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Original Research Paper

Dermatology

A STUDY OF DERMOSCOPIC FINDINGS OF SCALP DISORDERS IN A TERTIARY CARE CENTER

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ABSTRACT

Background: This study was conducted to observe Dermoscopic findings of various scalp disorders and to see whether addition of Dermoscopy increases the diagnostic accuracy.

Aim & Objectives: To determine whether the addition of Dermoscopic findings to clinical examination improves the diagnostic accuracy of scalp disorders.

Materials and Methods: A descriptive study was conducted using a Non Polarized Dermoscope. Records & clinical photographs were maintained.

Results: 55 patients were enrolled with 31 males and 24 females. Diagnosis was made on the basis of history, clinical examination and Dermoscopy. Most common encountered condition was androgenetic alopecia (23.6%). 47 cases were diagnosed with ease and rest 8 cases were labelled as difficult cases and Dermoscopy helped to confirm the diagnosis in 7 of them.

Conclusion: Dermoscopy helped to confirm the clinical diagnosis and also improved the diagnostic accuracy in doubtful cases.

KEYWORDS : Dermoscopy, Trichoscopy, scalp disorders. Non-polarized Dermoscope.

INTRODUCTION

Dermoscopy is one of the most developing fields in dermatology today. A dermoscope is an instrument that magnifies the surface and subsurface features of skin lesions and helps visualize skin lesions which are not visible to the naked eye. It is also known as epiluminiscence microscopy or skin surface microscopy, and is a non-invasive, in-vivo technique used for viewing skin lesions. [1] In 2006, Lidia Rudnicka and Malgorzata Olszewska coined the term "Trichoscopy" for Dermoscopy of hair and scalp. [2] The standard methods for diagnosis of hair and scalp disorders like a simple clinical examination, hair pull test and biopsy vary in reproducibility and invasiveness. The use of a non-invasive technique like Dermoscopy proves to be of great importance by improving the diagnostic accuracy. [3] For scalp examination, dermatologists can use a manual dermoscope (X 10 magnifications) or a videodermoscope with lenses of varying magnification (20x to1000x). [4] It can also be used to calculate the follicular density in donor area before follicular unit hair transplant.

Two dermatologists assessed the cases clinically and with hand held lens, recorded the history and clinical findings in a set proforma, and came to a provisional diagnosis individually which was later confirmed by Dermoscopy. The cases in which provisional diagnosis on the basis of clinical presentation and history was not possible were labelled as "difficult cases", and relevant investigations were done for those cases.

The study was conducted to see whether the addition of Dermoscopic findings to the clinical examination increases the diagnostic accuracy of various scalp disorders.

AIM AND OBJECTIVES

AIM- To study the Dermoscopic findings in scalp disorders in patients attending Dermatology, Venereology and Leprosy (D.V.L.) O.P.D. in a tertiary care center.

OBJECTIVES

1. To identify the provisional diagnosis by clinical examination of scalp disorders.
2. To study the Dermoscopic findings of the same.
3. To determine whether the addition of Dermoscopic findings to clinical examination improves the diagnostic accuracy of the scalp disorders.

MATERIAL AND METHODS

This was a descriptive Study carried out in Dermatology, Venereology and Leprosy (D.V.L.) department of Bharati Vidyapeeth (Deemed to be University) Medical College and Hospital Sangli, Maharashtra, after obtaining approval from the Institutional Ethics Committee.

A total of 55 patients diagnosed with scalp disorders were enrolled in the study from May 2020 to October 2020. Patients willing to participate in the study were included after obtaining written informed consent. A detailed clinical evaluation of each patient was done. Clinical photographs were taken with full precautions not to reveal the patient's identity.

A Non Polarized USB Digital Magna-scope with 8 LED light source, 20x to 200x magnification and 2 Mega Pixel image sensor was used for Dermoscopic evaluation. The cases were sorted according to age, gender and type of scalp disorders and Dermoscopic findings were observed and recorded in the set proforma.

