We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

4,800
Open access books available

122,000
International authors and editors

135M
Downloads

Our authors are among the

154
Countries delivered to

TOP 1%
most cited scientists

12.2%
Contributors from top 500 universities

CLARIVATE ANALYTICS BOOK CITATION INDEX INDEXED

WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

Chapter 3

Managing Pain with Laser Acupuncture

Szu-Ying Wu, Chun-En Kuo, Yu-Chiang Hung and Wen-Long Hu

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/62863

Abstract

According to the theory of traditional Chinese medicine, Qi flows through the body along specific paths known as meridians. Any disturbance in Qi evokes a Ying–Yang imbalance in the body, and consequently leads to disease. Pain results from blood stasis and Qi stagnation. Laser acupuncture (LA), first introduced clinically in the 1970s, combines the advantages of traditional acupuncture and modern laser medicine and has been applied for the treatment of various diseases. Here, we investigated studies on the use of LA for pain management according to current evidence. Articles including English keywords related to the use of LA for pain, published between January 2006 and August 2015 were sourced from PubMed, Medline, and Cochrane Library databases. On the basis of these papers, we explored the modern applications, mechanisms, and analgesic effects of LA. LA integrates the positive effects of acupuncture and low-level laser therapy, and is therefore effective in activating blood and in moving Qi. LA relieves pain through both anti-inflammatory and analgesic effects. No adverse effects or complications resulting from LA were reported in the literature. In the hands of an experienced physician, LA can be a useful and safe method for pain management.

Keywords: laser acupuncture, low-level laser therapy, acupuncture, pain, traditional Chinese medicine

1. Introduction

Although written accounts of acupuncture date back over 2000 years, archaeological evidence suggests more than 3000 years of practice. According to the principles of traditional Chinese medicine (TCM), energy (or Qi) flows through the body along specific paths known as meridians. Balanced Qi contributes to the maintenance of good health. On the other hand, any

disturbance in Qi results in an energy imbalance in the body. This imbalance, either an excess or a deficiency, may then result in disease [1]. Both blood stasis and Qi stagnation will lead to pain [2]. In 1996, the World Health Organization (WHO) confirmed 64 indications for acupuncture treatment. Acupuncture treats the underlying diseases by stimulating specific acupuncture points along the meridians. Acupuncture is one of the most common types of alternative treatments for patients who suffer from long-term pain. Moreover, it is a relatively safe procedure with minimal adverse effects [3]. Even though acupuncture has been proven to be effective for many therapeutic applications, metal needling is not widely accepted owing to fear of possible contamination or transcutaneous lesions [4]. Consequently, following the theory of TCM, the use of low-level laser on acupuncture points has been developed as a new therapeutic approach called laser acupuncture (LA) [5, 6].

LA was first introduced clinically in the 1970s [7]. It has been widely studied over several years to turn it into an evidence-based clinical practice. The use of low-intensity and nonthermal laser irradiation stimulation of acupuncture points is an effective alternative to traditional metal needling; it is a safe technique because it is noninvasive and is acceptable to needle-phobic persons. Thus, LA can be used at acupuncture points that require complicated applications of needles [1, 8]. The laser beam is an electromagnetic wave and can stimulate acupuncture points in the human body by depositing energy without causing heating. In contrast to needling, acupuncture points irradiated by a laser beam need to receive sufficient energy to induce a physiological effect at the cellular level based on the principle of "photobiomodulation." The beam excites the relevant channels and activities, regulates the function of organs, and promotes metabolism. Recently, several papers have reported that the decisive factor in the efficacy of LA is the applied dosage [5, 9–11].

Although the mechanisms underlying LA are not well understood, LA is widely applied clinically. LA is also referred to as low-level laser therapy (LLLT), with 0.1–0.5 J/cm^2 deposited per acupuncture point, or 1–4 J/cm^2 per Ashi point [12]. LLLT has an anti-inflammatory function because it can reduce the levels of certain biochemical factors (prostaglandin E2, messenger ribonucleic acid cyclooxygenase-2, interleukin (IL)-1β, and tumor necrosis factor (TNF)-α), neutrophil influx, oxidative stress, edema, and hemorrhaging [13]. Analgesia induced by laser phototherapy is mediated by peripheral opioid receptors [14]. Nevertheless, LA has both local and distant analgesic effects, which may be mediated by different mechanisms. LA combines the advantages of traditional metal-needle acupuncture and LLLT. This chapter on managing pain by LA focuses on how LA may be an alternative method of relieving pain and improving functional outcomes.

