

# Photobiomodulation as an adjuvant in the pharmacological treatment of trigeminal neuralgia. Case report

*Fotobiomodulação como adjuvante no tratamento farmacológico da neuralgia trigeminal. Relato de caso*

João Paulo Colesanti Tanganeli<sup>1</sup>, Denise Sabbagh Haddad<sup>2</sup>, Sandra Kalil Bussadori<sup>1</sup>

DOI 10.5935/2595-0118.20200042

## ABSTRACT

**BACKGROUND AND OBJECTIVES:** Trigeminal Neuralgia causes intense suffering and impaired quality of life. The diagnosis is clinical. Thermography has been proven to be a useful tool, both for confirming and monitoring this neuralgia. Photobiomodulation is being increasingly well documented, specially when associated with the first-choice therapy, which is pharmacotherapy. In this case report, the objective was to investigate the performance of the laser, associated with anticonvulsants, in a patient with trigeminal neuralgia, considering its results from a clinical and thermographic point of view.

**CASE REPORT:** Male patient, 62 years old, presenting idiopathic trigeminal neuralgia, diagnosed 4 years before, being controlled with oxcarbazepine (600mg), divided in 2 daily doses, being the dose doubled in the last year. In the last 4 months, the symptoms worsened with the increase in the drug dosage, generating side effects not supported by the patient. Photobiomodulation was proposed as a complementary treatment, with infrared thermography being performed before and after treatment. After the low-intensity laser therapy protocol, there was a significant improvement, demonstrated both by the patients report and the thermography, maintaining this result in the 6-month control. The dosage was reduced to 300 mg/day, restoring quality of life.

**CONCLUSION:** Low-intensity infrared laser photobiomodulation can be extremely useful when associated with an appropriate drug in the control of idiopathic trigeminal neuralgia, both in the immediate and medium-term outcome.

**Keywords:** Laser therapy, Thermography, Trigeminal Neuralgia.

## RESUMO

**JUSTIFICATIVA E OBJETIVOS:** A neuralgia trigeminal provoca intenso sofrimento e comprometimento da qualidade de vida. O diagnóstico é clínico. A termografia tem se mostrado uma ferramenta útil tanto para a confirmação quanto para o acompanhamento dessa neuralgia. A fotobiomodulação está cada vez mais bem documentada, em especial quando associada com a terapia de primeira escolha, que é a farmacoterapia. O objetivo deste estudo foi investigar a atuação do laser, associado a anticonvulsivante, em paciente com neuralgia trigeminal, considerando os seus resultados sob o ponto de vista clínico e termográfico.

**RELATO DO CASO:** Paciente do sexo masculino, 62 anos, portador de neuralgia trigeminal idiopática, diagnosticado há 4 anos, sendo controlado com oxcarbazepina (600mg), dividida em 2 doses diárias, sendo esta dose dobrada no último ano. Nos últimos quatro meses os sintomas se agravaram com o aumento da dose do fármaco, gerando efeitos adversos não suportados pelo paciente. Foi proposta a fotobiomodulação como tratamento complementar, sendo realizada a termografia infravermelha antes e depois do tratamento. Após o protocolo de laserterapia de baixa intensidade, houve melhora significativa, demonstrada tanto pelo relato do paciente quanto observado pela termografia, mantendo-se esse resultado no controle de seis meses. O fármaco foi reduzido para 300mg/dia, o que devolveu ao paciente a qualidade de vida.

**CONCLUSÃO:** A fotobiomodulação por laser de baixa intensidade infravermelho pode ser extremamente útil quando associada a um adequado fármaco no controle da neuralgia trigeminal idiopática, tanto no resultado imediato quanto a médio prazo.

**Descritores:** Neuralgia do trigêmeo, Terapia a laser, Termografia.

## INTRODUCTION

Trigeminal neuralgia (TN) is a disease that involves the cranial pair V, presenting intense, paroxysmal, and short duration pain. The patients report electric shock pain, frequently resulting from non-nociceptive stimulus, like chewing, combing hair, brushing teeth, shaving or even soft touches on the determined area, a phenomenon known as allodynia. The person suffering from TN usually goes through several healthcare professionals until the correct diagnosis is obtained. In this scenario, the dentist is often the first professional to be sought and has a key role in differential diagnosis regarding dental pain. Several iatrogenic procedures are frequently performed, such as endodontics and

João Paulo Colesanti Tanganeli – <https://orcid.org/0000-0002-8022-6987>;

Denise Sabbagh Haddad – <https://orcid.org/0000-0001-7053-0881>;

Sandra Kalil Bussadori – <https://orcid.org/0000-0002-9853-1138>.

