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Original Research Article

Efficacy of minoxidil in patients of patterned hair loss: A prospective study at a tertiary care hospital of Central India

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Abstract

Introduction: Androgenetic alopecia (AGA), commonly referred to as "male-pattern baldness" or "female-pattern hair loss," is a genetically determined condition characterized by an excessive sensitivity to androgens. Common methods for diagnosing hair disorders include clinical examination, assessment of hair loss patterns, pull test, trichogram, biopsy, and screening blood tests. Currently, trichoscopy is the most important diagnostic method for androgenetic alopecia (AGA) and has largely replaced scalp biopsies. There is a notable gap in research on the early effects of minoxidil therapy as observed through trichoscopy. This gap offers a unique opportunity for further investigation.

Materials and Methods: A prospective cohort study was conducted for one year at the department of pharmacology and department of dermatology, M.G.M Medical College, Indore, after approval by the institutional ethics committee. The study included patients presenting with hair loss and thinning. The treatment used was topical minoxidil. The study was conducted on 50 patients diagnosed with patterned hair loss, who met the inclusion and exclusion criteria.

Results: We aimed to assess efficacy of minoxidil therapy in patients diagnosed with patterned hair loss using trichoscopy. A total of 100 patients were enrolled, with 50 patients (Group M) receiving minoxidil alone—5% solution for males and 2% solution for females. The mean age of the minoxidil group was 33.58 ± 6.57 years. Our results showed significant improvements in several trichoscopic parameters, including an increase in vellus-like hairs, reduced anisotrichosis, the appearance of peripilar signs, yellow dots, and the presence of single-hair follicular units—indicating positive early responses to minoxidil therapy.

Conclusion: Minoxidil is an effective drug for the treatment of patterned hair loss, both in male and female patients as assessed by five different parameters using trichoscopy.

Keywords: Androgenetic alopecia, Male and female patterned hair loss, Treatment of alopecia, Topical minoxidil, Trichoscopy.

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1. Introduction

Androgenetic alopecia (AGA; also known as “female-pattern hair loss” and “male-pattern baldness” is a genetically predetermined disorder due to excessive response to androgens which affects up to 50% of males and females.[1] It is the most frequent type of hair loss in both sexes.[2-5] Miniaturization of hair follicles is due to alteration in hair cycle dynamics leading to transformation of terminal hair follicle into vellus one.[6-9] Male androgenetic alopecia (MAGA) is characterized by its typical bitemporal recession of hair and balding vertex, whereas female androgenetic alopecia (FAGA) is set apart by its more diffuse thinning of the crown area with an intact frontal hairline.[16-18]

A significant impairment in quality of life is seen in patients suffering from AGA and is known to affect >50% of them over 50 years of age. Due to progressive nature of disease and significant effects on patient’s quality of life especially disfigurement that leads on to significant psychological and emotional distress. Standard methods used to diagnose hair disorders are clinical inspection, pattern of

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hair loss, pull test, trichogram, biopsy and screening blood tests. They vary in sensitivity, reproducibility and invasiveness.[11-15]

The Food and Drug administration (FDA) approved two drugs for treatment of AGA: topical minoxidil and finasteride, both of which require at least a 4 to 6-month trial before noticing improvement and must be used indefinitely to maintain a response.[1,20]

Minoxidil was first introduced as an oral medication for the treatment of severe and recalcitrant hypertension in 1970's.[21] It is a piperidino-pyrimidine derivative, with chemical structure; 2,6-diamino-4- piperidinopyrimidine-1-oxide (**Figure 1**).[22]

