



## CASE REPORT

# The dermoscopic comma, zigzag, and bar code-like hairs: Markers of fungal infection of the hair follicles



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## ABSTRACT

Comma hair has been described as a specific dermoscopic feature of tinea capitis, however, it is not always present. Recognition of the additional dermoscopic features is therefore important. Furthermore, comma hair has never been shown to be applicable in fungal infection of the hair follicles on other parts of the body such as the eyebrows, axillary, or pubic areas. We encountered 13 Taiwanese patients who had been diagnosed with tinea capitis and evaluated their dermoscopic features using a nonpolarized, contact-type dermoscopic instrument with alcohol as the interface medium. Herein, we describe a woman with fungal infection of the eyebrow and present the under-recognized zigzag hair and bar code-like hairs for the first time.

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## Introduction

Tinea capitis typically affects children and the elderly. It is a disease caused by superficial fungal infection of the skin and hair of the scalp, eyebrows, and eyelashes.<sup>1–3</sup> Comma hair was first described by Slowinska et al and has been shown to be a specific dermoscopic feature of tinea capitis, which was hypothesized to represent cracking and bending of hyphae-filled hair shafts.<sup>1–6</sup> However, it has not been shown that comma hair can also be a feature of fungal infection of the hair follicles at other parts of the body such as the eyebrows, axillary, or pubic areas. Slowinska et al also described the zigzag hairs with a photo in a more recent article but also mentioned that in their unpublished data that an additional dermoscopic feature termed “morse code-like hair” was seen in their patients with tinea capitis but no photos were available.<sup>2</sup> We encountered 13 Taiwanese patients who had been diagnosed with tinea capitis and evaluated the dermoscopic features using a non-polarized, contact-type dermoscopic instrument [Derma9500S (-G,-R); DMI Inc., Yokohama, Japan] with alcohol as the interface medium, in combination with PowerShot 11 (PC1428, 7.4V; CANON Inc., Tokyo, Japan). Herein, we present two cases in detail including

a woman with fungal infection of the eyebrow and present the dermoscopic features of bar code-like hair for the first time and the summarized findings of our 13 patients.

