



# International Journal of Dermatology, Venereology and Leprosy Sciences

E-ISSN: 2664-942X  
P-ISSN: 2664-9411  
[www.dermatologypaper.com](http://www.dermatologypaper.com)  
Derma 2024; 7(2): 25-34  
Received: 04-06-2024  
Accepted: 13-07-2024

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## Role of trichoscopy in diagnosis of different hair and scalp disorders in pediatrics

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**DOI:** <https://doi.org/10.33545/26649411.2024.v7.i2a.189>

### Abstract

Children's hair and scalp abnormalities can be acquired or congenital, resulting from problems with the hair, scalp skin, or infections. Alopecia is the most prevalent symptom and can be caused by tinea capitis, trichotillomania, or patchy alopecia areata. Less prevalent conditions including early androgenetic alopecia, alopecia areata incognita, and congenital triangular alopecia can also cause hair loss. Trichoscopy, a noninvasive technique, increasingly aids in promptly diagnosing and following many diseases, including further investigation before treatment decisions. The use of dermoscopy, also known as trichoscopy, in the diagnosis and treatment of hair disorders is growing in popularity. Children and their parents tolerate this test well since it is noninvasive, painless, and can be used to evaluate a variety of hair and scalp diseases. Its repeatability also makes it possible to monitor the state of the hair or scalp after therapy and identify specific abnormalities of the hair shaft or scalp.

**Keywords:** Scalp disorders, trichoscopy, disorders in pediatrics

### Introduction

Infant and childhood hair and scalp disorders are prevalent and present complex clinical challenges, causing significant worry for both patients and families [1]. Children's hair diseases include both congenital and acquired forms, some accompanied by associated anatomical abnormalities and others not. They could occasionally be a component of dangerous inherited disorders [2]. Trichoscopy can be carried out using either a handheld dermatoscope or a digital video dermatoscopy system, making it a non-invasive method [3]. The method identifies hair and shaft abnormalities expeditiously, eliminating the requirement for ex vivo assessment through techniques such as optical or scanning electron microscopy. It can be used to differentiate between diffuse alopecia areata and androgenic alopecia, two prevalent acquired hair conditions [4].

### Congenital hair disorders

- **Hypotrichosis:** In hypotrichosis, the deficient hair regeneration is due to impairments in anchoring and cycling hair [5].
- **Hypotrichosis's Dermoscopy [6]:** Shafting changes of hair and yellow spots that are indicative of severe AGA are shown by dermoscopy [7]. Variability in the hair shaft and yellow patches, similar to severe AGA, are seen on dermoscopy [7]. This disease has been reported to have recent black dots [8]. (Figure 1)



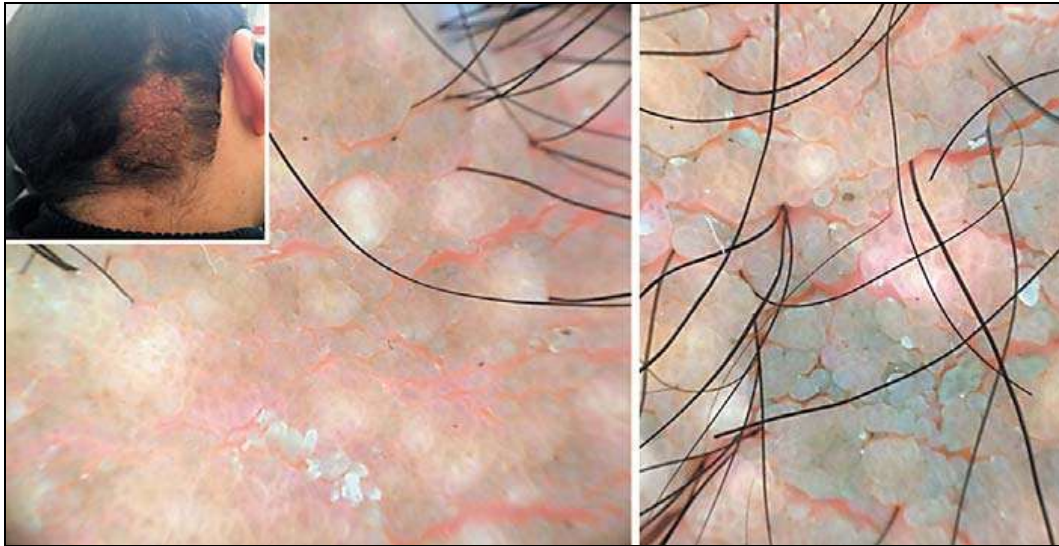
**Fig 1:** Shows a clinical and dermoscopic image of a patient with hypotrichosis, along with images of her cousins. Patients in (a), (b), (d), and (e) had non-growing scalp hair at birth, and a scalp dermoscopy revealed a normal hair shaft with variable hair thickness and decreased density [6].

