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Dermatological Health

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

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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.

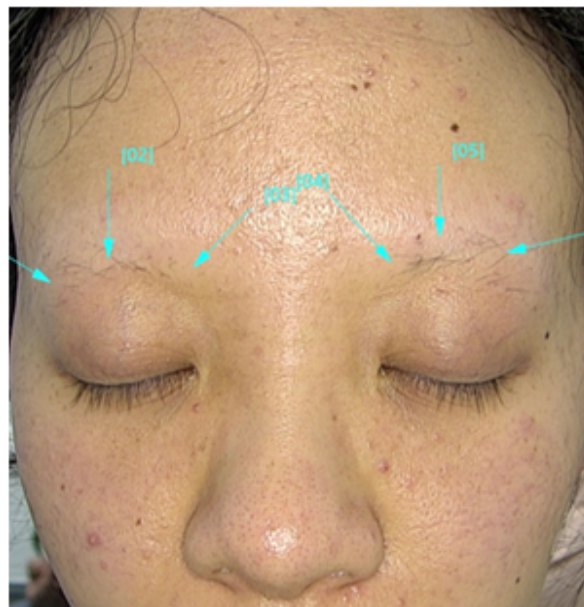


Figure 1. Bilateral eyebrow hair loss in the patient

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.

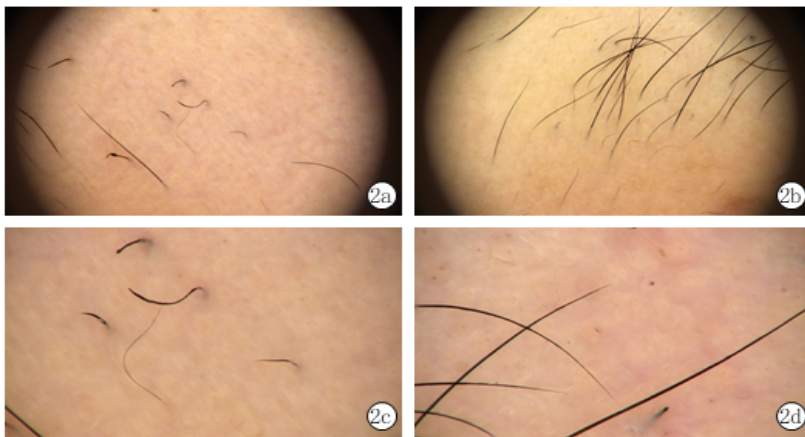


Figure 2. Dermoscopic examination: 2a, 2b (×20); 2c, 2d (×50)



Figure 3. Reflectance confocal microscopy examination

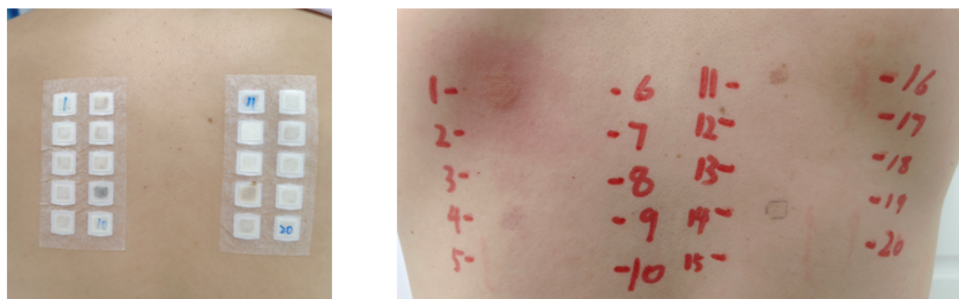


Figure 4. Patch test: Left side at 0 hours, right side 24 hours after patch removal (sample 1: eyebrow powder, showing a strong positive reaction; sample 4: p-phenylenediamine, showing a positive reaction; sample 11: methylisothiazolinone, showing a positive reaction)

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.

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Postoperative 3D-Printed Scar Device Aids in “Restoring the Ear to Its Original Appearance”

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Abstract: *Background:* To investigate the efficacy of a postoperative 3D-printed scar device in the treatment of ear scars.

Methods: The clinical data of six patients with ear keloids admitted to the Outpatient Department of Dermatology at the Fourth Affiliated Hospital of Harbin Medical University from August 2025 to September 2025 were selected. Following ear scar excision, a 3D-printed scar device was applied for 3 months to assess its therapeutic effect on patients' ear keloids.

