RESEARCH PAPER

A Study of Trichoscopic Findings in Scalp Alopecias and Its Fruitfulness in A Tertiary Care Centre in India

Darshini Adhinathan*[1], Anjugam Alagappan[2], Balaguru Natarajan[1], Narasimhalu C.R.V[1], Mythileeswari Lakshmikanthan[3], Sakthivel Muthu[4,*]

[1] *Department of Dermatology, Saveetha Medical College and Hospital (SMCH), Saveetha Institute of Medical and Technical Sciences (SIMATS), Thandalam, Chennai-602105, Tamil Nadu, India; darshiniadhinathan1998@gmail.com (D.A), bala1guru@gmail.com (B.N) and drnarasimhalu@yahoo.co.in (N. CRV).

[2] Department of Dermatology, Arunai Medical College and Hospital, Tiruvannamalai-606603, Tamil Nadu, India; dr.anjugam@gmail.com (A.A).

[3] Marine Nanomedicine Laboratory, Department of Research, Saveetha College of Nursing (SCON), Saveetha Institute of Medical and Technical Sciences (SIMATS), Thandalam, Chennai-602105, Tamil Nadu, India; mythileeswari@gmail.com (M.L).

[4] Natural Biomedicine Laboratory, Department of Dermatology, Saveetha Medical College and Hospital (SMCH), Saveetha Institute of Medical and Technical Sciences (SIMATS), Thandalam, Chennai-602105, Tamil Nadu, India; saktthivel@gmail.com (S.M).

[*] **Corresponding author:** saktthivel@gmail.com (S.M).

ABSTRACT

Trichoscopy is a non-invasive diagnostic technique that enables detailed visualization of hair and scalp structures, thereby improving the diagnostic accuracy of various alopecias and serving as a bridge between clinical and histopathological evaluation. This hospital-based cross-sectional study included 90 patients presenting with scalp alopecia. Following detailed clinical examination, trichoscopy was performed using a digital videodermoscope, and findings were recorded and analyzed. Of the total patients, 77 (85.5%) had non-cicatricial alopecia and 13 (14.4%) had cicatricial alopecia, with alopecia areata being the most common type (48.8%). Black dots (82.2%) were the most frequent trichoscopic finding. In alopecia areata, common features included black dots (88.6%), broken hairs (70.5%), yellow dots, and vellus hairs (68.2%), with exclamation mark hairs showing significant association (p=0.006). Broken hairs (p=0.008) and vellus hairs (p=0.029) were significantly associated with non-cicatricial alopecia, while trichotillomania demonstrated characteristic findings such as hairs broken at different lengths and trichoptilosis (p=0.005). Hair shaft diameter variability greater than 20% was indicative of androgenetic alopecia. In cicatricial alopecia, loss of follicular openings, perifollicular erythema (p=0.005), and pigmentation were significant findings. Among 34 clinically doubtful cases, trichoscopy aided diagnosis in 29 cases, with biopsy required in only 3 cases. Overall, trichoscopy proved to be a reliable, non-invasive tool for differentiating various scalp alopecias, reducing the need for invasive procedures, and aiding in effective clinical management.

Keywords: Trichoscopy, Alopecia areata, Non-Cicatricial alopecia, Cicatricial alopecia, Videodermoscopy

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INTRODUCTION

Hair plays a crucial role in human identity, contributing significantly to physical appearance, self-esteem, and psychosocial well-being. Disorders of hair loss, collectively termed alopecia, represent a common dermatological concern affecting individuals across all age groups and genders [1]. The clinical presentation of alopecia is highly heterogeneous, ranging from localized patchy hair loss to diffuse or scarring forms, often posing diagnostic challenges in routine clinical practice. Alopecia is broadly classified into non-cicatricial (non-scarring) and cicatricial (scarring) types, based on the preservation or permanent destruction of hair follicles [2,3]. Early and accurate differentiation between these categories is essential, as cicatricial alopecias are typically irreversible and require prompt therapeutic intervention to prevent disease progression. However, clinical evaluation alone may not always be sufficient due to overlapping features among different alopecia subtypes[4] (Cummins et al., 2021).

