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BRIEF REVIEW

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The Role of Topical Finasteride in Hair Loss Management: Current Evidence and Future Perspectives

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Abstract

Hair loss (HL), scientifically known as alopecia, is a prevalent condition affecting individuals globally. Its multifactorial origins encompass genetics, hormonal fluctuations, stress, aging, medical conditions, and medications. The psychological impact of HL on self-esteem, confidence, and overall quality of life has driven the pursuit of effective treatments to rejuvenate hair growth and appearance. Among these treatments, finasteride (FIN) has been employed to address male pattern HL, the most prevalent form of HL in men. This medication hinders the conversion of testosterone to dihydrotestosterone (DHT), a hormone that contributes to hair follicle shrinkage and cessation of hair production. While oral FIN has been widely explored, it entails undesirable side effects and varying effectiveness. This review delves into the role of FIN topical applications as a novel approach for HL treatment.**(International Journal of Biomedicine. 2023;13(4):236-239.)**

Keywords: hair loss • hair follicle • finasteride • dihydrotestosterone

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Introduction

Hair loss (HL) is a prevalent condition that impacts millions of individuals around the globe. It can have various causes, such as genetics, hormones, stress, aging, disease, or medication. HL can affect one's self-esteem, confidence, and quality of life. Therefore, many people seek effective treatments to restore their hair growth and appearance.[1]

One of the treatments used for male pattern HL, which is the most common type of HL in men, is finasteride (FIN). FIN is a medication that works by blocking the conversion of testosterone to dihydrotestosterone (DHT), which is the hormone that causes hair follicles to shrink and stop producing hair. FIN can be taken orally as a tablet or applied topically as a solution or gel.[2]

However, oral FIN may have undesirable side effects, such as decreased libido, erectile dysfunction, and gynecomastia. Although topical FIN may not be able to deliver enough concentration to the hair follicles to have a significant effect, some researchers have explored the possibility of using it as an alternative method of oral use in androgenetic alopecia.[3]

Topical FIN involves applying the drug to the scalp at the sites of HL. The aim is to deliver a higher concentration of FIN to the hair follicles and avoid systemic side effects. However, the role of FIN topical application in treating HL is not well established. There is limited evidence from clinical trials to support its efficacy and safety. Moreover, there are different protocols for the dose, frequency, and duration of FIN topical application, making it difficult to compare the results.[4]

This paper reviews the current literature on FIN topical application for HL and discusses its potential benefits and drawbacks. We will also suggest some directions for future research and clinical practice on this topic.

The Mechanism of HL and the Role of DHT

The hair growth cycle is a complex process consisting of distinct phases: anagen, catagen, and telogen. These phases collectively regulate the growth, rest, and shedding of hair. The anagen phase is an active growth phase, during which hair follicles produce and elongate hair strands. The duration of the anagen phase varies across individuals, contributing to

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differences in hair length. Healthy hair growth primarily occurs during this phase. Following the anagen phase, hair follicles enter the catagen phase, also known as the transitional phase. This short period involves the cessation of hair growth and the shrinking of the hair follicle. The hair shaft is disconnected from the blood supply during this stage. The telogen phase is the resting phase, during which hair follicles are relatively dormant. The old hair remains attached to the follicle but is eventually shed to make way for new hair during the next anagen phase.[5,6]

Various factors can disrupt the normal hair growth cycle, leading to HL. Genetic predisposition, hormonal imbalances, age, stress, and certain medical conditions can influence the duration of each phase and the overall balance of the cycle.[7] DHT plays a critical role in the progression of HL, particularly in androgenetic alopecia, commonly known as male pattern baldness. DHT is derived from testosterone through the action of the enzyme 5-alpha-reductase. This conversion occurs predominantly in hair follicles, skin, and the prostate.[8] While DHT is necessary during puberty to develop male secondary sexual characteristics, its excessive presence in hair follicles can lead to hair miniaturization. DHT binds to androgen receptors present on hair follicles, particularly those on the scalp. This binding triggers a process called miniaturization, where the affected hair follicles become progressively smaller with each growth cycle. As a result, the hairs produced become finer and shorter in length. Eventually, the hair follicles can become unable to produce visible hair strands, leading to baldness.[9]

Male pattern HL is characterized by a distinct pattern of hair thinning and balding. It typically begins with the recession of the hairline, followed by thinning of the crown area. DHT's influence on hair follicles leads to the gradual transformation of terminal hairs (thick, pigmented hairs) into vellus hairs (fine, colorless hairs), rendering the affected areas visibly sparse.[10]

Understanding the role of DHT in HL is pivotal for devising targeted interventions to counteract its effects. This knowledge has fueled the exploration of treatments aimed at inhibiting DHT's impact on hair follicles, including the use of FIN and the novel approach of FIN topical application.[11]

Current Treatment Approaches for HL

Oral FIN has been a prominent treatment option for addressing HL, mainly male pattern HL. FIN, administered orally, functions as a 5-alpha-reductase inhibitor, specifically targeting the Type II enzyme. By inhibiting the conversion of testosterone to DHT in the body, FIN aims to reduce the levels of DHT that contribute to hair follicle miniaturization.[12] Clinical studies have demonstrated the potential of oral FIN to slow down HL progression and promote regrowth in some individuals.[13] While oral FIN offers a systemic approach to mitigating DHT's effects, it is associated with potential adverse effects. These may include decreased libido, erectile dysfunction, gynecomastia, and mood alterations. Concerns about these side effects have led to hesitation among some patients, particularly those who prioritize their sexual and hormonal well-being.[3]