Results: The keloids of the patients in the treatment group were significantly reduced compared to before treatment.

Conclusion: The postoperative 3D-printed scar device is an effective method for treating ear keloids, and it significantly improves the precision, comfort, and efficacy of keloid treatment.

Keywords: 3D printing; Scar device; Ear keloid

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1. Background

Auricular keloids are a common clinical complication following ear piercing ^[1]. Although patients are initially motivated by aesthetic concerns, the formation of scars leads to adverse aesthetic outcomes. Consequently, this often exacerbates psychological burdens and leads to new issues. Due to the unique and complex three-dimensional anatomical structure of the auricle, treating ear scars is a significant challenge. Clinical treatment modalities for auricular scars include radiotherapy ^[2], silicone sheeting ^[3], corticosteroid injections ^[4], surgical repair ^[5], pressure earrings ^[6,7], or combined therapies ^[8]. To date, these methods have been associated with limitations such as uneven pressure application, difficulty in fixation, the need for frequent treatments, and an inability to adapt to individual anatomy, thereby compromising therapeutic outcomes. Recently, 3D printing technology, with its capabilities for customization and the manufacturing of complex structures, has provided new approaches to addressing the aforementioned problems ^[9,10]. By integrating CT and 3D scanning to acquire high-precision 1geometric data and using computer-aided technology to generate three-dimensional models, it

is possible to fabricate scar devices that closely conform to the patient's auricular anatomy. Furthermore, the pressure can be adjusted based on the scar's condition to achieve a uniform pressure distribution. Additionally, due to their characteristics of comfort, aesthetics, and concealment, these devices are more readily accepted by patients, thereby improving treatment compliance. This study investigates the therapeutic effects of 3D-printed scar devices on patients with postoperative auricular scars by analyzing clinical data.

2. Methods

Patient information and clinical data were collected from the Outpatient Department of Dermatology at the Fourth Affiliated Hospital of Harbin Medical University between August 2025 and September 2025. Six patients aged 18–70 years who had undergone auricular scar excision within one week were selected. Exclusion criteria included patients with allergies to materials such as resin, patients with poor wound healing, and patients with severe systemic diseases or mobility impairments. Patients were also required to accept this treatment modality, strictly follow medical advice, and undergo regular follow-ups. Before the study, all patients signed informed consent forms. All experiments were evaluated and approved by the Ethics Committee of Fourth Affiliated Hospital of Harbin Medical University.

CT imaging and three-dimensional scanning were used to image the affected ear and acquire detailed anatomical data. The collected data were imported into 3D modeling software for three-dimensional reconstruction. Subsequently, the reconstructed models were printed using medical-grade photosensitive resin. Following procedures such as polishing, curing, and disinfection, a finished lake-gray scar device comprising three components was obtained (**Figures 1–4**). The resin material enables precise replication of the complex, curved surfaces and minute anatomical structures of the auricle, facilitating “customization for the ear” for each patient. Most importantly, it achieves a uniform pressure distribution. The dark-colored design facilitates easier observation of the scar condition. Furthermore, the three screws incorporated into the scar device allow for pressure matched to the specific condition of the scar, thereby ensuring optimal therapeutic efficacy.

