

## CLINICAL EXPERIENCE OF MIXED ASTIGMATISM AND ANISOMETROPIC AMBLYOPIA CORRECTION IN ADOLESCENTS USING FEMTOLASIK TECHNOLOGY

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**Annotation. Relevance.** Refractive amblyopia against the background of anisometropic refraction, especially with mixed astigmatism, does not respond well to conservative treatment, is accompanied by a disorder of binocular functions and is one of the causes of visual disability. **Purpose of the study.** To evaluate the effectiveness and safety of excimer laser vision correction using the femtoLASIK method in adolescents with mixed astigmatism and anisometropic amblyopia. **Materials and methods.** The study group included 20 patients (20 eyes) aged from 14 to 17 years (average  $13.8 \pm 0.85$  years) with mixed astigmatism from 3.25 to 5.5 diopters. During surgery and in the postoperative period, no complications were noted in any case. **Results and conclusion.** As a result of laser correction, the following refractive indices were achieved in patients: a decrease in the amount of astigmatism by  $4.21 \pm 0.44$  diopters. (88.1% of the original value) and the value of anisometropia –  $4.1 \pm 0.53$  diopters. (90.1% of the original value). Conclusions. The effectiveness and safety of laser correction determines its priority in the complex treatment of refractive and anisometropic amblyopia in children and adolescents with mixed astigmatism. Reducing the degree of amblyopia and the magnitude of anisometropia using the femtoLASIK method improves the quality of vision and ensures optimal social adaptation of children and adolescents.

**Key words:** femtoLASIK, adolescents, mixed astigmatism, refractive amblyopia.

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## О'СМИРЛАРДА АРАЛАШ АСТИГМАТИЗМ ВА АНИЗОМЕТРИК АМБЛИОПИЯНИ ФЕМТОЛАСИК ТЕХНОЛОГИЯСИ ЙОРДАМИДА ТУЗАТИШНИ КЛИНИК ТАЖРИБАСИ

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**Annotatsiya. Dolzarbligi.** Anisometropik refraksiya fonida, ayniqsa aralash astigmatizm bilan, refraktiv ambliopiya konservativ davoga yaxshi javob bermaydi, binokulyar funksiyalarning buzilishi bilan birga keladi va ko'rish qobiliyatining buzilishining sabablaridan biridir. **Tadqiqot maqsadi.** Aralash astigmatizm va anisometropik ambliopiya bilan og'rikan

o'smirlarda FemtoLASIK usuli yordamida eksimer lazerli ko'rishni tuzatish samaradorligi va xavfsizligini baholash. **Material va usullari.** Tadqiqot guruhi 3,25 dan 5,5 dioptrigacha bo'lgan aralash astigmatizmga ega 14 yoshdan 17 yoshgacha (o'rtacha  $13,8 \pm 0,85$  yil) 20 bemorni (20 ko'z) o'z ichiga oldi. Jarrohlik paytida va operatsiyadan keyingi davrda hech qanday holatda asoratlar qayd etilmagan. **Tadqiqot natijalari va xulosa.** Lazerli tuzatish natijasida bemorlarda quyidagi sinishi ko'rsatkichlariga erishildi: astigmatizm miqdorining  $4,21 \pm 0,44$  dioptrga kamayishi. (asl qiymatining 88,1%) va anizometriya qiymati -  $4,1 \pm 0,53$  dioptr. (asl qiymatining 90,1%). **Xulosa.** Lazerli tuzatishning samaradorligi va xavfsizligi aralash astigmatizmli bolalar va o'smirlarda refraktiv va anizometropik ambliopiyaning kompleks davolashda uning ustuvorligini belgilaydi. FemtoLASIK usuli yordamida ambliopiya darajasini va anizometriya hajmini kamaytirish ko'rish sifatini yaxshilaydi va bolalar va o'smirlarning optimal ijtimoiy moslashuvini ta'minlaydi.

