Evaluation of trichoscopic findings in androgenetic alopecia and their association with disease severity

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Background: Androgenetic alopecia (AGA) is a non-scarring form of patterned hair loss characterized by the miniaturization of terminal hair into vellus hair. The scalp biopsy was once considered an ideal tool for diagnosing the disease, though dermatoscopy has emerged as a reliable technique that can aid in the diagnosis and monitor the disease severity.

Methods: A total of 68 patients (38 males and 30 females) in the age group of 21-70 years attending the dermatology outpatient department in 1 year were included in the study. A detailed history was taken, followed by a scalp examination. The type of hair loss in each patient was documented. Then, a dermatoscopic examination was done using a Dermlite DL4 dermoscope.

Results: Hair thickness heterogeneity was the most common dermatoscopic feature seen in all the patients of male and female pattern hair loss. There was a positive correlation between some dermatoscopic variables such as yellow dots and perifollicular pigmentation with the disease severity. Yellow dots were seen in the late stages of AGA ($P < 0.01$), while perifollicular pigmentation was observed in the early stages of AGA ($P < 0.01$).

Conclusions: Trichoscopy is a simple and non-invasive office tool that aids in diagnosing AGA. It allows the various sections of hair to be examined simultaneously and obviates the need for a scalp biopsy. Besides this, it helps assess the disease severity and the photographic documentation at each visit helps monitor the response to treatment.

Keywords: female androgenetic alopecia, male androgenetic alopecia, trichoscopy

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INTRODUCTION

Androgenetic alopecia (AGA) refers to the non-scarring form of alopecia characterized by patterned loss of terminal hair, affecting both men and women with a genetic predisposition. AGA in males, referred to as male pattern hair loss (MPHL), is the most common type of non-scarring hair loss in Asian men [1]. Androgenetic alopecia in females is referred to as female pattern hair loss (FPHL) because of the uncertain association of androgens and this entity [2]. Hair cycle alterations, follicular miniaturization of terminal hair into vellus hair, and inflammation are the pathophysiological features of AGA—follicular miniaturization being the hallmark [3].

As an obvious disease, AGA causes a considerable impact on the patient's psychological well-being and may impair their quality of life. Thus, early diagnosis and intervention are necessary to prevent hair loss progression. Scalp biopsy has been considered the gold standard technique for diagnosing AGA, but is not frequently accepted by patients due to

its invasive nature. Trichoscopy has emerged as a non-invasive technique for diagnosing AGA and differentiating it from various other types of alopecia. Along with this, trichoscopy helps in evaluation of disease severity and thus aids in monitoring the treatment response [4].

PARTICIPANTS AND METHODS

Ethical considerations

Informed consent was taken from each patient. Approval from the Institutional Ethics Committee was obtained in December 2018.

Participants and study design

The present cross-sectional and observational study was conducted on 68 patients presenting with the complaint of hair loss to the outpatient department of Dermatology, Venereology and Leprosy in Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar from January 2019 to September 2020.

Clinical assessment

A detailed history of all the patients was taken in terms of demographic details including the age, occupation, and hair loss duration. Scalp examination was done, and the hair loss pattern in males and females was graded based on Hamilton-Norwood grading and Ludwig grading, respectively. This was followed by a hair pull test. Thus, the diagnosis of AGA was based on history and clinical assessment. Then, a dermatoscopic examination of the scalp was done using a Dermlite DL4 dermoscope to see the various hair follicle and hair shaft patterns.

Statistical methods

The results were tabulated and analyzed using SPSS Software 19.0 version. Percentages and mean values with standard deviation were calculated wherever applicable. For comparing and finding a correlation between different variables with the diagnosis, the t-test was used. Results were considered significant if the P-value was less than 0.05 and highly significant when less than 0.001.

RESULTS

Out of 68 patients, 38 (19%) cases were males, and 30 (15%) patients were females. The mean age of presentation in MPHL was 33.10 years, with a standard deviation of 8.44 years. The mean duration of hair loss was 19.8 months, with a standard deviation of 12 months. The mean age of presentation in FPHL was 41.6 years. The mean duration of hair loss was 15.6 months with a standard deviation of 5.67 months.

The dermatoscopic features observed in male and female pattern hair loss included hair thickness heterogeneity (Figure 1), Perifollicular pigmentation

Figure 1. Hair thickness heterogeneity.

