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CASE REPORT: Herpes Zoster and Nd:YAG Photobiostimulation

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ABSTRACT

Herpes Zoster is a viral disease that affects the skin and the ganglia in the spinal nerves. The disease causes damage to the myelin nerve fiber, which is characterized by the emergence of intensely painful macro papules and vesicles borne by the skin dermatome concerned. Laser photobiomodulation is now a treatment option for this disease. Low-power laser therapy activates the lymphatic and blood microcirculation, increases the level of endorphins with painkiller and anti-inflammatory effects and accelerates the regeneration of nerve and skin tissues. It is contraindicated in patients with pacemakers, epileptic patients and pregnant women.

Key words: herpes, photobiostimulation, Nd:YAG.

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I. INTRODUCTION

Herpes zoster, commonly called shingles (or the flames of Satan), is a viral disease affecting the skin and nerves. The source of the disease is the same virus that causes varicella. One of its characteristic is to remain dormant in the body, nestled in the sensory ganglia of the dorsal roots of spinal nerves after the healing of varicella. The body parts most affected by the virus are the chest, face and limbs. [1, 2]

The clinical manifestations can be divided into three phases. [3]

a) Pre-eruptive phase (preherpetic neuralgia)

This phase is characterized by unusual skin sensations or pain in the affected dermatome, which heralds the onset of lesions within 2-3 days. During this period, patients may also experience other symptoms such as discomfort, myalgia, headache and fever.

b) Eruptive phase (3-10 days)

Lesions begin as erythematous macules and papules that develop rapidly within vesicles. Vesicular eruptions progress, break open, release their contents, dry out and form scabs. The symptoms subside and the skin lesions heal over 10-15 days. The patient remains infected until the formation of scabs.

c) Chronic phase (postherpetic neuralgia, after 10 days)

After healing, in some cases, damage to sensory nerve fibers may develop, which leads to postherpetic neuralgia. Neuropathic pain syndrome can cause considerable suffering for months or years and is often resistant to common painkillers and anti-inflammatories.

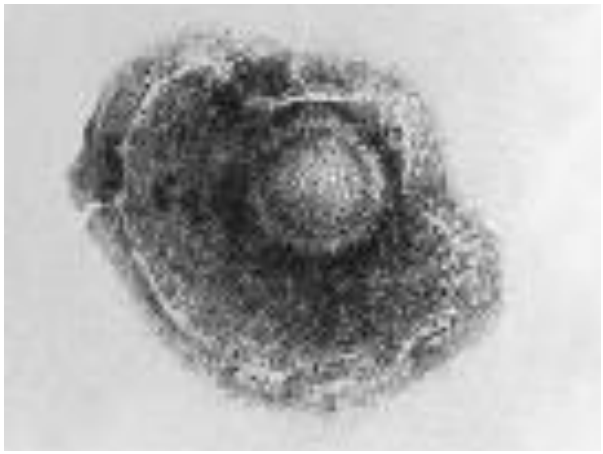

Figure 1: varicella virus under an electron microscope (source: Centers for Disease Control and Prevention)

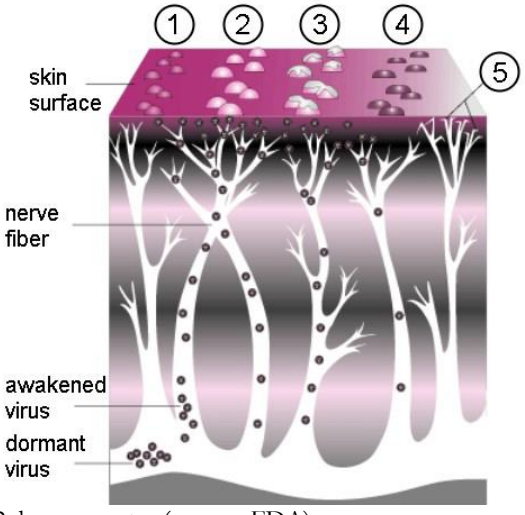

Fig. 2: herpes zoster (source: FDA)

Fig. 2 shows the formation and progression of herpes zoster:

- patchy erythema, irregular and confluent;
- forms into bubbles;
- vesicles fill with pus and break;
- form a scab;
- symptoms disappear.