2. Review of the clinical literature

Clinical literature in electronic databases—PubMed, Medline, and Cochrane library—was surveyed using the terms "laser acupuncture", "low level laser therapy", and "pain", published from January 2006 to August 2015. All papers had to meet the following criteria: randomized controlled trials (RCTs) that considered a control group (either placebo, sham LA,

nonstandard traditional acupuncture, or other therapeutic equipment) and retrospective/prospective clinical studies in which LA/LLLT was used. Studies cited in review articles were also included. Papers published in languages other than English were excluded. Conference abstracts, single-case studies, and paper for which full text was not available were also excluded.

Among the reviewed literature, most studies targeted myofascial pain, fibromyalgia, tendinopathy, radiculopathy, osteoarthritis (OA), low back pain, temporomandibular joint dysfunction (TMD), and headache. These are discussed below.

2.1. Myofascial pain

Kiralp et al. [15] reported a RCT in which 43 patients with myofascial pain were enrolled, and showed the positive effect of LA as compared to prilocaine injection. Eight other RCTs also showed the pain-relieving effect of LA; some of these focused on myofascial pain over the cervical region [16, 17], masseter [18], masticatory muscles [19, 20], trapezius [21, 22], or trigger points [23]. The consistency of these trials highlighted the efficacy of LA in the treatment of myofascial pain.

2.2. Fibromyalgia

Two RCTs showed different results for LA treatment of fibromyalgia [24, 25]. Both of these studies obtained subjective pain presentation using a visual analog scale (VAS), the Fibromyalgia Impact Questionnaire (FIQ), and other measures. Armagan et al. [24] reported positive results of LA for treating the pain of fibromyalgia. The difference between these studies was the dose and power density. Armagan et al. set the parameters of LA to 830 nm, 2 J/point, and 50 mW. These results suggested that the treatment effect of LA was inconclusive in fibromyalgia or that the power density used should be sufficiently high to manage the pain in this disease group.

2.3. Tendinopathy

Two RCTs showed positive results of LA in pain management of lateral epicondylitis (LE) [26, 27], also known as tennis elbow. Emanet et al. [27] reported that even though LA had no short-term advantage over the placebo in patients with LE, there was a significant long-term improvement, especially in functional parameters. Another RCT reported that LA had a treatment effect equal to that of ultrasound [28]. Moreover, a systemic review revealed that applying LLLT to myofascial trigger points of LE patients was an effective treatment for pain reduction and also led to increase in grip force, range of motion (ROM), and weight test [9]. As for tendomyopathy of the masticatory musculature, the pilot study showed inconclusive results because there were few participants [19].

2.4. Radiculopathy

Konstantinovic et al. [29] performed an RCT that enrolled 60 patients with acute neck pain with cervical radiculopathy. After a 3-week LA treatment, VAS, neck movement, neck

disability index, and quality of life indicated the positive effect of LA. Radiculopathy of other spinal segments was not reported.

2.5. Osteoarthritis

Among the four RCTs on the use of LA in treating the pain of knee OA, two showed a positive result [30, 31], one was inconclusive [32], and the other one reported efficacy after 2 weeks of treatment but not at the 4-week assessment [33]. However, the RCT showed the inconclusive result for only one point, ST35. An inappropriate dose or insufficient irradiation at a point may be the reason for the poor treatment effect.

2.6. Low back pain

Glazov et al. [34] had reported negative result for the use of LA to relieve low back pain in their study, in which LA was applied to local points of three meridians (Bladder, Gallbladder, and Governor vessel) and Ashi points. Subsequently, Glazov [35] reported another RCT, in which 100 patients with low back pain were enrolled, and found a positive result for pain management with LA. However, the parameter settings used for the second RCT were not described. Therefore, we were not able to determine the differences that contributed to the successful treatment. Nevertheless, further two RCTs showed a positive response for low back pain treated with LA [36, 37].