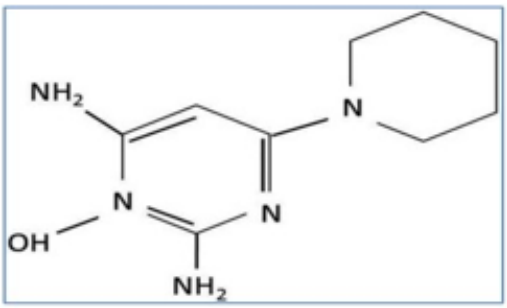

Figure 1: Chemical structure of Minoxidil

Coincidentally, physicians observed hair regrowth and generalized hypertrichosis in balding patients, which led to the development of topical minoxidil formulation for treating androgenic alopecia (AGA) first in male and then in female individuals. The 2% minoxidil solution was first launched in the market in 1986, followed by the 5% solution in 1993.[23] Compared to minoxidil solution (MS), propylene glycol free minoxidil foam (MF) allows for the increased delivery of the active ingredient to the target site and easy penetration of the drug with less irritation; hence, the US Food and Drug Administration (FDA) has granted approval for 5% MF for the treatment of AGA.MF is also more convenient to use, because it dries quicker and spreads less to the peripheral region.[24,25]

Trichoscopy is a valuable tool for the in vivo diagnosis of scalp and hair disorders, significantly enhancing clinical management. Both handheld dermatoscopes and video dermatoscopes can be used for this purpose. The principle of dermatoscopy/trichoscopy involves the transillumination of a lesion, allowing for high-magnification examination to detect subtle features. Through trichoscopy, various structures can be visualized, including hair shafts, hair follicle openings, perifollicular epidermis, and cutaneous microvessels.[7-10] Currently, trichoscopy is the most important diagnostic method for androgenetic alopecia (AGA) and has largely replaced scalp biopsies. It reflects the pathophysiology of AGA by revealing follicular miniaturization, where hair becomes shorter, thinner, and paler, with increased variability in diameter.[26,27]

There is a paucity of studies stating an ideal and efficient treatment protocol which is feasible and suitable for both male and females. In advent of same, we planned the present study with an objective of studying and knowing the efficacy of minoxidil in androgenic alopecia patients using trichoscopy as a diagnostic tool.

2. Materials and Methods

The prospective cohort single centered study was conducted in the department of pharmacology, M.G.M Medical College, Indore (MP) and in department of dermatology, M.Y Hospital, Indore (MP) from 1st February 2021 to 30 January 2022 after review and valid approval by institutional ethical committee (number – EC/MGM/Jan 21/14) on patients who presented with chief complaint of hair loss and hair thinning. The following materials were used. Drug used were topical minoxidil tugain solution by cipla, camera, torch, trichoscope/dermatoscope, gloves and a sanitizer.

The present study was conducted on 50 patients of either gender was randomly selected from 100 patients who were diagnosed with patterned hair loss and qualified the inclusion and exclusion criteria of the study. The inclusion criteria included patients diagnosed by clinician with patterned hair loss, age between 18 – 45 years, patients willing to give written informed consent and patients of either gender was included in the study, whereas the exclusion criteria was patients other than patterned hair loss were excluded from the study, pregnant and lactating females, the patients who gave history of telogen effluvium and alopecia areata, and patients with any comorbidity (diabetes mellitus, hypertension, thyroid disorder etc.) a written informed consent was taken from all the participating patients.

1. Group M (n=50): patients with hair loss who were given topical minoxidil 5% solution alone.

All baseline and demographic data were collected on follow up OPD visit. After taking a detailed history from the patient and clinical examination, baseline trichoscopy and score of patients from the self-assessment questionnaire were recorded both before and after the drug application on each follow up appointment. Patients were asked for any adverse drug reaction on each follow up visit. Trichoscope available with the department of dermatology, M.Y.H Hospital was used for the needful. Follow up at three, six and nine months was done and data was recorded for statistical data analysis. Clinical photographs were maintained to support the recorded data and the patient's confidentiality was maintained.

2.1. Statistical analysis plan

This was a prospective cohort type of study. The data was entered into the computer database. Statistical software, SPSS version 20.0 was used for statistical analysis. Prevalence of an outcome variable along with 95%

confidence limits was calculated. The data collected was quantitative in nature and values were recorded in mean ± SD. Student T-test was used to calculate the significance of difference between/among means. P value <0.05, would be considered statistically significant.

3. Results

In our study pre and post comparison of different trichoscopy parameters were done and in text citation of given tables are mentioned below. The tables are present at the end.

Table 1 shows demographics of mean age of minoxidil treatment group with mean ±SD is 33.58 ± 6.57, in which showing P value is 0.527.

