

The Role of Hormonal Imbalance in Female Pattern Baldness: Pathophysiology and Management

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Introduction

Female Pattern Baldness, also known as female androgenetic alopecia, is a common cause of hair loss in women, particularly after menopause. Unlike male pattern baldness, which is more commonly linked to genetic factors and hormonal influences, FPB involves complex interactions between genetic predisposition, hormonal imbalances, and environmental factors. This article reviews the pathophysiology of FPB, focusing on the role of hormonal imbalances, and explores current management strategies. Hair loss in women is a significant concern that can affect psychological well-being and quality of life. Female Pattern Baldness is characterized by diffuse thinning, usually beginning at the crown or the frontal scalp. The condition can result in significant emotional distress, particularly because hair is often associated with femininity and attractiveness. Hormonal changes, especially those related to androgens, are increasingly recognized as important contributors to FPB. This article aims to discuss the pathophysiological mechanisms underlying FPB with a focus on hormonal imbalances and to evaluate the available management options. The pathogenesis of FPB is multifactorial, with hormonal, genetic, and environmental factors playing pivotal roles. Hormonal imbalances are thought to be the most significant driver of hair thinning in women with FPB, particularly fluctuations in androgen levels. Androgens, including testosterone, dihydrotestosterone, and dehydroepiandrosterone, are hormones that typically contribute to male-pattern hair loss. In women, the levels of androgens increase during periods such as puberty, pregnancy, and menopause. Even though women have lower levels of androgens compared to men, the sensitivity of hair follicles to these hormones can be a key factor in FPB.

Dihydrotestosterone, a potent metabolite of testosterone, is considered the most critical androgen in the development of androgenetic alopecia. DHT binds to androgen receptors on hair follicles, leading to the miniaturization of these follicles, a hallmark of FPB. Hair follicles become progressively smaller, and the growth phase (anagen) shortens, while the resting phase (telogen) is prolonged, resulting in thinner, shorter, and less dense hair. A significant risk factor for FPB is menopause, which marks a period of profound hormonal changes.

Description

Estrogen, a hormone with a protective effect on hair follicles, declines during this time, allowing the effects of androgens to become more prominent. In women experiencing perimenopause or menopause, there is a noticeable

increase in hair thinning, particularly in the frontal and crown regions of the scalp. Estrogen normally counteracts the effects of androgens on hair follicles. During menopause, when estrogen levels decline, the unopposed action of androgens can promote hair thinning. In postmenopausal women, the ovaries produce less estrogen and more testosterone, which may be converted to DHT in peripheral tissues, exacerbating hair loss.

Another condition often associated with FPB is polycystic ovary syndrome. Women with PCOS often have elevated levels of androgens, particularly testosterone, which contributes to symptoms such as hirsutism (excessive hair growth) and female pattern baldness. Hyperandrogenism in PCOS leads to increased DHT levels, causing hair follicle miniaturization and thinning on the scalp. In addition to hormonal imbalances, genetic predisposition plays a significant role in FPB. Women with a family history of androgenetic alopecia are more likely to develop the condition. Environmental factors such as stress, diet, and medication use can also impact the severity of FPB, though their effects may be secondary to hormonal influences. The presentation of FPB typically involves diffuse thinning over the crown and frontal scalp. Unlike male-pattern baldness, FPB does not usually result in complete baldness but rather a gradual thinning that may be noticed over time. Women often report increased shedding, which may worsen during periods of hormonal changes such as pregnancy, postpartum, or menopause.

Managing FPB requires a multifaceted approach, focusing on addressing the underlying hormonal imbalances and stimulating hair growth. A combination of pharmacological, cosmetic, and lifestyle interventions is often needed. Several treatment options have been approved for use in FPB, with varying levels of efficacy and safety. The most widely used treatment for FPB is topical minoxidil, which has been shown to stimulate hair regrowth. Minoxidil is believed to work by prolonging the anagen phase of the hair cycle, thereby improving hair density and reducing shedding.

For women with FPB, particularly those with elevated androgen levels, anti-androgens such as spironolactone or finasteride are commonly prescribed. Spironolactone blocks androgen receptors and reduces the conversion of testosterone to DHT, helping to slow hair loss and promote regrowth. However, due to its potential teratogenicity, it is contraindicated in pregnant women. For postmenopausal women, estrogen replacement therapy may help reduce hair thinning by restoring the protective effects of estrogen on hair follicles [1-3]. However, the use of ERT is typically reserved for women with more severe menopausal symptoms, due to the associated risks, such as increased cardiovascular disease and cancer risks. In cases where medical management is insufficient, hair transplantation may be considered. This involves the extraction of hair follicles from a donor area (typically the back of the scalp) and transplanting them to areas of thinning or baldness. Hair transplantation can provide permanent, natural-looking results but is often costly and requires skilled surgical intervention. PRP therapy has gained popularity as a non-surgical treatment for FPB. It involves injecting the patient's own platelet-rich plasma into the scalp to stimulate hair follicle growth. Although research is still ongoing, preliminary studies suggest that PRP can help to rejuvenate hair follicles and promote hair regrowth [4,5].

Conclusion

In addition to pharmacological treatments, certain lifestyle changes may help manage FPB, Ensuring adequate intake of nutrients that support hair

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health, such as biotin, zinc, and iron, may help reduce the impact of hair thinning. Chronic stress can exacerbate hair loss, so engaging in stress-reducing activities such as yoga, meditation, and regular exercise may help mitigate FPB. Chemical treatments, heat styling, and tight hairstyles can damage hair and exacerbate thinning. Female Pattern Baldness is a complex, multifactorial condition often driven by hormonal imbalances, particularly during periods of significant hormonal changes such as menopause or in conditions like PCOS. Understanding the pathophysiology of FPB, particularly the role of androgens and estrogen, is critical for developing effective management strategies. While treatments like minoxidil, anti-androgens, and hair transplant surgery are commonly used, a holistic approach involving pharmacological, cosmetic, and lifestyle interventions is often the most effective. Future research into the hormonal pathways and new therapeutic options will be key to improving outcomes for women suffering from this condition.

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Conflict of Interest

None.

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