

Impact of Systematic Nursing Education and Psychological Intervention on Anxiety Reduction and Treatment Outcomes in Patients with Xanthelasma Treated with Pingyangmycin Running Title: Findings from a prospective cohort of 228 patients

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Running Title: Findings from a prospective cohort of 228 patients

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Abstract

Background: Xanthelasma palpebrarum (XP) is the most common subtype of cutaneous xanthoma, accounting for more than 95% of cases. Its incidence is increasing and parallels the global rise in obesity. As XP causes conspicuous cosmetic disfigurement, affected patients frequently experience anxiety.

Objective: In this study, we investigated the efficacy of intralesional pingyangmycin injection for XP and evaluated the impact of systematic nursing education and psychological intervention on anxiety reduction and treatment outcomes.

Methods: A total of 228 patients with XP (398 lesions) treated between December 2024 and August 2025 were enrolled. All patients underwent intralesional pingyangmycin injection and completed psychological assessments using the Hospital Anxiety and Depression Scale (HADS) at baseline and 1 month post-treatment. Systematic nursing education, including injection-related care, postoperative recovery guidance, and emotional support, was provided throughout the treatment process.

Results: Treatment outcomes showed that 63.31% of lesions achieved complete remission, 23.87% showed improvement, and 2.27% were ineffective. Psychological intervention significantly reduced both anxiety and depression scores ($P < 0.001$). Furthermore, reductions in anxiety were positively associated with improved treatment outcomes, including a lower incidence of complications and higher patient satisfaction.

Conclusions: Intralesional pingyangmycin injection is an effective treatment for XP. When combined with psychological intervention and structured nursing education, it not only alleviates anxiety but also enhances treatment compliance and patient satisfaction, thereby optimizing overall therapeutic outcomes.

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Impact of Systematic Nursing Education and Psychological Intervention on Anxiety Reduction and Treatment Outcomes in Patients with Xanthelasma Treated with Pingyangmycin

Running Title: Findings from a prospective cohort of 228 patients

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Abstract

Background: Xanthelasma palpebrarum (XP) is the most common subtype of cutaneous xanthoma, accounting for more than 95% of cases. Its incidence is increasing and parallels the global rise in obesity. As XP causes conspicuous cosmetic disfigurement, affected patients frequently experience anxiety. In this study, we investigated the efficacy of intralesional pingyangmycin injection for XP and evaluated the impact of systematic nursing education and psychological intervention on anxiety reduction and treatment outcomes. **Methods:** A total of 228 patients with XP (398 lesions) treated between December 2024 and August 2025 were enrolled. All patients underwent intralesional pingyangmycin injection and completed psychological assessments using the Hospital Anxiety and Depression Scale (HADS) at baseline and 1month post-treatment. Systematic nursing education, including injection-related care, postoperative recovery guidance, and emotional support, was provided throughout the treatment process. **Results:** Treatment outcomes showed that 63.31% of lesions achieved complete remission, 23.87% showed improvement, and 2.27% were ineffective. Psychological intervention significantly reduced both anxiety and depression scores ($P < 0.001$). Furthermore, reductions in anxiety were positively associated with improved treatment outcomes, including a lower incidence of complications and higher patient satisfaction. **Conclusion:** Intralesional pingyangmycin injection is an effective treatment for XP. When combined with psychological intervention and structured nursing education, it not only alleviates anxiety but also enhances treatment compliance and patient satisfaction, thereby optimizing overall therapeutic outcomes.

