ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Ocular biometric changes after trabeculectomy

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SUMMARY

Introduction/Objective Trabeculectomy is a conventional filtration procedure in surgical glaucoma treatment. Even after successful trabeculectomy, the patient's visual acuity can be reduced. Studies (1991) showed that changes in visual acuity occur due to changes of corneal curvature and anterior chamber depth. Anterior chamber depth change for 1 mm results in about 2 diopters change in refractive sphere. Simultaneous with anterior segment changes, anti-glaucoma surgery effect can also be manifested in posterior segment of the eye: choroidal thickness, axial length and the ocular perfusion. Axial length reduction after trabeculectomy was supposed according to biometry, more pronounced if intraocular pressure is higher preoperatively, or in the first postoperative week with spontaneous recovery to preoperative values one year after surgery. A study was conducted at the Clinic for Eye Diseases in Niš to determine the difference in pre/post-operative values of biometry on 60 patients with glaucoma.

Methods In this study we used retrospective-prospective biometric analysis in patients with open-angle glaucoma.

Results Anterior chamber depth was significantly different during the observed period, for 1.1 mm in first week ($p < 0.0001$) in the whole group and glaucoma type. The mean axial length varies considerably during the observed period, shorter for 0.39 mm in first week ($p < 0.05$).

Conclusion By analyzing biometric parameters, a postoperative difference of biometry with spontaneous recovery was determined. There is a difference in postoperative visual acuity of patients compared to preoperative, with spontaneous recovery at the end of the follow-up.

Keywords: glaucoma; trabeculectomy; ocular biometry; anterior chamber depth; axial length

INTRODUCTION

Trabeculectomy was developed in 1968. (Cairns) and still remains the most frequent filtration procedure in surgical glaucoma treatment that bypasses the aqueous outflow by creating a corneo-scleral fistula that leads in forming subconjunctival bleb. By using potential wound modulators (5-fluorouracil, Mitomycin-C) prolonged hypotensive effect could be achieved and yearly success rate for trabeculectomy increased to 70–80%. One of the greatest disappointments of glaucoma filtering surgery is suboptimal postoperative visual acuity. Even after successful procedure, it can be reduced for several lines at Snellen chart. The primary reason for poor postoperative visual acuity after filtering surgery could be astigmatism, hypotony, inflammation, or hyphema. Trabeculectomy leads to a large decrease in intraocular pressure (IOP) especially in early postoperative period. Potential complications include hypotony, choroidal effusion, hemorrhage, hypotonus maculopathy, corneal decompensation, and cataract [1]. After treating all medical reasons, refractive factors could remain (corneal curvature and ocular biometric changes), that are dynamic and changeable in postoperative period.

Biometry, according to early definition, is the method of applying mathematics and measurement to biology. The term was originally used by Whewell initially in the 1800s [2]. Ultrasound biometry is the measurement of various eye dimensions, its components, and their interrelationships. Ultrasound (echography, B-scan) uses high frequency sound waves (10 MHz) to produce images of the internal eye structures. Ultrasound biometry (A-scan) utilizes an ultrasound device for eye measurement: axial length (AL), anterior chamber depth (ACD), crystalline lens thickness, diagnosing and measuring masses in the eyes. As an invasive procedure, it requires direct ultrasound probe contact with the cornea by trained examiner to avoid errors due to excessive compression on cornea [3]. AL is the distance from anterior corneal surface to the retinal pigment epithelium. It can be done using optical or ultrasound methods, which can further be done by direct contact or immersion [4].

Ocular biometric changes after trabeculectomy with refractive implications are in AL and ACD. AL decreases due to improvement of ocular blood flow and increased choroidal thickness (CT) as dynamic parameter that is influenced by oscillations in IOP. Large decrease in IOP after trabeculectomy during the early

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postoperative period, may lead to significant CT changes and thickening because of the improved ocular perfusion. Until recently, no imaging modality could get accurate in vivo CT measurements. Enhanced depth imaging-optical coherence tomography uses low signal strength to achieve greater depth than spectral domain optical coherence tomography [5, 6].

Another factor affecting postoperative visual acuity is ACD. This was due to refraction shift secondary to depth changes, 1 mm change in ACD results in approximately 2 diopter change in refractive sphere (DSph). Visual acuity starts to return to pre-operative by the third post-operative week and usually recovers fully within six weeks. This alteration is caused by iris-lens plane movement partially. If cycloplegic drug was not applied postoperatively, anterior chamber tends to shallow in the post-operative period and maximal shallowing occurs by the fifth day with spontaneous reformation after two weeks [7, 8, 9].

It is stated that trabeculectomy can cause ACD changes and even small AL change could lead to unsatisfactory visual acuity and significant error in IOL power calculation and refractive prediction in cataract surgery [6]. Aim of this work is to determine presumed difference between pre/postoperative biometrics findings in glaucoma patients.

