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Efficacy of laser application for the rehabilitation of patients with Bell's palsy

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Abstract

Bell's palsy is reported as an acute peripheral paralysis of the facial nerve of unknown etiology. Its symptoms can range from mild to severe including a lack of wrinkles on the forehead, drooping eyelids of the affected side, uncontrolled tearing of the eye of the affected side, weakness or paralysis of the facial muscles, drooping of the mouth of the affected side and impaired taste. The aim of this review is to describe recent research data on the application of laser to patients with Bell's palsy. The PubMed and Google Scholar databases were searched for articles published between January 2015-May 2021 with the following.

Keywords: Bell's palsy, laser, physiotherapy. This review included nine articles in total; one systematic review, four randomized controlled clinical trials, three case studies and one study protocol proposal.

Discussion-Conclusions: The use of laser therapies is a safe and effective method of treating patients with Bell's palsy. Low-power lasers with active Ga-Al-As material are more common than high-power lasers, with the most effective parameters being: wavelength 810-930-880nm, power 100-150mW, energy density 10J/cm², contact application to eight points of the facial nerve. Laser acupuncture and high-power lasers are also effective.

Keywords: Bell's palsy, laser, physiotherapy

Introduction

The facial nerve is a mixed cranial nerve. It is the seventh cranial nerve (CN VII) and consists of motor, aesthetic and parasympathetic branches ^[1]. The connections and path from the cortex to the brainstem are complex. The facial nerve arises from the groove of the medulla oblongata and enters the temporal bone, where it gives branches to the glands of the tongue. After emerging from the temporal bone, it innervates the personal muscles ^[2]. Bell's palsy describes an acute peripheral paralysis of the facial nerve of unknown cause. Reactivation of the herpes simplex virus is widely recognized as the leading cause of Bell's palsy, but this has not been proven. Other viruses may also be associated with Bell's palsy, such as herpes zoster virus, human immunodeficiency virus, Epstein Barr virus, and hepatitis B virus ^[3]. Symptoms can range from mild to severe and may include the lack of wrinkles on the forehead, the drooping of the eyelid of the affected side, the uncontrolled tearing of the eye of the affected side, the weakness or paralysis of the facial muscles, the drooping of the mouth of the affected side and impaired taste ^[4].

The annual incidence of Bell's palsy varies around the world, with an estimated incidence of around 30 per 100000 people. It most often affects people with diabetes. Without treatment 70-75% of patients have a full recovery. Treatment in the early stages increases the chance of complete recovery to 82% ^[4]. No significant differences were found for the onset of Bell's palsy by age or gender. As a prognostic factor, the age of the patient seems to be important with older age negatively affecting the prognosis. This may be due to reduced peripheral blood flow in older adult patients due to vascular degeneration ^[5]. Physiotherapy interventions such as electrotherapy, massage and therapeutic exercise, have been shown to accelerate recovery ^[6]. The aim of this review is to describe recent research data on the application of laser to patients with Bell's palsy.

Literature review

The PubMed and Google Scholar databases were searched for articles published between January 2015-May 2021 regarding laser treatment of patients with Bell's palsy. The following keywords were used in the search: Bell's palsy, laser, physiotherapy.

Javaherian *et al.* [7] studied the efficacy of low-power lasers in patients with Bell's palsy. Their systematic review included four randomized controlled trials with a total of 171 patients with Bell's palsy, all in the subacute stage. The efficacy of Low-Level Laser Therapy (LLLT) was compared with placebo laser, therapeutic exercises, massage or no treatment at all. In two of the trials, a significant difference in the efficacy of the two groups in favor of the LLLT group was found, after six weeks of treatments with a wavelength of 830nm and a power of 100mW. The other two trials found no effect after four weeks and 15 days of treatments with wavelengths of 670nm and 830nm. The findings strongly suggest that laser treatments with Ga-Al-As active material, wavelength 830nm and 80J total per session for six weeks can effectively improve the condition of patients.

Furthermore, Ordahan and Karahan [8] studied the efficacy of low-power lasers in combination with facial expression exercises in patients with Bell's palsy. The study involved 46 patients who were divided into two groups. One group was treated with expression exercises only and one group with a combination of low-power laser treatment and expression exercises. The laser used had Ga-Al-As active material, wavelength 830nm, power 100mW and frequency 1 KHz. It was applied with an energy density of 10J/cm² at eight points on the affected side for two minutes at each point. The laser was in direct contact with the facial nerve. Sessions were held three times a week for six weeks. The condition of the patients was evaluated three times; before the start of treatments, at three weeks, and at six weeks. In the group treated only with expression exercises, no significant difference was found in the improvement of the condition of the patients at three weeks, but a significant difference was found at six weeks. In the combination therapy group, a significant difference was found in the improvement of the condition of the patients at both three and six weeks.