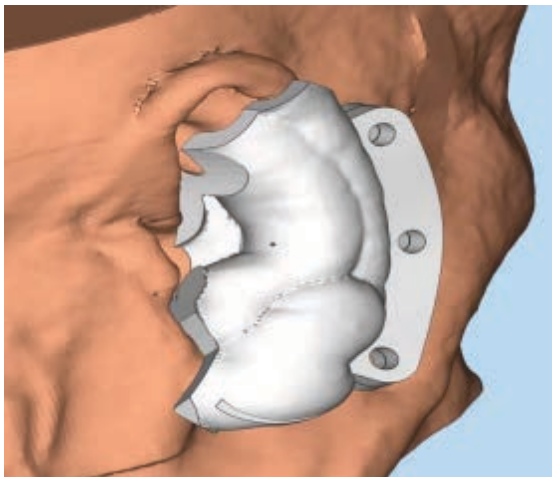


Figure 1. Front view of the 3D model

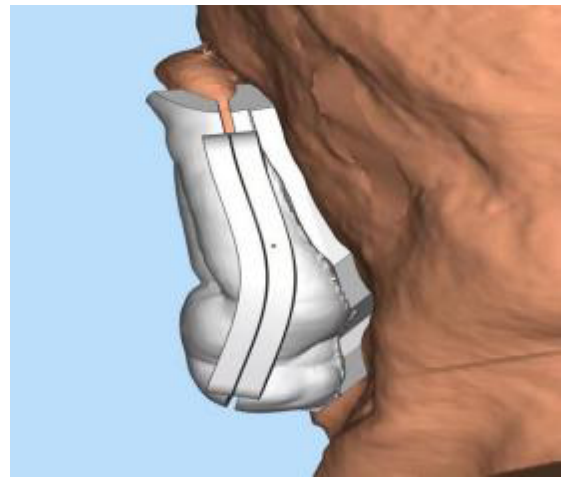


Figure 2. Back view of the 3D model



Figure 3. Finished scar device



Figure 4. Finished device components

Patients began wearing the device after suture removal (typically around 14 days post-operation). For the first two days, the device was worn for two hours daily. During this period, skin color and temperature were monitored to prevent excessive pressure. Appropriate pressure was defined as a palpable sense of tightness and sustained pressure without causing pain. After two days, the duration of wear and the pressure gradually increased until a daily duration of 10 hours was achieved. If daytime wear caused significant inconvenience, patients were permitted to wear the device at night. Patients were required to wear the device for three months, with a minimum of 10 effective hours per day. During this period, patients were instructed to maintain a daily log of their sensations and any issues, providing timely feedback to the clinicians. Monthly follow-up visits were conducted at the outpatient clinic. A professional medical team not involved in the treatment assessed the scars using the Vancouver Scar Scale (VSS), evaluating parameters including pliability, vascularity, height, and pigmentation. If changes in scar thickness were observed during assessment, the device was adjusted, or new geometric data were acquired to fabricate a replacement device, thereby ensuring continuous and practical pressure application. Finally, the primary outcome was to evaluate differences in the degree of keloid reduction by patient age characteristics and lifestyle variables to identify risk factors influencing the effectiveness of the scar device. Secondary outcomes included device breathability, side effects, and patient satisfaction with treatment results.

3. Therapeutic outcomes

Patient: A 70-year-old female presented to the Outpatient Department of Dermatology at the Fourth Affiliated Hospital of Harbin Medical University with a history of “keloids on the left earlobe for over 20 years.” She had a history of recurrence following previous surgical excision. **Specialist examination:** Two hemispherical keloids were observed on the left earlobe, involving the earlobe margin. The surface appeared pink, with no telangiectasia, ulceration, or exudation observed. The external auditory canal and hearing were unaffected. **VSS:** Pigmentation 1, vascularity 0, height 3, pliability 4; total score 8. **Diagnosis:** Auricular keloid. **Treatment:** Two weeks after surgical excision, the patient wore the 3D-printed scar device for 3 months, for at least 10 hours per day (**Figures 5–10**).



Figure 5. Preoperative



Figure 6. Postoperative



Figure 7. Following suture removal



Figure 8. Wearing the device



Figure 9. Front view of the ear after 3 months



Figure 10. Back view of the ear after 3 months

Initial treatment phase: The patient began wearing the scar device immediately following suture removal. The patient reported sensations of tightness and constriction but experienced no pain. No skin blanching or allergic reactions were observed, and no discomfort was reported.

Three months post-treatment: VSS: Pigmentation 0, vascularity 0, height 1, pliability 1; total score 2. This represented a significant reduction compared to the pre-treatment score of 8. Physical examination revealed that the scar tissue was essentially flat, with color approximating normal skin tone, and was soft and elastic to the touch. The patient's auricular structure was restored to a near-normal anatomical appearance. Her daily life was more convenient than before, and she was psychologically more relaxed. The patient expressed high satisfaction with the treatment, finding the scar device comfortable and aesthetically pleasing, without interfering with daily life or causing adverse reactions.

The postoperative use of 3D-printed scar devices demonstrates significant efficacy in treating auricular scars. Furthermore, its comfort and breathability enhance patient compliance, providing a novel approach to treating scars in complex, curved anatomical regions.

4. Results

The treatment group consisted of three females and three males, with three patients aged 18–30 years and three patients aged 55–70 years. All six patients strictly adhered to the protocol by wearing the scar device for 3 months, commencing approximately 14 days after auricular scar excision.

