CASE REPORT

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The use of laser therapy in the treatment of recurrent herpes – report of two clinical cases

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Abstract

The article discusses current therapeutic approaches to recurrent herpes and presents two clinical cases of lesions managed with laser-based therapy. HSV-1 and HSV-2 are among the most common human pathogens, responsible for oral and genital infections. Standard treatment with acyclovir (ACV) inhibits viral replication and relieves symptoms, but does not eliminate latent infection and therefore does not prevent recurrences. Increasing antiviral resistance highlights the need for complementary treatment options. Photodynamic therapy (PDT), including antimicrobial photodynamic therapy (aPDT) and photobiomodulation (PBM), offer non-invasive approaches that may reduce inflammation, promote healing, and improve patient comfort. In the presented cases, recurrent herpes lesions were treated using a 635 nm diode laser, resulting in rapid symptom relief, accelerated healing, and no recurrence during follow-up.

Key words

laser, PDT, herpes simplex virus, HSV, photobiomodulation, PAD, aPDT

INTRODUCTION

Herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2) are among the most common human pathogens of the Herpes simplex group. Both viruses are transmitted through close contact with an infected person and lead to persistent infection. HSV-1 is usually acquired in early childhood through contact with the oral mucosa and is mainly responsible for infections of the lips and mouth. HSV-2, in contrast, is mainly transmitted sexually and most often causes genital herpes [1].

It is estimated that approximately 3.8 billion people under the age of 50 (approximately 64%) worldwide are infected with HSV-1. Most infections – both HSV-1 and HSV-2 – are asymptomatic or undiagnosed, but symptomatic forms of the infection can manifest with painful, recurrent blisters or ulcers. Infection with one type of virus usually induces immunity [2].

Most patients first come into contact with the herpes virus during childhood, and the course of infection may be asymptomatic or manifest with acute inflammation. Symptoms may be particularly severe during the initial infection and include fever, muscle aches, sore throat (in the case of HSV-1) and headache, as well as enlargement of the surrounding lymph nodes [1–3]. Primary herpetic gingivostomatitis (PHGS) often clinically resembles bacterial or enteroviral infections of the throat, although it is usually self-limiting. Studies by Huang et al. have shown that fever occurs in 99.5% of children, with an average duration of about 5 days. Erosions and ulcers in the mouth, located in both the front and back of the mouth, swelling and bleeding of the gums, as well as coating on the tonsils, are also typical. The infection is often accompanied by non-specific general symptoms, such as fever, headache, irritability, loss of appetite, and general weakness, which may be mistakenly associated with teething [3, 4]. Skin and mucosal lesions are often preceded by a tingling, burning, or itching sensation. Blisters may burst and turn into painful ulcers, which are then covered with scabs [1, 2].

Recurrent episodes of the disease are usually milder than the initial infection, but can be troublesome, especially when they affect the genitals. Symptomatic treatment can alleviate the clinical course and reduce recurrence, but it does not eliminate the virus from the body. Importantly, infected individuals may be unaware of their infection and unknowingly transmit the virus to others [1]. Cold sores are a mild condition that usually resolves spontaneously within a week. However, in people with weakened immune systems, they may take longer to heal; Besides, the sores also tend to recur more often [5].

The initial HSV-1 infection goes through several stages, the most contagious of which is the vesicular stage. The stage is preceded by a prodromal phase, manifested by itching, pain, or tingling without visible lesions. This is followed by occurrence of vesicles, which burst to form ulcers and pustules, and in the next stage, they become covered with scabs. The final stage is healing, which can be accompanied by persistent erythema [5].

CASE 1

A 23-year-old Caucasian woman presented with a lesion located on the skin and red part of her upper lip. Based