Regarding other co-existing conditions, Aghamohamdi *et al.* [9] studied the effectiveness of low-power lasers in patients with Bell's palsy who had a history of diabetes. In their study, 30 patients received low-power laser treatment. Bell's palsy in three of them was rated as moderate to severe dysfunction, in 12 as severe dysfunction and in five as total paralysis. After 12 sessions there was complete recovery in 18 patients and improvement of paralysis to minimal dysfunction in six and moderate to severe dysfunction in another six. Patients were not taking medications, especially corticosteroids, to treat Bell's palsy due to diabetes. The findings show that low-power laser treatment is a safe and reliable approach to treating Bell's palsy, especially in cases of underlying conditions such as diabetes.

The use of laser acupuncture and its efficacy in patients with chronic Bell's palsy was the study focus of Gil Ton *et al.* [10]. The study involved 32 patients divided into two groups. In one group Laser Acupuncture Therapy (LAT) was performed with laser with active material Ga-Al-As, 810nm, 150mw/cm² and in the other LAT was performed with non-functional laser (placebo). Three treatments per week were performed for six weeks, in which the traditional acupuncture points were stimulated with low-power, non-thermal laser for 40 seconds and 3J of energy on the nearby acupuncture points and for 80 seconds and 6J of energy on the remote acupuncture points. In

the first group, the mean of the Facial Disability Index Score (FDI) improved from 68.6 before the start of treatments to 80.7 after the end of treatments. The findings show that LAT is effective in treating patients with chronic Bell's palsy and improves their physical and social well-being.

Kandakurti [11] proposed a research protocol on the efficacy of low-power laser therapy in combination with facial expression exercises and a comparison of the efficacy of electro stimulation and corticosteroid therapies. The 120 involved patients were divided into three groups. In the first group LLLT was applied in combination with expression exercises, in the second group electrical stimulation in combination with expression exercises and in the third group corticosteroids were administered in combination with expression exercises. It is recommended that the laser has Ga-Al-As active material, wavelength 795±5nm, 1W output power and 1cm² spot size. An average energy density of 1J/cm² in one second is proposed to be applied for four seconds (total 4J) at eight points of contact with the facial nerve (8x4 = 24 seconds per session) for 18 sessions. Finally, the physical and social condition of patients should be assessed with the FDI and the House-Brackmann scale (HBS).

In their case study, Tanganeli *et al.* [12] examined the outcome of low-power laser therapy in one patient. The patient was 71 years old diagnosed with grade V (severe) Bell's palsy, according to the HBS. They applied low-power laser with 100mW output power, 600µm beam diameter at eight contact points with 3.3J per point for 10 seconds. The patient after 10 sessions (one session every 48 hours for the first five weeks and two sessions per week for the remaining five weeks) showed complete recovery.

In comparison with other electrical therapies, Alyassiri and Zaidan [13] compared the therapeutic effects of low-power laser and Transcutaneous Electrical Nerve Stimulation (TENS) in patients with Bell's palsy. The 120 participants were equally divided into three therapy groups: a treatment group with LLLT, a treatment group with TENS and a group consisting of healthy individuals as a control group. According to HBS, five patients from the LLLT group and five from the TENS group had grade III palsy, 11 patients from the LLLT group and 11 from the TENS group had grade IV, 24 patients from the LLLT group and 24 patients from the group TENS had grade V. The results of the study showed a greater improvement in the patients of the LLLT group than the patients of the TENS group. After treatment for the LLLT group, five grade III patients changed to grade I, of the 11 grade IV patients, five changed to grade I and four to grade II, and of the 24 grade V patients, 20 changed to grade I. After the treatments for the TENS group, out of the five grade III patients only one changed to grade II, out of the 11 grade IV patients, five of them changed to grade III and two of them to grade II, while out of the 24 grade V patients, six of them changed to grade IV and nine to grade III. Early-stage LLLT intervention appeared to improve palsy without any side effects, and had better results than TENS, which caused discomfort to patients.

Moreover, Kumar [14] applied to five patients with Bell's palsy high-power laser at eight points of the facial nerve, for seven seconds at each point with an energy density of 10J/cm² (total 80J/cm² in each session). After seven sessions, one patient had complete recovery, three had almost complete, and in one their condition improved but did not reach normal. The results showed that class IV laser or high-power Laser is effective in treating patients with Bell's palsy.

Lastly, Rodriguez *et al.* [15] applied a low-power laser to a 25-year-old patient with Bell's palsy. They divided their treatment

into two phases. In the first phase for 18 sessions (three per week), they used laser with a wavelength of 880nm and an energy density of 40.65J/cm² at 59 points. In the second phase, they used for six sessions (one every 48 hours) laser with a wavelength of 880nm and an energy density of 60.97J/cm² at 59 points. The condition of the patient was assessed with HBS before the start of treatment as grade IV, after 12 sessions as grade III, and after 24 sessions as grade II. Electro my graphic evaluation before the start of treatments and after 24 treatments showed a similar improvement. The results showed that the treatment of Bell's palsy with low-power laser with 880nm wavelength and with the parameters used is effective.