- **Aplasia cutis congenita (ACC):** Also termed congenital absence of skin, involves the lack of a skin fragment at birth. The depth of skin absence in ACC can fluctuate. It can extend from the epidermis and upper dermis to the dura, the skull, the subcutaneous tissue, and the deep dermis, with minimal alopecic scarring [9].
- **Dermoscopy of aplasia cutis congenita:** The epidermis at the centre of the lesion in the study by Rakowska *et al.* [10] revealed elongated hair bulbs with darkly pigmented proximal ends, radial organization of hair shafts, and absence of follicular apertures, and conspicuous arteries associated with skin atrophy [9]. (Figure 2).



**Fig 2:** Congenital alopecia cutis (a) An arrow pointing to the hypopigmented plaque's position; (b) a dermoscopy magnified by 20 times: Translucent epidermis, obvious hair bulbs, absence of skin appendages, peripheral hair roots, and vessels [9]

- **Nevus sebaceous (NSJ):** A hamartoma, originating from epithelial and adnexal tissues, is typically asymptomatic at birth. yellow-greyish papillary appearance, yellowish globules collected in a "cobblestone pattern," and peripheral vascularization (linear, irregular, or arborescent) [12]. Brownish globules with a cerebriform or cratered look are seen in 80% of individuals [12]. (Figure 3).
- Dermoscopically** [11]: Dermoscopic characteristics include homogeneous yellowish, whitish-yellow lobular aspect,



**Fig 3:** Nevus sebaceous of Jadassohn with an elevated verrucous partly alopecic occipital plaque that has a yellow-greyish papillary look <sup>[11]</sup>

- **Congenital triangular alopecia (CTA):** Originally termed 'alopecia triangularis congenita de la tempe' by Sabouraud in 1905, this disorder is a nonprogressive, non-cicatricial type of alopecia that is sometimes referred to as Brauer nevus or temporal triangular alopecia (TTA) <sup>[13]</sup>.

