Trichoscopic Analysis of Androgenetic Alopecia in Men Less than Forty Years of Age: A Retrospective, Observational Study from a Tertiary Care Hospital

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ABSTRACT

Introduction: Androgenetic Alopecia (AGA) is the most common cause of hair loss worldwide. It is a non-scarring, progressive, patterned, and androgen-dependent condition seen in genetically predisposed individuals. AGA presents as gradual loss of terminal scalp hair. Trichoscopy is non-invasive dermoscopic imaging of the scalp and hair. It helps assess the disease activity, severity, and prognosis in trichology.

Aim: To identify and evaluate the association of trichoscopic features with severity of AGA in men under forty years of age.

Materials and Methods: The present retrospective, observational study was conducted in the Dermatology Department at Medical College and Research Institute, Bengaluru, Karnataka, India. The duration of the study was 12 months between January 2019 to December, 2019. Fifty men under the age of 40 with AGA were enrolled. Diagnosis was made based on clinical examination of all the areas of the scalp. Age, history, clinical type, and duration of disease were noted. Trichoscopic evaluation of the scalp was done and relevant images were captured. A digital trichoscope (Firefly DE330T videodermatoscope USA) was used. AGA grades 1 & 2 were categorised as mild; grades 3 & 4 as moderate, and grade 5 & 6 as severe. Chi Square test was used for statistical analysis. The results were considered statistically significant if the p<0.05.

Results: Among the 50 subjects, the youngest was 17 years and the oldest was 40 years. Seven trichoscopic features were observed, which were anisotrichosis, peripilar sign, white dots, yellow dots, predominance of single-hair follicular units, focal atrichia, and scalp pigmentation. All cases (100%) exhibited anisotrichosis, irrespective of AGA severity, making it the most common feature. Significant associations were found between AGA grading and the presence of white dots (p=0.035), focal atrichia (p=0.0007), and honeycomb pigmentation (p=0.0024).

Conclusion: The study found an association between white dots, focal atrichia and honeycomb pigmentation of the scalp and the grade of AGA. Trichoscopy detects early changes in hair follicles, often preceding visible and irreversible baldness. It is an excellent non-invasive tool that allows for the rapid scanning of large areas.

Keywords: Anisotrichosis, Focal atrichia, Peripilar sign, Scalp pigmentation, White dots, Yellow dots

INTRODUCTION

The AGA is one of the most common causes of non-scarring hair loss in both men and women across all ethnicities, causing significant mental stress due to cosmetic concerns [1]. It refers to a progressive, patterned loss of scalp hair. The conversion of terminal to vellus follicles is the central event in the pathogenesis of AGA in genetically predisposed individuals [2]. Hamilton and Norwood classification is a widely accepted and reproducible classification system. It categorises male pattern baldness into seven progressive stages by visually assessing the pattern and extent of hair loss, particularly at the temples, vertex (crown), and frontal hairline [3]. Clinical examination gives important clues to the diagnosis of AGA but to rule out other conditions like alopecia areata, telogen effluvium and certain scarring alopecia's, further examination is required. Two decades ago, a scalp biopsy was the only tool to confirm, diagnose, and monitor disease severity, until the advent of a dermoscope.

Dermoscopy, also known as epiluminescence microscopy or skin surface microscopy is a non-invasive, in-vivo technique primarily used for viewing pigmented skin lesions [4]. It allows for rapid examination of the entire scalp and is very helpful in identifying the affected hair shafts when the disease is focal [5]. In 2006, Lidia Rudnicka and Malgorzata Olszewska coined the term "Trichoscopy" for dermoscopy of hair and the scalp [6].

Trichoscopy utilises a manual or video dermatoscope with magnification powers ranging from 20x to 1000x, typically operating within a range of 10x to 100x magnification for everyday use [7,8]. It is an effective tool not only for diagnosing AGA but also for assessing the severity, prognosis, and monitoring the response during medical management [9]. Trichoscopic observations can be broadly grouped into hair signs, vascular patterns, pigment patterns and interfollicular patterns [10]. Structures that may be visualised by trichoscopy include hair shafts, hair follicle openings, perifollicular epidermis, and cutaneous microvessels. The most common trichoscopic feature in AGA is hair thickness heterogeneity; other features include predominance of single hair pilosebaceous units, perifollicular pigmentation, short vellus hairs, yellow dots, white dots, focal atrichia, and honeycomb pigmentation of the scalp [11,12]. AGA, though non-scarring, needs to be diagnosed early in its initial stages. This is essential for a better prognosis, lest the loss of follicles lead to irreversible alopecia. The advanced stages of AGA cannot be completely reversed. With current advancements in the field of hair therapeutics, medical interventions can not only effectively halt but also partially restore hair growth especially in mild to moderate AGA. Combining medical management with surgical hair restoration yields optimal outcomes and most comprehensive results [13].

