ECRONICON OPEN ACCESS

EC OPHTHALMOLOGY
Research Article

Results of Trifocal Intraocular Lenses Implantation in patients with Cataract and Presbyopia

Elena Belikova* and VA Borzykh

Federal State Budget Educational Institution of Additional Professional Education Institute for Advanced Studies of the Federal Medical and Biological Agency, Moscow, Russia

***Corresponding Author:** Elena Belikova, Federal State Budget Educational Institution of Additional Professional Education Institute for Advanced Studies of the Federal Medical and Biological Agency, Moscow, Russia.

Received: August 22, 2019; **Published:** December 30, 2019

Abstract

Purpose: To evaluate the clinical results of trifocal intraocular lenses implantation with different optical characteristics; optimization of preparation stages and intraocular correction of presbyopia.

Materials: Phacoemulsification with binocular implantation of trifocal intraocular lenses (IOL) was performed in 35 patients with cataract and presbyopia. IOL AcrySof® IQ PanOptix® was implanted in 32 eyes, AT LISAtri839MP - 38 eyes. Preoperative evaluation included standard examination with surgeon's consultation and clarification of patients' lifestyle and vision motivations at all distances. Postoperative evaluation included measurement of refraction, visual acuity at three distances, quality and visual acuity under mesopic conditions. Proposed to use the test questionnaire, visual acuity testing tables at intermediate distances, nomograms for IOLs power calculation developed by the authors.

Results: Postoperative spherical refraction was - 0.17 ± 0.23D, which did not exceed 0.5D deviation from the target refraction. Uncorrected distance visual acuity ≤ 0.5 reached 100% of patients on the first day after operation. Visual acuity ≤ 0.5 at intermediate distance was achieved in 34 eyes (89.5%) of patients with implanted IOL AT LISAtri, and the same results has been recorded for near in 33 eyes (86.8%). On the next day after surgery in the PanOptix® group, all patients monocular gave ≤ 0.6 for intermediate and near, and 96.9% of eyes ≤ 0.5 for far. All patients from both groups (PanOptix® or LISAtri) after 6 months binocular showed visual acuity ≤ 0.8 for far, near or intermediate distances, no patient noted a need to use any spectacle correction and did not notice significant visual impairment in mesopic conditions.

Conclusion: Implantation of Trifocal IOLs AcrySof® IQ PanOptix® and AT LISAtri 839MP allows patients spectacle independence and high-quality of vision in mesopic conditions. An individual approach to each patient, concomitant ophthalmopathology, general status, life style, primary refraction and precise IOLs power calculation, allows the surgeon widely to apply this technology for presbyopia intraocular correction.

Keywords: *Cataract; Presbyopia; Trifocal Intraocular Lenses; Vision at all Distances*

Introduction

Correction of presbyopia by the method of implantation of multifocal intraocular lenses was proposed in the 80s of the last century and was developing so rapidly that by now the share of using IOLs with a similar design has reached 2.4% of the total number of implanted lenses [1]. Initially, we got a bifocal design of these IOL models with a focus for far and near. At the same time, the first models of such IOLs had an increase in vision near 4.0 diopters and allowed patients to obtain high, even monocular visual acuity without glasses

at a distance of 30 - 35 cm. However, this type of IOL did not provide sufficient visual acuity at medium distances, and patients after implantation often noted side effects such as halos, decreased contrast sensitivity and increased dysfotopsia, leading to some dissatisfaction with the results [2,3].

The new trifocal design of multifocal IOLs was created to provide comfortable distance vision, at medium and short distances, and to improve vision quality, especially in mesopic conditions. Improving the quality of vision in this case is achieved by increasing the percentage of light transmission to the retina [4]. The diffraction optics of trifocal IOLs reduces the dependence of vision on the diameter of the pupil, extends the range of vision at close and medium distances from 35 to 80 cm, allowing the ophthalmologist to provide a personalized approach to each patient, taking into account their daily activities and needs [5].