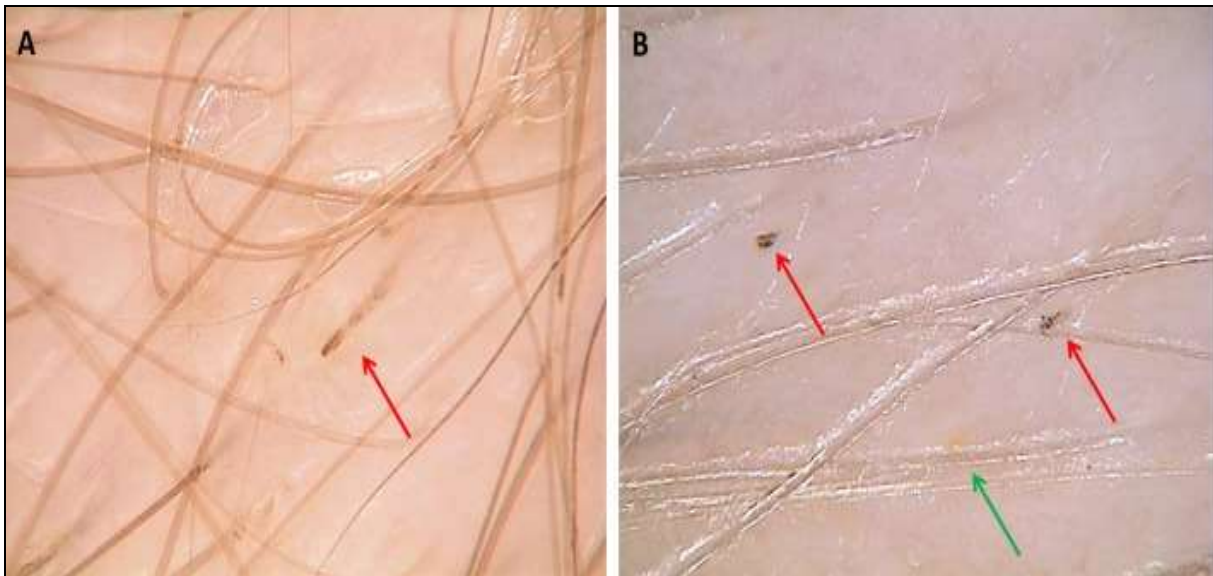
**Trichoscopic features <sup>[14]</sup>:** These traits - epidermal scaling, arborising red lines, and honeycomb pigment pattern - can provide crucial cues <sup>[15]</sup>. In addition to interfollicular characteristics like arborising red lines and a honeycomb pigment pattern, the presence of epidermal scaling may also provide important hints <sup>[15]</sup>. (Figure 4).



**Fig 4:** Alopecia triangularis temporal. In our cases, trichoscopic symptoms were noted. Blue arrow, vellus hair; green arrow, empty follicles; red circle, variability of diameter; red arrow, white hairs <sup>[14]</sup>

- **Loose anagen hair syndrome (LAHS):** is a rare, self-limiting illness that primarily affects young children with light hair and a fair phototype <sup>[16]</sup>.
- **Trichoscopic features <sup>[17]</sup>:** There are no particular trichoscopy characteristics that support the LAHS

diagnosis. Alopecia areata (AA), trichotillomania, congenital abnormalities of the hair shafts, and telogen effluvium (TE) are among the differential diagnoses <sup>[17]</sup>. (Figure 5).



**Fig 5:** When trichoscopy is performed on patients with loose anagen hair syndrome, it reveals single yellow spots (B; green arrow) and black rectangular characteristics with granular structure (A, B; red arrows) <sup>[17]</sup>

- **Trichorrhexis nodosa (TN):** is the most typical abnormality of the hair shaft. Under microscopy, it exhibits tiny greyish nodes along the hair shaft and resembles "thrust paint brushes." It might be acquired or congenital.
- **Trichoscopy:** confirmed the diagnosis with a "thrust paintbrush" pattern. Netherton's syndrome,

trichothiodystrophy, Menkes' kinky hair disease, hypothyroidism, and argininosuccinic aciduria have all been linked to TN: revealed a "thrust paintbrush" pattern that validated the medical diagnosis. TN may be linked to trichothiodystrophy, Netherton's syndrome, Menkes' kinky hair syndrome, hypothyroidism, or argininosuccinic aciduria <sup>[18]</sup>. (Figure 6).



**Fig 6:** Trichoscopy of trichorrhexis nodosa reveals a white patch along the hair shaft that is the consequence of broken and tangled hair <sup>[19]</sup>

- **Trichorrhexis invaginate (TI):** Netherton syndrome (NS) is an uncommon recessive autosomal disorder characterised by growth retardation, atopy, ischthyosis linearis circumflexa, erythroderma, and a particular hair shaft change known as bamboo hair (TI). TI is pathognomonic for NS and appears like a "ball in a

hoop" when seen microscopically. It is an invasion of the shaft's distal to proximal part. "Golf tee hair" is the term for fractured hair that has broken at the point of invagination and has an end that resembles a shell <sup>[20]</sup>. (Figure 7).



