

Laser Acupuncture- A Healing Light

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Abstract

Acupuncture is a traditional Chinese method (TCM), in which disease is treated by inserting needles at various points on the body referred to as the ‘acupuncture points’. The most common use of acupuncture is in pain management, for which a number of studies have shown effective results, particularly in the treatment of musculoskeletal pain. It is intended that acupuncture may play a promising role in certain dental conditions like temporomandibular joint disorder, decreasing the level of anxiety, facial pain and reducing gag reflex. Studies have shown the use of laser therapy at points of acupuncture as an alternative to metal needles. Laser acupuncture is now

by far the third most popular method for treating pain in the world. The current manuscript reviews the existing literature regarding the effects of laser acupuncture in dentistry, seeking treatment modalities in which this technique is used and which are able to generate positive clinical results. It is concluded that laser acupuncture could supplement conventional treatment modalities in the future.

Keywords: Laser acupuncture, needle, meridians, low level laser therapy, dentistry, medicine.

Introduction

The term “acupuncture” was coined by Willem Ten Rhyne, which consists of two words from the Latin: *acus* meaning needle and *punctura* meaning insertion. The term also refers to “to puncture with a needle”^[1]. Acupuncture was originated over 3000 years ago in China and is based on the insertion of needles into specific points on the body known as the ‘acupuncture points’ in order to stimulate the central nervous system (CNS) and peripheral release of neurotransmitters that promote the process of healing^[2]. The traditional Chinese Medicine Act in Singapore defines acupuncture as “the stimulation of certain points on or near the surface of the human body through any technique of point stimulation (with or without the insertion of needles), including the use of electrical, magnetic, light and sound energy, cupping and moxibustion to normalize physiological functions or to treat ailments or conditions of the human body”^[3].

Acupuncture was traditionally based on the belief that health is maintained in a delicate state of balance by two opposing forces, the cold, slow, or passive force, and the hot, excited, or active force. Disease or dysfunction arise when there is an imbalance in the two, which leads to a block in the flow of vital energy (known as Qi) along pathways known as ‘meridians’^[4].

There are 14 main meridian lines^[5,6,7], each of which corresponds to an individual organ of the body. When the vital energies flow through meridians in a balanced and even way, it results in good health.

Laser acupuncture is a treatment modality that uses light instead of needles to stimulate acupuncture points. It is promoted as being inherently safer than needle acupuncture because it is non-invasive. The earliest experimental application of lasers in acupuncture was done by using low power laser (LPL). In medicine, Andre Mester^[8] first reported the use of low power lasers for hair

re-growth and wound healing. He also described the use of ruby and argon lasers in the healing of chronic ulcers and from there the use of terms like “Needleless Acupuncture” and “Pain Attenuation” started^[9].

Laser acupuncture is mostly performed with wavelengths included in the optical window, ranging from about 600 nm (red) to about 1200 nm (near infrared)^[10]. The biostimulatory effects of laser therapy are often governed by the “Arndt-Schulz Law” which states that there is a biphasic dose response i.e. smaller doses have a stimulatory effect while higher doses have an inhibitory effect^[10].

Mechanism of Action

Needle acupuncture involves stimulating the acupoints by penetrating the skin with thin, solid, metallic needles that can be further stimulated manually or electrically. It is hypothesized that acupuncture produces its effects through CNS by stimulating the production of endorphins and neurotransmitters that modulate nociception and other involuntary bodily functions^[11,12]. Another theory suggests that acupuncture works through the gate control theory of pain, in which the nociceptive input is inhibited in CNS in the presence of another type of input (e.g., acupuncture needle)^[13].

It is also postulated that the presence of a foreign substance (e.g., acupuncture needle) within the tissue stimulates vascular and immune modulatory factors involved as mediators of inflammation^[14]. Elevated levels of adrenocorticotrophic hormone (ACTH) after acupuncture seem to support this theory^[15,16].

In laser acupuncture, acupuncture points are stimulated by laser irradiation. As we know, one of the therapeutic principles of acupuncture is to restore the flow of energy (Qi) in the patient, because its obstruction or stagnation in the channels or meridians results in pain. This same principle of distribution of hydrodynamic energy (Qi) can

be applied to the study of therapeutic lasers in the treatment of pain, because laser-irradiation, restores the local blood flow; i.e, lasers unblock the channels through which Qi and Xue (energy and blood, respectively) circulate, locally and systemically^[17].

