Favorable Outcome Of Cervical Radiculopathy Patients Treated With Low-Level Laser Therapy

D Ip

Citation

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Abstract

Introduction: This paper reports on the medium-term mean 2-year prospective follow-up of a patient cohort of 33 unselected patients with mean age of 46 years who visited our tertiary referral pain center for painful cervical radiculopathy refractory to not less than 6 weeks of conventional physical therapy with a view for treatment with low-level laser therapy (LLLT) as a possible alternative to operative intervention.

Materials and methods: All patients in this prospective cohort study had documentation of the diagnosis by magnetic resonance imaging documenting one level inter-vertebral disc prolapse before study entry and all had failed to respond to a combination of conventional physical therapy and nonsteroidal anti-inflammatory medications for not fewer than 6 weeks. LLLT, at a wavelength of 810 nm emitted from a GaAlAs semiconductor laser device with 5.4 J per point and a power density of 20 mW/cm2, was employed to irradiate not only the axial cervical spine, but also the relevant dermatome via the use of scanning mode for the whole affected dermatome. The treatment regimen consisted of three sessions of treatment per week for 12 consecutive weeks. Each treatment session lasted 540 seconds, with 180 seconds for irradiation of the axial skeleton and 360 seconds for the affected dermatome. Serial clinical assessment was undertaken using the Visual Analogue Score (VAS) for pain. Treatment failure being defined as break-through pain which necessitated operative intervention or the need for surgery within 2 years.

Results: A total of 33 cervical radiculopathy patients with one level disc prolapse with nerve root impingement were treated, with 2.1 years mean follow up. All subjects showed significant improvement in VAS pain score at the end of 12-weeks' LLLT treatment and the improvement was maintained at follow-up assessments at 1-year mark and 2-year mark. None of the subjects required operative intervention at the 2-year mark. The results achieved statistical significance as the null hypothesis was rejected.

INTRODUCTION

The use of low-level laser therapy (LLLT) in the management of deep-seated structures such as Sciatica patients from single-level PID was previously reported by the author in this journal (1). As high-lighted previously by the author in published journals, LLLT is a form of non-invasive physical therapy treatment modality that have bio-modulation action as well as anti-inflammatory actions; unlike conventional physical therapy machines such as ultrasound, trans-cutaneous electrical stimulation and so forth which neither have anti-inflammatory action nor bio-modulation actions on body cells. As shown by Chow et al (2) the pain-relieving function of LLLT not only stems from its anti-inflammatory actions, but also, by dint of its action on peripheral nerves.

This forms the rationale of the author adding a scanning mode of LLLT to the whole affected dermatome of painful sciatica patients as well as the path of the affected nerve root near the axial skeleton. The reader can find the relevant basic science studies on the subject of sciatica in the recent book written by the author (3). But unlike the study published by Chow et al, all subjects in this study did have MRI documented disc prolapse.

MATERIALS & METHODS

The study spanned from 2015 to 2019. The study population consisted of a prospective cohort of consecutive unselected 33 patients with mean age of 46 (range: 32–51) years being

referred to our tertiary referral pain center previously having failed response to a combination of nonsteroidal anti-inflammatory medications and not fewer than 6 weeks of conventional physical therapy. Magnetic resonance imaging was performed in each patient prior to entry to the study to confirm single-level inter-vertebral disc prolapse with nerve root impingement. Exclusion criteria included patients with more than one level of inter-vertebral disc prolapse; patients who had concomitant other spinal pathologies on magnetic resonance imaging such as congenital narrowing of spinal canal; patients with prior spine operations; and patients who had potential contraindications for the use of laser treatment, such as previous history of tumor or ongoing sepsis. We also excluded patients with previous neuromuscular conditions of the affected lower extremity. All patients signed informed consent detailing that they would be treated by LLLT and that only US Food and Drug Administration-approved devices would be employed. All subjects in this study suffer neck injury after road traffic accidents.

All patients received 3 treatment sessions per week for 12 consecutive weeks. Each treatment session consisted of 2 parts. Part 1 involve LLLT irradiation along the nerve root exit from the axial skeleton using the scanning mode., Part 2 involved LLLT irradiation of the surface dermatome of the affected nerve root, No separate irradiation of acupuncture points was performed in this study, unlike our previous study on the use of LLLT in painful sciatica due to inter-vertebral disc prolapse. C4/5 was the level of the spine affected in 30 subjects, the remaining 3 patients had C5/6 PID.

RESULTS

The male:female ratio of the study population was 2:1 with mean age of 46 (range: 32 to 51 years of age). The mean VAS pain score at study entry was 8 out of 10 (range: 7-9 out of 10), all were suggested to undergo operative intervention after failed conventional physical therapy plus analgesic medications by orthopedic surgeons. The mean VAS pain score upon completion of the study at the 12-week mark was 2 out of 10 (range 0 to 3 out of 10). All 33 subjects had good clinical response in terms of pain relief and all were satisfied with the procedure. As none of the subjects agreed to a sham light source as control, a placebo group cannot be arranged in the current scenario. Upon completion of the treatment, each subject was followed up on monthly basis either in the clinic or via telephone interview. At the one-year mark, the mean VAS pain score was still 2 out of 10 (range 0 to 3 out of 10), and the status was maintained during follow up in the 2-year mark. Analysis of the results using statistical methods showed statistical significance at ($p < 0.5$) and the null hypothesis was rejected.

DISCUSSION

The mechanism of pain relief by LLLT is manifold. Firstly, researchers found LLLT mimic the effect of anti-inflammatory medications by inhibition of cyclooxygenase 2 as reported by Sakurai (4). Other workers like Yamamoto have suggested possible role of an increase in endorphin production (5). What is more important in the present context is the possible role of LLLT in increasing the nociceptive threshold resulting in neural blockade, to be more specific: an inhibition of the A and C neural fibres (6). This inhibition can also be brought about by altering axonal flow (3) or via the inhibition of neural enzymes (6). Besides concomitant bio-modulation effects, LLLT can also increase the local blood flow via nitric oxide pathway (7, 8).

The current study represents the first study detailing the extremely high success rate of conservative treatment of painful cervical radiculopathy conditions arising from documented single level cervical PID managed by LLLT. It revealed that LLLT treatment alone of the axial skeleton and the relevant dermatome in the absence of irradiating acupuncture points is already conductive of an extremely favorable clinical outcome. There is in fact no need to resort to irradiation of acupuncture points.

CONCLUSION

The current prospective study showed an extremely high success rate of conservative treatment of painful cervical radiculopathy patients arising from a single level of inter-vertebral disc prolapse documented by magnetic resonance imaging, in that none of the patient required operative intervention. It further shows that there is in fact no need to irradiate the acupuncture points to obtain the extremely favorable clinical result. Further studies are worthwhile in assessing the clinical efficacy of LLLT in elderly subjects suffering from cervical radiculopathy due to degenerative spine in the elderly population.

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Author Information

David Ip
Wellness Pain Centre
Hong Kong