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Can Androgenetic Alopecia be Reversed and What Are the Effective Treatments?

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Abstract

Androgenic alopecia (AGA), also known as male and female pattern baldness, is the loss of hair on the scalp for both men and women. The onset of hair loss for men suffering from this condition can occur as early as their teens or early 20s. Symptoms include a receding hairline and gradual disappearance of hair at the vertex and frontal scalp. When women have female pattern baldness (FPB), their hair doesn't appear thinning until they reach their 40s or older. Generally, women experience a thinning of the hair over the whole scalp, with the most extensive hair loss at the vertex. The FDA-approved hair loss treatments finasteride and minoxidil topical are often capable of halting and even reversing hair loss when examined over the course of many treatments. Other medications that have shown effectiveness in treating hair loss have yet to be approved by the FDA, either due to a lack of evidence showing their effectiveness or because of concerns about side effects. The main disadvantage of using hair loss drugs is having to take them continuously in order to maintain their benefits and the intake of finasteride causing sexual functional disorders. For those who want to avoid the risk of sexual function disorders, there are other alternatives to these two drugs, such as low-level light therapy, platelet-rich plasma therapy (PRP), and hair transplant. Even though there is no cure for hair loss, this study discusses a number of treatments that are invasive or non-invasive, and the patient should consult with their doctor before beginning any treatment.

Abbreviations

AGA: androgenetic alopecia

AR: androgen receptors

DHT: dihydrotestosterone

FDA: Food and Drug Administration

FPB: female pattern baldness

KCZ: ketoconazole

LLLT: low-level laser therapy

MAA: male androgenetic alopecia

MPB: male pattern baldness

MPHL: male pattern hair loss

MS: minoxidil solution

OTC: over-the-counter

PDGF: platelet-derived growth factor

PG: propylene glycol

PRP: platelet-rich plasma

5AR: 5-alpha-reductase/5α−reductase

Introduction

Many people experience hair loss, medically known as alopecia. Hair loss comes in a variety of forms. Androgenetic alopecia (AGA), also known as male pattern baldness (MPB), is characterized by a receding hairline (making an "M" shape), thinning at the crown of the head, and is caused by hormones. By the age of 50, roughly 30-50% of men experience this type of hair loss (Rafi & Katz, 2011). The trend of hair loss in women differs from that of males. Women's hair thins all over the head, but the hairline does not recede like the men. In women, androgenetic alopecia rarely results in complete baldness (Medline Plus, 2015). Alopecia has few physical side effects, but it can cause psychological problems, such as excessive levels of anxiety, depression, and can greatly affect self-esteem and self-image (Cranwell & Sinclair, 2016). Males are typically thought to suffer from androgenetic alopecia more often than females (Feinstein, 2020). This study will determine whether lost hair can be regrown and review the pharmacologic treatments of androgenetic alopecia. Hormonal hair loss is the most common and well-studied kind, therefore, androgenetic alopecia will be the subject of this research.

Objectives

- To understand what androgenetic alopecia is
- The causes of androgenetic alopecia
- Discuss medicinal treatments for hair loss.
- Explain the clinical studies and chemical aspects of prescribed drug use among patients struggling with male and female pattern baldness.
- Explore the probable health complications with prescribed drug intake by the patient with androgenetic alopecia.
- Discuss alternative methods to manage hair loss, like platelet-rich plasma, therapy (PRP), low-level light therapy, and hair transplant.

Methods

This comprehensive review was conducted using multiple databases available through Google Scholar, Medline Plus, Mayo Clinic, and WebMD. Additional resources were available via the website of the National Center for Biotechnology (NCBI). Additionally, filters were applied to retrieve relevant articles. The search for articles on the topic revealed articles describing the treatments used for hair loss and the adverse effects that come with taking them.

Signs and Symptoms

How does one know if they are experiencing androgenetic alopecia? On average, people lose 50 to 100 hairs every day. This frequently goes undetected because new

hair grows at the same time. One of the symptoms of alopecia is when the hair that has fallen out is not replaced by new hair (Mayo Clinic Staff, 2020). The affected areas progress from highly pigmented, thick, terminal hairs to thinner, shorter, indeterminate hairs (Feinstein, 2020).