**Kalit so'zlar:** femtoLASIK, o'smirlar, aralash astigmatizm, refraktiv ambliopiya.

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**КЛИНИЧЕСКИЙ ОПЫТ КОРРЕКЦИИ СМЕШАННОГО АСТИГМАТИЗМА И АНИЗОМЕТРИЧЕСКОЙ АМБЛИОПИИ У ПОДРОСТКОВ С ПОМОЩЬЮ ТЕХНОЛОГИИ ФЕМТОЛАСИК**

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**Аннотация. Актуальность.** Рефракционная амблиопия на фоне анизометропической аметропии, особенно при смешанном астигматизме, тяжело поддается консервативному лечению, и сопровождается расстройством бинокулярных функций, что является одной из причин инвалидности по зрению. **Цель исследования.** Оценить эффективность и безопасность эксимерлазерной коррекции зрения методом ФемтоЛАСИК у подростков со смешанным астигматизмом и анизометропической амблиопией. **Материал и методы.** В исследуемую группу вошли 20 пациентов (20 глаз) в возрасте от 14 до 17 лет (средний  $13,8 \pm 0,85$  лет) со смешанным астигматизмом от 3,25 до 5,5 дптр. В ходе хирургического вмешательства и в послеоперационном периоде ни в одном случае осложнений не отмечено. **Результаты и заключение.** В результате лазерной коррекции у пациентов были достигнуты следующие рефракционные показатели: уменьшение величины астигматизма на  $4,21 \pm 0,44$  дптр. (88,1 % исходной величины) и величины анизометропии -  $4,1 \pm 0,53$  дптр. (90,1 % исходной величины). Эффективность и безопасность лазерной коррекции определяет ее приоритетность в комплексном лечении рефракционной и анизометропической амблиопии у детей и подростков со смешанным астигматизмом. Уменьшение степени амблиопии и величины анизометропии методом ФемтоЛАСИК повышает качество зрения и обеспечивает оптимальную социальную адаптацию детей и подростков.

**Ключевые слова:** ФемтоЛАСИК, подростки, смешанный астигматизм, рефракционная амблиопия.

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**Relevance.** Refractive amblyopia is the most common functional vision disorder in children and adolescents, representing a serious medical and social problem [9]. Currently, risk factors for the development of amblyopia have been identified [10], the degree of anisometropia contributing to the development of amblyopia has been studied [15], and its effect on the severity of the condition [15]. In addition to the well-known reasons associated with the difficulty of wearing glasses and possible complications of various types that arise when wearing contact lenses,

young children have the problem of maintaining continuity of correction [13]. Not all parents cope with difficulties and the need for constant monitoring.

Unfortunately, traditional methods of correction - glasses, contact lenses, with a high degree of astigmatism and anisometropia are not able to fully solve the problem of correcting this type of ametropia and create the necessary conditions for the normal development of the visual analyzer in children and adolescents [2,4,15]. The result is maladaptation of the visual system, refractive amblyopia. This

often leads to a pronounced decrease in visual functions and to psychological and social problems in this category of patients in everyday life, study, and subsequently in the professional sphere [7,11,13]. Unfortunately, in this category of young patients, functional conservative treatment methods - physiotherapeutic (electrical stimulation, magnetic stimulation) methods, various types of training aimed at both sensory and motor functions of the eye - are ineffective [3,6,10]. In these cases, many authors over the past two decades, during the period of rapid development of refractive surgery, have proposed performing laser correction of refractive errors [5,8,9,12]. In our opinion, the early and widespread use of keratorefractive surgical interventions, in particular excimer laser surgery, is hampered by the psychological "unpreparedness" of parents and the conservative attitude of ophthalmologists. In this regard, determining the optimal approach to the treatment of amblyopia in children and adolescents in the case of mixed astigmatism and anisometropia of more than 3.0 diopters is an urgent problem in pediatric ophthalmology today [1,14].

