Antipruritic Effect of Narrow Band Ultraviolet B Versus Transcutaneous Electrical Nerve Stimulation in Lichen Planus

Nesma M Allam

ABSTRACT

Objective: To compare antipruritic effect of Narrow Band Ultraviolet B versus Transcutaneous Electrical Nerve Stimulation in patients with Lichen Planus.

Design: A prospective, randomized clinical trial.

Materials and methods: 30 patients with Lichen Planus were enrolled in this study and were randomized into two equal groups. Group A (NBUVB group): received ultraviolet phototherapy (NBUVB) 3 times per week for 6 weeks. Group B (TENS group): received TENS therapy 3 times per week for 6 weeks. Severity of pruritus were assessed before and after treatment by using visual analogue scale (VAS) and the 5-D itch scale. The psychosocial impact of disease and quality of life were evaluated by the Dermatology Life Quality Index (DLQI).

Results: There was a significant decrease in VAS, 5-D itch scale and DLQI post treatment in both groups compared with that pre treatment (p > 0.001). There were significant differences between NBUVB group and TENS group in VAS, 5-D itch scale and DLQI.

Conclusion: Both NBUVB and TENS are effective for treatment of pruritus but TENS has an antipruritic effect more than NBUVB in patients with LP.

KEY WORDS

lichen planus, pruritus, narrow band ultraviolet B, transcutaneous electrical nerve stimulation

INTRODUCTION

Lichen planus (LP) is an inflammatory skin disease and may also affect mucous membranes, the hair follicles, and nails. It is characterized by presence of pruritic violaceous purpule papules that affect mainly wrists, forearms, lower legs, lower back, genitatlia, nails and less common in scalp. It may be idiopathic or secondary to drugs or infections (Shiohara and Kano, 2012, Fazel, 2014). Lichen planus affects mostly common middle-aged adults, it affects women more than men. LP is rare in children. While there were no symptoms with some patients, the most common symptom of LP is intense pruritus. There is unknown cause of LP; however, there are some cases of LP-type rashes (lichenoid reactions) occurring as allergic reactions to drugs for hypertension, heart disease and arthritis. These reactions are known as lichenoid mucositis or dermatitis (Halevy and Shai, 1993).

Management of patients with chronic pruritus is a great challenge. Conventional pharmaceutical drugs may not produce a satisfactory effect in pruritus and may have side effects (Tang et al., 1999). In patients with pruritus, topical therapy is not sufficient in managing their symptom. So, providing another therapeutic solutions becomes important for the successful dermatologist. Phototherapy is considered an effective and safe treatment modality to decrease the intensity of pruritus and can be used for age groups (Veith et al., 2011). Fluorescent tubes are used in narrow band ultraviolet B (NBUVB) therapy for emission of UVB at 310-315 nm with a peak at 312 nm (Dogra and Kanwar, 2004). UV therapy have an immunosuppressive effect in different inflammatory skin disorders that cause pruritus, as atopic dermatitis (AD), it also induces apoptosis in neoplasms as cutaneous T-cell lymphoma (CTCL). During neoplastic processes, the effect of UV on sensory nerves is still unknown. Thereafter, UV therapy may have an effect on sensation by controlling function of neurons (Steinhoff et al., 2011). TENS is a noninvasive and non pharmacological treatment that has recently been used as an effective therapeutic modality for pruritic dermatoses (Yuksek et al., 2011). TENS is effective for controlling pain by producing feedback inhibitory impulses on terminals of afferent fiber (Dennis and Melzack, 1977). There is unknown pathway for itching (Greaves and Wall, 1996), however it is thought that the effect of TENS on itching may be similar to its effect on pain (Monk, 1993). Pain and pruritus are similar sensations at the central and peripheral levels, so TENS could also have antipruritic effect for treatment of itchy skin conditions (Veith et al., 2011).

So, this study was established to compare antipruritus effect of NB-UVB and TENS in treatment of LP.