METHODS

This retrospective-prospective clinical investigation included 60 phakic eyes, of 60 operated patients with Open Angle Glaucoma (OAG) in two groups: 42 Primary Open Angle Glaucoma (POAG) patients and 18 Exfoliative Glaucoma (XFG) patients, to determine postoperative changes of biometry at the seventh, 30th, 60th day after standard trabeculectomy without antimetabolites. The study was performed from March 2015 to March 2016 at the Ophthalmology Clinic, Clinical Center of Niš, according to the Ethical Committee principles of the Helsinki Declaration, and written consent was obtained from all the participants. Each patient underwent pre/postoperative measurements of same parameters: visual acuity (Snellen chart), slit lamp examination, Goldmann applanation tonometry ACD, AL (Tomey Ultrasonic A/B scanner and biometer UD6000).

Although there are two modalities of A-scan ultrasound biometry available, contact and immersion, in this investigation contact A-scan biometry measurements were obtained because it is faster and simple to perform. After topical anesthesia of ocular surface (tetracaine hydrochloride 0.5%) ultrasound probe was placed on the vertex of cornea carefully, to avoid corneal indentation and off-axis measurements. All measurements were obtained by one ophthalmologist in aim to minimize inter-observer variability of results.

A special crystal embedded in a probe oscillates to generate a high-frequency ultrasound wave that penetrates the eye. These results are in one-dimensional time-amplitude representation of echoes received along the beam path. The height of the spikes is indicative of the strength for the specific eye tissue. The distance between the echo spikes recorded on the oscilloscope screen provides an indirect measurement of tissue such as ACD or AL of the eye and displayed in millimeters on the screen.

Obtained results were analyzed by statistical analysis and application of software SPSS 18 statistical package.

RESULTS

Effect of trabeculectomy, in surgically treated OAG patients is shown through IOP values and visual acuity changes in Table1 and 2. The mean IOP value shows a significant difference (Friedman test χ^2; $p < 0.0001$) in subjects compared to preoperative values. The average preoperative IOP of 32.5 ± 8.64 mmHg decreases in the next two months to a value 15.93 ± 3.46 mmHg at the end of a two-month monitoring interval. Similar values and fluctuations of IOP were in both groups of operated glaucoma patients (POAG, XFG) with discrete higher values in POAG group, from 33.38 ± 9.08 mmHg preoperatively to16.36 ± 3.51 mmHg two months later in comparison to XFG group of respondents with 30.44 ± 7.35 mmHg before surgical intervention, lowered to 14.94 ± 3.23 mmHg two months after the operation (Table 1).

Table 1. Intraocular pressure values (mmHg) in operated Open Angle Glaucoma patients in the time interval

Intraocular pressure in days	Intraocular pressure values in glaucoma type			
	Glaucoma type	Number of patients	Average intraocular pressure	Standard deviation
Intraocular pressure day 0	POAG XFG Total	42 18 60	33.38 30.44 32.50	9.08 7.35 8.64
Intraocular pressure day 7	POAG XFG Total	42 18 60	14.90 14.28 14.72	4.39 5.40 4.68
Intraocular pressure day 30	POAG XFG Total	42 18 60	15.90 16.44 16.07	4.07 4.85 4.28
Intraocular pressure day 60	POAG XFG Total	42 18 60	16.36 14.94 15.93	3.51 3.23 3.46

POAG – primary open angle glaucoma; XFG – exfoliative glaucoma

The visual acuity shows statistically significant difference in operated glaucoma patients in two-month interval (Friedman Test χ^2; $p < 0.0001$). From 0.4 ± 0.35 decreases for two lines on Snellen chart on the seventh postoperative day (0.22 ± 0.22), then improves for one line (30th postoperative day) and returns almost to the preoperative visual acuity in the next two months (0.37 ± 0.32). Similar visual acuity was in both glaucoma groups of patients (Table 2).

Among OAG group there was 28 (46.67%) female respondents with the mean age of 72.2 ± 7.92 years and the total number of men was 32 (53.33%) with the mean age 65.4 ± 11.56 years. Females are significantly older ($t = 2.626$; $p = 0.011$) (Table 3).

Of all patients 42 (70%) suffered from POAG with the mean age of 66.7 ± 11.1 years and the remaining 18 (30%) were patients with XFG type of glaucoma with the mean

Table 2. Visual acuity in glaucoma type (POAG, XFG) in time interval

Visual acuity days	Visual acuity in glaucoma type			
	Glaucoma type	Number of patients	Average visual acuity	Standard deviation
Visual acuity day 0	POAG XFG Total	42 18 60	0.41 0.37 0.4	0.35 0.36 0.35
Visual acuity day 7	POAG XFG Total	42 18 60	0.22 0.22 0.22	0.22 0.23 0.22
Visual acuity day 30	POAG XFG Total	42 18 60	0.28 0.29 0.28	0.25 0.3 0.26
Visual acuity day 60	POAG XFG Total	42 18 60	0.37 0.36 0.37	0,32 0.33 0.32