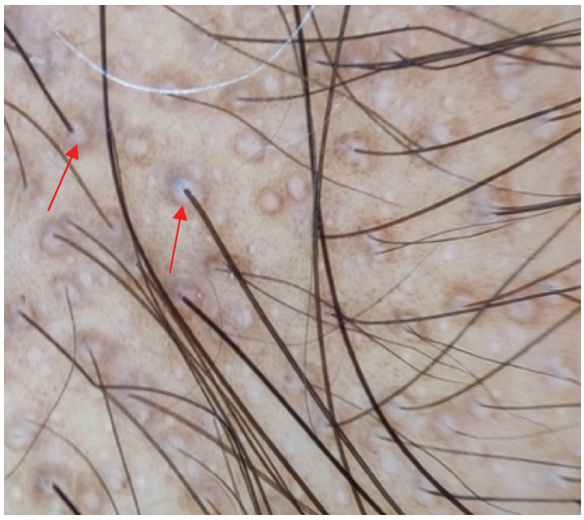

Figure 2. Peripilar sign.

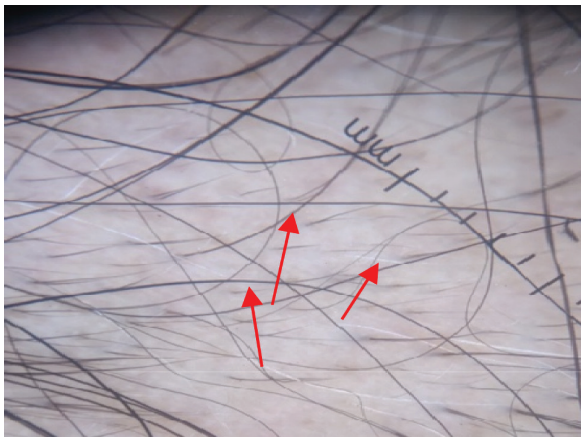

Figure 3. Short vellus hairs.

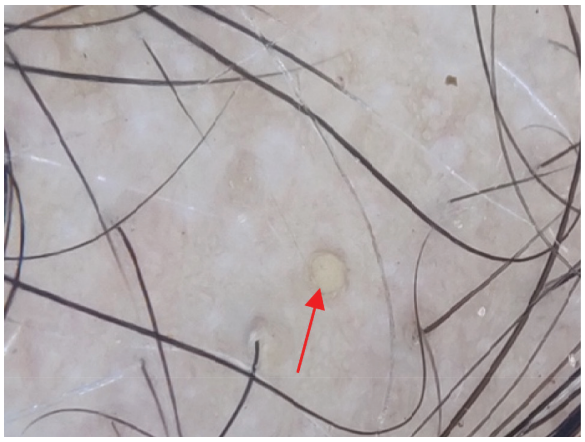

Figure 4. Yellow dot.

(Figure 2), Short vellus hair (Figure 3), yellow dots (Figure 4) and single hair pilosebaceous units.

Trichoscopic features of male pattern hair loss (MPHL)

The most common trichoscopic feature was hair thickness heterogeneity, which was seen in all patients with MPHL. This was followed by single hair pilosebaceous units in 24 patients (63.1%), perifollicular pigmentation in 23 cases (60.5%), short vellus hair in 17 subjects (44.7%), and yellow dots in 18 individuals (47.37%) (Table 1).

Trichoscopic features of female pattern hair loss (FPHL)

The most common trichoscopic feature was hair thickness heterogeneity, seen in all patients with FPHL. This was followed by single hair pilosebaceous units in 20 patients (66.6%), short vellus hair in 9 patients (30.00%), yellow dots in 13 patients (43.3%), and perifollicular pigmentation in 13 patients (43.3%) (Table 1).

Correlation of trichoscopic patterns with disease severity in male pattern hair loss (MPHL)

Eighteen out of 38 patients belonged to grade II of Norwood Hamilton classification, followed by 8 patients in grade I; 7 patients in grade III, and 5 patients in grade IV (Table 2). Hair thickness heterogeneity was seen in all the patients (100%) of all the grades.

Patients with grade IV showed the highest number of yellow dots (80%), followed by patients with grade III (71.4%), then grade II (38.8%), and grade I (25%). Short vellus hair was seen in 6 (75%) patients of grade I, 6 (33.3%) of grade II, 3 (42.8%) of grade III, and 2 (40%) patients of grade IV. Single hair pilosebaceous units were seen in 5 (62.5%) patients of grade I, 12 (66.6%) of grade II, 3 (42.8%) of grade III, and 4 (80%) of grade IV. Perifollicular pigmentation was seen maximum in grade I in 7 (87.50%) patients, followed by 12 (66.66%) patients in grade II, 3 (42.86%) patients in grade III, and 1 (20%) patient in grade IV (Table 2).

