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Original Article

# Assessment of efficacy of narrowband ultraviolet B phototherapy in the treatment of chronic foot eczema: A longitudinal study

# 窄譜紫外線 B 光照治療在治療慢性足部濕疹的療效評估：一項縱向研究

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***Background:*** Foot eczema is a chronic debilitating condition that presents a psychosocial burden on patients and often follows a long course which is frequently refractory to conservative therapies. ***Aim:*** To conduct a prospective study to assess the efficacy of narrowband ultraviolet B (NBUVB) therapy for chronic foot eczema. ***Methods:*** Twenty patients with foot eczema participated in the study. NBUVB therapy was administered twice weekly for 12 weeks. Clinical findings, such as erythema, itching, induration, desquamation, and fissuring, were scored every four weeks for a period of 12 weeks. ***Results:*** The mean age of patients was 27.8±15.3 years. Their ages ranged from 4 to 55 years. Majority of patients were female [14 (70%)]. History of atopy was present among four (20%) patients. Thirteen (65%) had foot involvement while seven (35%) had both hand and foot involvement. Of the 20 patients who completed the study, eight (40%) had excellent response, eight (40%) had good response, three (15%) had partial response, and one (5%) had poor response to phototherapy. Average number of sessions required to produce >75% response was nine, with an average dose of 900 mJ/cm$^2$. There was a significant difference in all the clinical scores from baseline and at the end of 12 weeks ($p<0.001$). ***Conclusion:*** NBUVB therapy is a safe and effective treatment for patients with chronic foot eczema and can be considered as first-line treatment.

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**背景**：足部濕疹是一種慢性身心折磨的疾病，抗病持久藥石無靈，給患者帶來心理社交的負擔。**目的**：進行一項前瞻性研究以評估窄譜紫外線 B 光照治療對慢性足部濕疹的療效。**方法**：20 名足部濕疹患者參加了本研究。窄譜紫外線 B 光照治療每週兩次，為時 12 週。臨床發現包括紅斑、瘙癢、硬結、脱屑和龜裂，每 4 週進行一次評分，共 12 週。**結果**：患者平均年齡為 27.8±15.3 歲。他們的年齡從 4 歲到 55 歲不等。大多數患者為女性 [14 (70%)]。四名（20%）患者有異位性體質病史。 13 名 (65%) 足部受累，另 7 名 (35%) 則手和足部皆受累。在完成研究的 20 名患者中，8 名 (40%) 反應優異、8 名 (40%) 反應良好、3 名 (15%) 有部分反應和 1 名 (5%) 對光療反應不佳。產生 >75% 反應所需的平均治療次數為 9 次，平均劑量則為 900 mJ/cm$^2$ 。基線和 12 週結束時相比，所有臨床評分均存在顯著差異（$p<0.001$）。**結論**：窄譜紫外線 B 光照治療對慢性足部濕疹患者是一種安全有效的治療，可以考慮作為第一線治療。

**Keywords:** Eczema, foot, hand, phototherapy

**關鍵詞**：濕疹、足、手、光照治療

## Introduction

Chronic foot eczema, a prevalent debilitating disorder affecting approximately 15% of the population, presents a socioeconomic and psychosocial burden on patients and often follows a chronic course, refractory to conventional therapies.[1] It is a disease with heterogenous aetiology, including irritant, allergic, atopic, idiopathic, or a combination of these.[2,3] Owing to its heterogeneity, classification of foot eczema is not fully determined and continues to be clinically challenging.[1] Risk factors for foot eczema, which are found in 29-43% of patients, include female gender, contact allergy, wet work, and underlying atopic dermatitis.[3-7] Allergic contact dermatitis can be due to shoe materials including leather, rubber, glues and nickel, stockings, topical medicaments, antiseptics and antiperspirants.