Hence, a non-invasive diagnostic tool like trichoscopy is crucial. Therefore, the present study aimed to identify and evaluate the association of the trichoscopic features with severity of AGA which will aid in early detection, grading and thereby timely intervention.

MATERIALS AND METHODS

The present retrospective observational study was conducted in the dermatology Outpatient Department at an Urban Tertiary Hospital (Medical College and Research Institute, Bengaluru) over a period of 12 months, between January 2019 to December, 2019. Ethical clearance was not obtained as there was no intervention, no drug involved and no disclosure of patient identity. The total sample size for the study was 50 participants.

Inclusion criteria: Men under the age of 40 who visited the dermatology out-patient department with a diagnosis of AGA were included in the study.

Exclusion criteria: Patients with hair loss conditions other than AGA, including chronic telogen effluvium, alopecia areata, anagen effluvium, scarring alopecia and scalp cancers, were excluded from the study.

Study Procedure

Patient's age, history, clinical type, and duration of disease were documented. A general physical, systemic, and dermatological examination was performed. Norwood Hamilton scale was used for grading [Table/Fig-1,2] [14,15]. Trichoscopy was performed, and relevant images were captured using a digital trichoscope (Firefly DE330T videodermatoscope, USA). All evaluations were conducted by a single examiner to avoid interobserver bias. The trichoscopic evaluation was based on established literature to ensure a standardised approach [9]. Well known documented features of AGA, which include Hair Shaft Thickness Heterogeneity (HSTH) also called anisotrichosis, Brown Peripilar Sign (BPPS), White Peripilar Sign/ White Dots (WPPS), yellow dots, focal atrichia and honeycomb scalp pigmentation were looked for in the frontal and vertex areas, and required images were obtained.
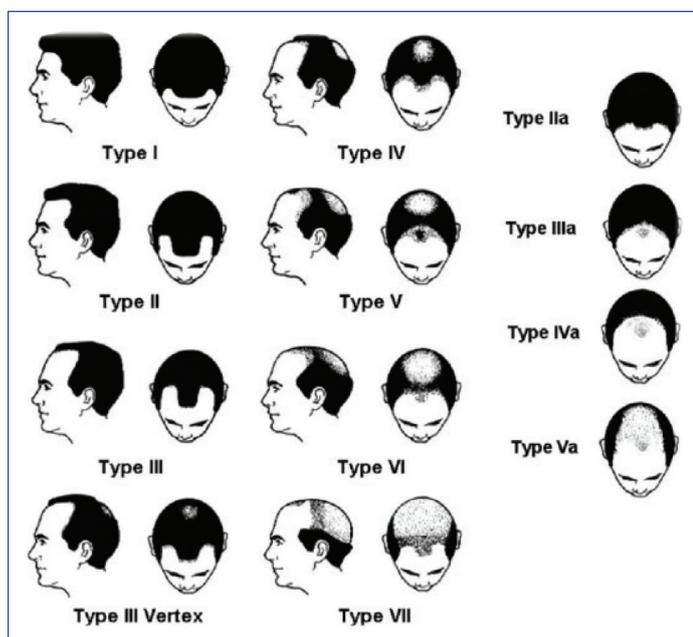
[Table/Fig-1]: Norwood-Hamilton classification of patterned hair loss in males [15].

STATISTICAL ANALYSIS

Graphpad Prism v9.3.1 software was used for statistical analysis. The Chi-square test was employed to assess the association between each parameter and AGA grading. For the purpose of statistical analysis AGA grades 1 & 2 were categorised as mild, grade 3 & 4 as moderate and grade 5 & 6 as severe. Results were considered statistically significant at p<0.05.

RESULTS

Out of the 50 patients enrolled in the study, the youngest was a 17-year-old and the oldest was a 40-year-old, the mean age being 29 years. The number of patients under each grade is given in [Table/

Grade	Description
1	There is minimal or no recession of the hairline.
2	There are triangular, usually symmetrical, areas of recession at the frontotemporal hairline.
3	This represents the minimal extent of hair loss sufficient to be considered as baldness. There is deep symmetrical recession at the temples that are bare or only sparsely covered by hair. In Type III vertex, the hair loss is primarily from the vertex with limited recession of the frontotemporal hairline that does not exceed the degree of recession seen in Type III.
4	The frontotemporal recession is more severe than in Type III and there is sparse hair or no hair on the vertex. The two areas of hair loss are separated by a band of moderately dense hair that extends across the top. This band connects with the fully haired fringe on the sides of the scalp.
5	The vertex hair loss region is still separated from the frontotemporal region but it is less distinct. The band of hair across the crown is narrower and sparser and the vertex and frontotemporal regions of hair loss are bigger.
6	The bridge of hair that crosses the crown is gone with only sparse hair remaining. The frontotemporal and vertex regions are joined together and the extent of hair loss is greater.
7	The most severe form of hair loss and only a narrow band of hair in a horseshoe shape remains on the sides and back of the scalp. This hair is usually not dense and may be quite fine.

