocytes and cortical follicles

become sparser and relatively larger in size as they approach the medulla (Figure 1).

Characteristic differences were also noted in the structure of the stromal tissue and the cells located between the follicles. In the cortical substance, connective tissue cells and fibers between primordial follicles are relatively few and sparsely arranged, whereas in the inner cortical zone and in the medulla, the connective tissue cells in the interstitial tissue are numerous and exhibit hyperchromatic staining.

In the cortical substance, atretic follicles are observed between the primordial follicles, the structural elements of which are intensely stained with hematoxylin in a dark blue color, indicating the development of calcification.

When examining the primordial oocytes and cortical follicles of the ovary under high magnification, the following results were obtained. In some primordial structures, an oocyte with a large nucleus and relatively hyperchromatic cytoplasm is present (Figure 2), surrounded by a single layer of granulosa cells.

In most primordial structures, a homogeneous eosinophilic material without a nucleus is observed, with sparse granulosa cells showing disrupted layering located at the periphery. In the interstitial spaces between primordial oocytes, relatively large clusters of pre-granulosa and coelomic cells are found in certain areas, while in other regions they are few in number and sparsely arranged.

The blood vessels of the interstitial tissue are represented by small capillaries, most of which are fully perfused.

Microscopic examination of the ovaries of 3-month-old girls, compared with newborns, revealed the following morphological changes. Primordial oocytes located in the ovarian cortex are more sparsely arranged due to the development of edema in the interstitial tissue. They also show histotopographic variability, acquiring diverse sizes and shapes.

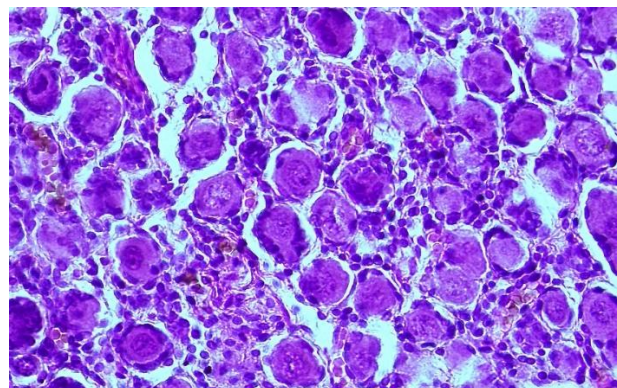
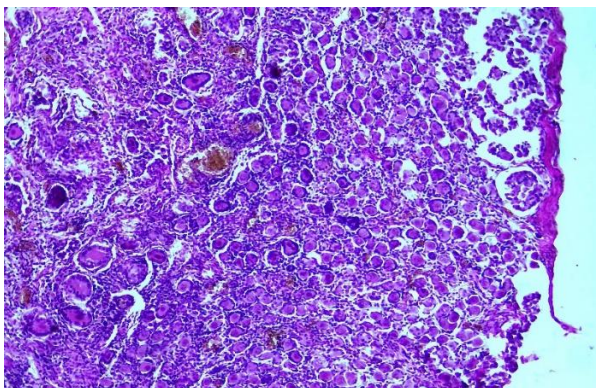


Figure 1. Ovary of a newborn child, cortical substance fully covered with primordial oocytes and follicles. Staining: H&E (hematoxylin-eosin). Magnification: 10×10.

Figure 2. Ovary of a newborn child: some primordial structures contain an oocyte, while others consist of eosinophilic material. Staining: H&E (hematoxylin-eosin). Magnification: 10×40.

Primordial structures containing oocytes are more intensely stained with eosin compared to others, and their nuclei exhibit hyperchromasia when stained with hematoxylin. Primordial oocytes with such histological features can be considered as undergoing atresia, since the granulosa cells surrounding them externally also show signs of degeneration and pathological changes.

In addition, the blood vessels of the interstitial tissue are tortuous, and diapedetic hemorrhages are observed around some of them. Unlike the previous period, certain areas of the interstitial tissue show proliferation of fibrous connective tissue. Pre-granulosa and coelomic cells, in contrast to the ovaries of newborns, are arranged in clusters of varying size.

