

CLINICAL REPORT

New Trichoscopy Findings in Trichotillomania: Flame Hairs, V-sign, Hook Hairs, Hair Powder, Tulip Hairs

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Differential diagnosis of trichotillomania is often difficult in clinical practice. Trichoscopy (hair and scalp dermoscopy) effectively supports differential diagnosis of various hair and scalp diseases. The aim of this study was to assess the usefulness of trichoscopy in diagnosing trichotillomania. The study included 370 patients (44 with trichotillomania, 314 with alopecia areata and 12 with tinea capitis). Statistical analysis revealed that the main and most characteristic trichoscopic findings of trichotillomania are: irregularly broken hairs (44/44; 100% of patients), v-sign (24/44; 57%), flame hairs (11/44; 25%), hair powder (7/44; 16%) and coiled hairs (17/44; 39%). Flame hairs, v-sign, tulip hairs, and hair powder were newly identified in this study. In conclusion, we describe here specific trichoscopy features, which may be applied in quick, non-invasive, in-office differential diagnosis of trichotillomania. Key words: alopecia areata; dermoscopy; dermatoscopy; diagnosis; exclamation mark hair; tinea capitis.

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Trichotillomania (TTM) is a form of traction alopecia resulting from habitual, repetitive removal of one's own hair (1–3). From the psychiatric point of view, this term encompasses an entire syndrome of pathological hair-pulling. According to the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV) diagnostic criteria for TTM are: (i) recurrent pulling out of one's own hair that results in noticeable hair loss; (ii) increasing sense of tension immediately before pulling out the hair, or when attempting to resist the behaviour; (iii) pleasure, gratification, or relief when pulling out the hair; (iv) the diagnosis is not given if the hair-pulling is better accounted for by another mental disorder; and (v) the disturbance must cause significant distress or impairment in social, occupational, or other important areas of functioning (4, 5). This definition describes a mental disorder, which should be rather called "TTM syndrome". Hence, the validity of the DSM-IV criteria

was recently questioned by multiple authors (4, 6). From the point of view of a dermatologist, TTM is self-induced hair loss, resulting from repetitive pulling of one's own hair (7, 8). Most patients fulfil no other DSM-IV criteria.

The condition most frequently affects children between 9 and 13 years of age (7). There is a female predominance of 70–93% (7). Adult-onset TTM may be secondary to underlying psychiatric disturbances and has a more long-lasting course (7).

Clinically, patients present with patches of irregular hair length or hairless areas. Commonly the vertex is affected. Hair loss in this area creates characteristic "tonsure TTM", or the "Friar Tuck sign" (9). A pull test is negative. Patients may pull hair at multiple sites, including eyebrows, eyelashes, face, arms, legs, and pubic area (7, 8).

The differential diagnosis is often very difficult. In recent years, dermatologists have been equipped with an additional diagnostic tool; trichoscopy (hair and scalp dermoscopy).

Trichoscopy is a rapid in-office technique, which has become a standard procedure in differential diagnosis of hair loss (10–12). There are only a few reports addressing trichoscopy features of TTM (13–18), all presenting case reports or short patient series and describing the most common findings.

The aims of this study were to evaluate trichoscopy in the differential diagnosis of TTM and to identify specific trichoscopy features of the disease.

MATERIALS AND METHODS

The study included 370 patients: 44 consecutive patients diagnosed with TTM, 314 with alopecia areata (AA), and 12 with tinea capitis. In all patients the diagnosis was based on anamnesis, clinical appearance and histopathology examination. Tinea capitis was confirmed by identification of fungal hyphae and spores in culture of hair roots and scalp skin scrapings.

In every patient 20 trichoscopy images were taken with Fotofinder II (10 images at the 20- and 70-fold magnification). A total of 7,400 images were analysed by 2 independent blinded evaluators, who evaluated abnormalities in hair shaft structure and skin surface. After the evaluation results were unblinded, the trichoscopic features were assigned to respective patients groups.