Traditional diagnostic methods for hair disorders include non-invasive techniques (hair pull test, hair count, trichogram), semi-invasive procedures (hair pluck), and invasive methods such as scalp biopsy with histopathology, which, although a gold standard, is time-consuming and uncomfortable for patients [5] (Kuźniak-Jodłowska et al., 2025). Trichoscopy, a non-invasive dermoscopic technique, enables in vivo visualization of hair and scalp structures, improving diagnostic accuracy by identifying characteristic features such as black dots, yellow dots, exclamation hairs, and anisotrichosis. It serves as a bridge between clinical evaluation and

*Author for Correspondence: saktthivel@gmail.com

histopathology, often reducing the need for biopsy and aiding disease monitoring. Despite its advantages, trichoscopy remains underutilized in routine practice, particularly in resource-limited settings, and region-specific data correlating trichoscopic findings with clinical diagnoses are limited [6] (Bakos et al., 2018).

Therefore, the present study was undertaken to systematically evaluate the trichoscopic features of various scalp alopecias, to establish their diagnostic relevance, and to assess their effectiveness in correlating with clinical findings. This study also aims to highlight the role of trichoscopy as a reliable, non-invasive modality in differentiating between cicatricial and non-cicatricial alopecias, thereby improving diagnostic accuracy and patient management.

MATERIALS AND METHODS

Study Design and Setting

This study was conducted as a hospital-based cross-sectional descriptive study in the Department of Dermatology, Venereology, and Leprosy at a tertiary care center in South India over a period of six months, from June 2019 to November 2019. Prior to commencement, ethical approval was obtained from the Institutional Ethics Committee, and the study adhered to established ethical guidelines for human research.

Study Population

A total of 90 patients presenting with clinical features of scalp alopecia were enrolled from the dermatology outpatient department. The study included individuals of all age groups and both sexes. Only patients who were willing to participate and provided written informed consent were included. Patients with incomplete clinical information or inadequate trichoscopic data were excluded from the study.

Clinical Evaluation

All participants underwent a comprehensive clinical evaluation. A detailed history was obtained, including the onset, duration, progression of hair loss, associated symptoms, relevant medical and drug history, and family history. This was followed by a thorough dermatological examination of the scalp and hair. Based on the clinical findings, a provisional diagnosis along with possible differential diagnoses was established.

Trichoscopic Examination

Trichoscopic evaluation was performed using a digital videodermoscope with 5× magnification and a resolution of 640 × 480 pixels, connected to a computer interface. Multiple representative areas of the scalp, including both affected and adjacent normal regions, were examined systematically. High-quality images were captured and stored for further analysis. The examination focused on identifying characteristic trichoscopic features, including hair shaft abnormalities, follicular patterns, perifollicular changes, vascular structures, and interfollicular findings, which are essential in differentiating various types of alopecia.

Histopathological Correlation

In cases where the clinical and trichoscopic findings were inconclusive, a scalp biopsy was performed in selected patients who provided consent. Histopathological examination was then used to confirm the diagnosis, particularly in suspected cases of cicatricial alopecia.

Statistical Analysis

All collected data were systematically recorded and analyzed using SPSS software version 20.0. Descriptive statistics were used to summarize demographic and clinical variables. The association between trichoscopic findings and different types of alopecia was assessed using Fisher's exact test, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

Demographic Characteristics

A total of 90 patients with scalp alopecia were included in the study, comprising 53 males (58.8%) and 37 females (41.1%), with a male-to-female ratio of approximately 1.4:1. The age of the patients ranged from 4 months to 67 years, with a mean age of 26.05 ± 12.7 years, indicating a predominance of young adults in the study population. The detailed demographic distribution and trichoscopic findings are summarized in (Table 1).