The average male or female patient notices a thinning of their scalp hair as they age (Shapiro, 1998). The most common form of hair loss is male androgenetic alopecia (MAA), which affects 30-50% of men by 50 years of age (Cranwell & Sinclair, 2016). Usually, after puberty, some men notice scalp hair loss or a receding hairline. As opposed to men, women usually begin experiencing symptoms in their 50s or 60s. Women may experience androgenetic alopecia earlier, as early as their 30s or 40s. Male-pattern baldness and female-pattern baldness are both hereditary conditions that lead to more drastic hair loss than that which occurs with normal aging (Shapiro, 1998).

For male pattern baldness, there is a receding hairline and thinning hair on the crown of their heads. There are different stages for males depicted in figure 1. With female pattern baldness, thinning occurs on the top and crown of the head (Figure 2). Women commonly experience this thinning as a widening of the midline hairline that leaves their front hairline untouched (Feinstein, 2020).

The image shows the normal amount of hair on a woman in stage 1. In stage 2 the image shows signs of hair loss by the widening of the central part. By stage 3 there is widening of the central part of the scalp and there is loss of volume lateral to the part line. Stage 4 shows the development of a bald spot anteriorly. The hair loss at Stage 5 is advanced (Sinclair, et al., 2015).

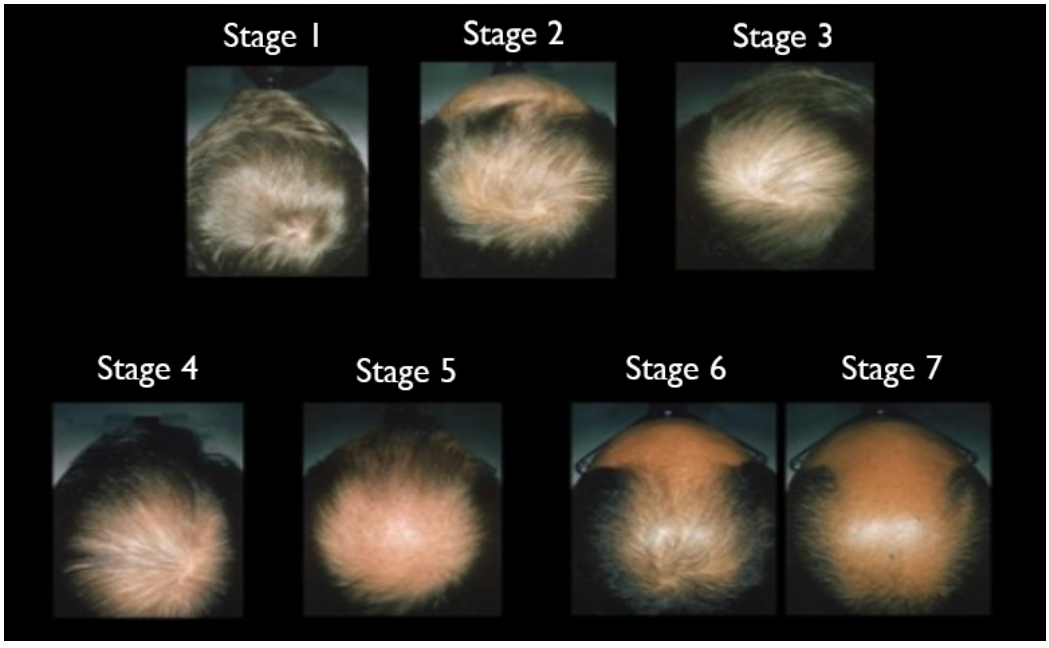

Figure 1: The Norwood- Hamilton Scale of male androgenetic alopecia (Cranwell, & Sinclair, 2016).