MATERIALS AND METHODS

The study was carried out in agreement with the principles of Declaration of Helsinki for experiments on humans and was approved by The Ethical Committee of Faculty of Physical Therapy, Cairo University, Giza, Egypt (P.T.REC/012/002366). All patients signed approval consent form to share in the study, and ethics committee clear-
The inclusion criteria were: (1) The patient's age was ranged from 20-60 years. (2) The affected areas were: the forearm, back, hands or legs (3) Patients suffering from chronic pruritus for at least 1 year which did not respond to the previous treatment as systemic corticosteroids or antihistamines. (4) All patients stopped any treatment 1 month before the initiation of the study (5) The history and detailed physical and dermatological examination were done for all patients. Exclusion criteria were: (1) Patients with other inflammatory skin disorders. (2) Patients with cardiac pacemaker. (3) Patients with loss or diminished sensation in the treatment area as in diabetic patients. (4) Patients with systemic diseases that may cause pruritus. (5) Pregnancy and breast feeding woman. (6) Presence of erosive oral LP, severe nail involvement or lichen planopilaris. (7) History of skin cancer, photosensitivity disorders or cataract. (8) patients on immunosuppressive therapy.

### Procedures

#### Assessment methods

Severity of pruritus was assessed before and after treatment by using visual analogue scale and the 5-D itch scale. The psychosocial impact of disease and quality of life was evaluated using the Dermatology Life Quality Index.

1. **Visual analogue scale (VAS):**
   - A visual analogue scale is a 10-cm line. The left point is the beginning of the line and is considered "no itch". Severity of pruritus was assessed by asking the patients to put a mark on the line that corresponds to his itching sensation. The score is the length of the line from the patient's mark to the beginning of the line on the left point in centimeters (Bergasa and Jones, 2017).

2. **5-D itch scale:**
   - This scale was used to assess itching. It is brief, easy to score and consists of 5 domains. There was 1 item in the duration, degree and direction domains, although there were 4 items in the disability domain. There were 16 locations of itch included in the distribution domain, 15 items in the body and one item including point of contact with clothes. All items were summed together to calculate the total score, the minimum score is 5 (no pruritus) and the maximum score is 25 (severe pruritus) (Elman et al., 2010). The Arabic version of 5-D itch scale was used for assessment for all patients.

3. **Dermatology Life Quality Index (DLQI):**
   - It is used for assessment of effect of pruritus on the quality of life. It consists of 10 items and covers six domains. Each item was scored from 0 "not relevant" to 3 "very much". The score of all items were summed giving the total score, the minimum score is 0 and the maximum score is 30. Higher scores means more impairment (Finlay and Khan, 1994, Lewis and Finlay, 2004.). The Arabic version of DLQI was used for assessment for all patients.

#### Treatment protocol

For performing NBUVB, (Waldmann (UV 7002), Schwenningen, Germany) equipped with (UVB: 21 lamps F79/120 W- TL 01) with a radiation spectrum of 311 nm to 313 nm was used. The minimal erythema dose (MED) was determined according to Fitzpatrick skin type for each patient. The starting doses were (150 mJ/cm² for skin type I-II and 200 mJ/cm² for skin type III-IV). The patients underwent NB-UVB sessions thrice weekly for 6 weeks. The dosage increased by 20% at every session if there was no erythema, edema and/or blister occurred immediately after the last treatment, and increased by 10% if there was barely perceptible short-lived erythema or aggravation of pruritus, and increased by 0% if there was definite pink erythema or pruritus intensification. Patients were placed in comfortable position and asked to wear protective goggles before entering the machine.

For performing TENS, (Myo 200 electrotherapy device; Gymna Uniphy, Bilzen, Belgium) was used. The electrodes were applied onto the most itchy skin lesion and to the same itchy lesion through the treatment sessions for every patient. A gel-based coupling agent was used for electrical impulse conduction. Elastic bandages were wrapped around filled the inclusion criteria and were initially randomized into two groups of equal number. Group A (NBUVB group): received ultraviolet phototherapy (NBUVB) 3 times per week for 6 weeks. Group B (TENS group): received TENS therapy 3 times per week for 6 weeks. A total of 30 subjects (11 male and 19 female) completed the study.