Keywords: Xanthelasma Palpebrarum; Pingyangmycin; Nursing education; Curative effect observation; Anxiety assessment

INTRODUCTION

Cutaneous xanthomas are benign skin lesions caused by lipid deposition. They typically present as soft, yellowish, flat, wart-like plaques and are most commonly located on the eyelids, known as xanthelasma palpebrarum (XP), often showing a symmetrical distribution [1]. Epidemiological studies have reported an overall prevalence of XP ranging from 0.56% to 1.5% in the general population, with marked differences between sexes. The prevalence is significantly higher in women than in men (1.1% vs. 0.3%), and it increases with age, being most frequent in middle-aged and elderly individuals[2]. Approximately 50% of patients present with concomitant hyperlipidemia or lipoprotein abnormalities. Therefore, XP is considered closely related to systemic lipid dysregulation

and is regarded as an external marker of hyperlipidemia [3, 4]. Importantly, its rising incidence parallels the global increase in obesity and metabolic syndrome, suggesting that XP may serve as a dermatological manifestation of broader metabolic health problems.

In clinical practice, patients usually seek medical care due to the cosmetic concerns associated with XP. Although benign, its localization on the eyelids and impact on appearance contribute to a considerable psychological burden. Conventional therapeutic options include surgical excision, laser ablation, cryotherapy, and chemical peeling; however, these approaches are limited by extensive tissue trauma, prolonged recovery, high rates of scarring or pigmentary alterations, and frequent recurrence, resulting in unsatisfactory outcomes [5]. In recent years, intralesional injection of pingyangmycin (PYM) has been introduced as a minimally invasive alternative. This approach offers advantages such as minimal trauma, rapid recovery, and a low incidence of adverse reactions, and has achieved promising clinical results [6-8].

Beyond the physical manifestations, patients with XP often experience marked anxiety and tension during both disease onset and treatment. Psychological issues such as anxiety and depression not only influence treatment compliance but also adversely affect postoperative recovery and quality of life. These concerns are particularly evident when undergoing injections in the periocular region, where uncertainty regarding pain, edema, and treatment efficacy may exacerbate emotional distress. Therefore, comprehensive management should not only focus on lesion regression but also incorporate psychological care to optimize the overall treatment experience.

In this study, we employed the Hospital Anxiety and Depression Scale (HADS)[9] to quantitatively assess anxiety and depression among XP patients before and after treatment. Combined with systematic nursing education and psychological support, we aimed to evaluate the efficacy of intralesional PYM injection for XP and to determine the role of nursing interventions in alleviating anxiety and improving treatment outcomes. Based on long-term clinical observations and practice, we summarize our findings to provide insights into the comprehensive management of XP.

METHODS

Patients

Between December 2023 and August 2025, a total of 228 patients with xanthelasma palpebrarum (398 lesions) were treated in the Department of Plastic Surgery, Shanghai East Hospital. The patients ranged in age from 28 to 69 years, with a mean age of 42.2 years. Written informed consent was obtained from all patients, and potential risks associated with intralesional injection were explained.

Exclusion criteria

Patients were excluded if they met any of the following conditions:

1. abnormal laboratory findings such as coagulation dysfunction;
2. cardiac or pulmonary dysfunction;
3. local skin damage or infection at the treatment site;
4. any other condition considered unsuitable for periocular intralesional injection.

Treatment protocol

The periorbital skin was disinfected with sterile cotton balls soaked in 75% ethanol, taking care to avoid eye contact. Pingyangmycin hydrochloride for injection (8 mg/vial, Jilin Aodong Pharmaceutical Co.) was dissolved in 2 ml of normal saline to prepare a 4 mg/ml solution. A 1-ml syringe with a 30G needle was used. The needle was inserted at the lesion margin at an angle of approximately 30° to the skin surface. After confirming no blood return, intralesional infiltration was performed from the subcutaneous layer to the dermis, extending 2 mm beyond the lesion margins until blanching of the lesion was observed, indicating adequate drug diffusion. The injection volume did not exceed 0.5 ml per cm², and the total dose for bilateral eyelids did not exceed 2 ml. The needle was withdrawn slowly after pausing for 3–5 seconds, and the injection site was disinfected again with ethanol.

