Original Article

The effect of low power LASER acupuncture on experimental pain threshold in normal subjects

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Abstract

Background: Acupuncture is an indispensable part of traditional Chinese medicine for relief of pain. *The purpose of this study was the immediate & latent of low power LASER Ga-Al-As irradiation applied to acupuncture points on experimental pain threshold.*

Methods: *This quasi-experimental study was conducted on seventy adult women ranging from 20 to 40 years old assigned randomly into two groups. LASER group (n=33) received low power Laser (LPL) Ga-Al-As to appropriate acupuncture points for wrist pain, control group (n=37) did not receive laser. This was a single blind research. We measured experimentally the induced pain threshold at ipsilateral nondominant wrist following electrical stimulus, once before treatment and three times after treatment with short intervals.*

Results: *The LASER group demonstrated a statistically significant (p=0.001) increase in mean value for pain threshold in 10 minutes after treatment, but not the control group. Also, changes of pain threshold in LASER group were greater than the control. This increase remained significant only for 10 minutes after treatment measurements (p=0.001).*

Conclusion: *Low power LASER Ga-Al-As radiation to acupuncture points can increase experimentally induced pain threshold.*

Key words: *Pain threshold, LASER, Experimental pain, Acupuncture.*

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Acupuncture is an indispensable part of traditional Chinese medicine and has four thousand years history. It continued to be used extensively in clinical practice.Acupuncture treatment is applicable to the treatment of musculoskeletal and soft tissue conditions, where it is particularly effective. Many of these conditions can not be satisfactorily treated by drugs due to the large number of side effects and the high cost of treatment. Its value in the management of pain has become widely accepted and it is presently offered as a powerful and effective therapy (1).

The commonest alternative related to the techniques in the points include the use of electric currents, particularly tens and low energy LASER (2,3). LASER acupuncture offers distinct advantages over traditional needling, because the procedure is noninvasive, painless and free infectious complication. Consequently, it is more appealing to the patients. Also, it can be useful in shortening the time required to the resume routine work of the patient as well as when it is combined with other therapeutic modalities (2,4,5).

LASER acupuncture treatment is inexpensive, highly effective and has no side effects (4). The purpose of this study was the immediate & latent effect of low power LASER Ga-Al-As irradiation applied to acupuncture points on experimental pain threshold.

Method

This study design was quasi-experimental and was conducted on 70 women between 20-40 years old. The persons were announced healthy with regard to their neurological and orthopedic problems and pain free. They did not have psychological reaction to electric stimuli and all of the participants were given written informed consent.

Due to the limitation of subject selection, it was done in a nonrandom and the volunteers were selected for the study randomized into two groups using low power LASER and placebo (LASER was off) in acupuncture points of the wrist pain respectively. This study was single blind and was conducted without the subjects' awareness of the possible results. The instruments used in this study consisted of:

1- Electrical stimulation, dynatron 438 by Enraf company,Holand, which produced a monophase square wave with a duration of 5 ms and intervals of 500 ms and with frequency of 100 HZ. The active electrode was a 2mm diameter pen electrode that created acute pain in ipsilateral nondominant wrist (fig1).

Fig1. location of stimulating electrode-distal end of left radius in this study.

The inactive electrode was a carbonized silicon electrode of 6×8 cm size placed on 7th cervical vertebra. This examination is done four times, once before and three times (immediately, 5 to 10 minutes) after laser radiation.8

At first, detectable sensation threshold as well as pain threshold were determined. Through this method – limits technique, the current was increased from zero to a constant rate (approximately 1.5 mA/s) until a light pin-prink (sensation threshold) was perceived. Stimulus was then immediately turned off, and the procedure was repeated three times. The average of three current levels was taken as the true sensory threshold in the distal end radius. For pain threshold, the same process was repeated, but the intensity was increased in 0.3mA steps until the first pain (pain threshold) was perceived.

2– Gallium-Alluminium - Arsenide Laser (Endo LASER 476 by Enraf Company, Holand) which produced continuous radiation with wave length of 780 nm. The output of 5 mw and 0.3 j/point energy, radiation technique was direct contact. Laser radiated on L.I.4 (Hegu) and L.I.5 (Yangxi) points have been determined before and (fig 2,3) (6).

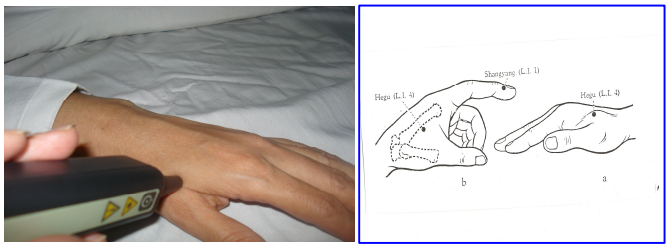

Fig 2. Location of acupuncture point L.I.4 (hegu) on the large intestine channel in this study.

