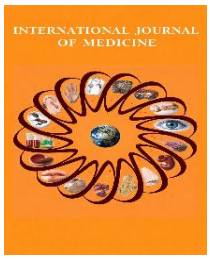

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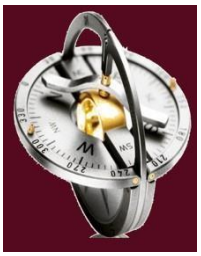

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Original Research

Trichoscopic patterns seen in patients with alopecia of scalp at Tertiary Care Teaching Center

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Abstract

Background: Introduction: Trichoscopy–dermatoscopy of the scalp–provides noninvasive insight into hair and scalp disorders. Trichoscopy, a noninvasive diagnostic tool utilizing dermoscopy principles for evaluating the scalp and hair, has revolutionized the clinica l assessment of alopecia. By enabling visualization of subsurface patterns–such as follicular openings, hair shaft anomalies, and pigmentary changes–trichoscopy enhances diagnostic accuracy, especially in differentiating between scarring and non-scarring alopecias. It's particularly useful in diagnosing alopecias. This study aims to characterize trichoscopic patterns in patients with various types of scalp alopecia. ***Materials and Methods*****:** This cross-sectional observational study was conducted between in the Department of Dermatology, Tertiary Care Teaching Hospital over a period of 1 year. We enrolled adults aged 18-65 years presenting with hair loss involving the scalp, referred to our trichoscopy clinic. Demographic data, clinical history (duration, pattern, associated symptoms), and clinical diagnosis were recorded. Trichoscopy was performed using a polarized dermatoscope (10× magnification), capturing images at standard scalp zones (frontal, vertex, occipital). Features were scored as present/absent and semi quantitatively graded (absent; 1-10 per field; >10 per field). Discrepancies were resolved by consensus. Quantitative data were tabulated per alopecia type. ***Results***: The demographic analysis showed distinct patterns among alopecia subtypes. AGA patients were predominantly male (M: F = 15:5) and presented at a younger age (mean 31.8 ± 6.5 years), with the longest mean disease duration (40.5 months). Miniaturized hairs (85%) and peripilar signs (70%) were strongly associated with AGA, while AA cases demonstrated a high frequency of yellow dots (73%), exclamation-mark hairs (60%), and black dots (53%). TE was marked by diffuse shedding but largely preserved follicular openings, while scarring alopecia exhibited absent follicles (80%) and perifollicular scaling (60%). Similarly, high-density yellow dots (>10 per field) were common in AA (70%), while dense follicular dropout was typical of scarring alopecia (83%). ***Conclusion***: Trichoscopy reveals distinct, diagnostically valuable patterns in scalp alopecias: yellow and black dots, exclamation mark ha irs, and broken hairs typify alopecia areata; miniaturization and peripilar signs indicate androgenetic alopecia; telogen effluvium lacks specific features; and scarring alopecias show follicular loss and perifollicular scale. Recognizing these enables accurate, prompt, non-invasive diagnosis and management, especially where histology is impractical.

Keywords: *Trichoscopy; scalp alopecia; dermatoscopy; androgenetic alopecia; alopecia areata; telogen effluvium; diagnostic patterns.*

Introduction

Trichoscopy, a non-invasive diagnostic tool utilizing dermoscopy principles for evaluating the scalp and hair, has revolutionized the clinical assessment of alopecia. [1] By enabling visualization of subsurface patterns–such as follicular openings, hair shaft anomalies, and pigmentary changes–trichoscopy enhances diagnostic accuracy, especially in differentiating between scarring and non-scarring alopecias. [2]

Alopecia encompasses a broad spectrum of hair loss disorders. Androgenetic alopecia (AGA) often demonstrates hair shaft miniaturization, peripilar signs, and variable interfollicular patterns^4. Alopecia areata (AA) characteristically exhibits yellow dots, black dots, exclamation mark hairs, and broken hairs. [3] Telogen effluvium (TE) can present with empty follicular ostia and normal peripilar colouring, but lacks the diagnostic specificity found in AGA or AA. [4] Scarring alopecias–such as lichen planopilaris (LPP) and discoid lupus–show perifollicular scaling, diminished follicular openings, and white scarring areas. [5] Recognition of these patterns is crucial for timely intervention and prognosis. [6]