Follow-up revealed that therapeutic outcomes in the older age group were superior to those in the younger age group. Among the six patients, one patient experienced prolonged depressed mood and frequent insomnia due to work-related stress; the therapeutic outcome for this patient was suboptimal compared to the other patients.

The postoperative 3D-printed custom scar device demonstrated significant therapeutic efficacy for patients with auricular scars. In all six patients, the keloids were significantly reduced compared to the preoperative status.

5. Discussion

Auricular scars result from the abnormal proliferative repair of fibrous connective tissue following damage to the dermis caused by trauma to the auricular skin. While generally asymptomatic, severe cases can lead to cicatricial stenosis of the external auditory canal, auricular deformity, and secondary infection. These complications compromise hearing and aesthetics, exacerbate patients' feelings of inferiority and anxiety, and severely impact their quality of life.

Due to the ear's complex curved surfaces and minute anatomical structures, traditional pressure therapies fail to apply uniform, sustained pressure to the scar. This often results in suboptimal therapeutic outcomes. In recent years, 3D printing technology has been widely used in the medical field, providing alternative solutions to numerous medical challenges. By reconstructing a three-dimensional model of the patient's ear, highly personalized and customized scar devices can be fabricated. This ensures not only a morphological fit but also, more importantly, a uniform distribution of pressure. The printing material used in this study was a photosensitive resin, which, compared with traditional silicone sheets, offers superior dimensional stability and pliability. It allows for timely pressure adjustments based on specific conditions to achieve optimal therapeutic

effects.

The process from data scanning to the clinical application of the 3D-printed scar device requires approximately one week. Patients can begin using the device immediately after suture removal, thereby capturing the critical window to prevent scar recurrence. The patient's three-dimensional geometric data of the auricle can be retrieved at any time; should the scar device be damaged or lost, it can be rapidly reproduced. Additionally, the 3D model data can be utilized for pre- and post-treatment comparisons, providing a valuable reference for subsequent treatments.

As an exploratory study, this research has certain limitations, including a small sample size and a relatively short duration of device usage. Future studies with more comprehensive protocols and longer-term follow-up are required. This study primarily investigated the combined therapy of surgery and pressure therapy using scar devices. Future research may explore additional combined modalities, such as integrating radiotherapy or pharmacological agents with scar devices, which remain to be investigated.

6. Conclusion

The postoperative 3D-printed scar device enables individualized design and high adaptation to the patient's auricular anatomy, resulting in uniform pressure distribution. It also effectively controls postoperative scar growth and improves patient compliance, representing an effective treatment modality that combines precision with comfort.

Disclosure statement

The authors declare no conflict of interest.

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The Impact of Intrinsic and External Environmental Factors on Treatment Efficacy in Patients with Chronic Spontaneous Urticaria: A Single-center Retrospective Study

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Abstract: *Purpose:* This study aimed to explore the association between patient-intrinsic factors, environmental exposures, and improvement in psychosocial adaptation among individuals with chronic spontaneous urticaria (CSU). *Methods:* We conducted a single-center retrospective cohort study by reviewing medical records of 84 CSU patients aged 18–65 years who attended a tertiary dermatology outpatient clinic between January 2023 and January 2024, with follow-up of at least 3 months. Data on demographic characteristics, disease severity (measured by UCT score), and psychosocial adaptation (assessed via the Chinese version of the Patient Attitude and Self-Adaptation Questionnaire, PASQ-CSD) were extracted from electronic health records, while environmental variables—including monthly averages of temperature, humidity, PM2.5 levels, and pollen concentration—were obtained from national meteorological and environmental monitoring platforms. Improvement in psychosocial adaptation was defined as an increase of ≥ 5 points in PASQ score during 3–6 months of follow-up. *Results:* The mean age of participants was 44.27 ± 14.86 years, with 55.9% being female. Although no significant differences were observed in UCT scores ($P = 0.402$) or PARS-3 scores across treatment groups, PASQ scores showed statistically significant intergroup variation ($P = 0.015$). Occupational distribution differed significantly among groups ($P = 0.034$), whereas marital status did not ($P = 0.219$). No direct causal relationship was identified between medication type and psychological improvement; however, findings suggest that sociodemographic roles and environmental stressors may act as potential modifiers. *Conclusion:* These results indicate that psychosocial adaptation in CSU patients is influenced by multiple contextual factors, highlighting the need for integrated biopsychosocial assessment in clinical management and supporting future prospective studies on environment–psychology interactions.