RESULTS

55 patients were enrolled in the study with 31 males (56%) and

24 females (43%). Most of the patients i.e. 33 (60%) belonged to the age group of 21-40 years. We broadly classified scalp disorders into Inflammatory disorders of the scalp, Hair disorders, Immunobullous disorders, Infections and Infestations, and Others. Most common condition in our study was Androgenetic alopecia (AGA) and Female pattern hair loss (FPHL) with total 13 patients (23%). Hair diameter diversity >20%, Reduced follicles per unit, Vellus hair, Empty follicles and Yellow dots were the most consistent findings in AGA in our study.

Table 1: Gender wise distribution (n = 55)

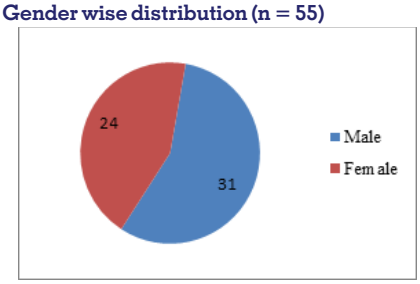

Table 2: Age wise distribution

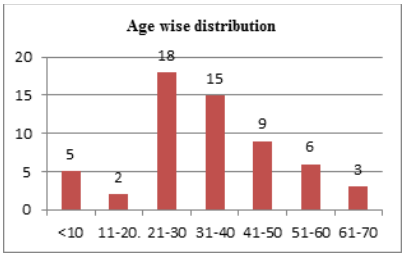

Table 3: Case wise distribution

Conditions	Number of cases
Androgenetic Alopecia (AGA) (Male)	9
Female Pattern Hair Loss (FPHL)	4
Alopecia Areata	7
Discoid Lupus Erythematosus (DLE)	2
Systemic Lupus Erythematosus (SLE)	5
Lichen planopilaris (LPP)	1
Scalp Psoriasis	5
Seborrheic Dermatitis	4
Lichen Planus Pigmentosus	1
Telogen effluvium	7
Pemphigus Vulgaris	1
Pemphigus Foliaceous	1
Furunculosis	1
Tinea Capitis	2
Pediculosis Capitis	1
Vitiligo	2
Acne Keloidalis Nuchae	1
Post Traumatic Cicatricial alopecia	1

Androgenetic Alopecia (aga + Fphl)

AGA is the most common cause of hair loss due to androgens affecting genetically predisposed persons. It is also the most common disorder encountered in our study. Hair diameter diversity of > 20% is considered diagnostic of AGA and was seen in all the cases in our study (Figure 1a). Vellus hair are hypopigmented, non medullated hair of less than 30 micrometre thickness & less than 3 mm length. [5] (Figure 1b). It is the sign of severe miniaturization. Peripilar sign is a brown depressed halo of approximately 1mm around the hair follicle which correlates with perifollicular inflammation [6] (Figure 1c). Yellow dots are the follicular ostia filled with keratosebaceous material (Figure 1d Yellow arrows). Reduced number of hair per follicular unit (Figure 1d). Red arrows). Wavy hair (Figure 1e) which represents incompletely miniaturized hair

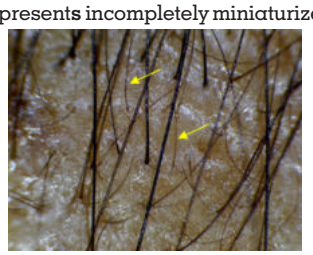

Figure 1a: Hair diameter diversity and Vellus hair (Yellow arrow)

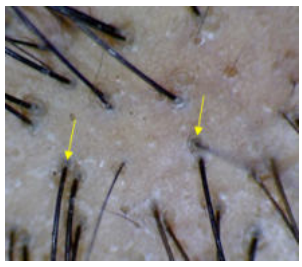

Figure 1c: Peripilar sign

Alopecia Areata (aa)