HADS assessment

The Hospital Anxiety and Depression Scale (HADS) was used to evaluate the psychological status of

patients during the treatment course. The scale consists of 14 items, including two subscales: anxiety (HADS-A, 7 items) and depression (HADS-D, 7 items). Each item is scored on a 4-point Likert scale ranging from 0 to 3, with subscale scores ranging from 0 to 21. According to established cut-off values, scores of 0–7 indicate normal status, 8–10 indicate borderline abnormality, and ≥ 11 indicate clinically significant anxiety or depression. In this study, all patients completed the HADS questionnaire at baseline (before treatment) and during follow-up visits (1 month post-treatment). The assessments were self-administered and reviewed by trained nursing staff to ensure completeness and accuracy.

Nursing education and perioperative care

Pre-treatment counseling: Patients were informed about (i) the potential association of xanthelasma with hyperlipidemia, atherosclerosis, or hepatobiliary dysfunction; (ii) the relationship between lipid metabolism and disease occurrence; (iii) dietary modifications including fat restriction; and (iv) the expected recovery time, process, and possible adverse reactions after injection.

Post-treatment care: The injection site was compressed with sterile cotton balls for 3–5 minutes, and patients were instructed not to rub the area. Patients were observed in the outpatient clinic for 10 minutes post-injection and advised to avoid water contact at the injection site for 4–6 hours.

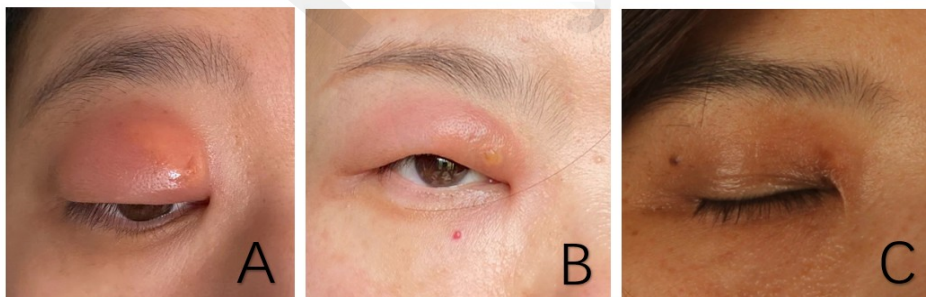
Recovery phase instructions:

1. At days 1 and 3 post-injection, patients were contacted to assess swelling and blister formation. The natural course of edema resolution was explained. Severe edema was managed with warm compresses, and large blisters were advised to seek medical attention.
2. At day 7, patients were informed that lesion regression may lag behind edema resolution, alleviating unnecessary anxiety.
3. At day 14, patients were asked about itching or burning at the injection site. Topical aloe gel was recommended if necessary, and scratching was discouraged to prevent skin damage. Patients were also advised to avoid sun exposure to reduce post-inflammatory hyperpigmentation.
4. Follow-up visits were scheduled at 1, 3, and 6 months to monitor lesion regression.

Follow-up and evaluation

Photographs were taken with a digital camera in both open- and closed-eye positions before treatment and at 1 week, 1 month, 3 months, and 6 months after treatment for comparison. Therapeutic efficacy was evaluated primarily at 1 month by a blinded third party, based on changes in lesion color and size, and was classified into four grades: cured, improved, partially relieved, or ineffective. Adverse events such as local edema, blistering, and hyperpigmentation were recorded throughout the follow-up period (Figure 1).

Figure 1. Complications following intralesional pingyangmycin injection for xanthelasma palpebrarum.



Notes: (A) Periorbital edema; (B) blister formation; (C) post-inflammatory hyperpigmentation.

RESULT

Treatment outcomes and follow-up

A total of 228 patients with xanthelasma palpebrarum (398 lesions) were followed up after treatment. Among these lesions, 252 (63.31%) achieved complete remission, 95 (23.87%) showed marked improvement, 42 (10.55%) demonstrated partial improvement, and 9 (2.27%) were classified as ineffective. Regarding complications, 4 patients (6 lesions) developed blisters, which resolved

spontaneously within 1 week. In addition, 17 patients (29 lesions) presented with varying degrees of hyperpigmentation at the 1-month follow-up; of these, 12 patients (22 lesions) experienced complete resolution after subsequent sun-protection management by the 6-month visit. No further adverse events were recorded during follow-up (Table 1, Figure 2).

