INTRODUCTION

Scales and casts are common findings in hair and scalp disorders. The first proper description of hair cast (HC) was given by Klingman[1] who thought it as a keratinized, internal root sheath which was retained and had failed to desquamate. Since then, multiple authors have described and classified HCs based on their composition and microscopic findings.[2,3] The parakeratotic HC is more common and found in parakeratotic disorders such as psoriasis and seborrheic dermatitis.[3] The peripilar keratin cast (PKC) or the tubular variant of HC has mostly been described in cases of tractional alopecia.[4‑6] The proper definition and widely accepted nomenclature of hair cast are still lacking. Trichoscopy allows a quick and noninvasive visualization of HCs, especially in higher magnification. The incidence and description of patterns of HCs could help in diagnosis, assessing the severity or monitoring the treatment of different hair and scalp disorders.

The classification of hair casts based on trichoscopy is not known. Multiple studies have reported the tubular hair cast (THC) as one of the trichoscopic findings in different types of hair and scalp disorders,[7‑9] however, a systematic study describing the incidence and pattern of hair casts is still lacking. Trichoscopy allows a quick and noninvasive visualization of HCs, especially in higher magnification. The incidence and description of patterns of HCs could help in diagnosis, assessing the severity or monitoring the treatment of different hair and scalp disorders.

The purpose of our study is to report the incidence and pattern of THC seen in trichoscopic examination of hair and scalp in a multitude of skin disorders and compare with existing studies.

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ABSTRACT

Introduction: Hair casts have been reported in a variety of hair and scalp disorders. Trichoscopy allows a quick and noninvasive method for the evaluation of hair and scalp disorders in high magnification. However, the study of hair casts seen in trichoscopy is lacking. Objective: The main objective is to study the occurrence and patterns of tubular hair cast (THC) in different hair and scalp disorders. Patients and Methods: The patients with hair and scalp disorders presenting at the dermatology department of our hospital were evaluated using trichoscopy. Cases of primary parakeratotic disorders and behavioral disorders were excluded. After a detailed history and evaluation of the hair and scalp, histopathology, light microscopic examination, potassium hydroxide examination, and fungal culture were done when necessary. Results: THC was seen in total 21 cases of seven different hair and scalp disorders. Of these, the majority of cases were of discoid lupus erythematosus (DLE) (5/21) and maximum frequency of THCs within a disorder was seen in cases of pemphigus foliaceus (PF) (50%). Proximal casts occurred in 90.47% of cases. Single cast involving two shafts was seen in a case of PF, and two casts within a single shaft were seen in two cases of DLE and one case of alopecia areata. Conclusions: THCs in trichoscopy can be seen in various hair and scalp disorders and their study may help during the diagnosis of those disorders when combined with other trichoscopic features.

Key words: Dermoscopy, hair and scalp disorders, hair cast, trichoscopy, tubular hair cast
PATIENTS AND METHODS

The patients with disorders involving the hair and scalp were evaluated using trichoscopy at our department from September 2017 to August 2018 after approval of Institutional Review Committee. Trichoscopy was performed with a Firefly DE300 handheld dermoscope (Firefly Global, MA, USA) in polarized mode at ×20 magnification without a contact medium and the images were recorded using MacBook Pro 2013 (Apple Inc., CA, USA).

Cases of parakeratotic scalp disorders such as psoriasis, seborrheic dermatitis, and disorders without obvious scalp pathology such as traction alopecia and trichotillomania were excluded from the study. Patients with active secondary bacterial infection and patients who did not consent were also excluded. Histopathology, light microscopic examination, potassium hydroxide examination, and fungal culture were done to confirm the diagnoses when required.

THC was defined as a tubular- or cylinder-shaped structure encircling the hair shaft rising above the scalp surface with the length greater than the width.

RESULTS

Trichoscopic images of 214 cases were evaluated. These included 57 cases of alopecia areata (AA), 48 cases of androgenetic alopecia, 26 cases of pediculosis capitis, 23 cases of tinea capitis (TC), 19 cases of discoid lupus erythematosus (DLE), 16 cases of lichen planopilaris (LPP), ten cases of frontal fibrosing alopecia (FFA), six cases of pemphigus foliaceus (PF), three cases of pemphigus vulgaris (PV), three cases of folliculitis decalvans (FD), and one case of woolly hair.