The wavelengths used in laser acupuncture are 635-700 nm (red) which is the most common (useful in the treatment of superficial lesions- mucositis) and 700-1000 nm (infrared) which has a deeper penetration depth, (useful for osteo-muscular-articular targets)^[18,19].

Also, laser acupuncture could have a positive effect on modulating inflammation, pain, and tissue repair, if appropriate irradiation parameters are followed^[20].

On cellular level, at optimal (stimulatory) doses, red and infrared laser wavelengths are absorbed by cytochrome C oxidase protein in the mitochondrial cell membranes (mitochondrial polarization). This absorption improves membrane permeability leading to increased adenosine triphosphate (ATP) production, intracellular calcium (Ca^{2+}), pH value, cyclic adenosine monophosphate (cAMP), anti-apoptotic factors, transcription factors and DNA synthesis. This cascade of cellular events accelerates cell proliferation which promotes healing^[20,21].

Nitric oxide (NO) inhibits cytochrome C oxidase activity, but LLLT dissociates NO from cytochrome C oxidase and improves cell physiology through increased cellular respiration and also protects cells against NO-induced death^[21]. It also appears to improve cell physiology by increasing the overall cell redox potential toward greater oxidation and increased reactive oxygen species (ROS) while simultaneously decreasing reactive nitrogen species.

These changes activate numerous intracellular signaling pathways, including nucleic-acid synthesis, protein synthesis, enzyme activation, and cell cycle progression^[22].

Dental Applications Of Laser Acupuncture / LLLT

Laser acupuncture apart from being painless, non-invasive and atraumatic, include advantages like- low risk of infection owing to it's bactericidal effect, ideal for patients with fear of needles, non-pharmaceutical, safe and effective with long lasting results, reduced treatment time, and an easy method to be performed by a qualified professional^[20].

Various soft and hard tissue applications includes:

1. Management of Trigeminal Neuralgia

Laser irradiation inhibits neural activity by slowing the conduction velocity in peripheral nerves^[23,24,25]. Also, it causes neural impairment , particularly in small diameter A δ and C fibers, which convey nociceptive stimuli that are relevant to pain^[26]. The patient is irradiated over the foramina where the sensory portions of the nerve exits: the superior orbital fissure, the foramen rotundum, and the foramen ovale, as well as over the striated muscles adjacent to relevant sensory branches of the nerve^[27].

2. Management of Dental Anxiety and Gag Reflex

The use of lasers at acupoints like PC6 (Pericardium 6, located on the transverse crease of the wrist) and CV24 (conception vessel 24, in the labiomental fold of the chin) [Figure 1] have been reported to significantly reduce gag reflex and nausea^[28]. Auricular acupuncture has also been suggested for treating severe gag reflex. It can be postulated that stimulation of the auricular acupuncture point may inhibit the muscular activity, thus reducing the gag reflex^[29].

3. Management of Temporomandibular Disorders (TMD)

Laser acupuncture has been used to relieve pain for TMDs, alone or in combination with conventional therapies such as physiotherapy exercises and occlusal splints. Pre-auricular, intra-auricular, and intraoral maxillary points in the rear maxillary area are stimulated;

also muscles affected by the symptoms are treated (trigger point)^[19,30]. Usually irradiation is applied between the origin, body or insertion of the masseter muscle (up to three irradiation points) and the anterior, middle, and posterior temporal muscle (upto two points each)^[31] [Figure 2,3]. Several mechanisms have been involved in pain reduction and therapeutic effects of lasers, including promoting the release of endogenous opioids, enhancing cell respiration and tissue healing, restoring blood flow, increasing pain threshold by affecting the cellular membrane potential, and decreasing inflammation, possibly due to the reduction of prostaglandin E2 and suppression of cyclooxygenase 2 levels^[32].

4. Management of Atypical Facial Pain

Experimental studies have shown that laser acupuncture reduces the levels of inflammatory mediators, thereby treating acute and chronic pains. Points ST6, ST7, L14, L12 are considered general stimulation points for facial pain relief^[33,34] [Figure 4]. Various mechanisms for pain relief have been suggested, including the suppression of substance P and bradykinin activity, increased β -endorphin release, increased production of serotonin affecting negatively neurotransmission, as well as the improvement of local microcirculation, increased tissue oxygenation, shift of metabolism from anaerobic to aerobic pathways, and the decreased production of acidic metabolites, which stimulate the pain receptors^[32].