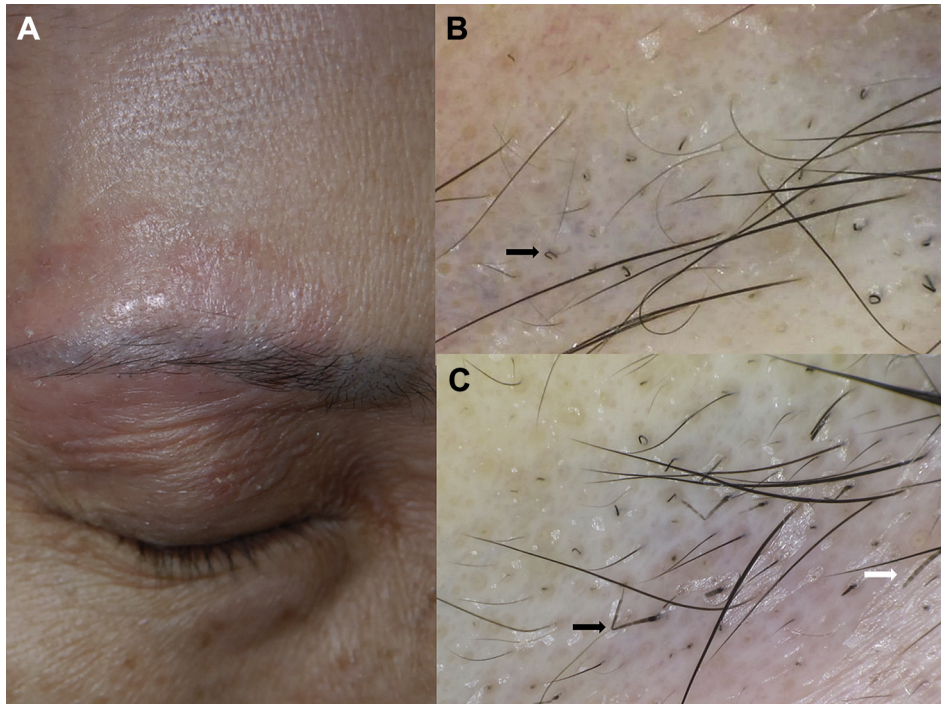
## Case reports

## Case 1

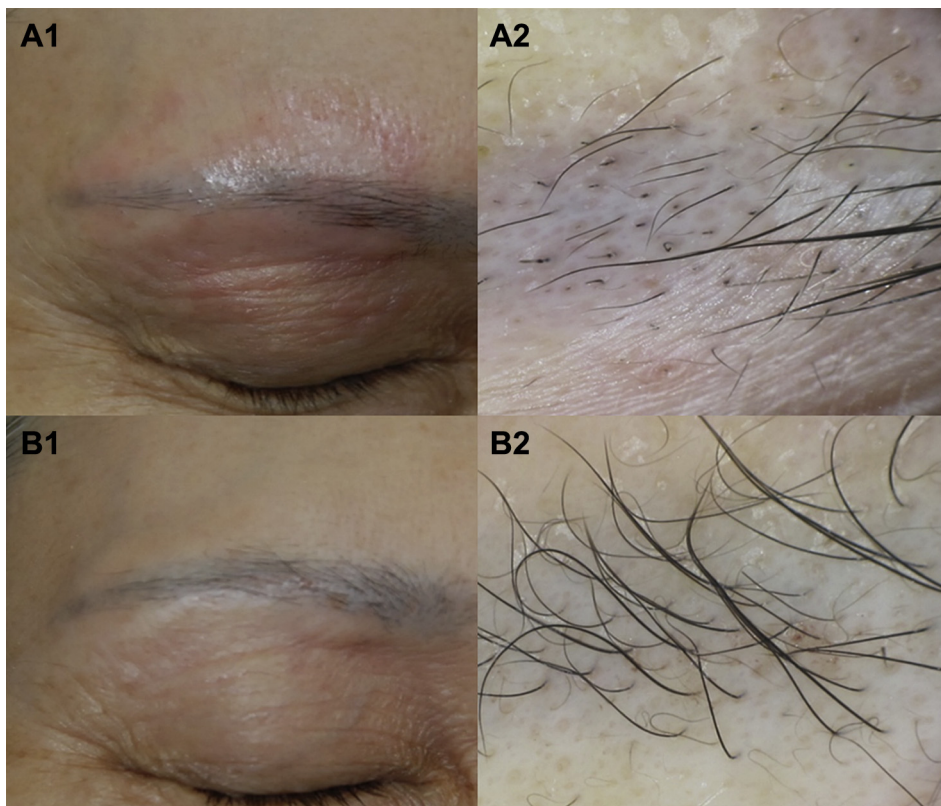
A 55-year-old female with no notable medical history presented with a 4-week history of a mildly pruritic rash around her right eyebrow. Examination revealed a 3.5 × 4.5 cm round erythematous patch with fine scaly borders (Figure 1A). In addition, the density of her right eyebrow was slightly reduced. Dermoscopy of the region showed comma hairs (Figure 1B, black arrow) on the lateral side of the eyebrow, and zigzag hair with bar code-like features (Figure 1C, black arrow), and bar code-like hairs on the medial side of the eyebrow (Figure 1C, white arrow). A 10% potassium hydroxide preparation of skin scrapings showed hyphae. The Wood's lamp test was unremarkable. The patient reported recent exposure to several cats with unidentified skin disease. She was subsequently commenced on oral ketoconazole 200 mg once a day (QD). At a 4-week follow-up, most of the comma hairs had disappeared, but there were still short broken hairs or black dots, which may represent hair regrowth on dermoscopy (Figure 2A and B). The fungus culture of the plucked hairs was positive for the zoophilic dermatophyte *Microsporum canis*. At a 6-week follow-up, no abnormalities were detected on dermoscopy (Figure 2C and D). She was treated successfully with 8 weeks of oral ketoconazole with no relapse at a 5-month follow-up.

Conflicts of interest: The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in this article.

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**Figure 1** Patient 1. (A) Image showing the patient with a 3.5 cm × 4.5 cm round erythematous patch with fine scaly borders and reduced density of her right eyebrow. (B) Dermoscopy of the right lateral eyebrow showed comma hairs (black arrow, magnification 6×). (C) Dermoscopy of the right medial eyebrow showed zigzag hair with bar code-like features (black arrow) and bar code-like hairs (white arrow, magnification 6×).



**Figure 2** Patient 1. (A) After 2 weeks of antifungal therapy, the patch became less erythematous and scaly. (B) After 2 weeks of antifungal therapy, there were still residual comma hairs and bar code-like hairs (magnification 6×). (C) After 6 weeks of antifungal therapy, the annular patch resolved with evidence of hair regrowth. (D) After 6 weeks of antifungal therapy, there was a complete disappearance of comma, zigzag, and bar code-like hairs with evidence of hair regrowth (magnification 6×).