The topical application of FIN has emerged as an alternative to oral administration, aimed at targeting the scalp more directly to provide a localized treatment option with reduced systemic exposure. While its mechanism of action remains similar to oral FIN, topical application could potentially reduce the risk of systemic side effects.[14] Studies investigating the efficacy of topical FIN have shown promising results in hair growth and maintenance, although direct comparisons with oral FIN require further research. One of the challenges of topical FIN lies in achieving consistent and sufficient drug delivery to hair follicles. The scalp's barrier function and the need for optimal absorption can make it difficult to achieve the desired therapeutic effect. Ensuring a standardized and effective formulation for topical application poses a significant difficulty.[15,16]

Topical Finasteride: The Concept and Rationale

Topical FIN introduces a unique strategy for delivering the drug directly to the scalp's hair follicles. The topical method bypasses the barriers presented by oral ingestion. This targeted delivery[17]) aims to enhance treatment efficacy by addressing the root cause of HL at the local level. Unlike oral administration, which exposes the entire body to the drug, topical application minimizes systemic absorption. This targeted approach seeks to mitigate the risk of systemic side effects, as the FIN concentration remains primarily confined to the treated area.[18]

The concept of topical FIN holds theoretical advantages, along with potential drawbacks and uncertainties that warrant careful consideration. Direct topical application enhances the concentration of FIN near the hair follicles. This higher drug concentration theoretically promotes more effective inhibition of DHT at the site of action, potentially enhancing hair regrowth and maintenance.[19] By systemic circulation, topical FIN aims to minimize the likelihood of systemic adverse effects, such as decreased libido and erectile dysfunction. This could make the treatment more appealing to individuals concerned about the systemic impact of traditional administration methods.[20]

While the concept is intriguing, there remain uncertainties regarding the optimal topical technique, dosing regimen, and potential safety concerns. The procedure requires careful consideration to avoid complications and ensure patient comfort. The long-term safety profile and potential local adverse effects also require comprehensive evaluation. It becomes clear that while the concept holds promise, rigorous clinical investigations are essential to validate its efficacy, safety, and potential as an alternative treatment modality for HL.[21]

Existing Evidence: Clinical Studies and Findings

Published studies have employed various study designs, ranging from randomized controlled trials to case series and observational studies. These studies have investigated different aspects of topical FIN, including dosing regimens, application techniques, and treatment durations.[14] Research findings have provided insights into the potential efficacy of topical FIN in promoting hair regrowth and reducing HL. Some studies have reported positive outcomes, including increased hair density and improvements in hair follicle health. Safety assessments have explored local and systemic adverse effects, shedding light on the potential tolerability of this treatment modality.[18,20]

While the existing evidence sheds light on the potential of topical FIN, several discrepancies and limitations within the literature warrant consideration. There is a lack of standardized protocols regarding the dose, frequency, and duration of FIN topical application. Different studies have employed diverse regimens, making comparing results and establishing a consensus on the optimal approach challenging.[22] Many published studies suffer from small sample sizes and relatively short follow-up periods. This limits the generalizability of findings and the ability to assess the treatment's long-term efficacy and safety. Comprehensive, larger-scale studies with extended follow-up are needed to provide more robust evidence.[15]

The absence of standardized outcome measures complicates the interpretation of study results. Variation in assessment tools, such as hair density measurements, patient-reported outcomes, and clinical evaluations, hinders the ability to draw definitive conclusions about treatment efficacy. As the research landscape on topical FIN continues to evolve, these discrepancies and limitations underscore the need for well-designed studies that adhere to standardized protocols, utilize larger sample sizes, and employ consistent outcome measures.[23]

Future Directions for Research and Clinical Practice

The key areas where future investigations can contribute to refining treatment protocols and enhancing the understanding of the topical FIN innovative approach may include:

A. Standardization of Application Protocols

1. Establishing standardized guidelines for dosing, application frequency, and treatment duration; and identifying optimal regimens that balance therapeutic efficacy with safety will contribute to a more cohesive body of evidence.

2. Collaboration between researchers and clinicians is pivotal in developing comprehensive and consistent topical protocols. Sharing experiences and insights can lead to a consensus on best practices, ensuring that future studies build upon a foundation of standardized approaches.

B. Long-Term Efficacy and Safety Assessments

1. To address lingering uncertainties surrounding topical FIN's long-term outcomes and safety profile, researchers must conduct studies with extended follow-up periods. This will help capture the effect of treatment on durability and on potential late-emerging safety concerns.

2. Conducting larger-scale studies with more diverse participant groups and longer observation periods can provide a clearer understanding of the treatment's efficacy and safety. Long-term assessments are essential for evaluating the treatment's potential for sustained benefits.

C. Comparative Studies with Existing Treatments

1. Comparative studies pitting topical FIN against existing treatments, such as oral FIN, oral minoxidil and topical minoxidil, can offer insights into relative efficacy, safety, and patient preferences. These studies enable clinicians to make informed decisions when tailoring treatment plans to individual needs.

2. Investigating the synergistic effects of combining topical FIN with other interventions, such as minoxidil or low-level laser therapy, holds promise. Such combinations could potentially amplify treatment outcomes by targeting multiple pathways involved in hair growth and maintenance.

As research on topical FIN advances, adherence to these future directions will contribute to the accumulation of robust evidence and the refinement of clinical practice.[24]

Conclusion

The pursuit of effective HL treatments is ongoing, driven by the desire to enhance the quality of life for those affected. The use of FIN topically promises advancement in this endeavor, offering the potential to address HL at its source while minimizing systemic side effects. As research continues and the evidence base matures, the landscape of HL management is poised to benefit from new insights and approaches that can make a meaningful impact on the lives of individuals worldwide.

Competing Interests

The authors declare that they have no competing interests.

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