2.7 Temporomandibular joint disorder

In our literature search, all four RCTs suggested a positive treatment effect for LA in treating the pain associated with TMD [4, 38–40]. Occlusal splinting is the nonsurgical standard treatment for this condition in dental clinics. In two RCTs, LA was found to be as effective as occlusal splinting in relieving TMD-associated pain [39, 40]. LA could be an alternative treatment choice to occlusal splinting. Sattayut and Bradley [41] compared low- and high-grade LA and found that high-grade LA, i.e., 820 nm, 107 J/cm^2, and 300 mW, showed a superior treatment effect. More recently, Hu et al. [42] clearly showed the therapeutic effects of LA in managing treatment-resistant TMD. In our literature review, another two clinical trials revealed the benefit of LA therapy for TMD patients [43, 44].

2.8. Headache

Gottschling et al. [45] reported an RCT in which LA was used to treat headache in children and showed a decrease in the VAS score and monthly hours with headache. Interestingly, the treatment in this study consisted of only four treatment episodes, at a frequency of once a week, yet the improvement of symptoms was excellent. This study also focused on the meridian-based selection of irradiation points. The basic points for patients with frontal headache were LI4 and ST36; for lateral pain, they were TE6 and GB34; for occipital pain, they were SI3 and BL60, and for holocephalic pain, it was GV20. Additional body acupuncture points and ear acupuncture points were chosen individually. The combination of TCM meridian theory with

LA energy treatment seemed to provide a better effect than simply irradiating the tender points.

2.9. Others

Chow et al. [17] reported that chronic neck pain of any etiology could be treated successfully with a program of 14 LA treatments over a period of 7 weeks. Ip and Fu [46] reported a prospective cohort study that proved the treatment efficacy of LA in painful adhesive capsulitis of the shoulder.

3. Conclusions

We have presented evidence supporting the use of LA in the management for various types of pain (Table 1). LA is a noninvasive technique involving the stimulation of traditional acupuncture points with low-intensity laser irradiation. LA has the advantages of being painless and safe as no heat is generated during the procedure, and it is more effective in some medical conditions and requires less time than needle-based acupuncture [47]. No adverse effects or complications resulting from LA have been reported in any study to date. The effectiveness of LA in managing pain depends on the selection of appropriate points and frequencies. Insufficient energy and very few therapeutic sessions will result in ineffective therapy. In conclusion, LA combines the positive effects of traditional Chinese acupuncture and LLLT, and is therefore effective in both activating blood and moving Qi. LA relieves pain through both anti-inflammatory and analgesic effects. As experienced physicians, we should optimize laser parameters, treatment intervals, and long-term follow-up for LA therapy.

Study	Study design	Subjects	Diagnosis	Control	Intervention time	Wavelength	Dose	Power	Irradiation time (s)	Acupoints	Outcome measure	Results
Kiralp et al. [15]	RCT	43	Myofascial pain syndrome	Prilocaine injection	4 weeks (12 sessions)	—	—	—	180	Trigger points in the neck, shoulder, and back muscles	VAS, VPS, pressure pain threshold by pressure algometer	Positive in pressure algometer
Chow et al. [17]	RCT	90	Chronic neck pain	Placebo	7 weeks (14 sessions)	830 nm	0.67 W/cm^2	300 mW	30	Tender points	VAS	Positive
Armagan et al. [24]	RCT	32	Fibromyalgia	Placebo	2 weeks (10 sessions)	830 nm	2 J/point	50 mW	60	Tender points	NTP, FIQ, morning stiffness, VSGI, and total myalgia score	Positive
Yurtkuran et al. [30]	RCT	52	Knee OA	Placebo	2 weeks (10 sessions)	904 nm	0.48 J	10 mW	120	SP9	VAS, 50-foot walking time, KC, MTS, WOMAC, NHP	Improvement in KC
Mazzetto et al. [38]	RCT	48	TMD	Placebo	4 weeks (8 sessions)	708 nm	89.7 J/cm^2	70 mW	10	One point inside the external auditive duct	VAS	Positive
Matsutani et al. [25]	RCT	20	Fibromyalgia	Stretching plus LLLT versus no laser	End of intervention	830 nm	3 J/cm^2	30 mW	—	—	VAS, dolorimetry at tender points, FIQ, SF-36	Negative
Lam and Cheing [26]	RCT	39	Lateral epicondylitis	Placebo	3 weeks (9 sessions)	904 nm	2.4 J/cm^2	25 mW	11	Tender points	VAS, DASH questionnaire	Positive
Dundar et al. [16]	RCT	64	Cervical Myofascial pain	Placebo	3 weeks (15 sessions)	830 nm	7 J/point	58 mW	120	Trigger points	VAS, ROM,	Positive