**Fig 7:** Details of trichoscopy: golf tee hair (arrow) with trichorrhexis invaginata [20]

- **Monilethrix:** it is characterized by localized or widespread dystrophy of the hair shaft causing patchy or diffuse hair loss [21].
- **The characteristic trichoscopic feature** is a “regularly bent ribbon sign” with periodic alteration of constrictions (defect) and nodes (real hair diameter)

causing the characteristic beading [22]. While the internodes are characterized by the wrinkling of cortical cells that cause the hair to become fragile and lack the medulla, the nodes appear to indicate normal growth. Furthermore, perifollicular keratotic papules may be seen [21, 23]. (Figure 8).



**Fig 8:** A monilethrix trichoscopic discovery. Typical moniliform or beaded hair look [23]

- **Pili torti:** Ronchese [24] published the first reports of pili torti in 1932 after seeing twisted hairs in two young sisters with blonde hair [25].

**Dermoscopy shows:** Under low magnification, dermoscopy reveals hair shafts that are asymmetrically bent at sharp angles. The distinctive 180° twists of flattened hair may be seen at extreme magnification [26]. (Figure 9).



**Fig 9:** Björnstad syndrome pilitorti Trichoscopy of the patient reveals irregularly bent and flattened hair shafts [26]

- **Pili annulate:** Although occasional examples have also been recorded, autosomal dominant inheritance accounts for the majority of its inheritance [27, 28].
- PA is indicated by the dermoscopic observation of

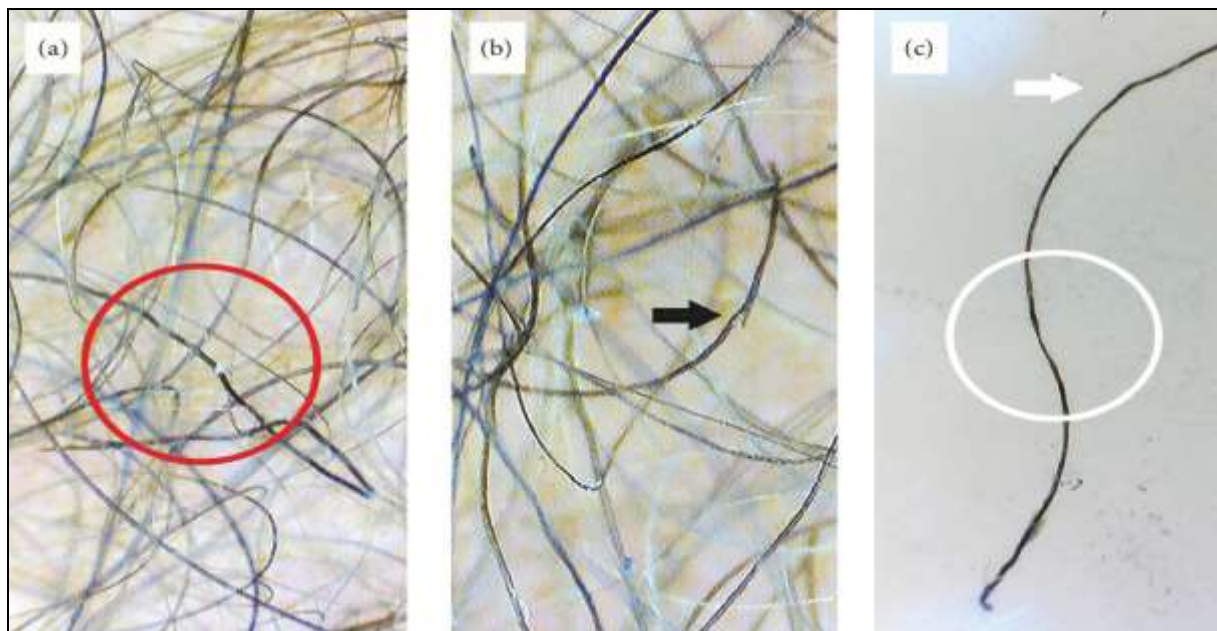
alternating bands of light and dark along a hair shaft. The air chambers within the shaft are shown by light bands [23, 26]. (Figure 10).