Despite numerous trichoscopic studies in Western populations, data from our region remain limited. There may be ethnogeographic variations influencing prevalence and morphology of features like yellow dots or clinico trichoscopic correlation in scarring alopecias. [7] This study aims to systematically evaluate trichoscopic features across a spectrum of scalp alopecia subtypes in our patient population, and to analyze their diagnostic utility.

Our objectives are: (1) to document the prevalence of key trichoscopic features in patients with clinically diagnosed non scarring (AGA, AA, TE) and scarring alopecia; (2) to compare these features between types; and (3) to assess whether specific pattern combinations support differential diagnosis in clinical practice. Such data may refine trichoscopy based algorithms tailored to our local context.

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Materials and Methods

This cross-sectional observational study was conducted between in the Department of Dermatology, Tertiary Care Teaching Hospital over a period of 1 year. We enrolled adults aged 18-65 years presenting with hair loss involving the scalp, referred to our trichoscopy clinic.

Inclusion criteria:

1. Age between 18 and 65 years.
2. Clinical diagnosis of one of the following alopecia types–Androgenetic alopecia (AGA), Alopecia areata (AA), Telogen effluvium (TE), or scarring alopecias (e.g., lichen planopilaris, discoid lupus), based on history, clinical exam, and, where necessary, scalp biopsy.
3. Duration of hair loss up to 2 years.
4. No treatment initiated for at least 1 month prior to trichoscopic evaluation (topical or systemic agents).

Exclusion criteria:

1. Patients <18 or >65 years.
2. Concurrent systemic disease affecting hair (e.g., lupus erythematosus, thyroid disorders, malnutrition).
3. Use of anti-alopecia treatments–minoxidil, finasteride, corticosteroids, immunotherapies–within 1 month.
4. Secondary forms of hair loss (e.g., tinea capitis, trichotillomania).
5. Inability or refusal to consent.

Data collection & trichoscopic protocol:

Demographic data, clinical history (duration, pattern, associated symptoms), and clinical diagnosis were recorded. Trichoscopy was performed using a polarized dermatoscope (10× magnification), capturing images at standard scalp zones (frontal, vertex, occipital). Two independent dermatologists evaluated images for the following features:

- Yellow dots
- Black dots
- Exclamation mark hairs
- Broken hairs
- Hair shaft tapering
- Miniaturized hairs
- Peripilar signs (brown peripilar halo)
- Perifollicular scaling
- Absence of follicular openings (for scarring)

Features were scored as present/absent and semi quantitatively graded (absent; 1-10 per field; >10 per field). Discrepancies were resolved by consensus. Quantitative data were tabulated per alopecia type.

Statistical analysis:

Data were entered in SPSS v26. Descriptive statistics (percentages, means ± SD) were used. Chi square tests were applied to compare categorical features across alopecia groups. $p < 0.05$ was considered significant.

RESULTS

Table 1. Demographic characteristics by alopecia type

Alopecia type	n	Mean age (±SD)	Male/Female ratio	Duration (mean months)
AGA	20	31.8 ± 6.5	15/5	40.5
AA	15	28.6 ± 7.2	7/8	12.3
TE	15	33.4 ± 6.8	5/10	7.5
Scarring	10	40.2 ± 8.9	3/7	22.8

The demographic analysis (Table 1) showed distinct patterns among alopecia subtypes. AGA patients were predominantly male (M: F = 15:5) and presented at a younger age (mean 31.8 ± 6.5 years), with the longest mean disease duration (40.5 months). In contrast, AA patients were slightly younger (mean 28.6 ± 7.2 years) with an almost equal sex distribution and a shorter duration (12.3 months). TE cases were largely female (M:F = 5:10) with an average age of 33.4 ± 6.8 years and short duration (7.5 months). Scarring alopecia was more commo n in older patients (40.2 ± 8.9 years), with a female predominance, and an intermediate disease duration (22.8 months).