It is a common autoimmune disorder causing non scarring alopecia. On Trichoscopy it shows Black dots (Figure 2a- yellow arrows) represents broken hair shafts. Empty follicles (Figure 2a- red arrow), Regrowing hairs (Figure 2a- blue arrow), Exclamation mark hair (Figure 2b) are thin and hypo pigmented proximally and thick and hyper pigmented distally. These are exclusively seen in AA. Presence of regrowing hair along with ongoing active disease is seen in AA (Figure 2c)

Discoid Lupus Erythematosus (dle)

DLE is seen as atrophic patches with depigmentation

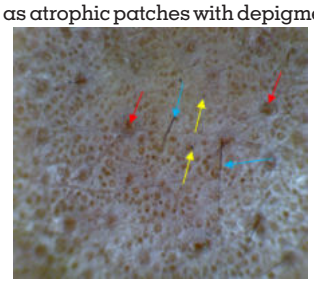

Figure 2a: Black dots (yellow arrows), Empty follicles (red arrow), Regrowing hairs (blue arrow)Figure 2a: Black dots (yellow arrows), Empty follicles (red arrow), Regrowing hairs (blue arrow)

Figure 2b- Exclamatory mark hair

& surrounding hyperpigmentation with scarring alopecia. Trichoscopy shows prominent keratotic follicular plugs (Figure 3a- Yellow arrow), Perifollicular and Interfollicular blue-grey pigmentation (Figure 3a – Red arrow), Thick arborizing vessels suggestive of giant irregular capillaries (Figure 3b- red arrow) & loss of follicular openings suggestive of scarring alopecia (Figure 3b – yellow arrow), Peri and interfollicular blue grey dots (Figure 3c).

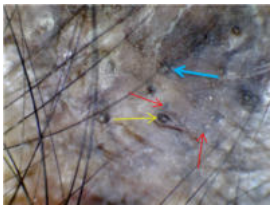

Figure 3a: DLE- Prominent keratotic follicular plugs (Yellow arrow), Perifollicular and Interfollicular blue-grey pigmentation (Blue arrow), Peri follicular and inter follicular blue grey dots (Red arrows).

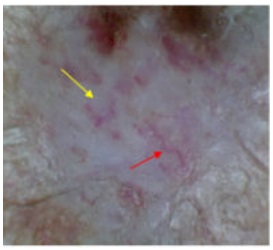

Figure 3b: DLE- Thick arborizing vessels (Red arrow) & loss of follicular opening suggestive of scarring alopecia (Yellow arrow)

Systemic Lupus Erythematosus (sle)

Trichoscopy showed Red lines representing arborizing blood vessels (Figure 4a- Yellow arrow), perifollicular erythema (Figure 4a- Red arrow), white areas of hair loss (Figure 4a- blue arrow). Scattered brown pigmentation (Figure 4b- Red arrow), Perifollicular blue-grey pigmentation (Figure 4b- Yellow arrows) suggests areas of interface dermatitis & pigment incontinence. Perifollicular scaling (Figure 4c- Yellow arrow), and majority of single hair per follicular unit can be seen.

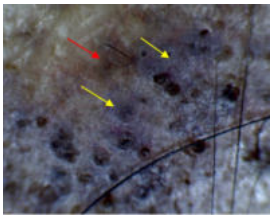

Figure 4a: SLE- Scattered brown pigmentation (Red arrow), Perifollicular blue-grey pigmentation (Yellow arrows)

Lichen Planopilaris (lpp)

Trichoscopy showed Peripilar cast (Figure 5a- Yellow arrow) surrounding a tuft of 4-5 hairs. Tufted hair is seen in only 5% cases of LPP. Broken hairs (Figure 5a- Red arrow), Perifollicular and inter follicular blue grey pigmentation (Figure 5b- Yellow arrow), scalp erythema (Figure 5b- Red arrow), empty follicles (Blue arrow) and White dots (Green arrow).