**Fig 10:** Trichoscopic feature of pili annulati with brightband along the hair shaft [23]

**Woolly hair syndrome (WHS):** An uncommon congenital structural defect of the scalp hair is called WH. It's either genetic or sporadic. The structure and excessive curl of the

hair are similar to sheep's wool, and the colour of the hair frequently has no distinctive qualities [29]. (Figure 11).



**Fig 11:** A 20x trichoscopy demonstrates (a) the look of a "crawling snake" (red circle), (b) trichoptilosis (black arrow), and (c) variations in shaft diameter and hair shaft kinking (white circle and white arrow) [30]

**Acquired Hair Disorders**

▪ **Non Cicatricial Alopecias**

- **Alopecia areata (AA):** is a very common autoimmune condition that manifests as recurrent, non-scarring hair loss. Even though it's a benign ailment, individuals and those who provide care for them may have severe emotional and psychological effects [31].

**Trichoscopic Findings in Alopecia Areata [32]:**

- **Yellow dots:** they represent sebum- or keratotic material-filled follicular infundibulums.
- This trichoscopic observation prevails in long-term

inactive diseases.

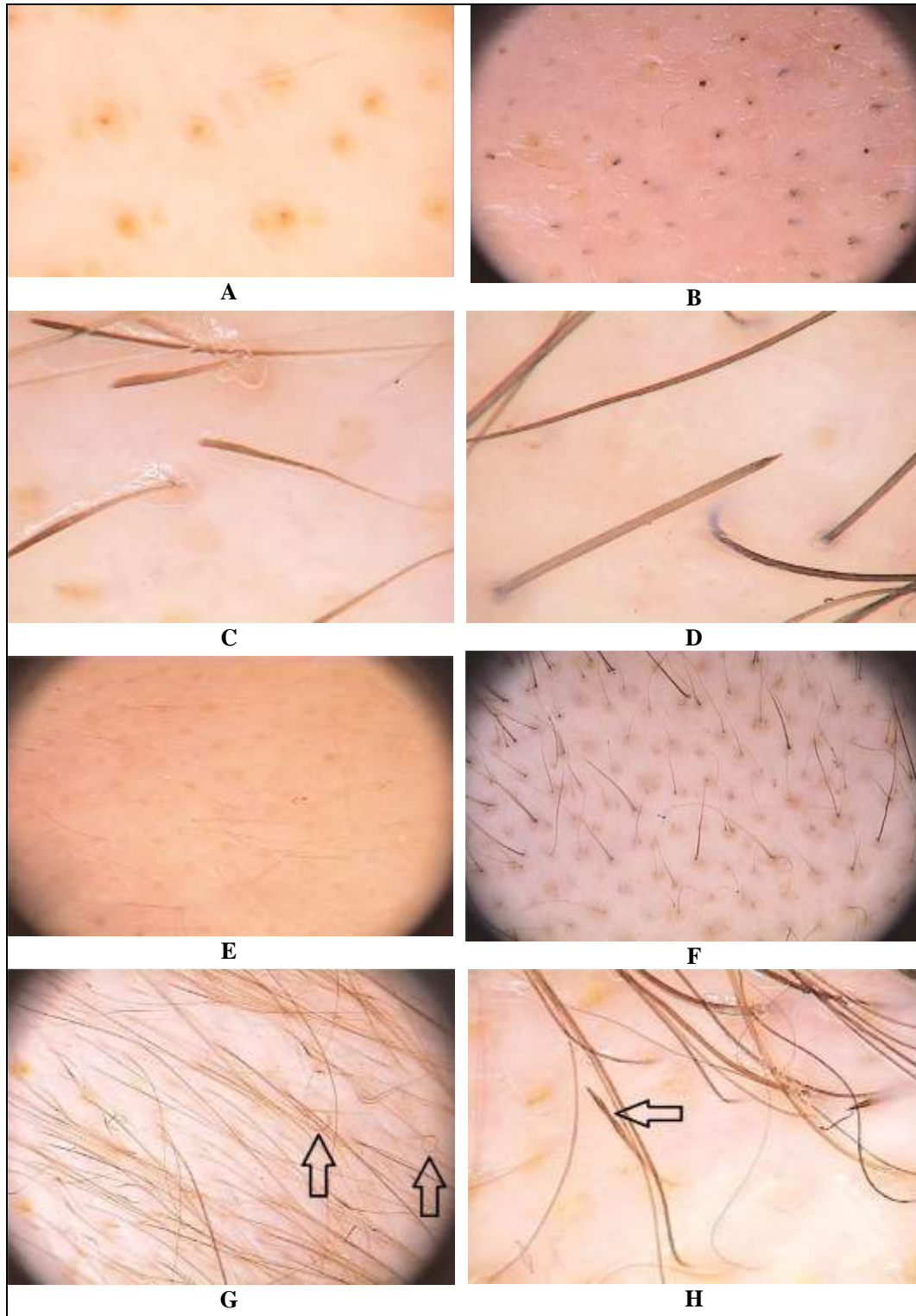
- **Blackheads:** These are considered as remnants of broken hair, split ends or thinning hair. Alopecia areata with active hair loss is primarily characterized by blackheads.
- **Exclamation hairs (Sharp hairs):** Irregular split hairs with a noticeably thicker distal tip that frequently has a tendency to be hyperpigmented, and a finer, typically hypopigmented proximal tip. Visible to the unaided eye, exclamation mark-shaped hairs range in length from 1 to 3 cm and signify a worsening of the illness.
- **Broken hair:** Originating from either the fast

