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# Laser therapy applied to a case of ophthalmic herpes zoster: A case report

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## ABSTRACT

Introduction: Herpes Zoster is an infectious disease caused by the reactivation of the Varicella Zoster virus, common in immunosuppressed people such as the elderly and those with chronic diseases. It is characterized by vesicle rashes, which can cause serious complications such as postherpetic neuralgia. The main treatment is antiviral therapy, with antidepressants, analgesics and laser therapy as complements. Objectives: To describe a clinical case of herpes zoster directed to the senile population, with an outcome due to ophthalmic neuralgia, as well as to discuss its prevention and control strategies and the promising role of the effects that Laser Therapy can have as a complementary therapeutic approach. Materials and methods: This is a case study, of exploratory and qualitative nature, which will use as a source of medical record data, laboratory tests associated with bibliographic research. Expected results: To recognize the pathophysiology and risk factors related to this disease, to enable early diagnosis and treatment, and to identify the resolution of pain with the use of lasertherapy, which minimize herpetic complications, enabling a better clarification on this topic for the general population. Conclusion: The case study highlights the importance of adequate treatment of Herpes Zoster in the elderly, emphasizing the early use of antivirals to minimize complications and improve quality of life. Laser therapy, especially with Low Power (LBP) and infrared Laser, has shown efficacy in reducing pain and accelerating healing. The study underlines the need for preventive strategies, new therapies, and more research to deepen knowledge about laser therapy in the treatment of HZ.

**Keywords:** Ophthalmic Herpes Zoster, Herpes Zoster, Laser Therapy, Postherpetic Neuralgia, Varicella-Zoster Virus Infection.

## INTRODUCTION

The varicella zoster virus (VZV) is a contagious pathogenic microorganism of the genus alpha herpes viridae that in childhood manifests itself causing chickenpox, popularly known as chickenpox, being the primary infection of the disease. At first, the virus infects the individual and remains latent in the sensory nerve ganglia, and is later reactivated by triggering factors for

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the decline of T-cell-mediated immunity, specific to the varicella-zoster virus, thus developing a cutaneous-sensory condition called Herpes Zoster (HZ) (Mbinta et al., 2022).

In view of the triggering factors of HZ, it is verified that the senile population is the most affected, due to the high prevalence of developing metabolic syndromes, as well as because they are individuals who have chronic comorbidities, such as systemic arterial hypertension, obstructive pulmonary diseases, acute kidney diseases, diabetes and immune-mediated diseases, among other pathologies that course with suppression of the immune system, favoring the emergence of post-herpetic complications (Marra, 2020). In this sense, according to the current scenario, during the COVID-19 pandemic, there was a significant change in the number of HZ cases, with an average increase of 10.7 cases per million inhabitants, in which there was a 23.6% increase in cases in the northeast region. This fact is associated with the immune imbalance caused by SARS-COV-2, in which there is a decrease in immune cells in our body, in which, associated with physical and mental stress, can cause the reactivation of VZV (Maia et al., 2021).

In general, this pathology manifests itself by causing unilateral lesions affecting a single dermatome, having characteristics of maculopapular skin rashes causing clear vesicles, pustules and finally crusts, usually the patient complains of itching, tingling and mild to intense pain (Luís; Martins, 2021). Therefore, when pain is persistent for more than 3 months in the affected area, it is considered a frequent complication of HZ that affects 5 to 30% of patients, called postherpetic neuralgia, with the most affected dermatomes being the thoracic, trigeminal, lumbar and cervical dermatomes, so that the ophthalmic branch of the trigeminal affects about 20% of the affected population (Kong et al., 2020).

Regarding the complications of Herpes Zoster, we can mention lesions in the ear canal and ophthalmic lesions, Ramsay Hunt syndrome, disseminated herpes, acute cerebellar ataxia and stroke, secondary bacterial infections in the skin, post-herpetic neuralgia, as already mentioned, among others. In this aspect, Ophthalmic Herpes Zoster (HZO) is characterized as the most common complication and occurs when there is injury to the ophthalmic branch of the trigeminal nerve and stromal cells, it is considered an ophthalmic emergency due to the risk of causing vision loss, in which the central outcomes range from epithelial punctate keratitis, which is an inflammation of the cornea, to orbital cellulitis and acute retinal necrosis (Cohen; Jeng, 2021).