Scalp Psoriasis

On Trichoscopy Red dots (Figure 6a) which represents twisted capillary loops, Extravasation of blood (Figure 6b) usually circular or oval is a feature of psoriasis, and Diffuse white feathery scaling (Figure 6c) which is a nonspecific finding.

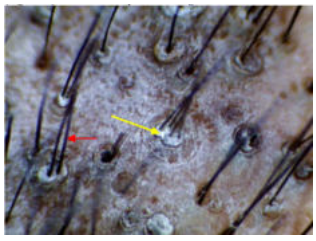

Figure 5a: LPP- Peripilar cast (Yellow arrow) surrounding a tuft of 4-5 hairs, Broken hairs (Red arrow)

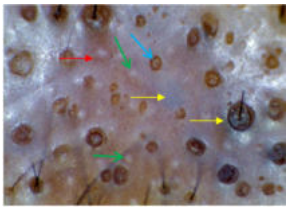

Figure 5b: LPP- Perifollicular and inter follicular blue grey pigmentation (Yellow arrow), scalp erythema (Red arrow), empty follicles (Blue arrow), White dots (Green arrow)

Seborrheic Dermatitis

A Papulo squamous disorder presenting with erythema and greasy scales in the seborrheic areas of the body. Trichoscopy showed Yellow greasy scales in perifollicular as well as interfollicular spaces (Figure 7a) and large thick yellow greasy crusts, seen in cradle cap (Figure 7b).

Lichen Planus Pigmentosus

Trichoscopy shows Diffuse blue grey pigmentation in perifollicular & interfollicular spaces (Figure 8a), and Blue-grey pigmentation arranged in circles (Figure 8b).

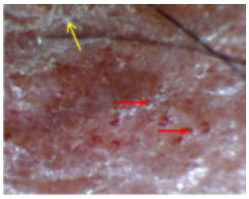

Figure 6a: Psoriasis- Red dots represent the twisted capillary loops (Red arrows), Diffuse white feathery scaling- not specific (Yellow arrow).

Figure 7a: Seborrheic dermatitis- Large thick yellow greasy crusts in perifollicular as well as interfollicular spaces- cradle cap

Telogen Effluvium

It is a sudden generalised shedding of Telogen hairs. The most common Trichoscopic features are as follows - Multiple upright regrowing hair (Figure 9a) - characteristic of Acute Telogen effluvium. [7] In Chronic Telogen effluvium the terminal hairs tend to become thinner over the years. [7] Multiple empty follicles (Figure 9b), Peripilar sign (Figure 9c- Yellow arrow), Majority of single hair per follicular units (Figure 9c- Red arrow).

Pemphigus Vulgaris

Patient presenting only with scalp lesions in Pemphigus vulgaris becomes a diagnostic challenge

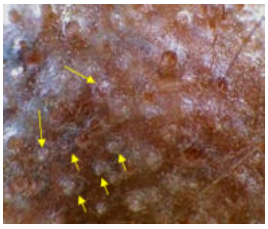

Figure 8b: Lichen planus pigmentosus- Diffuse blue grey pigmentation in perifollicular & interfollicular spaces (Red arrow), Blue-grey pigmentation arranged in circles (Yellow arrow)

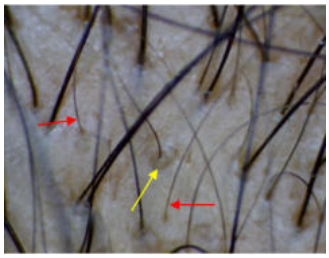

Figure 9a: Telogen effluvium- Peripilar sign (Yellow arrow), Multiple upright regrowing hair- characteristic of Acute Telogen effluvium (Red arrows) and Majority of Single hair per follicular units.

on Trichoscopy as very less literature is available at present.[8] **Nikolsky's sign of hair** [9] (Figure 10a) – It is seen as the hair shaft encircled with hair cast in the peri-lesional areas, it is formed due to acantholysis of the outer root sheath keratinocytes. Haemorrhagic areas (Figure 10b Red arrow) are the red polygonal haemorrhagic patches which are the most consistent but non-specific for pemphigus vulgaris and Pemphigus Foliaceous, [10] Yellow crusts (Figure 10b-Yellow arrow)