Study	Study design	Subjects	Diagnosis	Control	Intervention time	Wavelength	Dose	Power	Irradiation time (s)	Acupoints	Outcome measure	Results
											neck disability index	
Shen et al. [31]	RCT	48	Knee OA	Combined laser versus red light	3 times/week for 2 weeks then 2 times/week for 4 weeks	650 nm semiconductor laser plus 10.6 μm CO_2 laser	—	—	—	ST35	WOMAC	Positive but in-conclusive difference
Gottschling et al. [45]	RCT	43	Headache in children	Placebo	4 weeks (4 sessions)	830 nm	0.9 J/point	30 mW	30	LI4, ST36; TE6, GB34; SI3, BL60; GV20	VAS; monthly hours with headache	Positive
Shirani et al. [20]	RCT	16	Myofascial pain of masticatory system	Placebo	3 weeks (6 sessions)	660 nm; 890 nm	6.2 J/cm^2; 1 J/cm^2	17.3mW; 9.8 W	180; 600	Tender points	VAS	Positive
Shen et al. [32]	RCT	40	Knee OA	Placebo	4 weeks (12 sessions)	650 nm semiconductor laser plus 10.6 μm CO_2 laser	—	36 mW; 200 mW	1200	ST35	WOMAC	In-conclusive
Glazov et al. [34]	RCT	100	Chronic non-specific low back pain	Placebo	5–10 sessions	830 nm	0.2 J/point	10 mW	20	Points on BL, GB, GV meridians; Ashi points	VAS; ODI; DASS-21; PWI-A	Negative
Carrasco et al. [23]	RCT	60	Myofascial pain	Placebo	4 weeks (8 sessions)	780 nm	25, 60 and 105 J/cm^2	—	—	Trigger point	—	Positive
Zhao et al. [33]	RCT	40	Knee OA	Non-acupoint sham control	4 weeks (12 sessions)	650 nm semiconductor laser plus 10.6 μm CO_2 laser	650 nm laser energy of 43.2 J ; 10.6 μm laser energy of 120 J	36 mW; 200 mW	1200	ST35	WOMAC	Positive after 2 weeks treatment, but not at 4 weeks
Öz et al. [39]	RCT	40	Myofascial pain due to TMD	occlusal splint	5 weeks (10 sessions)	820 nm	3 J/cm^2	300 mW	—	—	VAS	As effective
Katsoulis et al. [19]	Pilot study	11	Tendomyopathy of masticatory musculature	Placebo	3 weeks (6 sessions)	690 nm	40-60 J	40 mW	900	ST6, SI18, SI3, LI4	VAS	In-conclusive
Glazov [35]	RCT	100	Low back pain	Placebo	5–10 sessions	—	—	—	—	—	VAS	Positive
Hotta et al. [43]	Clinical trial	10	TMD	No treatment	10 weeks (10 sessions)	780 nm	35 J/cm^2	70 mW	20	LI4, HT3, ST6, ST7	EMG, VAS	Positive
Konstantinovic et al. [29]	RCT	60	Acute neck pain with cervical radiculopathy	Placebo	3 weeks (15 sessions)	905 nm	2 J/cm^2	12 mW/cm^2	120	Lateral to spinous process and the two next spinal segment	VAS, neck movement, neck disability index, quality of life	Positive
Lee and Han [21]	RCT	24	Myofascial trigger point pain	Placebo	End of intervention	830 nm	386, 771, 1929 J/cm^2	450 mW	1, 2, 5 min	Trigger points	PPT	Positive in 5 min
Emanet et al. [27]	RCT	50	Lateral epicondylitis	Placebo	3 weeks (15 sessions)	905 nm	1 J/cm^2	—	120	Two most sensitive points around the lateral epicondyle	VAS, tenderness, DASH questionnaire, PRTEE test, pain-free grip strength, NHP questionnaire	Positive in long-term evaluation (12 weeks)
Skorupska et al. [28]	RCT	80	Tennis elbow	Ultrasound	10 days with a weekend break (10 sessions)	820 ± 10 nm	1; 5 J/cm^2	400 mW	—	Trigger points	Algometer, VAS, DASH questionnaire, and hand grip strength	Equally effective
Kannan [22]	RCT	45	Myofascial pain of upper trapezius	ultrasound ; ischemic compression	5 days (5 sessions)	904 nm	74 mJ/cm^2	—	30	Trigger points	VAS, provocative pain test, active lateral bending of the cervical spine	Positive
Sattayut and Bradley [41]	RCT	30	Temporomandibular joint disorder	Low-energy-density laser versus high-energy versus placebo	1 week (3 sessions)	820 nm	21.4, 107 J/cm^2	60 mW; 300 mW	—	3 points around TMJ; 3 most tender trigger points	PPT, MOSP, SSI, EMG	Positive in higher energy group
Lin et al. [36]	RCT	60	Low back pain	Placebo	5 days (5 sessions)	808 nm	15 J/cm^2	40 mW	600	BL40; Ashi acupoints	VAS, Ryodoraku	Positive
Ferreira et al. [4]	RCT	40	TMD	Placebo	3 months (12 sessions)	780 nm	112.5 J/cm^2	50 mW	90	ST6, SI19, GB20, GB43, LI4, LR3, NT3, EX-HN3	VAS	Positive
Uemoto et al. [18]	RCT	21	Myofascial pain syndrome of masseter muscle	Anesthetic injection,	8 days (4 sessions)	795 nm	Right: 4 J/cm^2; Left: 8 J/cm^2	80 mW	—	Trigger points	Surface EMG, mouth opening, VAS	Positive

