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Dermascopic Features of Androgenetic Alopecia: A Review Article

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Abstract

Background: Hair and scalp dermoscopy, also known as trichoscopy, is a useful, non-invasive method for diagnosing alopecia and other scalp and hair conditions. It is gaining popularity, but there are still few review reports on the dermascopic findings of AGA.

Objective: The aim of this study is to review the clinical and trichoscopic features of AGA patients.

Methods: A comprehensive search was conducted with the PubMed, Cochrane Library, Embase, and Scopus databases. We identified eligible published articles up to February 2022.

Results: Included were 18 articles yielding 3202 patients with androgenic alopecia. Most patients with androgenic alopecia displayed yellow dots, black dots, white dots, honeycomb pigmentation, vellus hairs, tapered hair, peripilar sign, Hair thickness heterogeneity, and perifollicular hyperpigmentation under the dermoscope.

Conclusion: This study has shown the significances of trichoscopy with androgenic alopecia patients, which can prove important to monitor early disease activity.

Keywords: Androgenic alopecia; Trichoscopy; Dermoscopy; Hai rloss; Pattern hair loss

Introduction

Androgenetic alopecia is a genetic disorder characterized by progressive transformation of terminal hairs into indeterminate and eventually vellus hairs. It is an extremely common disease that affects men and women [1]. Men with this condition, called male pattern baldness, can start losing hair from their teens through their twenties. It is characterized by a receding hairline and progressive hair loss from the crown and frontal scalp [2]. Women with a condition called female pattern baldness do not see significant thinning until they are 40 or older. Women experience a general thinning over the entire scalp, with the most extensive hair loss at the crown [3]. Standard methods used to diagnose hair diseases include clinical examination, hair loss pattern, traction test, trichogram, biopsy and screening blood tests. Their different in sensitivity, reproducibility and invasiveness. Trichoscopy is very useful for *in vivo* diagnosis of scalp and hair conditions and can greatly improve clinical management. Both handheld dermatoscope and video dermatoscope can be utilized [4]. The basic principle of dermatoscopy is trans-illumination of a lesion and studying it with high magnification to visualize subtle features. Structures visualized by trichoscopy include hair shafts, hair follicle openings, perifollicular epidermis, and dermal micro vessels. Trichoscopy allows analyzing acquired and congenital hair diseases [5]. Recent studies have gathered evidence that the use of trichoscopy in the clinical evaluation of hair disorders improves diagnostic options beyond the simple clinical examination.

Literature Review

Search strategy

A systematic search of three databases-PubMed, cochrane library, embase, and scopus was performed in February 2021 (Figure 1). A total of 18 observational study articles were included into the review and analysis [6-9]. Articles concerning data on androgenic alopecia were included. The frequency of trichoscopic features was reported in reference to the total number of included patients with AGA. The search terms were ‘‘alopecia’’ and ‘‘androgenic alopecia,’’ ‘‘trichoscopy’’ and ‘‘dermascopy,’’ ‘‘(review)’’ and ‘‘pattern hair loss. Articles written in English were included. There were no limitations on article type. After the selection process, the references of all included articles were assessed for missing publications [10].

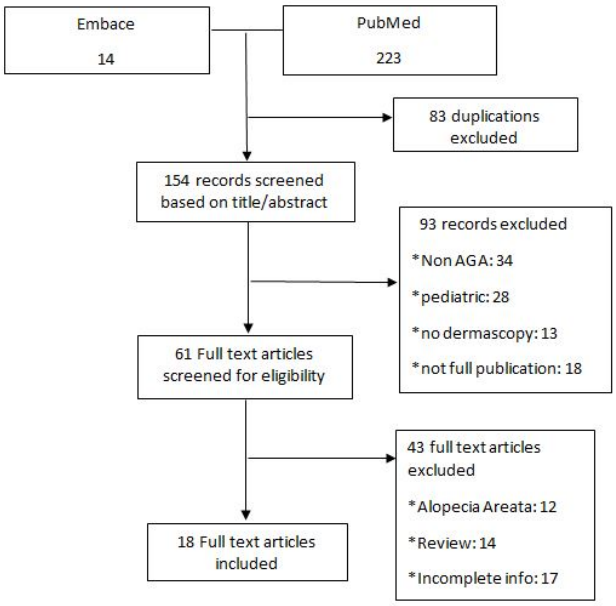

Figure 1: Study selection flow diagram.