5. Management of Xerostomia (Dry Mouth)

Studies have shown good and persistent results with the stimulation of acupuncture points to increase the salivary flow^[35,36,37]. Laser irradiation stimulates the glandular tissue, promoting cellular responses. In addition to points located on the face (ST6, ST7, ST5, SI19), points are used in other parts of the body like limbs and trunk.

6. Lymphatic Drainage for Edema

In cases of lymphadenitis or lymphoedema, laser acupuncture have proved to be extremely useful in controlling the inflammatory process, recruiting scavenger cells such as neutrophils and macrophages and modulating their activities so that the obstruction is cleared and the lymphatics returned to normal, and enhancing local blood flow to assist in controlling and clearing the inflammatory response^[38]. Various facial lymph nodes of head and neck are treated using laser acupuncture [Figure 5,6].

7. Management of Post Herpetic Neuralgia (PHN)

Studies have shown that in PHN, the typical sensation produced by stimulation of type A fibers is absent. The C fibers (unmyelinated nerve fibers), which are responsible for the perpetuation of pain, have been found to be more easily stimulated by laser light. These fibers stimulated by lasers, suffer less degradation during the acute phase and/or undergo faster repair. Also it has been suggested that by restoring blood flow, laser therapy prevents the death of a large number of nerve fibers, thereby decreasing the possibility of the development of PHN^[39] [Figure 7].

8. Management of Paresthesia

Laser acupuncture is a possible alternative for the treatment of paresthesia often due to injury occurring in procedures such as tooth extraction (more commonly after third molar extractions), cystectomy, apicectomy, surgery for implant placement, needle use for anesthesia, etc^[40,41]. Different acupuncture points are used including areas near the lower lip, chin and the region of mental foramen which are shown in the figure below [Figure 8,9].

Laser Acupuncture Devices

Lasers used for acupuncture applications typically have a power output of 5–499 mW and are categorized as Class 3b “soft” lasers.

Acupuncture Pen^[42] is a dual-purpose handheld device for both clinic and personal healthcare use that provides effective in-depth stimulation of the acupuncture points, which makes this method simple, clean, painless, gentle and ideal for people sensitive to acupuncture needling. No piercing of the skin is required while stimulus is conducted by simply touching the button. [Figure 10].

A new therapy with “**Laser Needles**”^[42] was introduced into medical acupuncture in 2001. It is a pain-free procedure with practically no side effects. Laser needles can be used on multiple acupuncture points with high-power density, simultaneously on body, skull, or ear, thus stimulating the acupoints. Here, the “needles” represent the ends of light-conducting fibers that transport the beam generated in the laser diodes to the body, and introduce them by means of direct contact. The term needle must not be confused, because this needle is not punctured into the body and rather it is only the extremely focused beam that penetrates the body like a needle to ensure an adequate acupuncture stimulation and thus the term “laser needle acupuncture” [Figure 11,a,b].

Discussion

There are numerous studies^[43,44] supporting the use of laser acupuncture as a supplement for the treatment of various diseases encountered in dentistry. Laser acupuncture has many features that make it an attractive treatment option, compared with classic needle acupuncture. It may be preferred by pediatric and geriatric patients and by patients with needle phobias as it does not penetrate the skin, and is associated with minimal sensation and minimal risk of infection, trauma, and bleeding complications. These features may make laser acupuncture more feasible in patients with serious comorbid conditions, hospitalized patients, and other patients with increased risks of complications such as

bleeding and infection. In addition, the duration of treatment is generally shorter.

Numerous studies^[45,46] have shown the benefits of laser acupuncture applied to multiple conditions affecting the head and neck, especially for chronic conditions such as myofascial pain and TMJ pain. Existing evidence provides some insight into the anti-inflammatory effects, neuromodulation, and cellular effects of low level lasers; however, the data remain sparse overall. Only a limited number of studies have assessed the effects of laser acupuncture on specific acupoints and hence we have tried and compiled all the data to the best of our knowledge. However, more studies are needed to examine the effects on additional acupoints and to determine how these effects may be translated into clinical outcomes.