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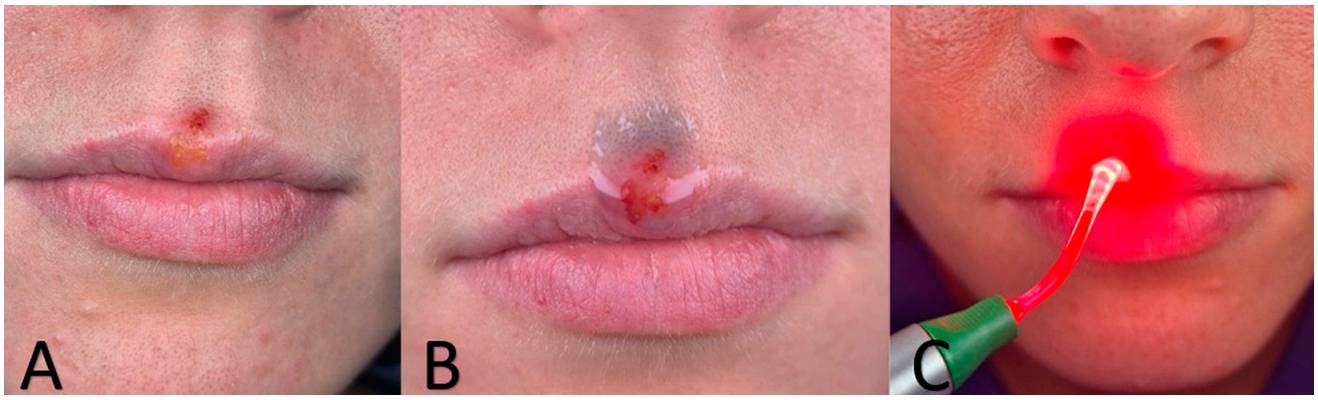

Figure 1. Case 1 A. Pre-treatment clinical status, B. Application of photosensitizer, C. Laser irradiation with a 635 nm diode during the PAD procedure

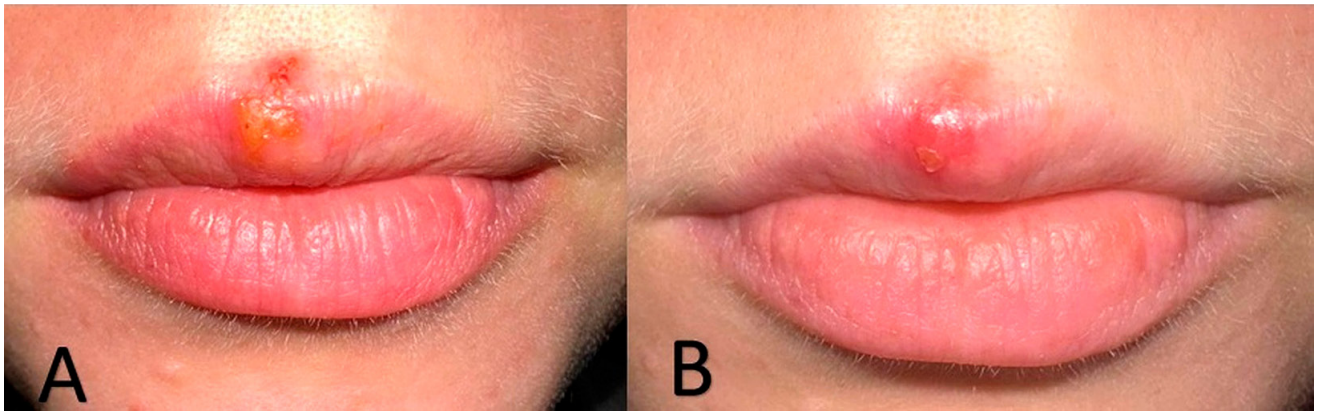

Figure 2. Case 1 A. 2 days after the PAD procedure. B. 4 days after the PAD procedure

on the clinical picture, recurrent herpes was diagnosed. Photodynamic therapy (PDT) with 0.1% methylene blue, containing: medical grade toluidine blue powder, water, methylcellulose, sodium phosphate (buffer), was used as part of the treatment as a photosensitizer, with an exposure time of 5 minutes.

Photoactivated disinfection was performed using a 635 nm diode laser in continuous-wave mode with a BIO applicator (tip diameter 4 mm; spot area ≈ 0.13 cm^2). The output power was set to 400 mW and the irradiation time to 15 s per point, which corresponded to an energy of 6 J per point (fluence ≈ 48 J/cm^2). Irradiation was applied 3 times – to both margins of the lesion and centrally – resulting in a total delivered energy of approximately 18 J. The applicator was maintained in gentle contact with the mucosal surface (Fig. 1, 2, 3).