Foot eczema is characterised by a symmetrical smooth, red-glazed appearance of the skin with fissuring, loss of epidermal ridge pattern, and fine scaling. It has a predilection for the distal parts of the soles and toes, particularly the great toe, sparing the intertriginous spaces.[8] Since its first report in 1968, it has been described under a variety of names (e.g. forefoot dermatitis, atopic winter feet, dermatitis plantaris sicca, forefoot eczema, peridigital dermatitis, and sweating sock dermatitis).[9,10] Traditional treatments for foot eczema include topical and systemic treatments.[4] Topical treatments, such as corticosteroids and immunomodulators, such as calcineurin inhibitors, are often unable to provide sustained responses in patients with foot eczema. Compliance with these treatments may be suboptimal due to messy daily application required for symptomatic control, in addition to side effects including irritation with topical calcineurin inhibitors and skin atrophy with prolonged use of topical steroids. Systemic therapies, such as oral corticosteroids, retinoids, and immunomodulators, show variable efficacy and they can potentially cause serious adverse effects especially with prolonged use.[3] Few studies have shown that Psoralen plus ultraviolet A (PUVA) photochemotherapy as a treatment modality. Narrowband ultraviolet B (NBUVB) has been used successfully in the treatment of various conditions such as atopic dermatitis and psoriasis, however studies demonstrating the effect of NBUVB on foot eczema are lacking. Therefore, we conducted this study to assess the effectiveness and safety of NBUVB phototherapy for foot eczema.

## Materials and methods

This longitudinal study was conducted between January 2018 and December 2019 at a tertiary care hospital in Mangalore. Institutional ethical committee approval was obtained. Patients with a clinical diagnosis of foot eczema were included in the study using convenience sampling.

The main inclusion criterion was a clinical diagnosis of foot eczema of more than six months. Other inclusion criteria were erythema, fissuring, and scaling of the soles with or without involvement of the dorsa of the feet. Patients with well-defined plaques suggestive of psoriasis were excluded from this study. Exclusion criteria included the use of topical treatment with corticosteroids or calcineurin inhibitors within two weeks or systemic treatment with corticosteroids or other immunosuppressive agents within four weeks, unilateral disease, pregnancy, skin infections and inability to attend follow-up. Written informed consent for participation was taken from all patients.

Detailed history including age at onset, occupation, personal and family history of atopy, aggravating factors, seasonal variation, and associated hand eczema, were recorded. NBUVB therapy was administered twice per week, starting at dose of 500 mJ/cm$^2$. Subsequent treatments were increased by 50 mJ/cm$^2$ if no erythema was noted. Patients were provided UV-protective glasses throughout treatment. Patients were followed up for 12 weeks.

### *Clinical evaluation and statistical analysis*

Clinical assessments were performed by the same investigator every four weeks during the 12-week treatment period. Erythema, desquamation, induration, fissures and itching were evaluated. Each criterion was assessed on a 4-point scale: 0=none, 1=mild, 2=moderate, and 3=severe. The total clinical score was calculated as the sum of the scores for each variable.

These clinical findings were scored every 4 weeks, along with clinical photographs for a period of 12 weeks. Response was defined as excellent, good, partial, and poor if there was >90%, 75-90%, 50-75%, and <50% of reduction of total clinical score respectively. To minimise inter-observer variability, the same dermatologist evaluated and scored each patient throughout the study. Data entry and analysis were performed using IBM SPSS for Windows version 25.0, Armonk, NY, USA. Wilcoxon signed-rank test was used for statistical analysis. A p-value of <0.05 was considered significant.

## Results

A total of 22 patients with a clinical diagnosis of foot eczema were included. One patient was lost for follow up and one patient was tested positive for fungus on Potassium hydroxide (KOH) mount, and excluded from the study. Hence, 20 patients were included for analysis. The mean age of patients was 27.8±15.3 years, ranging from 4 to 55 years. Majority of patients were female [14 (70%)] (Table 1). History of atopy was present among four (20%) patients. Thirteen patients (65%) had foot involvement, while seven (35%) had both hand and foot involvement. After 12 weeks of NBUVB therapy, eight patients (40%) had excellent response, eight (40%) had good response, three (15%) had partial response, and one (5%) patient had poor response (Figures 1-4). Average number of sessions required to produce >75% response was nine, with an average dose of 900 mJ/cm$^2$. There

**Table 1.** Socio-demographic distribution among patients with eczema

| Characteristics | Number | Percentages |
|---|---|---|
| Age distribution (years) | | |
| ≤10 | 4 | 20.0 |
| 11-20 | 3 | 15.0 |
| 21-30 | 5 | 25.0 |
| 31-40 | 3 | 15.0 |
| 41-50 | 4 | 20.0 |
| >50 | 1 | 5.0 |
| Gender | | |
| Male | 6 | 30.0 |
| Female | 14 | 70.0 |
| Occupation | | |
| Student | 7 | 35.0 |
| Housewife | 6 | 30.0 |
| Healthcare worker | 4 | 20.0 |
| Mason | 2 | 10.0 |
| Other | 1 | 5.0 |
| Total | 20 | 100.0 |