The occurrence of the scored trichoscopic criteria within each group (TTM, AA and tinea capitis) was evaluated by respective Z-tests. To prevent α -inflation in repeated tests, the significance level was adjusted according to Bonferroni ($\alpha = 0.05/n$) and set to $p < 0.001$.

RESULTS

Trichoscopy abnormalities identified in the evaluated patient groups included: broken hairs, coiled hairs, short hairs with trichoptilosis, upright re-growing hairs, exclamation mark hairs, tapered hairs, flame hairs, tulip hairs, v-sign, hair powder, hook hairs, amorphous hair residues, black dots, yellow dots, yellow dots with black peppering, re-growing pigtail hairs (circular or oval), hypopigmented vellus hairs, comma hairs, corkscrew hairs, zig-zag hairs, no hairs in field of view. Details of these trichoscopic features are described in Table SI¹. Pohl-Pinkus constrictions and monilethrix-like hairs were excluded from this study because of their rarity.

One of the most common findings in patients with TTM was the presence of irregularly broken hairs (44/44 patients, 100%) (Fig. 1A). However, this finding was not specific. Broken hairs were observed in 212/314 (67%) patients with AA and in 10/12 (83%) patients with tinea capitis. Other characteristic findings in these 3 groups of patients included coiled hairs (Fig. 1B), observed in 17/44, (39%), 2/314 (0.6%) and 0/12 (0%), respectively. Trichoptilosis was found in 15/44 (34%), 5/314 (2%) and

0/12 (0%), respectively. Flame hairs (Fig. 1C), which represent semi-transparent, wavy and cone-shaped hair residues, were found to be specific for TTM (25%/0/0). Other highly characteristic features of TTM included the v-sign (Fig. 1D), and tulip hairs (Fig. 1E). In TTM, hair shafts may be totally damaged by mechanical manipulation and only a sprinkled "hair powder" is visible (Fig. 1F). Detailed results are shown in a Table SII¹.

DISCUSSION

Several common trichoscopy features of TTM were identified. Decreased hair density, hairs broken at different lengths, short hairs with trichoptilosis ("split ends"), irregular coiled hairs, upright re-growing hairs and black dots were described (13–17, 19). In a recent case study, Peralta & Morais (17) identified extravasations as an additional trichoscopy feature of TTM. Our study identified novel trichoscopy features characteristic of TTM: flame hairs, v-sign, tulip hairs, and hair powder. Also, "partially coiled" hairs (hook hairs) were observed in patients with TTM. The diagnostic value of these findings was tested by comparative analysis of trichoscopy images from patients with other common forms of focal, non-cicatricial alopecia, i.e. AA and tinea capitis.

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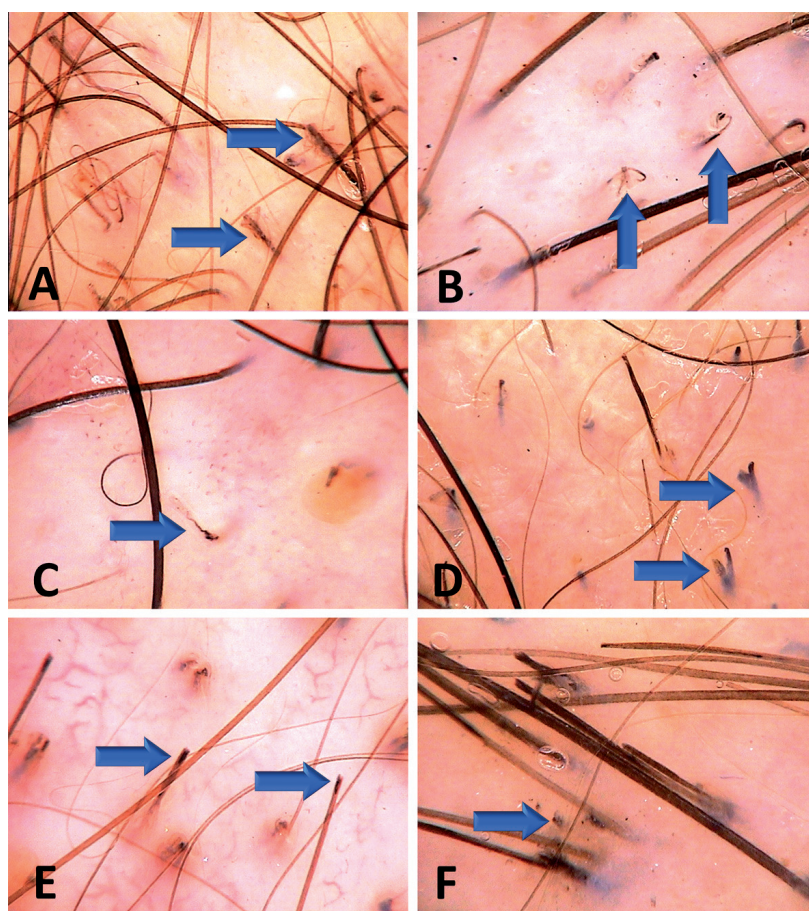


