Dermatological Health, 2025, Volume 3, Issue 4
http://ojs.bbwpublisher.com/index.php/DH
Online ISSN: 2981-8206
Print ISSN: 3083-4775

A Case of Cosmetic-Related Eyebrow Loss: Combined Analysis Using Dermoscopy and Reflectance Confocal Microscopy

Jiaming Chen, Dongjie Sun*

Department of Dermatology, The First Affiliated Hospital of Kunming Medical University, Kunming 650032, Yunnan, China

**Author to whom correspondence should be addressed.*

Abstract: This case report presents a 23-year-old female patient who developed eyebrow and follicular damage following the use of cosmetic products. The patient experienced gradual eyebrow thinning and hair loss after applying eyebrow powder. Physical examination was unremarkable, while dermoscopy revealed hair breakage, follicular damage, and the presence of the black dot sign. Reflectance confocal microscopy showed infiltration of inflammatory cells. Patch testing was strongly positive. After excluding other systemic conditions, a diagnosis of cosmetic-induced follicular damage was established based on the clinical findings and test results. Discontinuation of the cosmetic product led to eyebrow regrowth. This case underscores the potential risks of cosmetic ingredients to hair health and highlights the utility of non-invasive diagnostic techniques for clinical evaluation.

Keywords: Eyebrow injury; Cosmetic side effects; Dermoscopy; Reflectance confocal microscopy; Hair loss

Online publication: December 31, 2025

1. Introduction

Cosmetic use has become increasingly prevalent in modern society [1], yet prolonged exposure to cosmetic ingredients has led to the emergence of associated side effects and health risks [2]. This study reports a rare case of cosmetic-induced eyebrow and follicular damage, diagnosed through the combined use of dermoscopy, reflectance confocal microscopy, and patch testing, thereby avoiding the need for invasive biopsy. The findings highlight the potential risks of cosmetic ingredients to hair health and offer valuable insights for the early identification and prevention of similar cases.

2. Clinical data

A 23-year-old female patient presented with progressive hair loss in both eyebrows over a period of three

months. The patient reported that the hair loss and thinning began gradually after her initial use of eyebrow powder three months ago. She denied any history of improper makeup removal practices, eyebrow trauma, or self-induced hair plucking. Her past medical history was unremarkable, with no history of chronic systemic conditions such as hypertension or diabetes. Additionally, she denied any family history of alopecia or similar hereditary disorders.

2.1. Physical examination

No abnormalities were observed in any system upon examination. Dermatological assessment revealed symmetrical hair thinning in both eyebrow regions, with the most pronounced thinning observed in the outer third of each eyebrow. The remaining hairs were fine, short, and displayed a significantly reduced diameter throughout (**Figure 1**). A modified pull test indicated painless hair loss. The skin in the eyebrow area exhibited uniform color, with no signs of localized or diffuse hyperpigmentation. No erythema, papules, or scarring were noted. Additionally, there was no evidence of scaling, epidermal desquamation, or lichenification. Palpation of the area revealed normal skin temperature.

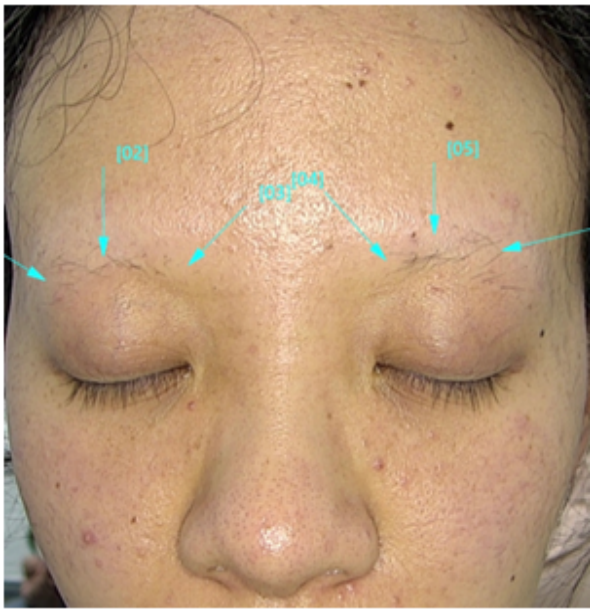

Figure 1. Bilateral eyebrow hair loss in the patient

2.2. Supporting tests

Thyroid function tests demonstrated that both TSH and FT4 levels were within normal ranges, with no abnormalities observed. Complete blood count results revealed a hemoglobin (Hb) level of 11.1 g/dL, which is below the normal range (11.6–15.0 g/dL), while other parameters, including hematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW), and reticulocyte count, remained within normal limits. Iron metabolism markers, including serum iron, total iron-binding capacity (TIBC), transferrin saturation, ferritin, and transferrin, showed no significant abnormalities. Among inflammatory markers, C-reactive protein (CRP) was slightly elevated at 0.012 g/L, above the reference range (<0.008–0.010 g/L). Dermoscopy examination revealed a macroscopically normal skin background, with no hyperkeratosis or atrophic changes observed.