development of incomplete broken hairs that had previously created black spots or from an uneven transverse fracture of the terminal hair shaft weakened by an inflammatory process. Patients with active hair loss and acute alopecia areata are the majority who have them.

- **Short and fluffy hair:** Short and fluffy hair is more common in the long and remission phase of alopecia areata.
- **Re-erect hair growth:** New, healthy hair with a vertical position and a tapering distal tip is known as re-

erect hair.

- Tail hair, also known as circular hair, has small tips, is uniformly spiralling, grows back, and is short. They often disappear within a few weeks and signify the development of hair.
- **Pohl-Pinkus strictures:** "Pohl-Pinkus strictures" are regions of the scalp where there is less hair density. These contractions happen when a fast and recurrent external or internal factor suppresses the follicle's metabolic and mitotic activity (Figure 12).



**Fig 12:** A) Yellow dots ( $\times 70$ ), B) Black dots ( $\times 20$ ), C) Exclamation mark hairs ( $\times 70$ ), D) Broken hairs ( $\times 70$ ), E) Short vellus hairs ( $\times 20$ ), F) Upright regrowing hairs ( $\times 20$ ), G) Pigtail (circle) hairs (black arrows) ( $\times 20$ ), H) Pohl-Pinkus constrictions (black arrow) ( $\times 70$ )<sup>[32]</sup>

