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MODERN APPROACHES TO THE CORRECTION OF ASTIGMATISM

Abstract

At the present stage of development of lens surgery, the main task is to achieve maximum visual acuity without correction already in the early postoperative period. In the absence of concomitant pathology of the eyeball, the main obstacle to achieving high visual functions is astigmatism. Measures have been developed and studied in detail to prevent induced astigmatism, including after cataract phacoemulsification (PE). However, corneal astigmatism that exists before PE in a significant number of patients can significantly reduce the quality of patient rehabilitation. Spectacle and contact correction of astigmatism in the pseudophakic eye has a number of known disadvantages, limitations, in some cases it is poorly tolerated, which ultimately negatively affects the quality of vision and life, and also causes patient dissatisfaction with the surgical intervention. In this regard, a large number of surgical methods for the correction of astigmatism, combined with cataract surgery, have been proposed, which can be divided into keratorefractive and intraocular.

Keywords: *lens, astigmatism, development, glasses, surgical treatment*

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Astiqmatizmin korreksiyasına müasir yanaşmalar

Xülasə

Lens cərrahiyyəsinin inkişafının indiki mərhələsində əsas vəzifə əməliyyatdan sonrakı erkən dövrdə korreksiya etmədən maksimum görmə kəskinliyinə nail olmaqdır. Göz almasının müşayiət olunan patologiyası olmadıqda, yüksək vizual funksiyalara nail olmaq üçün əsas maneə astiqmatizmdir. Kataraktın fakoemulsifikasiyasından (FE) sonra da induksiya edilmiş astiqmatizmin qarşısını almaq üçün tədbirlər hazırlanmış və ətraflı öyrənilmişdir. Bununla belə, xəstələrin əhəmiyyətli bir hissəsində FE-dən əvvəl mövcud olan kornea astiqmatizmi xəstənin reabilitasiya keyfiyyətini əhəmiyyətli dərəcədə azalda bilər. Psevdofakik gözdə astiqmatizmin tamaşa və təmas korreksiyası bir sıra məlum çatışmazlıqlara, məhdudiyyətlərə malikdir, bəzi hallarda zəif tolere edilir, nəticədə görmə və həyat keyfiyyətinə mənfi təsir göstərir, həmçinin xəstələrin cərrahi müdaxilədən narazılığına səbəb olur.

Açar sözlər: *lens, astiqmatizm, inkişaf, eynək, cərrahi müalicə*

Introduction

Astigmatism is a combination of two or more refraction values in one eye; astigmatism is not an independent type of clinical refraction of the eye, but is a measure of the non-sphericity of the optical system of the eye.

The main sections (meridians) of the astigmatic eye are two sections (meridians) located at an angle of 900 to each other in which the refraction is the strongest and the weakest.

Astigmatism is a refraction anomaly of the eye, in which light rays cannot be focused in the form of a point on the retina. Due to this, a distorted image is formed, which significantly worsens the quality of life. Primary (or genetically determined) astigmatism, associated with anatomical features of the organ of vision, and secondary − as a result of acquired changes or surgical operations on the eyeball are distinguished (Rosenblum, Optmometry, 1996: 247; Myagkov, Parfenova, Demina, 2016: 205).

The causes of astigmatism have not been fully studied. In most cases, astigmatism has a congenital and hereditary nature, and is revealed in childhood. However, the cause of astigmatism may be operations or eye injuries. The image of subjects with astigmatism is unclear, blurred in places, straight lines look curved. In addition to defects in visual perception, astigmatism is usually accompanied by rapid eye fatigue, decreased vision, and headaches.

If there are patients with astigmatism in the family, the child must be examined by an ophthalmologist. Astigmatism is detected only with full ophthalmological examination. The patient with astigmatism feels only a decrease in visual acuity. For the correct determination of the degree of astigmatism and, especially, its axes, a thorough computer examination is necessary. Even small errors in diagnosis can lead to complete intolerance of glasses or lenses, as well as to deterioration of vision.

