Diagnostic Accuracy of Trichoscopy in Inflammatory Scalp Diseases: A Systematic Review

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Keywords

Dermoscopy · Eczematous skin diseases · Psoriasis · Scalp dermatoses · Trichoscopy

Abstract

Background: The common inflammatory scalp diseases, such as psoriasis, seborrheic dermatitis, lichen planopilaris, discoid lupus erythematosus, contact dermatitis, or pemphigus may share similar clinical features. **Objective:** To identify and systematically review the available evidence on the accuracy of trichoscopy in inflammatory scalp disorders. **Methods:** A systematic review was performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A total of 58 articles were included in the analysis. **Results:** The following trichoscopy features were found to show the highest specificity for the respective diseases: in psoriasis: diffuse scaling, simple and twisted red loops, red dots and globules, and glomerular vessels; in seborrheic dermatitis: atypical vessels, thin arborizing vessels, and structureless red areas; in discoid lupus erythematosus: follicular plugs and erythema encircling follicles; in lichen planopilaris: milky red areas or fibrotic patches; in contact dermatitis: twisted red loops; in pemphigus foliaceus: white polygonal structures and serpentine vessels; in pemphigus vulgaris: red dots with whitish halo and lace-

like vessels; and in dermatomyositis: lake-like vascular structures. **Limitations:** Different nomenclature and variability in parameters, which were analyzed in different studies. **Conclusion:** This systemic analysis indicates that trichoscopy may be used with high accuracy in the differential diagnosis of inflammatory scalp diseases.

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Introduction

The differential diagnosis of erythematous and desquamative scalp lesions may be challenging. Diseases such as psoriasis, seborrheic dermatitis, contact dermatitis, lichen planopilaris, tinea capitis, discoid lupus erythematosus, pemphigus foliaceus, pemphigus vulgaris, dermatomyositis, or syphilis present with similar clinical manifestations, most commonly as erythematous patches and scaling, often associated with pruritus [1–6].

Trichoscopy is a diagnostic method [7, 8] widely used for the differential diagnosis of hair loss. Recently, several research articles addressed the possible application of trichoscopy in inflammatory scalp diseases.

The aim of this systematic review was to evaluate the diagnostic value of trichoscopy in inflammatory diseases of the scalp.

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIS-MA) flow diagram.

Methods

A systematic search of three databases – PubMed, Scopus, and Embase – was performed in February 2021 (Fig. 1). A total of 58 articles (31 original studies and 27 case reports) were included into the review and analysis. Articles concerning data exclusively on tinea capitis were excluded as a comprehensive review of literature on this topic has been recently published [9]. The frequency of trichoscopic features was reported in reference to the total number of included patients with a particular disease. Sensitivity and specificity as well as positive and negative predictive value (PPV and NPV) were calculated for all described features using data on their frequency for all analyzed diseases in this review.

Results

Sensitivity, specificity, PPV, and NPV for all described features are shown in Table 1. All results and data on equipment used in the cited studies are summarized in the online supplementary table (for all online suppl. material, see www.karger.com/doi/10.1159/000517516).

Scalp Psoriasis

Trichoscopy in scalp psoriasis was evaluated in a total of 12 studies – 8 original studies and 4 case reports – including a total of 218 patients and additionally 48 lesions (number of patients not known) [4, 10–20].

Table 1. Sensitivity, specificity, PPV, and NPV of the analyzed trichoscopy features of common inflammatory scalp diseases