Discussion-Conclusions

The results of this review show that the use of laser therapies is a safe and effective method of treating patients with Bell's palsy. It seems that the use of low-power lasers with active Ga-Al-As material is more widespread compared to high-power lasers [7, 8, 10, 11]. The most effective parameters appeared to be the following: wavelength 810-930-880nm, power 100-150mW, energy density 10J/cm², contact application at eight points of the facial nerve [7, 8, 10, 12, 14, 15]. The efficacy of low-power lasers with TENS currents for treating patients with Bell's palsy was also compared and the results showed that low-power lasers proved more efficient [13]. One study combined low-power laser therapy with facial expression exercises and found positive results [8], while another proposes a protocol in which low-power laser therapy combined with expression exercises should be compared to pharmacotherapy and electrical stimulation therapy [11]. Low-power laser therapy has also been shown to be effective in patients with diabetes as an alternative to medication due to the limitations imposed by their condition [9]. One study applied laser acupuncture with a wavelength of 81nm and 150mW/cm² to traditional acupuncture points and found it effective [10]. Only one study examined the effectiveness of high-power or class IV lasers, which also appeared to be effective [14]. More research needs to be done on the efficacy of lasers, especially high-power ones due to lack of literature, in combination with or compared to other therapies.

References

1. Ho ML, Juliano A, Eisenberg RL, Moonis G. Anatomy and pathology of the facial nerve. *Am J Roentgenol* 2015;204(6):W612-9.
2. Yang SH, Park HK, Yoo DS, Joo W, Rhoton A. Microsurgical anatomy of the facial nerve. *Clin Anat*. 2021;34(1):90-102.
3. Fu X, Tang L, Wang C, Li M, Wu H, Li J, *et al*. A network meta-analysis to compare the efficacy of steroid and antiviral medications for facial paralysis from bell's palsy. *Pain Physician* 2018;21(6):559-69.
4. Somasundara D, Sullivan F, Cheesbrough GF. Management of Bell's palsy Aetiology. *J* 2017;40(3):1-9.
5. Cai Z, Li H, Wang X, Niu X, Ni P, Zhang W, *et al*. Prognostic factors of Bell's palsy and Ramsay Hunt syndrome. *Med (United States)* 2017;96(2):1-5.
6. Gatidou AM, Kottaras A, Lytras D, Gatidou C, Iakovidis P, Kottaras I. Physiotherapy management of Bell's palsy- A review of evidenced based physiotherapy practice. *Int J Adv Res Med* 2021;3(1):402-6.
7. Javaherian M, Attarbashi Moghaddam B, Bashardoust Tajali S, Dabbaghipour N. Efficacy of low-level laser therapy on management of Bell's palsy: a systematic review. *Lasers Med Sci* 2020;35(6):1245-52.
8. Ordahan B, Karahan A yavuz. Role of low-level laser therapy added to facial expression exercises in patients with idiopathic facial (Bell's) palsy. *Lasers Med Sci* 2017;32(4):931-6.
9. Aghamohamdi D, Fakhari S, Farhoudi M, Farzin H. The efficacy of low-level laser therapy in the treatment of bell's palsy in diabetic patients. *J Lasers Med Sci [Internet]* 2020;11(3):310-5. Available from: <https://doi.org/10.34172/jlms.2020.52>
10. Ton G, Lee LW, Ng HP, Liao HY, Chen YH, Tu CH, *et al*. Efficacy of laser acupuncture for patients with chronic Bell's palsy. *Medicine (Baltimore)* 2019;98(15):e15120.
11. Kandakurti PK, Shanmugam S, Basha SA, Amaravadi SK, Suganthirababu P, Gopal K, *et al*. The effectiveness of low-level laser therapy combined with facial expression exercises in patients with moderate-to-severe Bell's palsy: A study protocol for a randomised controlled trial. *Int J Surg Protoc [Internet]* 2020;24:39-44. Available from: <https://doi.org/10.1016/j.isjp.2020.11.001>
12. Tanganeli JPC, De Oliveira SSI, Da Silva T, Fernandes KPS, Motta LJ, Bussadori SK. Complete and Fast Recovery from Idiopathic Facial Paralysis Using Laser-Photo bio modulation. *Case Rep Dent* 2020;2020:10-3.
13. Alyassiri AMH, Zaidan TF. Comparison between the beneficial Effects of Low Level Laser Therapy (Diode Laser) and Trans cutaneous Electrical Nerve Stimulation in Recovery of Patients with Bell's palsy. *Indian J Forensic Med Toxicol [Internet]* 2019;13(1):332-7. Available from: www.ijfmr.com
14. Kumar S. Effect of Class IV LASER on Bell's Palsy: A case series. *Indian J Phys Ther Res* 2019;1(1):55.
15. Bernal Rodriguez CG, Berlingieri Polho I, Azevedo LH, De Paula Eduardo C. Photo-biomodulation therapy to treat facial paralysis of 8 years: Case report. *Photobiomodulation, Photomedicine, Laser Surg* 2020;38(8):477-80.