Clinical Spectrum of Alopecia

Among the enrolled patients, the majority (85.5%, n=77) were diagnosed with non-cicatricial alopecia, while 14.4% (n=13) had cicatricial alopecia. The most common subtype observed was alopecia areata, accounting for 48.8% of cases, predominantly presenting as the patchy variant. Other non-cicatricial types included trichotillomania, androgenetic alopecia (male and female pattern hair loss), telogen effluvium, traction alopecia, tinea capitis, physiological hair loss, and systemic lupus erythematosus–associated alopecia. Among cicatricial alopecias, lichen planopilaris was the most frequently encountered subtype, followed by discoid lupus erythematosus and unclassified variants. The distribution of these conditions is detailed in (Table 1).

Trichoscopic Findings in Alopecia Areata and Non-Cicatricial Alopecia

Trichoscopic evaluation revealed that black dots were the most common finding overall, observed in 82.2% of patients. In alopecia areata, the predominant features included black dots (88.6%), broken hairs (70.5%) (Fig. 1a), yellow dots (Fig. 1b), and vellus hairs (68.2%), followed by exclamation mark hairs (34.1%) (Fig. 1c). Additional findings such as angulated hairs (Fig. 1d), coiled hairs (Fig. 1e), pigtail hairs (Fig. 1f), and empty follicular openings (Fig. 1g) were also noted, reflecting varying stages of disease activity and regrowth.

In trichotillomania, the most consistent feature was broken hairs of varying lengths (Fig. 2a), seen in all patients, along with frayed hairs and trichoptilosis (Fig. 2b), indicating mechanical trauma to the hair shaft. Telogen effluvium was characterized by the presence of uniformly thin hairs, while vellus hairs were observed in physiological hair loss (Fig. 3). In traction alopecia, features such as black dots, broken hairs, peripilar casts (Fig. 4), and traction folliculitis were noted. In androgenetic alopecia, a hallmark finding was hair shaft diameter variability exceeding 20% (anisotrichosis) (Fig. 5a, 5b), observed in both male and female pattern hair loss.

Trichoscopic Findings in Cicatricial Alopecia

In patients with cicatricial alopecia, the most consistent trichoscopic feature was loss of follicular openings (Fig. 8), indicating permanent follicular destruction. Perifollicular changes such as erythema, pigmentation, and scaling were frequently noted. In lichen planopilaris, perifollicular pigmentation and scaling were prominent (Fig. 6a, 6b, 6c), whereas discoid lupus erythematosus was characterized by arborizing blood vessels, scaling, crusting, and follicular plugging (Fig.

Comparative Analysis of Trichoscopic Features

Statistical analysis demonstrated significant associations between specific trichoscopic features and types of alopecia. Broken hairs (p=0.008) and vellus hairs (p=0.029) were significantly associated with non-cicatricial alopecia. Alopecia areata showed a significant association with white hairs, exclamation mark hairs (p=0.006), and broken hairs. Features such as trichoptilosis, frayed ends, and hairs broken at different levels (p=0.005) were distinctive for trichotillomania. In contrast, loss of follicular openings, perifollicular erythema (p=0.005), and perifollicular pigmentation were significantly associated with cicatricial alopecia. Additionally, variability in hair shaft diameter greater than 20% was characteristic of androgenetic alopecia. These comparative findings are summarized in (Table 2).

Diagnostic Utility of Trichoscopy

Among 34 clinically doubtful cases, trichoscopy proved to be a valuable diagnostic tool, aiding in diagnosis in 29 cases. Histopathological confirmation was required in only 3 cases of cicatricial alopecia, highlighting the effectiveness of trichoscopy in reducing the need for invasive procedures.

DISCUSSION

Dermoscopy, also referred to as epiluminescence microscopy, is a well-established non-invasive diagnostic technique primarily utilized for the evaluation of pigmented skin lesions and the early detection of melanoma. Over time, its application has expanded into the assessment of hair and scalp disorders, leading to the development of trichoscopy, which allows detailed vivo visualization of hair shafts and scalp structures [7]. The term "trichoscopy" was first introduced by Rudnicka et al. in 2006, marking a significant advancement in the non-invasive diagnosis of alopecias [8].