1. Universidade Nove de Julho, Programa de Pós-Graduação em Biofotônica Aplicada às Ciências da Saúde, São Paulo, SP, Brasil.

2. Universidade de São Paulo, Departamento de Estomatologia, Disciplina de Radiologia, São Paulo, SP, Brasil.

Submitted on January 21, 2020.

Accepted for publication on May 13, 2020.

Conflict of interests: none – Sponsoring sources: none

### Correspondence to:

João Paulo Colesanti Tanganeli

Rua Cotoxó, 303 cj 86 – Perdizes

05021-000 São Paulo, SP, Brasil.

E-mail: tanganeliodonto@hotmail.com tanganeliodonto@gmail.com

unnecessary exodontics, which can even worsen the patient's situation. According to the International Classification of Headache Disorders (ICHD), established by the International Headache Society, the TN falls under Part III, item 13: painful cranial nerve injuries and other facial pain, subdivision 13.1.1, with the following divisions: - 13.1.1.1: classic TN; - 13.1.1.2: secondary TN and 13.1.1.3: idiopathic TN.

The diagnosis is clinical, but it can be complemented by infrared thermography, useful for diagnosis and follow-up of the evolution of the case. Literature is still scarce regarding the use of thermography in TN. However, the authors are unanimous in affirming the promising use of this test as a diagnostic aid. Moreover, they stress the importance of this test in differentiating between neuropathic and pulpal pain. As a non-invasive diagnostic imaging method, thermography is capable of detecting and recording infrared images that reflect the microcirculatory dynamics of the skin surface in real time, comprising the vascular, neurovegetative and musculoskeletal systems, as well as the inflammatory processes<sup>1-3</sup>.

The objective of the present study was to investigate the laser performance, associated with anticonvulsant on a TN patient, considering the results under a clinical and thermographic point of view.

## CASE REPORT

Male patient, 62 years old. Complaints of intense short duration electric shock pain, near the nose wing, right side, grade 9 on the visual analog scale (VAS). As triggering factors, the patient cited chewing, shaving, brushing his teeth and speaking. The records stated that the pain was diagnosed 4 years ago as idiopathic TN, being treated by the neurologist with oxcarbazepine (600mg) divided into 2 doses a day in the first two years, a dosage which was doubled in the last year. Between 2016 and 2017 the patient underwent prosthetic rehabilitation with dental implants.

The neurologist's proposal was to increase the dose even more, and this approach was not tolerated by the patient because of the adverse effects, such as drowsiness, loss of reflexes and vertigo. Thus, in order to improve the symptoms without increasing the experienced adverse effects, the treatment was proposed using low intensity laser (LIT). In order to facilitate the diagnosis and quantify the therapeutic follow-up, an infrared thermography examination was requested. In the first register, it was possible to identify the hyporradiant involvement of the second and third trigeminal nerve branches on the right side, thermal asymmetry of the middle thirds= $0.4^{\circ}\text{C}$  and lower thirds= $0.6^{\circ}\text{C}$ . The equipment used for the image acquisition was ThermaCAM® T450 (FLIR®Systems, Inc., Wilsonville, OR), and the entire thermographic protocol was based on the guideline of the American Academy of Thermology (AAT)<sup>4</sup>.

The photobiomodulation treatment was proposed and accepted following the protocol below:

LIT with 100mW output power, using the near infrared wavelength, 808nm. Spot application, with a distance of 5 mm between points, along the path of the maxillary branch of the lower region of the zygomatic arch until the emergence of the infraorbital

nerve, and along the lower alveolar nerve part of the trigeminal mandibular branch, extra oral and intra oral path region of the lingula and mental foramen. The energy delivered per point was 4J ( $133.2\text{J}/\text{cm}^2$ ), 10 sessions and 72h interval between applications. At the end of the photobiomodulation protocol, a new thermographic register was performed, showing that the pattern became symmetrical ( $\Delta T < 0.3^{\circ}\text{C}$ ). The neurologist reduced the administration of the drug to 150mg/day, achieving significant pain control. In the six-month follow-up, the patient reported effective pain control (VAS between 1 and 2) with complete recovery of the quality of life.