Furthermore, regarding therapeutic measures, it is verified that the early use of antiviral drugs (Acyclovir, Fanciclovir, Valacyclovir or Brivudine) is recommended for various complications, especially for neuralgia, as well as for symptom relief the use of tricyclic

antidepressants, selective serotonin reuptake inhibitors, transdermal drugs (topical use of capsaicin), donepezil, statins, ambroxol, transcutaneous electrostimualization, echoguided retrolaminar block, photobiostimulation, nerve block, and pulsed radiofrequency nerve stimulation (Restrepo, 2021).

In addition, research is being carried out on the use of Laser Therapy as an elective therapeutic modality, in which it emits non-ionizing radiation that interacts with cells and tissues, promoting healing, analgesic action, photobiomodulation in inflammatory processes, stimulation of angiogenesis and increase of local circulation. In this context, there are laser spectra, with red (660 nm), indicated for healing and lymphatic drainage, and infrared (808 nm), which reaches greater depths and is used for analgesic, inflammatory, tissue repair, and neuromuscular dysfunctions (Ferreira, 2021).

In view of this, the relevance of studies on HZ is evident, in which recognizing risk factors, pathogenesis with clinical manifestations and complications, allow the establishment of the diagnosis and prevention of post-herpetic complications. Thus, this work is configured as a case report, which aims to describe a clinical case of herpes zoster directed to the senile population, with an outcome by ophthalmic neuralgia, as well as to discuss its prevention and control strategies and the promising role of the effects that Laser Therapy can have as a complementary therapeutic approach.

## METHODOLOGY

This is an exploratory, descriptive, case report study, which used as theoretical and methodological support research in the following databases: Cochrane, Scientific Electronic Library Online (SciELO) and National Institutes of Health (NIH). The case report is presented as a study with a qualitative approach in which characteristics and other aspects related to a clinical syndrome are evaluated (Bardin, 1977). The research systematizes knowledge, especially about Herpes Zoster in the elderly population, which has relevant outcomes for society and the scientific community, containing descriptions, elucidations and interpretations.

In the meantime, the data collected were based on the medical records, laboratory and imaging tests provided by the patient, and were therefore not interventions performed by the team of researchers. The data collected were reorganized by means of files according to the date of the tests, type of request, reference values, findings and results of greater relevance to the case and, to clarify the phenomenon studied, they were associated with the articles chosen according to the theme of the research, being taken from the databases mentioned above. The analysis and

structure of the data were carried out through the filing of the most relevant information related to the case to be studied, considering the contents of interest.

In view of this, this case report tends to clarify the complexity of this pathology in an 89-year-old woman, not immunized against the varicella zoster virus, focusing on HZO, since she presented pain and skin lesions on the right hemiface, as a result of this complication. The study was authorized by the patient and her family for publication, upon acceptance of the Informed Consent Form (ICF), after approval by the Research Ethics Committee (CEP), respecting the confidentiality of the patient's identification and Certificate of Ethical Appreciation and Approval (CAAE): 80200824.0.0000.0012.

## DESCRIPTION

Female patient, 89 years old, widowed, hypertensive, with hypothyroidism, lives at home accompanied by her caregiver. She has 8 children and all of them are present in her routine with daily visits, as well as accompanying her to her medical appointments. She follows a diet based on healthy eating and does not perform physical activities due to her limited mobility. She uses medications, namely: Levothyroxine sodium, Valsartan, and currently using Duloxetine and Quetiapine.

The patient attended the Municipal Hospital of the city where she lives on 06/25/2022, accompanied by her daughter, complaining of intense headache with high sensitivity to touch in the right hemiface, starting 2 days ago. At the time of consultation, signs of hyperemia and ophthalmic edema were found in the right hemiface, diagnosed by the physician on duty as Herpes Zoster, and treatment with oral (800mg, PO, 5 times/day for 7 days) and topical (5 times/day, 4/4h for 7 days) and topical clobetazole (2 times/day for up to 4 weeks) was prescribed.  in addition to dipyrone (500 mg, PO, 1 to 4 times/day). and nimesulide (100mg, PO, 2 times/day) for pain, and was discharged soon after.

Five days after discharge, the patient returned again with the headache symptom, with no improvement after the use of dipyrone (1g PO) at home. She attended the Municipal Hospital and this time, hospitalized for better monitoring. During this hospitalization, the use of ketoprofen (200 mg, IV) was prescribed, which evolved without improvement, followed by morphine (initial dose of 2.5 mg, IV) and tramadol (50 mg, IV), followed by morphine (initial dose of 2.5 mg, IV) and tramadol (50 mg, IV). With all these medications, the patient reported momentary relief, but little pain resolution.

