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Efficacy of low level laser therapy in the treatment of postherpetic neuralgia

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Abstract

Background: Postherpetic neuralgia (PHN) is the most common complication of herpes zoster (HZ) and defined as pain that persists for more than 90 days after the onset of HZ rash. The chronic pain of PHN is debilitating and often associated with significant morbidity. It is a neuropathic pain and manifests as allodynia, hyperalgesia, or spontaneous pain. Although it is not considered to be life-threatening, sometime HZ is inadequately treated and may result in more severe PHN. Various treatment protocols for PHN are available; however, the result remains unsatisfactorily. The use of low level laser therapy (LLLT) in pain management is relatively new and is used with increasing frequency in the management of chronic pain.

Aim: To assess the efficacy of low level laser therapy in the treatment of postherpetic neuralgia.

Methods: Articles were searched through Pubmed/ MEDLINE, Cochrane, and Google scholar. Two randomized-controlled trials by Kemmotsu et al. and Moore et al. were obtained and critically appraised.

Results: Based on the appraisal, studies by Kemmotsu et al. and Moore et al. are considered valid, important, and applicable. The results demonstrated a significant reduction in PHN intensity following a course of LLLT ($p < 0.05$).

Conclusion: There is a statistically significant difference between the involvement of LLLT in PHN patients and without involvement of LLLT. LLLT is a noninvasive, painless, and safe method of treatment and may be recommended as an early intervention for pain therapy of PHN.

Keywords: *low level laser therapy, herpes zoster, pain, postherpetic neuralgia, treatment*

Background

Herpes zoster, characterized by dermatomal pain and vesicular rash, results from the reactivation of varicella-zoster virus (VZV). The average lifetime risk of herpes zoster in developed countries is estimated to be approximately 30% and increases as life expectancy increases.¹

Postherpetic neuralgia (PHN) is the most common complication of herpes zoster. A standard definition of PHN is lacking, but it is often defined as pain that persists for ≥ 90 days after the onset of the rash.² PHN is estimated to occur in 8-27% people with herpes zoster and the risk increases markedly with age.¹ The chronic pain of PHN is debilitating and can persist for months or years.²

The lifetime risk of contracting herpes zoster is one in four, but this risk increases markedly after 50 years of age due to an age-related decline in VZV-specific cell-mediated immunity. PHN incidence also increases rapidly in individuals after the age of 60 years. About 10%-20% herpes zoster patients with age over 50 years old will develop PHN.²

Various treatments are available for PHN, some of them are anticonvulsants, tricyclic antidepressants, opioid, nerve block injection, and physiotherapy. However, no single treatment is completely effective in treating PHN. Low level laser therapy (LLLT) is a non-invasive, painless, light-based therapy. LLLT uses infrared to relieve inflammation process and to diminish pain in patients with PHN.³ New anecdotal reports have suggested that LLLT is effective in relieving various types of neuralgia and the use of LLLT for pain management is

increasing. This evidence-based case report aims to assess whether the involvement of LLLT will increase the PHN treatments' efficacy.

Case

A seventy-years-old woman came to our clinic with chief complaint of persistent pain on her chest which radiated to left part of her back since 4 months prior to admission. Four months prior to admission, she was diagnosed with herpes zoster on her left chest to the left side of her back. After completing treatment with antiviral, the dermatological lesions disappeared, however the pain persists. She complained disturbing pain which interfered her daily activities and sleeps.

On physical examination, patient was compos mentis, moderately ill with pain score assessed with visual analog scale (VAS).⁶ On dermatologic examination, we found multiple hyperpigmented macules on left side of the chest and back, with diffuse-to-circumscribed border, discrete, accompanied by pain on palpation. There were no abnormalities found on other parts of the body.

Patient was diagnosed with postherpetic neuralgia and treated with gabapentin. The starting dose of gabapentin was 100 mg on first day, titrated up to 300 mg 3 times daily in 2 weeks. LLLT was considered to increase treatment efficacy for the patient.

Clinical question

A clinical question was formed based on the case reported above:

In patients with postherpetic neuralgia, will involvement of low level laser therapy increase the treatment efficacy?

P: Patients with postherpetic neuralgia

I: LLLT

C: without LLLT

O: better treatment efficacy

Type of clinical question: therapy

Methods

Literature search was performed through Pubmed, Cochrane databases, and Google Scholar on January 14, 2015 using the keywords of 'adult', 'postherpetic neuralgia', and 'low level laser therapy' along with their synonyms and related terms.

Selection

We found a total of 126 articles from the literature search. The first step of selection is done by screening titles or abstracts, eliminating double publications. The remaining articles were reviewed using our inclusion criteria, which included suitability to the clinical question and availability of full text versions of the articles. Figure 1 shows selected strategies with the final results were two selected articles that suited the clinical question of this evidence-based case report (EBCR).