Aim of the Study

The aim of our study was to evaluate the clinical results of the implantation of trifocal intraocular lenses with various optical characteristics and to optimize the stages of preparation and conduct of intraocular correction of presbyopia with this technique.

Methods

A retrospective assessment of the results of implantation of two models of trifocal intraocular lenses with different optical characteristics was performed: AcrySof® IQ PanOptix® (Alcon Labs, Ft Wotth, USA) and AT LISA tri 839MP (Carl Zeiss Meditec AG, Germany). All operations were performed by one surgeon (E. Belikova) in one clinic (Eye clinic Dr. Belikova) from February 2016 to February 2018. Indications for replacing the lens with a trifocal IOL were as follows: the patient's desire after surgery not to use additional correction tools in everyday activities, the patient has cataracts of varying degrees of density, a clear lens in the presence of presbyopia in combination with ametropia (myopia, hyperopia), astigmatism - not higher 1.0 diopters. The exclusion criteria were: pronounced violations of the transparency of the cornea and vitreous body, the presence of pathology of the retina and optic nerve, age younger than 18 years. In the conversation with the patient before the operation, special attention was paid to explaining the need for postoperative adaptation to multifocal optics and the addiction or neutralization of negative optical phenomena with special glasses in the form of flare and ghosting when they occur, as well as possible decrease in visual acuity and quality in low light conditions. Before the operation, all patients were offered to fill out a short test questionnaire (E Belikova, 2013) with a clarification of lifestyle and postoperative expectations.

All candidates for trifocal IOL implantation underwent an extensive ophthalmological examination, which included: auto refractometry, non-contact tonometry (Tonoref II, NIDEK CO., LTD, Japan), visual acuity examination without correction and with maximum distance correction, for near (automatic refractor RT-5100, Nidek). For intermediate with using own modified table to check visual acuity at a distance of 60 - 80 cm (E. Belikova). For photopic conditions, illumination was created in the diagnostic room up to 85 cd/m^2. Visual acuity testing under mesopic conditions was carried out after 10 minutes of adaptation to low light at about 3 cd/m^2. Bio microscopy of the anterior and posterior segments of the eye, fundus examination with a three-mirror Goldman lens, keratogram (ALLERGO Topolyzer VARIO, ALCON Laboratories, Inc, USA), measurement of the radius of curvature of the cornea, pachymetry, anterior chamber depth, pupil size and axial eye length were performed. and ultrasound (optical biological indicator AL-Scan NIDEK CO., LTD, Japan), optical coherence tomography of the retina and optic nerve (Cirrus HD-OCT 5000, Carl Zeiss Meditec AG, Germany).

In all patients, dominant eye (DE) was determined using the main diaphragm test designed for monovisual correction of presbyopia with contact lenses (Robboy MW, Cox IG, Erickson P 1990). With low visual acuity, the test was difficult and we used an indirect method for determining the leading eye, based on a survey of the patient: which eye he used when shooting, working with a microscope, camera, magnifying glass, etc.

All operations were performed under topical anesthesia, with using an ultrasound ophthalmic surgical system for phacoemulsification INFINITI® vision system (ALCON Laboratories, Inc, USA) according to standard methods. To improve the accuracy of IOL calculations and reduce the degree of postoperative surgical astigmatism, the VERION® diagnostic navigation system (ALCON Laboratories, Inc, USA) was used. The main corneal incision corresponded to a size of 2.2 mm, paracentesis - 1.2 mm, capsulorexis - an average of 5.5 mm, were

performed by manual technique. The implantation of the PanOptix® IOL was carried out by an Auto Sert® automatic injector (INFINITI®, Alcon), LISA tri - by the original injector - Blueject.