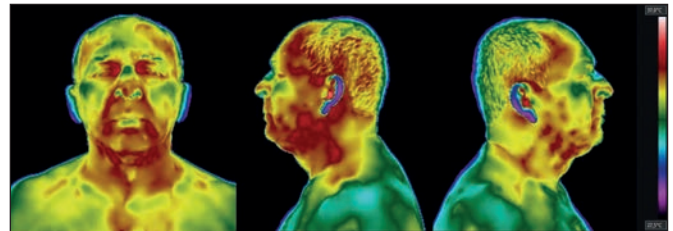


Figure 1. Thermography before treatment

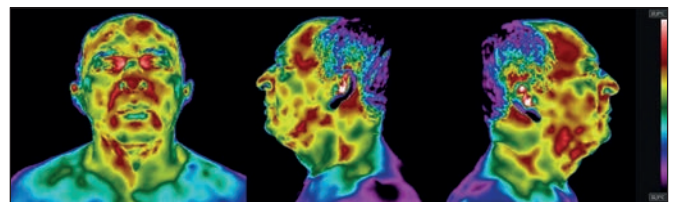


Figure 2. Thermography after treatment - 72 hours after the last session

## DISCUSSION

The effects of photobiomodulation are very well documented, including the control of neuropathic pain. A recent systematic review evaluating the efficacy of LIT therapy in the treatment of neuropathic pain concluded that such treatment can be effective for both TN and other conditions such as occipital neuralgia and burning mouth syndrome, isolated or in combination with other therapies<sup>5</sup>. This same recommendation can be observed by another study<sup>6</sup>. As for the combination of laser therapy and drug, the controlled study<sup>7</sup> demonstrated that the use of laser can complement pharmacotherapy allowing the reduction of the dose and consequently achieving less adverse effects. Variations in protocols have been observed in the literature, which may lead to erroneous conclusions due to underdosing, inadequate wavelength, etc.<sup>8</sup>. Photobiomodulation has also been investigated for other orofacial neuropathic pains, such as post-herpetic neuralgia<sup>9,10</sup>, diabetic neuropathic pains<sup>11,12</sup> and non-orofacial neuropathic pains, such as in the sciatic nerve<sup>13</sup>. Comparison of photobiomodulation and other non-pharmacological therapies, such as transcranial electromagnetic stimulation, has shown that both can be effective, the former being more effective when dealing with pain associated with systemic diseases, such as multiple sclerosis<sup>14</sup>.

The mechanisms that can explain these positive effects are related to the optimization of the mitochondrial activity, modulation of

the afferent nociceptive information, alteration of neural excitability and conduction, as well as modulation of the associated inflammatory process<sup>15,16</sup>. An interesting systematic review shows that LIT therapy is effective in the treatment of neuropathic pain, recommending the use of infrared wavelength (780 to 905nm) with minimum output power of 70mW. However, an adequate protocol regarding the final dose could be yet established, due to its variation with respect to successfully employed doses<sup>16</sup>. Regarding the use of thermography in neuropathic pain, the literature shows satisfactory results, especially in the conditions of peripheral neuropathy associated with diabetes<sup>17,18</sup>. However, regarding orofacial pain, there still is a shortage of articles and no standardization regarding protocols, but the literature shows that the use of this imaging technique is promising as a diagnostic aid. Thermal asymmetry is the determinant that will indicate possible alterations. The sympathetic reflexes that will trigger paroxysmal pain without nociceptive stimuli can be detected by temperature differences of  $0.4^{\circ}\text{C}^{1-3}$ . In the present report, it was possible to observe that the patient's improvement was coherent to the thermic symmetry thermographic images between the right and left side with  $\Delta T < 0.3^{\circ}\text{C}$ , for the immediate post-surgery as well as the six months control, remaining stable and effective.

## CONCLUSION

The photobiomodulation associated with the first-choice anticonvulsant drug was effective in controlling pain caused by idiopathic TN. The registries obtained by thermography were coherent to the improvement of the symptoms reported by the patient, both in the immediate and mid-term results. The use of LIT has allowed the reduction of drug dosage and, consequently, of adverse effects, significantly improving the quality of life of the patient. New optimized protocols should be created, both in photobiomodulation and the recording of thermographic patterns in patients with neuropathic orofacial pain and TN.