Pemphigus Foliaceous

Differential diagnosis of scalp lesions in pemphigus vulgaris and pemphigus foliaceous may be challenging, especially if they are the only manifestation of the disease. [10] Currently there is no literature available on the usefulness of Trichoscopy in the diagnosis of pemphigus except in a 57 year old pemphigus vulgaris. [11] In our study Trichoscopy showed Thick white polygonal crusts [12] (Figure 11a- yellow arrow) and yellow white diffuse scaling [10] (Figure 11a- Red arrow). Scaling in pemphigus foliaceous is more than in pemphigus vulgaris. Diffuse areas of erythema can also be seen (Figure 11b). None of these findings are pathognomonic for pemphigus foliaceous.

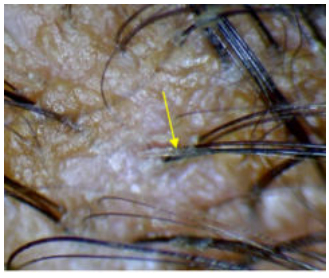

Figure 10: - Pemphigus vulgaris- Nikolsky's sign of hair

Tinea Capitis

Tinea capitis is the dermatophytic infection of scalp seen more commonly in paediatric population. [13] We observed Broken hairs [14] (Figure 12- Red arrows)- broken and dystrophic hair, common but a non-specific finding for tinea capitis. Black dots (Figure 12- Yellow arrows) - they are hair follicles broken at the level of scalp, and Diffuse and peri-follicular scaling (Figure 12- Blue arrow).

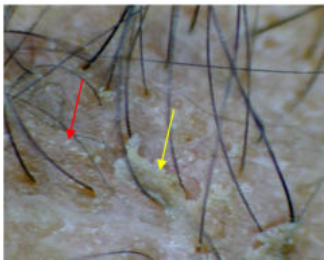

Figure 11a: Pemphigus Foliaceous- Thick white polygonal crusts (Yellow arrow) and yellow white diffuse scaling (Red arrow)

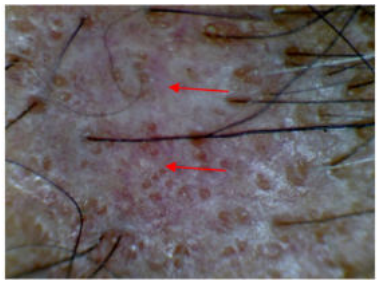

Figure 11b: Pemphigus Foliaceous- Diffuse areas of erythema

Furunculosis

Infection of hair follicle by *Staphylococcus aureu*. Clinically it presents as painful nodules on the hairy parts of body. Recurrence may be seen in *Staphylococcus aureus* carriers. On Trichoscopy we observed formation of pustule around the hair follicle (Figure 13a), Marked Perifollicular hyperkeratosis and crusting involving multiple hair follicles (Figure 13b), and areas of extravasation of blood involving multiple hair follicles (Figure 13c).

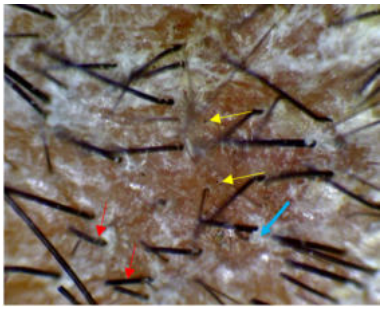

Figure 12: Tinea capitis- Broken hairs- (Red arrows), Black dots (Yellow arrows), Diffuse and Peri-follicular scaling (Blue arrow)

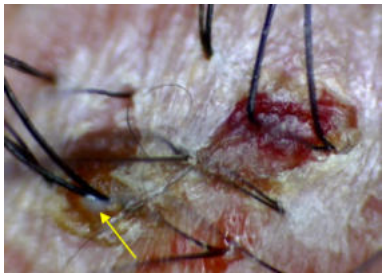

Figure 13: Furunculosis- Formation of pustule around the hair follicle (Yellow arrow), Marked perifollicular hyperkeratosis and crusting and areas of extravasation of blood involving multiple hair follicles.