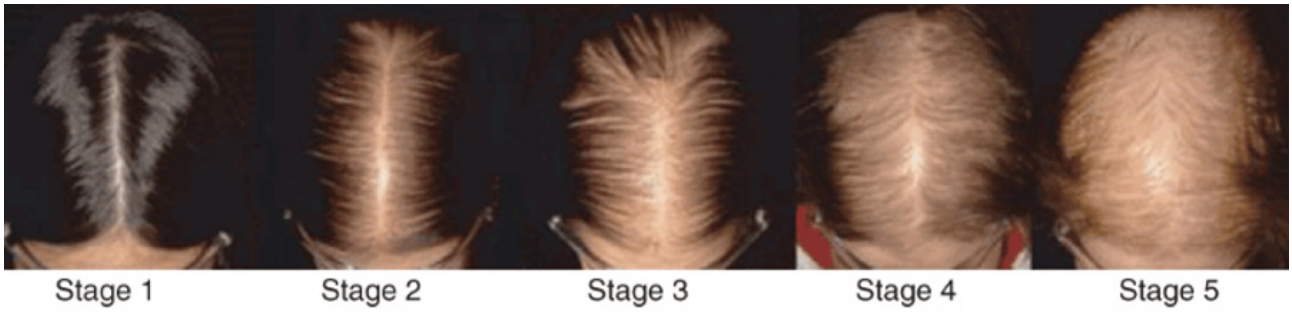

Figure 2: Sinclair Scale for female pattern baldness

Cause

Androgenetic alopecia is caused by both genetic and hormonal factors (Shapiro, 1998). Hair loss caused by androgenetic alopecia can be inherited from both the mother and the father. The disease tends to run in families with male androgenetic alopecia and having a close relative

with patterned hair loss appears to be a risk factor for developing the condition (Medline Plus, 2015). About 80% of the risk is inherited (Cranwell, & Sinclair, 2016). There are a number of genetic factors that influence male pattern baldness, but the main influencers are the body's production of androgens (Liang, et al., 2018). Androgens are the male sex hormones, which are responsible for various male characteristics such as body and beard hair, muscle mass, bone growth, fat distribution throughout the body, voice deepening, etc (Jewell, 2019). As the body tries to encourage the development of male sexual characteristics during puberty, significant amounts of androgens are produced (Liang, et al., 2018). Androgens in men are usually available in the form of testosterone, much of which is converted to dihydroxy testosterone (DHT). DHT is a naturally occurring by-product of testosterone. 5α–reductase, an enzyme in the hair follicle's sebaceous (oil) glands helps convert testosterone to DHT. This process happens in both men and women, even though women have less testosterone than men. In research studies, about 10% of testosterone molecules are converted to DHT by the enzyme 5α–reductase (Jewell, 2019). By DHT binding to the scalp hair follicle androgen receptors (AR), it causes androgenetic alopecia (Cranwell, & Sinclair, 2016). DHT is a far more potent hormone for hair growth than testosterone due to its higher binding affinity and lower dissociation constant with the androgen receptor (French, et al., 1990). As DHT travels through your bloodstream, it can then bind to receptors on hair follicles on your scalp, causing them to shrink and become less able to support a healthy head of hair (Jewell, 2019).

A significant pathophysiological feature of androgenetic alopecia is the alteration of hair cycle development and the miniaturization of the hair follicle (Cranwell & Sinclair, 2016). Understanding the hair growth cycle helps understand how DHT causes hair loss. The cycle includes four phases: growing (anagen), transitional (catagen), resting (telogen) and shedding (exogen). Over time, DHT accumulates in hair follicles, interfering with its growth cycle. Known as miniaturization, DHT shrinks hair follicles, slowing the rate at which hair strands reproduce by either shortening the growing phase or lengthening the resting phase. With each subsequent life cycle, AGA advances along with the destruction of follicles by DHT, which causes hair to become thinner, brittle, and lighter in color. A follicular pore ultimately remains empty because the hair will not grow long enough to reach the surface of the skin during the anagen phase. Eventually, the follicles shut down and will no longer produce hair (Cranwell & Sinclair, 2016).