### Table 1: Basic characteristics of participants:

<table>
<thead>
<tr>
<th></th>
<th>NBUVB group</th>
<th>TENS group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>43.53 ± 6.53</td>
<td>43 ± 5.92</td>
<td>0.81</td>
</tr>
<tr>
<td>Duration of illness (month)</td>
<td>18.86 ± 2.77</td>
<td>18.06 ± 3.12</td>
<td>0.46</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6 (40%)</td>
<td>5 (33.3%)</td>
<td>0.7</td>
</tr>
<tr>
<td>Female</td>
<td>9 (60%)</td>
<td>10 (66.7%)</td>
<td></td>
</tr>
<tr>
<td>Affected areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>4 (26.7%)</td>
<td>3 (20%)</td>
<td>0.9</td>
</tr>
<tr>
<td>Back</td>
<td>6 (40%)</td>
<td>5 (33.3%)</td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td>3 (20%)</td>
<td>4 (26.7%)</td>
<td></td>
</tr>
<tr>
<td>Leg</td>
<td>2 (13.3%)</td>
<td>3 (20%)</td>
<td></td>
</tr>
<tr>
<td>Previous treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>10 (66.7%)</td>
<td>9 (60%)</td>
<td>0.7</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>5 (33.3%)</td>
<td>6 (40%)</td>
<td></td>
</tr>
</tbody>
</table>

x̄, Mean; SD, standard deviation; p-value, level of significance

### Subjects

Forty participants with LP were randomly selected from the Outpatient Clinic of Dermatology, Kasr Al Aini Hospital, Cairo University, Egypt, from January 2017 to January 2019. 36 subjects ful-
the areas to press the electrodes onto the skin to ensure perfect contact. TENS was used at a frequency 100 Hz, with the duration of each session being 30 minutes, administered on 3 days/week for 6 weeks. All patients were asked to report any adverse events associated with treatment as erythema, swelling, aggravation of pruritus, blisters or irritation in each visit.

### RESULTS

As shown in figure 1, 40 patients were selected for eligibility, and 36 subjects fulfilled the inclusion criteria and were initially randomized into two groups of equal number. A total of 30 subjects (11 male and 19 female) completed the study. Six patients did not complete the treatment and their data were not used in the statistical analysis.

#### Subject characteristics:

Table 1 showed the subjects' characteristics of the study groups. There was no significant difference between both groups in the mean age and duration of illness, the distribution of sex, affected areas and previous treatment between both groups (p > 0.05).

#### Effect of treatment on VAS, 5- D itch scale and DLQI:

Mixed MANOVA revealed that there was a significant interaction of treatment and time (Wilks Lambda = 0.19; F = 36.93 (3,26) p < 0.001). There was a significant main effect of time (Wilks Lambda = 0.01; F = 439.73 (3,26) p < 0.001). There was a significant main effect of treatment (Wilks Lambda = 0.53; F = 7.43 (3,26) p < 0.001). Table 2 showed descriptive statistics of VAS, 5- D itch scale and DLQI and the significant level of comparison between groups as well as significant level of comparison between pre and post treatment in each group.

#### Between groups comparison:

There was no significant difference in VAS, 5- D itch scale and DLQI between both groups (p > 0.05). Comparison between groups post treatment revealed a significant decrease in VAS, 5- D itch scale and DLQI of TENS group compared with that of NB-UVB group (p < 0.01).

#### Within group comparison:

There was a significant decrease in VAS, 5- D itch scale and DLQI post treatment in both groups compared with that pre treatment (p < 0.001). The percent of decrease of VAS, 5- D itch scale and DLQI in NB-UVB group were 50.93, 21.92 and 55.04% respectively and that in TENS group were 73.91, 53.06 and 73.11% respectively (Figure 2).

### DISCUSSION

Previous studies reported that NB-UVB was effective in the treatment of pruritus in patients with generalized LP. Also, several studies proved that TENS has antipruritic effect in generalized LP. But there was no previous study compared the effect of NB-UVB versus TENS on pruritus in patients with generalized LP. So, the aim of this randomized clinical trial was to compare antipruritic effect of NB-UVB versus TENS in patients with generalized LP. The results of this study revealed that there was a significant difference between NB-UVB and TENS groups post treatment in VAS, 5- D itch scale and DLQI and that TENS group revealed a significant decrease compared with that of NB-UVB group (p > 0.01). These results coincided with the findings of the previous studies that reported the effect of NB-UVB in pruritus in patients with LP.