Fig. 1. Common trichoscopy signs of trichotillomania. (A) Broken hairs, which show extreme variability in length and morphology ($\times 70$). (B) Coiled hairs. In response to a pulling force a hair shaft fractures and the remaining, distal part, which is fixed to the scalp, may contract and coil. This produces coiled hairs, which are irregular in shape and frequently have features of trichoptilosis (split ends) ($\times 70$). (C) Flame hairs. A characteristic flame hair is indicated by the blue arrow. A flame hair is a type of proximal hair residue, which remains attached to the scalp after pulling anagen hairs ($\times 70$). (D) V-sign. When 2 hairs emerging from 1 follicular opening are broken at equal level, the v-sign is created. Partial coiling of the distal part of fractured hairs results in a hook-like appearance also highly characteristic for trichotillomania (upper left) ($\times 70$). (E) Tulip hairs. These hairs are short and have darker, tulip flower shaped ends (arrows). These hairs are characteristic for trichotillomania, but may be also observed in other diseases. We hypothesize that these are hairs in which pulling caused a diagonal fracture. (F) Hair powder. In trichotillomania, hair shafts may be totally damaged by mechanical manipulation and only a sprinkled "hair powder" is visible ($\times 70$).

Flame hairs are semi-transparent, wavy and cone-shaped hair residues, which develop as a result of severe mechanical hair pulling and shredding. This trichoscopy finding was present in 25% of patients with TTM and absent in patients with other types of hair loss. Thus, the finding may be considered specific for TTM.

When hair shafts are almost totally damaged by mechanical manipulation, only a sprinkled hair residue is visible. We refer to this finding as “hair powder”. Our results indicate that also this finding is specific for TTM.

A v-sign is created when 2 or more hairs emerging from one follicular unit are pulled simultaneously and break at the same length above scalp surface. This feature has to be distinguished from a pair of healthy, re-growing terminal hair in a person with shaved scalp. In the latter case all hairs in the field of view will have similar length, while in a patient with TTM the v-sign is surrounded by long terminal hairs. We have observed this trichoscopy finding in the majority of patients with TTM and in only 0.6% of patients with AA.

Tulip hairs are short hairs with darker, tulip flower shaped ends. These hairs develop when a hair shaft fractures diagonally. They are characteristic for TTM, but may be also observed in other diseases, such as AA. Tulip hairs were a common finding in TTM (48%), but were also present in 10% of patients with AA.

Coiled hairs, which represent another manifestation of proximal hair parts remaining attached to the scalp after the distal part has been pulled (18), may have diverse trichoscopic appearance depending on hair thickness, mechanical force and angle of hair tearing. Partially coiled hairs may have a question mark or hook-like appearance (hook hairs).

Coiled hairs should be differentiated from re-growing pigtail hairs (circular hairs) by their irregular appearance and frayed end. The pigtail hairs are regular, circular or oval, with a pointed end, characteristic of re-growing hairs (11, 20).