Gene Factor of MPB

The main cause of male pattern hair loss is DHT. DHT affects both the natural genetic predisposition to hair loss as well as natural processes in your body that lead to hair loss as you age. Proteins called androgen receptors allow hormones such as testosterone and DHT to bind to them. As a result, normal hormonal processes such as hair growth occur. Depending on how the androgen receptor gene (AR) is configured, some individuals are more susceptible to the effects of DHT on scalp hair. Therefore, having variations in the AR gene increases the chances of experiencing MPHL (Jewell, 2019).

Treatments

Alopecia androgenetic is an androgen-dependent trait determined primarily by genetics (Redler, et al., 2017). It is characterized by the gradual conversion of terminal hairs into indeterminate, with the help of the DHT hormone. Both men and women are affected by this disease. In order to treat androgenetic alopecia, there are only two drugs that have been approved by the US Food and Drug Administration (FDA) (Feinstein, 2020). The two drugs increase hair length and diameter by modulating the hair-growth cycle, although their mechanisms of action are different. Both medications slow the rate of hair loss but only partially reverse baldness, and must be taken continuously to maintain their effectiveness. AGA can also be treated with oral dutasteride, ketoconazole, platelet-rich plasma (PRP), low-level laser therapy, and hair transplantation (Dabek, et al., 2019).

Minoxidil

In today's technologically advanced world, minoxidil can be found as an oral drug, a topical cream, and a foam. Minoxidil is used both by men and women who suffer from pattern hair loss. It is a non-androgen hair-growth stimulator, it promotes new hair growth by allowing blood vessels in the scalp to carry nutrients to the affected hair follicles. Minoxidil does not stop DHT from reaching the follicles. It is effective for many men because it encourages hair growth and makes areas of the scalp with thin hair look thicker, fuller, and less affected by hair loss (Suchonwanit, et al., 2019).

Minoxidil was first introduced in the 1970s as an oral medication to treat severe hypertension (Campese, 1981). A topical minoxidil formulation was developed as a result of physicians observing hair growth in balding patients and generalized hypertrichosis in women after they observed hair regrowth in male patients (Suchonwanit, et al., 2019). According to Suchonwanit, the minoxidil 2% solution was first made available to the public in 1986,

followed by its 5% version in 1993. The US FDA approved minoxidil brand-name Rogaine, at a maximum concentration of 5%, for over-the-counter use in 1996 (Goren & Naccarato, 2018). A generic version is available by prescription in the form of oral tablets and over the counter in the form of a topical liquid or foam.

Many studies have shown that minoxidil has been widely used since the early 1980s; however, the mechanisms by which it promotes hair growth are not completely understood (Suchonwanit, et al., 2019). The hair growth that is caused by minoxidil has been attributed to various theories. This molecule opens potassium channels, which induces hyperpolarization of cellular membranes, as well as acting as a vasodilator; it is hypothesized that by widening blood vessels and opening potassium channels, it allows more oxygen, blood, and nutrients to pass to the follicles. In addition, in the telogen phase, hair follicles can shed, usually shortly before they are replaced by new, thicker hair in the anagen phase (Rossi, et al., 2012)

The effectiveness of topical minoxidil was investigated in numerous clinical trials using different concentrations and preparations. For men with AGA, 5% MS increased the mean difference in hair density significantly compared to 2% MS or a placebo. Significantly more hair regrowth was noted in the 5% MS group than in the 2% MS group at week 48. FPHL results for both the 2% and the 5% MS groups were promising. There were, however, more side effects with 5% MS, including dermatitis, headaches, and hypertrichosis. Women are prescribed the 2% solution, while men receive the 5%. It is preferred for women to use 2% MS since hypertrichosis could be problematic for them, having unwanted hair growth that can occur, resulting in poor treatment compliance (Suchonwanit, et al., 2019).