Pediculosis Capitis

Pediculosis Capitis is the infestation of scalp with *Pediculus humanus var capitis*. Tricshoscopy showed Nits (Figure 14a) which are the Louse eggs attached firmly to the base of hair shaft and Nit cast (Figure 14b) which is an empty egg which appears as a translucent structure loosely fixed to the hair shaft.

Vitiligo

Assessment of stability of vitiligo lesions is an essential pre requisite for determining the outcome of vitiligo surgeries and Dermoscopy plays an important role in the same. We observed Loss of normal pigmentation of scalp with Peri-follicular hyperpigmentation (Figure 15a) in a patient, which is suggestive of Unstable Vitiligo. In another patient we observed Perifollicular depigmentation (Figure 15b-Yellow arrow) and areas of erythema (Figure 15b- red arrow) which suggests stable vitiligo and response to the treatment

respectively. [15] Leucotrichia (Figure 15c- yellow arrow) which suggests resistance to treatment. [15]

Acne Keloidalis Nuchae

It is a chronic inflammatory condition of posterior neck leading to keloidal plaques and scarring alopecia. Trichoscopy showed Tufted hair (Figure 16a) which are several hairs emerging from one follicular opening and peri pilar cast (Figure 16b).

Post Traumatic Cicatricial Alopecia

Although there are no pathognomonic features on Trichoscopy, we observed areas of atrophy (Figure 17a) showing diffuse erythema and areas with loss of hair follicles (Figure 17b).

Figure 14a: Pediculosis Capitis Nits- Louse eggs attached firmly to the base of hair shaft

Figure 14b: Nit cast- empty egg which appears as a translucent structure loosely fixed to the hair shaft

Figure 15a: Vitiligo- Loss of normal pigmentation of scalp with Peri-follicular hyperpigmentation

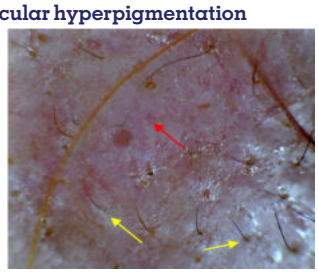

Figure 15b: Perifollicular depigmentation (Yellow arrow), Areas of erythema (Red arrow)

