International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 36-41
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ijmscr

Research Article

USE OF PHOTODYNAMIC THERAPY IN CHEMICAL BURNS OF DIFFERENT ETIOLOGIES OF THE SURFACE OF THE EYE

Submission Date: November 01, 2022, Accepted Date: November 08, 2022,
Published Date: November 18, 2022
Crossref doi: https://doi.org/10.37547/ijmscr/Volume02Issue11-07

Oralov Behruz Abdukarimovich
PHD, Assistant Of The Department Of Ophthalmology, Tashkent Medical Academy, Uzbekistan

ABSTRACT

60 patients (90 eyes) with a burn of the eyes of I and II degree of severity of various etiologies were examined. In the control group of patients, traditional treatment was carried out, for patients of the main group, in addition to the above treatment, photodynamic therapy was carried out. The level of protein, malondialdehyde, and catalase activity were determined in the lacrimal fluid. The use of photodynamic therapy in the complex treatment of patients with eye burns activates catalase and reduces the high level of malondialdehyde, especially with II degree burns, reduces the degree of endogenous intoxication and helps to accelerate the reparative processes of post-burn damage.

KEYWORDS

Acid burn, alkaline burn, chemical burn of the eye, malondialdehyde, catalase, anterior surface of the eye

INTRODUCTION

In diseases of the anterior segment of the eye, an ophthalmologist has a large selection of treatment methods. However, with the development of new techniques and modern methods of treatment, in the last decade, the study of laser therapy has become of great importance.

International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 36-41
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

In medical practice, in all branches of medicine, lasers of the red and infrared radiation spectrum have mainly found application.

Lasers with a wavelength in the range of 0.61-0.69 µm of the red spectrum are used to influence the mucous membranes, nearby skin and tissues, since the penetration depth reaches 2 cm [5].

The red spectrum can cause both antioxidant and prooxidant effects in the form of the formation of singlet oxygen. Significantly facilitates the non-invasive use of the red spectrum, the high transparency of biological tissues for it relative to other wavelengths of the optical range. In human tissues, photoacceptors of the red spectrum are molecules of deoxyribonucleic acid, the maximum absorption of which occurs at a wavelength of 0.620 nanometers (nm), cytochrome oxidase - 0.600 nm, cytochrome - 0.632 nm, superoxide dismutase - 0.630 nm and catalase at a wavelength of 0.628 nm [7].

To influence deep tissues and organs, laser radiation of 0.8-0.95 microns in the infrared range is universal. The infrared spectrum penetrates into biological tissues to a depth of 6-7 cm, the energy of its quantum is not enough to influence biochemical processes, and its initial effect is a thermal effect [9].

The clinical effects of the infrared spectrum are manifested in improving blood microcirculation, reducing the intensity of pain. The disadvantage of this spectrum lies in the energy of its quanta, which is 1 eV. When biochemical processes in biological tissues have an energy of about 2 eV [4], near-infrared radiation is absorbed mainly by nucleic acid molecules at a wavelength of 0.820 nm, and most importantly, both radiation spectra are also absorbed by oxygen [2,3,8].

All of the above factors in the form of DNA and enzymes are the basis for the further proper functioning of structures in various lesions. But a considerable controversy arose around the red spectrum of radiation in the application of certain ophthalmopathologies. There have been numerous studies devoted to this wavelength.

Purpose of the work. Improving the complex treatment of eye burns using photodynamic therapy.

Research methods. On the basis of the multidisciplinary clinic of the Tashkent Medical Academy, together with the emergency ophthalmic microsurgical department of the Clinical Emergency Hospital, 60 patients (90 eyes) with eye burns of I and II degrees of severity of various etiologies were examined. I degree burns were detected in 57 eyes, II degree burns - in 33 eyes.

Depending on the treatment, the patients were divided into two groups. Depending on the severity of the burn injury and clinical and functional manifestations, the groups were homogeneous.

In the control group, 30 patients (45 eyes) underwent traditional treatment, including tetracycline derivatives on an ointment basis (3 times a day), instilled M-anticholinergics in the form of 1% tropicamide (2 drops 2 times a day), 20% corneregel gel (1 drop 3 times a day), antihistamines 1 tablet 1 time a day, vitamin B complex 2.0 ml IM. In addition to the above treatment, 30 patients (45 eyes) of the main group underwent photodynamic therapy (PDT) at a dose of 300 mJ (630 nm), exposure for 3 minutes, for 7 days on domestic-made equipment - the Vostok laser therapy device with a specially created ophthalmic nozzle with a diameter of 3 cm, repeating the horizontal anatomical section of the human eye. A 1% aqueous solution of methylene blue was used as a

International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 36-41
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

photosensitizer, which was instilled immediately before laser irradiation, 1 drop into the conjunctival cavity. In many cases, the process was two-sided, therefore, in the future, when describing the results obtained, data on the number of eyes will be given.