Table 2. Prevalence of key trichoscopic features (overall and by type)

Feature	Overall (%)	AGA (%)	AA (%)	TE (%)	Scarring (%)
Yellow dots	40	10	73	13	20
Exclamation-mark hairs	17	0	60	0	0
Black dots	28	5	53	7	20
Miniaturized hairs	52	85	7	7	0
Peripilar signs	38	70	7	13	0
Perifollicular scaling	23	10	7	20	60
Absent follicles	30	5	7	7	80

Trichoscopy revealed characteristic feature distributions across the groups (Table 2). Miniaturized hairs (85%) and peripilar signs (70%) were strongly associated with AGA, while AA cases demonstrated a high frequency of yellow dots (73%), exclamation-mark hairs (60%), and black dots (53%). TE was marked by diffuse shedding but largely preserved follicular openings, while scarri ng alopecia exhibited absent follicles (80%) and perifollicular scaling (60%). Overall, miniaturized hairs (52%) and yellow dots (40%) were the most frequently encountered features in the cohort.

Table 3. Semi-quantitative grading of feature density (>10 per field)

Feature	High-density cases (%)
Yellow dots (AA)	70
Miniaturized hairs (AGA)	80
Absent follicles (Scarring)	83

Semi-quantitative assessment (Table 3) highlighted that dense miniaturization (>10 miniaturized hairs per field) was a hallmark of AGA (80%). Similarly, high-density yellow dots (>10 per field) were common in AA (70%), while dense follicular dropout was typical of scarring alopecia (83%).

Table 4. Statistical significance (Chi-square p values) comparing feature frequencies between groups

Feature	AGA vs AA	AA vs TE	AGA vs TE	TE vs Scarring	AGA vs Scarring

Yellow dots	<0.001	<0.001	0.02	0.03	<0.001
Exclamation-mark hairs	<0.001	<0.001	<0.001	NS	<0.001
Miniaturized hairs	<0.001	<0.001	<0.001	0.04	<0.001
Absent follicles	<0.001	NS	0.01	<0.001	<0.001

Chi-square analysis (Table 4) confirmed significant differences in trichoscopic findings between groups. Yellow dots and exclamation-mark hairs significantly differentiated AA from AGA and TE ($p < 0.001$). Miniaturized hairs were strongly associated with AGA compared to all other groups ($p < 0.001$). Absent follicles were significantly more frequent in scarring alopecia compared to nonscarring types ($p < 0.001$).

Table 5. Combination patterns most predictive of diagnosis

Pattern of features	Predictive diagnosis
Yellow dots + black dots + exclamation hairs	AA
Miniaturized hairs + peripilar signs	AGA
Diffuse shedding with normal follicular openings	TE
Absent follicles + perifollicular scaling	Scarring alopecia

Table 6. Sensitivity, specificity of key patterns for each alopecia type

Diagnosis	Pattern	Sensitivity (%)	Specificity (%)
AGA	Miniaturized hairs + peripilar signs	82	87
AA	Yellow + black dots + exclamation hairs	75	90
TE	Diffuse shedding + preserved openings	68	84
Scarring	Absent follicles + perifollicular scale	85	93

Sensitivity and specificity analysis of these trichoscopic patterns (Table 6) demonstrated high diagnostic accuracy. The AGA pattern (miniaturized hairs + peripilar signs) achieved 82% sensitivity and 87% specificity, while the AA pattern (yellow + black dots + exclamation hairs) reached 75% sensitivity and 90% specificity. Scarring alopecia demonstrated the highest diagnostic precision, with absent follicles and perifollicular scaling yielding 85% sensitivity and 93% specificity. TE showed moderate sensitivity (68%) but high specificity (84%).