Key Message—Laser Acupuncture is a newer approach which is gaining lots of popularity. Because of its safety and reports of efficacy, more patients select it as part of their therapeutic plan. Knowing about the benefits of this new treatment option, clinicians should either expand the scope of his or her practice by taking additional training to administer laser acupuncture or should refer to credible, well trained laser specialist whenever required.

Conclusion

Laser acupuncture has proved to be an effective option for the existing treatments and as a supplement to the current treatments as well. Acupressure with lasers is a proven, natural and cost effective professional and self-care system of treatment that can improve the quality of life of the patients. It can be therefore concluded that laser is a healing light that can be used to alleviate pain with minimal side-effects. This low power laser treatment can also provide safe and cost-effective treatment and hence it emerges as a new treatment modality to relieve patient’s pain that is unresponsive to conventional mode of treatment.

Compliance with Ethical Standards

Informed Consent: An informed consent was taken by the patient before surgery.

References

1. Naik. P, A. Kiran, Yalamanchal. S, Kumar. V, Goli. S, Vashisht. N. Acupuncture: An Alternative Therapy in Dentistry and Its Possible Applications. *Medical Acupuncture* 2014;26(6):308-14.
2. Oliveira. R, Silva. C, Cersosimo. M, Borsatto. M, Freitas. P. Laser therapy on points of acupuncture: Are there benefits in dentistry? *Journal of Photochemistry and Photobiology B: Biology* 2015;151:76–2.
3. Li Beng Wong. Acupuncture in Dentistry: Its Possible Role and Application. *Proceedings of Singapore Healthcare* 2012;21(1):48-6.
4. Duggal P. Laser acupuncture: the emerging light of hope. *Guident* 2013;6:60-2.
5. Wei-Bo Zhang, Guang-Jun Wang, and Kjell Fuxe. Classic and modern meridian studies: a review of low hydraulic resistance channels along meridians and their relevance for therapeutic effects in traditional chinese medicine. Review article. *Evidence-Based Complementary and Alternative Medicine* 2015;(15):1-14.
6. Li J, Wang W, Liang H, Dong H, Li Y, Ng EHY, Wu X. Biophysical Characteristics of Meridians and Acupoints: A Systematic Review *Evidence-Based Complementary and Alternative Medicine* 2012;(12):1-6.
7. WHO Scientific Group on International Acupuncture Nomenclature- A proposed standard international acupuncture nomenclature: report of a WHO scientific group. WHO Geneva 1991.
8. Gaspar L. Professor Endre Mester, the father of photobiomodulation professor. *J Laser Dent* 2009;17: 146–8.
9. Text book of Weiners. Williams J.E. Ch.76: Acupuncture and Traditional Chinese Medicine; pp 1121-31.
10. Ying-Ying Huang, Aaron C.-H. Chen, James D. Carroll, Michael R. Hamblin. Biphasic dose response in low level light therapy. *Dose-Response* 2009;(7):358–83.
11. Chu LSW, Yeh SDJ, Wood DD. Acupuncture manual: a western approach. New York: Marcel Dekker;1979.
12. Stux G, Berman B, Pomeranz B. Basics of acupuncture. ed 5. Berlin: Verlag; 2003.
13. Melzack R. Myofascial trigger points: relation to acupuncture and mechanisms of pain. *Arch Phys Med Rehabil* 1981;62:114-7.
14. Zijlstra FJ, van den Berg-de Lange, Huygen FJ, et al. Anti-inflammatory actions of acupuncture. *Mediators Inflamm* 2003;12:59-9.
15. Wen HL, Ho WK, Wong HK, et al. Changes in adrenocorticotrophic hormone (ACTH) and cortisol levels in drug addicts treated by a new and rapid detoxification procedure using acupuncture and naloxone. *Comp Med East West* 1979;6:241-5.
16. Carlo Ammendolia, Andrea D. Furlan, Marta Imamura, Emma L. Irvin, Maurits Van Tulder. *Needle Acupuncture. Complementary and Alternative Medical Therapies, Section VII. Ch 20;pp:269-85.*
17. Mario Pansini, Fabiano Augusto Sfier de Mello, and Andrea Malluf Dabul de Mello. Traditional Chinese medicine and laser therapy. *Lasers in Dentistry: Guide for Clinical Practice, First Edition* 2015;pp:238-42.
18. Huang Y, Chen A, Hamblin M. Low-level laser therapy: an emerging clinical paradigm. *SPIE Newsroom*. 2009;9:1–3.