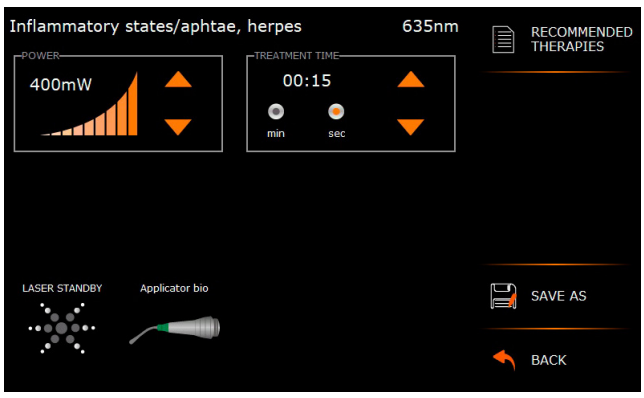

Figure 3. Parameters used in the PAD protocol

After 7 days of treatment, the lesion was completely healed. The patient remained under observation for 5 months, with no recurrence of the disease. Recurrence was defined as the reappearance of a clinically evident HSV lesion in the same anatomical region as previous episodes. She reported previous episodes of recurrent herpes, once or twice a year, mainly on the upper lip. Long healing periods (over 2 weeks) and severe pain were the main problems.

The patient rated the photoactive disinfection procedure using a diode laser as painless. She reported a significant reduction in pain and a clearly shorter healing time. The lesion healed and did not leave a scar. The patient has been observed for 5 months without recurrence.

CASE 2

A 27-year-old female patient presented with a lesion located at the border between the skin and the red part of the upper lip, with clinical features characteristic of recurrent herpes. She reported frequent episodes of the disease – about 10 per year – and no other systemic diseases. The lesion was accompanied by significant spontaneous pain, which intensified with lip movements, and a burning sensation.

Treatment consisted of photobiomodulation (PBM) therapy combined with topical application of acyclovir cream (5 times daily for 5 days). PBM was performed using a 635 nm diode laser in continuous-wave mode with a photobiomodulation applicator (tip diameter 8 mm; spot area ≈ 0.5 cm^2). The output power was set to 100 mW and the irradiation time to 20 s, resulting in an energy output of approximately 2

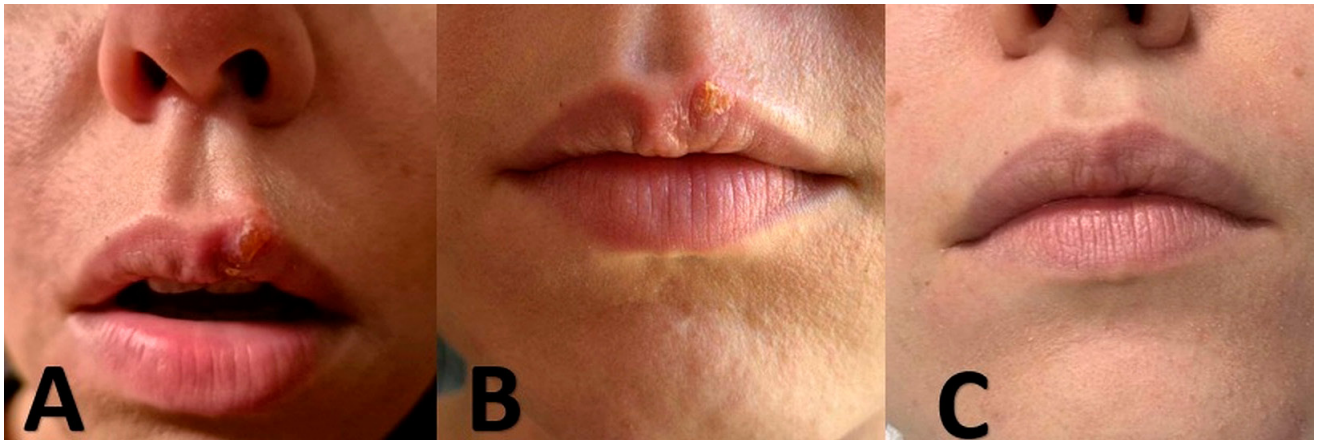

Figure 4. Case 2 A. Clinical status before PBM. B. Clinical status after 2 treatment sessions. C. Clinical status after 4 treatment sessions

J delivered per point (fluence ≈ 4 J/cm²). Irradiation was applied in a single point over the lesion. The irradiation cycle consisted of four 4 sessions: on the day of presentation and then at 2-day intervals (Fig. 4 and 5). After several days of therapy, the lesion healed completely. The patient has been under observation for 11 months, with no further recurrences. Previously, herpes appeared every 2 months, on average, mainly on the upper lip, with prolonged healing time (more than 2 weeks) and severe pain.