Treatment of androgenetic alopecia with topical minoxidil has been demonstrated to be safe and effective. In order for the hair to be maintained consistently, it must be applied once or twice a day. (Rossi, et al., 2012). After 12 weeks of daily treatment, results should be visible, but hair loss will return within four to six months if treatment is discontinued (Dabek, et al., 2019). Usually, regrowth occurs at the vertex rather than in the frontal areas and it is not observable for at least 4 months (Feinstein, 2020). While complications are extremely rare, patients who use minoxidil may experience symptoms such as pruritus, scaling of the scalp, skin irritation, orthostatic hypotension, and erectile dysfunction (Dabek, et al., 2019). However, reports show that the most common adverse reactions of the topical formulation are irritant and allergic contact dermatitis on the scalp with symptoms like itching and scaling (Rossi, Mari, et al., 2012). According to studies, several topical solutions containing propylene glycol are known to cause allergic reactions, particularly if they contain galenic. When using 2% minoxidil, the incidence is lower than with 5% minoxidil. Propylene glycol (PG) or minoxidil itself can also cause allergic contact dermatitis. It is important to conduct a patch test to identify the cause. Minoxidil can cause an allergic reaction, but it is rare. It is recommended to substitute butylene glycol, glycerin, or polysorbate if the patient is allergic to PG. If the reaction does not resolve, minoxidil foam (MF), which is PG-free, should be prescribed. In such a circumstance, a minoxidil allergy should be suspected, and all minoxidil preparations should be discontinued (Friedman, et al., 2002).

Many patients who are prescribed topical minoxidil have difficulties adhering to the treatment plan because it requires two applications a day, it causes undesirable hair texture, and it causes scalp irritation (Randolph & Tosti, 2021). To address these concerns, a topical foam of minoxidil was developed that is free of propylene glycol. A study comparing a minoxidil solution and minoxidil foam was conducted. As a result, the US Food and Drug Administration (FDA) has approved 5% MF for the treatment of both men and women who have AGA due to its ability to deliver the active ingredient to the target site and penetrate the drug easily with less irritation. A major advantage of MF is that it dries quicker and spreads less to the peripheral region. (Campese, 1981).

As an alternative to topical MS, another study was conducted on oral minoxidil. This was found to be an effective, safe, and well-tolerated treatment option for healthy patients who had difficulty with topical formulations (Randolph & Tosti, 2021). The benefit of topical minoxidil is that it has greater patient compliance in addition to its therapeutic properties. Studies recommend that woman take less than 0.25 mg daily, while men should take at least 1.25 mg daily for maximum effect (Villani, et al., 2021).

In order to determine the most effective treatment protocol, including dosage and treatment duration, larger randomized comparative studies should be conducted. The evidence appears to suggest that minoxidil can be used effectively to treat male pattern baldness.

Finasteride

FDA has approved only two drugs to treat hair loss and finasteride is one of them. It is an inhibitor of the enzyme 5α–reductase that can potentially reduce male pattern baldness. The FDA approved finasteride for medical use in 1992 (Fischer & Ganellin, 2006). Patients with benign prostatic hyperplasia were initially prescribed finasteride at a dose of 5mg daily under the brand names Proscar and Propecia. In men, this medication is now used to treat benign prostatic hyperplasia and hair loss. (Cranwell & Sinclair, 2016).

Despite its name, finasteride is an antiandrogen because it inhibits 5α-reductase type II and III. As a result, dihydrotestosterone (DHT) production drops by about 70% in the prostate gland and on the scalp. This is accomplished by finasteride binding to the 5-AR proteins and preventing DHT from binding with them. Since DHT cannot bind to your hair follicles, your hair follicles will not shrink. (Cranwell & Sinclair, 2016).

An oral finasteride dose of 1 mg/day is recommended to treat male pattern hair loss (Gormley, et al., 1990). By taking this daily, it will reduce the scalp DHT by 64% and serum DHT by 68%. The efficacy of finasteride in patients with MAA was further demonstrated in a randomized, double-blind, placebo-controlled twin study. Four out of five subjects in the finasteride group had an increase in hair count by month 12, while 44% of the placebo group had decreased hair count. In the finasteride group, levels of serum DHT were significantly lower, while placebo levels did not change significantly. (Cranwell & Sinclair, 2016).

