Ophthalmic system based on excimer KrCl laser (223 nm)

Trials of using in ophthalmology for refraction errors and some eye’s deceases treatment (1988-2014)

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Abstract—Review of development and clinical trials conclusions of the ophthalmic KrCl (223 nm) laser system is presented. Medical safety, physical and technical advantages of the new laser system in comparison with widespread ArF (193 nm) laser systems for refractive surgery are demonstrated. The method of eye virus diseases treatment by usage of the KrCl laser radiation is proposed.

Keywords—excimer KrCl laser; eye surgery; 223 nm opthalmic laser system

I. INTRODUCTION

Currently, excimer lasers are widely used in ophthalmology in the correction of refractive errors, in the treatment of superficial forms of herpetic keratitis and keratitis of bacterial etiology. The most widely used ophthalmic systems are based on an electric discharge ArF excimer laser with a wavelength of 193 nm, the first created by A.M. Razhev et al. in 1977 [1]. This laser was the basis for a new type of ophthalmic laser system, which in 1987-89 was first carried out operations to correct refractive errors by a procedure known as LASIK today [2, 3]. Although the ArF laser (193 nm) remains the most popular source of intense UV radiation for ophthalmic applications, there are other lasers having a number of advantages compared to it. One of these is the electric discharge laser KrCl laser with a wavelength of 223 nm, for the first time created by A.M. Razhev et al. in 1977 [4]. Later, based on this laser the world's first ophthalmic laser system with a wavelength of 223 nm was developed and successfully passed clinical trials in the FSI IRTC “Eye Microsurgery”. To date, by using this laser system several hundred operations for the correction of refraction errors and treatment of superficial forms of herpetic keratitis were carried out [5].

II. RESULTS

Analysis of the clinical and functional results of operations indicates that the UV laser system radiation with a wavelength of 223 nm is safe for eyes, and a highly predictable refractive laser surgery invasion. Average uncorrected visual acuity after surgery was equal 0.9 ± 0.05 and remained as high in the long-term follow up to two years. The data obtained during thermal study indicate that the difference between minimum and maximum values of the temperature on the cornea surface during UV laser ablation with a wavelength 223 nm was not more than 5.5°C, in contrast to the wave length of 193 nm, where the difference was equal to 11°C. As a result of UV laser radiation (223 nm) influence is no development of destructive inflammation and activation of the immune response. UV laser system with a wavelength of 223 nm is highly effective for the treatment of superficial forms of ophthalmic herpes [6]. Operations carried out showed a high degree of treatment and no recrudescence within a few years. All the above arguments, subject to further upgrading and equipping the latest technical advantages of laser radiation the delivery, such as «flying spot», active tracking system and other systems of control, indicates good potential ophthalmic system with a wavelength of 223 nm.

REFERENCES