Trichoscopy has emerged as a rapid, cost-effective, and reproducible bedside tool that enhances diagnostic accuracy in various hair disorders by identifying specific morphological patterns [9]. It enables the evaluation of follicular, perifollicular, vascular, and interfollicular features, thereby facilitating differentiation between cicatricial and non-cicatricial alopecias, as well as among different subtypes within these categories. Previous studies, including the review by Miteva and Tosti, have emphasized its utility in distinguishing alopecia areata, androgenetic alopecia, and tinea capitis, and in detecting early disease changes before they become clinically apparent [10].

In the present study, alopecia areata was the most common form of non-cicatricial alopecia, predominantly presenting as the patchy type. The characteristic trichoscopic findings observed, such as black dots, broken hairs, yellow dots, and exclamation mark hairs, are consistent with the pathophysiology of the disease, which involves autoimmune-mediated damage to the hair bulb leading to dystrophic hair formation and increased fragility [11,12]. The presence of exclamation mark hairs reflects proximal shaft tapering due to abrupt transition from anagen to telogen phase, while features such as pigtail hairs indicate regrowth [13]. These findings are in concordance with previous reports highlighting their diagnostic significance in alopecia areata.

Trichotillomania demonstrated distinctive trichoscopic features, particularly broken hairs of varying lengths, frayed ends, and trichoptilosis, reflecting repeated mechanical trauma to the hair shaft. Recently described features such as flame hairs, V-sign, and tulip hairs further support the diagnosis of trichotillomania and help differentiate it from other patchy alopecias [14,15].

In androgenetic alopecia, hair shaft diameter variability exceeding 20% (anisotrichosis) was a consistent finding, which is considered a hallmark feature and correlates with progressive follicular miniaturization [16].

The role of trichoscopy in telogen effluvium remains limited, as it is largely a diagnosis of exclusion and lacks specific dermoscopic features, thereby necessitating careful clinical correlation [17]. However, it can still aid in ruling out other causes of diffuse hair loss.

In the current study, cicatricial alopecia was characterized by the absence of follicular openings, along with perifollicular erythema, pigmentation, and scaling. These findings indicate irreversible follicular destruction and are crucial for early diagnosis. In lichen planopilaris, perifollicular pigmentation and scaling were prominent features, while discoid lupus erythematosus exhibited arborizing blood vessels, follicular plugging, and crusting, consistent with previous observations [18].

Our findings are comparable to those of Chiramel et al., who reported yellow dots and thin hairs as common features in non-cicatricial alopecia, along with

statistically significant associations of specific trichoscopic patterns with different conditions [19]. Similarly, Ummiti et al. demonstrated that hair shaft diameter variability is a key feature of androgenetic alopecia and can be detected early through trichoscopy [20]. Studies on cicatricial alopecia, including those by Thakur et al. and Trachsler and Trueb, have also highlighted the importance of trichoscopic and histopathological correlation in identifying conditions such as lichen planopilaris and discoid lupus erythematosus [20,21].

A significant observation in this study was the diagnostic utility of trichoscopy in clinically ambiguous cases, where it contributed to diagnosis in most patients and reduced the need for invasive biopsy. This underscores its role as a bridge between clinical evaluation and histopathology, improving diagnostic confidence and facilitating early intervention. However, studying has certain limitations. The relatively small sample size, particularly in some subtypes of alopecia, may limit the generalizability of the findings. Additionally, the sensitivity of trichoscopic features and their correlation with disease severity were not evaluated, which could be explored in future studies.

CONCLUSION

Among the 32 clinically doubtful cases, trichoscopy was helpful in establishing the diagnosis in 29 cases, with histopathological confirmation required in only 3 cases of cicatricial alopecia. This highlights its significant role as a reliable, non-invasive diagnostic modality. Trichoscopy serves as an effective bridge between clinical evaluation and histopathological analysis, thereby reducing the need for invasive procedures such as scalp biopsy. Furthermore, trichoscopy enables accurate differentiation between various types of scalps alopecias by identifying characteristic morphological patterns, thus facilitating early diagnosis and appropriate management. Overall, it represents a valuable and practical tool in the routine workup of hair and scalp disorders.