Intraocular lenses

AT LISA tri 839MP is an aspherical diffractive intraocular lens made of hydrophilic acrylic with a hydrophobic coating, with 25% water content, equipped with a UV filter. The design of optics and haptics is similar to previous AT LISA models, it has a planar monolithic shape. The total diameter of the IOL is 11 mm, the diameter of the optical part is 6 mm. The optical diffraction part is represented by a combination of a central 4.34 mm trifocal zone and a peripheral bifocal zone to the very edge of the lens. Due to the presence of 21 diffraction zones, this model of a trifocal lens has an addiction for near +3.33D and for an intermediate distance + 1.66D. Light distribution: 50% for distance, 20% for average distance, 30% for near vision. Light transmittance - 86%.

AcrySof® IQ PanOptix® monoblock non-apodized diffractive IOL made of hydrophobic acrylate/methacrylate with an ultraviolet filter and a blue light filter used in AcrySof® lenses [6]. This IOL has a 6.0 mm optical zone, consisting of a 4.5 mm trifocal region in the center with 15 diffraction rings and an external refractive rim. The defocusing curve of the PanOptix® IOL is smoother than the bifocal IOL. PanOptix® provides a continuous range of view at a distance of 40 - 80 cm, with a preferred focal point at a distance of 60 cm [6,7]. When using bifocal optics, 18% of the light energy is lost due to scattering, and only 82% reaches the retina. PanOptix® IOL provides only 12% of the luminous flux loss while maintaining 88%, respectively. For a pupil diameter of 3 mm, the percentage of light distribution is as follows: for the distance - 50%, at an average distance - 25% and the remaining 25% - for near. Addition in the plane of the lens for near is +3.25 D, for the average distance +2.17 D [7,8].

Features of calculating the optical power of the IOL

To calculate the optical power of the IOL, the formulas SRK/T, Hoffer Q, Holladay I and II, Barrett, Haigis were used. Target refraction in eyes with emmetropia and hyperopia was chosen closest to "0" or first "+" date and in patients with primary myopia with the first minus value. Table 1 presents the original working nomograms for calculating the strength of multifocal IOLs taking into account the axial length, keratometry and the depth of the anterior chamber (Belikova EI 2017).

Eye parameters	Formula		Target refraction	
	Main	Control	DE	NDE
AL (mm)				
< 23.0	Hoffer Q	Holladay I-II, Barrett	+0,25D	0,0D
23,0 - 25,0	SRK/T	Hoffer Q, Barrett	0 +0,25D	0 -0,25D
> 25,0	SRK/T	Hollyday I-II, Haigis	- 0,25D	-0,25 -0,5D
Km (D)				
< 42.0	Holladay I-II	Haigis, Barrett	-0,25 - 0,5D	-0,5D
42,0 - 44,0	SRK/T	Hoffer Q, Holladay I-II	+0,25 - 0,25D	0 - 0,25D
> 44,0	Holladay I-II	Haigis, Barrett	+0,25 +0,5D	0 +0,25D
ACD (mm)				
< 2.8	Hoffer Q	Holladay I-II, Barrett	+0,25D	0,0D
2,8 - 3,6	SRK/T	Hoffer Q, Hollyday I-II	0 +0,25D	0 - 0,25D
> 3,6	Haigis	Holladay I-II, Barrett	- 0,25D	-0,25 -0,5D

***Table 1**: Nomogram for calculating multifocal IOLs for dominant and non-dominant eyes, taking into account the axis length, keratometry and anterior chamber depth.*
AL: Axial Length; Km: Mean Keratometry; ACD: Anterior Chamber Depth; DE: Dominant Eye; NDE: Non-Dominant Eye.

To assess patient satisfaction with the results of implantation of trifocal IOLs, they were offered to fill out a questionnaire modified by the authors, Catquest 9-SF (E Belikova, 2013). Evaluation and comparison of pre- and postoperative quality of vision, taking into account the presence of glare, ghosting and illumination, was carried out according to a 4-point system from 0 to 3 in increasing symptoms of discomfort (0 - no problems, 1 - sometimes occur, but do not interfere; 2 - there is, but do not interfere; 3 - there is constant and interfere).

For statistical data processing and evaluation of the effectiveness and reliability of the results, the package of applied computer programs "Statistica 6" was used. Studies included the determination of average, maximum and minimum indicators, standard deviation, the value of t-student test. Differences at $p \leq 0.05$ were considered statistically significant.

