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Case report

A case report of Ramsay Hunt syndrome in a patient with HIV treated by dual-wavelength photodynamic therapy

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ABSTRACT

In this paper we report on the application of dual-wavelength photodynamic therapy with a topical chlorin-based photosensitizer for treatment of Ramsay Hunt syndrome in a patient with HIV. Traditional treatment approach (combination of acyclovir and a glucocorticosteroid) failed to provide a significant outcome, while photodynamic therapy resulted in fast positive dynamics. No recurrence was observed in a 5-month-long follow-up.

1. Introduction

The Ramsay Hunt syndrome (RHS) was first described in 1907 by an American neurologist James Ramsay Hunt. Classical development of the disease is associated with the varicella-zoster virus, an exclusively human neurotropic alpha-herpesvirus, which, after the initial exposure, persists in the sensory ganglia of the cranial and spinal nerves. When the virus is reactivated, its reproduction begins, resulting in the development of a herpetic lesion of the ganglion and a corresponding dermatome [1]. A vesicular rash in the external auditory canal, in the area auricle and/or in the oral mucosa, a peripheral facial nerve palsy, and earache are the pathognomonic symptoms for this disease [2]. In particular cases, dizziness may occur together with a decrease in hearing acuity (up to its complete loss) due to a lesion development in the vestibulocochlear nerve. For proper diagnosis, a thorough neurological examination is of high importance. The basic strategy of the RHS treatment is a combination of antiviral drugs and corticosteroids. Besides, other treatment approaches aimed at restoring the nerve function are recommended (physiotherapy, massage, vitamin therapy, acupuncture). Early initiation of antiviral and corticosteroid therapy prevents the progression of the disease [3]. Numerous factors, such as diabetes mellitus, oncologic pathologies, stress, particular medication courses, as well as immunodeficiency states increase the risk of occurrence and complicate the course of this disease. For example, patients with human immunodeficiency virus (HIV) often exhibit multiple lesions of cranial nerves, a tendency to dissemination of infection and neurological complications, as well as frequent recurrences [4].

Photodynamic therapy (PDT) is a minimally invasive treatment approach based on photoactivation of a photosensitizer delivered to the anatomy requring treatment. This approach has been successfully used against oncologic pathologies [5]; in recent years, it was actively introduced for treatment of acute and chronic inflammatory diseases of various localization [6]. Chlorin-based photosensitizers provide additional opportunities for choosing the treatment tactics due to two peaks in absorption spectra at the wavelengths of 405 and 660 nm, to perform irradiation at these wavelengths separately or employing their combinations [7].

2. Case report

A 51 years old male patient was referred to the outpatient department of ENT in 2019, February, 11 with complaint of dizziness, pain and exudation from the right ear, sore throat, face asymmetry, lacrimation, increase in body temperature to 38.0 °C. The patient history included appearance of the first symptoms (pain in right ear and throat) on February 3, 2019. The patient reported that prior to seeking medical care in the outpatient department he performed self-treatment included gargling with antiseptic solution and application of antibacterial drops in the ear 3 times a day, which gave no noticeable effects. Visual examination indicated that the right side of auricle is hyperemic and edematous, an infiltration was noted in the area of the anticepala together with purulent vesicles, the skin of the external auditory canal

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exhibited pronounced edema and hyperemia, abundant purulent exudate in it, also accompanied by purulent vesicles. The eardrum was purple-cyanotic, the identification marks were smoothed, the distance of auditory perception was 5 m.

Pharyngoscopy revealed edema, hyperemia of the mucous membrane of the right palatine tonsil, palatine arches on the right, and the posterior pharyngeal wall on the right, accompanied by purulent vesicles. The neurological status included clear consciousness, negative meningeal syndrome, preservation of visual acuity; a pronounced right-side prosoparesis was noted (smoothness of frontal and nasolabial folds, right-side lagophthalmos, positive Bell symptom, positive lash symptom), together with increased lacrimation from the right eye, right-side hyperacusis, right-side hypogeusia of the front 2/3 section of the tongue. In Romberg's test staggering without a predominant direction is noted.

To exclude acute mastoiditis, multispiral computed tomography (CT) was performed (on February 11, 2019). No bone-destructive changes in the pyramid and mastoid process of the right temporal bone process were revealed, no volumetric formations of the cerebral-cerebellar angle were found. Standard laboratory examination and microbiological examination of the ear discharge were performed. A firstly revealed HIV-positive result was obtained, in addition, *Ps. aeruginosa* 10^{4-5} was revealed in the discharge from the outer ear.

Based on the results of otho-and pharyngoscopy, neurologist examination, and multispiral CT data, RHS was diagnosed with acute diffuse right otitis media, tonsillopharyngitis, and pronounced paresis of the right facial nerve. Taking into account the complexity of clinical manifestations of otitis externa, the patient was hospitalized for inpatient treatment. The following treatment scheme was selected: acyclovir 200 mg 5 times a day orally, betahistine 24 mg 2 times a day, fluconazole 150 mg once, dexamethasone 16 mg intravenously, ceftriaxone 1.0 2 times a day intramuscularly, proserin 1 ml 0.05% n / a, vitamins of group B (alternating B1, B6, B12) intramuscularly, and local treatment (hygiene of the external auditory canal with antiseptic solutions). Within several days of this chosen treatment scheme, the positive dynamics was insignificant (Fig. 1). In this connection, PDT was added to the standard treatment.