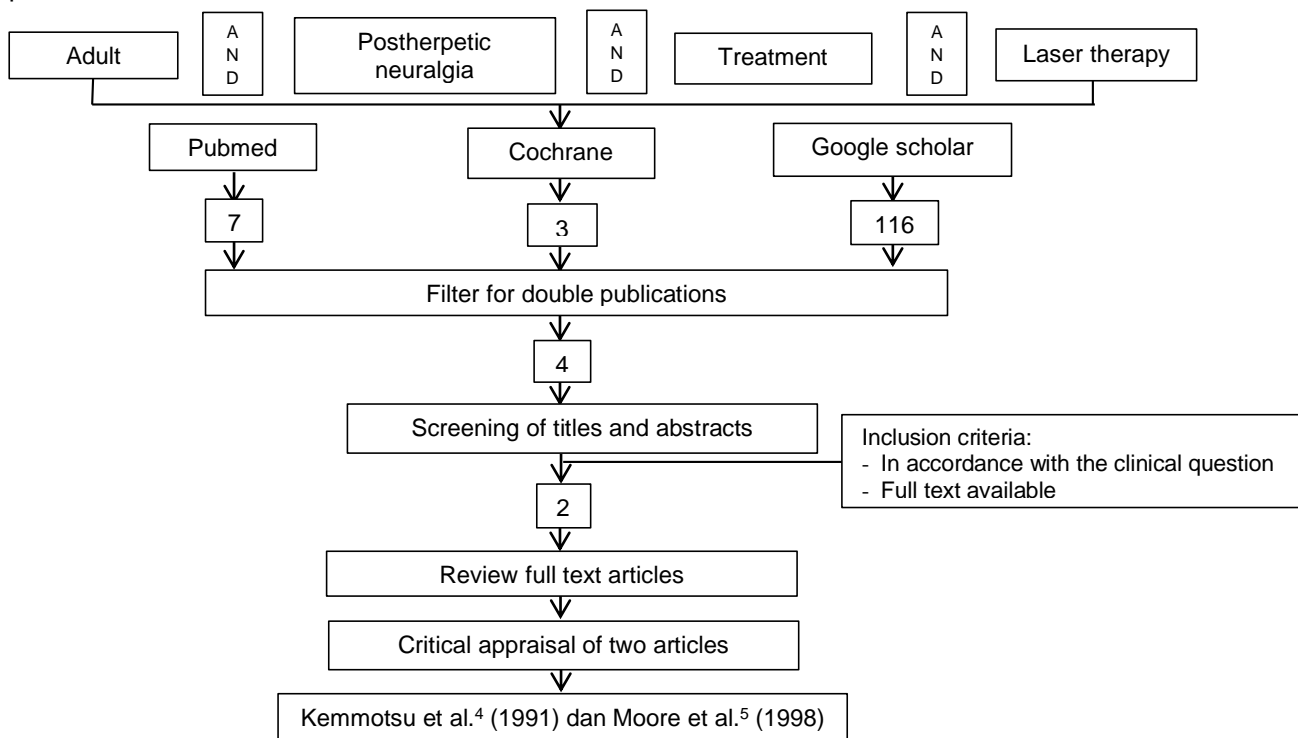


Figure 1. Literature Searching Strategy

Critical Appraisal

Two relevant articles by Kemmotsu et al. and Moore et al. were reviewed by authors according to

validity, importance, and applicability criteria (table 1, 2, 3).

Table 1. Are the results of this single preventive or therapeutic trial valid?

	Kemmotsu et al.	Moore et al.
Was the assignment of patients to treatments randomised?	Yes	Yes
Was the randomisation list concealed?	No	No
Was follow-up of patients sufficiently long and complete?	Yes	Yes
Were all patients analysed in the groups to which they were randomised?	Yes	Yes
Were patients and clinicians kept "blind" to treatment?	Yes	Yes
Were the groups treated equally, apart from the experimental treatment?	Yes	Yes
Were the groups similar at the start of the trial?	Yes	Yes

Table 2. Are the valid results of this randomised trial important?

	Pain score (0-10)		p value
	Group I (intervention)	Group II (control)	
Kemmotsu et al.	4.0 ± 2.1	8.5 ± 1.6	< 0.05
Moore et al.	2.1 ± 0.876	9.3 ± 0.675	0.01

Level of Evidence: 1b*

*Based on The Oxford Centre of Evidence-based Level of Evidence

Table 3. Can you apply this valid, important evidence about therapy in caring for your patient?