Figure 2. Distribution of treatment outcomes in patients with xanthelasma palpebrarum.

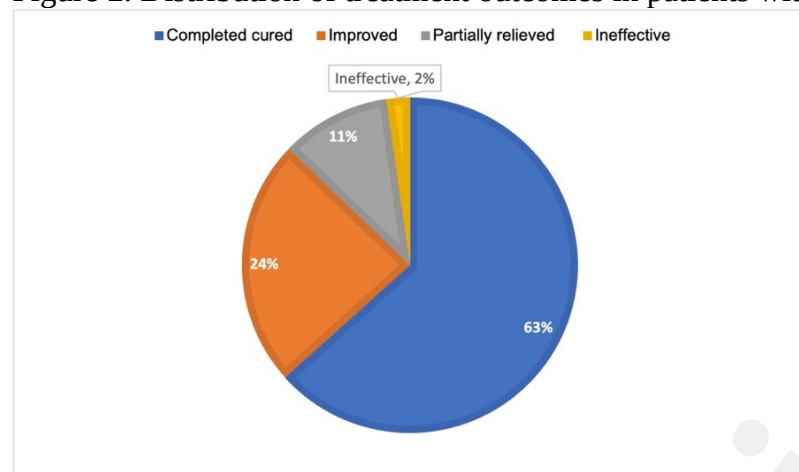


Table 1. Percentage and numbers of treatment outcomes in patients with xanthelasma palpebrarum.

Completed cured	Improved	Partially relieved	Ineffective
252(63.31%)	95(23.87%)	42(10.55%)	9(2.27%)

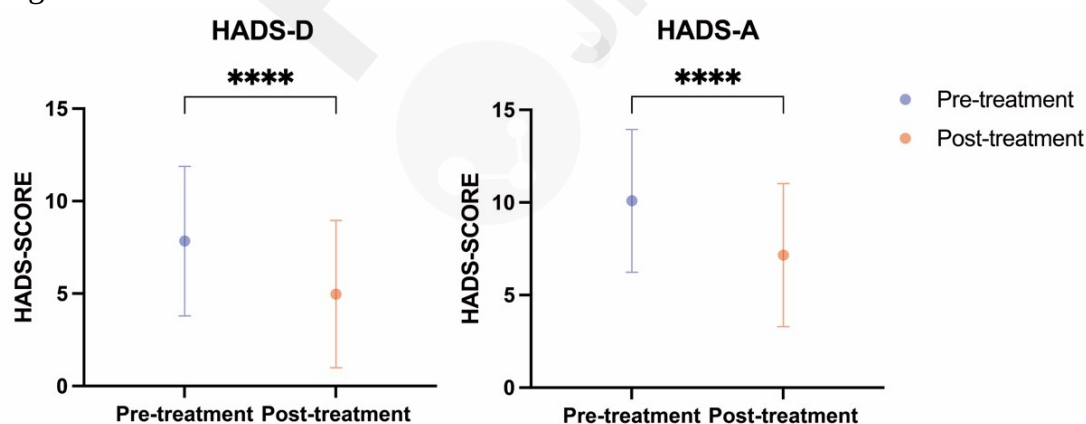
HADS assessment results

The HADS questionnaire was administered at baseline and at 1 month after treatment. The mean HADS-A (anxiety) score significantly decreased from 10.09 ± 3.86 at baseline to 7.09 ± 3.12 at 1 month post-treatment ($P < 0.01$). Similarly, the mean HADS-D (depression) score declined from 7.84 ± 4.05 to 4.84 ± 4.57 ($P < 0.01$). The proportion of patients with abnormal anxiety (HADS-A ≥ 11) decreased from 41.96% before treatment to 21.43% after treatment, while those with abnormal depression (HADS-D ≥ 11) decreased from 23.21% to 8.04% (Table 2, Figure 3).