## Case 2

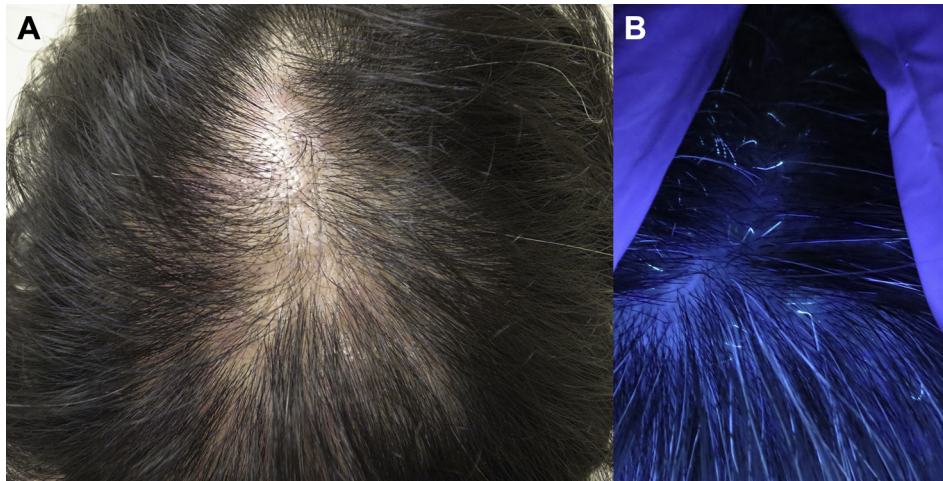
A 65-year-old female presented with a 1-month history of painful scalp skin eruptions associated with progressive hair loss (Figure 3A). The Wood's lamp examination of the scalp elicited green fluorescent hairs (Figure 3B). Dermoscopy revealed diffuse bar code-like hairs, zigzag hairs (Figure 4A, white arrows), comma hair, black dots, and broken hairs. Three plucked hairs including a bar code-like hair (Figure 4B, white arrow) all showed green fluorescence under the Wood's lamp. The bar code-like hair was examined under the microscope which showed that the paler or hypopigmented parts were also narrower (Figure 4C, black arrows). At higher microscopic power, fungal elements were identified (Figure 5, magnification 400 $\times$ ).

Table 1 shows the demographic information, clinical findings, causative organisms, and dermoscopic findings of 13 patients who were diagnosed and treated successfully as tinea capitis. There were four children, two adults, and seven patients over the age of

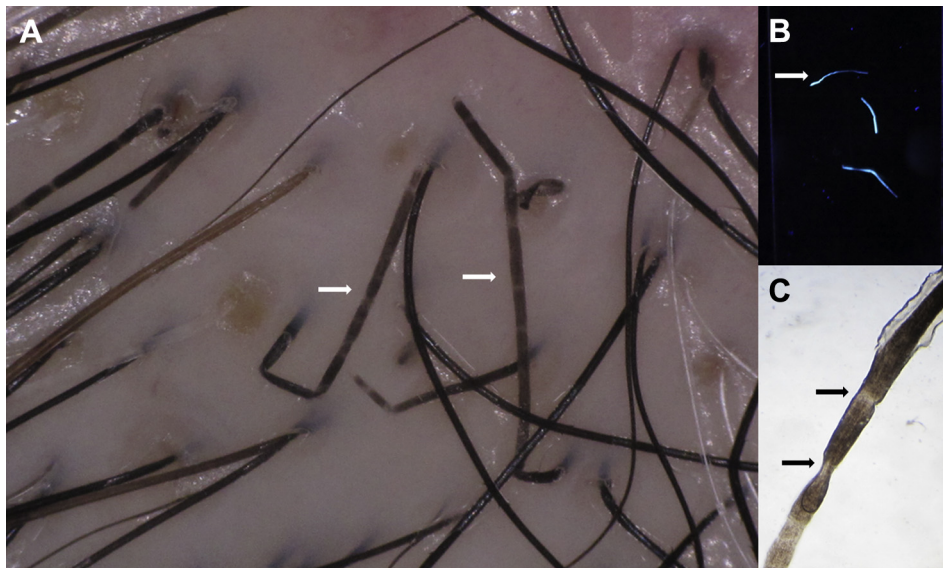
60 years. Twelve out of 13 (92%) patients had inflammatory tinea capitis. Twelve out of 13 (92%) patients had comma hairs, six out of 12 (46%) had zigzag hairs, and six out of 13 (46%) had bar code-like hairs. Six patients had definitive organisms isolated on cultures. Four were due to the ectothrix dermatophytes including *M. canis*, *Microsporum ferrugineum*, and *Microsporum audouinii*. Two were due to the endothrix dermatophyte *Trichophyton violaceum*. All patients (4/4) who had an ectothrix dermatophyte identified had bar code-like hairs, however, none (2/2) of the patients who had endothrix dermatophyte identified had bar code-like hairs. Five patients who had zigzag hairs also had bar code-like hairs and vice versa.

## Discussion

It is in our experience and the reported literature that both endothrix and ectothrix types of fungi can produce dermoscopic comma or corkscrew hairs.<sup>1–5</sup> Dermoscopic comma hairs have only been



**Figure 3** Patient 2. (A) There was diffuse hair loss and scalp erythema. (B) The Wood's lamp examination of the scalp elicited multiple green fluorescent hairs.