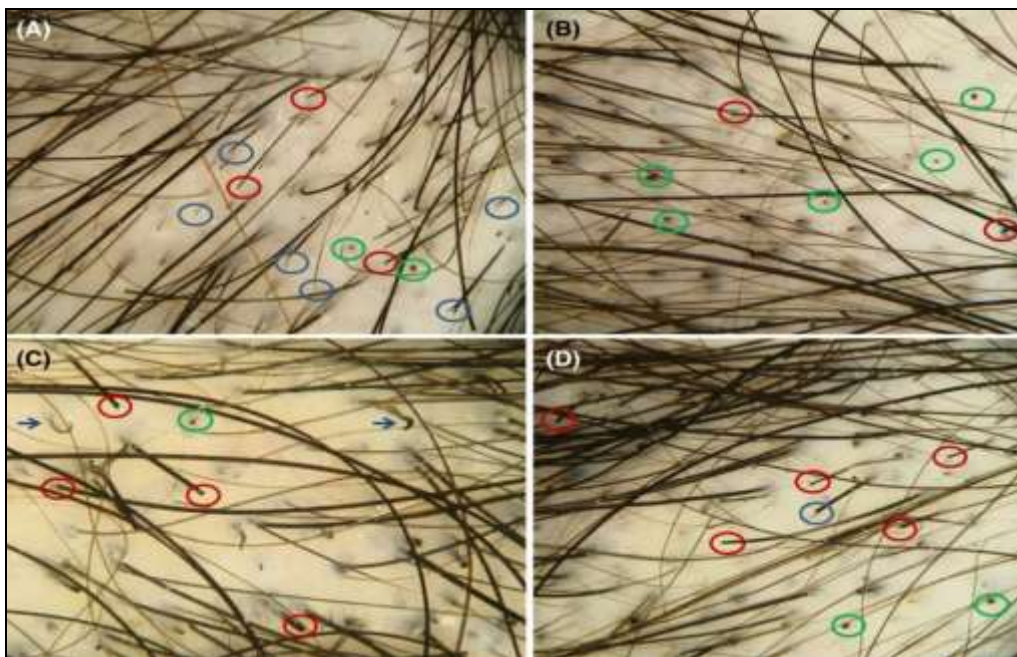
### More trichoscopic observations related to alopecia areata <sup>[32]</sup>

1. Honey patterns, which consist of homogeneous, mosaic, or contiguous brown rings, appear in chronically sun-exposed areas experiencing hair loss or total baldness, especially on the scalps of dark-skinned individuals. The honey pattern includes homogeneous, mosaic or contiguous brown rings and can be found in areas chronically exposed to the sun with hair loss or complete hair loss and on the scalp of dark patients.
2. After shampooing, non-microbial environmental particles no longer appear in the form of dirty spots. Dirty spots represent non-microbial environmental particles that disappear after shampooing.
3. In some cases of alopecia areata, the absence of follicular ostia has been identified. In cicatricial alopecia, scarring is a defining characteristic. Although it is considered a specific marker of cicatricial alopecia.
4. Khunkhet *et al.* <sup>[33]</sup> coined the term "angular hair" for hairs featuring an acute angle along the shaft, comprising checkerboard hair, zigzag hair, and trichorrhex nodular. In cases of alopecia areata, certain

types of angular hair may occur. All subtypes of angular hair are occasionally described in patients with alopecia areata.

**Trichotillomania:** A compulsive hair-pulling disorder that results in significant hair loss, especially in the parietal and crown areas. Girls between the ages of 9 and 13 are the most usually affected by the disease (70 to 93% of instances), and they typically deny the behaviour <sup>[34]</sup>. In clinical practice, it can be difficult to accurately diagnose trichotillomania. Irregular broken hair is the most common diagnosis of trichotillomania, as a result of hair shaft breakage and tugging <sup>[35]</sup>.

**Trichoscopic features:** Changes include a decrease in hair density, hair breakage at various lengths, and trichoptilosis in short hair, sometimes known as "split ends" <sup>[36, 37]</sup>. Irregular or erect hair growth has been observed in patients with TMD <sup>[38]</sup>. Blackheads are believed to be hair remnants from damaged hair, broken hair, and kinked hair <sup>[38]</sup>. (Figure 13)



**Fig 13:** A trichoscopic examination reveals the signs of trichotillomania. Green circles represent black dots with a wide range of widths and forms; blue circles represent split ends (division in a Y-shaped of the distal segment of the hair); red circles represent broken hairs (short hairs with darker coloured ends); blue arrows represent hook hairs (partially coiled hairs). Computerised polarized-light video microscopy (Foto Finder Dermoscope, Teach screen Software, Bad Birnbach, Germany) was used to take the images at a 20-fold magnification <sup>[34]</sup>

### Acquired Inflammatory Diseases of the Scalp

1. Scalp psoriasis is a significant issue for research because, in addition to being a physical burden, it also significantly increases psychological stress in patients, which is out of proportion to the body part that is afflicted <sup>[39]</sup>. Studies have indicated that the scalp is the most often involved first location of psoriasis in children <sup>[39]</sup>. The scalp is also the site of preference for the disease. Studies have indicated that the scalp is the most often involved first location of psoriasis in children, and it is also the site of preference for the condition <sup>[40]</sup>.

