

Polycystic Ovary Syndrome: Anatomy, Mechanisms of Development, Diagnosis, and Treatment

Bizhanova Diora Kairatovna ¹, Nurimova Dilorom Majidovna ²

¹ Student of the Faculty of Medicine, Tashkent State Dental Institute, Tashkent

² Scientific Advisor, Lecturer, Tashkent State Dental Institute, Department of Anatomy

Abstract:

Polycystic ovary syndrome (PCOS), also known as Stein-Leventhal syndrome, is one of the most common endocrine disorders in women of reproductive age. The condition is characterized by multiple cystic changes in the ovaries, menstrual irregularities, hyperandrogenism, and metabolic disorders. This article examines the anatomical and physiological features of healthy ovaries and those affected by PCOS, alongside the key mechanisms underlying the pathology. The importance of early diagnosis and modern treatment approaches is emphasized.

Keywords: endocrine disorders, reproductive age, polycystic ovary syndrome, menstrual irregularities, hyperandrogenism, metabolic disorders, anatomical and physiological features of ovaries.

Relevance

According to studies, polycystic ovary syndrome (PCOS) affects approximately 8–13% of women of reproductive age, causing significant hormonal disturbances and difficulties in conception [1]. This condition has a profound impact on women's health and quality of life, increasing the risk of chronic diseases such as type 2 diabetes, cardiovascular conditions, and cancer. An in-depth exploration of the genetic, endocrine, and metabolic aspects of PCOS highlights its medical significance [2].

Main Content

1. Normal Anatomy and Functions of the Ovaries

The ovaries are paired female reproductive glands located on either side of the uterus. Their primary functions include synthesizing sex hormones (estrogens, progesterone, and androgens) and producing and ovulating mature eggs. Normally, ovaries are oval-shaped and measure 3–5 cm in length, consisting of cortical and medullary layers. The cortical layer contains follicles at various stages of development, facilitating egg maturation, while the medullary layer comprises connective tissue, blood vessels, and nerves.

Under normal conditions, the ovaries functionally adapt to hormonal changes occurring during the menstrual cycle, ensuring regular ovulation [3].

The structural organization of the ovarian cortex is critical for follicular development, as oocyte maturation is closely tied to its efficient functioning [16]. Recent research highlights the essential role of the medullary vascular network in transporting hormonal signals and nutrients to developing follicles, ensuring their viability and growth [17].

2. Anatomical Changes in Polycystic Ovaries

In PCOS, the ovaries enlarge (exceeding 10 cm³) and develop multiple cysts (10 to 25) ranging from 2 to 9 mm in diameter, typically located peripherally. Follicular maturation is arrested at the pre-ovulatory stage, leading to cyst accumulation.

The process of ovulation is disrupted due to an excess of androgens and a deficiency of luteinizing hormone (LH) [4].

In polycystic ovary syndrome (PCOS), hormonal changes occur. There is an increase in androgen levels, including testosterone and dehydroepiandrosterone.

The ratio of luteinizing hormone (LH) to follicle-stimulating hormone (FSH) is imbalanced, which negatively affects ovarian function and leads to an increase in ovarian volume [5].

Ovaries affected by this condition also undergo structural changes. Thickening of the ovarian capsule is observed, which hinders ovulation.

Additionally, there is an increase in stromal tissue along with hyperplasia of theca cells, which further stimulates androgen production [6].

3. Key Mechanisms of PCOS Development

Hereditary gene mutations associated with androgen synthesis and insulin sensitivity play a significant role [7].

Insulin resistance also plays a crucial part. In 70% of patients, decreased tissue sensitivity to insulin is observed, which exacerbates hyperandrogenism and contributes to cyst formation [8].

Chronic inflammation activates androgen synthesis and disrupts the follicular growth process [9].

A sedentary lifestyle and dietary habits contribute to the development of metabolic disorders, further worsening the overall condition [11].

In addition to genetic, metabolic, and inflammatory factors, hormonal dysregulation remains a key aspect of the pathophysiology of polycystic ovary syndrome (PCOS). Recent studies highlight changes in gonadotropin signaling pathways and their interaction with insulin resistance, leading to impaired ovarian function [12].