19. Ercole Romagnoli and Adriana Cafaro. PBM. Theoretical and Applied Concepts of Adjunctive Use of LLLT/PBM Within Clinical Dentistry. *Lasers in Dentistry—Current Concepts, Textbooks in Contemporary Dentistry* 2017;pp:132-60.
20. Tony Y. Chon, Molly J. Mallory, Juan Yang, Sara E. Bublitz, Alexander Do, Peter T. Dorsher. *Laser Acupuncture: A Concise Review. Medical acupuncture* 2019;31(3):164-8.
21. Farivar S, Malekshahabi T, Shiari R. Biological effects of low level laser therapy. *J Lasers Med Sci.* 2014;5(2):58–62.
22. Cotler HB, Chow RT, Hamblin MR, Carroll J. The use of low level laser therapy (LLLT) for musculoskeletal pain. *MOJ Orthop Rheumatol.* 2015;2(5).pii:00068.
23. Wakabayashi H, et al. Effect of irradiation by semiconductor laser on responses evoked in trigeminal caudal neurons by tooth pulp stimulation. *Lasers Surg Med* 1993; 13(6): 605–10.
24. Snyder-Mackler L, Bork CE. Effect of helium-neon laser irradiation on peripheral sensory nerve latency. *Phys Ther* 1988; 68(2):223–5.
25. Wesselmann U, Lin SF, Rymer WZ. Effects of Q-switched Nd:YAG laser irradiation on neural impulse propagation: I. Spinal cord. *Physiol Chem Phys Med NMR* 1991;23(2):67–80.
26. Chow R, et al. Inhibitory effects of laser irradiation on peripheral mammalian nerves and relevance to analgesic effects: a systematic review. *Photomed Laser Surg* 2011;29(6):365–81.
27. Leonard F. Vernon, DC, Rafael J. Hasbun. Low-level Laser Therapy for Trigeminal Neuralgia. *Practical Pain Management* 2014;8(6):1-6.
28. Sari E, Sari T. The role of acupuncture in the treatment of orthodontic patients with a gagging reflex: A pilot study. *Br Dent J* 2010;208:E19.
29. Karst M, Winterhalter M, Münte S, Francki B, Hondronikos A, Eckardt A, et al. Auricular acupuncture for dental anxiety: A randomized controlled trial. *Anesth Analg* 2007;104:295-300.
30. Herranz A, et al. The use of low level laser therapy in the treatment of temporomandibular joint disorders: review of the literature. *Med Oral Patol Oral Cir Bucal.* 2013;18(4):e603–12.
31. Caroline Maria, Gomes Dantas, Carolina Lapaz Vivan. Temporomandibular disorders. *Lasers in Dentistry: Guide for Clinical Practice, First Edition* 2015.Ch 27;pp:223-28.
32. Nasrin Zand. Non-Thermal, Non-Ablative CO2 Laser Therapy (NACLT): A New Approach to Relieve Pain in Some Painful Oral Diseases. *CO2 Laser - Optimisation and Application* 2012;388-14.
33. Zhou Y. An advanced clinical trial with laser acupuncture anesthesia for minor operations in the oro maxillofacial region. *Lasers Surg Med.* 1984;4:297–03.
34. Nasouri B, Murphy TE, Berberoglu H. Simulation of laser propagation through a three-layer human skin model in the spectral range from 1000 to 1900 nm. *J Biomed Opt.* 2014;19(7):075003.
35. Bloom M, Dawidson I. The effect of acupuncture on salivary flow rates in patients with xerostomia. *Oral Surg Oral Med Oral Pathol.* 1992;73:293–8.
36. Wang WC, et al. Treatment of xerostomia in prosthetic patients using local acupuncture points on the face. *J Cont Dent Pract.* 2004;5:133–8.
37. Cafaro A, et al. Effect of laser acupuncture on salivary flow rate in patients with Sjögren’s syndrome. *Lasers Med Sci.* 2015;30(6):1805–9.