Study	Study design	Subjects	Diagnosis	Control	Intervention time	Wavelength	Dose	Power	Irradiation time (s)	Acupoints	Outcome measure	Results
				dry needling, placebo								
Huang et al. [44]	Clinical trial	20	TMD	Placebo	Once a week till symptom relief or 3 weeks of no improvement	800 nm	100.5 J/cm^2	0.75 W/cm^2	134	ST6, ST7, LI4 and one local Ashi point	VAS	Positive
Demirkol et al. [40]	RCT	30	Myofascial pain due to TMD	occlusal splint; placebo	10 days (10 sessions)	1064 nm	8 J/cm^2	250 mW	20	Trigger points	VAS	As effective as occlusal splint
Hu et al. [42]	Clinical trial	29	Treatment-resistant TMD	—	4 weeks (12 sessions)	810 nm	7.5–26.25 J/cm^2	5 W/cm^2	5 sec (acupoint); 40 sec (Ashi point)	ST7, ST6, LI4 and Ashi point	VAS, MMO	Positive
Shin et al. [37]	RCT	56	Low back pain	Sham laser	1 week (3 sessions)	660 nm	—	50 mW	180	GV3, GV4, GV5, BL23, BL24, BL25, BL40, GB30	VAS, PPT, PGIC, EQ-5D	Positive
Ip and Fu [46]	Prospective cohort study	50	Painful adhesive capsulitis of shoulder	—	8 week (24 sessions)	810 nm	5.4 J/point	20 mW/cm^2	20–30	6 anatomic points; SI11, SI12	Constant Murley shoulder score	Positive

DASH: disabilities of the arm, shoulder, and hand; DASS-21: Depression Anxiety Stress Scale; EMG: electromyography; EQ-5D: Euro-Quality-of-Life Five Dimensions questionnaire; KC: knee circumference; MOSP: maximum mouth opening (MMO) without pain; MTS: medial tenderness score; NHP: Nottingham Health Profile; NTP: number of tender points; ODI: Oswestry Disability Index; PGIC: Patient Global Impression of Change; PPT: pressure pain threshold; PRTEE: Patient-Related Lateral Epicondylitis Evaluation; PWI-A: Personal Wellbeing Index; SF-36: 36-item Short-Form Health Survey; VPS: verbal pain scale; VSGI: global improvement on a verbal scale; WOMAC: Western Ontario and McMaster Universities osteoarthritis index.

Table 1. Summary of clinical studies into pain management with laser acupuncture.