**Figure 4** Patient 2. (A) Dermoscopy revealed diffuse bar code-like hairs, zigzag hairs (white arrows), comma hair, black dots, and broken hairs (magnification 6 $\times$ ). (B) Three plucked hairs including a bar code-like hair (white arrow) all showed green fluorescence under the Wood's lamp. (C) The bar code-like hair was examined under the microscope, which showed that the paler or hypopigmented parts were also narrower (black arrows) (magnification 10 $\times$ ).



**Figure 5** Patient 2. Fungal elements were identified with KOH preparation (magnification 400×). KOH = potassium hydroxide preparation of the infected hair shafts.

developed countries, diagnosis of early fungal infection of the hair follicles can be difficult, as many conditions such as seborrheic dermatitis and psoriasis of the scalp or eyebrow may appear clinically similar; however, the reported dermoscopic features of these conditions are quite distinctive.<sup>4,5</sup> Seborrheic dermatitis is characterized by arborizing vessels and atypical vessels in the absence of red dots and globules, whereas psoriatic lesions are characterized by the global presence of twisted red loops in either red dots or globules.<sup>4,5</sup>

The bar code-like hairs seen here in our patients are characterized by irregularly interrupted hairs with normally pigmented and paler narrowed intervals on dermoscopy. As Slowinska et al have reported that the fungal hyphae such as *M. canis* in patients with tinea capitis perforate the hair cuticle at some points to produce the conidia on the hair surface, we hypothesize that the narrowed paler parts of the bar code-like hairs most likely represent the points of fungal penetration from within.<sup>4</sup> Furthermore, we have also observed that the zigzag hairs consistently bend at these narrowed paler parts of the infected hair shafts, which suggest its structural weakness (Figure 4A, black arrow).<sup>2</sup>

Dermoscopy is a fast, readily available test that can be performed at the bedside, and recognition of these dermoscopic features is simple.<sup>1,3–6</sup> Because topical antifungal treatment would be ineffective in eradicating follicular fungal infection, it is important that dermatologists are aware of these findings and commence systemic antifungal therapy for patients with tinea capitis. Further study is required to show that the presence of bar code-like hairs is an additional reliable finding of fungal infection of the hair follicles.

**Table 1** Demographic information, clinical findings, causative organisms, and dermoscopic findings of 13 patients who were diagnosed with tinea capitis and treated successfully.

Patient number	Sex	Age (y)	Location and clinical type	Causative organism	CH	ZH	BCH	Biopsy or KOH
1	F	55	Eyebrow: inflammatory	<i>Microsporum canis</i>	+	+	+	Y
2	F	65	Scalp: inflammatory	Negative	+	+	+	Y
3	M	70	Scalp: inflammatory	<i>Microsporum ferrugineum</i>	+	–	+	Y
4	F	10	Scalp: kerion	n/a	+	–	–	N
5	F	4	Scalp: inflammatory	<i>Microsporum canis</i>	+	+	+	N
6	M	6	Scalp: inflammatory	n/a	+	+	+	N
7	F	36	Scalp: noninflammatory; seborrheic form	n/a	+	–	–	Y
8	F	70	Scalp: inflammatory	Negative	+	+	–	Y
9	F	67	Scalp: inflammatory	<i>Trichophyton</i> species	–	–	–	Y
10	F	68	Scalp: inflammatory	<i>Penicillium</i> species (possible contamination)	+	–	–	Y
11	F	10	Scalp: inflammatory	<i>Trichophyton violaceum</i>	+	–	–	Y
12	F	65	Scalp: inflammatory	<i>Microsporum audouinii</i>	+	+	+	Y
13	F	62	Scalp: inflammatory	<i>Trichophyton violaceum</i>	+	–	–	Y

CH = comma hair; BCH = bar code-like hair; F = female; KOH = potassium hydroxide preparation of the infected hair shafts; M = male; n/a = culture not performed; N = no; Y = yes; ZH = zigzag hair.

shown to develop in patients with tinea capitis, whereas corkscrew hairs can be seen in patients with ectodermal dysplasias.<sup>2</sup> Additional dermoscopic findings in tinea capitis such as broken hairs, damaged hairs, and black dots are also quite common but are not specific to tinea capitis, they can be seen in alopecia areata, trichotillomania, and various conditions that cause nonscarring alopecia.<sup>4,5</sup> As fungal cultures often take weeks to obtain results, dermoscopy is particularly useful in detecting early follicular infection when the clinical findings are minimal or in patients with the “seborrheic form” of tinea capitis where hair loss is often ambiguous.<sup>1</sup> Furthermore, when the Wood’s lamp test is negative, dermoscopy allows better selection of specimen for further mycology study. Given the rarity of tinea capitis in certain parts of

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