	Kemmotsu et al.	Moore et al.
Do these results apply to your patient?		
Is your patient so different from those in the study that its results cannot apply?	No	No
Is the treatment feasible in your setting?	Yes	Yes
What are your patient's potential benefits and harms from the therapy?		
Benefits:		
- Improvement from the suffering chronic pain		
- Holistic approach in the treatment		
- Sufficient follow-up in measuring patients' long term outcome		
Harms:		
- Accidental irradiation, but the laser itself has power density well below that necessary to cause a photothermal effect. Moreover, the laser uses a probe which is activated with skin contact, thus minimizing the possible harm even more.		
Are your patient's values and preferences satisfied by the regimen and its consequences?		
Do your patient and you have a clear assessment of their values and preferences?	Yes	Yes
Are they met by this regimen and its consequences?	Yes	Yes

Level of Evidence: 1b*

*Based on The Oxford Centre of Evidence-based Level of Evidence

Results

We found two double-blind randomized controlled trial from our literature search. In study by Kemmotsu et al., 12 subjects with more than 1 year PHN were divided into 2 groups. One group received 1 session of laser treatment and the other group (control group) received 1 placebo session. In the group receiving laser treatment, pain score dramatically decreased from 10 to 4.0 ± 2.1 ($p < 0.05$), while in the control group, no significant difference was reported and the pain score only decreased from 10 to 8.5 ± 1.6 ($p > 0.05$).

The second study was conducted by Moore et al. in 20 subjects with PHN. The mean duration of PHN was slightly longer, 2.5 years. Subjects were then divided into 2 groups. Each group received 4 treatment sessions. The first group received 4 laser treatment sessions, while the other group received placebo treatment. In treatment group, pain score reduced from 10 to 2.1 ± 0.876 ($p = 0.01$). In placebo group, pain score reduced slightly to 9.3 ± 0.675 ($p = 0.01$). The results of this study were statistically significant, as well as the study by Kemmotsu et al.

Discussion

Two articles were appraised from the performed literature search according to the clinical question. These studies were double-blind randomized controlled trials, so that the bias can be controlled and minimized.

The subject of both studies was elderly with postherpetic neuralgia. From 63 patients recruited, 38 were female patients (Kemmotsu et al.). In study by Moore et al., 9 out of 20 patients were female patients. The mean age of the subject was 69 ± 13 years old (Kemmotsu et al.) and 69 years old (Moore et al.). This was in accordance with our patient, who was a 70-year-old woman. Several factors were thought to contribute in increasing risk of PHN in elderly, some of them are: elderly have bigger nerve fibers; decreasing immunity may cause elderly become more susceptible to herpes zoster infection; and varicella-zoster virus, which attacks the nerves, causes an imbalance proportion of damaged nerves and healthy nerves.⁶

Lasers utilized in both studies were Oh-Lase 3DI (Japan Medical Laser Laboratory, Tokyo, Japan) gallium aluminum arsenide (GaAlAs) diode laser with 60 mW on 830nm output which was considered to be safe. The use of the lasers were accordingly to the procedure of GaAlAs lasers, which belonged to class IIIB lasers.⁷

The inflammatory response of acute herpes zoster triggers a sympathetic stimulation that causes decreased blood flow in the intraneural capillary plate, leading to ischemia. When ischemia prolongs, there is a possibility of damage to the endothelial nerve capillaries leading to leakage and formation of neural edema. If it is not treated properly, ischemia may lead to progressive deterioration that may end up as irreversible neurological death.⁶ LLLT reduces pain in NPH by increasing blood flow, decreasing the production of pain-causing cytokines such as bradykinin, increasing the threshold of excitatory pain, stimulating the formation and release of endogenous opioids, and normalizing immune activity. When LLLT is given early enough, perhaps within 2 months after herpes zoster infection, intraneural blood flow can be restored, also neurological death and progression to PHN can be prevented.⁶

Results from both studies showed that laser therapy reduced the pain score significantly. Study by Kemmotsu et al. showed decreased pain score by $\pm 60\%$ ($p < 0.05$). Study by Moore et al. showed even lower decrease of pain score, which is $\pm 80\%$ ($p = 0.01$). From the results of these studies, the involvement of LLLT with GaAlAs diode is considered effective in overcoming pain in PHN and is a noninvasive, painless, safe, and recommended method of early intervention for PHN.

Based on the critical appraisal performed, in terms of applicability, this study can be applied to our patient because the characteristics are almost similar. Both studies also meet in terms of validity and importance. There are, however, some shortcomings, such as unrestricted year of in literature search due to the limited availability of the journal. Thus, the results of this study may be less appropriate with current conditions.

Conclusion

Based on the critical appraisal performed, in terms of applicability, this study can be applied to our patient because the characteristics are almost similar. Both studies also meet in terms of validity and importance. The involvement of LLLT is proven to have better efficacy in reducing pain in PHN. LLLT is a non-invasive, painless, safe treatment method and recommended for PHN.

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