New findings also point to the role of endocrine disruptors in the pathogenesis of polycystic ovary syndrome. These chemical substances, present in the environment, can interfere with hormonal

regulation and amplify insulin resistance, particularly in individuals with a genetic predisposition [14].

4. Diagnosis and Treatment

The diagnosis of the disease is carried out according to the Rotterdam criteria (2003), which require the presence of two out of three signs: (1) ovulatory dysfunction, (2) hyperandrogenism, (3) polycystic ovaries detected by ultrasound.

The main diagnostic methods used to confirm the diagnosis are:

- Blood test for female sex hormones (estrogen, prolactin, FSH, LH)
- Blood test for male sex hormones (testosterone, androstenedione, dehydroepiandrosterone sulfate)
- Blood test for cortisol (stress hormone)
- Blood test for glucose, insulin, and TSH
- Ultrasound of the ovaries to assess their enlargement, as well as the number and size of cysts, and changes in ovarian structure.

Treatment includes:

- Medication (hormonal therapy, insulin sensitizers)
- Lifestyle changes (diet, physical activity)
- Surgical (laparoscopic ovarian drilling for severe cases) [10].

Laparoscopic ovarian drilling is a method where small puncture holes are made in the thickened ovarian capsule without incisions, using small punctures in the abdominal wall.

A more comprehensive approach to treating polycystic ovary syndrome involves addressing the cardiovascular risks associated with the condition, as women with PCOS are more likely to have hypertension and lipid metabolism disorders [13].

In addition to traditional treatment methods, significant attention is given to preventing long-term metabolic consequences, such as diabetes and obesity. Comprehensive metabolic monitoring and early interventions may reduce risks associated with PCOS in the long term [15].

Conclusion

Polycystic ovary syndrome (PCOS) is a widespread condition that causes hormonal and metabolic disturbances. Timely diagnosis and comprehensive treatment can help manage the disease's progression and prevent complications such as infertility and type 2 diabetes.

References:

1. Teede H. et al. (2018). "International guidelines for the assessment and management of PCOS." Human Reproduction Update.
2. Azziz R. et al. (2020). "Polycystic ovary syndrome: A review." Nature Reviews Disease Primers.
3. Norman R. et al. (2021). "Understanding the physiology of ovarian function in PCOS." Reproductive Medicine Journals.
4. Rotterdam ESHRE/ASRM (2003). "Revised criteria for PCOS diagnosis." Human Reproduction.
5. Goodman N. et al. (2019). "Insulin resistance and PCOS: new insights." Endocrinology Journal.

6. Legro R. et al. (2020). "Ovarian morphology in PCOS: current perspectives." *Journal of Clinical Endocrinology*.
7. Franks S. et al. (2021). "Genetics of PCOS: what have we learned?" *Trends in Endocrinology and Metabolism*.
8. Dunaif A. et al. (2022). "Insulin action in the pathogenesis of PCOS." *Metabolism Journal*.
9. Moran L. et al. (2020). "Role of inflammation in PCOS." *Fertility and Sterility*.
10. Palomba S. et al. (2023). "Surgical treatment of PCOS: risks and benefits." *Gynecological Surgery*.
11. Joham A. et al. (2023). "Lifestyle interventions and their impact on PCOS outcomes." *Obesity Reviews*.
12. Zhao Y. et al. (2022). "Advances in understanding the hormonal regulation of PCOS." *Endocrine Reviews*.
13. Wild R. et al. (2021). "Cardiovascular risks associated with PCOS." *American Journal of Obstetrics and Gynecology*.
14. Diamanti-Kandarakis E. et al. (2018). "The role of endocrine disruptors in PCOS pathogenesis." *Endocrine Journal*.
15. Marshall J. et al. (2023). "Long-term metabolic outcomes in women with PCOS." *Diabetes and Metabolism Research Reviews*.
16. Stouffer R. et al. (2022). "Ovarian follicular development and function in health and disease."
17. Johnson M. et al. (2021). "Structure-function relationships in ovarian physiology."