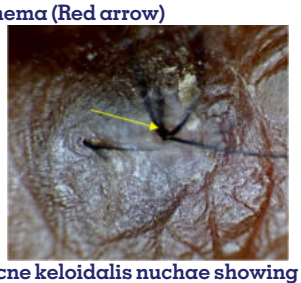

Figure 16a: Acne keloidalis nuchae showing Tufted hair

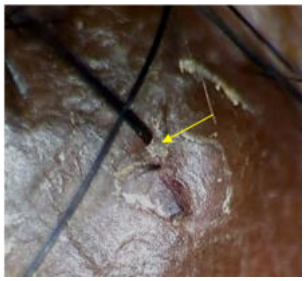

Figure 16b: Peri pilar cast in Acne keloidalis nuchae

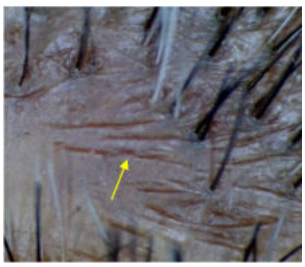

Figure 17a: Post traumatic cicatricial alopecia showing areas of atrophy

Table 4: Trichoscopic Findings Of Commonly Encountered Conditions

Scalp disorder	No. of patients	Common Trichoscopic findings
AGA (Male)	9	Diameter diversity >20% (100%), vellus hair (88.8%), empty follicles (55.5%), yellow dots (44.4%), Peripilar sign (11.1%), wavy hair (22.2%)
FPHL	4	Diameter diversity >20% (100%), empty follicles (75%), vellus hair (75%), yellow dots (50%), Peripilar sign
Alopecia areata	7	Yellow dots (85.7%), vellus hair (85.7%), empty follicles (71.4%), broken hair (71exclamatory mark hair (28.5%).4%), black dots (42.8%), and
SLE	5	Follicular plugging (100%), Blue grey pigmentation (60%), erythema (60%), empty follicles (60%), loss of hair follicles (40%), Scattered brown pigmentation (20%), giant irregular capillary (20%),
Psoriasis	5	Silvery white scales (100%), red dots (20%), extravasation of blood (40%)
Seborrheic dermatitis	4	Yellow greasy Scales (100%), black dots (40%)
Telogen effluvium	7	Empty follicles (100%), Regrowing hair (85.7%), vellus hair (85.7%), black dots (28.5%), thin hair (42.8%)
AGA: Androgenetic alopecia, FPHL: Female pattern hair loss, SLE: Systemic lupus erythematosus,		

We broadly classified the conditions into:

1) Inflammatory disorders of the scalp

Androgenetic alopecia: (Male and female pattern hair loss)
Alopecia areata
Discoid lupus erythematosus
Systemic lupus erythematosus
Lichen planopilaris
Scalp psoriasis
Seborrheic dermatitis
Lichen planus pigmentosus

2) Hair disorders

Telogen effluvium

3) Immunobullous disorders

Pemphigus Vulgaris

Pemphigus Foliaceous

4) Infections and Infestations
Tinea capitis
Bacterial infections/ furunculosis
Pediculosis capitis

5) Others
Vitiligo
Acne keloidalis nuchae
Post-traumatic cicatricial alopecia

Utility Of Trichoscopy
The cases where provisional diagnosis on the basis of clinical presentation and history was not possible were labelled as difficult cases. Out of 55 cases, 8 were labelled as difficult cases. 47 cases were diagnosed on the basis of clinical picture and history by the investigators. Amongst the 8 difficult cases, Dermoscopy helped to confirm the diagnosis of 7 cases (87.5%) [Table 5], and in 1 case, Dermoscopy did not yield any diagnostic clue and so biopsy was needed to confirm the diagnosis.

Table 5: Utility Of Dermoscopy In Scalp Disorder

Provisional diagnosis	No. of patients	Dermoscopic diagnosis	Other investigations	Final diagnosis	Was Dermoscopy useful?
SD/Tinea capitis	1	SD	No	SD	Useful
SD/PRP	1	SD	No	SD	Useful
Psoriasis/ Tinea capitis	1	Psoriasis	Biopsy	Psoriasis	Useful
Psoriasis/SD	1	Psoriasis	No	Psoriasis	Useful
FPHL/TE	1	FPHL	No	FPHL	Useful
AA/Tinea capitis	1	AA	Biopsy	AA	Useful
LPP/Psoriasis	1	LPP	Biopsy	LPP	Useful
AA/FPHL	1	FPHL	Biopsy	AA	Not useful
AA: Alopecia areata, FPHL: Female pattern hair loss, SD: Seborrheic dermatitis, TE: Telogen effluvium, LPP: Lichen planopilaris					

DISCUSSION
The main objective of our study was to determine whether the addition of Dermoscopic findings to clinical examination improves the diagnostic accuracy of scalp disorders.

In androgenetic alopecia, Diameter diversity of more than 20%, empty follicles, vellus hair, and yellow dots were most common findings in our study (Table 4). We found hair diameter diversity of > 20% to be the most common finding of our study in both AGA (100%), and FPHL (100%). This finding is in accordance with the previous study done by Inui *et al.* [16] where hair diameter diversity of more than 20% was seen in all the 50 Asian men with androgenetic alopecia. In another study done by Chiramel, *et al.* [17] who studied 22 patients of AGA and 9 patients of FPHL, they found it to be slightly lower at 95.1% and 88.9% respectively.