Keywords: Chronic urticaria; Psychosocial adaptation; Longitudinal study; Multivariate logistic regression; Treatment outcome prediction

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1. Introduction

Chronic spontaneous urticaria (CSU), the predominant subtype of chronic urticaria, is a common skin disorder characterized by recurrent episodes of wheals and/or angioedema without apparent triggers lasting for more than six weeks, with a global point prevalence of approximately 1%^[1,2]. The pathogenesis of CSU has not been fully elucidated, but it is currently believed to be closely associated with autoimmune abnormalities, spontaneous mast cell activation, and chronic inflammatory states^[1-3]. Clinically, it manifests as episodic skin wheals and severe pruritus, with some patients experiencing angioedema, significantly affecting sleep, mood, and daily functioning, thereby imposing a substantial disease burden^[2,4,5]. Current first-line treatment involves standard or up-dosed second-generation non-sedating antihistamines; however, approximately 30%–50% of patients show inadequate response and require escalation to therapies such as omalizumab, cyclosporine, or biologics^[1,2]. The significant variability in treatment response suggests potential influences from both intrinsic patient factors (e.g., age, sex, disease duration, Dermatology Life Quality Index score, anxiety and depression status, allergy history, autoimmune disease history) and external environmental factors (e.g., seasonal changes, temperature fluctuations, air humidity, PM2.5/PM10 concentrations, pollen levels, periods of viral infection outbreaks)^[4,5]. Nevertheless, systematic review analyses on the combined impact of these factors on treatment response in real-world settings are lacking. Although current guidelines mention environmental triggers, they do not thoroughly explore their interactions with individual patient characteristics^[6]. Therefore, this study aims to investigate the impact of individual characteristics and environmental exposures on treatment response in CSU patients through a single-center retrospective study, to identify predictors of therapeutic efficacy and provide evidence for clinical individualized management.

2. Materials and methods

2.1. General information

Medical records of patients diagnosed with chronic spontaneous urticaria (CSU) at the dermatology outpatient clinic of a hospital between January 2023 and January 2024 were retrospectively collected. Inclusion criteria: (1) met diagnostic criteria for CSU with symptoms lasting more than 6 weeks; (2) aged between 18 and 65 years; (3) completed the Chinese version of the Psychological Adaptation Scale (PASQ-CSD) at both initial visit and follow-up; (4) follow-up duration of no less than 3 months. Exclusion criteria: (1) presence of severe psychiatric disorders or diagnosed psychological conditions; (2) suffering from severe systemic diseases affecting psychological assessment (e.g., malignancies, end-stage organ diseases); (3) in an acute exacerbation phase or with severe allergic reactions at first visit; (4) incomplete medical records or missing key variables. A total of 98 patients were screened, among whom 4 were younger than 18 years, 1 refused to participate, and 1 was lost to follow-up without follow-up assessment records. Finally, 84 patients meeting the criteria were included in the analysis.

2.2. Data collection and variable definition

Demographic and clinical information, including gender, age, marital status, occupation, education level, disease duration, comorbidities, and scores on the Chinese-adapted Psychological Adaptation Scale (PASQ-CSD) completed at initial diagnosis and follow-up, were extracted from the hospital's electronic medical record system and outpatient follow-up records. All scales were completed under the guidance of trained professionals during routine clinical practice and archived as part of clinical assessment data.

In this study, patient characteristics such as gender, age, and disease duration were classified as internal environmental factors, while variables reflecting psychosocial background, including marital status, employment

status, living conditions, and sources of social support, were classified as external environmental factors. All variables were independently extracted by two researchers and cross-verified; discrepancies were resolved through discussion or adjudication by a third researcher. Data extraction included initial visit date, follow-up time points, original scores for each PASQ-CSD dimension, and total scores. All analyses were based on existing clinical records, with no interventions or additional data collection performed.