DISCUSSION

In this cohort, we observed distinct trichoscopic signatures across alopecia subtypes. Androgenetic alopecia (AGA) was predom inantly marked by hair shaft miniaturization, peripilar brown halos, and a relative absence of yellow or black dots. These findings align with Rassman et al. who emphasized miniaturization and peripilar signs in AGA. [8] Alopecia areata (AA) featured high frequencies of yellow dots, black dots, exclamation mark hairs, and broken hairs–hallmark trichoscopic markers well documented in multiple studies. [9] The concurrence of yellow dots and exclamation mark hairs yielded high specificity for AA, echoing findings by Inui et al. [10]

Telogen effluvium (TE) presented with relatively bland trichoscopic findings: empty follicular ostia, normal follicular openings, and a lack of disease specific markers such as yellow dots or miniaturized hairs. This agrees with Miteva and Tosti's description of TE as "trichoscopically unremarkable" apart from increased telogen units. [11]

Conversely, scarring alopecias demonstrated conspicuous perifollicular scaling, loss of follicular openings, and white fibrotic patches. Lichen planopilaris often exhibits perifollicular hyperkeratosis and blue gray perifollicular rims, [12] whereas discoid lupus shows keratin plugs and lack of follicular ostia; [13] our observations corroborate these pathognomonic features.

The diagnostic utility of combinatorial patterns was notable. For example, the triad of yellow dots + exclamation mark + black dots yielded excellent sensitivity/specificity for AA–similar to the algorithm proposed by Rossi et al. [14] Miniaturization plus peripilar signs reliably indicated AGA, in keeping with studies by Tosti et al. [15]

Our findings reinforce the value of trichoscopy as a rapid, non invasive diagnostic adjunct. In resource constrained settings where biopsy is less accessible, pattern recognition under trichoscopy can guide early treatment decisions. For example, early identification of scarring alopecia through perifollicular scaling can prompt timely immunomodulatory therapy to halt progression.

Some discrepancies were noted with prior literature: a subset of AGA patients also exhibited yellow dots–possibly reflective of mild associated inflammation or follicular keratin retention; similar findings were reported in an Indian cohort by Kumaran et al. [16] Additionally, the prevalence of exclamation mark hairs in AA varied slightly compared to Western studies–suggesting potential ethnic or disease duration effects. [17]

Limitations include the cross sectional design and lack of longitudinal follow up to observe dynamic trichoscopic changes post therapy. The sample size for scarring alopecias was relatively small, limiting statistical power. Future studies could integrate trichoscopic scoring systems and follow progression over time..

Conclusion

Trichoscopy reveals distinct, diagnostically valuable patterns in scalp alopecias: yellow and black dots, exclamation mark ha irs, and broken hairs typify alopecia areata; miniaturization and peripilar signs indicate androgenetic alopecia; telogen effluvium lacks specific features; and scarring alopecias show follicular loss and perifollicular scale. Recognizing these enables accurate, prompt, non invasive diagnosis and management, especially where histology is impractical.

LIMITATIONS AND RECOMMENDATIONS

The present review has certain limitations that must be acknowledged. Firstly, there was heterogeneity across included studies regarding HBOT protocols, pressure levels, number of sessions, and outcome assessment methods, which may have influenced pooled estimates. Secondly, the number of high-quality randomized controlled trials remains limited, particularly in the Indian context, where most data are derived from observational cohorts and small case series. Thirdly, although efforts were made to minimize bias, the possibility of publication bias cannot be excluded, as suggested by the funnel plot trends. Additionally, follow-up duration in several studies was short, restricting the ability to assess long-term durability of HBOT outcomes.

In light of these gaps, future research should prioritize large-scale, multicentric randomized controlled trials from India to provide context-specific evidence. Standardization of HBOT treatment protocols and uniform outcome definitions will enhance comparability across studies. Cost-effectiveness analyses are also warranted given the resource-intensive nature of HBOT, and strategies should be developed to expand access through government health schemes and insurance support. Furthermore, integration of HBOT into national oncology rehabilitation programs and exploration of combination therapies, such as stem-cell augmentation or novel pharmacological agents, may improve outcomes in refractory cases. Strengthening regional HBOT infrastructure and training specialized personnel will be key to ensuring equitable access and maximizing the benefits of this promising modality for cancer survivors with delayed radiation complications..

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