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Table 1. Demographic and trichoscopic findings in each type

Condition	**No. of pts**	**M/F**	**Median age in years**	**Trichoscopic findings in percentage**
AA	44	29/15	22.8	BD (88.6), YD (68.2), WH (50), VH (68.2), AH (43.2), BH (70.5), FH (4.5), EH (34.1), TH (27.3), CH (27.3), PH (11.4), trichoptilosis (2.3)
TTM	5	2/3	18.6	BD (60), YD (40), VH (40), BH of different lengths (100), FH (80), TH (20), Trichoptilosis(60), CH (20)
Tinea capitis	1	0/1	7	BD, YD, BH, scaling, comma hair
FPHL	5	0/5	37.4	BD (100), YD (40), WH (20), VH (60), AH (40), BH (60), HSD difference>20% (80)
Telogen effluvium	3	0/3	42.3	BD (100), YD (33.3), WH (66.7), VH (66.7)
MPHL	12	12/0	30.08	BD, YD, VH (66.7), WH, AH (16.7), BH (8.3), TH (25), HSD DIFF.>20% (91.7)
PHL	2	2/0	0.5	YD (50), VH (100)
Diffuse hair fall	2	1/1	41	BD (100), WH & BH (50), perifollicular erythema & scaling (100)
Traction alopecia	3	3/0	16.6	BD, YD, WH, VH, AH, BH, peripilar casts, traction folliculitis (66.7), TH, trichoptilosis (33.3)
LPP	5	0/5	22.6	Loss of follicles & perifollicular pigmentation (100), perifollicular erythema (83.3), YD, WH, BH, perifollicular scaling (33.3), VH (16.7)
DLE	6	4/2	35.8	Loss of follicles, arborising blood vessels& scaling& crusting (100), BD, YD (50), follicular plugging (33.3)
Cicatricial alopecia (not specified)	2	0/2	38	Loss of follicles (100), BD (80), YD (60), WH, AH, BH (20)

Abbreviations Used: BD-Black Dot, YD-Yellow Dot, WH-White Hair, VH-Vellus Hair, AH-Angulated Hair, BH-Broken Hair, FH-Frayed Hair, EH-Exclamatory Hair, TH-Tapering Hair, CH-Coiled Hair, PH-Pigtail Hair, HSD diff- Hair Shaft Diameter difference

Table 2. Comparison of trichoscopic findings

Groups compared	**Significant findings with P value <0.05**
Non Cicatricial Vs Cicatricial Alopecia	BD, YD, VH, BH, EH, and diameter diversity favor non cicatricial. Loss of follicles, Perineal erythema, scaling, pigmentation, arborising blood vessels favor cicatricial
AA Vs AGA	WH, BH, EH favor AA
AA Vs TTM	WH, YD IN AA, BH of different lengths in TTM
MPHL Vs FPHL	BD, YD in both, BH in MPHL
LPP VS DLE	Perifollicular pigmentation in LPP, arborizing vessels in DLE

Abbreviations used: BD- Black Dot, YD- Yellow Dot, VH- Vellus hair, BH- Broken hair, EH- Exclamatory hair, WH- White hair, AA- Alopecia areata, AGA- Androgenetic alopecia, TTM- Trichotillomania, MPHL- Male pattern hair loss, FPHL- Female pattern hair loss, LPP- Lichen planopilaris, DLE- Discoid lupus erythematosus