2.3. Measurement tools

2.3.1. Assessment of patients' psychosocial adaptation

To evaluate and monitor patients' psychosocial adaptation, the PASQ-CSD scale adapted into Chinese by the author was used ^[7]. The scale underwent bilingual comparison and back-translation using the Brislin translation model, and cultural adjustments were made to the items based on expert input—for instance, changing “I still consider myself attractive” to “I am confident that I have not been socially excluded after illness.” The scale consists of 18 items divided into three dimensions: emotional (8 items), self-perception (6 items), and social adaptation (4 items). A 5-point Likert scale (always/often/sometimes/rarely/never) is used for scoring; higher total scores indicate stronger psychosocial adaptation. Exploratory factor analysis confirmed its structural validity (KMO = 0.848, cumulative variance explained = 65.142%), and Cronbach's α coefficient reached 0.930, indicating good internal consistency. Changes in scores can reflect intervention effects. For example, a significant increase in scores on the emotional dimension after intervention (e.g., rising from 20 to 40 points) suggests that psychological support measures may be effective.

2.3.2. UCT

After treatment, the Urticaria Control Test (UCT) ^[8] was used to assess disease control in both patient groups. It includes four questions, each with five response options (0–4 points). The total score is the sum of the four item scores, with a maximum of 16 points. Lower total scores indicate poorer disease control and higher disease activity. According to UCT scores, disease control is classified as uncontrolled/no response (12 points), partially controlled/partial response (12 to <16 points), or fully controlled/complete response (16 points). An UCT score ≥ 12 indicates effective treatment. A change of 3 points is considered the minimum clinically relevant difference in UCT.

2.4. Statistical analysis

Statistical analysis was performed using STATA 17.0. Normally distributed continuous variables were expressed as $\bar{x} \pm s$, and intergroup differences were compared using the independent samples t-test. Categorical data were presented as numbers (percentages), and group comparisons were conducted using the χ^2 test. The statistical significance level was set at two-tailed $\alpha=0.05$.

3. Results

3.1. Baseline characteristics

A total of 84 patients were enrolled in this study, with the following baseline characteristics: the mean age was 44.27 ± 14.86 years (age as a continuous variable, without adjustment for case count); regarding gender, there were 47 females (55.9%) and 37 males (44.1%); in terms of marital status, 57 patients were married (67.9%), 25 were unmarried (29.8%), and 2 were divorced (2.4%). Educational level was primarily university/undergraduate (33

cases, 39.3%) and junior high school (22 cases, 26.2%), followed by college diploma (13 cases, 15.5%), senior high school (7 cases, 8.3%), primary school (5 cases, 6.0%), postgraduate (3 cases, 3.6%), and vocational high school (2 cases, 2.4%). Occupations were varied: 17 were clerks (20.2%), 17 were unemployed (20.2%), 12 were workers (14.3%), 11 were students (13.1%), 10 were self-employed (11.9%), 7 were retirees (8.3%), and all other occupations accounted for less than 6%. In disease assessment, the UCT score was 14.00 (11.00, 15.00). According to control status, 41 patients (48.8%) had partial control, 30 (35.7%) had uncontrolled disease, and 13 (15.5%) had complete control.

Table 1. Baseline characteristics of patients

Variable	Category	Count	Percentage
Age (years)	44.27 ± 14.86		
Sex			
	Female	51	55.4%
	Male	41	44.6%
Marital Status			
	Married	62	67.4%
	Unmarried	27	29.3%
	Divorced	3	3.3%
Education Level			
	College/Bachelor	36	39.1%
	Junior High	24	26.1%
	Junior College	14	15.2%
	Senior High	8	8.7%
	Primary	5	5.4%
	Postgraduate	3	3.3%
	Secondary Technical	2	2.2%
Occupation			
	Clerk	18	19.6%
	Unemployed	18	19.6%
	Worker	13	14.1%
	Student	12	13.0%
	Self-employed	11	12.0%
	Retired	8	8.7%
	Civil Servant	5	5.4%
	Sales	3	3.3%
	Teacher	2	2.2%
	Medical Worker	1	1.1%
	Nurse	1	1.1%
UCT Score	14.00 (11.00, 15.00)		
UCT Control Status			
	Partially Controlled	45	48.9%
	Uncontrolled	33	35.9%
	Fully Controlled	14	15.2%

3.2. Comparison of marital status among three groups

In the distribution of marital status, the ebastine group had 21.4% unmarried, 71.4% married, and 7.1% divorced; the levocetirizine group had 20.0% unmarried, 76.0% married, and 4.0% divorced; the loratadine group had 47.1% unmarried, 52.9% married, and no divorced individuals. There was no statistically significant difference in marital status among the three groups ($P = 0.219$), analyzed using the chi-square test.

