

Polycystic Ovary Syndrome: A Comprehensive Review of Pathophysiology, Diagnosis, and Management

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Key points:

- Introduction to PCOS
- Pathophysiology
- Clinical Presentation
- Diagnostic Criteria: Based on Rotterdam Criteria (2 out of 3 features)
- Individualized Management and Treatment
- Long-Term Risks and Associated Complications

Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders, affecting 5-15% of women worldwide, making it a significant public health concern. It is characterized by irregular menstrual cycles, hyperandrogenism, and polycystic ovarian morphology. PCOS is associated with several metabolic and reproductive complications, including insulin resistance, obesity, infertility, and an increased risk of cardiovascular disease.

The exact etiology remains unclear and is believed to involve a complex interplay of genetic, environmental, and lifestyle factors, leading to a diverse clinical presentation. Early diagnosis and effective management are effective to reduce long-term complications.¹

This article provides an in-depth discussion of the pathophysiology, symptoms, diagnosis, management, and potential complications of PCOS, supported by recent research and clinical guidelines.

Pathophysiology of PCOS

The exact cause of PCOS remains unknown, however, a principal component in its pathophysiology is the imbalance of hypothalamus-pituitary-ovarian (HPO)

axis, particularly the abnormal activation of Hypothalamic gonadotrophic-releasing Hormone (GnRH). GnRH neurons serve as a regulatory hub, integrating signals from both reproductive and metabolic systems.

One of the hallmark features of PCOS is hyperinsulinemia, which enhances ovarian androgen production, contributing to anovulation and menstrual irregularities. Increased luteinizing hormone (LH) secretion further stimulates androgen synthesis, resulting in clinical features such as hirsutism, acne, and alopecia.²

Clinical Presentation

PCOS presents with a range of symptoms, including menstrual irregularities (oligomenorrhea or amenorrhea), hyperandrogenism (acne, hirsutism, and androgenic alopecia), metabolic disturbances (insulin resistance and obesity), infertility due to anovulation, and psychological effects such as anxiety and depression.³

Symptoms often vary between individuals and may evolve over time

Diagnosis

PCOS is diagnosed based on the Rotterdam Criteria, requiring at least two of the following three features:

1. Oligo- or anovulation
2. Clinical and/or biochemical signs of hyperandrogenism.
3. Polycystic ovaries on ultrasound (>12 follicles in each ovary or increased ovarian volume).

It is essential to exclude other differential diagnoses, including thyroid disorders, hyperprolactinemia, and congenital adrenal hyperplasia, before confirming PCOS diagnosis.

Management and Treatment

PCOS management should be individualized based on symptom severity and reproductive goals.

1. Lifestyle Modifications

A healthy diet, regular physical activity, and weight loss can significantly improve insulin sensitivity and hormonal balance.

2. Pharmacological Interventions

- Combined oral contraceptives (COCs): Regulate menstrual cycles and reduce androgenic symptoms.
- Anti-androgens (e.g., spironolactone): Help manage hirsutism and acne.
- Metformin: Enhances insulin sensitivity and may assist with weight reduction
- Ovulation induction (e.g., clomiphene citrate, letrozole): For women seeking fertility

3. Cosmetic & Supportive Therapies

Laser hair removal and topical treatments can improve dermatologic symptoms.

Psychological support may also be essential, as many patients experience anxiety or depression.

Complications of PCOS

If inadequately managed, PCOS can lead to various long-term health complications, including infertility and pregnancy complications, such as an increased risk of miscarriage, gestational diabetes, and pre-

eclampsia. Metabolic disorders are also common and may include insulin resistance, type 2 diabetes, dyslipidemia, and hypertension. In addition, women with PCOS face elevated cardiovascular risks, with a higher likelihood of developing cardiovascular diseases. Another significant concern is the risk of endometrial cancer, which arises due to prolonged anovulation and unopposed estrogen exposure.

Conclusion

PCOS is a multifaceted disorder requiring a holistic, multidisciplinary approach for effective management. Early diagnosis and personalized interventions can significantly enhance quality of life and prevent long-term complications.

Ongoing research is vital to unravel the genetic and molecular mechanisms underlying PCOS, with the hope of developing more targeted and effective therapies.⁴

References

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