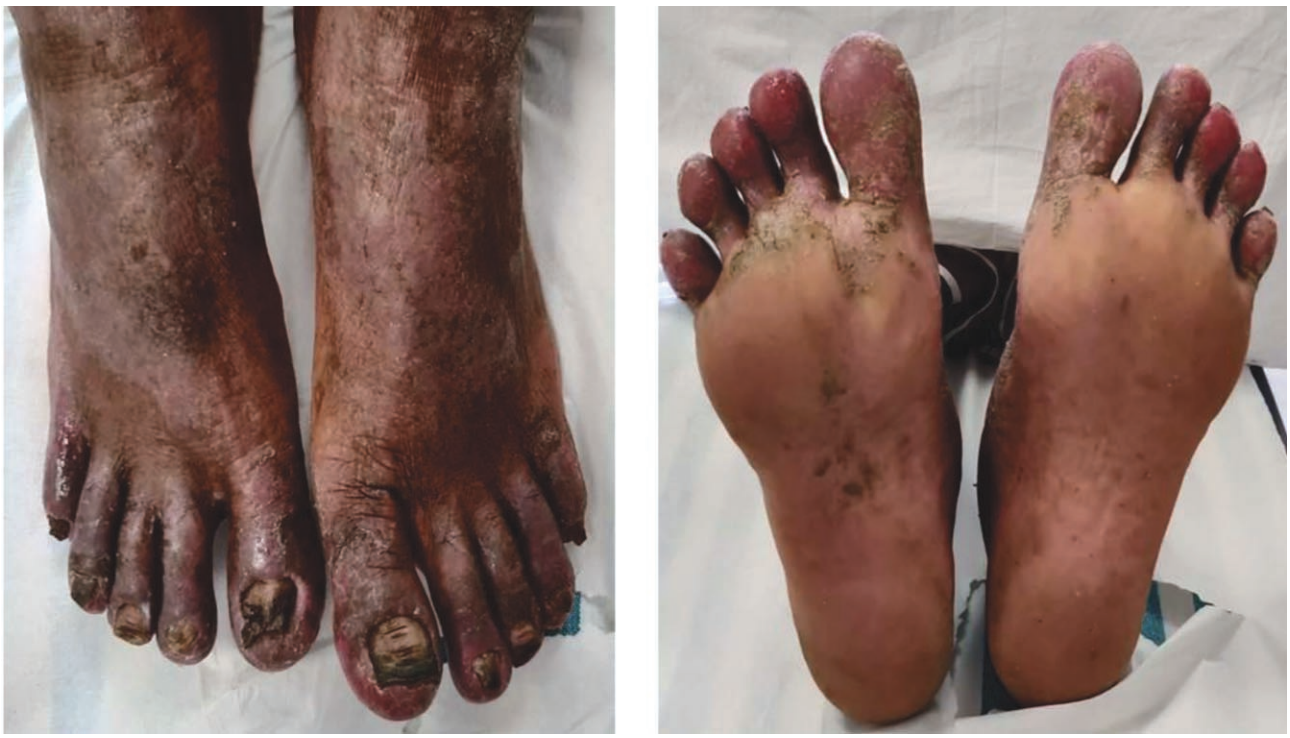

**Figure 1.** Patient A - at baseline before phototherapy.

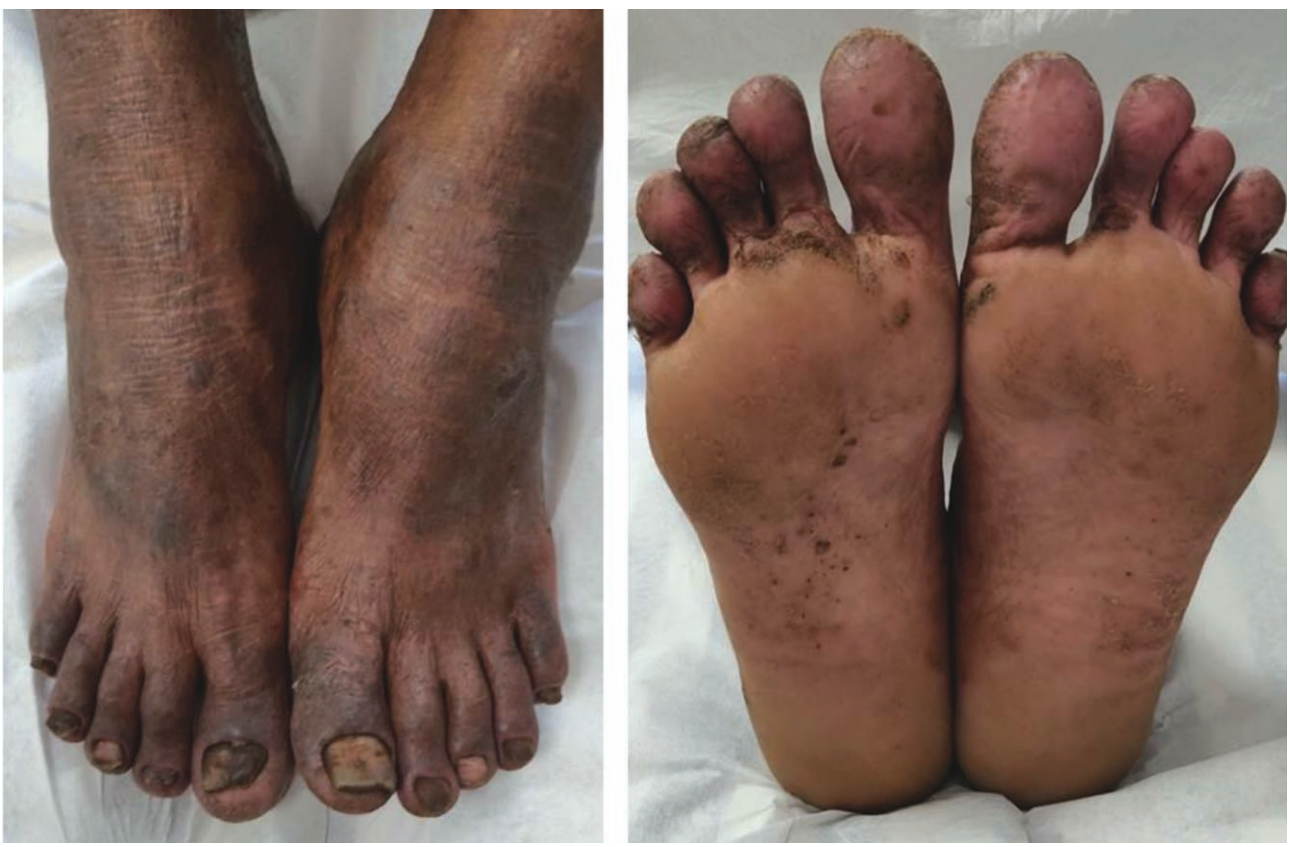

**Figure 2.** Patient A - significant improvement seen after 12 weeks of NBUVB phototherapy.

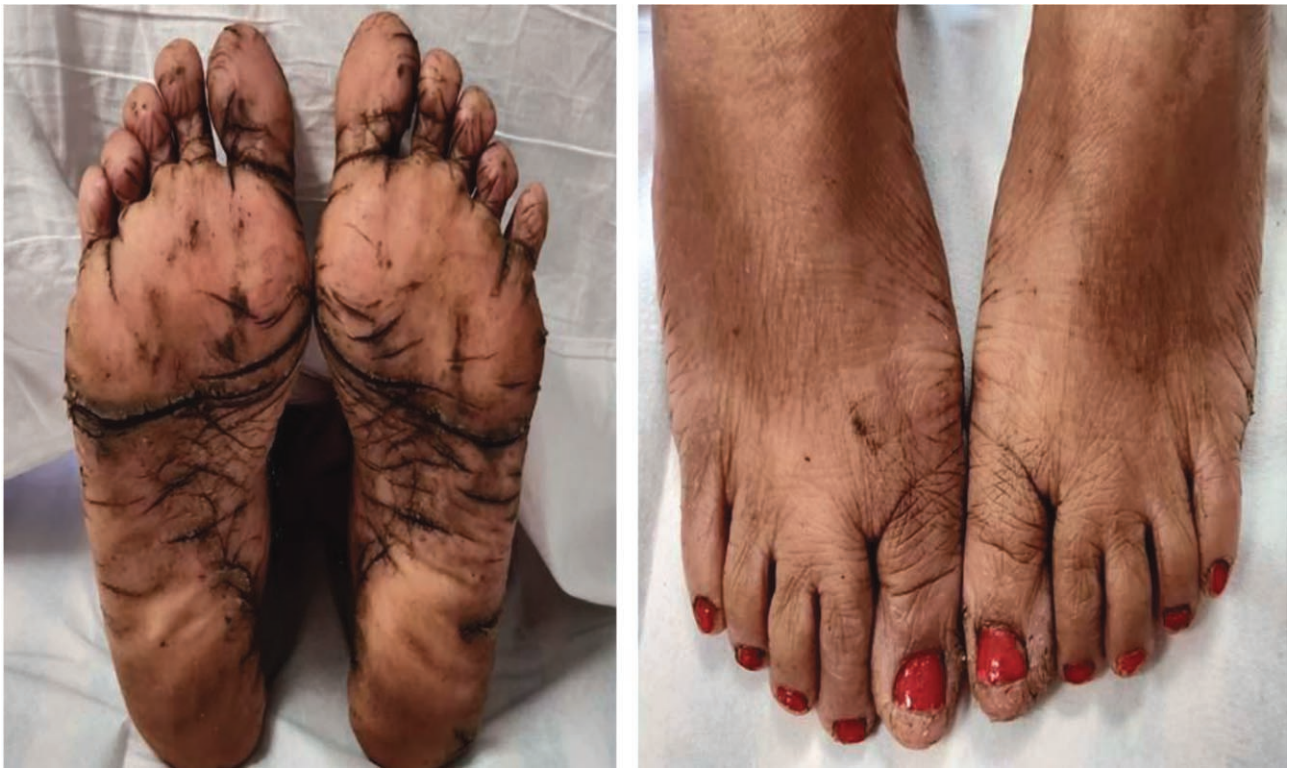

**Figure 3.** Patient B - at baseline before phototherapy.

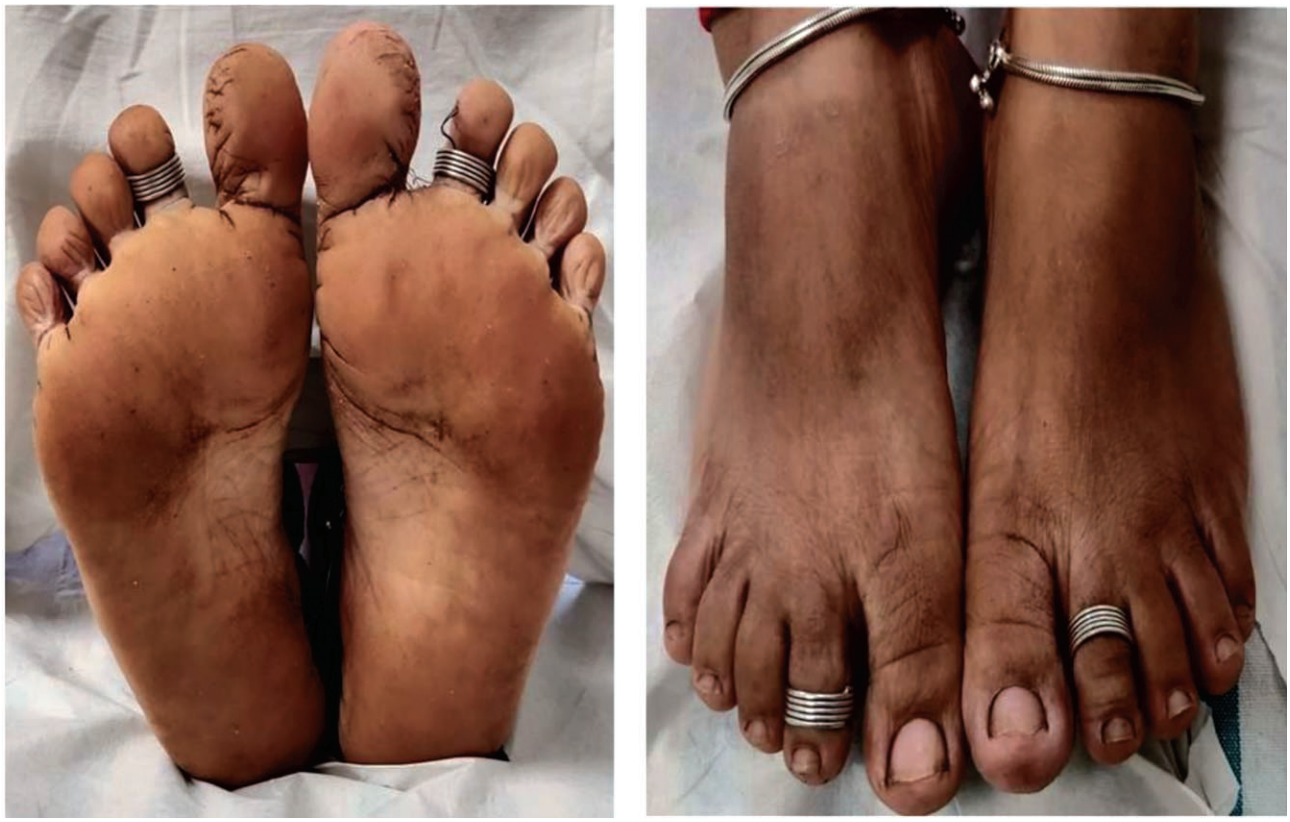

**Figure 4.** Patient B - significant improvement seen after 12 weeks of NBUVB phototherapy.

was a significant improvement in all clinical scores between baseline and after 12 weeks of treatment ($p<0.001$) (Table 2). Mild skin dryness was the only side effect reported in two patients (10%), which subsided with the application of emollients.