Results

The study included 35 patients (70 eyes) who underwent phacoemulsification with implantation of trifocal IOL binocularly. At the same time, AcrySof® IQ PanOptix® model was implanted in 16 patients (32 eyes), AT LISA tri 839MP in 19 patients in 38 eyes. In the total cohort of patients, women accounted for 54% (n = 19), men - 47% (n = 16). A detailed assessment of preoperative parameters is presented in table 2.

	AT LISA tri group (38 eyes)			PanOptix® group (32 eyes)		
	Mean ± SD	**Min**	**Max**	**Mean ± SD**	**Min**	**Max**
Age (years)	61,24 ± 12,09	50	79	58,71 ± 13,36	32	71
Sphere (D)	2,26 ± 1,46	-4,0	5,0	2,62 ± 1,75	-3,75	6,25
Cylinder (D)	0,62 ± 0,32	0,5	1	0,4 ± 0,63	0,25	1,25
mean KM	43,27 ± 1,64	39,61	46,23	43,36 ± 1,41	41,67	45,55
Pupil size in mesopic conditions[1] (mm)	4,94 ± 1,43	2,9	8,1	5,27 ± 0,82	3,7	6,4
AL opt (mm)	23,41 ± 0,85	22,04	25,42	22,95 ± 1,23	21,3	24,57
ACD	3,17 ± 0,42	2,57	3,86	3,03 ± 0,24	2,69	3,46
IOP (mm Hg)	15,56 ± 2,75	11,0	21,0	15,92 ± 2,05	14,0	20,0
IOL (D)	21,62 ± 2,48	16	25,5	23,82 ± 3,09	19,5	32,0
Target refraction	-0,13 ± 0,18	-0,61	+0,11	-0,12 ± 0,19	-0,47	+0,12

Table 2: *Patient's data in studied groups before surgery*

D: Diopter; KM: Keratometry; Ast: Astigmatism; AL: Axis Length (optical biometry); ACD: Anterior Chamber Depth; IOP: Intraocular Pressure; IOL: Intraocular Lens, calculated optical power before implantation; [1]: The test is performed automatically by the AL-scan optical biometer program with the light source turned off.

Operations and the postoperative period in all patients were without complications. As a rule, i.e. in 91% of cases, the worse seeing eye was operated on first, after 3 - 15 days the operation was performed on the second eye. The maximum follow-up period for patients with LISA tri is 25 months; for patients with PanOptix®, 12 months. Evaluation of postoperative results was carried out on the 1st, 7th, 30th day and 6, 12 and 24 months after surgery and included: determination of refraction, visual acuity into the distance, near and at intermediate distance without correction and with full spectacle correction at sufficient and low light, the presence of optical phenomena, patient satisfaction with implantation results. In the study, a selection of key indicators was performed at 1 day, 1 month, and 6 months after implantation, since, according to the authors, they are the main ones in assessing the effectiveness of cataract surgery as a refractive procedure using premium class intraocular lenses.

Visual acuity and refraction

On the 1st day after the operation, there was a significant increase in visual acuity without correction (UCVA) monocularly at all distances in both groups. At the same time, in patients with LISA tri, UCVA (Decimal) for distance of 0.5 and above was recorded in 38 eyes

(100%), at intermediate distance - in 34 eyes (89.5%), near - in 33 eyes (86.8%). In the PanOptix® group, 32 eyes (96.9%) read 0.5 and above, 100% of the eyes were seen at an average distance and near 0.6 above (Table 3).