Table 2. Changes in HADS-A and HADS-D scores before and after treatment

HADS-A		HADS-D	
Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
10.09 ± 3.86	7.09 ± 3.12	7.84 ± 4.05	4.84 ± 4.57

Figure 3. HADS-A and HADS-D scores before and after treatment



Notes: Bar graph showing mean $\pm$ SD values of anxiety (HADS-A) and depression (HADS-D) scores. Both were

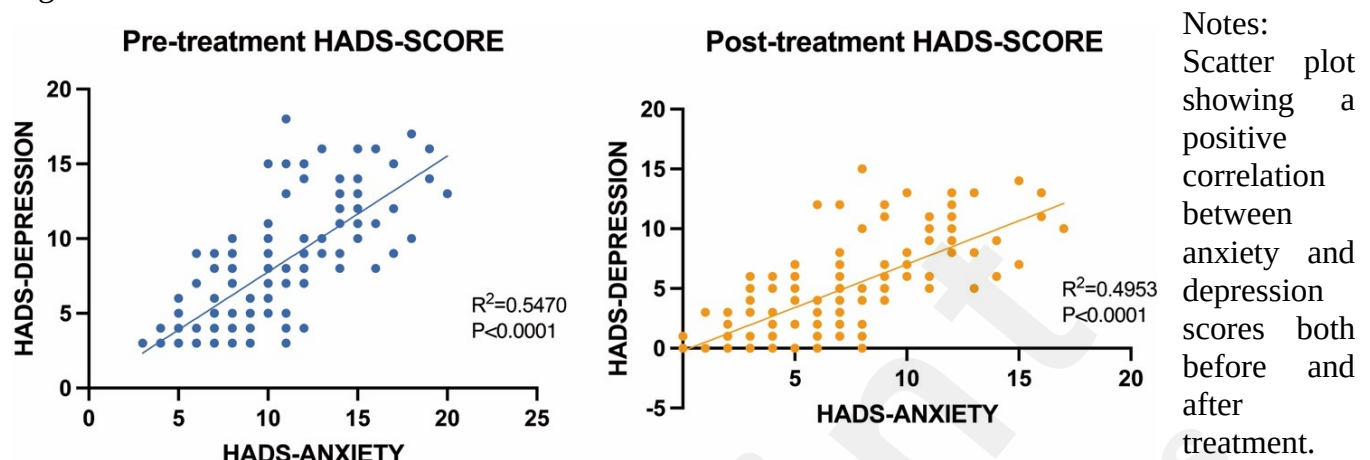
significantly lower after treatment compared with baseline ($P < 0.01$).

HADS correlation analysis

Correlation analysis demonstrated a significant positive association between HADS-A and HADS-D scores both before treatment ($r = 0.547$, $P < 0.001$) and at 1 month post-treatment ($r = 0.4897$, $P < 0.001$).

0.001), indicating that anxiety and depression symptoms were closely interrelated in this patient population. These findings suggest that comprehensive care and intralesional therapy not only improved lesion regression but also effectively alleviated psychological distress (Figure 3).

Figure 4. Correlation between HADS-A and HADS-D scores



DISCUSSION

The incidence of xanthelasma palpebrarum has been increasing in recent years, with a growing number of patients seeking treatment for both cosmetic and psychological reasons. Conventional therapeutic approaches, such as chemical peeling, cryotherapy, laser ablation, and surgical excision, are often associated with considerable trauma, prolonged recovery, postoperative scarring, or pigmentary changes, and high recurrence rates, leading to unsatisfactory outcomes in many cases [10-15]. Intralesional injection therapy has emerged as an alternative that avoids the creation of large wounds, shortens the recovery period, and significantly reduces postoperative scarring and pigmentation, and has therefore been increasingly accepted by patients [16]. Among available agents, pingyangmycin has demonstrated reliable efficacy and a low incidence of adverse reactions, making it the drug of choice for intralesional treatment.