Abbreviations

DASH disabilities of the arm, shoulder and hand

DASS-21 Depression Anxiety Stress Scale

EMG electromyography

EQ-5D Euro-Quality-of-Life Five Dimensions questionnaire

FIQ Fibromyalgia Impact Questionnaire

FIQ Fibromyalgia Impact Questionnaire

KC knee circumference

LA laser acupuncture

LE lateral epicondylitis

LLLT low-level laser therapy

MOSP maximum mouth opening (MMO) without pain

MTS medial tenderness score

NHP Nottingham Health Profile

NTP number of tender points

OA osteoarthritis

ODI Oswestry Disability Index

PGIC Patient Global Impression of Change

PPT pressure pain threshold

PRTEE Patient-Related Lateral Epicondylitis Evaluation

PWI-A Personal Wellbeing Index

RCT randomized controlled trial

ROM active range of motion

SF-36 36-item Short-Form Health Survey

SSI symptom severity index

TCM traditional Chinese medicine

TMD temporomandibular joint (TMJ) disorder

VAS visual analogue scale

VPS verbal pain scale

VSGI global improvement on a verbal scale

WHO World Health Organization

WOMAC Western Ontario and McMaster Universities osteoarthritis index

Author details

Szu-Ying Wu[1], Chun-En Kuo[1], Yu-Chiang Hung[1,2] and Wen-Long Hu[1,3,4*]

*Address all correspondence to: oolonghu@gmail.com

1 Department of Chinese Medicine, Kaohsiung Chang Gung Memorial Hospital and School of Traditional Chinese Medicine, Chang Gung University College of Medicine, Kaohsiung, Taiwan

2 School of Chinese Medicine for Post Baccalaureate, I-Shou University, Kaohsiung, Taiwan

3 Fooyin University College of Nursing, Kaohsiung, Taiwan

4 Kaohsiung Medical University College of Medicine, Kaohsiung, Taiwan

References

[1] Whittaker P. Laser acupuncture: past, present, and future. Lasers in Medical Science. 2004;19(2):69–80.

[2] Bing Z, Hongcai W. Diagnostics of traditional Chinese medicine. 1st ed. London and Philadelphia: Singing Dragon; 2010. 224 p.

[3] Rickards LD. Therapeutic needling in osteopathic practice: An evidence-informed perspective. International Journal of Osteopathic Medicine. 2009;12(1):2–13.

[4] Ferreira LA, de Oliveira RG, Guimarães JP, Carvalho ACP, De Paula MVQ. Laser acupuncture in patients with temporomandibular dysfunction: A randomized controlled trial. Lasers in Medical Science. 2013;28(6):1549–1558.

[5] Baxter GD, Bleakley C, McDonough S. Clinical effectiveness of laser acupuncture: A systematic review. Journal of Acupuncture and Meridian Studies. 2008;1(2):65–82.

[6] Round R, Litscher G, Bahr F. Auricular acupuncture with laser. Evidence-Based Complementary and Alternative Medicine. 2013;2013:984763. doi: 10.1155/2013/984763. 22 pages.

[7] Hill S. Letter: Acupuncture research in the USSR. The American Journal of Chinese Medicine. 1976;4(2):204.

[8] Litscher G. High-tech laser acupuncture is Chinese medicine. Medical Acupuncture. 2008;20(4):245–254.

[9] Chang W-D, Wu J-H, Yang W-J, Jiang J-A. Therapeutic effects of low-level laser on lateral epicondylitis from differential interventions of Chinese-Western medicine: Systematic review. Photomedicine and Laser Surgery. 2010;28(3):327–336.

[10] Peplow PV, Chung T-Y, Baxter GD. Laser photobiomodulation of proliferation of cells in culture: A review of human and animal studies. Photomedicine and Laser Surgery. 2010;28(S1):S3–S40.

[11] Litscher G, Opitz G. Technical parameters for laser acupuncture to elicit peripheral and central effects: State-of-the-art and short guidelines based on results from the Medical University of Graz, the German Academy of Acupuncture, and the scientific literature. Evidence-Based Complementary and Alternative Medicine. 2012;2012:697096. doi: 10.1155/2012/697096. 5 pages.

[12] Wen-Long Hu, Yu-Chiang Hung, I-Ling Hung. Explore Laser Acupuncture's Role. In: Lucy L. Chen, Tsung O. Cheng, editors. Acupuncture in Modern Medicine. 1st ed. Rijeka: InTech; 2013. p. 205-220. ch9.