THCs were detected in 21 cases. These THCs differed in location and number within the hair shaft. Similarly, the number of shafts involved by a single cast and the amount of surrounding scales also varied. These patterns are illustrated in Figure 1.

THCs were seen in seven types of hair and scalp disorders which included cicatricial alopecias, noncicatricial alopecias, and blistering disorders and are summarized in Table 1.

Among total cases with THC, the majority (n = 5) were cases of DLE [Figure 2]. However, maximum percentage (50%) of THC within a disorder was seen in PF [Figure 3].

DISCUSSION

After the first description of hair cast by Klingman in 1957,[1] few authors have described and classified the HCs based on their composition.[2-3] Brunner[10] described them as persistent hair root sheaths that had failed to disintegrate. Scott and Roenigk[2] in 1983 proposed a two-group classification of hair casts. The first group was PKCs and the second group was peripilar nonkeratin casts. They also presented a practical staining technique that differentiates PKCs from other types of casts. Keipert[5] also classified HCs into two types - the parakeratotic HC which was frequently associated with parakeratotic scalp disorders and the PKC which was defined as a tubular or cylinder shaped structure encircling the hair shaft and whose length is greater than the width and is much more regular. He described PKC as an uncommon type of cast which is not usually associated with scalp diseases and seen only in the female. This uncommon type of cast has been reported in females with tractional alopecia,[5-7] due to deodorant spray,[11] due to psychological trauma,[12] etc.
in association with *Propionibacterium acnes*,\(^{13}\) associated with androgenetic alopecia,\(^{14}\) and few other studies where the association was not mentioned or described as idiopathic.\(^{15-18}\)
THC as a trichoscopic finding has been described in association with hair and scalp disorders including LPP,\textsuperscript{[7,8,19‑22]} DLE,\textsuperscript{[8]} FD,\textsuperscript{[7,23]} PF,\textsuperscript{[9,24]} and PV.\textsuperscript{[25]}

Our study focused on the occurrence of tubular-shaped hair casts in trichoscopy of hair and scalp disorders. We excluded parakeratotic disorders including psoriasis and seborrheic dermatitis as the scales in these conditions are irregular and extensive which makes it difficult to appreciate a proper tubular pattern.

In our study, THCs were observed in 26.31% of cases of DLE. Chiramel \textit{et al}.\textsuperscript{[8]} found tubular scaling in only 11.1% of DLE patients while studying the relevance of the trichoscopy in the differential diagnosis of alopecias. This difference in percentage might be attributable to the

| Case number | Diagnosis  | Location within a shaft | Maximum number within a shaft | Maximum shafts involved by a single cast | Surrounding scaling |
|-------------|------------|-------------------------|------------------------------|----------------------------------------|--------------------|
| 1           | DLE        | Distal                  | One                          | Single                                 | Minimum/absent     |
| 2           | DLE        | Both                    | One                          | Single                                 | Extensive          |
| 3           | DLE        | Proximal                | One                          | Single                                 | Medium             |
| 4           | DLE        | Both                    | Two                          | Single                                 | Extensive          |
| 5           | DLE        | Both                    | Two                          | Single                                 | Extensive          |
| 6           | LPP        | Proximal                | One                          | Single                                 | Minimum/absent     |
| 7           | LPP        | Proximal                | One                          | Single                                 | Minimum/absent     |
| 8           | LPP        | Both                    | One                          | Single                                 | Minimum/absent     |
| 9           | LPP        | Proximal                | One                          | Single                                 | Minimum/absent     |
| 10          | TC         | Proximal                | One                          | Single                                 | Medium             |
| 11          | TC         | Proximal                | One                          | Single                                 | Medium             |
| 12          | TC         | Proximal                | One                          | Single                                 | Medium             |
| 13          | TC         | Both                    | One                          | Single                                 | Minimum             |
| 14          | FFA        | Proximal                | One                          | Single                                 | Minimum/absent     |
| 15          | FFA        | Distal                  | One                          | Single                                 | Minimum/absent     |
| 16          | FFA        | Both                    | One                          | Single                                 | Minimum/absent     |
| 17          | PF         | Both                    | One                          | Double                                 | Extensive          |
| 18          | PF         | Both                    | One                          | Single                                 | Extensive          |
| 19          | PF         | Proximal                | One                          | Single                                 | Extensive          |
| 20          | AA         | Both                    | Two                          | Single                                 | Minimum/absent     |
| 21          | PV         | Both                    | One                          | Single                                 | Extensive          |