Study eligibility, selection criteria, and screening

Independent assessment of the titles and abstracts was performed out independently. All articles reporting cases of AGA and dermascopic screening were used in this study. Both males and females with AGA was included in the article [11]. The diagnosis of AGA was based on Hamilton-Norwood scale for male patients, and Ludwig classification for females patients. The following criteria were used to exclude articles. Pediatric patients (<18 years), patients with any scalp disorders such as irreversible alopecia, trichotillomania, alopecia area ta and scalp psoriasis were excluded from the study [12-14]. Articles that failed to mention the necessary trichoscopic results were also excluded.

Data extraction and statistical analysis

The following variables where gathered as available: Nationality of patients, sample size, age, gender, hair loss severity, areas of scalp observed, examination tool, and dermascopic findings [15].

Results and Discussion

Systemic search results

We included 18 articles yielding 2302 patients with androgenic alopecia that was examined with dermascopy. The majority of articles comprised of observational studies (71%) followed by case control studies (25%). The mean age at presentation was 48.2 years [16]. With a male to female ratio at 3:6:1.

Hair thickness heterogeneity

The heterogeneity of hair thickness is characterized by the simultaneous presence of hair of different thicknesses. Vellus, thin, intermediate and thick. In the case of androgenic alopecia, a change in the diameter of more than 20% of the hair in the androgen dependent region is considered an important diagnostic criterion for androgenic alopecia (Figure 2). Kasumagic, et al., and Adriana, et al., both had most common trichoscopic finding as hair thickness heterogeneity. Kasumagic, et al., showed that all of the participants (104/104) displayed HTH with different thicknesses: Vellus, thin inter mediate and thick hairs [17]. Adriana Rakowska, et al. showed that mean percentage of thin hairs in androgenic alopecia was significantly higher than in healthy controls [18].

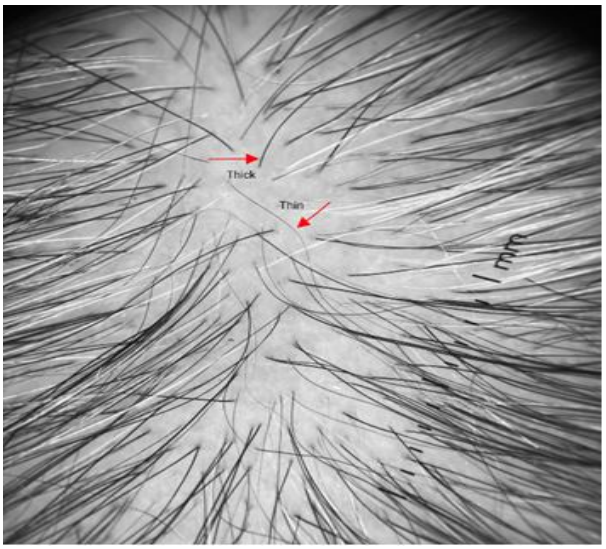

Figure 2: Dermascopy showing hair thickness heterogeneity. Red arrows pointing at thick and thin hair shafts.

Yellow dots

Trichoscopic yellow dots correspond to an enlarged follicular infundibulum filled with keratotic material and/or sebum [19]. They appear as round or polycyclic structures of various sizes, yellowish pink to tan in color and usually hairless. This difference in results can be explained by the difference in the ethnic groups included in the studies, which means a difference in the activity of the sebaceous glands, as well as the degree of pigmentation of the scalp in advanced stages [20]. Yellow dots were found in 70.88% of patients during examinations in both the early and late stages of AGA. On the other hand, Shruthi, et al., emphasized yellow dots being higher in late AGA in their study. In nearly all studies, yellow dots were observed. Emina, et al.; and Minu, et al. showed 100 % presence of yellow dots in their study (Figure 3).

