CONTRIBUTION OF OVARIAN FOLLICULAR TISSUE ABNORMALITIES INTO THE DEVELOPMENT OF OVARIAN DYSFUNCTION

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Ultrastructural, in vitro radioautographic, and stereological study of the morphogenesis of ovarian cystic formations in women of reproductive age distinguished ovariopathy as a common pathological phenomenon, developing as a result of the ovarian follicular cell regenerative and plastic insufficiency syndrome. Degenerative dystrophic changes in the follicular compartment, reduced biosynthetic reactions in the follicular cells, and reactive sclerosis of the stroma remodulate the parenchyma-stromal relationships.

Key Words: ovarian dysfunction; laparoscopic biopsy of ovaries; electron microscopy; in vitro radioautography

The greater part of modern studies of ovarian dysfunction is focused on mutations of genes, involved in normal development of the ovaries and/or follicles. It was shown on experimental models that these mutations caused a wide spectrum of phenotypical restructuring of the follicles from ovarian dysgenesis to gonadotropic resistance [6,12]. Hence, modern diagnostic strategy is aimed at the search for genetic causes of ovarian dysfunction [7,11,13,14] detected, together with other methods, by electron microscopy [11,12].

In addition to genetic factors, ovariotoxic epigenomic factors play an important role in the development of ovarian diseases [1,10]. The incidence of dystrophic degenerative processes progressively increases, which is caused by exposure to a complex of unfavorable factors, including the toxic ones. Degenerative transformation and the resultant organ dysfunction were detected in respiratory, gastrointestinal, and excretory organs and skin [3]. Follicular cell degeneration with subsequent reduction of their number can be regarded within the framework of this process.

We carried out a complex pathomorphological analysis of ovarian biopsy specimens in ovarian dysfunction in order to clear out the morphogenesis of cystic transformation.

MATERIALS AND METHODS

A complex clinical endoscopic and pathomorphological study was carried out in 82 women aged 20-37 years with cystic changes in the ovaries: 53 patients with ovarian cysts (follicular and endometrioid) and 29 with the polycystic ovarian syndrome. The main clinical syndromes were infertility, menstrual dysfunction (primarily hypomenstrual syndrome, dysmenorrhea, and secondary amenorrhea). Common clinical studies, dynamic ultrasonic examination, measurements of gonado-
tropic and sex hormones in the blood and peritoneal fluid, endoscopic laparoscopy with biopsy of the involved and “intact” ovaries were carried out. In addition, comparative retrospective analysis of the results of surgical treatment was carried out in two groups of patients after resection of the ovaries (40 cases) and resection combined with omento-ovariopexy (42 cases), regarded as a method improving innervation and vascularization of the ovaries [2].

Ovarian biopsy specimens were studied by light and electron microscopy, in vitro radioautography, and stereological analysis. Paraffin sections were stained with hematoxylin and eosin with Perls reaction, by the method of van Gieson with post-staining of elastic fibers by Weigert resorcin-fuchsin, and PAS reaction was carried out. Specimens for electron microscopy were treated routinely and embedded into epon-araldite mixture. Semithin sections were contrasted with uranyl acetate and lead citrate and examined under a JEM 1010 electron microscope at accelerating voltage of 80 kV. Thin sections were stained with 1% azur II solution; ultrastructural changes in the primordial and maturing follicular epithelium and cystic atresia of maturing forms.

Cystic transformation was characterized by stereotypical ultrastructural changes in follicular cells: reduction of the protein-synthesizing and mitochondrial compartments, presence of filamentous structures and formation of residual structures (Fig. 1, a), poorly manifest zona pellucida, and reduction of the microvilli (Fig. 1, b), which reflected reduced contact area between the follicular epithelium and oocyte. Oocyte ultrastructure contained no signs of intensive gamete growth stage: poor development of the protein-producing cytoplasmic organelles, few small mitochondria, reduction of Golgi complexes, and absence of cortical granules were noted (Fig. 1, c).

Resection in combination with omentoovariopexy led to reduction in the number of degenerative primordial and primary follicles. Cystic atresia of the follicular system was combined with compensatory theca interna hyperplasia. Restructuring of the connective tissue with predominance of the matrix over fibrous structures and intensification of the organ vascularization were seen in the cortical stroma.

In addition, changes in the intracellular organization of the somatic and gamete compartments were detected in the follicles at stage 1 of maturation. Proliferation of follicular cells (Fig. 1, d) was noted, filamentous structures were replaced with free ribosomes in epitheliocytes, the number of elements of the granular endoplasmic reticulum and mitochondria increased (Fig. 1, e), which reflects induction of intracellular regeneratory reactions and together with the findings of light microscopy could be interpreted as reduction of the follicular cell dystrophy. Hyperplasia of folliculocyte microvilli increased the area of contact between the oocyte and follicular epithelium; zona pellucida components accumulated and transosomes were visualized against its background. Improvement of the gamete nutrition caused hyperplasia of the Golgi complexes and accumulation of the cortical granules (signs of partial recovery of the gamete intense growth stage; Fig. 1, f).

Recovery of the menstrual cycle and reproductive function was more incident in patients with retained follicular system in comparison with the patients with significant reduction of the follicular compartment and pronounced stromal sclerosis. On the whole, the results of treatment positively correlated with the type of structural changes in the ovaries.