38. Lopes LA, Lopes A, Tuner J, Calderhead RG. The use of laser therapy in the treatment of inflammation through lymphatic drainage. *Lasers in Medical Science* 2003;18:208.
39. Nurmikko T, Bowsher D. Somatosensory findings in post herpetic neuralgia. *J Neurol Neurosurg Psychiatry* 1990;53:135–41.
40. de Oliveira RF, et al. Laser Therapy in the Treatment of Paresthesia: A Retrospective Study of 125 Clinical Cases. *Photomed Laser Surg.* 2015;33(8):415–23.
41. Torreira MMG, Lopes MDR, et al. Paresthesia caused by endodontic treatment. *Oral Med* 2003;8:299–03.
42. Michael Weber, Thomas Fussganger, Tillman Wolf. “Needles of Light”: A New Therapeutic Approach. *MEDICAL ACUPUNCTURE* 2007;19(3):141-51.
43. Rosted P. The use of acupuncture in dentistry: A systematic review. *Acupunct Med.* 1998;16(1):43–48.
44. Peter Whittaker. Laser acupuncture: past, present, and future. *Lasers in Medical Science* 2004;(19):69-80.
45. Cho SH, Whang WW. Acupuncture for temporomandibular disorders: A systematic review. *J Orofac Pain.* 2010;24(2):152–162.
46. Silva SA. Acupuncture for the relief of pain of facial and dental origin. *Anesth Prog.* 1989;36(4–5):244–45.

Legend Figure

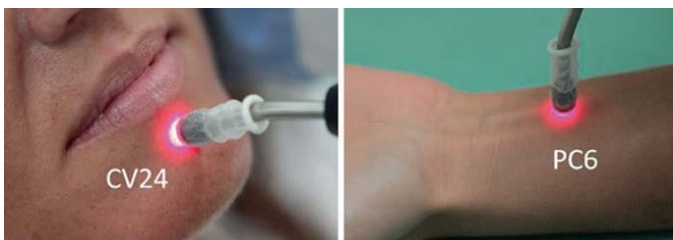


Figure 1: Laser acupuncture points for nausea control

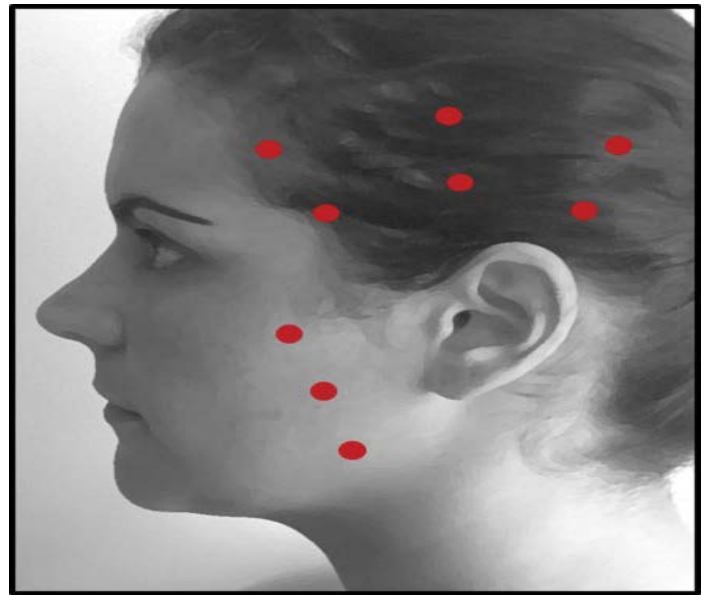


Figure 2: Possible points of laser application for the masseter and temporalis muscles.

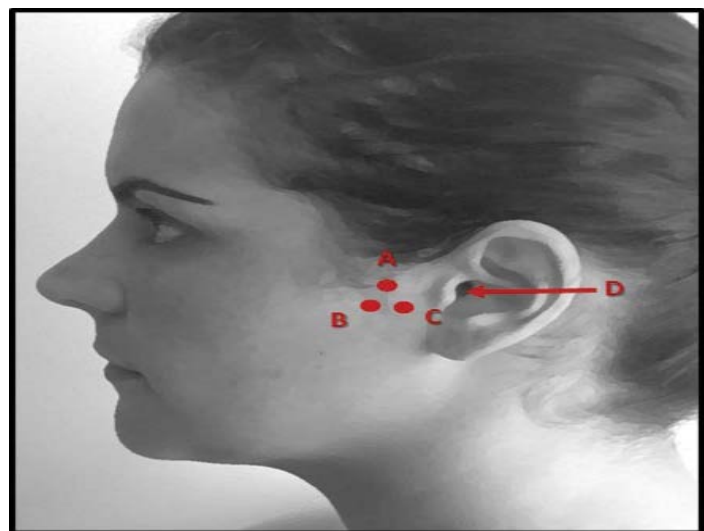


Figure 3: Points of laser application for the TMJ: (a) above, (b); anterior, and (c) posterior to the condyloid process; (d) an intra-auricular point towards the joint



Figure 4: Specific points for pain control.