[13] Bjordal JM, Johnson MI, Iversen V, Aimbire F, Lopes-Martins RAB. Low-level laser therapy in acute pain: A systematic review of possible mechanisms of action and clinical

effects in randomized placebo-controlled trials. Photomedicine and Laser Therapy. 2006;24(2):158–168.

[14] Serra AP, Ashmawi HA. Influence of naloxone and methysergide on the analgesic effects of low-level laser in an experimental pain model. Brazilian Journal of Anesthesiology. 2010;60(3):302–310.

[15] Kiralp MZ, Ari H, Karabekir I, Dursun H. Comparison of low intensity laser therapy and trigger point injection in the management of myofascial pain syndrome. The Pain Clinic. 2006;18(1):63–66.

[16] Dundar U, Evcik D, Samli F, Pusak H, Kavuncu V. The effect of gallium arsenide aluminum laser therapy in the management of cervical myofascial pain syndrome: A double blind, placebo-controlled study. Clinical Rheumatology. 2007;26(6):930–934.

[17] Chow RT, Heller GZ, Barnsley L. The effect of 300mW, 830nm laser on chronic neck pain: A double-blind, randomized, placebo-controlled study. Pain. 2006;124(1):201–210.

[18] Uemoto L, Antonio C Garcia M, Vinicius D Gouvêa C, Vilella OV, Alfaya TA. Laser therapy and needling in myofascial trigger point deactivation. Journal of Oral Science. 2013;55(2):175–181.

[19] Katsoulis J, Ausfeld-Hafter B, Katsoulis K, Blagojevic N, Mericske-Stern R. Laser acupuncture for myofascial pain of the masticatory muscles. A controlled pilot study. Schweiz Monatsschr Zahnmed. 2010;120(3):213-225.

[20] Shirani AM, Gutknecht N, Taghizadeh M, Mir M. Low-level laser therapy and myofacial pain dysfunction syndrome: A randomized controlled clinical trial. Lasers in Medical Science. 2009;24(5):715–720.

[21] Lee JH, Han JT. The dose-dependent effect of an 830-nm, 450-mW low-level laser therapy on the myofacial trigger point of the upper trapezius muscle: A randomized, double-blinded, clinical trial. Journal of Physical Therapy Science. 2011;23(6):933–935.

[22] Kannan P. Management of myofascial pain of upper trapezius: A three group comparison study. Global Journal of Health Science. 2012;4(5): 46-52.

[23] Carrasco TG, Guerisoli LDC, Guerisoli DMZ, Mazzetto MO. Evaluation of low intensity laser therapy in myofascial pain syndrome. CRANIO®. 2009;27(4):243–7.

[24] Armagan O, Tascioglu F, Ekim A, Oner C. Long-term efficacy of low level laser therapy in women with fibromyalgia: A placebo-controlled study. Journal of Back and Musculoskeletal Rehabilitation. 2006;19(4):135–140.

[25] Matsutani L, Marques A, Ferreira E, Assumpção A, Lage L, Casarotto R, et al. Effectiveness of muscle stretching exercises with and without laser therapy at tender points for patients with fibromyalgia. Clinical and Experimental Rheumatology. 2007;25(3): 410–415.

[26] Lam LKY, Cheing GLY. Effects of 904-nm low-level laser therapy in the management of lateral epicondylitis: A randomized controlled trial. Photomedicine and Laser Surgery. 2007;25(2):65–71.

[27] Emanet SK, Altan Lİ, Yurtkuran M. Investigation of the effect of GaAs laser therapy on lateral epicondylitis. Photomedicine and Laser Surgery. 2010;28(3):397–403.

[28] Skorupska E, Lisinski P, Samborski W. The effectiveness of the conservative versus myofascial pain physiotherapy in tennis elbow patients: Double-blind randomized trial of 80 patients. Journal of Musculoskeletal Pain. 2011;20(1):41–50.

[29] Konstantinovic LM, Cutovic MR, Milovanovic AN, Jovic SJ, Dragin AS, Letic MD, et al. Low-level laser therapy for acute neck pain with radiculopathy: a double-blind placebo-controlled randomized study. Pain Medicine. 2010;11(8):1169–1178.

[30] Yurtkuran M, Alp A, Konur S, Özçakir S, Bingol U. Laser acupuncture in knee osteoarthritis: A double-blind, randomized controlled study. Photomedicine and Laser Therapy. 2007;25(1):14–20.