### Trichoscopy of scalp psoriasis

Trichoscopy for psoriasis of the scalp Trichoscopy has

shown to be crucial in determining the diagnosis of psoriasis in all of its manifestations. Certain veins were found to be present in the scalp after a light scrape in order to disclose the capillaries in the interfollicular area and create the trichoscopic sign of initial diagnosis. The optimal way to utilize trichoscopy is to begin with the dry approach and then, once the scales have been removed, use a liquid as an interface to more clearly see the distribution and form of the vessel <sup>[41]</sup>.

### Seborrheic Dermatitis (SD)

It is an inflammatory skin condition with recurring and chronic forms that is concentrated in parts of the body with plenty of sebaceous glands, such the face, chest, and scalp <sup>[42]</sup>.



**Trichoscopic Signs**

Diffuse yellow scales, individual and cluster scales on an erythematous background scattered among follicular units, peripillary needles, thin arborising vessels multiplied in comparison to healthy controls, and a multicomponent vascular system are some of the most notable trichoscopic indicators of SD that have been reported, and a model with numerous dots, commas, linear and small arborising vessels, as well as basic cane loops <sup>[43]</sup>.

**Acquired Infectious Diseases of the Scalp**

**Tinea capitis:** It is a fungus that infects the hair on the scalp. Tonsural herpes and ringworm infection are other names for ringworm <sup>[44]</sup>. The dermatophyte species *Trichophyton* and *Microsporum* are mostly responsible for it. Fungi are able to penetrate the outer sheath of hair follicles and penetrate into the hair shaft <sup>[45]</sup>.

Black dots, phone handles, white sheath hairs, broken hairs, dystrophic hairs, cork hairs, tail hairs, zigzag hairs, comma hairs, and Morse code hairs (barcode hairs) are common dermoscopic observations. Moreover, follicular keratoses and scales are commonly observed in non-inflammatory tinea, but V-shaped hair crusts and follicular pustules are the most prevalent findings in inflammatory tinea <sup>[46]</sup>. Given that the elimination of dermoscopic abnormalities linked to tinea is a sign of clinical care, it was proposed that dermatoscopy may be used to track the effectiveness of therapy <sup>[46]</sup>.

**Pediculosis capitis:** Lice are obligate parasitic insects that lack a point of their life cycle where they are free-living; symptoms usually appear three to four weeks after direct skin-to-skin or fomite-to-skin contact <sup>[47]</sup>.

**Trichoscopic characteristics:** Include the following: in dermatoscopy, nits containing nymphs have an ovoid shape and a brown colour; dead embryos also have a collapsed nymph, which shows as a focal brown region in the pupa and may have an air pocket, which appears as a transparent area in the egg; empty nits look translucent, with an oval shape deformed by a flattened free tip <sup>[48]</sup>.

**Acquired hair shaft disorders**

**Trichoptilosis:** characterized by the longitudinal separation or rubbing of the hair's distal end, it is one of the acquired structural abnormalities of the scalp. It is the result of physical and chemical damage compounding over time, and it may be produced experimentally by vigorously brushing healthy hair <sup>[49]</sup>.

**Trichonodosis:** This disorder, which is marked by bare hair in the distal portion of the hair, can occur on its own or as a result of mechanical causes such as vigorous hair combing or scratching <sup>[50]</sup>.

**Conflict of Interest**

Not available

**Financial Support**

Not available

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**How to Cite This Article**

Gharib EAAT, El-deen MAS, Elfar NN, El-Tatawy RAR. Role of trichoscopy in diagnosis of different hair and scalp disorders in pediatrics. *International Journal of Dermatology, Venereology and Leprosy Sciences*. 2024; 7(2): 25-34.

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