

**MORPHOLOGICAL AND FUNCTIONAL FEATURES OF POLYCYSTIC OVARIES****Mukhitdinova Khurshida Samikhovna**

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Polycystic ovarian syndrome (PCOS) is a chronic condition in which a woman does not ovulate or rarely ovulates, i.e. a mature egg does not leave the ovary for fertilization by sperm.

Otherwise, this condition is called polycystic ovarian syndrome, or Stein—Leventhal syndrome. It is accompanied by reproductive disorders (inability to conceive and have a child), metabolic disorders and psychological problems.

PCOS is the most common endocrine disorder that occurs in 5-20% of girls of childbearing age [3]. It is indicated by the presence of any two main criteria: excess of male sex hormones produced in the ovaries — manifests itself in the form of external signs (seborrhea, "male-type" hair loss, acne, hair loss) and/or laboratory increase in androgen levels; prolonged non-occurrence of ovulation (oligoovulation) or its complete absence; distinctive polycystic changes in the ovaries, detected by ultrasound [1][2].

There are two most significant theories of PCOS development:

1. Theory of disruption of hormone production regulating the ovaries in the hypothalamus and pituitary gland. These areas of the brain are responsible for its neuroendocrine activity and the work of the whole organism.

2. The theory of insulin resistance is a decrease in the sensitivity of body cells to insulin, followed by a violation of glucose metabolism and its entry into cells [3][4].

Both theories explain the complaints and laboratory changes that occur in patients with polycystic ovaries.

The contribution of genetic factors to the development of PCOS is also discussed. In particular, we are talking about genes that are involved in the formation or action of male sex hormones, the transmission of the insulin signal and metabolism, the formation of follicles in the ovary and other processes [4][23]. For example, a woman has a 30-50% risk of developing PCOS if her mother or sister has polycystic ovaries [3].

Symptoms of polycystic ovary

The signs of polycystic ovary disease include:

- irregular menstrual cycle;
- abnormal uterine bleeding;
- infertility;
- symptoms of hyperandrogenism — excess of male sex hormones;
- overweight or obese (body mass index of 25.0 or higher);

- black acanthosis — dark brown patches in the skin folds of the neck, armpits, and groin (an optional sign of insulin resistance) [5];

- Psychological and psychosexual disorders;
- eating disorders (overeating) [1].

An irregular menstrual cycle is understood to mean:

- cycle duration of more than 90 days in the first year after the onset of menarche — the first menstruation;

- cycle duration is less than 21 days or more than 45 days from the 1st to the 2nd year after the onset of menarche;

- cycle duration of less than 21 days or more than 35 days or less than 8 cycles per year in women of childbearing age (i.e., from the 3rd year after menarche to menopause) is most often observed;

- the initial absence of menstruation at the age of 15 (primary amenorrhea) or their absence for more than three years from the onset of breast development (telarche) [1].

In 20% of women with polycystic ovaries, the menstrual cycle is not disrupted, while ovulation does not occur. Therefore, it is wrong to judge the presence of ovulation only based on the regularity of the cycle [5]. Abnormal uterine bleeding occurs when the thickened endometrium (the inner layer of the uterus) is not completely and irregularly rejected. At the same time, the bleeding becomes more abundant and prolonged.

Infertility, according to some literature data, is 15 times more common in women with polycystic ovaries compared with women without this pathology [3]. However, in 70-75% of cases, it is primary (if pregnancy has never occurred) and is associated with the presence of cycles in which ovulation has not occurred [4].

The symptoms of an excess of male sex hormones include:

- seborrhea — increased sebum formation on the scalp, face, anterior surface of the chest, back, shoulders;

- hirsutism — excessive growth of dark coarse hair in the upper lip, chin, chest, back and abdomen, inner thighs;

- acne (acne) is a disease of the sebaceous glands of the skin associated with blockage of their outlet ducts;

Androgen-dependent alopecia is a progressive hair loss that begins on the crown or temples and spreads to the parietal and occipital regions.