Photodynamic therapy was performed with the topical application of chlorin e6-based photosensitizer "Revixan derma" (Revixan Ltd., Russia); a dual-wavelength setup ("Harmony", Russia) was employed for irradiation. A thin layer of photosensitizer was applied on the skin region behind the ear, on the lesion area of the auricle and the external auditory canal. In 30 min, the remaining photosensitizer was removed, and irradiation was performed in a non-contact mode with a total light dose of 75 J/cm^2: a dose of 25 J/cm^2 was delivered at the wavelength of 405 nm followed by 50 J/cm^2 at the wavelength of 660 nm. A total of 2 procedures were performed with a 24-h interval. The patient signed an informed consent.

3. Results

In 24 h after the first PDT procedure the positive effect was detected: visual examination revealed a decrease in manifestation of hyperemia and skin infiltration, the patient noted reduction of pain. After the second procedure, a pronounced positive dynamics was observed: local inflammatory processes stopped, vesicular rash and purulent discharge disappeared (Fig. 2), no otalgia was found. Only a very limited area of hyperemia with skin maceration persisted, without purulent discharge. Neurological status included reduction of lagophthalmos, a decrease in nasolabial fold flattening, a reduction in lacrimation, relief of hyperacusis, restoration of the tongue taste sensitivity. Control microbiological study revealed no presence of *Ps. aeruginosa*.

Relief of local inflammatory manifestations and general infectious syndrome together with positive dynamics in neurological symptoms allowed the patient to be discharged for outpatient treatment. It was recommended to continue the standard treatment aimed at restoring the *n. facialis* function.

During the follow-up period till July 2019 (5 months), no recurrences of the disease were detected.

4. Discussion

The problem of proper choice of treatment tactics for RHS has not been completely resolved problem to date. Combination of acyclovir and a glucocorticosteroid is the most frequently recommended therapy, however, the optimal doses of these drugs vary and are discussed in various studies [8]. Inadequately selected therapy protocol can lead to multiple lesions of cranial nerves [4,8], thus leading to severe delayed

Fig. 1. Images of the patient skin behind right ear (a) and auricle (b) prior to the PDT procedure (February 15, 2019).

Fig. 2. Images of patient skin behind right ear (a) and auricle (b) in 4 days after the first PDT procedure (February 19, 2019).

symptoms and frequent recurrences. Significant complications occur in the presence of another pathology, in particular, of HIV infection [4]. This motivates the search for novel treatment approaches and protocols.

We found no reports on application of PDT for RHS treatment in the literature. At the same time, many studies report on the antimicrobial and anti-inflammatory effects of PDT in the treatment of inflammatory diseases of various localization [6]. In order to suit antimicrobial PDT, a photosensitizer should satisfy a number of requirements, such as low level of dark toxicity, the presence of absorption bands in the optical transparency wavelength range (600–900 nm), and high yield of reactive oxygen species. An ideal photosensitizer for antimicrobial treatment should be efficient against several microbial classes in low concentration and under comparatively low light doses [9]. *P. aeruginosa* detected in the reported case is a Gram-negative bacterium responsible for many life-threatening infections, especially in patients with HIV. Structural features of the outer membrane of Gram-negative bacteria ensure its permeability. This complicates the elimination of Gram-negative bacteria by PDT, since not every photosensitizer can penetrate in the plasmatic membrane or in the cytoplasm, thus inducing photochemical decontamination [10].

Recently, the potential of PDT to stimulate regeneration processes has been demonstrated [11]. Employment of non-standard irradiation wavelengths for alternative or complementary light exposure was also proposed to increase the efficiency of PDT [12]. It should be noted that the previously reported results mainly relate to the use of protoporphyrin-based photosensitizers, while the studies of chlorin-based photosensitizers are rather limited [13].

In the reported clinical case, the use of dual-wavelength PDT using chlorin-based photosensitizer in the complex treatment of RHS in a patient with HIV resulted in positive outcome due to a good antimicrobial effect and recovery stimulation. Excellent outcome of this case report should encourage further study of the use of PDT in the complex treatment of Ramsey-Hunt syndrome.

5. Conclusion

Our first experience demonstrates that PDT can serve as a complementary approach in the treatment of Ramsay Hunt syndrome, especially in patients with pronounced local inflammatory manifestations and aggravating factors in history, such as HIV-positive status. In our opinion, employment of dual-wavelength PDT protocols with chlorin-based photosensitizers allows to achieve good antimicrobial effect and boost the recovery process.

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Declaration of Competing Interest

The authors declare no conflicts of interest.

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