(Tan and Taylor, 2002) were the first to assess the effect of NB-UVB therapy in 5 patients with LP after 40 sessions and a mean dose of 82.7 J/cm2, with minimum side effects. (Saricogu et al., 2003) proved that NB-UVB is an effective treatment alternative for unresponsive cases for conventional therapy. (Habib et al., 2005) proved that NB-UVB has a positive effect for treatment of widespread lichen planus in a retrospective study in 20 patients. NB-UVB was applied three times/ week. (Pavlotsky et al., 2008) reported that NB-UVB is generally safe and well tolerated. Also, it can be safely combined with topical corticosteroids or oral antihistamines. They suggested UVB as a preferable treatment of generalized LP. (Gamal et al., 2009) recorded reducing itching severity by decreasing score of VAS and reducing DLQI scores. Improving both cosmetic appearance and psychological functioning of patients. (Iraj et al., 2011) found that application of NB-UVB three times/week with a maximum dose of 9 J/cm2 for 6 weeks was more effective than systemic corticosteroids for the treatment of pruritus in patients with generalized LP. (Waked., 2012) compared the efficacy of NB-UVB (311-313 nm) and BBUVB (290-255 nm) on forty patients with generalized LP, three sessions weekly for 10 weeks with a total of 30 sessions. The results provide evidence that NB-UVB is superior to BBUVB in the efficacy of treatment of generalized LP patients. (Solak et al., 2015) evaluated the effect of NB-UVB on patients with generalized LP. They proved that NB-UVB does not have significant adverse events related to treatment in contrast to systemic drugs such as corticosteroids after prolonged use. A recent study by (Arumilli et al., 2018) observed a good response after 20-25 sessions, three times/week. They observed that pruritus reduced after approximately 10 sessions. They proved that NB-UVB therapy is effective for treatment of generalized LP in adults and children.

Also, the results of this study confirms the results of the previous studies that proved that TENS had an antipruritic effect and is considered a safe and effective treatment for patients with LP. The possible mechanism is a peripheral nociceptive effect of electrical current on itching and pain fibres. TENS at rates of 5-100 Hz produces analgesia that is not reversible by naloxone. Transmission of nociceptors are blocked by stimulation of large myelinated fibres at the level of the spinohilar tract cell bodies (Tinogate and Mclelland, 2002). TENS can produce neuro-modulation by three mechanisms: (I) presynaptic inhibition in the spinal cord (gate control theory); (II) endogenous pain control by releasing chemicals (endorphins, encephalins and dynorphins) (III) direct inhibition of abnormally firing nerves (IV) afferent input restoration (Wall, 1978). (Abdelhalim, 2014) proved that capsaicin phophoresis as well as TENS might prove to be useful modalities for the treatment of pruri-

### Table 2: Mean VAS, 5- D itch scale and DLQI pre and post treatment in NB-UVB and TENS groups:

<table>
<thead>
<tr>
<th></th>
<th>NB-UVB group</th>
<th>TENS group</th>
<th>Between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td></td>
<td>x ± SD</td>
<td>x ± SD</td>
<td>p value</td>
</tr>
<tr>
<td>VAS</td>
<td>6.93 ± 2.12</td>
<td>3.4 ± 0.82</td>
<td>0.001*</td>
</tr>
<tr>
<td>5- D itch scale</td>
<td>20.66 ± 2.71</td>
<td>16.13 ± 2.13</td>
<td>0.001*</td>
</tr>
<tr>
<td>DLQI</td>
<td>18.53 ± 4</td>
<td>8.33 ± 2.82</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

x, Mean; SD, standard deviation; p-value, level of significance; * Significant
tus in LSC with no significant difference between them. (Mourad et al., 2015) evaluated efficacy of TENS in chronic pruritus. They suggested TENS as an alternative treatment for chronic pruritus in patients who were unresponsive to long term treatment with other drugs. A recent study by (Waked et al., 2018) found that 74% of patients with LP having a response an improvement of > 50% in VAS scores, and 65% of patients had an improvement of > 50% in DLQI. They reported that TENS is a safe, suitable and effective modality for treatment of pruritus in LP in patients who were unresponsive to corticosteroids.

CONCLUSION

The results of this study revealed that both NBUVB and TENS are effective for treatment of pruritus but TENS has an antipruritic effect more than NBUVB in patients with LP.

ACKNOWLEDGEMENT

The author would like to thank all the physicians and patients participated in the study for their cooperation and patience to complete the study.

REFERENCES