Before operation	ATLISA tri group (38 eyes)			PanOptix® group (32 eyes)		
UCVA	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Far	0,39 ± 0,43	0,03	0,9	0,31 ± 0,30	0,1	1,0
Intermediate	0,17 ± 0,28[1]	0,05	0,5	0,28 ± 0,11[2]	0,1	0,5
Near (35cm)	0,28 ± 0,19	0,05	0,8	0,24 ± 0,10	0,1	0,4
1st day after operation						
Far	0,76 ± 0,19	0,5	1,0	0,78 ± 0,19	0,5	1,0
Intermediate	0,73 ± 0,21[1]	0,3	1,0	0,75 ± 0,15[2]	0,4	1,0
Near (35 cm)	0,78 ± 0,13	0,5	1,0	0,75 ± 0,15	0,4	1,0

Table 3: *Visual acuity at three distances before and the 1st day after implantation in the study groups. UCVA: Uncorrected Visual Activity (Decimal); Min: The minimum value; Max: The maximum value; [1]: 80 cm; [2]: 60 cm.*

By the 1st month of observation, the best indicators of visual acuity were determined in conditions of good illumination at all distances, however, the differences between the groups were not statistically significant ($p > 0.05$). Visual acuity at intermediate distance of 60 cm is better in patients with PanOptix® IOL, and at 80 cm the best indices were found in LISA tri, which corresponds to the requests of manufacturers (Table 4). Testing of visual acuity near was carried out at a distance of 35 cm, since it is considered the most comfortable for reading, both according to patients and according to the literature [9].

DE		AT LISA tri group (38 eyes)			PanOptix® group (32 eyes)		
		NE	**OU**	**DE**	**NE**	**OU**	
Photopic conditions (85 cd/m^2)	Far	0,85 ± 0,18	0,82 ± 0,18	0,87 ± 0,19	0,87 ± 0,12	0,85 ± 0,2	0,88 ± 0,2
	Intermediate	0,85 ± 0,19[1]	0,75 ± 0,21[1]	0,78 ± 0,18	0,82 ± 0,18[2]	0,79 ± 0,16[2]	0,84 ± 0,2[2]
	Near	0,86 ± 0,19	0,87 ± 0,18	0,88 ± 0,19	0,84 ± 0,15	0,85 ± 0,16	0,87 ± 0,2
Mesopic conditions (3 cd/m^2)	Far	0,75 ± 0,18	0,68 ± 0,18	0,79 ± 0,19	0,77 ± 0,12	0,75 ± 0,2	0,82 ± 0,2
	Intermediate	0,71 ± 0,18[1]	0,61 ± 0,18[1]	0,75 ± 0,18	0,75 ± 0,18[2]	0,69 ± 0,16[2]	0,81 ± 0,2[2]
	Near	0,77 ± 0,21	0,57 ± 0,19	0,78 ± 0,23	0,76 ± 0,18	0,75 ± 0,16	0,79 ± 0,2

Table 4: *Uncorrected visual acuity in different illumination conditions (1 month after implantation). DE: Dominant Eye; NDE: Non-Dominant Eye; OU: Oculus Uterque; [1]: 80 cm.; [2]: 60 cm.; [3]: 35 cm.*

By the 6th month of observation, there was an improvement in all indicators of UCVA at all distances. There were no significant differences between the groups (Table 5).

Postoperative refraction by the 1st month of observation in the LISA tri group was sph - 0.18 ± 0.24D, in the PanOptix® group - 0.16 ± 0.27D, which did not exceed 0.5D deviation from the refraction of the target, which was -0.13 ± 0.18D and -0.12 ± 0.19D, respectively.

Satisfaction with treatment results

According to the results of the survey (Catguest 9-SF) 3 months after the operation, 32 patients (91.4%) were satisfied with the results of the operation and did not experience any difficulties in everyday life. 2 patients (5.7%): one with PanOptix®, the other with LISA tri complained of tearing in both eyes, which made it difficult to read, 1 patient (2.9%) with LISA tri noted the presence of glare and ghosting

	AT LISA tri group (38 eyes)			AcrySof® IQ PanOptix® group (32 eyes)		
	DE	NDE	OU	DE	NDE	OU
UCVA (Decimal)						
Far[1]	0,98 ± 0,13	0,89 ± 0,14	0,98 ± 0,05	0,98 ± 0,09	0,95 ± 0,14	1,03 ± 0,07
Intermediate[2]	0,94 ± 0,16	0,93 ± 0,13	1,0	0,96 ± 0,08	0,95 ± 0,13	1,0
Near[3]	0,97 ± 0,14	0,98 ± 0,14	1,0	0,92 ± 0,11	0,97 ± 0,14	1,0