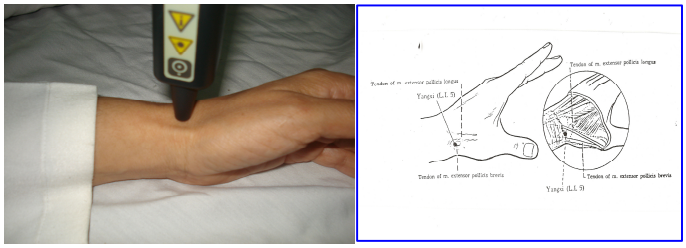

Fig 3. Location of acupuncture point L.I.5 (yangxi) on the large intestine channel in this study.

The time intervals were also checked for the control group. The statistical package for the social sciences (SPSS) was used for the analysis.

Results

Seventy five subjects were selected as normal volunteers, but 5 cases were excluded because they had psychological reaction to electrical stimulation. In the laser group, one way variance analysis showed an increasing trend in pain threshold, especially 10 minutes after laser irradiation ($p=0.001$). No significant changes were detected in pain threshold at various time intervals in controls. Tables 1 shows pain threshold at various time intervals in laser irradiated and controls.

Table1. Pain threshold (mA) in controls and laser group

Time Group	Before treatment	Immediately after treatment	5 minutes after treatment	10minutes after treatment
Controls	3.58±1.17	3.54±1.13	3.49±1.15	3.48±1.08
Laser	3.34±1.22	3.46±1.28	3.87±1.37	4.52±1.41

Also Independent T-test showed a significant difference in pain threshold between laser and control 10 minutes after irradiation (p=0.001) (Fig 4).

Fig 4. Comparison between pain threshold trends in laser and controls

Discussion

There were significant changes in pain threshold 10 minutes after radiation, which may be due to the relieving effect of acupuncture points and LASER together. The Laser did not only give the acupuncture effect, but also had its own direct analgesic effect on the tissues (7).

The low power LASER has a photochemical (not thermal) effect on the cells. The light energy is absorbed by the cell and converted to chemical energy. Cell function improves, allowing healing to take place. Enzymes such as endorphins and serotonin are released to give pain relief (11). Laser energy transfering all through out the meredian and lateral channels thus creating analgesic effect (8). Also, it increases never ending threshold (7, 9).

The therapeutic effect of L.P.L is not fully understood but King et al. demonstrated that Helium- neon laser radiation on auricular acupuncture points elevates the pain threshold by raising the level of endorphins in the brain (9). Stimulation of acupuncture points can raise the endorphin level in the brain (10), and can lead to an increase in the activity of the opiodergic system, including panopoid activity and beta endorphin levels in plasma (10,11).

Our study involved body points stimulation only, combining ear and body points stimulation has been suggested an effective pain relief method (12, 13). Kleinkort and Foley reported decreased pain and other positive healing outcomes in patient with chronic pain using laser stimulation of combined ear and body points (12).

We found comparable results with King et al.(8). Although they used continuous Helium- neon laser on auricular points and detected immediate change in pain threshold, this was may be due to LASER type used. Ga Al As lasers maybe is more effective for analgesic effects in the deep and superficial tissue, respectively (14-16). Also treatment parameters, numbers and kind of points received laser radiation.

Walker stimulated the skin overlying peripheral nerves for 20 seconds to each site, accompanied by skin stimulation over painful facial area for 30 to 90 seconds. We stimulated only two points associated with analgesia of the wrist,1 and each point was stimulated for 60 seconds, which was appropriate in the study. Increased stimulation time or additive effects of Laser treatment , an optimal stimulation time would need to be determined by such factors as rational for treatment and intended physiological response (eg,pain relief,wound healing) (17).

In this study, we have focused on the effect Ga Al As LASER in healthy individuals (pain free) on experimental pain. Due to the many variables involved in pain and lack of visible objective findings there is the effect of many cultural and psychological factors on pain expression (18). Evaluation of pain in real context is not a practical way. Therefore, experimental pain stimuli was used in this study (19). Seibert and Gould found significant experimental pain threshold increase at the left fifth distal phalanx after helium-neon stimulation, but pain threshold in their study was recorded as a burning pain sensation and measured in number of seconds for the sensation to occur (20). However, it opposed to our use of a painful pin-prink sensation and the measured current intensity.

In the control group, in all time test, no increase was detected in pain threshold. Even the small decrease occurred in this group, the repetition of stimuli resulted in the increase of perception which might be due to hypersensitization of peripheral pain receptors or in upper nervous levels. Since no significant changes were noticed in pain threshold before and

after the placebo radiation, then this could be described that in the control group there was not instructional effect (19). Low power Ga-Al-As LASER radiation to acupuncture points can increase experimentally induced pain threshold.

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