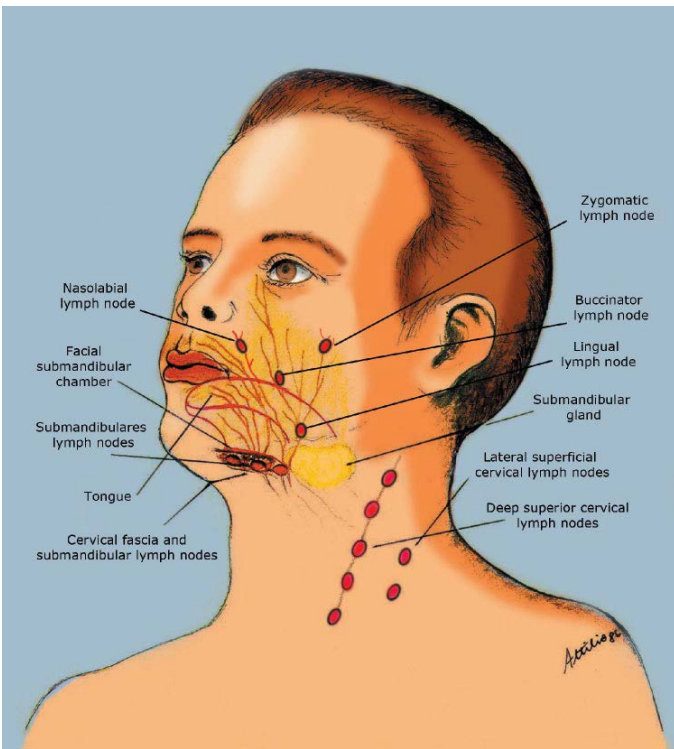


Figure 5: Facial lymph nodes

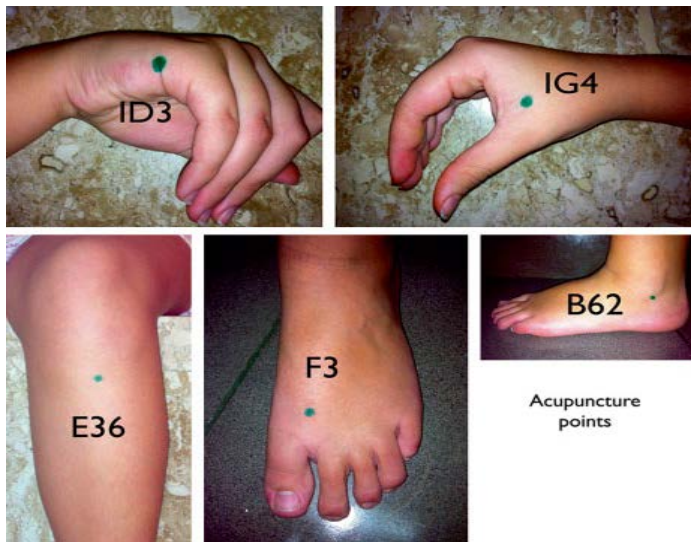


Figure 8: Laser acupuncture points for paraesthesia



Figure 9: Extraoral laser acupuncture points for paraesthesia



Figure 6: Application of the lymphatic drainage technique with lasers on the facial lymph nodes.

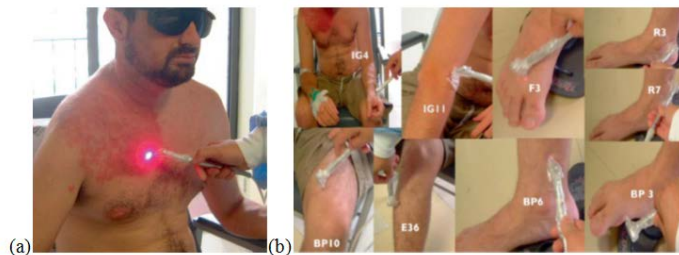


Figure 7: (a) Visible red laser application all over the injured area. (b) Laser (infrared) acupuncture points.



Figure 10: Laser acupuncture pen with dental applicator