[Table/Fig-2]: The various grades of hair loss described by Norwood – Hamilton Classification [15].

Fig-3]. Mild, moderate and severe categories include six, 38 and six patients, respectively.

Grade	Number of patients	In percent (%)
Grade 2	6	12
Grade 3	23	46
Grade 4	15	30
Grade 5	2	4
Grade 6	4	8

[Table/Fig-3]: Number of patients with each grade of Androgenetic Alopecia (AGA).

Anisotrichosis [Table/Fig-4] was observed in all 50 (100%) subjects. Predominant findings apart from anisotrichosis were peripilar sign [Table/Fig-5] seen in 40 (80%) patients, yellow dots [Table/Fig-6] in 11 (22%) patients, white dots [Table/Fig-7] in 24 (48%) patients, focal atrichia [Table/Fig-8] in 18 (36%) patients, honey comb pigmentation [Table/Fig-9] in 25 (50%) patients and predominance of single hair follicular units [Table/Fig-10] in 29 (58%) patients.

[Table/Fig-4]: Hair diameter variability/anisotrichosis (Black arrow shows vellus hair, Blue arrow shows follicles with intermediate thickness and Red arrow shows a follicle with normal thickness).

The trichoscopic features according to severity are elaborated in [Table/Fig-11-13]. Grade wise prominent features observed in the study are shown in [Table/Fig-14]. The trichoscopic features were more pronounced in the frontal than in the occipital area.

A statistically significant association was observed between AGA grading and the presence of white dots (p=0.035), focal atrichia
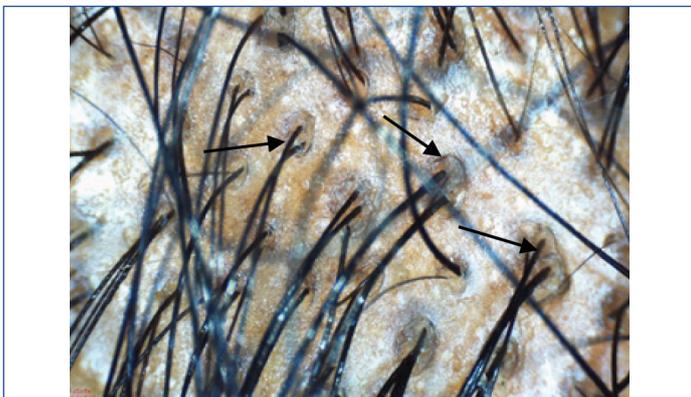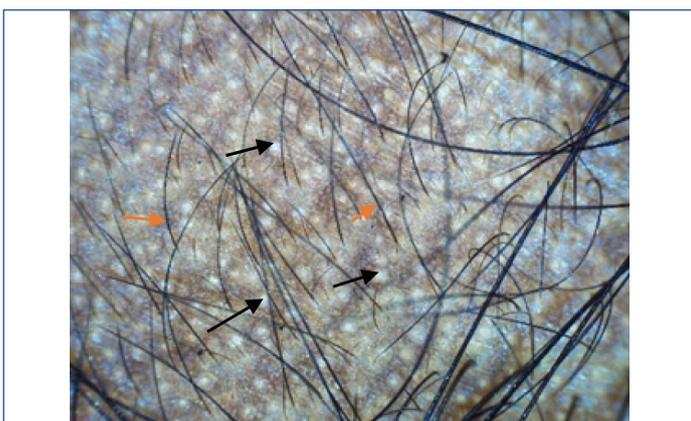
[Table/Fig-5]: Peripilar sign (marked with black arrows).

[Table/Fig-6]: Yellow dots.

[Table/Fig-7]: Numerous white dots (marked with black arrows), single hair follicular units (marked with red arrows).

[Table/Fig-8]: Focal atrichia (The areas marked with no hair follicles).

[Table/Fig-9]: Honeycomb pigmentation.

[Table/Fig-10]: Predominance of single hair follicular units.