The duration of the disease averaged 8±2 days, the average age of patients was 49±28 years.

In the course of treatment, safety measures were taken into account, since the domestic device belongs to class 1 in terms of the safety of laser radiation according to the "international sanitary standards and rules for the operation of lasers" and in terms of electrical safety class 2 with a degree of protection BF. The treatment was carried out in accordance with the Law of the Republic of Uzbekistan "On the protection of the health of citizens" and according to the ethical principles of the Helsinki Declaration (2013).

As a rule, PDT was carried out on the periphery of the pathological focus with the obligatory capture of healthy tissues, remotely at a distance of 1-3 cm from the surface, moving the defocused beam, that is, scanning it over the irradiated surface. The laser therapy procedure was carried out between 9 and 12 hours on the recommendation of a number of authors. Treatment was carried out for 7-10 days depending on the severity of the lesion. The procedures were carried out in the morning 1 time per day, daily or every other day. The total number was 5 sessions. After the procedure, patients were allowed to rest for 30 minutes.

The degree of burn damage to the cornea and limbus was controlled biomicroscopically (classification by V.A. Puchkovskaya 2002), while the ocular surface was stained with 1% sodium fluorescein solution, assessing the uniformity and depth of burn damage according to the recommendations of the National Eye Institute (NEI/Industry Workshop on Clinical Trials in dry eyes) [1].

The levels of protein, malondialdehyde (MDA), and catalase activity were determined in the lacrimal fluid (LF). From the affected eye of patients, SF was taken with a cannula from the lacrimal lake, stimulated (0.15 ml) by inhalation of vapors of 10% ammonia, following the required rules according to the method of N.A. Terekhina before and after treatment. The resulting tear fluid was placed in a centrifuge tube and centrifuged at 1500 rpm for 5 minutes [9].

The Statistica 10.0 program was used for static data processing.

Research results. When studying the effect of traditional therapy and PDT in groups of patients, the data of SG were compared. Our data indicate a decrease in the production of acute-phase inflammatory proteins and the effectiveness of ongoing therapeutic measures, especially during PDT (Table 1.)

Table 1

MDA content and catalase activity in lacrimal fluid of patients with eye burns during treatment (M±m)

International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 36-41
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

	MDA content (nmol/ml)		Catalase activity (μmolH2O2/min mg protein)	
Groups	Control group	Main group	Control group	Main group
I degree burns				
Before treatment	2,61±0,05***	2,63±0,08***	0,14±0,005*	0,144±0,006*
After treatment	2,05±0,06*^^^	1,85±0,06^^^	0,16±0,006^	0,21±0,011^^^
II degree burns				
Before treatment	4,70±0,14***	4,74±0,17***	0,085±0,01***	0,087±0,004***
After treatment	2,65±0,05***^^^	2,09±0,065*^^^	0,166±0,01	0,21±0,012^^^

Note: * - differences relative to the data of the healthy group are significant (* - p<0.05, *** - p<0.001), ^ - differences relative to the data of the group after treatment are significant (^^^ - p<0.05)

Conducted basic therapy for burns of II degrees and I leads to adequate activation of catalase in the SF by 1.13 and 1.89 times, and their approximation to the values of practically healthy individuals. This led to a decrease in the level of MDA in the SF by 1.24 and 1.64 times relative to the values before treatment. Despite such positive changes, the intensification of lipid peroxidation persisted, since the values of the MDA level were still statistically significantly higher than the values of practically healthy individuals by 1.14 and 1.55 times, respectively, in groups of patients with burns of II degrees, and I which indicates preservation of destructive processes in the eye. PDT in patients with eye burns led to a more pronounced activation of catalase: an increase of 1.41 and 1.19 times in patients with I degree burns, 2.32 and 1.22 times in the treatment of II degree burns, respectively, the initial parameters and relative to the values of patients receiving basic treatment. In both groups, the activity of the enzyme even slightly exceeded that of practically healthy individuals. Such activation of catalase in the SF contributed to a more pronounced neutralization of peroxide radicals, which was manifested by a decrease in the level of MDA after PDT by 1.39 and 2.21 times, respectively, in groups of patients with burns of I and II degrees, respectively, of the initial parameters. It should be said that these values were 1.09 and 1.30 times lower than those of the groups of patients who received basic treatment, respectively, for the above pathologies. It should be said that if the level of MDA in the SF approached the values of practically healthy individuals in patients with first degree burns, then in the group of patients with second degree burns it remained 1.16 times higher than the norm.