Accompanied by her daughter, the patient was transferred to a Private Hospital in the city of Caruaru/PE, where she remained for 27 days under hospitalization. During this period, the patient presented daily neuralgia in the ophthalmic region, using opioids such as morphine and tramadol to relieve the condition, in addition to intravenous acyclovir (250mg, IV) and topical associated with duloxetine. The lesions evolved from hyperemia to crusted, with high tactile sensitivity. During the first days of hospitalization, the patient presented a gradual decrease in the level of consciousness (Glasgow 11), with mixed delirium, possibly due to the medications in use. It was necessary to use a nasogastric tube for feeding and a urinary catheter for relief periodically for urogenital physiological needs.

During the 22 days of hospitalization (period between 07/05/2022 and 07/27/2022), the patient developed nosocomial pneumonia, and antibiotic therapy was started on 07/16/2022 with Piperacillin (4g, IV, 6/6h) + Tazobactam (500mg, 4V, 6/6h), and after 8 days, adjusted to Meropenem (1g, IV. 8/8h).

Throughout this period, laboratory and radiological tests were carried out, such as:

- Hemogram: microcytosis, leukocytosis, conserved morphology leukocytes.

Table 1. Results presented in a blood count performed by the patient on July 5, 2022. Caruarú - PE. 2022.

| | | | |
|---|---|---|---|
| **Haematocrit** | 35.6% | **Metamielócitos** | 0.0% |
| **Hemoglobin** | 12.6 g/dl | **Rods** | 74.0% |
| **Erythrocytes** | 4.51 million/mm³ | **Targeted** | 74.0 % |
| **VCM** | 78.9 fl | **Typical lymphocytes** | 15.4% |
| **HCM** | 27.9 pg | **Atypical lymphocytes** | 0.0% |
| **CHCM** | 35.4 g/dl | **Monocytes** | 8.3% |
| **RDW** | 14.0% | **Eosinophils** | 2.3% |
| **Leukocytes** | 12,430 /mm³ | **Basophils** | 0.0% |
| **Myelocytes** | 0.0% | **Platelets** | 332,000 ml/mm³ |

Source: Prepared by the authors based on the results obtained in the exam. Porto Velho – RO, 2024.

- Cranial computed tomography: Foci of gliosis due to microangiopathy in supratentorial white matter. Volumetric alteration of the brain parenchyma. Carotid and vertebral atheromatosis. Thickening of the lining mucosa of ethmoidal and sphenoidal cells.
- Ultrasonography of the Urinary System: Bladder with a very distended regular walls, with sediment on its floor.

During hospitalization, the patient was monitored by a multidisciplinary team, composed of physicians, nurses, speech therapists, nutritionists, dentists, psychologists and social workers.

To relieve neuralgia, 10 sessions of low-level laser therapy were performed, with intervals of 48 hours between them, following the path of the affected nerve, aiming at symptomatic relief of neuropathic manifestations. The treatment has the following objectives and

effects: analgesic action, photobiomodulation in inflammatory processes and fight against oxygen free radicals, healing and acceleration of cell and tissue regeneration, stimulation of angiogenesis and increase of local microcirculation, among other processes, all in a painless, safe and effective way.

Between the last 4 days of hospitalization (07/22 to 07/26), the patient evolved with an improvement in the level of consciousness (Glasgow 14), recognized the family and the place where he was, and the nasogastric tube was removed and food was successfully reintroduced orally. Thus, on 07/27, he was discharged from the hospital to receive multidisciplinary outpatient follow-up, following the use of Duloxetine (60 mg, PO, 1 time/day) for neuropathic pain and quetiapine for insomnia.

The patient continued with a good improvement in the general condition, but continues to the present day with neuralgia and sensitivity at intervals of every 3 days (this being the time interval for the use of neuropathic medication – duloxetine), which is considered a chronic complication of the referred condition: Post-herpetic neuralgia.

Figure 1: Hyperemia of the right hemiface as the first manifestation of the disease.

Figure 2: Evolution with right periorbital edema.

Figure 3: Manifestation of crusted lesions during hospitalization.