The disease severity correlated significantly with hair thickness heterogeneity ($P < 0.001$), yellow

Table 1. Trichoscopic features of male pattern hair loss (MPHL) and female pattern hair loss (FPHL)

Trichoscopic feature	MPHL		FPHL	
	Number	Percentage	Number	Percentage
Yellow dots	18	47.37	13	43.33
Short vellus hair	17	44.73	9	30.00
Hair thickness heterogeneity	38	100.00	30	100.00
Single hair pilosebaceous unit	24	63.16	20	66.66
Perifollicular pigmentation	23	60.52	13	43.33

Table 2. Correlation of trichoscopic patterns with disease severity in male pattern hair loss (MPHL) and female pattern hair loss (FPHL)

Trichoscopic feature	MPHL									FPHL						
	Grade I (n=8)		Grade II (n=18)		Grade III (n=7)		Grade IV (n=5)		*P*-value	Grade I (n=8)		Grade II (n=16)		Grade III (n=6)		*P*-value
	N	%	N	%	N	%	N	%		N	%	N	%	N	%	
Yellow dots	2	25	7	38.89	5	71.43	4	80	0.006**	2	25	7	43.75	4	66.67	0.003**
Short vellus hair	6	75	6	33.33	3	42.86	2	40	0.864^{NS}	2	25	5	31.25	2	33.33	0.360^{NS}
Hair thickness heterogeneity	8	100	18	100	7	100	5	100	< 0.001**	8	100	16	100	6	100	< 0.001**
Single hair pilosebaceous unit	5	62.5	12	66.67	3	42.86	4	80	0.573^{NS}	5	62.5	11	68.75	4	66.66	0.413^{NS}
Perifollicular pigmentation	7	87.5	12	66.66	3	42.86	1	20	< 0.001**	6	75	6	37.5	1	16.67	< 0.001**

** Significant at 0.01 level of significance
* Significant at 0.05 level of significance, NS: Non-significant

dots ($P = 0.006$), and perifollicular pigmentation ($P < 0.001$), but not with short vellus hair ($P = 0.864$) or single hair pilosebaceous units ($P = 0.573$)

Correlation of trichoscopic patterns with disease severity in female pattern hair loss (FPHL)

Sixteen out of 30 patients belonged to Grade II of Ludwig's classification, followed by 8 patients in Grade I and 6 patients in Grade III.

Hair thickness heterogeneity was seen in all 30 (100%) patients with FPHL. Yellow dots were seen maximum in grade III in 4 out of 6 (66.6%) patients, followed by 7 out of 16 (43.7%) patients in grade II and 2 out of 8 (25%) patients in grade I. Short vellus hairs were seen in 2 (25%) patients in grade I, 5 (31.2%) patients in grade II, and 2 (33.33%) patients in grade III. Single hair pilosebaceous units were seen in 5 (62.5%) patients of grade I, 11 (68.7%) patients of grade II, and 4 (66.6%) patients of grade III. Perifollicular pigmentation was seen maximum in grade I in 6 (75%) patients, followed by 6 (37.5%) patients in grade II and 1 (16.6%) patient in grade III (Table 2).

Disease severity correlated significantly with hair thickness heterogeneity ($P < 0.001$), yellow dots ($P = 0.003$), and perifollicular pigmentation ($P < 0.001$), but not with short vellus hair ($P = 0.360$) or single hair pilosebaceous units ($P = 0.413$).

DISCUSSION

We diagnosed androgenetic alopecia (AGA) clinically based on thinning of hair at the specific site involved and the presence of a receding hairline in males or widening of the central partition in females. Then, a hair pull test was done, which was negative in all patients.

The most common grade in our study in MPHL was Hamilton-Norwood grade II, followed by grade I and then grade III, similar to that observed by Krupa Shankar *et al.* in the Indian population [5]. However, in a study done by Sehgal *et al.*, grade II (28%) was the most common, followed by grade III (15%) [6]. The predominant grade in our study in FPHL was Ludwig's grade II, followed by grade I and then grade III, similar to that observed in a study conducted by Ummiti *et al.* in 91 patients with AGA [7].

The dermatoscopic features observed in male and female pattern hair loss included hair thickness heterogeneity, yellow dots, perifollicular pigmentation, single hair pilosebaceous units, and short vellus hairs. The most common dermatoscopic feature seen in both MPHL and FPHL was hair thickness heterogeneity, seen in 100% of patients. Govindarajaulu *et al.* conducted a study on 100 patients and observed that hair diameter diversity was present in all the patients, similar to our findings [8]. Another study conducted by Inui *et al.* reported corresponding findings [9]. Hair diameter diversity of more than 20% in males and 10% in females has been considered to be significant [10]. It has also been established as one of the major criteria of FPHL, as described by Rakowska *et al* [11].

In our study, single hair pilosebaceous units were seen in 63% of patients with MPHL and 67% of patients with FPHL, comparable to the study done by Rakowska *et al* [11]. A greater than 2:1 frontal to occiput ratio of single hair pilosebaceous units is one of the minor diagnostic criteria for the diagnosis of FPHL [11].

