

The efficacy of IPL and ammonium lactate 14% versus ammonium lactate alone in the treatment of keratosis pilaris

Amir Hossein Siadat, MD
 Siamak Rahmani, MD
 Fariba Iraj, MD*
 Ali Asilian, MD
 Seyed Mohsen Hosseini, MD
 Mohammad Ali Nilforoushzadeh, MD

*Skin Disease and Leishmaniasis
 Research Center, Isfahan University of
 Medical Sciences, Isfahan, Iran*

**Corresponding author:
 Fariba Iraj, MD
 Skin Disease and Leishmaniasis
 Research Center, Isfahan University of
 Medical Sciences, Isfahan, Iran
 Email: Iraj@med.mui.ac.ir*

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Background: Keratosis rubra pilaris is a common condition with an estimated percentage of 40% involvement in the population. This condition is inherited as an autosomal dominant trait and more commonly involves patients with dry skin. In the current study, we evaluated the efficacy of intense pulsed light (IPL) plus ammonium lactate versus ammonium lactate alone in the treatment of keratosis pilaris.

Methods: A total of 50 patches were selected in 10 patients. If there were two similar patches with the same color and same location, each of them was randomized to receive ammonium lactate (Kerapil cream®) or ammonium lactate (Kerapil cream®) +IPL. Treatment was performed for 3 months, and improvement was rated by physicians and patients one month and two months after the intervention.

Results: The grade of improvement in the IPL + ammonium lactate was not significantly higher than ammonium lactate alone group as rated by blinded physicians at week 4 ($P > 0.05$). However, the score of improvement was also higher, as rated by the patients, in the IPL + ammonium lactate versus ammonium lactate alone ($P < 0.05$) at week 8.

Conclusion: Our results demonstrated that addition of IPL to ammonium lactate could improve the clinical response of keratosis pilaris lesions.

Keywords: Ammonium lactate, intense pulsed light therapy, keratosis pilaris

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INTRODUCTION

Keratosis rubra pilaris is a common condition with an estimated percentage of 40% involvement in the population. This condition is inherited as an autosomal dominant trait and more commonly involves patients with dry skin¹. Positive family history is observed in 67% of the patients². In this condition, the infundibulum of the hair follicles is filled with hard keratin ball. The lesions of the keratosis pilaris are worsened during the winter

and tend to be improved during warm weather of the summer³.

Different types of treatment have been suggested for this condition such as use of mild cleansers like baby and glycerinated soaps, use of emollients, and keratolytics, including urea, salicylic acids and lactic acids^{4,5}.

Ammonium lactate is a compound of lactic acid and ammonium hydroxide. Lactic acid is one of the alpha hydroxy acids that can remove stratum corneum from the epidermis. This compound has

high moisturizing effect and is commonly used in conditions such as dermatitis, pruritus and inflammation, and some inherited diseases like ichthyosis⁶.

Intense pulse light (IPL) is a light source emitting non-coherent light with the wave lengths of 500–1200 nanometers (nm) and pulses with different duration and different energies⁷. Intense pulse light has been used for the treatment of different dermatologic conditions such as acne, melasma, telangiectasia, and sebaceous hyperplasia⁸.

In the current study, we evaluated the efficacy of IPL plus ammonium lactate versus ammonium lactate alone in the treatment of keratosis pilaris.

MATERIALS AND METHODS

This was a randomized, non-blinded clinical trial performed at Isfahan University of Medical Sciences and Skin Diseases and Leishmaniasis Research Center clinics from 2016 to 2017 (Research no: IRCT2016061428448N1). The ethical committee clearance and informed consent were achieved. All of the selected patients had a history of keratosis pilaris. All of the selected patients were female, and only patients who were older than 5 years old were recruited. The lesions were randomized to receive ammonium lactate (Kerapil cream[®], Noreva Laboratories, France) or IPL + ammonium lactate (Kerapil cream[®]) using the simple randomization method.

Exclusion criteria included history of sensitivity to ammonium lactate, pregnancy, lactation, aggravation of the lesion after ammonium lactate or IPL treatment, history of skin cancer or connective tissue disorder and non-compliance of the patients for treatment. A total of 50 patches of were selected in the 10 patients (8 patients were Fitzpatrick skin type III, and 2 patients were Fitzpatrick skin type IV). The patches were located on extensor arms, lateral thighs and buttocks. If there were two similar patches with the same color and same location, each of them were randomized to receive ammonium lactate (group A) or ammonium lactate + IPL (group B).