	Sensitivity, %	Specificity, %	PPV, %	NPV, %
<i>Psoriasis</i>				
Diffuse scaling	12.4	100	100	83.8
Simple red loops	11.0	99.1	72.7	83.5
Dots and globules	36.7	96.1	67.2	87.3
Glomerular vessels	41.3	92.9	56.3	87.8
Twisted red loops	57.8	87.7	50.8	90.4
White scaling	50.0	82.6	38.8	88.3
Perifollicular scaling	50.0	53.6	19.2	83.0
<i>Seborrheic dermatitis</i>				
Structureless red areas	54.5	97.6	90.9	83.2
Atypical red vessels	26.0	96.9	78.5	75.2
Yellow dots	13.2	96.2	60.0	71.9
Arborizing red lines	49.6	90.6	69.6	80.6
Glomerular vessels	18.6	89.1	42.5	71.7
White scaling	43.8	85.7	56.9	77.9
Twisted red loops	32.9	84.8	48.4	74.5
Perifollicular scaling	46.0	52.5	29.5	69.2
<i>Contact dermatitis</i>				
Twisted red loops	20.0	79.5	0.8	99.2
Arborizing red lines	10.0	78.4	0.4	99.1
<i>Lichen planopilaris</i>				
Milky red areas	52.2	100	100	83.4
White fibrotic patches	45.2	100	100	81.4
Perifollicular erythema	34.0	100	100	78.4
Pigmented halo in targetoid pattern	32.3	100	100	78.0
Loss of vellus hair	21.6	100	100	75.4
Perifollicular vessels	19.4	100	100	74.8
Black dots	32.0	99.8	98.3	77.9
Pigmented network	38.2	99.4	96.5	79.4
Tubular casts	15.2	97.0	67.5	73.3
Loss of follicular units	83.1	96.2	90.2	93.2
White dots	20.5	92.8	54.5	73.7
Perifollicular scaling	63.8	59.9	39.9	79.8
<i>Discoid lupus erythematosus</i>				
Follicular plugs	44.6	100	100	92.4
Erythema encircling follicles	29.3	100	100	90.5
Perifollicular whitish halo	13.4	100	100	88.6
White patches	19.7	99.7	91.2	89.3
Honeycomb pigmentation	15.3	96.6	40.0	88.4
Yellow dots	14.6	94.6	28.8	88.1
White dots	27.4	91.3	32.1	89.4
Arborizing red lines	41.4	81.5	25.0	90.3
Loss of follicular units	18.5	71.6	8.8	85.5
Perifollicular scaling	40.8	52.0	11.2	85.5
<i>Pemphigus foliaceus</i>				
Scaling – white polygonal structures	21.4	100	100	98.2
Fried egg sign	14.3	99.2	28.6	98.0
Yellow hemorrhagic crusts	64.3	97.9	41.9	99.1
Serpentine vessels	10.7	97.7	10.0	97.9
Yellow scaling	42.9	97.6	29.3	98.6
Tubular casts	32.1	94.0	11.3	98.3
Hemorrhages	75.0	96.0	30.9	99.4
White perifollicular scaling	35.7	77.1	3.6	98.1

Table 1 (continued)

	Sensitivity, %	Specificity, %	PPV, %	NPV, %
<i>Pemphigus vulgaris</i>				
Red dots with whitish halo	18.9	100	100	97.5
Lace-like vessels	13.5	100	100	97.3
Fried egg sign	27.0	99.7	71.4	97.7
Serpentine	18.9	99.7	70.0	97.5
Yellow scale	24.3	97.3	22.0	97.6
Hemorrhages	78.4	96.7	42.6	99.3
Dots and globules	35.1	91.0	10.9	97.8
<i>Syphilis</i>				
Reduced number of terminal hair shafts	50.0	100	100	99.6
Broken hairs	30.0	100	100	99.4
Hemorrhages	10.0	94.4	1.5	99.2
Yellow dots	30.0	93.6	3.8	99.4
Pigmented network	10.0	88.3	0.7	99.2
White scaling	10.0	76.6	0.4	99.0
Loss of follicular units	30.0	72.9	0.9	99.2
Perifollicular scaling	10.0	52.6	0.2	98.6
<i>Dermatomyositis</i>				
Lake-like vascular structures	14.3	100	100	98
Serpentine vessels	71.4	99.2	66.7	99.3
Interfollicular scaling	50.0	98.6	45.2	98.8
Tubular casts	57.1	94.6	20.0	98.9
PPV, positive predictive value; NPV, negative predictive value.				

Vessels. The most common vessel type observed in the interfollicular region were twisted red loops (126/218 [57.8%]) [4, 10, 12–15], glomerular vessels (90/218 [41.3%]) [10, 12, 14–16], and red dots and globules (80/218 [36.7%] patients and 46/48 [94%] lesions) [10–18] (Fig. 2a, b). The diameter of homogeneously distributed tortuous and dilated capillaries (bushy pattern) described by Rosina et al. [16] equaled $73 \pm 17 \mu\text{m}$ and in the study by our group $94 \pm 22 \mu\text{m}$ and $112 \pm 33 \mu\text{m}$ for glomerular vessels and twisted loops, respectively [15].

Scaling. White, perifollicular scaling (Fig. 3a) was observed in 109/218 (50%) patients [14, 15, 19, 20], but in 48/48 (100%) lesions reported by Lallas et al. [18], yellow scaling was rarely reported [15, 18]. The distribution of the scaling was described as diffuse or patchy [15, 18].