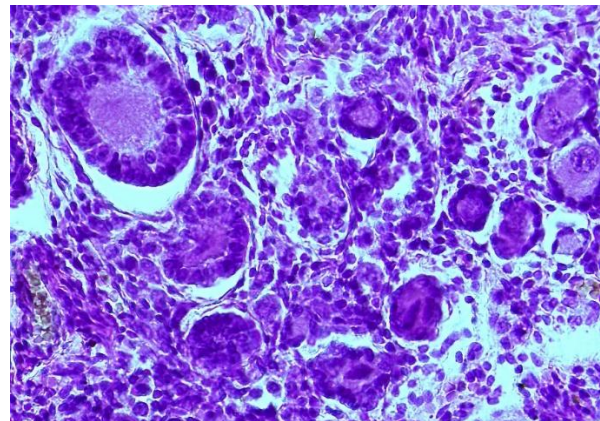
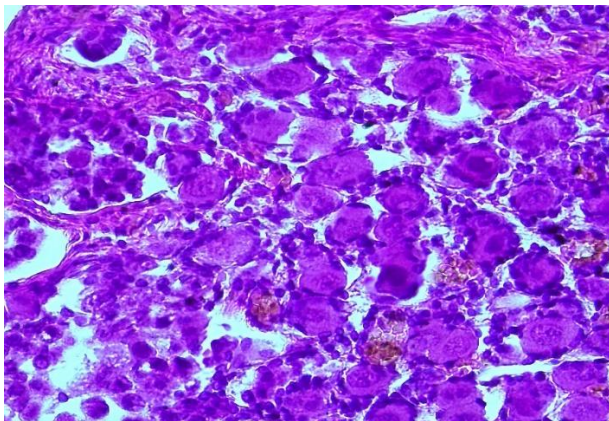


Figure 3. Ovary of a three-month-old child: primordial oocytes have undergone various types of degenerative and destructive changes. Staining: H&E (hematoxylin-eosin). Magnification: 10×40.

Figure 4. Ovary of a three-month-old child, cortical–medullary boundary: some primordial follicles are enlarged and have formed cyst-like structures. Staining: H&E (hematoxylin-eosin). Magnification: 10×40.

Histological examination of the boundary between the cortical and medullary regions of the ovary in a 3-month-old girl revealed the following findings. Unlike in newborns, in this area primordial follicles are fewer in number and more sparsely arranged; in some, cyst-like structures form due to proliferation of granulosa cells.

Most of the primordial follicles in this zone exhibit characteristic pathological changes: in some, the central oocyte undergoes destruction and disappears, while the surrounding granulosa cells experience various types of pathological alterations and are arranged irregularly. In other follicles, proliferation of granulosa cells leads to their compaction and the formation of conglomerates; in some cases, the overgrowth of granulosa cells results in structures resembling follicles of various sizes.

The interstitial tissue of this ovarian region also exhibits specific pathological changes (Figure 4). The

interstitial tissue is expanded due to edema and cellular infiltration; pre-granulosa and coelomic cells actively proliferate, forming abundant cellular infiltrates. Pre-granulosa and granulosa cells are concentrated around the primordial follicles, forming clusters. At the same time, coelomic cells in the interstitial tissue are relatively sparsely distributed, and fibrous connective tissue proliferation is noted around the blood vessels.

CONCLUSION. In the cortical substance of the ovaries of newborns, primordial oocytes are densely arranged; at the boundary with the medulla, follicular structures form due to proliferation of granulosa cells, and pre-granulosa and coelomic cells of varying density are present in the interstitial tissue between them.

By three months of age, the primordial oocytes in the cortical substance become more sparsely distributed, most of them undergo degenerative and destructive changes, and bundles of fibrous connective tissue appear in the interstitial tissue.



From the early postnatal period, a portion of the primordial oocytes responsible for reproductive function undergo destruction and atresia, while the number of granulosa and theca cells in the interstitial tissue increases.

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