The hair on the bitemporal and vertex regions of the male scalp is particularly susceptible to high levels of circulating androgens, and it responds well to finasteride oral treatment (Dabek, et al., 2019). It was also clinically observed, that finasteride acts in both the front area and the vertex, (Rossi, Mari, et al., 2012). On the vertex and superior-frontal areas of the scalp, the finasteride group showed significant improvement in hair growth, whereas neither group showed improvements in hair growth on the temporal or anterior hairline areas. Compared to the minimal response over the temporal and anterior hairline regions, this study shows the relative efficacy of finasteride in protecting hair over the vertex and superior-frontal regions of the scalp (Cranwell & Sinclair, 2016).

A randomized controlled study using 5% topical minoxidil and 1 milligram of finasteride showed that finasteride increased hair growth dramatically. The effectiveness of finasteride is greater than that of minoxidil, but it comes with its own side effects (Cranwell & Sinclair, 2016). The tolerability of the placebo and finasteride receiving groups was similar overall. In the group receiving finasteride, the main difference between those who received finasteride and those who did not was a higher percentage of sexual function abnormalities (Waldstreicher, et al., 1997). The sexual function disorders include libido and impotence, and in severe cases, it may cause gynecomastia, pain in the testicles, and inability to urinate (WebMD, 2021). In both groups, there was a difference, but it was quite small, only 3.8% in the placebo group and 2.1% in the finasteride group. The majority of patients who reported sexual problems during treatment were able to resolve those problems despite continuing to take finasteride. Many of those who withdrew from the trial due to sexual disorders reported that the problems resolved after discontinuing the drug (Waldstreicher, et al., 1997). Based on these studies, it appears that men experience reduced hair loss when taking finasteride. From this study, we see that Finasteride causes hair regrowth by altering DHT levels, which lends credence to the DHT theory of baldness.

Along with knowing the side effects, it is essential not to use finasteride near pregnant or nursing women. Dermatologically, the drug can be absorbed. It is not recommended that pregnant or planning to become pregnant women handle a tablet if the film coating has been broken or if the tablet has been crushed. An infant exposed to finasteride may develop abnormalities of the genital area (WebMD, 2021).

In order to determine the most effective treatment protocol, including dosage and treatment duration, larger randomized comparative studies should be conducted. It is well known that minoxidil is an effective treatment for male pattern hair loss. However, it is less effective than finasteride, but the advantage of using a topical solution is that it is easily absorbed into the scalp. Since one needs to use finasteride continuously to prevent further hair loss, long-term studies of potential side effects are necessary.

Dutasteride

The FDA does not approve all drugs, but some of them are potentially helpful medications. Dutasteride 0.5mg dosage was approved by the FDA for the treatment of benign prostatic hyperplasia while MAA uses are off-label. The oral drug dutasteride may also be used for androgenetic alopecia, like finasteride. Approximately three times as potent as finasteride in inhibiting the type II enzyme, and 100 times as potent in inhibiting the type I enzyme, this drug inhibits both types I and II 5-a reductase isoenzymes (Feinstein, 2020). In comparison, dutasteride can decrease serum DHT by more than 90%, whereas finasteride decreases it by 70%. Due to these properties, dutasteride makes a more promising candidate for MPB treatment. Although dutasteride has more desirable properties, relatively little research has been conducted on its use in the treatment of MPB (Rafi & Katz, 2011).

During a phase II randomized placebo-controlled trial, it was determined dutasteride had a stronger effect than finasteride when it came to improving scalp hair growth in men between the ages of 21 and 45. An observational phase II randomized placebo-controlled trial of dutasteride and finasteride found that dutasteride was more effective than finasteride at increasing scalp hair growth, and 2.5mg dutasteride was more effective at enhancing growth in men aged 21 to 45. As compared to

finasteride, it also increased hair growth. Hair count data and clinical assessment data at 12 and 24 weeks were used to demonstrate this (Rafi & Katz, 2011).

According to another recent randomized, double-blind, placebo-controlled study, dutasteride 0.5mg/day significantly reduced hair loss progression in men with MAA. According to another recent randomized, double-blind, placebo-controlled study, dutasteride 0.5mg/day significantly reduced hair loss progression in men with MAA. In a case report a woman who had failed to show any response to finasteride had success with dutasteride 0.5mg (Cranwell & Sinclair, 2016).