Table 5: *Uncorrected visual activity results in monocular and binocular groups (6 months after operation) taking in the account dominant eye at tree distances. Mean, max and min results are indicated.*
DE: Dominant Eye; NDE: Non-Dominant Eye; UO: Oculus Uterque; UCVA: Visual Acuity Without Correction; [1]: VA Measured on Optical For Opter; [2]: Distance 80 cm for IOL AT LISA tri and 60 cm for IOL ArcySof IQ Pan Optix; [3]: Distance 35 cm.

when driving at night but this did not force him to give up driving. All patients after trifocal IOL implantation did not use additional spectacle correction and noted a significant improvement in the qualitative parameters of vision, even in low light conditions.

During the observation period, 2 patients with 2 eyes (5.7%) (one eye with LISA tri 6 months after implantation and 1 eye with PanOptix® 1 month after surgery) underwent YAG laser capsulotomy to improve visual function.

Discussion

What did we expect from three-focus IOL models? The first - comfortable vision without correction at intermediate without loss of visual acuity in the distance and near; the second is the improvement of vision quality in low light conditions; the third is more satisfied patients and confident surgeons. According to the results of our research, we are going in the right direction.

Indicators and visual acuity the day after implantation allow more than 50% of patients to receive visual acuity without correction of 0.8 and higher at all distances, and during the first month this percentage reaches 90, which makes 99% of patients satisfied with the results of implantation of these models IOL Noteworthy is the improvement in the acuity and quality of vision of our patients in low light conditions. According to studies, visual acuity loss does not exceed one line objectively, and subjectively, patients do not cause complaints similar to artifact with binocular models [6,7,10,11]. Visual acuity was increased near at a distance of 35 cm, against the previously stated 40 cm, which creates additional comfort at close distances, especially for nearsighted patients.

Separately, it is necessary to dwell on indicators of visual acuity at medium distances. Indeed, the goal of ridding the patient of glasses at a distance of 60 - 80 cm has been achieved. Binocular visual acuity at 6 months of follow-up was 1.0 in 100% in both study groups. At the same time, it was possible to detect obvious differences only during the first month after implantation; later, patients of both groups showed similar high visual functions in the entire range of vision from 35 to 100 cm. Binocular visual acuity was higher in all cases. Comfort and quick adaptation to the text at a distance of 60 cm were noted by patients with PanOptix® and a distance of 80 cm was preferred by patients with LISA tri, as stated in the recommendations of the manufacturers. This fact allows us to recommend the implantation of these models of trifocal IOLs to patients, taking into account the lifestyle and preferred average distance. For example, for users of smartphones and tablets, it is better to implant the PanOptix® model, and LISA tri will create comfort for working with a laptop and desktop computer.

An important topic for discussion is car driving and comfort in low light conditions. When we asked a patient with LISA tri binocular artifact, "When did he forget about the operation?", He answered: "The evening does not let you forget!" And objectively, when interviewing patients about the presence of evening flares and halos after implantation, 45% of patients with PanOptix® and 85% of patients with LISA tri note such phenomena with varying degrees of severity, but this does not make them refuse to drive and only our questions drew their attention on this fact. In addition, patients were warned about all negative phenomena and compromises in visual acuity and quality of vision after the implantation of multifocal IOLs in a conversation before surgical treatment (test questionnaire of the patient before

correction of presbyopia). Thus, the problem has not been completely addressed, but the comfort of drivers has increased significantly. At the same time, reading at close range in poor lighting conditions did not cause discomfort for our patients, which also adds a big "plus" to new IOL models.