Sometimes postherpetic neuralgia can occur due to nerve damage.

II. CASE

A female Caucasian patient, 42 years old, had an erythematous, painful, ovoidal lesion at her right hemithorax (submammary) area (Fig. 3).

Figure 3: Initial case

Medical history: pertussis at 10 months, varicella at 3 years, tonsillectomy at 4 years, appendectomy at 6 years, parotitis at 15 years.

Next, the patient reports that on the previous night she felt burning and pain below her right breast. Inspecting the area with a mirror, she noticed that small areas of skin were flushed. The next morning the redness had expanded over most of the submammary fold.

On the surface of the skin of the right hemithorax at the submammary fold, a physical examination showed a lesion of ovoid shape about 8 cm long and 2 cm wide, characterized by irregular, confluent patchy erythema. There was an absence of vesicles. The lesion was extremely sensitive to touch and provoked a burning pain.

DIAGNOSIS AND PRESCRIPTION OF PHOTOBIOSTIMULATION (LLLT)

The medical history and physical examination suggested a diagnosis of herpes zoster. The varicella virus (VZV), also known as herpes virus type 3 - HSV3, after remaining dormant in the dorsal roots of the spinal nerves, can be reactivated following stimulus (fever, trauma, psychophysical stress, immunosuppression, etc.) and migrate through the nerve fibers along infected axons, the corresponding dermatome (area of the skin served by a single sensory root of a spinal nerve), reaching the skin where it causes painful symptoms. For this patient's treatment, photobiostimulation (LLLT) was recommended as a monotherapy; this laser therapy does not work via the development of heat on the skin, but through photochemical and photobiological effects within cells and tissues.

The laser energy absorbed by intracellular chromophores (hemoglobin, melanin and mitochondrial enzymes in particular) is converted into metabolic energy at the level of the mitochondrial respiratory chain. The effects of laser therapy (LLLT) on damaged tissue vary, including: increased intracellular energy ATP (Adenosine Triphosphate), microcirculation activation, increased lymphatic circulation, increased endorphin levels, anti-inflammatory effects, and analgesic biostimulative decontamination. [4, 5] This results in a reduction of pain, inflammation, edema and an acceleration of healing and tissue regeneration. Photobiostimulation is a therapy that can be given with different types of lasers. [4-8] The stimulating wavelengths range from visible red (632 nm He-Ne) to the near infrared diode laser (808-810-904-980-1064 nm). The first biostimulants are more superficial, the second ones go deeper, in particular the 1064 nm (Nd: YAG). For this therapy, a 1064 nm Nd:YAG laser was used because it has an emission frequency effective for the treatment of pain and for biostimulation properties. This laser, coupled with a "flatplane wave handpiece", make for an excellent tool, because it provides a collimated beam with a uniform distribution of laser energy regardless of distance. It has a spot size of 11 mm (surface 1 cm2) that can treat large areas of skin. The therapy is delivered to the tissue locally and progressively, point by point, like a medicinal product.

TREATMENT CONTRAINDICATIONS

Contraindications include pregnancy, epilepsy, having a pacemaker, or if the individual refuses treatment.

ALTERNATIVE TREATMENTS

Systemic and/or local antiviral pharmacological therapies (Acyclovir) and painkillers. These treatments require a long time compared with laser therapy.

INFORMED CONSENT

The therapy process was shown in detail to the patient, along with complete and comprehensive information about alternative treatments. The patient accepted the proposed laser therapy, signing an informed consent document in the presence of a witness. The subscribed consensus has been included in the patient's dossier.

