

# REVIEW OF CURRENT KNOWLEDGE AND MANAGEMENT OF ANDROGENETIC ALOPECIA

LAURA FUS-MAZURKIEWICZ<sup>1</sup>, JUSTYNA SAK<sup>2</sup>, MICHAŁ NOWIŃSKI<sup>3</sup>,  
DOMINIKA KRÓL<sup>4</sup>, WOJCIECH MAZURKIEWICZ<sup>1</sup>,

<sup>1</sup> Wojskowy Szpital Kliniczny z Polikliniką SPZOZ w Lublinie,

<sup>2</sup> Krakowski Szpital Specjalistyczny im. św. Jana Pawła II w Krakowie

<sup>3</sup> Wojskowy Szpital Kliniczny z Polikliniką SPZOZ w Krakowie, Polska

<sup>4</sup> Wojewódzki Szpital Specjalistyczny im. Marii Skłodowskiej Curie w Zgierzu

E-mail: laura.fus@mail.com

## Abstract

Androgenetic alopecia is a disease in which hair loss occurs due to miniaturization of hair follicles. It is a complex cosmetic as well as social, health and economic problem. It leads to a reduced quality of life for patients and contributes to the development of other disorders. The purpose of this paper is to review the available knowledge on treatment methods for this condition.

To analyse the key publications, we searched English-language databases: Google Scholar, PubMed and available reference materials and textbooks, analysing only publications published after 2012. 31 articles were analysed, using the keywords: "androgenetic alopecia", "management", "therapy".

The problem of androgenetic alopecia affects both men and women. It is caused by the negative effects of DHT on the hair papilla, leading to a reduction in hair thickness and number. Current treatment guidelines for this condition focus on the use of oral and topical medications, transplantation or laser therapy. Oral finasteride is effective in reducing the negative effects of DHT on the hair follicle. Recent reports suggest the benefits of using finasteride topically, so that side effects are kept to a minimum. When applied topically, minoxidil contributes to an increase in anagen hair. Dutasteride used orally has similar effects to finasteride. Study results indicate its superiority over finasteride. Research indicates the effectiveness of mesotherapy in the treatment of androgenic alopecia, using, among others, platelet-rich plasma, PDRN and dutasteride.

**Key words:** androgenetic alopecia, management, therapy

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## Introduction and objective

Androgenetic alopecia is a form of non-scarring hair loss associated with the miniaturization of hair follicles, affecting predisposed individuals [1]. It is not only a cosmetic problem, but also a social, health problem (it can arise as a result of a number of diseases including PCOS, hormonal disorders) and an economic problem. Those affected are prone to a higher incidence of depression and anxiety [2]. Studies indicate a reduced quality of life for patients and a greater need for psychological and psychosocial support, which generates costs for the health care system [3,4]. The purpose of this paper is to analyse and compare the available knowledge and management of androgenetic alopecia. This is necessary to popularize the current therapeutic options in androgenetic alopecia, to identify the most effective treatment regimens and to guide further research. To analyse the key publications, we searched Google Scholar, PubMed and available reference

materials and textbooks, analysing only works published after 2013. 33 papers in English and Polish were used, using the keywords: "androgenetic alopecia", "management", "therapy".

## Discussion

### Definition and epidemiology

Androgenetic alopecia is the most common cause of hair loss in both men and women. It is a dermatological hair disease in which the hair follicles miniaturize in successive hair cycles, particularly in the frontal, parietal and on the top of the head. Over the years, this leads to the conversion of terminal hair to a mesquite form. In men, the disease begins with thinning in the parietal region and on top of the head (Hamilton pattern baldness). This type of baldness in women does not involve the frontal line, but the top of the head. In this area, there is diffuse thinning of the hair, which is demonstrated by widening of the parting (alopecia according to the Ludwig pattern). The condition is sometimes mistakenly