CONCLUSIONS

Chemical burns of the eye, regardless of etiology, are serious injuries that affect the patient's quality of life.

International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 36-41
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

Such serious cases require urgent medical assistance. Due to untimely and unqualified help, the patient often becomes disabled. Effective treatment or management of the disease makes it possible to prevent negative complications and consequences and to develop comprehensive measures. The most important point is that washing the eye surface is important in case of chemical eye burns. Many foreign authors believe that washing is the best early measure to prevent the corrosion process from spreading to the eye and the subsequent development of complications, to eliminate inflammatory proteins. It was recommend in all official standards worldwide (ANSI standards in Germany and Berufsgenossenschaften recommendations) for first aid for eye burns.

In the lacrimal fluid of patients with eye burns, the level of malondialdehyde increases, against the background of a decrease in catalase activity and an imbalance in the lipid peroxidation/antioxidant blood protection system, especially in patients with II degree burns. The use of photodynamic therapy in the complex treatment of patients with eye burns activates catalase and reduces the high level of malondialdehyde, especially with II degree burns, reduces the degree of endogenous intoxication and accelerates the reparative processes of post-burn lesions.

REFERENCES

1. Ashurov A.M., Ashurov O.M., Muratov N.N., Oralov B.A.., Medical tactics for cavernous sinus thrombosis in patients with COVID-19 // Journal of Biomedicine and Practice 2022, vol. 7, issue 1, pp.217-226. DOI: http://dx.doi.org/10.5281/zenodo.6405202
2. Bakhritdinova F.A., Bilalov E.N., Oralov B.A., Mirrakhimova S.Sh., Safarov J.O., Oripov O.I., Nabiyeva I.F. The assessment of lacrimal film condition in patients with dry eye syndrome during therapy. Russian ophthalmological journal. 2019; 12 (4): 13-8 (in Russian). DOI: https://doi.org/10.21516/2072-0076-2019-12-4-13-18
3. Bakhritdinova F.A., Egamberdieva S.M., Oralov B.A., Khusainova A.S. Peculiarities of local immunity of eyeball and its role in the development of inflammatory diseases // Point of view. East – West. -2020. -№ 4. –P. 62-65. DOI: https://doi.org/10.25276/2410-1257-2020-4-62-65
4. Bakhritdinova F.A., Mirrakhimova S.Sh., Narzikulova K.I., Oralov B.A. Dynamics of cytological parameters of the conjunctiva in the course of a complex treatment of eye burns using a low-intensity laser radiation. The EYE Glaz. 2019; 3: 7-11. DOI: https://doi.org/10.33791/2222-4408-2019-3-7-11
5. Bakhritdinova F.A., Mirrakhimova S.Sh., Oralov B.A., Ashurov O.M., Khadzhimukhamedov B.B. Reparative and antioxidant therapy of chemical eye burns. Russian ophthalmological journal. 2021; 14 (4): 31-7 (In Russian). https://doi.org/10.21516/2072-0076-2021-14-4-31-37
6. Bakhritdinova F.A., Narzikulova K.I., Mirrakhimova S.Sh., Oralov B.A., Shorustamova M.M. Photodynamic therapy for eye burns // Bulletin of the Tashkent Medical Academy. -Tashkent, 2020. -№3. –P. 35-37
7. Mirrakhimova S.Sh., Bakhritdinova F.A., Narzikulova K.I., Oralov B.A., Matkarimov A.K., Determination of the eye surface damage index for burning eyes, Journal of Biomedicine and Practice 2020, Special issue, pp. 391-396. DOI: https://dx.doi.org/10.26739/2181-9300-2020-SI-2-63

International Journal of Medical Sciences And Clinical Research (ISSN – 2771-2265)
VOLUME 02 ISSUE 11 PAGES: 36-41
SJIF IMPACT FACTOR (2021: 5. 694) (2022: 5. 893)
OCLC – 1121105677 METADATA IF – 5.654
Publisher: Oscar Publishing Services

8. Narzikulova KI, Bakhritdinova FA, Mirrakhimova SSh, Oralov BA. Development and evaluation of the effectiveness of photodynamic therapy in inflammatory diseases of the ocular surface. Ophthalmology Journal. 2020;13(3):55-65. https://doi.org/10.17816/OV33828

9. Oralov B.A., Mirrahimova S.Sh., Narzikulova K.I., Matkarimov A.K., Nabieva I.F. Differentiated approach to diagnosis of the secondary dry eye syndrome // Problems or Biologv and Medicine. -2020. -№2. -Vol. 118. -P. 193-197. DOI: http://doi.org/10.38096/2181-5674.2020.2.00120