Figures

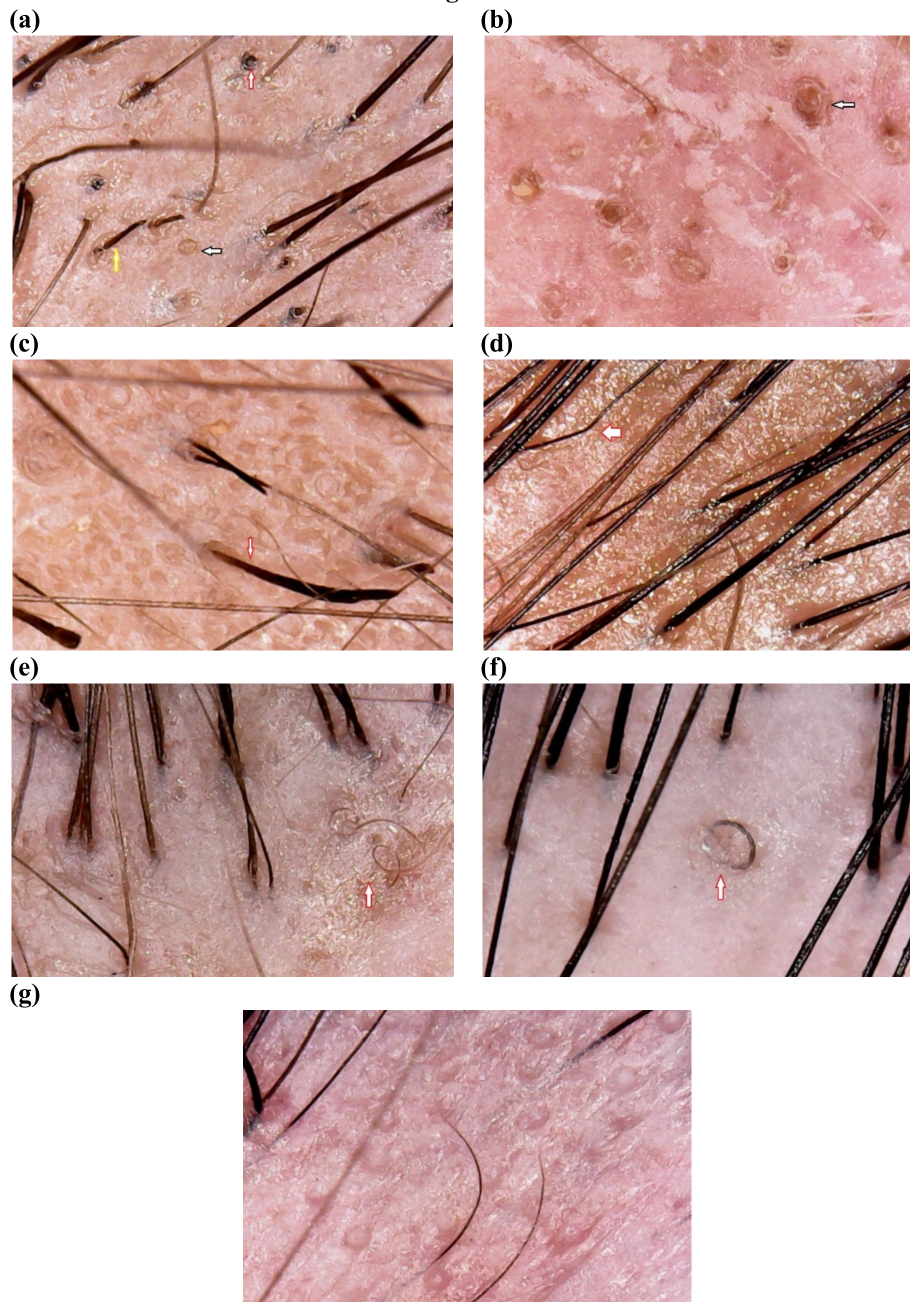


Figure 1. In cases of alopecia areata, 1a showing black dot (red arrow), broken hair (yellow arrow), empty follicles (black arrow), 1b showing yellow dots (black arrow), 1c showing exclamation hair (red arrow), 1d showing angulated hair (red arrow), 1e showing coiled hair (red arrow), 1f showing pigtail hair (red arrow) and 1g showing empty follicular openings in non-cicatricial alopecia.