The patients were recommended to apply a small amount of ammonium lactate to their lesions twice a day. Intense pulse light was performed once a month for 3 consecutive months with 2 passes, including 1 pass with a vascular filter (570 nm) and 1 pass with a hair removal filter (670 nm).

Cooling using ice pack was performed between the passes to prevent possible burning. For IPL, Solari Device (Lutronic company), with the contact cooling temperature of -5°C was used.

Standard digital photograph was taken at baseline, 4 weeks and 8 weeks after the last treatment. Two dermatologists who did not perform the laser procedure evaluated the response through images. Global improvement score (according to keratotic papules, roughness, hyperpigmentation, and erythema) was evaluated using the grading system for improvement: Grade 1, 1–25% improvement (minimal); grade 2, 26–50% improvement (moderate); grade 3, 51–75% improvement (good); grade 4, > 75% improvement (excellent).

Patient satisfaction was assessed at the end of the study (8th week of the follow-up). They were requested to rate the improvements of their lesions according to grading scores (0: unsatisfied; 1: poor; 2: fair; 3, satisfied; 4, extremely satisfied).

Statistical methods

Fisher exact test was used to compare continuous data between two dependent samples. All analyses were conducted using STATA version 13 (Stata Corp., College Station, Texas, USA). A *p*-value of 0.05 or less was considered statistically significant.

RESULTS

A total of 10 healthy female patients with 50 patches of keratosis pilaris were enrolled in our study. The patches were located on extensor arms, lateral thighs and buttocks. The mean of age was similar in the two groups and was 25.6 as the patches of both cases and controls were selected in the same patients.

The grade of improvement in the IPL + ammonium lactate group (group B) was not significantly higher than that in the ammonium lactate alone group (group A) as rated by blinded physicians at week 4 ($P = 0.07$). However, the score of improvement was also higher as rated by the patients, in the IPL + ammonium lactate versus ammonium lactate alone at week 8 ($P = 0.04$; Table 1). All patients rated improvement of their lesions according to the patients' satisfaction score (Table 2, Figure 1).

Table 1. Global assessment of keratosis rubra pilaris improvement in IPL+ammonium lactate group (group B) versus ammonium lactate alone (group A) as rated by blinded dermatologists.

Grading	4 weeks of follow-up n = 50		8 weeks of follow-up n = 50	
	Group A	Group B	Group A	Group B
1 (<25% improvement, minimal)	15 (60.0)	7 (28.0)	15 (60.0)	7 (28.0)
2 (26–50% improvement, moderate)	6 (24.0)	9 (36.0)	7 (28.0)	9 (36.0)
3 (51–75% improvement, good)	4 (16.0)	9 (36.0)	3 (12.0)	9 (36.0)
4 (>75% improvement, excellent)	—	—	—	—
Total	25 (100)	25 (100)	25 (100)	25 (100)
P-value	0.070		0.040*	

Test analysis using Fisher's exact test
**P-value<0.05; *P-value<0.001

P-value 8 weeks = 0.040 < 0.050; P-value 4 weeks = 0.07 > 0.05. Number, n.

Table 2. Patients' satisfaction in the IPL + ammonium lactate group (Group B) versus ammonium lactate alone (group A) at 8-weeks follow-up.

Patients' grading	Group A n = 25	Group B n = 25
0 (unsatisfied)	0	0
1 (poor)	8	3
2 (fair)	10	12
3 (satisfied)	7	10
4 (extremely satisfied)	0	0

Number, n.