Table 2 shows gender variation of minoxidil treatment group in between male and female in which total N (%) is 50(100%).

Table 3 shows the pre and post comparison of mean value of vellus like hair variable within minoxidil treatment group for frontal location and occipital location respectively. In frontal location, the post mean value (23.06) was significantly higher than the pre mean value (11.04) which indicate that there was significant improvement in the value of vellus like hair variable within minoxidil treatment group. In occipital location the post mean value (8.22) was significantly higher than the pre mean value (5.26) which indicate that there was significant improvement in the value of vellus like hair variable within minoxidil treatment group.

Table 4 shows the pre -post comparison of mean value of anisotrichosis variable within minoxidil treatment group for frontal location and occipital location respectively. In frontal location, the post mean value (33.9) was significantly higher than the pre mean value (21.78) which indicate that there was significant improvement in the value of anisotrichosis variable within minoxidil treatment group. For occipital location, the post mean value (17.9) was significantly higher than the pre mean value (11.86) which indicate that there was significant improvement in the value of anisotrichosis variable within minoxidil treatment group.

Table 5 shows the pre and post comparison of mean value of peripilar sign variable within minoxidil treatment group for frontal location and occipital region respectively. For frontal location, the post mean value (1.18) was significantly higher than the pre mean value (6.98) which indicate that there was significant improvement in the value of peripilar sign variable within minoxidil treatment group. For occipital region, the post mean value (1.46) was significantly higher than the pre mean value (4.3) which indicate that there was significant improvement in the value of peripilar sign variable within minoxidil treatment group.

Table 6 shows the pre and post comparison of mean value of yellow dots variable within minoxidil treatment group for frontal location and occipital region respectively. For frontal location, the post mean value (1.12) was significantly higher than the pre mean value (2.48) which indicate that there was significant improvement in the value of yellow dots variable within minoxidil treatment group. For occipital location, the post mean value (0.24) was significantly higher than the pre mean value (0.86) which indicate that there was significant improvement in the value of yellow dots variable within minoxidil treatment group.

Table 7 shows the pre and post comparison of mean value of single hair follicular units variable within minoxidil treatment group for frontal location and occipital region respectively. For frontal location, the post mean value (6.38) was significantly higher than the pre mean value (12.6) which indicate that there was significant improvement in the value of single hair follicular units variable within minoxidil treatment group. For occipital location. The post mean value (4.08) was significantly higher than the pre mean value (6.12) which indicate that there was significant improvement in the value of single follicular units variable within minoxidil treatment group.

Table 1: Demographics of mean age of minoxidil treatment group

Variable	Group	N	Mean ± S. D	T Test	P Value	Result
Age	M	50	33.58 ± 6.57	0.635	0.527	Non Sig

Table 2: Gender variation of minoxidil treatment group

Sex		Treatment Group
		M No of Patients (%)
Female	n (%)	7 (14%)
Male	n (%)	43 (86%)
Total	N (%)	50 (100%)
Pearson Chi-Square	Value	Df
	0.088	1

Table 3: Pre and post comparison of mean value of vellus like hair variable within minoxidil treatment group for frontal location and occipital location

Location	Minoxidil Treatment	Time Interval	N	Mean	Std. Deviation	Pair T Test	P Value	Result
Frontal	Vellus like hairs	Pre	50	11.04	1.538	153.72	0.000	Sig
		Post	50	23.06	1.463			
Occipital	Vellus like Hairs	Pre	50	5.26	1.291	31.294	0.000	Sig
		Post	50	8.22	1.250			

Table 4: Pre-post comparison of mean value of anisotrichosis variable within minoxidil treatment group for frontal location and occipital location

Location	Minoxidil Treatment	Time Interval	N	Mean	Std. Dev	Pair T Test	P Value	Result
Frontal	Anisotrichosis	Pre	50	21.78	1.404	101	0.000	Sig
		Post	50	33.9	1.502			
Occipital	Anisotrichosis	Pre	50	11.86	1.325	151	0.000	Sig
		Post	50	17.9	1.298			

Table 5: Pre and post comparison of mean value of peripilarsign variable within minoxidil treatment group for frontal location and occipital region