[31] Shen X-Y, Ding G-H, Wu F, Wang L-Z, Zhao L, Wang M, et al. Effects of 650 nm-10.6 μm combined laser acupuncture-moxibustion on knee osteoarthritis: A randomized, double-blinded and placebo-controlled clinical trial. Journal of Acupuncture and Tuina Science. 2008;6:315–317.

[32] Shen X, Zhao L, Ding G, Tan M, Gao J, Wang L, et al. Effect of combined laser acupuncture on knee osteoarthritis: A pilot study. Lasers in Medical Science. 2009;24(2): 129–136.

[33] Zhao L, Shen X, Cheng K, Deng H, Ding G, Tan M, et al. Validating a nonacupoint sham control for laser treatment of knee osteoarthritis. Photomedicine and Laser Surgery. 2010;28(3):351–356.

[34] Glazov G, Schattner P, Lopez D, Shandley K. Laser acupuncture for chronic non-specific low back pain: A controlled clinical trial. Acupuncture in Medicine. 2009;27(3): 94–100.

[35] Glazov G. The influence of baseline characteristics on response to a laser acupuncture intervention: An exploratory analysis. Acupuncture in Medicine. 2010;28(1):6–11.

[36] Lin M-L, Wu H-C, Hsieh Y-H, Su C-T, Shih Y-S, Lin C-W, et al. Evaluation of the effect of laser acupuncture and cupping with ryodoraku and visual analog scale on low back pain. Evidence-Based Complementary and Alternative Medicine. 2012;2012:521612. doi: 10.1155/2012/521612. 7 pages.

[37] Shin J-Y, Ku B, Kim JU, Lee YJ, Kang JH, Heo H, et al. Short-Term effect of laser acupuncture on lower back pain: A Randomized, Placebo-Controlled, Double-Blind Trial. Evidence-Based Complementary and Alternative Medicine. 2015;2015:808425. doi: 10.1155/2015/808425. 8 pages.

[38] Mazzetto MO, Carrasco TG, Bidinelo EF, de Andrade Pizzo RC, Mazzetto RG. Low intensity laser application in temporomandibular disorders: A phase I double-blind study. CRANIO®. 2007;25(3):186–92.

[39] Öz S, Gökçen-Röhlig B, Saruhanoglu A, Tuncer EB. Management of myofascial pain: Low-level laser therapy versus occlusal splints. Journal of Craniofacial Surgery. 2010;21(6):1722–1728.

[40] Demirkol N, Sari F, Bulbul M, Demirkol M, Simsek I, Usumez A. Effectiveness of occlusal splints and low-level laser therapy on myofascial pain. Lasers in Medical Science. 2014;30(3):1007–1012.

[41] Sattayut S, Bradley P. A study of the influence of low intensity laser therapy on painful temporomandibular disorder patients. Laser Therapy. 2012;21(3):183–192.

[42] Hu W-L, Chang C-H, Hung Y-C, Tseng Y-J, Hung I-L, Hsu S-F. Laser acupuncture therapy in patients with treatment-resistant temporomandibular disorders. PLoS One. 2014;9(10):e110528.

[43] Hotta PT, Hotta TH, Bataglion C, Bataglion SA, de Souza Coronatto EA, Siéssere S, et al. Emg analysis after laser acupuncture in patients with temporomandibular dysfunction (TMD). Implications for practice. Complementary Therapies in Clinical Practice. 2010;16(3):158–160.

[44] Huang Y-F, Lin J-C, Yang H-W, Lee Y-H, Yu C-H. Clinical effectiveness of laser acupuncture in the treatment of temporomandibular joint disorder. Journal of the Formosan Medical Association. 2014;113(8):535–539.

[45] Gottschling S, Meyer S, Gribova I, Distler L, Berrang J, Gortner L, et al. Laser acupuncture in children with headache: A double-blind, randomized, bicenter, placebo-controlled trial. Pain. 2008;137(2):405–412.

[46] Ip D, Fu N-Y. Two-year follow-up of low-level laser therapy for elderly with painful adhesive capsulitis of the shoulder. Journal of Pain Research. 2015;8:247–252.

[47] Hu W-L, Chang C-H, Hung Y-C. Clinical observations on laser acupuncture in simple obesity therapy. The American Journal of Chinese Medicine. 2010;38(05):861–867.