In the framework of this study, we did not set the task of comparing the results of visual acuity and patient comfort in groups with LISA tri and PanOptix®, since initially we could not conduct randomized patient selection and provide groups that were equivalent in terms of preoperative parameters. The implantation of trifocal IOLs began 2 years ago with the use of the LISA tri model, and the first patients were selected with contraindications for bifocal models, which significantly influenced the early results. After 6 months, having gained positive experience working with trifocal IOLs, we more boldly and consciously began to use the same Alcon IOL model. Perhaps this fact explains the lower visual acuity and quality of vision in patients with LISA tri artifact. Further research is needed for a detailed and objective analysis of these results.

An important condition for obtaining the planned target refraction in calculating the optical power of the IOL is the maximum approximation to emtropy, taking into account primary refraction. For a patient with hyperopia, this is low hyperopia (+0,25D), and for myopic candidates, it is low myopia (-0,25D).

Conclusion

Based on the results of implantation of new trifocal AcrySof® IQ PanOptix® IOL models (Alcon Labs, Ft Wotth, USA) and AT LISA tri 839MP (Carl Zeiss Meditec AG, Germany), this intraocular presbyopia correction technology can be considered highly effective, safe, predictable and stable, since all operations went without complications, patients received the expected freedom from spectacle correction at the stated three distances and noted high satisfaction with the treatment results.

In our opinion, due to the fact that patients with LISA tri showed better results in near visual acuity than patients with PanOptix®, but more often noted the presence of glare and ghosting when driving in the evening, it is advisable to recommend these models of trifocal IOLs to women, patients with myopia and non-professional drivers, and a preferred average distance of 80 cm allows them to work comfortably with a stationary computer and laptop. Therefore, implantation of the PanOptix® trifocal model is preferred by professional drivers, active users of smartphones and tablets, and patients with hyperopia.

An individual approach to each patient, taking into account the state of the organ of vision, general body status, lifestyle, primary refraction and accurate IOL calculation, allows the surgeon to be confident in the planned success of the operation and to widely use this technology to correct presbyopia. Patient satisfaction with the result of correction depends on proper communication with him at all stages of treatment.

Financial Disclosure

Supported by Alcon.

Conflict of Interests

The authors declare that they have no conflicts of interest.

Bibliography

1. Market Scope. "Ophthalmic Market Perspectives". Marketscope LLC (2015).

2. Product information AcrySof IQ PanOptix presbyopia - correcting IOL.

3. Sanders., *et al*. "Comparison of the SRK II formula and other second-generation formulas". *Journal of Cataract and Refractive Surgery* 14.2 (1988): 136-141.

4. Holladay., *et al*. "A three-part system for refining intraocular lens power calculation". *Journal of Cataract and Refractive Surgery* 14.1 (1988): 17-24.

5. Retzlaff., *et al*. "Development of the SRK/T IOL power calculation formula". *Journal of Cataract and Refractive Surgery* 16.3 (1990): 333-340.

6. Weeber HA., *et al*. "Extending the range of vision using diffractive intraocular lens technology". *Journal of Cataract and Refractive Surgery* 41.12 (2015): 2746-2754.

7. Lawless M., *et al*. "Visual and refractive outcomes following implantation of a new trifocal intraocular lens". *Eye and Vision* 4 (2017): 10.

8. Hoffer. "Hoffer Q formula: a comparison of theoretic and regression formulas". *Journal of Cataract and Refractive Surgery* 19.6 (1993): 700-712.

9. Marques EF and Ferreira TB. "Comparison of visual outcomes of 2 diffractive trifocal lens". *Journal of Cataract and Refractive Surgery* 41.2 (2015): 2707-2714.

10. de Vries NE., *et al*. "Dissatisfaction after implantation of multifocal intraocular lenses". *Journal of Cataract and Refractive Surgery* 37.5 (2011): 859-865.

11. Makhotkina NY., *et al*. "Effect of active evaluation on the detection of negative dysphotopsia after sequential cataract surgery: discrepancy between incidences of unsolicited and solicited complaints". *Acta Ophthalmologica* 96.1 (2018): 81-87.

Volume 11 Issue 1 January 2020