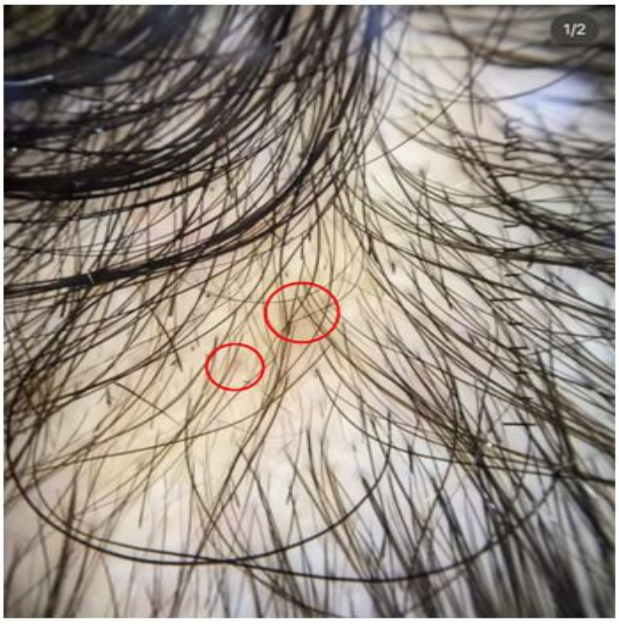

Figure 3: Dermoscopic picture showing yellow dots (red circles).

Black dots

Black dots indicate broken hair follicles on the surface of the skin. They are located in the follicular ostia and are considered a specific trichoscopic sign of alopecia. Shruthi Madhavi, et al., screened the hair shaft and root, as well as tests for hair anchorage and fragility on 100 cases. The mean age of the study group was 26 ± 14.8 years. She found that the common trichoscopic follicular features noted were black hair at 48%. Another study done by Melike, et al., shows a study where black dots sized 1 mm-2 mm were determined in alopecia, and were different from the regular black dots or HCPP seen in alopecia previously (Figure 4). A biopsy from one of these areas in a patient showed no perifollicular, epidermal or dermal infiltration but revealed intense demodex colonisation in follicular ostia.

Figure 4: Dermoscopic picture with black dots (black circle).

White dots

It usually represents dead follicles being replaced by fibrous ducts. They can sometimes be confused with the eccrine duct openings which also appear pale, but they can be distinguished because they have a well-defined, rounded structure, are regularly spaced, and can be seen on normal and diseased scalps. In the study conducted by Melike Kibar, et al., white dots were related to severe androgenic alopecia, and that cumulative sun damage makes these dots more visible with honeycomb pigmentation. Soha S. Tawfik et al., reported white dots in 20.3% (16/79) of patients, and according to her study it was related to findings in advanced androgenetic alopecia.

Vellus hairs

Vellus hairs are fine hairs less than 0.04 mm in diameter. Vellus hairs are a sensitive indicator of hair growth. These regrowth hairs can be curled as a pigtail and can be seen in alopecia cases. In AGA patients, the occurrence of vellus hair has been reported in the articles with a frequency of 65%-84%. Jin Park, et al., reports trichoscopic results of three hundred and twenty seven participants, with different alopecia types. Vellus hairs were the most common findings in AGA patients at 55.3%. On the other hand, Adriana Rakowska, et al., calculated dermoscopic image in 20-fold magnification which only showed 2 short hairs in frontal and occipital area and 3 in temporal area in some patients (Figure 5).