Chiramel, *et al.* [17] found vellus hair to be present in 40.9% cases of AGA and 22.2% cases of FPHL as compared to 88.8% in AGA and 75% in FPHL in our study. Yellow dots were seen in 44.4% cases of AGA and 50% cases of FPHL in our study as compared to 92.4% and 88% respectively by Ummiti, *et al.* [18] *and* 20.1% and 24% respectively in a study done by Hu *et al.* [19] Peripilar sign was seen in 11.1% cases of AGA and 25% cases of FPHL in our study. Similar results were seen in the study done on Indian patients by Chiramel, *et al.* [17] who found it to be 9% and 11.1% respectively. In a study done by Inui *et al.* [16] Peripilar sign was seen in 66% AGA cases and 20% FPHL cases. This finding was less in our study possibly due to difficulty in identification of this feature in darker skin.

In Alopecia areata, the most consistent findings in our study were Yellow dots in 85.7% cases and vellus hair in 85.7%. These findings are in accordance with the largest Trichoscopic study done by Inui *et al.* [16] on 300 Asian patients with Alopecia areata, who found that yellow dots and short vellus hair were the most sensitive diagnostic markers of Alopecia areata. Almost similar results were also reported by Chiramel, *et al.* [17] on 24 patients with Yellow dots in 87.5% cases and black dots in 79.2% cases. They reported exclamation mark hair in 70.8% cases and vellus hair in 50% cases as compared to 28.5% and 87.5% respectively in our study.

In SLE we found the most common finding to be follicular plugging, seen in all the cases followed by perifollicular and inter follicular blue grey pigmentation in 60% cases, Peri follicular erythema in 60% cases, loss of hair follicles in 40%, arborizing blood vessels 20% and scattered brown pigmentation in 20%. In a study on 109 SLE patients and 305 healthy controls, Suchonwanit *et al.* [20] reported arborizing blood vessels as the most common finding in 60% cases, blue grey pigmentation was seen in similar 44% cases, scattered brown pigmentation in 5.5% cases. The differences in findings may be attributed to the use of Non polarized Dermoscope and darker skin of the patients.

In Telogen effluvium Chiramel, *et al* [17] reported Thin hair in 70% cases as compared to 42.8% in our study. They reported short tip regrowing hair in only 10% cases as compared to 85.7% in our study. Empty hair follicles were seen in all the cases in our study although it is a nonspecific finding.

In a study of 78 patients of vitiligo, Jha *et al* [15]
Suggested that perifollicular hyperpigmentation was observed in the cases of unstable vitiligo, perifollicular depigmentation was observed in cases of stable vitiligo. Intralesional and peri lesional erythema was seen as a response to treatment and leucotrichia was seen in the cases resistant to treatment. All these findings were also observed in our patients.

In Lichen planopilaris we observed empty follicles, white dots, scalp erythema, Peripilar cast and Perifollicular and inter follicular blue grey pigmentation. Similar findings were reported in a study of 16 patients of Lichen planopilaris by Chiramel, *et al.* [17]

Limitations
In the current global pandemic time, lesser Number of participants in each group made it difficult to make comparative analysis for all the groups. Some patients were already on treatment and the treatment itself could have interfered with the characteristic findings on Dermoscopy. Biopsies could not be done for all the difficult cases either due to the lack of consent or due to financial constraints of the patients.

CONCLUSION
Dermoscope was helpful in diagnosing the scalp disorders and also aided to reach to a conclusive diagnosis in 7 out of 8 difficult cases (87.5%). The ability to store the data digitally helps us to compare the findings in future visits and also improves patient's compliance. It also obviates the need for invasive diagnostic procedures like skin punch biopsy for diagnosis. Hence we conclude that Dermoscope is a useful tool for diagnosing scalp disorders.

Conflict Of Intrest- None.

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