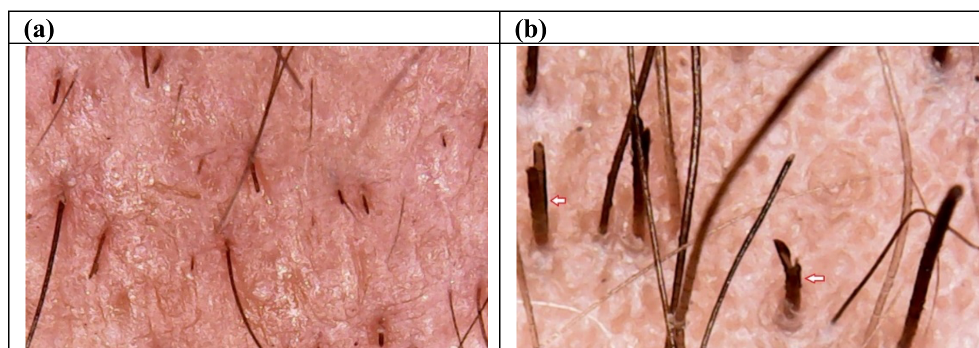


Figure 2. In cases of trichotillomania (a) shows broken hair of different lengths and 2 (b) shows trichoptilosis (red arrow).

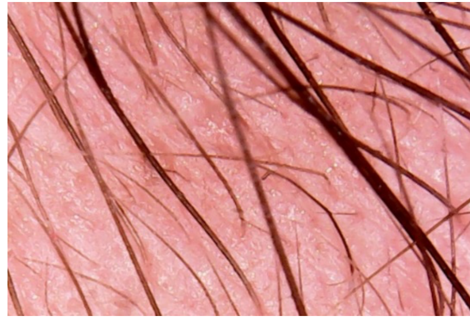


Figure 3. Showing Vellus hair (red arrow) in cases of physiological hair loss.

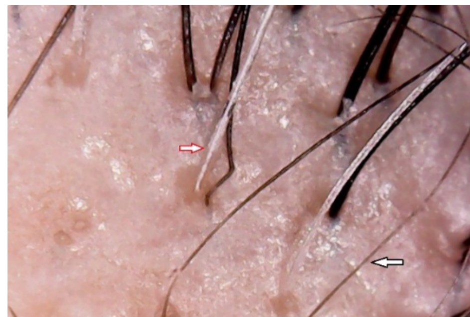


Figure 4. Showing Peripilar cast (red arrow) in case of traction alopecia.

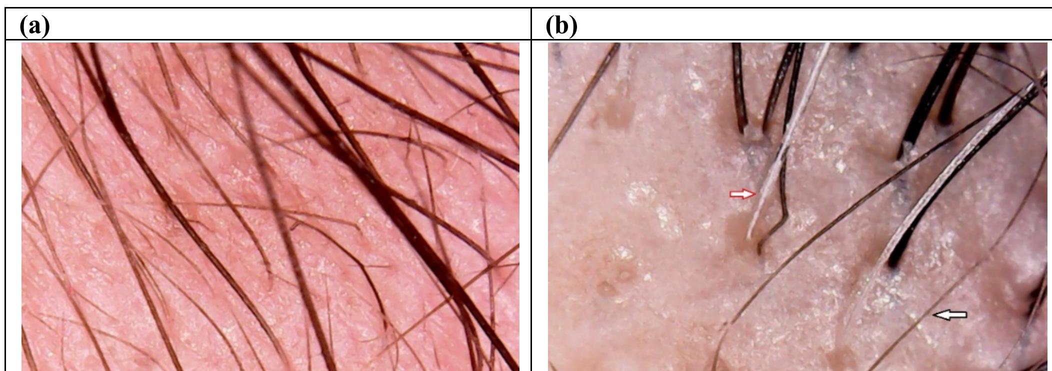
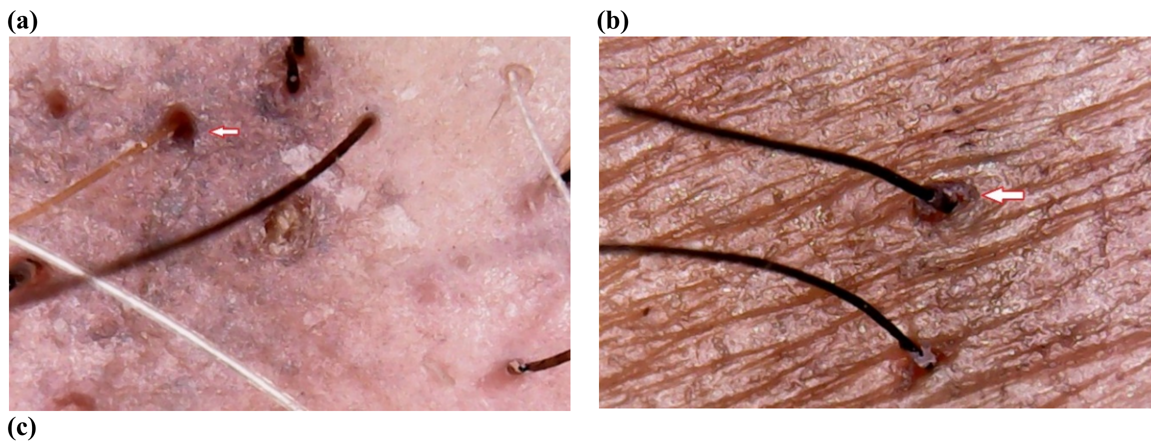