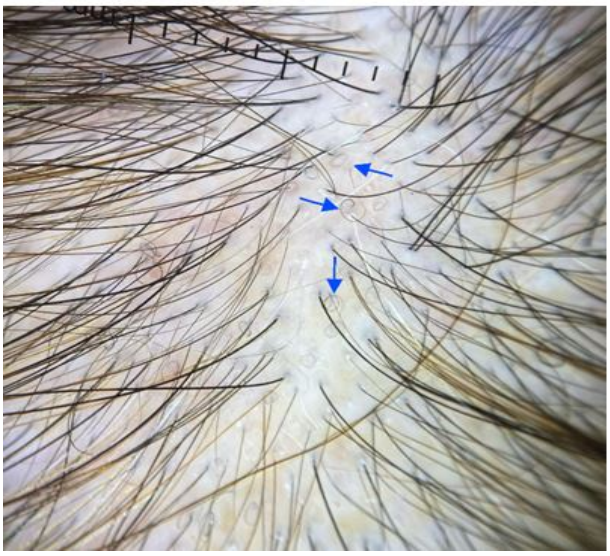

Figure 5: Dermoscopic picture showing vellus hair in coiled pigtail form (blue arrows).

Perifollicular pigmentation

The dermascopic findings of perifollicular pigmentations are thought to be the result of dermal infiltrates in androgenic alopecia patients. Isha Verma, et al., reports of a >3:1 ratio of hair with perifollicular discoloration at the frontal and occipital area in their patients, which were observed in the later stages of alopecia. In other case Emina Kasumagic, et al., showed us that perifollicular pigmentations was seen in 40.38% of patients in the study group (Figure 6). In some repots it states that perifollicular inflammation is allegedly due to the effects of cosmetics, chemicals, ultraviolet light, deposits of mucus and melanocytes, however, the pathogenesis remains not know.

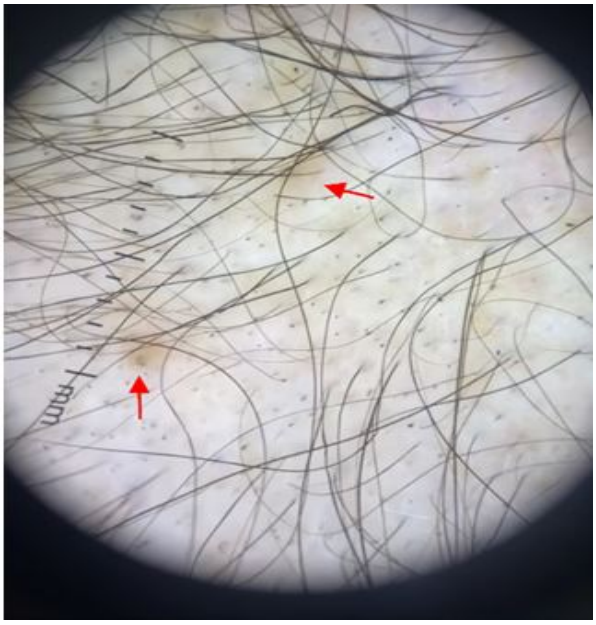

Figure 6: Perifollicular pigmentation seen on dermascope (red arrows).

Honeycomb pigmentation

The pigment network consists of a network of intersecting pigment lines that form a honeycomb pattern. The anatomical basis of the pigment network is the melanin of keratinocytes or melanocytes. This pattern was observed in most of the studies found. Jin Park, et al., observed honeycomb pigment network in 19.7% of his patients with the age range of the patient group being 2~81 years. In another study Soha S Tawfik, et al., showed us honeycomb scalp pigmentation in 17.7%. In this study it is also suggested that it is seen more often in ethnic groups of darker skin with alopecia. In the study conducted by Amudha Ummiti, et al., with patients at the age group between 18 and 70 years shows that honeycomb pigmentation was found in 87.9% of patients, which is statistically significant, and was most commonly seen in all stages of alopecia (Figure 7).