Perifollicular pigmentation corresponds to the perifollicular lymphocytic infiltrate on

histopathology [12]. This is typically seen in the early stages of male and female pattern hair loss [11]. Thus, it indicates the involvement of perifollicular hair disorders directly involved in the early stage of the disease. Perifollicular pigmentation in MPHL (61%) in our study was comparable to Govindarajaulu *et al.*'s finding [8]. On the other hand, Kibar *et al.* [13] and Chiramel *et al.* [14] observed perifollicular pigmentation in 46% and 9% of patients with MPHL, respectively.

In the present study, 43% of patients with FPHL had perifollicular pigmentation, agreeing with the study conducted by Hu Ruiming *et al.* (44.5%) [10]. On the other hand, Kibar *et al.* [13] and Chiramel *et al.* [14] observed perifollicular pigmentation in 64.9% and 11.1% of patients with FPHL, respectively. The variability in the incidence of perifollicular pigmentation can be explained based on the differences in scalp color [10].

We observed that perifollicular pigmentation decreased with the increase in grade and, thus, with the increase in disease severity. In our study, in males, perifollicular pigmentation was seen most in cases of grade I MPHL and least in cases of grade IV MPHL. In females, perifollicular pigmentation was seen most in grade I cases and least in grade III cases of FPHL. Similar findings were observed by Umitti *et al.* in 91 patients with AGA [7].

Yellow dots are characteristically seen in the advanced stages of MPHL and FPHL [15]. The importance of yellow dots in patterned hair loss is based on the fact that the presence of four or more yellow dots on four trichoscopic fields in the frontal region is one of the major dermoscopic criteria for the diagnosis of FPHL, as described by Rakowska *et al* [11].

Yellow dots were seen in 18 (47%) patients with MPHL in our study. Govindarajaulu *et al.* [8] and Kibar *et al.* [13] reported yellow dots in 21.4% and 28.4% of patients with MPHL, respectively. However, Chiramel *et al.* [14] observed yellow dots in 100% of patients with MPHL. Maximum yellow dots in the present study were seen in grade IV and least in grade I of MPHL, in accordance with Hu Ruiming *et al.*'s [10] and Zhang *et al.*'s findings [16].

In regards to FPHL, we found yellow dots in 43% of patients, similar to the findings of Govindarajaulu *et al.* [8] and Chiramel *et al.* [14]. On the other hand, fewer studies reported a lower incidence of yellow dots in FPHL. Hu R *et al.* [10] and Kibar *et al.* [13] reported yellow dots in 24.1% and 18.7% of patients with FPHL, respectively. The variability in yellow dots in different studies is due to differences in scalp color, shampooing habits, and type of dermoscope [17].

We recorded yellow dots more in MPHL than FPHL, with Inui *et al.* reporting a similar finding [9]. Yellow dots in MPHL and FPHL predominantly consist of sebum and result from sebaceous hypertrophy. This explains the higher incidence of yellow dots in MPHL considering the higher levels of androgens.

A frontal to occipital ratio of greater than 1.5:1 in the number of vellus hairs is established as one of the minor criteria for diagnosing FPHL [11]. Short vellus hairs were seen in 17 (45%) of patients with MPHL and 9 (30%) of patients with FPHL. These findings are comparable to the findings of Chiramel *et al* [14].

In the present study, dermatoscopic features such as yellow dots and perifollicular pigmentation correlated with the disease severity of AGA. There was no correlation of single hair pilosebaceous units and short vellus hairs with the disease severity. Yellow dots were seen in a higher percentage of patients with an advanced stage of the disease than in the early stage. Perifollicular pigmentation was seen more in the early stage of the disease compared with the advanced stage, indicating that perifollicular lymphocytic infiltration is more common in the early stage. Thus, yellow dots and perifollicular pigmentation are considered to be the markers of disease severity in MPHL and FPHL. Hu Ruiming *et al.* studied the association of trichoscopic findings in AGA patients and also observed that yellow dots and perifollicular pigmentation correlated with disease severity [10]. Similar observations have also been reported by Umitti *et al* [7]. On the other hand, there was no correlation between the dermoscopic features and disease severity in a study conducted by Kibar *et al* [13]. Thus, we found a significant correlation between some trichoscopic features such as yellow dots and perifollicular pigmentation and disease severity, which may aid in diagnosing the early and late stages of MPHL and FPHL.

Trichoscopy has emerged as a simple and non-invasive tool for diagnosing hair and scalp disorders. It aids in recognizing various hair loss patterns and structures and improves the observer's

sensitivity in diagnosing hair disorders. Our study mainly analyzed the trichoscopic features of AGA and evaluated their correlation with the disease severity. Thus, trichoscopy is a novel diagnostic tool that aids in assessing disease severity so that early intervention can be planned and further progression of hair loss can be avoided.

Limitations

The present study did not include the cases with other forms of hair loss for the comparisons of trichoscopic features. To have more significant results, a larger number of patients should be studied in different age groups with histopathological confirmation of the results.

Conflict of interest: None declared.

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