Other. The most common other dermoscopic features included punctate hemorrhage [14, 15] (Fig. 3b), blotchy erythema [17], and structureless red areas [10].

Seborrheic Dermatitis

A total of 9 original studies including 365 patients described trichoscopic features of seborrheic dermatitis of the scalp [4, 10, 12, 14, 16, 17, 21–23].

Vessels. The most common vascular pattern present in seborrheic dermatitis lesions on the scalp were arborizing red lines (181/365 [49.6%]) [4, 10, 12, 14, 21–23], twisted red loops (120/365 [32.9%]) [4, 10, 12, 14, 21–23], atypical vessels (95/365 [26%], the morphology not precisely described by authors) [10, 12, 14], and glomerular vessels (68/365 [18.6%]) [10, 12, 21–23] (Fig. 2c, d).

Scaling. Perifollicular scaling was described in 168/365 (46%) patients, white color dominating over yellow/oily scaling [12, 17, 21, 22] (Fig. 3c).

Contact Dermatitis

One original study and 2 case reports described the trichoscopic features of contact dermatitis of the scalp in a total of 10 patients [24–26]. Twisted red loops [26] and arborizing vessels [25] were reported (Fig. 2e, f). Scaling was also present. However, its color and location was not specified [26] (Fig. 3d).

Lichen Planopilaris

A total of 22 studies (15 original studies, 7 case reports) reported on trichoscopic features of lichen planopilaris.

Fig. 2. Trichoscopy with immersion. Fotofinder Medicam 1000, Bad Birnbach, Germany. **a** Psoriasis, $\times 20$. **b** Psoriasis, $\times 70$; regularly distributed simple red loops (arrows), twisted red loops (stars), and globules (arrowheads). **c** Seborrheic dermatitis, $\times 20$. **d** Seborrheic dermatitis, $\times 70$; arborizing red lines (arrows) and yellow dots (arrowheads). **e** Contact dermatitis, $\times 20$. **f** Contact dermatitis, $\times 70$; irregularly distributed twisted red loops (arrows) and comma vessels (arrowheads).

Fig. 3. Trichoscopy, $\times 20$. Fotofinder Medicam 1000, Bad Birnbach, Germany. **a** Psoriasis – thick layers of whitish-yellowish scale. **b** Psoriasis – hemorrhagic dots in white scale. **c** Seborrheic dermatitis – regularly distributed whitish-yellowish scale. **d** Contact dermatitis – thin white scale, patchily distributed. **e** Lichen planopilaris – silver-white perifollicular scaling. **f** Discoid lupus erythematosus – scattered red-brown discoloration of the skin.

Fig. 4. Trichoscopy. Fotofinder Medicam 1000, Bad Birnbach, Germany. **a** Lichen planopilaris, $\times 20$ with immersion; structureless area (star) and pigmented halo (arrows). **b** Lichen planopilaris, $\times 70$; perifollicular scaling with scales entangling hair shafts. **c** Discoid lupus erythematosus, $\times 20$ with immersion; keratotic plugs (stars). **d** Discoid lupus erythematosus, $\times 70$ with immersion; arborizing red lines (arrows) and yellow dots (arrowheads). **e** Pemphigus foliaceus, $\times 20$ with immersion; yellow scale and prominent vascular pattern. **f** Pemphigus foliaceus, $\times 70$ with immersion; helical vessels (arrows) and linear serpentine vessels (arrowheads).

The analyzed group consisted of 356 patients [4, 17, 27–46].

Vessels. The morphology of vessels was reported in 114/356 (32%) patients, most commonly as perifollicular vessels (69/356 [19.4%]) [4, 27, 29–33]. Arboriform vessels were reported at the late stage of the disease [45].

Scaling. Perifollicular hyperkeratosis was described in 227/356 (63.8%) patients [27, 29, 31, 34–37]. The presence of tubular casts was observed in 54/356 (15.2%) patients [17, 28, 32–34, 38–40]. Peripilar casts were also observed in a case report of late-stage lesions [41] (Fig. 3e, 4a, b).