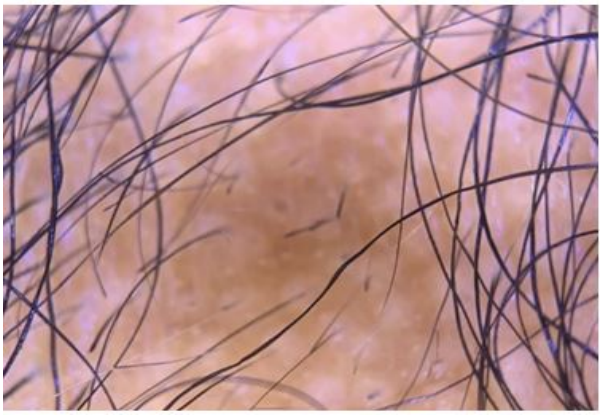

Figure 7: Dermoscopic picture showing honeycomb pigmentation.

Peripilar sign

Is usually seen as a subtle brown halo and is a specific finding seen in early stages of alopecia. It reflects perifollicular inflammation. Soha S Tawfik, et al., reported of a study that observed androgenic alopecia in seventy nine dark skinned patients with alopecia. Clinical and trichoscopic examination revealed, peripilar brown halo in 32.9% of patients, and also peripilar white halo in 10.1%. The study concluded that peripilar signs are characteristic signs of androgenetic alopecia in ethnic groups of darker skin types (Figure 8). Shoba Mani, et al., showed a study where 47 patients presenting with alopecia were subjected to dermoscopy with a video dermoscope of magnification 50X and 200X. Out of the 47 atients 27 displayed peripilar signs. Marwa Said, et al., reports of a study performed on a total of 200 patients. Among the high statistically significant trichoscopic findings were peripilar sign at 61%. Najam U Saqib, et al., showed a hospital based observational study of 200 alopecia patients, with a median age of onset of 21 years. Peripilar halo among these patients was at 88.7%. Jin Park, et al., observed three hundred and twenty-seven patients with alopecia, where he found 36.1 percent of the study group with peripilar sign (Table 1).

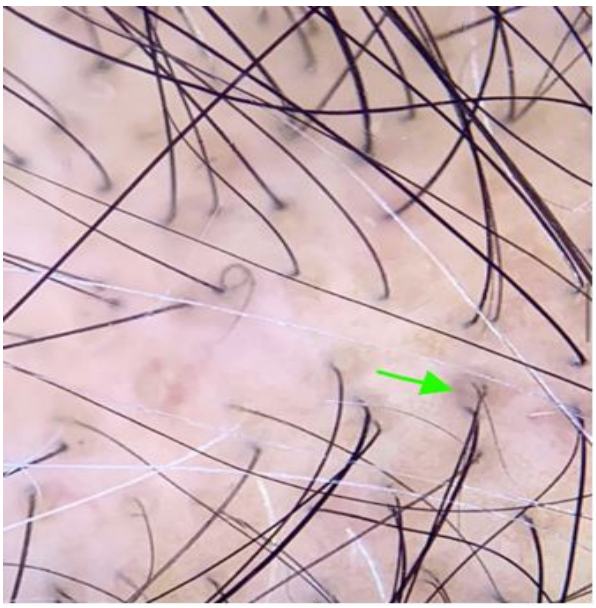

Figure 8: Dermoscopic pictures showing peripilar sign (green arrow).

Article (year): Study design	Country	Sample Size	Age, years	Female	Hair loss severity	Scalp regions observed	Examination toll	Trichoscopic findings
Ruiming Hu et al. Case control study	China	950 patients	18-60 years	200/950	Grade II-VII (H-N) scale, grade F1-F3 Ludwig scale	3-4 images were taken of vertex, frontal and temporal hair line	10-fold magnification dermascope	HSTH of more than 20%, BPPS, WPPS, yellow dots, focal atrichia and scalp honeycomb pigmentation (P<0.001), and less com mon trichoscopic features were pinpoint white dots (P<0.05).
Emina Kasumagic et al. Case control study	Bosnia	104 patients	22-69 years	44/104	Grade II-VII (H-N) scale, F2-F3 Ludwig scale	Frontal, occipital and both temporal	MoleMax II videodermatosc ope or handheld	HTHS=104 (100%), yellow