Due to its ability to inhibit type I and type II five-alpha reductase, it may be superior to finasteride at promoting hair growth in young males. Nevertheless, finasteride is the preferred treatment for androgenetic alopecia. Dihydrotestosterone plays important physiological roles unrelated to androgenetic functions in finasteride, researchers stated. With dutasteride, side effects are more likely than with finasteride. Among the possible side effects are decreased libido, impotence, and gynecomastia (enlarged breasts). In patients treated with dutasteride, the sperm count, and volume were reduced (Cranwell & Sinclair, 2016).

Ketoconazole

Ketoconazole, pharmaceutically known as Nizoral, is an antifungal agent with anti-inflammatory and anti-androgenic properties. It is available as a cream, solution and shampoo for cutaneous fungal infections. It is commonly known to be used as an anti-fungal shampoo to treat seborrheic dermatitis, dandruff, caused by excess Malassezia. Besides KCZ treating fungus, there has been evidence accumulated that shows ketoconazole being an effective treatment for hair loss (Perez, 2004).

There is no clear explanation for why ketoconazole causes hair regrowth. It was found that Ketoconazole works by interfering with DHT production, the hormone responsible for hair loss in men. When it is used topically on hair, it works as a mild DHT antagonist compared to finasteride. However, KCZ works as well as the FDA-approved topical treatment minoxidil (Piérard-Franchimont, et al., 1998). It is also found effective when used either alone or when used with another FDA-approved hair loss treatment, like finasteride or minoxidil (Perez, 2004).

There are different postulated theories of how KCZ shampoo helps with hair loss It may be caused by an inflammatory reaction abutting the hair follicles (Piérard-Franchimont, et al., 1998). Fields explains that every individual's head contains a fungus called Malassezia. When there is too much buildup of Malassezia, it causes dandruff and it produces inflammation, resulting in flaking and itching and some hair loss (Fields, et al., 2020). Interestingly, researchers have found that men with male pattern baldness have more Malassezia on their heads than the general population (Perez, 2004).

The ketoconazole anti-fungal shampoo gives relief from dandruff and itching by killing the excess Malassezia (Huang, et al., 2019). Malassezia may contribute to the process of inflammation in androgenic alopecia, based on the data presently available. A study was conducted to determine how KCZ acted as an active against the microflora and showed intrinsic anti-inflammatory activity that improved alopecia. Researchers compared 2% KCZ shampoo to an unmedicated shampoo with or without 2% minoxidil therapy in a study. There was an almost similar improvement in hair density, size, and proportion of the anagen follicles by both KCZ and minoxidil regimens, and there was a significant decrease in sebum levels by KCZ. To assess the clinical significance of the results, a larger sample size is needed (Piérard-Franchimont, et al., 1998).

According to Cranwell, W., and Sinclair, R., a study was conducted showing that topical ketoconazole shampoo increased hair growth in both humans and rodents. Additionally, there was an increase in the diameter of hair shafts in association with the agents. Researchers found topical ketoconazole to be an effective adjunctive or alternative treatment for androgenetic alopecia (Cranwell & Sinclair, 2016). Another study, conducted in 1998, found that ketoconazole shampoo increased hair density as well as the proportion and size of hair follicles (Piérard-Franchimont, et al., 1998).

Ketoconazole may cause irregular hair texture, discoloration, irritation, or pimple-like bumps on the scalp. In addition, hair and scalp may be oily or dry. Ketoconazole shampoo is only approved for treating seborrheic dermatitis of the scalp and dandruff. As an anti-hair loss treatment, the product cannot be advertised or marketed to the general public. Further studies need to be conducted to show the effectiveness of KCZ. It is also worth noting that more research needs to be done on the mechanism behind how hair growth is caused. There also needs to be research to demonstrate whether taking ketoconazole for an extended period is safe.

PRP Treatment

The growth factors and stimulatory mediators naturally present in platelet-rich plasma (PRP) can be extracted from whole blood for use in medicine. PRP therapy has been used for decades for the stimulation of muscle, tendon, and ligament healing. A recent limited study suggests that PRP can also be used as a standalone treatment

for AGA with minimal side effects. This procedure uses platelet-rich plasma, which can be found in your blood, to promote hair growth on your scalp (Cranwell & Sinclair, 2016).