TREATMENT

a) Treatment objectives

The objective of this therapy was to eliminate pain and enable the rapid healing of skin lesions produced by the infection without inducing detectable complications during therapy and aftercare.

b) Laser operating parameters

Figure 4: Fotona AT-Fidelis laser

Laser: Nd:YAG (Fig. 4) Fotona AT-Fidelis, with the following operating specifications:

- wavelength: 1064 nm
- emission: pulsed
- max power: 15 w 100 Hz
- delivery system: Fotona Genova "flat top" handpiece with integrated optical fiber; uniform power distribution, up to 105 cm within the spot area (Fig. 6).
- spot diameter: 10 mm

Laser setting:

- power: 0.5 W
- frequency: 10 Hz
- MSP 0.1 ms pulse mode
- Application time: 60 s per point

Figure 5: Fotona AT-Fidelis laser's working parameters

The parameters used with the Fotona Genova "flat top" handpiece (Fig. 6) (at the time of writing, not yet on the market) have been optimized through extensive testing in my laser laboratory.

Figure 6: Genova "flat top" handpiece

The experiments were performed on Paramecium primaurelia organisms by measuring the increase of ATP as a function of power, pulse width and frequency of the Neodymium (Nd:YAG) Fotona SP Spectro laser.

c) Treatment delivery sequence

Preliminary to patient treatment

The operating room was secured; hazardous environment warning devices were activated (lights

that indicates a functioning laser).

The laser was activated and verified its state of operation.

The patient lay down: she was reminded of the therapy and gave oral consent.

Safety goggles were applied first to the patient, then to the operators.

Treatment sequence

The set parameters (power: 0.5 W - 10 Hz, MSP, time: 60s) were rechecked. The "Genova" handpiece was held perpendicular to the tissue to be irradiated and, in a clockwise motion, point by point, we proceeded with the irradiation of the entire surface by placing the handpiece over each point for 60 seconds, moving clockwise (1 cm at a time). The treatment was repeated for three consecutive days (acute herpes zoster). Low Level Laser Therapy (LLLT) has a cumulative effect on pain.

d) Postoperative treatment

The patient was instructed to topically apply a mentholated talc twice a day for refreshment and not to wear underwear in contact with the injury until healing was complete.

e) Treatment records

All procedural details, both general ones and those related to the use of lasers, have been placed in the patient's file along with details of the agreement. The information contained in the patient's file reflects the therapy described above.

POST SURGERY

The post treatment healing was devoid of both local and general complications.

FOLLOW-UP CARE

The patient was reviewed with the following sequence:

1) before the second application (24 h after the first);
2) before the third application (48 h after the first);
3) 72 h after the first application;
4) 10 days after the first application;
5) 30 days after the first application.

24 hours after the first application: the burning had disappeared and the redness significantly diminished.


Figure 7: 24h checkup

48 hours after the first application: there was no burning and the skin appeared almost intact.


Figure 8: 48h checkup

72 hours after the first application: there was no burning and the skin appeared almost intact.


Figure 9: 72h checkup

10 days after: the skin has been restored to its original state, no post-herpetic painful symptoms.


Figure 10: 10 day checkup

30 days after: no postherpetic painful symptoms.


Figure 11: 30 day checkup

III. CONCLUSIONS

Photobiostimulation (Low Level Laser Therapy) with 1064 nm Nd:YAG and the use of correct parameters has proved effective in the control of skin infection from the herpes virus. The treatment is a non-invasive and painless therapy because it is athermic, has no side effects, does not produce tissue damage and is comfortable for the patient. This therapy, if done prodromal, accelerates the healing of skin and significantly reduces the onset rate of postherpetic neuropathic syndrome, a severe disability that can last months or even years. Photobiostimulation is a therapy that stimulates the regeneration of nerve fibers.

The cells, stimulated by the laser radiation at the mitochondrial level, recharge with energy and, if damaged for reasons of inflammation, degeneration, etc. are brought back to their primary physiological function

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