

# Do Sciatica Patients Suffering From Single-Level Inter-Vertebral Disc Prolapse (PID) Require Operative Intervention?

D Ip

## Citation

D Ip. *Do Sciatica Patients Suffering From Single-Level Inter-Vertebral Disc Prolapse (PID) Require Operative Intervention?*. The Internet Journal of Orthopedic Surgery. 2018 Volume 26 Number 1.

DOI: [10.5580/IJOS.52897](https://doi.org/10.5580/IJOS.52897)

## Abstract

This paper reports on the medium-term mean 2-year prospective follow-up of a patient cohort of 50 unselected patients with mean age of 55 years who visited our tertiary referral pain center for painful sciatica refractory to not less than 8 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 8 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/cm<sup>2</sup>, was employed to irradiate not only the relevant acupuncture points, but also 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 180 seconds for the affected dermatome. An additional 180 seconds will be used to irradiate the relevant acupuncture points. 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 50 sciatica patients with one level disc prolapse with nerve root impingement were treated, with 2.2 years mean follow up. With the exception of one patient who defaulted after one week of therapy, all subjects showed significant improvement in VAS pain score at the end of 12-weeks' LLLT treatment and, surprisingly, the improvement was found 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 bony fractures with delayed union had previously been reported by the author in this journal (1). As highlighted 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, besides irradiation of the relevant acupuncture points. The reader can find the relevant basic science studies on the subject of sciatica in the recently published book chapter written by the author (3).

## MATERIALS & METHODS

The study spanned from 2014 to 2017. The study population consisted of a prospective cohort of consecutive unselected

50 patients with mean age of 55 (range: 43–61) 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 8 weeks of conventional physical therapy and originally scheduled for operative intervention. 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, such as a previous cerebrovascular accident. 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 used.

All patients received 3 treatment sessions per week for 12 consecutive weeks. Each treatment session consisted of 3 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, Part 3 involved irradiation of relevant acupuncture points using approved pointer-pulse devices (Fig 1). For example, for L4/5 inter-vertebral disc prolapse (PID) the acupuncture points irradiated include: BL 25, BL 26, ST 40, BL 58, GB 35, ST 42, and LR3. And, for the case of L5/S1 PID, the relevant irradiated acupuncture points include: BL 26, BL 27, BL 31, BL 59, BL 60, and GB 41.

## RESULTS

The male:female ratio of the study population was 2:3 with mean age of 55 (range: 43 to 61 years of age). The mean VAS pain score at study entry was 7 out of 10 (range: 6-9 out of 10), all were initially scheduled to undergo operative intervention after failed conventional physical therapy plus analgesic medications. 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). Apart from one patient who defaulted follow up after 1-week treatment; all the remaining 49 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 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 sciatica conditions arising from single level PID. It represents a combined approach of both high technology western medicine in the form of LLLT plus the benefit received from traditional Chinese medicine – in this case we did not resort to the use of needles, but simply irradiate the relevant acupuncture points.

## CONCLUSION

The current prospective study showed an extremely high success rate of conservative treatment of painful sciatica 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. Further studies are worthwhile in assessing the clinical efficacy of LLLT in elderly subjects suffering from sciatica due to multiple etiology.

## References

1. Ip D (2017) Use of low-level laser therapy in conservative treatment of delayed union of human upper and lower limb fractures IJOS Vol 25 Number 1
2. Chow RT et al (2007) 830 nm laser irradiation induces varicosity formation, reduces mitochondrial membrane

potential and blocks fast axonal flow in small and medium diameter rat dorsal root ganglion neurons J Peripher Nerv Syst 12, 28-39

3. Ip D (2016) Use of low-level laser in Orthopedics Lap Lambert Academic Publishing Germany

4. Sakurai Y et al (2000) Inhibitory effect of low-level laser irradiation on LPS-stimulated prostaglandin E2 production and cyclooxygenase 2 in human gingival fibroblasts Eur J Oral Sci 108, 29-34

5. Yamamoto H et al (1988) Antinociceptive effect of laser irradiation on Hoku points in rats Pain Clin 8, 43-48

6. Kudoh C et al (1989) Effects of 830 nm gallium

aluminium arsenide diode laser radiation on rat saphenous nerve sodium-potassium-adenosine triphosphate activity: a possible pain attenuation mechanism explained Laser Surg 1, 63-67

7. Cidral-Filho FJ et al (2014) Light emitting diode therapy induces analgesia in a mouse model of postoperative pain through activation of peripheral opioid receptors and the L-arginine/nitric oxide pathway Lasers Med Sci 29, 695-702

8. Mitchell UH et al (2013) Low-level laser treatment with near infra-red light increases venous nitric oxide levels acutely Am J Phys Med Rehab 92, 151-156

**Author Information**

**David Ip**

Digital Healthcare Pain Centre

Hong Kong