## DISCUSSION

Herpes Zoster (HZ) is characterized by the reactivation of the Varicella Zoster virus, which progresses with a pleomorphic clinical picture and with different evolutionary forms that depend on intrinsic factors, hematogenous dissemination, involvement of peripheral nerves or ganglia, the dermatome involved, and associated complications. In view of this scenario, the Ministry of Health considers as a suspected case the patient who progresses with neuralgic pain, paresthesias, burning and local itching, fever, headache and malaise, so that the elementary lesion is usually unilateral and presents in the thoracic (53% of cases), cervical (20%), pathway corresponding to the trigeminal nerve (15%) and lumbosacral (11%) regions. Still in the case of MS, the diagnostic protocol involves clinical detection through detailed anamnesis and physical examination, and in cases that need to perform the differential diagnosis, ELISA, latex agglutination, indirect immunofluorescence, and polymerase chain reaction are available (BRASIL, 2022).

Regarding the case, the patient was treated according to the protocol, with the perception of signs of hyperemia and ophthalmic edema on physical examination, in addition to other manifestations such as headache and hypersensitivity to touch, leading to the diagnosis of HZ, without the need for complementary tests at the time of the first consultation. However, the picture reveals a symptomatology that is not specific, especially because it is the involvement of the trigeminal nuclear system, which, due to the composition of its ophthalmic roots (most common), maxillary and mandibular, there may be a cephalic presentation of pain, which contributes to delay the diagnosis of the affection of this nerve and its possible complications, such as postherpetic neuralgia (Moreira et al., 2021).

The treatment of complications of Herpes Zoster, especially post-herpetic neuralgia, aims to promote the recovery of the area affected by the manifestation of the virus, as well as to cease the pain and, in this way, promote the return to the patient's quality of life. Therapeutic measures consist of drug and non-drug interventions, which together contribute to a clear improvement in the initial clinical picture. (Silva et al., 2024)

In the first analysis, after the diagnosis of Herpes Zoster, drug treatment is recommended, so the first line consists of choosing antivirals such as Acyclovir, Valacyclovir (prodrug) and Famciclovir. Such drugs are synthesized in nucleoside analogue substances, and their mechanism of action is to block the replication of viral DNA in affected cells. As an extrapyramidal reaction, renal toxicity is considered rare, therefore, caution in dosage is essential in patients with renal failure (Patil; Goldust; Wollina, 2022).

Hospitalization for intravenous drug administration depends on the severity of the disease, and neurological involvement is one of the main indications, for example, due to ophthalmic or visceral involvement, or the presence of disseminated infection. In such a way that, if not treated early, they can result in visual impairment, nerve paralysis and opportunistic infections, and these consequences are of potential severity that interferes with the patient's quality of life and functionality (Oliveira; Silva, 2023).

In addition to treatment with first-line antivirals, other drugs are part of the therapeutic regimen, such as glucocorticoids, gabapentinoids, tricyclic antidepressants, and Vitamin C. Glucocorticoids aim at the recovery of skin manifestations, in addition to minimizing acute pain, however, they should be used as adjuvants to antivirals. Gabapentinoids (Gabapentin and Pregabalin) have a neuropathic action in the control of pain resulting from acute nervous involvement. Antidepressants have evidence of controversial resoluteness and Vitamin C had as a prominent factor the prevention of opportunistic infections (Luís; Martins, 2021).

In view of the above, it is clear that it is of fundamental importance to prevent Herpes Zoster in the population, whether through daily measures, such as hygiene factors and avoiding contact with herpetic lesions, as well as vaccination in the senile population (Oliveira et al., 2021). Currently, in Brazil, the vaccine for the prevention of HZ is available for the entire population over 60 years of age and from the age of 50 for those with previous herpetiform infection. The administration is given by a single dose and subcutaneous. The vaccine has as an established mechanism the elevation of the immune response of T Lymphocytes against Varicella Zoster, resulting in protection and prevention of complications from infection (García et al., 2023).

A new therapeutic modality, still under study, is photobiostimulation, which consists of the release of energy in the form of light, which can be continuous, pseudocontinuous, or pulsatile. In this regard, the Brazilian Society of Dermatology establishes parameters about the laser, which are irradiance, force density that refers to the amount of energy released per area of skin treated, fluence, energy released per area of tissue in a given period, and exposure time. In addition to pain, such therapy can also be applied to vascular lesions, pigmented lesions (benign and malignant), hair removal, among others. This interaction between the laser and the tissue depends on the evaluation of the wavelength, that is, the longer the length, the greater its penetrance, with the spectrum of greatest action being infrared followed by red, yellow, green, blue, and ultraviolet (Nascimento et al. 2022).