Correct astigmatism is an astigmatism in which the refractive power of the optical system of the eye is different, but unchanged in two perpendicular meridians (sections), as a result of which a beam of parallel rays of light coming from any point in space and falling on the eye is gathered not in a focal point, but in a figure having two focal lines - the front and back located on the optical axis. These lines, together with the circle of least light scattering between them and the figures of horizontal and vertical ovals, make up the so-called Sturm conoid (Kaimbo, Kaimbo, 2012: 59-74).

Incorrect astigmatism is an astigmatism in which the refractive power changes within the meridian, and the beam of parallel rays of light falling on the eye does not form a line, circle or oval figure on the optical axis. Irregular astigmatism is formed as a result of eye diseases that deform the shape of its optical surfaces: with keratoconus, keratoglobus, corneal scars of various genesis, dystrophic changes of the cornea, lenticonus, subluxation of the lens and other conditions (Rosenfield, 2006: 3-34).

Incorrect astigmatism requires a special approach to correction and treatment and is not considered in these clinical recommendations.

Astigmatism is often a congenital condition and is caused by the shape of the eye's refracting surfaces (the shape of the front and back surfaces of the cornea, the lens, the unevenness of their curvature, the ratio of the refractive power to the optical axis of the eye, the shape of the posterior pole of the eye), which forms the inequality of refraction of the main meridians of the eye (Kushnarevich, Proskurina, 2004: 56-60).

The formation of correct acquired astigmatism is associated with uneven growth of the eye or with a change in the interrelationships of the optical elements of the eye (Korsakova, Ivanova, Vasileva, 2013). In addition, correct and incorrect astigmatism of the eye can be formed as a result of: keratoconus, keratoglobus, dystrophic changes of the cornea, subluxation of the lens, corneal scars of various genesis, surgical interventions on the cornea (including refractive), cataract surgery and other surgical interventions on the eye, eyelid diseases and other reasons (Proskurina, 2007: 46-50).

Clinical picture of astigmatism − complaints of patients are reduced to deterioration of distance and near vision, distortion of the visible space, monocular diplopia or polyplopia, focusing difficulties, visual fatigue, headaches associated with visual stress, decrease in distance vision in the dark.

Astigmatism is revealed in objective refraction research. When examining visual acuity, a decrease in uncorrected visual acuity is revealed, while depending on the type and type of astigmatism, the patient can correctly name only horizontally or vertically oriented optotypes and mistakenly name others. Applying stigmatic lenses to the eye can slightly increase visual acuity, but it always turns out to be lower than the visual acuity achieved with astigmatic correction (cylindrical lens or a combination of stigmatic and cylindrical lenses). When a cylindrical lens or a combination of a stigmatic and a cylindrical lens is placed on the eye, visual acuity increases to 1.0 and higher. In cases where astigmatic correction does not increase visual acuity to normal values, they speak of refractive amblyopia induced by astigmatism.

Binocular functions are preserved in most patients with astigmatism. Changes on the part of the anterior segment of the eye are not detected. The environments are transparent. No specific changes are found on the fundus.

Optical correction-optical correction is recommended for children and adults with astigmatism to compensate for refractive and functional disorders (Wang, Xiao, Meng, Wang, Wang, 2018).

It is recommended to prescribe optical correction for astigmatism of any size in adults and contact children if: cylinder correction increases visual acuity compared to a sphere or refractive amblyopia is detected in order to compensate for refractive and functional disorders (Read, Collins, Carney, 2007: 5-19; Varssano, 2012: 15-32).

It is recommended to prescribe optical correction for astigmatism less than 0.75 dptre in adults and contact children, if cylinder correction increases visual acuity compared to a sphere and/or if astigmatism requiring optical correction is detected in the paired eye compensation of refractive and functional disorders and/or improvement of adaptation to correction (Hashemi, Fotouhi, Yekta, Pakzad, 2018: 3-22).

Astigmatism less than 0.75 dptr can be self-compensated and often does not require optical correction. Correction is required in cases where cylinder correction increases visual acuity compared to a sphere, as a rule, it is cases of reverse astigmatism and astigmatism with oblique axes. Correction of direct astigmatism in 0.75 dptr and less is required less often, but possible. In cases where the pair eye has astigmatism that requires correction, astigmatism of small values is also corrected, but only if correction with a cylinder does not reduce visual acuity.