Table 2. Comparison of marital status among three groups

Category	Ebastine group	Levocetirizine group	Loratadine group	<i>P</i> -value	Test Type
Single	9 (21.4%)	5 (20.0%)	8 (47.1%)	0.219	Chi-square test
Married	30 (71.4%)	19 (76.0%)	9 (52.9%)		
Divorced	3 (7.1%)	1 (4.0%)	0 (0.0%)		
Total					

3.3. Occupational distribution

Regarding occupational distribution, in the ebastine group, unemployed/job seekers accounted for 26.2%, students 11.9%, workers 7.1%, sales personnel 0.0%, self-employed individuals 4.8%, clerks 26.2%, nurses 4.8%, teachers 2.4%, medical workers 2.4%, and retirees 14.3%; in the levocetirizine group, unemployed/job seekers accounted for 16.0%, students 12.0%, workers 16.0%, sales personnel 8.0%, self-employed individuals 16.0%, clerks 20.0%, nurses 0.0%, teachers 0.0%, civil servants 4.0%, and retirees 8.0%; in the loratadine group, unemployed/job seekers accounted for 11.8%, students 5.9%, workers 35.3%, sales personnel 0.0%, self-employed individuals 29.4%, clerks 0.0%, nurses 0.0%, teachers 0.0%, civil servants 11.8%, and retirees 5.9%. The differences in occupational distribution among the three groups were statistically significant ($P = 0.034$), analyzed using the chi-square test.

Table 3. Occupational distribution of three groups

JOB	Ebastine group	Levocetirizine group	Loratadine group	<i>P</i> -value	Test Type
Unemployed/Job-seeking	11 (26.2%)	4 (16.0%)	2 (11.8%)	0.034	Chi-square test
Student	5 (11.9%)	3 (12.0%)	1 (5.9%)		
Worker	3 (7.1%)	4 (16.0%)	6 (35.3%)		
Salesperson	0 (0.0%)	2 (8.0%)	0 (0.0%)		
Self-employed	2 (4.8%)	4 (16.0%)	5 (29.4%)		
Employee	11 (26.2%)	5 (20.0%)	0 (0.0%)		
Nurse	2 (4.8%)	0 (0.0%)	0 (0.0%)		
Teacher	1 (2.4%)	0 (0.0%)	0 (0.0%)		
Civil servant	0 (0.0%)	1 (4.0%)	2 (11.8%)		
Medical worker	1 (2.4%)	0 (0.0%)	0 (0.0%)		
Retired	6 (14.3%)	2 (8.0%)	1 (5.9%)		
Total					

3.4. Comparison of UCT scores and psychosocial adaptation scores

Regarding PASQ scores, the ebastine group scored 79.83 ± 7.9 , the levocetirizine group scored 76.04 ± 10.16 , and the loratadine group scored 72.06 ± 11.19 , with a p-value of 0.015 for intergroup comparison; regarding UCT scores, the ebastine group scored 14.0 [12.0, 15.0], the levocetirizine group scored 12.0 [11.0, 16.0], and the loratadine group scored 11.0 [10.0, 15.0], with a p-value of 0.402 for intergroup comparison.

Table 4. Comparison of physical exercise behavior, UCT scores, and psychosocial adaptation scores among three groups

Category	Ebastine group	Levocetirizine group	Loratadine group	P-value
PASQ	79.83 ± 7.9	76.04 ± 10.16	72.06 ± 11.19	0.015
UCT	14.0 [12.0, 15.0]	12.0 [11.0, 16.0]	11.0 [10.0, 15.0]	0.402

4. Discussion

This study, through a single-center retrospective analysis of 84 patients with chronic spontaneous urticaria (CSU), preliminarily reveals differences in patients' psychosocial adaptation ability (PASQ) and their potential associations with demographic and occupational characteristics under established clinical pathways. The core finding shows that UCT scores reflecting disease control did not differ significantly among the three groups (*P* values of 0.984 and 0.402, respectively), whereas PASQ scores exhibited significant intergroup differences (*P*=0.015). This superficially resembles previously reported trends suggesting that different antihistamine treatment pathways may influence patients' quality of life ^[6]. However, it must be emphasized that the grouping in this study originated from historical prescription records rather than random allocation, thus precluding causal inference about the drugs themselves. A more plausible explanation is that systematic differences in healthcare-seeking behaviors exist among distinct sociodemographic clusters, which consequently manifest as divergent psychological adaptation trajectories. This highlights the importance of addressing patients' psychosocial dimensions beyond physiological symptoms in CSU management.

