Histol Histopath (1986) 1: 251-254

Histology and Histopathology

The ovaric lobule: a histoembryological unit

Mario Alberto Vestfrid

Department of Pathology, Hospital Zonal General de Agudos "Dr. Ricardo Gutierrez" de La Plata, Argentina

Summary. Microscopic study of newborn female ovaries showed a constant and characteristic architectonic pattern on the surface area of the organ cortex. This pattern consisted of units that have been called "ovaric lobules" and that are made up of the various cellular types involved in the formation of the gonad (oocytes, cells derived from surface epithelium and connective-vascular elements). These structural units might be the site where synchronization or coordination for development and maturation of the successive groups of follicles occurs in post-natal life.

Key words: Ovary-Female genital tract-Embriology

Introduction

The human ovary undergoes deep morphological changes from its origin in intrauterine life up to its regressive atrophy during menopause. In the last months of foetus development and during the neonatal period the follicle layout in relation to interstitial cells and connective-vascular elements is such that it gives rise to the temporary appearance of very typical units or "lobules". This microscopic aspect, which disappears with further development of the gonad, apparently has a fundamental importance in the mechanisms of growth coordination and maturation of the various groups of follicles (Merchant and Zamboni, 1972).

The purpose of this paper is to describe the morphological characteristics of the so-called "ovaric lobule" making special mention of the probable histophysiological importance that these units may have in the future function of the organ in post-natal life.

Offprint requests to: Dr. Mario Alberto Vestfrid, Department of Pathology, Hospital Zonal General de Agudos Dr. Ricardo Gutierrez, Diag. 114 entre 39 y 40, 1900, La Plata, Argentina

Materials and methods

This research was carried out by analysing semi-seriated microscopic sections of 17 newborn ovaries from necropsies performed in the Pathology Service of the Hospital Zonal General de Agudos "Dr. Ricardo Gutierrez" of La Plata.

The material was fixed in a 10% formalin solution, embedded in paraffin and slides stained with haematoxylin and eosin.

Results

In the various sections analysed, a very peculiar microscopic aspect was noticed at the ovary cortex, characterized by lobulation, or arrangement of the various structural elements that, in architectonic units, make up the cortex (Figs. 1, 2). These units or "lobules" are composed of a central mass of oocytes which are surrounded and separated from other similar units by thin connective-vascular septs or partitions the surfaces of which are in contact with invaginations of the surface epithelium of the organ, which are called "crypts" (Motta, 1974). From these crypts, it was possible to observe proliferation of solid cellular cords that became thicker in the cortex (Fig. 3) and that were in relation with the septs or partitions mentioned above. These proliferant cords, formed by cellular elements originating in the surface epithelium, tended to project into the lobules interspersing with the oocytes lying in the center of these units. This microscopic image, constant at this stage of development, was noticed in the surface areas of the ovary cortex whereas, in the deep area and especially in the area next to the organ medulla,

it disappeared as a consequence of the gradual proliferation and increase of the stromal component that gradually fragmented the lobules and separated one oocyte from another until the classical image of primordial follicles developed (Fig. 3).

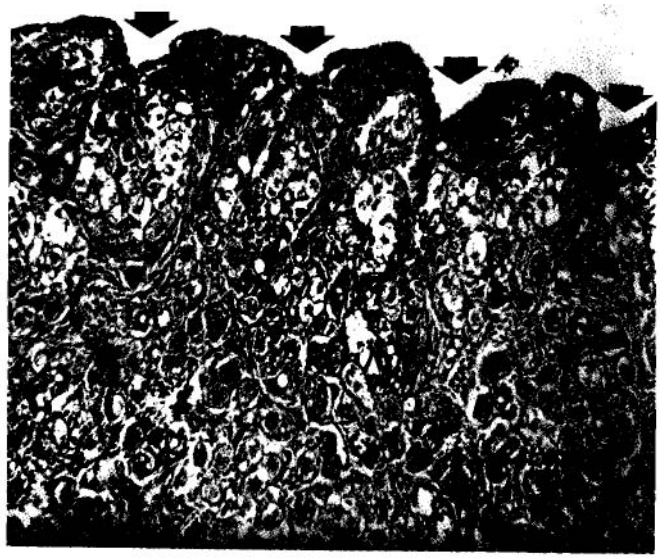

Fig. 1. In a panoramic view, the ''lobulized''appearance can be clearly seen in the surface area of the ovary cortex in a newborn child. On the other hand, in depth, each primordial follicle acquires typical characteristics (lower half of the picture). The arrows show the various "crypts". H.E. x 60

Fig. 2. Greater magnification showing, in the centre, an "ovaric lobule" marked with arrows at the surrounding connective-vascular septs. Oocytes in contact among themselves without interference from other structures can be clearly seen. H.E. x 150

Fig. 3. Arrow shows how cellular cords proliferate and become marked as from a crypt in the underlying stroma. Note typical image of primordial follicles in the area next to the organ medulla (lower part of picture). H.E. x 120

Discussion

As has already been reported (Vestfrid, 1977), a newborn ovary shows intense proliferating activity. In fact, not only is growth and maturation of the follicle constant but there is also marked activity of the surface epithelium jointly with progressive increase of the connective-vascular elements derived from gonadal mesenchyma. From this intricate proliferating activity and trough arrangement of the various structural components, a very particular aspect of lobulation or distribution in architectonic units, that has been given the name of "ovaric lobules", appeared at the level of the developing ovary cortex.