However, some areas displayed tortuous and atypical vascular structures. Hair shaft diameters varied, with tapered hair tips and reduced follicular openings. Black dots, along with broken hairs of varying lengths that were curved or deformed, were visible. Characteristic “matchstick-like” breakage, marked by proximal clubbing of the hair shaft, was noted. A brown halo, approximately 1 mm in diameter, was observed around broken hair follicles. Malnourished hair and a small amount of new vellus hair were also present. No evidence of hair shaft sheaths, keratin plug formation, epidermal scaling, or scarring was observed (**Figure 2**). Reflectance confocal microscopy suggested dense inflammatory cell infiltration around follicles in the stratum spinosum, along with empty follicles (**Figure 3**). Patch testing demonstrated a strong positive reaction (+++) to the eyebrow powder product, a positive reaction (++) to p-phenylenediamine, and a positive reaction (++) to methylisothiazolinone (**Figure 4**). Mycology examination, performed with direct microscopy using 10% KOH, revealed no hyphae or spores, and Sabouraud culture was negative with no growth observed by day 14. A skin biopsy was not performed, as per the patient’s preference.

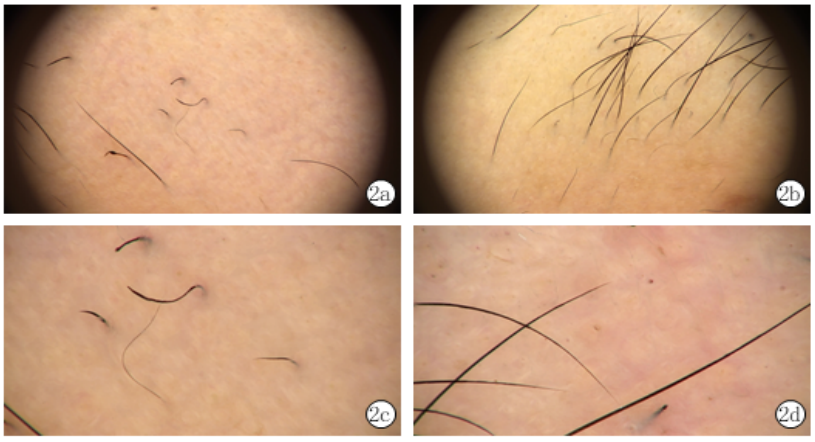

Figure 2. Dermoscopic examination: 2a, 2b (×20); 2c, 2d (×50)

Figure 3. Reflectance confocal microscopy examination

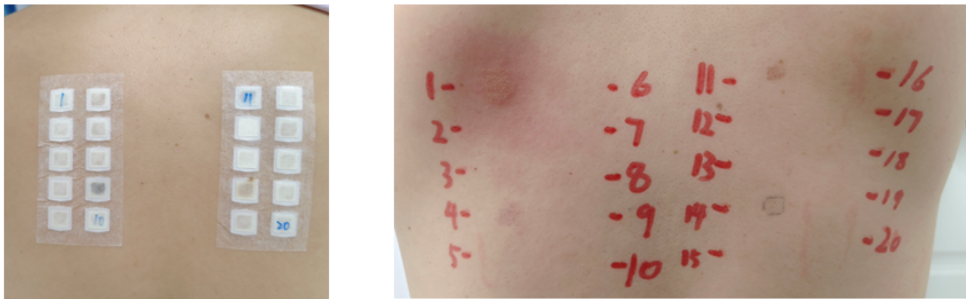

Figure 4. Patch test: Left side at 0 hours, right side 24 hours after patch removal (sample 1: eyebrow powder, showing a strong positive reaction; sample 4: p-phenylenediamine, showing a positive reaction; sample 11: methylisothiazolinone, showing a positive reaction)

3. Diagnosis

After excluding other systemic diseases, such as systemic lupus erythematosus, thyroid dysfunction, iron deficiency anemia, syphilis, leprosy, trichotillomania, and others, and considering the results of auxiliary tests in conjunction with the clinical manifestations, the condition is diagnosed as cosmetic-induced follicular damage,

resulting in eyebrow loss and inhibited hair growth.

4. Treatment

Discontinue the use of eyebrow cosmetics and makeup removers. Emphasize strengthening the skin barrier and avoiding excessive friction. Close monitoring is recommended, with regular follow-up appointments. At the 3-month follow-up, both eyebrows had fully regrown, showing significant improvement in density and hair shaft diameter compared to baseline. The modified pull test was negative at this time.