A study conducted in Spain in 2015 proved that plasma rich in growth factors, called PGRP, could be effective in treating androgenetic alopecia. In the study of over 100 patients, PGRF was administered intradermally twice a week for a total of four cycles. It was found that the anagen follicle count significantly increased by 6.2% compared with baseline, while telogen follicle count decreased by 5.1%. There were no adverse effects observed in any of the patients (Cranwell & Sinclair, 2016).

Low-level Light Therapy

As an over-the-counter hair growth method, laser light therapy, in particular a red-light hairbrush, is being marketed. The HairMax LaserComb® has been approved for medical use by the FDA as a medical device. In this approval, safety has been emphasized rather than effectiveness, and the data necessary to demonstrate the safety and effectiveness of medical devices differ considerably from those needed for drugs (Feinstein, 2020).

An extensive study was published in 2014, which had the largest sample size to date. The purpose of this double-blind, randomized, sham-controlled study was to examine 128 males and 141 females with pattern hair loss. Researchers randomized participants to either receive a sham or a real HairMax Lasercomb®. Over the course of 26 weeks, patients received three treatments per week, with varying treatment times per day depending on the model of Lasercomb®. This ensured that the total laser dose remained the same across all models. Based on the results, all LLLT-treated groups showed statistically significant improvement in hair density compared to their sham counterparts. Although not all patients experienced statistically significant results, most self-assessments of hair loss condition and thickness showed improvement after LLLT treatments. A number of adverse events have been reported, including dry skin, pruritus, a warm sensation, and scalp tenderness. The current study has several strengths, including the large sample size, sham device-controlled, double-blind design, as well as objective measurements and self-assessments by the subjects (Darwin, et al., 2018).

In the case of androgenic alopecia, LLLT is a safe and effective treatment option. In studies with similar treatment durations, oral finasteride and topical minoxidil appear to be comparable in their hair growth efficacy. In comparison with other AGA treatment options on the market, LLLT has been shown to have no significant side effects. The research suggests that the drug may be effective when combined with minoxidil and finasteride, as well as a primary treatment option. Patients who have not reacted to finasteride or minoxidil and do not want to undergo hair transplantation may benefit from the LLLT. The device is safe and easy to use, and it does not leave any residue on the scalp. In order to determine the optimal wavelength and intensity of LLLT as a treatment for androgenic alopecia, further research is needed. In addition, further study is required to understand the physiology and mechanism of LLLT for hair regrowth (Darwin, et al., 2018).

Hair transplant

Surgical hair transplants are reserved for individuals who do not respond to topical minoxidil and/or oral finasteride, or who cannot tolerate their risks. Individuals with very little hair may not be recommended to have a hair transplant. During a hair transplant, hair from the occipital scalp is removed and re-implanted into the bald vertex and frontal scalp. It has only been in the last few years that modern grafting techniques have permitted grafts to survive reliably with greater than 90% survival. The two prerequisites for the procedure are the stabilization of the hair loss with medical treatment as well as a healthy population of donor hair in the area of occipital hair (Cranwell & Sinclair, 2016).

Discussion

Based on the research, DHT is a major cause of male pattern hair loss, caused both by a genetic predisposition to hair loss as well as by natural changes in the body that causes hair loss as one ages. Plenty of hair loss treatments addressing DHT are available and reducing hair loss may make us feel more confident about our appearance in our everyday life. It is still best to consult a doctor before beginning any treatment, since not all treatments are safe or effective for everyone.

Conclusion

Having androgenetic alopecia is distressing for many men and women, and an increasing number of men and women are pursuing treatment to prevent and reverse the process. It has been found that there are medications that can slow or stop hair loss, and therefore, we may conclude that androgenetic alopecia can be managed. Additionally, it is concluded that drugs used to treat AGA are only effective for so long as they are administered. This means hair loss cannot be cured. In order to find a cure for hair loss, we need a comprehensive theory that explains the mechanism.

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