Regarding patient-related factors, the baseline characteristics of this cohort generally align with global epidemiological data. The mean patient age was 44.27 years, falling within the high-incidence age range for CSU. Gender distribution showed a female proportion of 55.9%, slightly lower than the commonly reported international range of 60%–80% favoring women ^[9], yet still consistent with the overall pattern indicating greater disease burden among females. This finding corroborates Kocatürk et al. (2025), who emphasized that CSU imposes a serious burden on quality of life ^[10]. Nevertheless, this study found that the heavy disease burden does not uniformly translate into psychological maladaptation, as PASQ differences across groups were independent of UCT scores—strongly supporting the hypothesis that “psychological adaptation ability may operate independently of the level of physiological disease control” ^[11]. Individual cognitive resources, such as higher education levels observed in this study (39.3% holding university or bachelor's degrees), may serve as a key protective factor.

The social support system and occupational stress represent another critical dimension for interpreting the heterogeneity of findings in this study. Occupational distribution differed significantly among the three groups (*P* = 0.034): the loratadine group had the highest proportion of workers (35.3%) and self-employed individuals (29.4%), whereas the ebastine group included more clerical staff (26.2%) and unemployed individuals (26.2%). This distribution is unlikely random and may profoundly reflect social determinants of health (SDH) ^[12]. Workers

and self-employed individuals often face unstable work environments, high physical demands, and potentially inadequate healthcare coverage—factors that may deplete the psychological and social resources available for coping with illness. In contrast, clerical workers typically enjoy more stable employment conditions and better medical benefits, while unemployed individuals, despite financial stress, may have more time for self-health management. These resource disparities may partially explain why, despite similar disease severity, psychosocial adaptation scores (PASQ) showed a declining trend from the ebastine group (79.83 ± 7.9) to the loratadine group (72.06 ± 11.19). Occupation here serves not merely as a demographic variable but as a key indicator reflecting socioeconomic status, stress exposure, and access to social support networks.

It is essential to acknowledge the methodological limitations of this study, particularly the absence of potential environmental confounders. The results were obtained without controlling for external environmental exposures, which constitute major confounding factors. Substantial evidence indicates that environmental factors such as PM_{2.5} and pollen concentration are closely linked to acute exacerbations of CSU ^[13]. Moreover, some studies suggest that for every 10 $\mu\text{g}/\text{m}^3$ increase in PM_{2.5} exposure, anxiety scores among dermatology patients may rise by 0.8 points ^[14]. Geographic living and working environments of patients in this cohort, along with variations in seasonal allergen exposure, could influence both symptom control (UCT scores) and psychological adaptation (PASQ scores) by triggering stress responses ^[15]. The lack of such data prevents us from determining how much of the observed intergroup PASQ differences stem from intrinsic psychological traits versus reactions to varying environmental stressors. This interpretive limitation is inherent to retrospective data, and any causal inference must be made with extreme caution.

5. Conclusion

This study offers clear implications for clinical practice and future research. The clinical value lies primarily in two aspects: first, clinical assessment should adopt a “biopsychosocial” dual-track approach. While monitoring hives, itch, and UCT scores remains essential, incorporating psychological items from PASQ or DLQI into routine follow-ups is recommended to enable early identification of patients at high risk for poor psychosocial adaptation. Second, treatment and support strategies should be personalized; for patients experiencing high occupational stress and limited social support (e.g., workers, self-employed), clinical communication should be more supportive, and referral to psychological or social work services should be considered. The main limitations of this study are twofold: first, the single-center retrospective design restricts sample representativeness and cannot eliminate prescription selection bias; second, critical data on environmental exposures and dynamic monitoring of psychological processes are missing. Therefore, future research should focus on two directions: first, conducting multicenter prospective cohort studies that integrate air quality and pollen data via geographic information systems (GIS), and employ ecological momentary assessment (EMA) to capture real-time fluctuations in patients’ psychological states and environmental exposures; second, further exploring protective factors and intervention pathways for psychosocial adaptation, such as evaluating the effectiveness of mindfulness-based stress reduction or cognitive behavioral therapy in improving PASQ scores among CSU patients, ultimately advancing clinical models from symptom control toward holistic mind-body recovery.

Disclosure statement

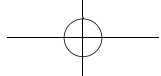
The authors declare no conflict of interest.

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