In order for the concept of ovaric lobule to be clearly understood, there follows a brief history of embryological development especially emphasizing the stages that may be distinguished in the process.

From the embryological point of view the ovary originates from three different cellular components: primordial germinal cells, coelomic epithelium and mesenchyma (Hamilton and Mossman, 1973). The gonad develops by interaction of these cellular groups and three stages may be distinguished which partly overlap even though they have their own individual characteristics: colonization, organization and compartimentalization. (Zamboni et al., 1980).

The first stage, colonization, is characterized by migration of the primordial germinal cells from their endodermic origin in the vitelline sac (Valdes-Dapena, 1979) and by their invasion of the gonadal crest, thus constituting the undifferentiated gonad stage (Novak and Woodruff, 1974).

In the second, or organization stage, a series of inductive or cellular interaction phenomena starts among the various cellular components that give origin to the ovary, causing its septalization. This gives rise to the appearance of a characteristic architectonic pattern. At this stage the ovary cortex acquires the lobulized aspect Shown in Figures 1 to 3.

Finally, in the third and last stage, compartimentalization of the gonad takes place, together with fragmentation of the lobules and formation of the primordial follicles (Reeves, 1980).

Even though overlap is slight between the first and second stages, it is marked between the second and the third, since it occurs during a large portion of the process. In fact, whereas in the surface of the ovary cortex, the typical lobular pattern of the second stage is noticed, in its depth, typical primordial follicles are seen near each other at first but then gradually separate from each due to the progressive increase of the stromal tissue of the organ. This characteristic is typical of the third or

compartimentalization stage from which follicular and stromal compartments of the ovary cortex develop (Reeves, 1980).

As can be seen, the second or organization stage and its morphological characteristcs, with its typical architectonic pattern is not visible throughout the whole development of the ovary even though it occurs in a large portion of it. For this reason, the lobular aspect is clearly evident in the last months of intrauterine life, continues through part of the neonatal period and then, from the strictly morphological point of view, gradually disappears (Zamboni et al., 1980).

As has been mentioned in detail, the three cellular types that give origin to the gonad are involved in the constitution of the "ovaric lobule" and, as a synthesis, it may be said that each lobule or unit is formed by a group of oocytes surrounded by cells originating at the ovary surface epithelium and separated from other nearby units by connective-vascular septs or partitions.

Although the existence of these lobules is temporary and short-lived from the morphological point of view, they may, nevertheless, prove to be of histophysiological importance, even if this cannot be determined at present.

From work carried out in mammals, it has been demonstrated that there are tubules connecting granulosa cells of two or more follicles and some authors suppose that these could serve as a means of synchronization of the growth and maturation of the various groups of follicles, in spite of such connections not having been found in the adult animal (Merchant and Zamboni, 1972).

Our point of view somewhat coincides with that of those authors since there is great similarity in the morphological appearance of the findings reported in this paper and those described by other researchers as regards various mammal species, namely, the temporary connection or relation existing among follicle groups.

References

Hamilton W.J. and Moosman H.W. (1973). Embriologia Humana-Desarrollo de la forma y la funcion. 4td ed. Inter-Médica. Buenos Aires.

Merchant H. and Zamboni L. (1972). Presence of connections between follicles in juvenile ovaries. Am. J. Anat. 134, 127-132.

Motta P. (1974). Superficial epithelium and surface invaginations in the cortex of mature rabbit ovaries: a note on the histogenesis on the interstitial cells. Fertility and Sterility 25, 336-347.

Novak E.D. and Woodruff J.D. (1974). Gynecologic and Obstetric Pathology. 7th ed. W.B. Saunders Company. Philadelphia. pp 355-357.

Reeves G. (1980). Stromal and follicular compartments of the ovary. In: Endocrine Phisiopathology of the ovary (Proceedings of the International Symposium on Endocrine Physiopathology of the Ovary held in Rosario, Argentina, 23-26 May, 1979). Elservier/North-Holland Biomedical Press, Amsterdam. pp 137-150.

Valdes-Dapena M.A. (1979). Histology of the fetus and newborn. W.B. Saunders Company. Philadelphia. pp 433-467.

Vestfrid M.A. (1977). Una contribución a la histologia del ovario de la recien nacida (Trabajo de Adscripcion). Biblioteca de la Facultad de Ciencias Médicas de la Universidad Nacional de La Plata.

Zamboni L., Upadhyay S., Bezard J., Luciani J-M and Mauleon P. (1980). The role of the mesonephros in the development of the mammalian ovary. In: Endocrine Physiopathology of the ovary (Proceedings of the International Symposium on Endocrine Phisiopathology of the Ovary held in Rosario, Argentina, 23-26 May, 1979). Elservier/North-Holland Biomedical Press, Amsterdam. pp 3-42.

Accepted May 12, 1986