Exclamation mark hairs (also called micro-exclamation mark hairs) are rare in TTM (11, 21), but they may be a diagnostic pitfall and cause misdiagnosis of AA (22). We found exclamation mark hairs in 14% of patients with TTM vs. 71% of patients with AA. The difference was statistically significant. In TTM, exclamation mark hairs more often tended to have a flat distal end and a pigmented proximal end. In AA, exclamation mark hairs more commonly had an uneven, ragged, distal end and a hypopigmented proximal end. However, both types of exclamation mark hairs were observed in both diseases. AA may be the initial trigger for TTM and these 2 conditions may coexist (7), which makes trichoscopic differential diagnosis even more challenging, especially in the presence of exclamation mark hairs. In such cases, the presence of other trichoscopic features may lead to establishing the correct trichoscopy diagnosis. However, it has to be emphasized that, in every case, the final diagnosis has to be based on all available data, including anamnesis,

clinical manifestation, results of additional examinations and histopathology, if necessary. Despite remarkable progress in recent years, trichoscopy remains an accessory diagnostic tool in the hands of the dermatologist, not a substitute for clinical evaluation.

It has to be emphasized that exclamation mark hairs may be present in every type of hair loss associated with development of Pohl-Pinkus constrictions (20), such as chemotherapy-induced alopecia (23), severe recurrent bleeding, or periodical malnutrition (20). We have not observed exclamation mark hairs in tinea capitis.

Yellow dots are generally not observed in TTM (13). Inui et al. (24) observed yellow dots in one patient with this condition. These dots differed from yellow dots in other diseases by containing a black dot in their central part (24). In our study yellow dots were found in 7% of patients diagnosed with TTM; most of them contained a black dot or fine black hair residues. Unlike most cases of AA, in TTM yellow dots were very sparse and not regularly distributed.

Other conditions associated with repetitive hair pulling, such as scalp dysesthesia, trichodynia or trichoknesis (25), may be expected to show analogous trichoscopy features to those observed in TTM. However, there are currently no literature data to support this deduction.

Our trichoscopy findings in AA are analogous to those previously described in the literature (10, 11, 26–28). We observed yellow dots in 66% of patients with AA. The respective proportion in other studies varies from 44% to 70% (18, 24, 29–31). Black dots were observed in 53% of patients with AA. They were also present in TTM (27%) and tinea capitis (25%). The erroneous opinion that black dots are specific to AA was challenged in a recent study (32), which showed that they may also be present in chemotherapy-induced alopecia and dissecting cellulitis. Another publication (26) indicated indirectly that authors observed black dots in patients with tinea capitis. Our observations indicate that black dots tend to be uniform in size and shape in AA, whereas in TTM and tinea capitis there is a high variability in diameter and shape (round, oval, irregular) of black dots in the individual patient.

Other findings in patients with AA included broken hairs, trichoptilosis, upright re-growing hairs, re-growing pigtail hairs (circular or oval), vellus hairs, and zig-zag hairs. Lack of hairs in a field of view is another feature that differentiates AA from TTM. In TTM, proximal hair residues of different lengths are present in every field of view (19). A summary of the key features, which allow us to distinguish between TTM and AA in trichoscopy, are shown in Table SIII¹.

Our findings in tinea capitis included comma hairs, which are a trichoscopic hallmark of the disease (33–36). Comma hairs seem to be specifically associated with dermatophyte-induced fungal scalp infections. In a case of *Alternaria chlamydospora* infection of the scalp no comma hairs were observed (37). A recent case report

showed that hair trichoscopy features of tinea capitis dissolve with successful therapy and hair re-growth (38). Other common trichoscopy features of tinea capitis in our study included black dots, broken hairs, block hairs, i-hairs, and zig-zag hairs. These types of hairs were previously described in detail by our group (20).

In conclusion, we describe here novel trichoscopy features, which may be applied in differential diagnosis of non-cicatricial, focal alopecia. The results of our study indicate that trichoscopy can be applied as a quick, non-invasive method for differential diagnosis of TTM, which is particularly important in diagnosing hair loss in children.

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