Location	Minoxidil Treatment	Time Interval	N	Mean	Std. Dev	Pair T Test	P Value	Result
Frontal	Peripilar sign	Pre	50	6.98	1.186	64.194	0.000	Sig
		Post	50	1.18	0.962			
Occipital	Peripilar sign	Pre	50	4.3	1.074	36. 639	0.000	Sig
		Post	50	1.46	0.838			

Table 6: Pre and post comparison of mean value of yellow dots variable within minoxidil treatment group for frontal location and occipital region

Location	Minoxidil Treatment	Time Interval	N	Mean	Std. Dev	Pair T Test	P Value	Result
Frontal	Yellow dots	Pre	50	2.48	0.931	15.236	0.000	Sig
		Post	50	1.12	0.689			
Occipital	Yellow dots	Pre	50	0.86	0.670	5.822	0.000	Sig
		Post	50	0.24	0.476			

Table 7: Pre and post comparison of mean value of single hair follicular units variable within minoxidil treatment group for frontal location and occipital region

Location	Minoxidil Treatment	Time Interval	N	Mean	Std. Dev	Pair T Test	P Value	Result
Frontal	Single hair follicular units	Pre	50	12.6	1.512	55.674	0.000	Sig
		Post	50	6.38	1.427			
Occipital	Single hair follicular units	Pre	50	6.12	1.304	51.00	0.000	Sig
		Post	50	4.08	1.338			

4. Discussion

Androgenetic alopecia (AGA) is a common hereditary condition that results in progressive hair thinning, receding hairlines, and balding, often influenced by androgen hormones in genetically predisposed individuals. The FDA-approved treatments for AGA are currently limited to minoxidil and finasteride. Trichoscopy, a non-invasive dermoscopic examination of the scalp and hair, has proven valuable for diagnosing and monitoring hair disorders, including AGA. It provides an easy, reliable way for dermatologists to track treatment responses, including the effects of minoxidil, though there is limited research specifically focusing on its role in early-stage minoxidil therapy monitoring.[28,29]

Numerous studies have demonstrated the utility of trichoscopy for diagnosing various hair and scalp disorders, including androgenetic alopecia (AGA). Additionally, many

studies have compared the efficacy of treatments such as minoxidil and platelet-rich plasma (PRP) by assessing trichoscopic features in AGA patients. However, most of these studies focus on female patients and typically rely on subjective patient assessments and visible improvements, alongside the evaluation of specific trichoscopic variables. Moreover, these studies often involve longer follow-up periods, as minoxidil typically takes 4 to 6 months to show noticeable effects on hair growth.[30,31]

To date, there is a lack of studies investigating the early effects of minoxidil therapy using trichoscopy. Furthermore, there are no reports emphasizing the potential of trichoscopy to enhance patient compliance by providing early evidence of treatment efficacy. This gap suggests an opportunity for further research into how trichoscopy could be used to monitor and demonstrate the initial effects of minoxidil, which may encourage better adherence to therapy.[32]

In a recent study we utilized this opportunity and observed the early changes in patients having minoxidil therapy using trichoscope, 50 patients out of 100 received minoxidil treatment alone (group M) —5% solution for males and 2% for females—to assess its impact on AGA. The mean age of minoxidil alone group was 33.58 ± 6.57 years was statistically not significant. In our results there is significant improvement after giving minoxidil to patients as seen in trichoscopy through different parameters like vellus like hair, anisotrichosis, peripilar sign, yellow dots and single hair follicular units. For effectiveness of minoxidil alone comparable results were found in study by Ahmed EI-Garf et al.,[33] in which 95% reduction in peripilar sign was seen after 6 months of 2% minoxidil therapy in patients with FPHL, however non-comparable results were found in study by Prachi Chandankumar Gjjar et al.,[34] in which no significant reduction (p=0.96) in peripilar sign was seen after 4 months of 5% minoxidil therapy in patients with MPHL.

5. Conclusion

Treatment of patterned hair loss with topical 5% minoxidil proved effective clinically and reasonably safe in studied patients in our institution, however with limited sample size.

6. Source of Funding

None.

7. Conflict of Interest

None.

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