- These changes in appearance, as well as excess weight, are quite difficult for women and girls with polycystic ovaries to accept. Because of this, they often experience symptoms of moderate to severe anxiety and depressive disorder [1].

## Pathogenesis of polycystic ovaries

Ovarian follicles are peculiar biological capsules containing eggs. The processes of their maturation and further transformations are regulated by many hormones. The leading regulators are follicle-stimulating and luteinizing hormones produced by the pituitary gland, FSH and LH.

- FSH regulates the growth and development of follicles along with maturing eggs, promotes the formation of estradiol in the follicles, a female sex hormone (a type of estrogen), which is formed from testosterone, the male sex hormone. The larger the size of the follicle, the more estrogens it produces [4].

- Normally, in the middle of the menstrual cycle, under the influence of estradiol accumulated in the follicles, the maximum release of FSH occurs along with a sharp increase in LH levels. Due to these peaks, the largest mature (dominant) follicle ruptures and releases an egg, potentially ready for fertilization. This process is called ovulation. Peak increases in LH and FSH are very important for its adequate launch, rather than a long-term chronic increase in these hormones. [3][4][6].

- Under the influence of the PH peak, the process of transformation of the accumulated follicle into a yellow body, a temporary endocrine gland, is triggered. It produces progesterone—a hormone necessary for the fixation of a fertilized egg in the uterine cavity. LH also stimulates the formation of androgens, male sex hormones, in the ovary.

- If the egg is not fertilized by sperm, the corpus luteum gradually decreases and reduces progesterone production. As a result, this leads to the onset of menstruation — the rejection of the inner layer of the uterus (endometrium), which is not useful for attaching a fertilized egg.

- One of the reasons for the development of PCOS is the genetically programmed excessive production of LH, occurring ahead of time, while maintaining low-normal levels of FSH. The increased concentration of LH stimulates the excessive formation of male sex hormones — testosterone and androstenedione. Their excess disrupts the development of follicles, leading to their premature degradation (degeneration into a corpus luteum) and the formation of small follicular cysts in their place, which can be detected during ultrasound.

- The absence of a dominant follicle leads to the inability to ovulate (hence infertility) and the inability to form a corpus luteum, the source of progesterone production. Therefore, in the second phase of the cycle, there is a low level of progesterone in the blood. This, in turn, is the reason for the absence of endometrial rejection — the cessation of menstruation or a long delay in its onset. The absence of rejection of the inner layer of the uterus can lead to its overgrowth, i.e. endometrial hyperplasia. This disorder is a risk factor for cancer.

An excess of androgens can to some extent be converted into estrogens (mainly not into estradiol, but into estrone, another female sex hormone). Estrone further stimulates an increase in LH. This is how this pathological process closes and self-sustains.

Another reason for the development and progression of PCOS is considered to be genetically programmed disorders of the production and action of insulin with the formation of insulin resistance — insufficient tissue response to its action.

Insulin is a hormone that regulates the metabolism of carbohydrates, as well as fats and proteins. It has an anabolic (growth) effect on many organs and tissues. Due to a decrease in tissue sensitivity to it, the effect of the hormone becomes insufficient, which may be accompanied by an increase in blood glucose levels. In an attempt to lower sugar levels, insulin production increases, i.e. excess insulin is detected in the blood when glucose levels are not low.

Insulin is able to stimulate the growth of follicle cells that produce androgens. In addition, excess insulin in the liver reduces the production of the hormone globulin (SHBG).

Normally, it binds some of the male sex hormones, preventing them from exerting their function. A decrease in the amount of SHBG leads to an increase in free testosterone in the blood, which further enhances the manifestations of hyperandrogenism — acne, hirsutism, alopecia, etc. [10].