5. Discussion

This paper presents a rare case of eyebrow and hair follicle damage induced by cosmetics. Common eyebrow powders rely on pigment particles that physically adhere to the hair shaft surface and can be removed with water. However, following the use of the cosmetic, the patient developed proximal club-shaped hair breakage in the eyebrow region. Dermoscopic examination revealed characteristic signs of chemical hair shaft damage, indicating that cosmetic ingredients may have disrupted keratin disulfide bonds, thereby reducing the hair's tensile strength and leading to brittleness. Localized confocal microscopy further revealed inflammatory cell infiltration and follicular damage. Patch testing confirmed the patient's allergy to the product's ingredients. Discontinuation of the cosmetic resulted in significant improvement in hair loss symptoms, providing further support for the clinical diagnosis.

The causes of eyebrow loss are varied, with common conditions including alopecia areata, trichotillomania, and systemic telogen effluvium. Alopecia areata typically presents as sudden, well-defined, non-scarring hair loss, often accompanied by characteristic dermatoscopic features such as melanin granules, broken hairs, vellus hairs, and exclamation mark hairs [3]. While some clinical features in this case resemble alopecia areata, the patient's rapid eyebrow regrowth following the discontinuation of cosmetics, coupled with a strongly positive patch test, strongly suggests that external irritants or contact allergies are the primary cause. Trichotillomania typically presents with dermatoscopic features such as the V-sign and hooked hairs, often accompanied by a characteristic behavioral history [4]. Systemic telogen effluvium is generally triggered by factors such as iron deficiency or hypothyroidism, and typically presents as diffuse eyebrow thinning [5]. In this case, however, the patient exhibited normal thyroid function, essentially normal iron metabolism markers, only mild anemia, and focal hair loss—none of which align with the characteristics of telogen effluvium.

Dermoscopy is an effective non-invasive tool that allows for precise assessment of hair and follicular health by magnifying microscopic structural changes in the skin surface, hair follicles, and hair shafts [6]. Reflectance confocal microscopy enhances this capability by providing real-time *in vivo* imaging, offering high-resolution cellular images that can replace traditional biopsies, thereby achieving a "virtual biopsy" [7]. Unlike conventional biopsies, reflectance confocal microscopy avoids invasive procedures and enables the capture of minute follicular changes in real time, sensitively detecting inflammatory cell infiltration and follicular damage. This is particularly valuable for identifying early-stage lesions. This case exemplifies the application of non-invasive diagnostic strategies in diagnosing, evaluating, and elucidating the mechanisms of hair loss, underscoring the practicality and precision of this method in clinical practice.

6. Conclusion

In this case, the diagnosis began with a comprehensive review of the patient's medical history, including a detailed inquiry into their makeup application and removal routines, coupled with patch testing to identify the specific allergen. Dermoscopy and reflectance confocal microscopy subsequently provided non-invasive, rapid visualization of the affected area, facilitating differentiation from other forms of alopecia. Treatment involved discontinuing the suspected cosmetics and implementing interventions, such as enhancing skin barrier repair, to promote eyebrow regrowth. This diagnostic approach exemplifies rigorous clinical reasoning, offering valuable insight for managing similar conditions and demonstrating significant potential for broader application. However, as this study is a single case report, further validation through additional clinical cases is required to fully assess the universality and reliability of its conclusions. Moreover, when selecting cosmetics, careful attention should be given to ingredient labeling to avoid products containing potentially irritating components or allergens, thereby minimizing risks to skin and hair. In the event of allergic reactions, prompt medical attention should be sought, and scratching should be avoided to prevent further damage.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Luo G, Wu Z, Xie Z, 2025, Determining the Cosmetics Usage Patterns of Consumers for Exposure Assessment in China. Food Chem Toxicol, 197: 115273.

[2] Kumari S, Atem T, Chaudhary V, et al., 2024, Prevalence and Risk Factors of Cosmetic-Induced Adverse Events: A Systematic Review and Meta-Analysis. J Appl Pharm Sci, 14(11): 252–263.

[3] Raj C, Behera D, Behera D, et al., 2025, Dermoscopic Analysis of Patients with and without Poor Prognostic Indicators in Alopecia Areata—A Comparative Study. Indian Dermatol Online, 17(1): 57–62.

[4] Kaczorowska A, Rudnicka L, Stefanato CM, et al., 2021, Diagnostic Accuracy of Trichoscopy in Trichotillomania: A Systematic Review. Acta Derm Venereol, 101(10): adv00565.

[5] Altaf A, Omer N, Malik T, et al., 2024, Trichoscopy as a Useful Tool to Diagnose Telogen Effluvium. Ann Pak Inst Med Sci, 20(4): 784–788.

[6] Kesharwani S, Gupta K, Meena S, et al., 2025, Evaluation of Dermatoscopic (Trichoscopic) Patterns in Hair and Scalp Disorders: A Clinical Observational Study. Clin Dermatol Rev, 9(2): 120–127.

[7] Starace M, Mandel VD, Ardigo M, et al., 2025, Defining Predictive Factors for Permanent Chemotherapy-Induced Alopecia: Trichoscopy, Reflectance Confocal Microscopy and Histopathology Study on 77 Patients. Dermatol Ther, 15(4): 869–887.