**Purpose.** To evaluate the effectiveness and safety of excimer laser correction with FemtoLASIK technology in adolescents with mixed astigmatism and anisometropic amblyopia.

**Material and methods.** In the innovative clinic of Dr. Maksudova, 20 adolescents with mixed astigmatism, anisometropic amblyopia and emmetropic refraction in the fellow eye were examined, and operated. Indications for laser correction were: anisometropia more than 3.0 diopters, severe asthenopic complaints despite optimal spectacle correction of astigmatism, intolerance to contact correction; lack of effect from conservative treatment of refractive amblyopia. The necessary conditions for surgical treatment were: stable refraction for two years; absence of concomitant ophthalmopathy; establishing psychological contact between the doctor and the child and his parents. To achieve mutual understanding with the child and parents, a detailed explanatory conversation was held about the progress of the operation and its prognosis. The study group included 20 patients (20 eyes) aged from 14 to 17 years (average  $15.8 \pm 0.85$  years) with mixed astigmatism from 3.25 to 5.5 diopters (the average degree was  $4.13 \pm 0.40$  diopters). 100% of patients had grade II–III amblyopia. The observation period was 12 months. Before the operation and during repeated examinations, a comprehensive ophthalmological examination was carried out, which included: visometry without and with correction, refractometry with and without cycloplegia, determination of the nature of vision, tonometry, keratotopography on WaveLight® Oculyzer™ II., pachymetry, biomicroscopy, ophthalmoscopy.

**Results and discussion.** During surgery and in the postoperative period, no complications were noted in

any case. Within 4 hours after laser correction, patients noted slight discomfort, photophobia and lacrimation, which did not require the use of painkillers. The most important criterion for assessing the effectiveness of refractive intervention is uncorrected visual acuity (UCVA) after surgery and the ratio of this indicator to the preoperative value of corrected visual acuity (CVA).

As a result of FemtoLASIK, the average BCVA in patients was statistically significantly higher than the average CVA before surgery:  $0.66 \pm 0.25$  and  $0.48 \pm 0.14$  ( $P < 0.01$ ), respectively. In 60% of cases (12 eyes), when correcting mixed astigmatism, visual acuity without correction exceeded the preoperative values of visual acuity with maximum correction by 0.1–0.5. The average BCVA increased by 0.25 ( $P < 0.01$ ) compared to the preoperative BCVA value and became equal to  $0.69 \pm 0.16$ . Thus, the elimination of astigmatism created more favorable conditions for the operation of the visual analyzer with a corresponding increase in visual acuity. During the entire observation period, in no case was there a loss of a single line of the CVA, which indicates the high safety of this operation in adolescents. After laser correction, patients underwent courses of physiotherapeutic treatment. In 23.5% of cases, an increase in corrected visual acuity of 0.1–0.2 was noted, whereas before surgery, conservative treatment methods had no effect. Thus, surgical techniques can be considered as a factor in creating conditions for the treatment of amblyopia. Postoperative refraction in all cases was statistically significantly different from preoperative ( $P < 0.001$ ) at all follow-up periods. Refraction was largely stabilized by the second month after surgery. As a result of laser correction, the following refractive indices were achieved in patients: a decrease in the amount of astigmatism by  $4.21 \pm 0.44$  diopters. (88.1% of the original value) and the value of anisometropia –  $4.1 \pm 0.53$  diopters. (90.1% of the original value). Our research and operations on adolescents showed similar results to those of foreign authors. which indicates the high clinical effect of laser vision correction as a method of preventing refractive amblyopia.

**Conclusions.** Excimer laser surgery using FemtoLASIK technology is a rational, effective and safe method for correcting mixed astigmatism and refractive amblyopia with anisometropic refraction in adolescents. Reducing the degree of amblyopia and the magnitude of anisometropia using the FemtoLASIK method improves the quality of vision and ensures optimal social adaptation of children and adolescents. In adolescents, keratorefractive excimer laser surgeries should be considered in combination with conservative methods of treating amblyopia.

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