#### Classification and stages of development of polycystic ovaries

The main criteria for polycystic ovaries include the absence of ovulation or its rare occurrence, hyperandrogenism and polycystic ovarian changes [2]. Depending on them, PCOS is classified into the following types::

- classic type — all three criteria are present (occurs in 46% of cases);
- ovulatory type — ovulation is preserved, while there is only clinical or laboratory hyperandrogenism with signs of polycystic ovary on ultrasound (occurs in 23% of cases);
- nonandrogenic type — signs of hyperandrogenism are not observed, but there is no ovulation and there are ultrasound characteristics of polycystic ovaries (occurs in 18% of cases);
- anovulatory type — there is no ovulation, there are signs of hyperandrogenism (it is less common in 13% of cases) [6][11].

Depending on the complaints that come to the fore and related treatment approaches, there are three types of PCOS:

- metabolic type, in which metabolic disorders predominate (type 2 diabetes mellitus, overweight, impaired cholesterol metabolism);
- hyperandrogenic type, in which cosmetological problems associated with an excess of male sex hormones (acne, increased hair loss, etc.) come to the fore;

• reproductive type, in which the main complaints are problems of conception and bearing a child [11].

Complications of polycystic ovary disease

PCOS leads to the following disorders:

1. Metabolic syndrome is a correctable disorder that combines obesity with two or more criteria.:

2. increased blood glucose  $\geq 5.6$  mmol/l or the presence of type 2 diabetes mellitus;

3. high blood pressure ( $\geq 130/85$  mmHg) or hypertension;

4. Blood triglyceride level  $\geq 1.70$  mmol/L;

5. Blood HDL cholesterol (high-density lipoproteins)  $< 1.3$  mmol / L or treatment with drugs to normalize blood lipids.

6. Gestational diabetes mellitus is diabetes that occurs during pregnancy.

7. Fatty liver hepatosis is an excessive accumulation of fat in the liver in people who do not abuse alcohol, associated with insulin resistance.

8. Hypertension is a persistent increase in blood pressure.

9. Obstructive sleep apnea syndrome is the collapse of the respiratory tract with stopping or weakening of breathing during sleep. It leads to the development of various metabolic and vascular disorders. It is manifested by the presence of snoring, daytime sleepiness, fatigue, and mood disorders [1].

10. Diseases of the cardiovascular system:

11. vascular atherosclerosis — deposition of cholesterol and other lipids in the walls of the arteries;

12. Coronary artery disease is a partial or complete blockage of atherosclerotic plaques in the arteries supplying blood to the heart.;

13. myocardial infarction — necrosis of the heart muscle due to acute blood flow disorder;

14. stroke is an acute violation of cerebral circulation, etc. [10].

15. Increased blood clotting with the formation of blood clots, which can clog the lumen of the vessels of various organs.

16. Oncological burden.

17. Endometrial hyperplasia is an overgrowth of the inner layer of the uterus. At the same time, women with polycystic ovaries have an increased risk of developing endometrial cancer (2-6 times), which often occurs before menopause. [1][4][12].

18. Depression, the main sign of which is a decrease in mood, self-esteem and the ability to have fun.

Therefore, patients with PCOS are recommended to be screened for anxiety and depressive disorders. The Beck scale is the most convenient. Depending on the results, you may need to consult a psychiatrist who will help you decide whether you need medication or psychotherapeutic support.

The main cause of most of these complications is insulin resistance, which, in the case of PCOS, is present in 95% of obese or overweight women, as well as in 75% of normal—weight women [13]. It underlies the development of prediabetes, type 2 diabetes, obesity, hypertension and hypercholesterolemia, which, in turn, lead to the development of cardiovascular diseases.

Thus, in the presence of insulin resistance, prediabetes can eventually develop in half, and type 2 diabetes mellitus in a third of patients with polycystic ovaries [12]. Among other things, insulin resistance in the case of PCOS is considered as a small trigger for the development of Alzheimer's disease — senile dementia [12][14].

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