



THE IMPORTANCE OF HORMONAL ASSESSMENT IN MEDICINE

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Abstract.

This study examines the prognostic and pathogenesis-related importance of various hormones in reproductive health and endocrine disorders. Anti-Müllerian hormone (AMH) is demonstrated to be a key marker that protects the ovarian reserve from premature depletion and predicts the onset of menopause as well as the success of IVF. In assessing risks to female reproductive health, total thyroxine ($T_4 > 100$ nmol/l) and cortisol (< 215 nmol/l) are shown to possess high prognostic value, while the diagnostic utility of anti-TG and anti-TPO is determined to be moderate. In men, a strong correlation is established between hypothyroidism and decreased testosterone levels, which is proven to be a contributing factor to vascular disorders (erectile dysfunction) and structural alterations of the prostate gland. Furthermore, it is reported that the hormone melatonin is synthesized not only in the pineal gland but also in numerous peripheral tissues (intestines, liver, thyroid gland, etc.) following a distinct 24-hour rhythm.

Keywords: AMH, total thyroxine, cortisol, hypothyroidism, erectile dysfunction, testosterone, melatonin, extratopic synthesis.

Relevance of the Problem

In modern medicine, reproductive pathologies and infertility problems caused by hormonal imbalances are increasing year by year. The pathogenesis-related links between premature ovarian reserve depletion in women, erectile dysfunction in men, and thyroid diseases (hypothyroidism), as well as the diagnostic value of specific hormonal markers (AMH, T_4 , cortisol), have not yet been fully systematized. Additionally, the synthesis of melatonin in peripheral tissues requires a novel approach to studying hormonal rhythms. Therefore, a comprehensive investigation into the close interconnections between hormones and their impact on reproductive health is of paramount relevance.

- **"Preservation" (Protection) of Primordial Follicles:** AMH prevents sleeping (primordial) follicles in the ovaries from entering the growth phase prematurely and uncontrollably. In other words, it acts as the primary "brake" that protects the ovarian reserve from early depletion.

- **Protection against FSH:** It shields growing follicles from the excessive stimulating effects of follicle-stimulating hormone (FSH).

- **Ovarian Reserve Indicator:** Based on its blood levels, AMH is considered the most fundamental and reliable marker indicating the remaining egg reserve in a woman's ovaries.

- **Predicting the Onset of Menopause:** AMH levels consistently decline with age. Based on its concentration in the blood, it is possible to accurately predict when a woman will enter menopause, even several years in advance.

• **Determining Success in IVF Programs:** In artificial insemination procedures, it helps predict how many oocytes can be retrieved from the ovaries during stimulation.

Total thyroxine (T₄) levels above approximately 100 nmol/l indicated that the woman belongs to a high-risk group regarding reproductive health (with an absolute prognostic value of AUROC = 1.0). The prognostic significance of autoantibodies against thyroglobulin and thyroid peroxidase (anti-TG and anti-TPO) was found to be moderate; therefore, their utility as markers for the risk of reproductive health disorders is limited. Cortisol levels demonstrated exceptionally high significance as a marker for reproductive health disorders, characterized by an AUROC value of 0.982 in the zone of values below approximately 215 nmol/l.

Thus, a hypothyroid state (decreased thyroid function) was identified in the majority of patients with erectile dysfunction (ED) accompanied by a decline in total testosterone, proving to be the primary (dominant) underlying cause of these disorders. A hypothyroid state in men is a statistically reliable cause leading to impaired blood supply to the penis (via venous and corporo-venous ED types), the exact mechanism of which requires further elucidation in the future.

In patients with hypothyroidism and low total testosterone levels, structural alterations of the prostate gland, specifically its "flattening," are more frequently observed. A tight correlation is noted between the hypothyroid state, decreased levels of sex hormones, and the severity of vascular disorders in the pathogenesis of ED.

For a long time, it was believed that melatonin was synthesized exclusively in the pineal gland. In recent years, researchers have refuted this consensus.

Melatonin concentration varies across different cellular compartments. Moreover, the 24-hour rhythm of melatonin in peripheral tissues differs from the pineal rhythm. Researchers have demonstrated the synthesis of melatonin by the retina, respiratory epithelium, skin, intestines, liver, kidneys, thyroid gland, thymus, spleen, immune system cells, and endothelium. The enzymes responsible for its synthesis have been identified in almost all of these tissues.

Conclusion

Based on the conducted research, the following final conclusions were reached:

1. Anti-Müllerian hormone (AMH) protects the ovarian reserve from premature depletion by inhibiting the growth of primordial follicles, and serves as the most reliable marker to accurately predict the onset of menopause and the success of IVF.
2. In the early identification of risk groups in female reproductive health, total thyroxine (T₄ > 100 nmol/l) and cortisol (< 215 nmol/l) indices possess high prognostic value (with AUROC scores of 1.0 and 0.982, respectively).
3. In men, hypothyroidism (decreased thyroid function) was proven to be the primary factor causing a decline in testosterone levels, impaired penile blood circulation (venous ED), and structural alterations ("flattening") of the prostate gland.
4. It was confirmed that melatonin is synthesized not only in the pineal gland but also in numerous peripheral tissues of the body (intestines, liver, thyroid gland, etc.) based on an independent 24-hour rhythm.

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