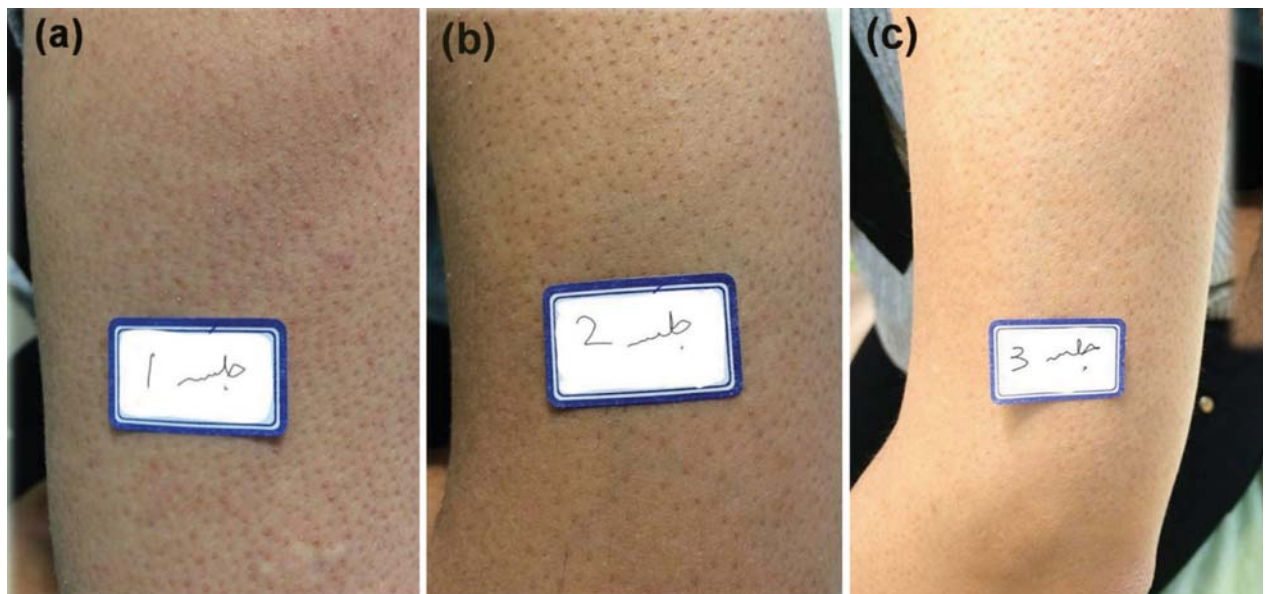
DISCUSSION

Keratosis rubra pilaris may cause a sense of cosmetic disfigurement for patients; therefore, many different modalities of treatments have been

suggested for these patients⁹.

Rodríguez-Lojo *et al.* evaluated the efficacy of IPL in four female patients with keratosis pilaris atrophicans using 570-nm filter. Additionally, 75% and 100% reductions in the severity of erythema were observed in all patients with no side effect and no recurrence after 10 months of follow up; reduction of roughness was also obtained in the patients¹⁰. The results of this study were consistent with the results of our study and confirmed the efficacy of IPL in reduction of erythema and roughness of keratosis pilaris lesions; however, our selected cases were affected by keratosis rubra pilaris and not by keratosis pilaris atrophicans.

One recent study showed successful treatment of keratosis pilaris rubra with pulsed dye laser

**Figure 1.** Clinical improvement in a patient in the IPL and ammonium lactate group at baseline (a), week 4 (b), and week 8 (c).

(PDL). In this study, eight patients were treated with PDL for keratosis pilaris rubra, and all of them showed noticeable improvement after one to four treatments. The authors concluded that PDL was effective, easily accessible, and underused therapy in the treatment of keratosis pilaris rubra¹¹. The results of this study were also consistent with the results of the current study; however, in our study, we used IPL instead of PDL that may provide less expensive treatment as compared to PDL. Furthermore, to achieve maximum efficacy in reduction of roughness, we used ammonium lactate cream.

Vachirammon *et al.* used fractional CO₂ laser for the treatment of adult patients with keratosis pilaris¹². In this study, fractional CO₂ laser was performed to one side of the arm, and the contralateral arm served as control, and the patients were followed for 3 months. The results demonstrated that 30% of lesions on the laser-treated side had moderate to good improvement, and keratotic papules and hyperpigmentation responded better than the erythematous component. However, four patients with Fitzpatrick skin type V developed transient pigmentary alteration. In the current study, we used IPL instead of fractional CO₂ laser having less down time and may be more effective for the erythematous component of keratosis pilaris. As CO₂ fractional laser was more effective on keratotic papules, we suggest that in another study, the efficacy of IPL plus CO₂ fractional laser is evaluated for patients with keratosis pilaris.

The efficacy of diode laser was also assessed in the treatment of keratosis pilaris¹³. Eighteen patients were randomized to receive 2 passes of laser treatment on the right or left arm for 3 treatments. Significant improvements in skin texture and roughness/bumpiness in keratosis pilaris patients were observed, but baseline erythema was not improved. We recommend that the efficacy of IPL plus diode laser be evaluated for patients with keratosis pilaris.

CONCLUSION

Overall, regarding the results of our study, we suggest that combination use of the IPL plus

keratolytic cream or some methods of treatment such as lasers and microdermabrasion could be effective for patients with keratosis rubra pilaris. It is recommended that further studies be conducted with a larger number of patients and a longer follow-up period to better evaluate the efficacy of IPL in the treatment of keratosis rubra pilaris.

Conflict of interest: None declared.

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