X axis- number of patients in percentage

Y axis- parameters per grade of AGA in percentage
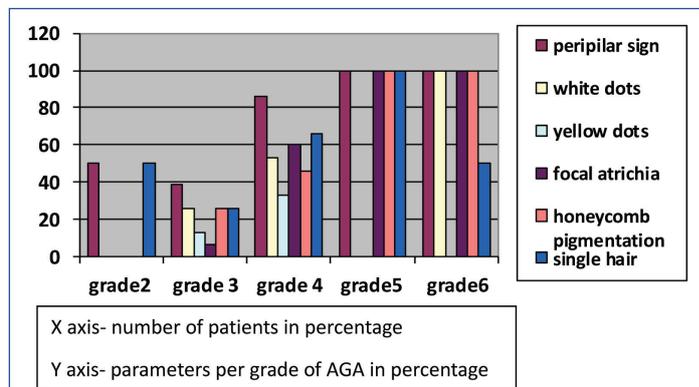
[Table/Fig-11]: Trichoscopy findings according to the severity (anisotrichosis not inclued since present in all).

DISCUSSION

In the present study, the mean age of presentation was 29, which is very low compared to other studies, because of the age limit taken by the authors. The trichoscopic features observed included anisotrichosis, white dots, yellow dots, predominance of single hair follicular units, scalp pigmentation, focal atrichia and peripilar sign which were the features well documented in existing literature [9]. The authors observed that anisotrichosis is seen in all the cases enrolled in the study further proving its sensitivity. The findings peripilar sign, yellow dots and predominance of single hair follicular units though have increased with the severity of the disease, did not show a strong correlation statistically, while the features white dots, focal atrichia and honey comb pigmentation of the scalp were seen in higher grades as compared to lower grades which with further scientific evidence, can be used as markers to detect the grade of AGA in a patient on dermoscopic examination, which is the main objective of the study.

Hair thickness heterogeneity, also called anisotrichosis is characterised by the simultaneous presence of hairs of varying

(p=0.0007), and honeycomb pigmentation (p=0.0024). The p-values for the peripilar sign, yellow dots, and predominance of single-hair follicular units were 0.084, 0.107, and 0.84, respectively, indicating no significant association. Statistical analysis demonstrated a positive correlation between trichoscopic findings and AGA grades.

Trichoscopic feature	Grade 2 (N=6)	Grade 3 (N=23)	Grade 4 (N=15)	Grade 5 (N=2)	Grade 6 (N=4)
Variation in hair diameter	6 (100%)	23 (100%)	15 (100%)	2 (100%)	4 (100%)
Honeycomb pattern	0	12 (52.17%)	7 (46.66%)	2 (100%)	4 (100%)
Peripilar sign	3 (50%)	18 (78.26%)	13 (86.66%)	2 (100%)	4 (100%)
Yellow dots	0	6 (26.08%)	5 (33.33%)	0	0
White dots	0	12 (52.17%)	8 (53.33%)	0	4 (100%)
Focal atrichia	0	3 (13.04%)	9 (60%)	2 (100%)	4 (100%)
Single hair follicular units	3 (50%)	12 (52.17%)	10 (66.66%)	2 (100%)	2 (50%)

[Table/Fig-12]: A summary of number of AGA patients with various levels of severity of the disease based on the Hamilton–Norwood grades (H-N) Here N is the number of patients enrolled in each grade.

Trichoscopic feature		AGA grade (N=50)			p-value
		Mild (N=6)	Moderate (N=38)	Severe (N=6)	
Anisotrichosis	Yes	6	38	6	NA
	No	0	0	0	
Peripillar sign	Yes	3	31	6	0.08
	No	3	7	0	
White dots	Yes	0	20	4	0.035
	No	6	18	2	
Yellow dots	Yes	0	11	0	0.107
	No	6	27	6	
Focal Atrichia	Yes	0	12	6	0.00076
	No	6	26	0	
Honey comb pigmentation	Yes	0	19	6	0.0024
	No	6	19	0	
Single hair	Yes	3	22	4	0.842
	No	3	16	2	

[Table/Fig-13]: Association between the AGA grading and trichosopic features (anisotrichosis, Peripillar sign, White dots, yellow dots, Focal atrichia, honeycomb pigmentation, single hair).
Chi-square test of association for trichoscopic features and AGA grading found that white dots, focal atrichia and honeycomb pigmentation have significant association with AGA grading with a p-value<0.05

Grade	Prominent features
Grade 2	Peripilar sign; predominance of single hair follicular units
Grade 3	Peripilar sign; white dots; honeycomb pigmentation; predominance of single hair follicular units
Grade 4	Peripilar sign; predominance of single hair follicular units (with other signs)
Grade 5	Focal atrichia (significant); features of earlier grades
Grade 6	Yellow dots (not appreciated in earlier grades); features of earlier grades

[Table/Fig-14]: Grade-wise prominent trichoscopic features.

thickness/diameters: vellus, thin, intermediate, and thick. Diameter variation of more than 20% in the androgen-dependent region is considered a major diagnostic criterion for AGA. This sign is very useful for diagnosis of initial AGA. Anisotrichosis has been shown to reflect follicle miniaturisation in AGA [16]. All subjects demonstrated anisotrichosis, similar to other studies [10,16].