It is recommended to prescribe astigmatic correction for children up to three years of age with astigmatism of more than 2.0 dptres accompanying spherical ametropia requiring correction in order to compensate for refractive errors and prevent functional disorders (Hashemi, Rezvan, Yekta, Hashemi, Norouzirad, 2014: 175181).

In children under one year, correction of astigmatism is necessary only in as an exception. At the age of three years, in the midst of the process of emmetropization, astigmatism of more than 2.0 dptr is corrected, based on data from an objective study, especially if it is accompanied by spherical ametropia. As a rule, a partial correction of astigmatism is prescribed, taking into account that by the age of three, astigmatism decreases in most children.

In astigmatism, the solution of two main tasks is assumed: firstly, the most accurate diagnosis of astigmatism; secondly, choosing the optimal correction of it. The best way to diagnose astigmatism is automatic refractometry, which allows to investigate astigmatism quickly and accurately in adults and children older than three years with narrow and wide pupils. In children up to three years old, manual modifications of autorefractometers are used, including special pediatric ones or skiascopia (retinoscopy). Skiascopia with a flat mirror is the most crude method of diagnosing astigmatism, the error can reach 1.5-2.0 dptr, and the direction of the main meridians can be determined very approximately. A final judgment of astigmatism should be made only after thorough subjective tests: power and axial. When choosing astigmatism correction, the following are taken into account: magnitude of astigmatism, type of astigmatism, type and degree of accompanying ametropia, age, possibility and results of subjective research, previous correction, tolerability of astigmatic correction, nature of visual strain (Grosvenor, 2002: 649).

Conclusion

Currently, there are three recognized methods of correcting astigmatism, namely:

Glasses are the most common method of correcting astigmatism, especially in children. Glasses with special cylindrical lenses are used for astigmatism - positive or negative - depending on the type of astigmatism. With all their dignity, glasses bring a lot of inconvenience to their owner - they constantly get dirty, fog up, slip and fall, interfere with sports and any other active physical activity. Glasses do not provide 100% vision correction. Glasses significantly limit lateral vision, disrupt the stereoscopic effect and spatial perception, which is especially important for drivers. In an accident or fall, broken glass lenses can cause serious injury. In addition, improperly selected glasses can cause constant eye fatigue and progression of astigmatism. Nevertheless, even today, glasses remain the simplest, cheapest and safest method of correcting astigmatism.

Contact lenses − contact lenses are used to correct astigmatism, a small degree (up to 3 diopters). With astigmatism, special toric lenses are used, which must be selected by an ophthalmologist. Toric lenses have all the limitations and inconveniences, as well as other types of contact lenses.

Laser correction of astigmatism − for adults (over 18 years) with a stable form of astigmatism, modern ophthalmology offers the most progressive method of correction - laser correction of astigmatism. The best laser vision correction technology for astigmatism today is LASIK - an operation that guarantees normal vision to a patient with astigmatism, without any restrictions.

Contraindications to laser vision correction − absolute contraindications-General:

Autoimmune diseases (collagenosis, arthritis); primary and secondary immunodeficiency states; systemic diseases affecting the healing process.

From the side of the eye:

The only eye; The thickness of the cornea is less than 450(440) μm;

Glaucoma; keratoconus with thinning of the cornea; progressive myopia;

Cataract, regardless of stage of development operative detachment of the retina; Herpes simplex and herpes zoster.

Relative contraindications

General:

Diabetes; the presence of a cardiac pacemaker in the patient; pregnancy and the postpartum period of feeding the child (hormonal shifts); endogenous psychoses.

From the side of the eye:

Acute and chronic inflammatory diseases of the anterior and posterior parts of the eye, lacrimal apparatus;

Penetrating scars of the cornea (in the optic zone);

Pronounced changes on the part of the fundus.

There are conditions in which laser vision correction operations should be postponed:

Retinal changes that require prophylactic laser coagulation.

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