Histology and Histochemistry of the Ovary during Pregnancy and in the Postpartum Period

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SUMMARY

A study of ovarian histology during pregnancy and the puerperium is presented. The relationship of the findings to both physiological and pathological situations is discussed.


A complex glandular structure of the mammalian ovary has long been surmised. The terms 'thecal gland' and 'interstitial gland' have been used to designate different stages in the development and function of cells derived from the theca interna of the developing follicle.

In 1955, Shippel postulated that the hyperthecosis syndrome could follow on an otherwise normal pregnancy, especially when breast feeding was not practised. The ultimate fate of the hyperplastic theca interna cells, which are observed during pregnancy, is not known. These cells have been observed by a number of workers. Govan thought they were degenerative when he observed them in late pregnancy, whereas Guraya, reporting on transmission electron microscopy studies in 1973, considered them to be functional. The behaviour of these cells in the puerperium could be significant in disturbances of ovarian-uterine bleeding during this period. It was, therefore, decided to examine histologically and histochemically biopsy specimens obtained from the ovarian cortex of pregnant and postpartum women who also required surgery.

MATERIALS AND METHODS

Forty-one biopsies were carried out on cortical tissue taken at Caesarean sections and at abdominal pelvic operations performed at different times in the postpartum period. Specimens obtained from 16 patients were stored in liquid nitrogen for later enzymic study. The remainder of the specimens were fixed in 10% formal-saline and sectioned at 8 μm prior to their being stained with basic haematoxylin and eosin. The histochemical studies included: (i) the oil red O methods for neutral fat; (ii) the fast TR-azo dye coupling method for alkaline phosphatase; (iii) MTT method for glucose-6-phosphate dehydrogenase; (iv) a test for 3β-ol-dehydrogenase. Of the 41 specimens for biopsy, 16 were obtained in late pregnancy, 9 during the first week of the puerperium and the remainder after the first week postpartum up to 11 weeks. Histochemical studies were performed in 6 of the pregnant group and in 10 of the postpartum group.

RESULTS

The most significant findings were related to the theca interna and the corpora atretica fibrosa. All specimens obtained in late pregnancy and the first week of the puerperium contained hyperplastic zones in the theca interna. These areas were devoid of granulosa cells and thus could be said to have originated from atretic follicles, but their vascularity and enzymic activity indicated a possible functional role. Tissue enzyme studies were not performed on any of the patients seen during the first week of the puerperium, but the histological appearance of the ovarian tissue examined during this period was very similar to that seen during pregnancy. After the first week, postpartum hyperplastic zones of the theca...
interna were observed in only 6 patients. One was observed on day 9 of the puerperium and the remainder between the 6th and 11th weeks postpartum. The presence of particulate lipid and enzymic activity were observed in 4 of the 6 patients. Of considerable interest was the fact that breast feeding was not practised by any of the 6 women. In 2 of these, endometrium was also available for study and this revealed the presence of cystic glandular hyperplasia with atypical subnuclear vacuolation. A further feature was the presence of large, usually multiple corpora atretica fibrosa in 12 of 16 specimens. Twelve of the 16 specimens were obtained in the period after the first week postpartum. As these fibrous bodies were multiple, they had probably not originated in old corpora lutea, but rather from rapid atresia of larger follicles. Primordial follicles were noted with varying frequency in the sections studied. In sections obtained from 22 of the 41 biopsy specimens, less than 5 primordial follicles were noted.

DISCUSSION

Hyperplasia of the theca interna of developing and atretic follicles was observed in all specimens obtained in late pregnancy and the first week of the puerperium. Most of the follicles observed were atretic with absent granulosa zones. Chorionic gonadotrophin (HCG) is probably responsible for the persistence and hyperplasia of the theca interna cells in pregnancy, and since HCG takes about a week to disappear from the circulation, its effects on the ovaries may continue to be observed in the first week of the puerperium. A situation analogous to hyperstimulation after gonadotrophin therapy does not develop, however, during normal pregnancy. This effect may result from the low circulation levels of follicle-stimulating hormones observed during pregnancy. Although hyperplastic, many of the ovarian follicles appear to be of the atretic type and seldom enlarge to more than 4 mm in diameter.

The 6 cases of persistent hyperplasia of the theca interna, all occurred in non-lactating women. It is possible that the ovaries during lactation may be refractory to stimulation. Lactation may, therefore, assist follicular atresia to result in ovarian involution.

In another unpublished study, endometrial hyperplasia was found in 9 of 155 endometrial specimens obtained in the postpartum period. Exogenous hormones were excluded from these cases. Eight of the 9 patients with hyperplasia were non-lactating, while 79 of the remaining 146 normal postpartum endometrial specimens, came from non-lactating women. The chi-square for the relationship between postpartum endometrial hyperplasia and the absence of milk secretion is 4.17 on 1 df, which is significant at the 95% level.

The variability of primordial follicle counts in these cases suggests the unreliability of ovarian biopsy as a method for assessing ovulatory potential in patients presenting with secondary amenorrhoea.

CONCLUSIONS

Failure of involution of the puerperal ovaries may be a sequel to failure of lactation, and endometrial hyperplasia may result from the persistence of the active zones of the theca interna. This phenomenon could account for some cases of postpartum endometrial haemorrhage and for the cases of postpartum hyperthecosis observed by Shippel in 1955.

REFERENCES