associated only with the male gender, as it can develop in both sexes. The prevalence among Caucasians is 80% of men and 42% of women. Among males, the disease has a genetic basis, while among women the causes are not clear, although genes are responsible for the early development of the disease. In the pathogenesis of androgenetic alopecia in men, dihydrotestosterone (DHT) plays a major role, negatively affecting the hair papilla. As a consequence, the volume of the hair papilla is reduced, the anagen phase is shortened and the kenogen phase is prolonged, in addition, in some hair follicles there may be exponents of microinflammation. The pathogenesis of the development of the disease in women has not been sufficiently studied; however, it has been observed that the disease is more common in patients suffering from hyperandrogenism (including in the course of endocrine gland malignancies, polycystic ovary syndrome and other endocrine disorders). Cytokines (TGF-beta1, TGF-beta2, interleukin-6) and prostaglandins (PGD2 and PGD2 synthetase) are also involved in the development of the disease. In women, alopecia is often accompanied by hirsutism, unresponsive adult acne, moderate to severe acne, galactorrhoea, dark keratosis, and irregular menstruation [5,6,7]. In men, androgenetic alopecia is usually diagnosed on the basis of history and clinical picture. In women and in case of diagnostic doubt in men, trichoscopic examination may additionally be performed. In rare cases, a biopsy is taken from the scalp [8].

#### Current diagnostic and therapeutic recommendations

The latest guidelines of the Polish Society of Dermatology for the management of androgenetic alopecia in men and women indicate finasteride 1 mg/day orally for general treatment in men and minoxidil 2% and 5% for external treatment in both sexes [9].

The European Dermatology Forum recommends the use of:

1. minoxidil 2-5% 1ml applied topically twice daily in both men and women,
2. finasteride orally 1mg per day for a minimum of 6-12 months in men,
3. to improve the results of treatment follicular unit transplantation (FUT) hair transplantation with concurrent oral finasteride therapy 1mg per day in men,
4. low-level laser (light) therapy (LLLT, laser hair comb) in both sexes [10].

#### Oral finasteride

Finasteride is a 5- $\alpha$ -reductase inhibitor, used in the treatment of androgenetic alopecia, reducing the concentration of DHT (dihydrotestosterone), among others, in the scalp. This reduces the negative effects of DHT on the papilla of the hair follicle and inhibits the process of hair miniaturization [11,12]. The efficacy and safety of orally administered finasteride has been confirmed in numerous studies and meta-analyses [13,14]. Due to its potential teratogenic and feminizing effects on male foetuses, the drug belongs to category X (according to the ABCDX classification by the FDA of drugs used in pregnancy) and should not be used in women of reproductive age. Some studies confirm the effectiveness in treating androgenetic alopecia with finasteride in postmenopausal women at a dose of 2.5-5mg per day, although this is still

an off-label treatment [15]. Finasteride (at a dose of 1mg per day) included in patients younger than 40 was shown to be more effective than in older patients [16]. Finasteride can also be applied topically in the form of a solution, spray or foam. Many studies have shown positive effects of such therapy, with no systemic side effects [17,18,19].

#### Topical minoxidil

Minoxidil is a topical vasodilator drug that allows more blood and with it oxygen and nutrients to reach the hair follicles. Initially, it can cause an increased severity of telogen hair loss, which is quickly replaced by new anagen hair. It is most commonly used at a concentration of 2% or 5% in women and 5% in men [20]. The use of minoxidil has been shown to contribute to an increase in the number of non vellus hairs [21]. Concentrations higher than 5% have proven more effective for topical therapy, but carry a higher risk of local adverse reactions (e.g., irritation) [22].

#### Oral dutasteride

Like finasteride, dutasteride is a 5-alpha-reductase inhibitor, but dutasteride is both a type I and type II 5-alpha-reductase inhibitor. The use of dutasteride is an off-label treatment [23]. Taken orally at a dose of 0.5mg, it proved more effective than finasteride taken orally at a dose of 1mg, increasing overall hair count and reversing follicular miniaturization. The incidence of side effects such as sexual dysfunction appeared to be similar when using both formulations. However, larger studies, on a larger study group, and long-term follow-up are needed, as available studies are limited [24,25].