						areas of the scalp	dermatoskope DermLite II pro	dots=55 (52.88%), vellus hairs=51 (49.03%), Perifollicular hyperpigmented= 42 (40.38%).=55
Amudha Ummiti et al. Observational study	India	91 patients	18-70 years	66/91	Grade II-VII (H-N) scale, grade F1-F3 Ludwig scale	Crown, midscalp, frontal region.	eScope Oitez Digital Microscope, optical magnification 10-40X, 200X	BPPS was seen in early grades of AGA P<0.01, WPPS and focal atrichia were seen in later grades of AGA P<0.01. honeycomb pigmentation was commonly seen in all stages.
Shruthi Madhavi et al. Observational study	India	100 patients	Mean age of 26 ± 14.8 years	57/100	Grade III-IV (H-N) scale, grade F1-F3 Ludwig scale	Frontal, occipital and both temporal areas of the scalp	Dermoscope Dermlite DL3N with X10 magnification	Broken hair (48%), black dots (48%), single hair follicle unit (45%), short vellus hair (94.1%), upright hair (41%), and yellow dots (40%), honey comb pigment pattern (64.7%).
Jin Park et al. Case-control study	South Korea	327 patients	20=81 years	178/327	Grade II-VII (H-N) scale, grade F1-F3 Ludwig scale	Frontal, vertex and occiput	Polarized-light handheld dermoscope Dermlite DL 3; 3Gen 3 or 4-fold optical zoom canon camera	Hair diversity 71.2%, short vellus hairs (55.4%), peripilar sign 31.7%, single hairs 25.2%, uniform thinning 15.7%, honeycomb pigment 19.6%
Najam U Saqib et al. Observational study	India	200 patients	19-70 years	200/200	Grade F1-F3 Ludwig scale		USB-connected video dermoscopeat magnifications ranging from 20X to 220X	Hair diversity >20%, with a singular hair coming out of follicular openings and thin hair 100%. Other findings were vellus hair 98.3%, peripilar sign 88.7%, yellow dots 28.7%, and focal atrichia 16.5%.

Shigeki Inui et al. Case-control study	Japan	60 patients	18-65 years	10/50	(H-N) scale, of the 50 AGA patients, 10 had type III AGA, 16 type III vertex, 21 type IV and three type Va. According to Ludwig classification, all 10 AGA patients had type II hair loss.	Central scalp, frontal, and vertex	DermLite II Pro dermoscope (3Gen, San Juan Capistrano, CA, USA), Nikon	Peripilar signs were seen in 66%, Yellow dots was 63,7%, Vellus hairs 51% (49.03) Coolpix 4500 digital camera.
Adriana Rakowska et al. Observational study	Poland	59 patients	18=56 years	28/59	Grade F3 Ludwig scale	Vertal and frontal scalp	Trichoscopy with 20-fold magnification.	Increased number of yellow dots 46% and thin hairs 53%, as well as decreased average hair thickness in frontal area.
Melike Kibar et al. Observational study	Turkey	206 patients	18-75 years	143/206	Grade I-VII (H-N) scale, grade F1-F3 Ludwig scale	Parietal, frontal, occipital, and lesional areas.	X100 magnification dermascopy	Diversity (HDD), Structure less Red Areas (SRA), Brown Dots (BD), and Perifollicular White Scales (PWS) ($p<0.001$).
Krishnendra Varma et al. Observational study	India	269 patients	18-50 years	96/269	Grade II-VII (H-N) scale, grade F1-F3 Ludwig scale	vertex, frontal and temporal hair line	Dermascopy with camera magnifications ranging from 20X to 220X.	Peripilar sign (77%) followed by short vellus hair (75%), honey comb pigmentation (46%), single follicular units (40%) and yellow dots (37%).
Melike Kibar et al. Observational study	Turkey	201 patients	25-60 years	138/201	Grade II-VII (H-N) scale, grade F1-F3 Ludwig scale	Vertex, frontal and temporal hair line	Molemax 3 video dermoscopy	Trichoscopic findings of a honeycomb hyperpigmentation pattern, cumulus like clustered white dots, white dots and black dotted pigmentation.
Minu Jose Chirame et al. Observational study	India	22 patients	18-60 years	9/22	Grade II-VII (H-N) scale, grade F1-F3 Ludwig scale	Bilateral fronto-temporal, bilateral parieto-temporal	Non polarized Heine delta 20 mini dermoscope (10X magnification)	Yellow dots (100%), diameter diversity>20% (95.1%), thin hair (90.9%), vellus hair (40.9%), honeycomb