The photobiomodulation procedure with a diode laser was completely painless. A marked reduction in pain, erythema and healing time was observed, and the lesion resolved completely without scarring. The main clinical outcomes assessed were pain intensity, healing time, and the absence of recurrence during follow-up.

The laser parameters applied in both presented cases were selected based on previously published clinical evidence and on the therapeutic goals of the procedure. The settings used for photobiomodulation therapy were chosen to achieve combined analgesic, anti-inflammatory and biostimulatory effects, which have been shown to contribute to accelerated epithelialisation, reduction of pain, and prolonged recurrence-free periods in patients with herpes labialis. The parameters remained within the ranges commonly described in the literature as effective and clinically safe, ensuring adequate tissue response without the risk of thermal damage [5, 8–12, 14].

Similarly, the protocol of antimicrobial photodynamic therapy (aPDT) was designed in accordance with existing publications, aiming at local viral inactivation through reactive oxygen species generation, while simultaneously supporting tissue healing. The wavelength, exposure time and the use of a photosensitiser were consistent with therapeutic standards reported in previous studies and clinical applications of photodynamic therapy in viral and mucosal lesions, ensuring both effectiveness and a favourable safety profile [16–19].

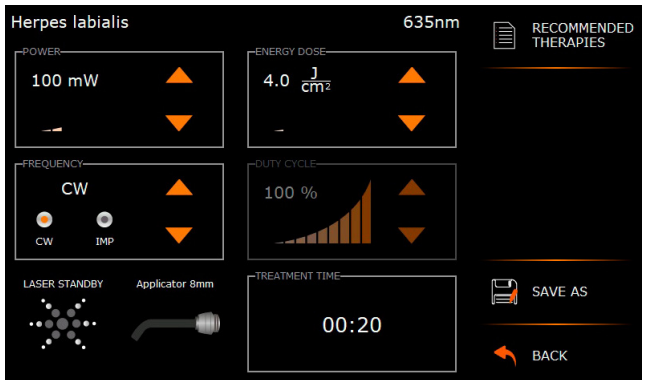

Figure 5. Parameters used for PBM

DISCUSSION

Recurrent herpes labialis remains a common and clinically relevant condition, often associated with pain, prolonged healing time, and impaired quality of life. Conventional pharmacological management based on acyclovir alleviates symptoms but does not eliminate latent infection, and therefore does not prevent future relapses. Moreover, prolonged treatment, incomplete symptom control and the risk of developing viral resistance, may limit the overall therapeutic success.

The standard treatment for cold sores is acyclovir (ACV), an antiviral drug that relieves symptoms but does not eliminate latent infection. ACV can be administered topically, orally, or intravenously. Topical application is the least effective but the risk of side-effects is also lower. On the other hand, oral and intravenous administration is indicated for patients with recurrent lesions or compromised immunity, as non-selective use can lead to complications [5]. The most common side-effects of ACV are headache, nausea, diarrhoea, itching, rash, photosensitivity, fatigue, and fever [6]. The risk of developing resistance is increased by long-term therapy, low doses, immunosuppression, and active viral replication [7]. These limitations justify the search for complementary therapeutic approaches that may accelerate healing, improve symptom control, and enhance patient comfort in recurrent herpes labialis. This manuscript report does not aim to provide a comprehensive literature review, but rather presents two 2 clinical cases supported by a selective, evidence-based discussion based on the most relevant publications.

Laser therapy, especially photobiomodulation, is a promising therapeutic alternative for patients with herpes. PBM utilises analgesic and anti-inflammatory effects, as well as stimulation of tissue repair processes such as fibroblast proliferation, immune response modulation and angiogenesis [8]. It is effective by inhibiting HSV-1 replication at the cellular level and modulating the immune response, which translates into a faster healing process, reduced

pain, and fewer recurrences. PBM reduces inflammation, relieves immediate pain, accelerates healing, and prolongs recurrence-free time [5, 9, 10].