## REFERENCES

- Graff-Radford SB, Ketelaer MC, Gratt BM, Solberg WK. Thermographic assessment of neuropathic facial pain. *J Orofac Pain*. 1995;9(2):138-46.
- Haddad DS, Brioschi ML, Baladi MG, Arita ES. A new evaluation of the heat distribution on facial skin surface by infrared thermography. *Dentomaxillofac Radiol*. 2016;45(4):20150264.
- Hardy PA, Bowsher DR. Contact thermography in idiopathic trigeminal neuralgia and other facial pains. *Br J Neurosurg*. 1989;3(3):399-401.
- American Academy of Thermology. Guidelines for dental-oral and systemic health infrared thermography. *Pan Am Journal Med Thermol*. 2019;5(1):41-55.
- de Pedro M, López-Pintor RM, de la Hoz-Aizpurua JL, Casañas E, Hernández G. Efficacy of low-level laser therapy for the therapeutic management of neuropathic orofacial pain: a systematic review. *J Oral Facial Pain Headache*. 2018;34(1):13-30.
- Falaki F, Nejat AH, Dalirsani Z. The effect of low-level laser therapy on trigeminal neuralgia: a review of literature. *J Dent Res Dent Clin Dent Prospects*. 2014;8(1):1-5.
- Ebrahimi H, Najafi S, Khayamzadeh M, Zahedi A, Mahdavi A. Therapeutic and analgesic efficacy of laser in conjunction with pharmaceutical therapy for trigeminal neuralgia. *J Lasers Med Sci*. 2018;9(1):63-8.
- Amanat D, Ebrahimi H, Lavaee F, Alipour A. The adjunct therapeutic effect of lasers with medication in the management of orofacial pain: double blind randomized controlled trial. *Photomed Laser Surg*. 2013;31(10):474-9.
- Al-Maweri SA, Kalakonda B, AlAizari NA, Al-Soneidar WA, Ashraf S, Abdulrab S, et al. Efficacy of low-level laser therapy in management of recurrent herpes labialis: a systematic review. *Lasers Med Sci*. 2018;33(7):1423-30.
- Gomes RN, Viana LV, Ramos JS, Castro NM, Nicolau RA. Effects of photobiostimulation in the treatment of post-herpetic neuralgia: a case report. *Rev Bras Geriatr Gerontol*. 2018;21(1):102-7.
- Abdel-Wahhab KG, Daoud EM, El Gendy A, Mourad HH, Mannaa FA, Saber MM. Efficiencies of low-level laser therapy (LLLT) and gabapentin in the management of peripheral neuropathy: diabetic neuropathy. *Appl Biochem Biotechnol*. 2018;186(1):161-73.
- Rocha IR, Ciena AP, Rosa AS, Martins DO, Chacur M. Photobiostimulation reverses allodynia and peripheral nerve damage in streptozotocin-induced type 1 diabetes. *Lasers Med Sci*. 2017;32(3):495-501.
- de Andrade ALM, Bossini PS, do Canto de Souza ALM, Sanchez AD, Parizotto NA. Effect of photobiomodulation therapy (808 nm) in the control of neuropathic pain in mice. *Lasers Med Sci*. 2017;32(4):865-72.
- Seada YI, Nofel R, Sayed HM. Comparison between trans-cranial electromagnetic stimulation and low-level laser on modulation of trigeminal neuralgia. *J Phys Ther Sci*. 2013;25(8):911-4.
- Holanda VM, Chavantes MC, Wu X, Anders JJ. The mechanistic basis for photobiomodulation therapy of neuropathic pain by near infrared laser light. *Lasers Surg Med*. 2017;49(5):516-24.
- de Andrade AL, Bossini PS, Parizotto NA. Use of low-level laser therapy to control neuropathic pain: a systematic review. *J Photochem Photobiol B*. 2016;164:36-42.
- Astasio-Picado A, Martínez EE, Gómez-Martín B. Comparison of thermal foot maps between diabetic patients with neuropathic, vascular, neurovascular, and no complications. *Curr Diabetes Rev*. 2019;15(6):503-9.
- Gatt A, Falzon O, Cassar K, Ellul C, Camilleri KP, Gauci J, et al. Establishing differences in thermographic patterns between the various complications in diabetic foot disease. *Int J Endocrinol*. 2018;12:2018:9808295.