DLE – Discoid lupus erythematosus; FFA – Frontal fibrosing alopecia; PF – Pemphigus foliaceus; TC – Tinea capitis; LPP – Lichen planopilaris; AA – Alopecia areata; PV – Pemphigus vulgaris
fact that we were specifically focusing on one trichoscopic feature in our study.

Tubular casts and scaling have been reported in LPP in multiple studies.\cite{7,8,19-22} Nikam and Mehta\cite{20} reported THC in 50% of LPP cases and Chiramel et al.\cite{8} reported their presence in 6.2% of LPP cases. In our study, 25% of cases of LPP showed THCs.

The study by Nikam and Mehta\cite{20} found that the tubular scaling could be helpful to differentiate LPP from DLE. This finding is in contrast to our study where tubular scaling occurred in similar frequency in LPP (25%) and DLE (26.31%).

Of 10 cases of FFA in our study, three showed THCs on trichoscopy. To the best of our knowledge, no studies have reported the incidence of THCs in FFA which could be due to the preference of reporting authors to consider FFA as a variant of LPP.

Although hair casts have been reported in TC\cite{26} studies describing tubular-shaped casts are not known. We report tubular casts in four cases of TC which were more irregular than the THCs seen in other conditions.

Hair casts have been reported in blistering disorders such as PF and PV\cite{9,24,25} THCs were more commonly seen in cases of PF (50%) than PV (20%) in our study. This is similar to the finding reported by Sar-Pomian et al.\cite{9} who reported tubular scaling in 41.2% of cases of PF and 7.7% of cases of PV. Pirmez\cite{25} reported tubular scaling in a case of PV and thought that they were possibly due to acantholysis within the outer root sheath. He also proposed that the presence of hair casts should be regarded as a sign of ongoing acantholysis and the therapy should be adjusted for better disease control. We observed that the THCs in PF were more extensive than any other conditions. We observed a single THC involving more than one shaft in a case of PF. All the cases of PF had extensive surrounding scaling. In our study, DLE was the only other condition which had cases with extensive surrounding scaling.

Tubular casts have not been reported in the cases of AA in the past. However, a single case of AA showed tubular scaling in trichoscopy over the periphery of alopecic patch observed in our study which is the first ever finding reported in the literature.

Rakowska et al.\cite{7} described a tubular scaling pattern in 66% of patients of FD. We did not find tubular scaling pattern in our patients of FD.

We observed that the THCs were more frequently seen in trichoscopy of cicatricial alopecias (n = 12). In a disorder involving the scalp, where TC can be ruled out clinically, the presence of tubular cast may point towards a cicatricial form of alopecia. Certain specific patterns such as extensive surrounding scaling in DLE and PF, minimum or absence of surrounding scales in LPP and FFA were also observed in our study. Proximal THCs were seen in most of the cases, and single cast within a shaft was the most common pattern.

Since a systematic study focusing on the hair casts is lacking, our study may set a base for further research of hair casts in a variety of hair and scalp disorders.

Limitation

Our study focused on the trichoscopic finding of tubular casts without microscopic findings at a single center. Some of the cases included in our study were already under treatment or applying some form of topical medications which could alter the appearance of the casts. The limited number of patients with various disorders restricted statistical analysis of the cast patterns.

CONCLUSIONS

We conclude that the THCs in trichoscopy can be observed in multiple hair and scalp disorders besides primary parakeratotic and behavioral disorders. This finding may be helpful in the diagnosis of disorders when combined with other trichoscopic patterns of a specific disorder.

Acknowledgment

We would like to thank Prof. Dr. T.S. Rao and Dr. Subechhya Jaiswal, Department of Pathology and Hari Prasad Chalise, Department of Community Medicine, College of Medical Sciences, Bharatpur for their support.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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