Early complications of injection therapy include ecchymosis or hematoma due to inadequate compression or vascular injury, which is particularly relevant in the periorbital region given its rich vascular supply. Such events can alter eyelid contour and skin color for 2–3 weeks, prolong recovery, negatively affect patients' appearance, and increase anxiety, thereby reducing compliance. Previous studies using intralesional heparin reported an increased risk of hematoma due to impaired coagulation [17]. In contrast, the use of pingyangmycin combined with immediate compression in our protocol minimized the risk of hematoma formation, accelerated recovery, and improved patient satisfaction.

Periorbital edema is another common complication due to the loose eyelid tissue. As the eyelids represent a highly visible area, patients often experience heightened concern and anxiety during the swelling phase. Pre-treatment counseling regarding the natural course of edema resolution (typically 5–7 days) helped patients to prepare mentally and organize daily activities, thereby reducing postoperative anxiety and improving compliance. Close communication during the peak edema phase (days 1–3), including inquiries regarding swelling and blister formation and provision of tailored instructions, further alleviated emotional distress. Early interventions in severe cases reduced the risk of secondary complications such as blistering or persistent soft tissue thickening.

At 7–10 days post-treatment, patient anxiety regarding swelling generally subsided but was often replaced by concerns about the apparent efficacy of therapy. Patients commonly questioned why plaques did not regress simultaneously with edema resolution. In fact, early therapeutic responses to pingyangmycin typically present as lesion discoloration, while reductions in size and thickness occur later, following clearance of damaged foam cells by macrophages [18]. Repeated explanations of the non-concordance between edema resolution and plaque regression at baseline and day 7 proved

effective in reducing patient worry and enhancing long-term adherence.

Other minor symptoms, such as itching or burning around 2–3 weeks post-injection, also added to the psychological burden. Topical application of aloe gel provided symptomatic relief and facilitated recovery. In addition, strict sun protection was found to effectively reduce post-inflammatory hyperpigmentation, further improving patient satisfaction.

Consistent with previous studies, xanthelasma is strongly associated with lipid metabolism disorders and hyperlipidemia [19]. Therefore, in addition to perioperative nursing interventions, lifestyle and metabolic management remain crucial. Patients underwent baseline lipid screening, and those with abnormalities were advised to seek pharmacological treatment from cardiology or endocrinology specialists. Even patients with normal lipid levels were counseled on dietary fat restriction and physical activity to mitigate disease progression and reduce recurrence risk.

Importantly, our study incorporated the Hospital Anxiety and Depression Scale (HADS) to quantitatively evaluate psychological outcomes. Both HADS-A and HADS-D scores significantly decreased after treatment, and correlation analysis revealed a strong association between anxiety and depression scores, suggesting that these symptoms are interrelated in this patient group. These findings highlight that comprehensive care—including intralesional pingyangmycin injection, structured nursing education, psychological support, and metabolic management—not only achieves effective lesion regression but also improves patient-reported outcomes by alleviating treatment-related anxiety and enhancing overall satisfaction.

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Consent to participate:

This study complies with the "Helsinki Declaration" and all participants signed an informed consent form and volunteered to participate. This study was approved by the research ethics committee of Shanghai East Hospital (approval number: [2024-345]).

Conflict of Interest Statement:

This was not an industry supported study. The authors report no conflicts of interest in this work.

Declaration of generative AI in scientific writing:

The artificial intelligence (AI) and AI-assisted technologies were only used to improve readability and language. This article was oversighted and controlled by human.

Authors' contributions

HJ and HW designed the study. LL, XYY and JHY collected data. JWG, QHX and XYY contributed new methods and models, LL and QHX analyzed the data. QHX and XYY performed the research, QHX wrote the manuscript. All the authors read and approved the final manuscript.

Submission declaration and verification:

The work described has not been published previously, that it is not under consideration for publication elsewhere.

Consent for publication:

All authors agree to publish.

Data availability:

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Code availability:

Not applicable.

Acknowledgments

Not applicable.