White dots, indicative of perifollicular fibrosis [17], were observed in 48% of patients in the study, with a statistically significant p-value (0.035). This prevalence is lower than that reported by the Indian study, Ummiti A et al., (60.6%) but higher than that reported by the Chinese study, Hu R et al., (20.7%) [18,19]. While Hu R et al., noted the presence of white dots in 65% of patients with grade 6 disease, the present study found them in 100% of such cases. Their frequency generally increased with disease severity.

Yellow dots, which represent follicular infundibula filled with keratotic material or sebum, corresponds to either empty follicles or those containing miniaturised hairs [20]. In the present study, yellow dots were observed in 22% of patients, and were noted exclusively in grades 3 and 4, indicating moderate severity. In contrast, Ummiti A et al., reported the presence of yellow dots in 92.4% of male patients across both early and late stages of AGA [18]. However, Hu R et al., observed them in only 20.1% of patients with advanced-stage disease [19].

Predominance of single-hair follicular units, referring to the emergence of only one hair per follicular unit, was observed in 58% of subjects while it was observed in 85% subjects in the study done by Wang Y et al., [21]. The number of such units increased with disease severity suggesting progressive follicular miniaturisation, though not statistically significant in the present study. This is a characteristic, though non-specific, feature of both AGA and Female Pattern Hair Loss (FPHL).

Honeycomb pigmentation: Scalp pigmentation in the form of honeycomb pigmentation was observed in 50% of patients in the study, with a statistically significant p-value (0.002). The extent of honeycomb pigmentation increased with the severity of baldness, likely due to greater scalp exposure to sunlight. Ummiti A et al., reported honeycomb pigmentation in 87.9% of male patients in the late stages of AGA, whereas Hu R et al., noted it in 33.2% of patients with advanced disease [18,19].

Focal atrichia was observed in 36% of patients in the study, with a statistically significant p-value (0.0007). The findings are consistent with those of Ummiti A et al., who reported focal atrichia in 21.2% of male patients, and Hu R et al., who observed it in 28%, both showing a trend of increasing frequency with advancing severity of AGA [18,19].

The peripilar sign refers to brown, slightly depressed halos approximately 1 mm in diameter surrounding the emergence of the hair shaft [22]. Inui S et al., hypothesised that, in Asians, the peripilar sign may result from postinflammatory hyperpigmentation [16]. Karadağ Köse Ö and Güleç AT suggested that the peripilar sign is specific to AGA. In healthy scalps, less than 5% of follicular openings demonstrate brown peripilar pigmentation [23]. Extensive presence of the peripilar sign is considered a poor prognostic indicator in AGA. In the present study, the peripilar sign was observed in 80% of patients- higher than the prevalence reported by Hu R et al., [19] (44%) and Inui S et al., [16] (66%), but lower than that reported by Ummiti A et al., (89.4%) and Deloche C et al., (90%). Although the sign was present in some patients with lower-grade AGA, its frequency increased with advancing severity, though not statistically significant [18,22]. In AGA, trichoscopic abnormalities are more pronounced in the frontal than in the occipital area which was also observed in the present study [10]. The association of the aforementioned trichoscopic features with the grade of AGA highlights the importance of early detection. Identification of these features in the initial stages of the condition may indicate a favorable response to medical therapy, as early-stage AGA is generally amenable to pharmacological management. Timely intervention can help prevent or delay progression to advanced stages characterised by irreversible hair loss, where surgical options such as hair transplantation become the primary treatment modality.

Limitation(s)
Sample size calculation was not done. Large scale studies with more subjects control group and involving all age groups and both the sexes are required.

CONCLUSION(S)
There is a significant association between white dots, focal atrichia, and honey comb pigmentation with AGA grading therefore establishing a positive correlation of trichoscopic findings with

AGA grades. Trichoscopy serves as a valuable, non-invasive tool for diagnosing AGA, educating patients, and monitoring treatment response. Recognition of grade-specific trichoscopic signs enhances its diagnostic utility.

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• Was informed consent obtained from the subjects involved in the study?   No
• For any images presented appropriate consent has been obtained from the subjects.   NA