								pigment network (40.9%), peripilar sign (9%)
Isha Verma et al. Case-control study	India	50 patients	18-69 years	50/50	Grade 3-4 Sinclair scale	Frontal, occipital, and left temporal after parting of hairs with comb	Magnified images and provided results in millimeters) at 58X (covers an area of 9 mm^2)	>4 Yellow dots in the frontal scalp zone, >2-1 ratio of single hair units (frontal: occiput) and >3-1 ratio of hair with perifollicular discoloration (frontal: occiput) are commonly noted in late stages of FAGA *i.e.* grade 4/5 and >1.5-1 ratio of vellus hairs (frontal/ occiput) in early stages *i.e.* grade 2/3 while lower mean hair thickness in frontal area and >10%.
Marwa Said et al. Observational study	Egypt	200 patients	18-65 years	200/200	Grade F1-F3 Ludwig scale	Vertex, frontal and temporal hair line	Trichoscopy ×100 magnification	Yellow dots, 45%, peripilar sign, 61%, hair diameter diversity, 100%, and single hair pilosebaceous unit was, 96%.
Tugba Rezan Ekmekci et al. Observational study	Turkey	60 patients	Mean age: (32.21 8.37)	60/60	Grade F2 Ludwig scale	Midscalp and on the occiput	TG with digital camera attached to a dermoscope	On the midscalp, increase of percentage of thin hair in consistent with clinical stages in the AGA was noted.
Shoba Mani, et al. Observational study	India	65 patients	20-65 years	28/65	Grade I-VII (H-N) scale, grade F1-F3 Ludwig scale	Frontal, vertex and occiput	Dermoscopy with videodermoscope of magnification 50X and 200X.	Peripilar pigmentation (27), honeycomb pigmentation (16), Yellow dots (7), Pilosebaceous single hair unit (27).
Adriana Rakowska et al. Observational study (2)	Poland	59 patients	19-58 years	59/59	Grade F2-F3 Ludwig scale	Frontal, occipital and both temporal areas of the scalp	20-fold and 70-fold magnification	Yellow dots noted 1.59 6 2.0 mm the mean hair thickness was 0.061 6 0.008 mm.

								in the frontal area *vs.* 0.058 6 0.007 mm in the occipital area (P, 0.001).
Soha S Tawfik et al. Observational study	India	79 patients	18-54 years.	79/79	Grade F1-F3 Ludwig scale	Frontal scalp, vertex, area, righ and left temporal scalp, occiput	Dermlite DLIII dermoscope with 10-fold magnification.	97.4% (77/79), peripilar brown halo seen in 32.9%, peripilar white halo in 10.1%, and honeycomb like scalp pigmentation in 17.7% of patients, yellow dots in 15.2%, white dots in 20.3%, and hidden hair in 7.6%.

Table 1: Baseline characteristics.

Conclusion

Trichoscopy is a useful non-invasive diagnostic tool which can aid in diagnosing of androgenic alopecia. Several characteristic findings suggestive AGA can be identified by trichoscope. Yellow dots and short vellus hairs were the most common, and thus most sensitive trichoscopic findings. Followed by, black dots, white dots, honeycomb pigmentation, vellus hairs, tapered hair, peripilar sign, hair diversity, and Perifollicular hyperpigmentation. These early onset findings may prove to be very important to monitor early disease activity of androgenic alopecia. Further studies are needed to substantiate this finding and its relevance to the severity of androgenic alopecia.

Data availability statement

All data included in this review are available in the articles listed in references. Images are available from the corresponding author, APC, upon reasonable request.

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