Figure 5. In cases of androgenetic alopecia, 5a showing hair shaft diameter diversity >20% and 5b showing white hair (red arrow) and intermediate hair (black arrow).



(c)

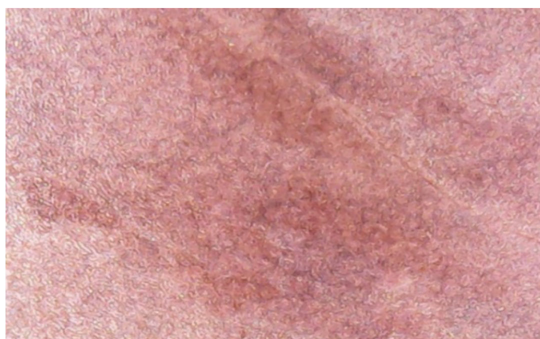


Figure 6. In cases of lichen planopilaris, 6a showing perifollicular pigmentation (red arrow), 6b showing perifollicular scaling and erythema (red arrow) and 6c showing honeycomb pigmentation.

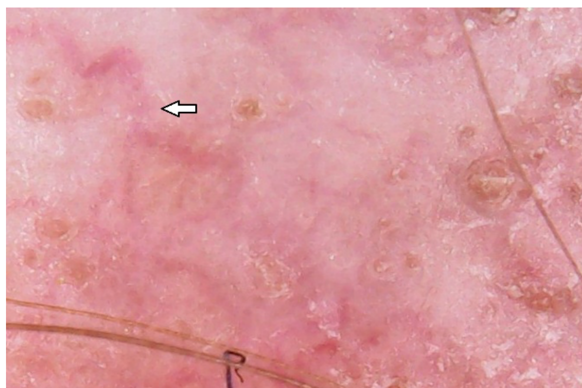


Figure 7. Arborizing blood vessels (black arrow) and scaling in case of discoid lupus erythematosus

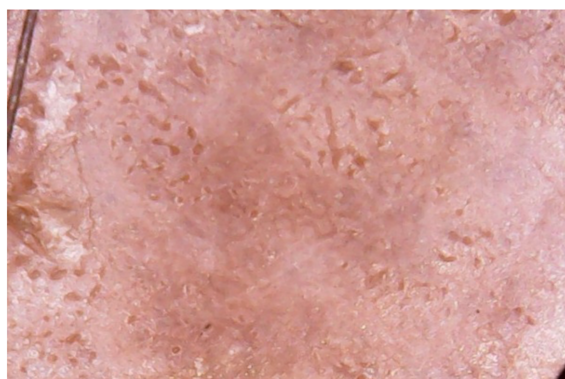


Figure 8. Loss of hair follicles in cicatricial alopecia