## Discussion

Since the late 1980s, narrowband ultraviolet B (NBUVB, wavelengths 311±2 nm) has been recognised as an alternative treatment to either broadband UVB (BBUVB) or psoralen plus UVA (PUVA).[11,12] NBUVB phototherapy has been shown to be equally or more effective than BBUVB or PUVA therapies in eczematous conditions like atopic eczema.[13] In a study by Sezer and Etikan on hand eczema, significant improvement in clinical scores was seen following NBUVB treatment.[14] The initial treatment for foot eczema, is to avoid any triggers and liberal use of moisturisers. If problem persists, potent topical steroids can be prescribed. These measures often provide symptomatic relief, but if symptoms persist, light-based (UV) therapy or tablets can be considered. PUVA is one of the traditional therapy and has been used for 30 years. However, it is time consuming. Moreover, there are some concerns that excessive PUVA exposure could increase the risk of skin cancers, and thus multiple prolonged courses of treatment should not be used. A pilot study by Brass et al showed that NBUVB is a safe and effective method for treatment of hand eczema.[15] Our study showed that foot eczema had a significant response to NBUVB therapy. All clinical scores for erythema, pruritus, desquamation, induration, and fissuring showed significant improvement after 12 weeks of phototherapy. No serious adverse effects were observed, except for mild dryness in two patients.

## Conclusion

This study showed that NBUVB phototherapy is an effective and safe therapy for foot eczema. It can be considered as first line treatment for patients with foot eczema refractory to topical therapy.