#### Platelet-rich plasma mesotherapy

Platelet-rich plasma is a fraction of plasma with a higher concentration of platelets than baseline values. Activation of platelets leads to the release of Growth Factors (GF), which then activate Vascular Endothelial Growth Factor (VEGF), Epidermal Growth Factor (EGF), Platelet-Derived Growth Factor (PDGF), Transforming Growth Factor  $\beta$ 1 (TGF- $\beta$ 1), Insulin-like Growth Factor-1 (IGF-1), Transforming Growth Factor  $\alpha$  (TGF- $\alpha$ ), Basic Fibroblast Growth Factor (bFGF) and other substances [26]. Mesotherapy (intradermotherapy) of the scalp is a minimally invasive, non-surgical procedure involving multiple intradermal injections of small amounts of diluted substances [27]. Giovanni Schiavone, et al. investigated the effect of twice-daily platelet-rich plasma mesotherapy three months apart on the clinical condition of 64 patients suffering from androgenetic alopecia. The study group included both men and women. Six months after the first treatment, the first evaluator observed clinical improvement in 62 patients, while the second evaluator observed clinical improvement in all subjects. The mean change in patients' clinical scores was, respectively: 3.9 (95% CI, 3.5-4.3) and 3.2 (95% confidence interval [CI], 2.9-3.5). This indicates a significant improvement in the condition of patients [28]. Further, more comprehensive studies are needed, as a small group of patients was included in the study, no control trial was included, and patients were not observed over the long term.

### Admixed polydeoxyribonucleotide injections (PDRN)

Si-Hyung Lee, et al. conducted a study on a group of 40 women, dividing them into two groups. In the first group of 20 patients, 1 admixed injection of autologous platelet-rich plasma and 12 sessions of polydeoxyribonucleotide injection (PDRN) were performed at weekly intervals. The second group received only 12 sessions of polydeoxyribonucleotide injection (PDRN) at weekly intervals. The first group showed clinical improvement in mean hair thickness ( $16.8 \pm 10.8\%$ ;  $p < 0.001$ ) and mean hair number ( $23.2 \pm 15.5\%$ ;  $p < 0.001$ ). The second group also showed an increase in mean hair number ( $17.9 \pm 13.2\%$ ;  $p < 0.001$ ) and mean hair thickness ( $13.5 \pm 10.7\%$ ;  $p < 0.001$ ). The results of the study indicate that combination therapy of plasma mesotherapy and PDRN results in a greater improvement in hair thickness than treatment with PDRN injections alone ( $p = 0.031$ ). This difference was not seen in terms of hair count ( $p > 0.05$ ) [29]. The study was performed on a small group of female patients and did not include men, and there was no control group, so further research on this topic is needed.

### Mesotherapy with dutasteride

Another way of administering the 5-alpha-reductase inhibitor can be a mesotherapy treatment. It turns out that this way of administering the drug does not affect sexual dysfunction, and mesotherapy can be as effective as oral therapy. The most common adverse reaction reported by patients was soreness during treatment (45.5% of a group of 541 patients) [30]. Studies confirm reduction in hair loss and an increase in overall hair count as a result of dutasteride mesotherapy for scalp in both men and women [31,32]. It is a method of treatment in people who, for various reasons, do not want to opt for systemic treatment.

## Conclusions

Androgenetic alopecia is a condition that affects a significant portion of the population, with multifaceted effects on both the individual and society. People of both sexes suffer from the condition, although the severity and pattern of hair loss differ between men and women. The problem is often downplayed due to a lack of knowledge of management methods. Today, there are many therapeutic options, whether systemic, topical or combined. Numerous scientific studies confirm the effectiveness of methods currently used as off-label. Analysing the effectiveness of these methods and spreading knowledge about them can help treat patients more effectively. Based on an analysis of the available scientific studies, the need for further research, with larger study groups, control groups and observation of patients over a longer period of time, is apparent.

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