Other. Fifteen out of 22 studies reported loss of hair follicle units in a total of 296/356 (83.1%) patients [27, 29–42]. Milky red areas were described in 186/356 (52.2%) [31–33, 40], white fibrotic patches in 161/356 (45.2%) [31, 33, 36, 41, 42], and perifollicular erythema in 121/356 (34%) patients [29–31, 33, 35, 42]. Pigmented network, mostly scattered, was another frequent trichoscopic feature observed in 136/356 (38.2%) [29, 31–36] patients, followed by pigmented halo in targetoid pattern in 115/356 (32.3%) [17, 27, 28, 31–33, 43, 44], black dots in

114/356 (32%) [17, 27, 28, 31–33, 43, 44], white dots in 73/356 (20.5%) [4, 17, 27, 28, 32–44], and loss of vellus hair in 77/356 (21.6%) patients [31, 32, 37].

Discoid Lupus Erythematosus

Twelve original studies and 6 case reports, including a total of 157 patients, reported on trichoscopy in discoid lupus erythematosus [4, 17, 28, 29, 33, 36, 44, 47–57].

Vessels. Arborizing red lines were observed in 65/157 (41.4%) patients [4, 28, 33, 36, 47–50, 53].

Scaling. Follicular hyperkeratosis was reported in 64/157 (40.8%) patients [17, 29, 33, 36, 48, 51, 52]. Focal scaling was reported in 2/2 (100%) patients by Cervantes et al. [50] and interfollicular scaling in 10/10 (100%) by Thakur et al. [44]. In a case report, Ankad et al. [28] described the presence of white scaling, whereas Nikam and Mehta [17] observed the presence of flakes of scaling in 3/5 (60%) patients in polarized trichoscopy.

Other. Follicular plugs were reported in 70/157 (44.6%) patients [36, 48–52] (Fig. 4c, d). Loss of follicular ostia was observed in 29/157 (18.5%) patients [17, 29, 33, 36, 51, 53, 54]. Red dots were present in 46/157 (29.3%) pa-

tients [28, 52, 55], whereas white dots were visualized in 43/157 (27.4%) patients [17, 36, 52, 56]. Brown discoloration, structureless brown areas (Fig. 3f), perifollicular pigmentation, perifollicular erythema, white rosettes, bluish-white veil-like structures, and large yellow dots with radial, thin arborizing vessels (“red spider in yellow dot”) were described [17, 28, 31, 33, 36, 48, 50, 52, 57].

Pemphigus Foliaceus

Two studies [58, 59] and 1 case report [60] reported on trichoscopy in pemphigus foliaceus. Twenty-eight patients were included into the analysis.

Vessels. The reported types of vessels included linear serpentine vessels, dotted vessels, and arborizing vessels. Linear helical vessels and glomerular vessels occurred in single patients and correlated with high Pemphigus Disease Area Index for the scalp and a severe disease course [59] (Fig. 4e, f).

Scaling. Yellow diffuse scaling was observed in 12/28 (42.9%) [58, 59], white diffuse scaling in 10/28 (35.7%) [58, 59], and tubular perifollicular scaling in 9/28 (32.1%) patients [58, 59]. An additional type of scaling reported in pemphigus foliaceus were white polygonal structures occurring in 6/28 (1.4%) patients [59].

Other. Extravasations were observed in both studies in 21/28 (75%) patients [58, 59]. Yellow hemorrhagic crusts were observed in 18/28 (64.3%) patients [58, 59]. Yellow dots with a whitish halo (“fried egg sign”) were observed [58–60].

Pemphigus Vulgaris

Two original studies [58, 59] and 2 case reports [61, 62] including a total of 37 patients reported on the trichoscopic picture of pemphigus vulgaris.

Vessels. Dotted vessels were the most common vascular feature, described in 13/37 (35.1%) [58] patients, followed by red dots with whitish halo [58, 59], linear-serpentine, lace-like, glomerular, and arborizing vessels [59]. Linear helical and glomerular vessels correlated with high Pemphigus Disease Area Index for the scalp alike in pemphigus foliaceus [59].

Scaling. Yellow diffuse scaling was observed in 9/37 (24.3%) patients [58].

Other. Extravasations (29/37 [78.4%]) [58, 59], hemorrhagic crusts (25/37 [67.6%]) [58, 59, 61], and yellow dots with whitish halo (10/37 [27%]) [58] were observed.

Syphilis

Trichoscopy of syphilis was described in 1 study [63] and 3 case reports [64, 65] including a total of 10 patients.

Dilated capillary vessels were described in one patient [63]. Thin, whitish scaling and perifollicular hyperkeratosis was observed focally in lesions of patient described by Tognetti et al. [65]. Other features were related to abnormalities in hair shaft density or structures and were rather the effect of syphilitic alopecia than inflammatory lesions.