When it comes to pain, the use of laser has a very diverse range, research shows that, at the level of the central nervous system, it increases the release of endogenous opioids, such as betaendorphins, while in the peripheral system it reduces the secretion of substance P, which is responsible for hyperalgesia. In this context, laser has also shown action on tissue repair, especially in the modulation of certain types of cells during healing (Silva et al. 2023).

The Low Power Laser (LBP) is a therapeutic method that emits non-ionizing electromagnetic radiation, in which when interacting with cells and tissues they promote biochemical, bioelectrical and bioenergetic effects, the main one being healing, however, we can also observe analgesic action, photobiomodulation in inflammatory processes, stimulation of angiogenesis, increase in local circulation, among other processes (Moreira et al., 2023). In view of this, it can be analyzed that among its benefits, the increase in blood flow in the initial phase of the healing process causes the activation of inflammatory mediators during the coagulation phase, modification of prostaglandin levels, increased synthesis of adenosine triphosphate and due to these actions, cell necrosis will not occur that will induce the propagation of cells that help the production of collagen for the final phases of healing (Silva; Fernandes; Neiva, 2021).

Regarding the types of laser used, the low-power laser (LBP) has two types of laser, red and infrared. Thus, it is noteworthy that the first has a wavelength of 660 nanometers (±10nM), indicated for healing and lymphatic drainage. The second, on the other hand, has a wavelength between 808 nanometers (±10nM), thus reaching greater depths, having analgesic, inflammatory, tissue repair and neuromuscular dysfunction effects, as well as neural repair, local drainage and painful symptoms (State Department of Health of the Federal District, 2019).

Therefore, in the clinical case of this patient who evolved with postherpetic neuralgia in the ophthalmic branch, Laser Therapy was proposed in the infrared spectrum and power of 100

mV, associated with drug therapy, in which this type of laser would perform the function of accelerating nerve stimuli, consequently accelerating the regeneration and recovery of the neural fiber, as well as the reduction of pain. In view of this, it is exemplified in the table below that 10 sessions were performed every 48 or 72 hours, using the punctual technique with 1 cm between the points, following the path of the affected nerve.

Table 2: Applied low-level laser therapy

| Session | Power | Time | Spectrum |
|---|---|---|---|
| 1st Session | 2 J per point | 20 seconds | Infrared |
| 2nd Session | 2 J per point | 20 seconds | Infrared |
| 3rd Session | 3 J per point | 30 seconds | Infrared |
| 4th Session | 3 J per point | 30 seconds | Infrared |
| 5th Session | 4 J per point | 40 seconds | Infrared |
| 6th Session | 4 J per point | 40 seconds | Infrared |
| 7th Session | 4 J per point | 40 seconds | Infrared |
| 8th Session | 4 J per point | 40 seconds | Infrared |
| 9th Session | 4 J per point | 40 seconds | Infrared |
| 10th Session | 4 J per point | 40 seconds | Infrared |

Source: Santos, Ortega, Santos, 2024 / or / Prepared by the authors.

In the foreground, the patient was started with a low energy dose, as the nerve fibers were sensitive, as evidenced by a physical examination of palpation with tactile pain response.

Then, still in the hospital environment, the energy dosage was increased during the sessions, proving an improvement of the patient, in which she reduced her oral medications and was discharged from the hospital after the 6th session, continuing the therapy at home until the 10th session.

## CONCLUSION

In view of the above, the case study highlights the importance of recognition and appropriate treatment of Herpes Zoster (HZ), especially in the senile population, who are more vulnerable due to comorbidities and immunosuppression. The study reinforces the relevance of the early use of antivirals to minimize complications and improve the quality of life of patients. The introduction of laser therapy as a complementary therapeutic approach, especially the use of Low Power Laser (LBP), has shown promise in pain management and in accelerating the healing process and neural regeneration. Infrared laser therapy has demonstrated significant benefits in reducing postherpetic neuralgia, highlighting its potential efficacy as part of integrated treatment for HZ. This case report underlines the need for prevention, control, and new therapeutic modalities to improve clinical outcomes in patients affected by HZ. However, this research had limitations such as the availability of studies on the subject, especially recent and open access

studies, which highlights the need for more research and greater access to scientific literature to deepen the knowledge and clinical application of laser therapy in the treatment of HZ.

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