The analgesic effect is associated with stimulation of peripheral nerves, which increases ATP production and stabilizes cell membranes, raising the pain threshold. In addition, PBM reduces pain conduction and increases the production of endogenous opioids. Accelerated healing of lesions is contributed by improved blood supply, neovascularization, and inhibition of prostaglandin E_2 synthesis. The lower recurrence rate may be related to stimulation of the immune response rather than direct inhibition of the HSV virus [11, 12]. The current findings are consistent with these mechanisms, as the patient treated with PBM experienced rapid pain reduction, accelerated healing and prolonged recurrence-free follow-up.

PAD, or antimicrobial photodynamic therapy (aPDT) and photodynamic therapy (PDT), are methods based on the same physicochemical mechanism, involving the activation of a photosensitizer by light at a specific wavelength in the presence of oxygen, which leads to the formation of reactive oxygen species (ROS) with cytotoxic effects. However, their scope and purpose of application are different [16, 17]. PAD mainly involves elimination of microorganisms (bacteria, fungi, viruses) and is used, for example, in dentistry for root canal disinfection, treatment of periodontitis or peri-implantitis [17, 18]. The protocol is used in the context of broadly understood antimicrobial therapy, which also includes skin and mucosal infections [19]. PDT has a wider therapeutic application and includes treatment not only of infections (bacterial, viral, fungal), but also cancer, dermatological diseases, and chronic inflammatory changes. PDT utilizes the effect of ROS not only on pathogens, but also on host cells, including modulation of the inflammatory response and induction of apoptosis [19]. These properties provide a strong biological rationale for using aPDT in herpes labialis, enabling both local viral reduction and favourable tissue response. This corresponds with the outcome observed in the presented patients, who demonstrated rapid clinical improvement and no recurrence during follow-up.

In the study by Seyyedi et al., patients were randomly assigned to two 2 groups: the first received a combination therapy, consisting in an application of a cream containing 5% ACV, and PBM with a wavelength of 940 ± 10 nm, energy density of 4 J/cm², and power of 100 mW. The other group were administered 5% ACV 5 times a day for 5 days and treated with a sham laser. Results showed that the group treated with PBM in combination with ACV experienced significantly less pain. PBM may therefore be an effective adjunct to ACV therapy, offering additional benefits such as pain reduction, lesion size reduction, and increased patient satisfaction [13].

A meta-analysis by Barros et al. demonstrated superiority of laser therapy over other treatment methods. This method appears to reduce pain, shortens healing time, and decreases the recurrence rate. Despite promising results, further research is needed to systematize the used protocols [5]. A systematic review by Al-Maweri et al. showed that the use of PBM was associated with significantly shorter healing times for herpes lesions, compared to control groups, and more effective reduction of swelling compared to ACV therapy [14]. Most of the studies included in this review reported a reduced recurrence. No adverse effects were reported in any of the studies. A meta-analysis of results indicates that PBM may be an effective and safe method of reducing pain, accelerating healing, and reducing the recurrence of cold sores [14]. Carlos de Paula Eduardo et al. also presented an interesting approach, developing a pilot protocol for the prophylactic treatment of cold sore symptoms in patients with normal immunity. The authors assumed that early prophylactic laser irradiation could reduce the frequency of recurrences, shorten the duration of episodes, and alleviate pain. A three 3-year follow-up confirmed that recurrences were less frequent, resolved more quickly, and symptoms were less severe [15].

Taken together, current evidence suggests that PBM and aPDT may represent valuable complementary therapeutic strategies in recurrent herpes labialis, offering clinical benefits beyond pharmacological therapy alone.

Limitations of the study. This report is limited by the small number of presented cases and the lack of a control group, which does not allow the results to be generalised. Although the clinical outcomes were favourable, follow-up times remained limited and further long-term observation is required. In addition, variability in reported laser parameters in the literature highlights the need for standardised, well-designed clinical trials to establish optimal therapeutic protocols.

Table 1. Photosensitizers [16–20]

Photosensitizers used in PDT	Photosensitizers used in PAD
• Porphyrins and their derivatives o 5-aminolevulinic acid – 5-ALA o Methyl ester of aminolevulinic acid – MAL	• Phenothiazines (similar to those used in PDT, but at lower concentrations) o Toluidine blue O (TBO) o Methylene blue (MB)
• Phenothiazines o Toluidine blue O (TBO) o Methylene blue (MB)	• Indocyanine green (ICG)
• Chlorins	• Curcumin
• Phthalocyanines	• Rose Bengal
• Others	• Chlorin (E6) • Others

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