Dermatomyositis

Our literature search revealed only 1 study including 28 patients [66].

Vessels. Enlarged tortuous capillaries and vascular lake-like structures were observed in 20/28 (71.4%) and 4/28 (14.3%) patients, respectively [66]. Bushy vessels were observed in <50% of patients [66].

Scaling. Peripilar casts were visualized in 16/28 (57.1%) and interfollicular scaling in 14/28 (50%) patients [66].

Other. Other trichoscopy features of dermatomyositis included hair tufts as well as interfollicular and perifollicular pigmentation [66].

Discussion

Inflammatory scalp dermatoses of different etiology may share clinical similarities. Therefore, trichoscopy as a quick, noninvasive, and in-office diagnostic method may be of significant value in clinical practice.

Differentiation between psoriasis and seborrheic dermatitis of the scalp is the most common clinical dilemma. According to Sticherling [67], white color of the scale on clinical examination indicates psoriasis, whereas yellow scale indicates seborrheic dermatitis [10]. However, according to our literature review, the frequency of white scale is comparable in both dermatoses (50.0% and 43.8% of patients, respectively, $p = 0.15$). According to Kim et al. [10], the differentiation between psoriasis and seborrheic dermatitis should be performed on the basis of vascular features. This systematic review confirms this observation. The trichoscopy features with the highest specificity for psoriasis are simple red loops and dots and globules, while seborrheic dermatitis may be characterized by comma vessels and arborizing red lines.

The diagnosis of discoid lupus erythematosus and lichen planopilaris also may be problematic in clinical practice [28]. In both diseases crystalline structures marking areas of fibrosis are visible and a “blink sign” was observed [68]. According to Shim et al. [29], the main criterion enabling distinguishing discoid lupus erythematosus from lichen planopilaris is the presence of keratin plugs. Our data indicate that keratin plugs are specific for discoid lu-

pus erythematosus. The trichoscopic features with the highest specificity for lichen planopilaris were perifollicular vessels, perifollicular erythema, and loss of vellus hairs.

Erythematous lesions on the scalp may also be caused by allergic diseases. Data on the use of trichoscopy in diagnosing contact dermatitis of the scalp are scarce. There are no reports on trichoscopic features of contact dermatitis without concomitant alopecia, which limits the evaluation of the usability of trichoscopy in this indication.

The use of trichoscopy is reported to be efficient also in a group of bullous diseases. The presence of serocrust in coexistence of tubular perifollicular scaling, extravasations, and yellow hemorrhagic crusts on the scalp may indicate pemphigus foliaceus, while extravasations, hemorrhagic crust, and “fried egg sign” may indicate pemphigus vulgaris [58, 59]. Yellow hemorrhagic crusts observed in inflammatory diseases analyzed in this review present 100% specificity for the diagnosis of pemphigus (both vulgaris and foliaceus). However, in the literature yellow hemorrhagic crusts were also reported in diseases associated with pus secretion not included in this review, such as folliculitis decalvans or dissecting cellulitis [57].

Conclusion

This systematic review indicates that trichoscopy may serve as a useful accessory tool in the differential diagnosis of inflammatory scalp diseases. We identified trichoscopic features of the highest specificity for psoriasis (diffuse and patchy scaling, simple red loops), seborrheic dermatitis (comma vessels, perifollicular pigmentation), contact dermatitis (twisted red loops), lichen planopilaris (milky red areas, fibrotic patches), discoid lupus erythematosus (follicular plugs, erythema encircling follicles), pemphigus foliaceus (scaling – white polygonal struc-

tures, serpentine vessels), pemphigus vulgaris (red dots with whitish halo, lace-like vessels), and dermatomyositis (lake-like vascular structures).

Key Message

Trichoscopy of inflammatory scalp diseases can be used with high accuracy in clinical practice.

Statement of Ethics

Ethics approval was not required because this review contains only published literature.

Conflict of Interest Statement

The authors have no conflict of interest to declare.

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Author Contributions

J. Golińska made substantial contributions to the conception and design of the study, the acquisition of data, the analysis and interpretation of data, prepared the draft of the article, and gave final approval of the version to be submitted. M. Sar-Pomian made contributions to the conception and design of the study, the analysis and interpretation of data, participated in drafting the article and revising it critically for important intellectual content, and gave final approval of the version to be submitted. L. Rudnicka made contributions to the conception of the study, the analysis and interpretation of data, participated in drafting the article and revising it critically for important intellectual content, and gave final approval of the version to be submitted.

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