**Table 2.** Comparison of clinical scores of various clinical signs among patients with foot eczema at baseline and at 12th week of phototherapy (n=20)

| Clinical scores | Median scores | IQR | Mean negative ranks | Mean positive ranks | Z value | p value |
|---|---|---|---|---|---|---|
| Desquamation | | | | | | |
| Baseline | 2.5 | (2,3) | 10.0 | 0 | 3.919 | <0.001 |
| 12th week | 1 | (1,1) | | | | |
| Erythema | | | | | | |
| Baseline | 2 | (0.75,2.0) | 8.5 | 0 | 3.704 | <0.001 |
| 12th week | 0 | (0,0) | | | | |
| Itching | | | | | | |
| Baseline | 2.5 | (2,3) | 10.5 | 0 | 3.999 | <0.001 |
| 12th week | 0 | (0,0) | | | | |
| Induration | | | | | | |
| Baseline | 1 | (0,1) | 6.0 | 0 | 3.127 | <0.001 |
| 12th week | 0 | (0,0) | | | | |
| Fissuring | | | | | | |
| Baseline | 2 | (0.75,2) | 8 | 0 | 3.542 | <0.001 |
| 12th week | 0.5 | (0,1) | | | | |

## Conflict of interest

Nil

## Funding

Nil

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