POAG – primary open angle glaucoma; XFG – exfoliative glaucoma

Table 3. Sex structure

Sex	Years of life			
	Number of patients	Percent of patients	Mean age	Standard deviation
Female	28	46.67%	72.2	7.92
Male	32	53.33%	65.4	11.56
Total	60	100%	68.6	10.52

Table 4. Glaucoma type according to sex and years of life

Sex	Glaucoma type		
	POAG	XFG	Total
Female %	21 75%	7 25%	28 100%
Male %	21 65.63%	11 34.38%	32 100%
Total %	42 70%	18 30%	60 100%
Age Standard deviation	66.67 11.11	73.06 7.49	68.58 10.52

POAG – primary open angle glaucoma; XFG – exfoliative glaucoma

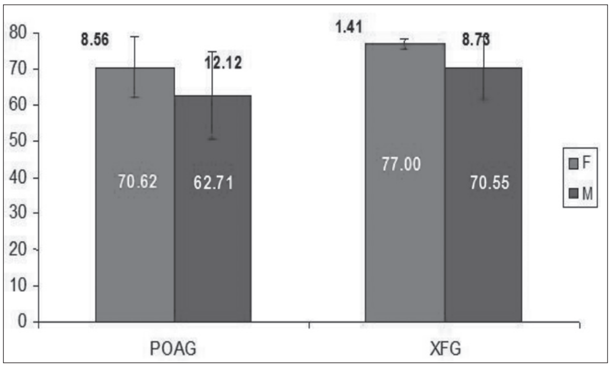

Figure 1. Age structure of respondents by sex in both glaucoma types

POAG – primary open angle glaucoma; XFG – exfoliative glaucoma

Table 5. Time distribution of anterior chamber depth

Anterior chamber depth (mm)	Anterior chamber depth in glaucoma type			
	Glaucoma type	Number of patients	Average anterior chamber depth	Standard deviation
Anterior chamber depth day 0	POAG XFG Total	42 18 60	2.73 2.94 2.79	0.56 0.81 0.65
Anterior chamber depth day 7	POAG XFG Total	42 18 60	3.85 3.99 3.89	1.45 1.37 1.42
Anterior chamber depth day 30	POAG XFG Total	42 18 60	3.59 3.59 3.59	1.06 1.64 1.25
Anterior chamber depth day 60	POAG XFG Total	42 18 60	3 3.28 3.08	0.84 1.37 1.02

POAG – primary open angle glaucoma; XFG – exfoliative glaucoma

Table 6. Time distribution of axial length change

Axial length (mm)	Axial length values in glaucoma type			
	Glaucoma type	Number of patients	Average AL	Standard deviation
Axial length day 0	POAG XFG Total	42 18 60	23.49 23.24 23.41	1.4 0.85 1.26
Axial length day 7	POAG XFG Total	42 18 60	23.07 22.88 23.02	1.37 1.03 1.27
Axial length day 30	POAG XFG Total	42 18 60	23.14 22.98 23.09	1.26 0.9 1.16
Axial length day 60	POAG XFG Total	42 18 60	23.22 23.69 23.36	1.25 2.9 1.89

POAG – primary open angle glaucoma; XFG – exfoliative glaucoma

age of 73.1 ± 7.5 years. Patients with XFG type are significantly older ($t = 2.195$; $p < 0.05$). The mean age of the operated group of patients was 68.58 ± 10.5 years (Table 4).

Following graph presents age structure of respondents by sex in both glaucoma types (POAG and XFG) (Figure 1). Females in XFG group are the oldest, 77 years on average. Male respondents in XFG group are younger (70.55 years) than females. In POAG group, females are older (70.62 years) than male (62.71 years).

Upcoming results illustrate implications of anterior segment anti-glaucoma surgical approach to biometric parameters of the eye.

ACD varies considerably during the two-month period (Friedman test χ^2; $p < 0.0001$) in the whole group and according to glaucoma type (POAG; XFG). From an average preoperative value of 2.79 ± 0.65 mm, its value increases mostly on the seventh day (3.89 ± 1.42 mm), then decreases on the 30th day (3.59 ± 1.25 mm) and further reduced at the end of the following period to 3.08 ± 1.02 mm, near to preoperative values. Similar values of ACD were in both glaucoma types during the two-month time interval (Table 5).

The mean AL varies considerably during the observed monitoring period (Greenhouse-Geisser; $p < 0.05$). Preoperatively, the mean value was 23.41 ± 1.26 mm for the whole group, and its value decreased by a small but significant amount, reaching 23.02 ± 1.27 mm on the seventh day and 23.09 ± 1.16 mm on the 30th day, and then increased at the end of the second month to the approximate preoperative value of 23.36 ± 1.89 mm. A week after operation, AL became shorter for 0.39 mm. Similar measurements were found in both glaucoma types. In POAG it become shorter for 0.42 mm a week later and in XFG was shorter 0.36 mm the first week after operation (Table 6).

The dynamic relationship between change in IOP and the state of sclera and choroid manifested and showed as

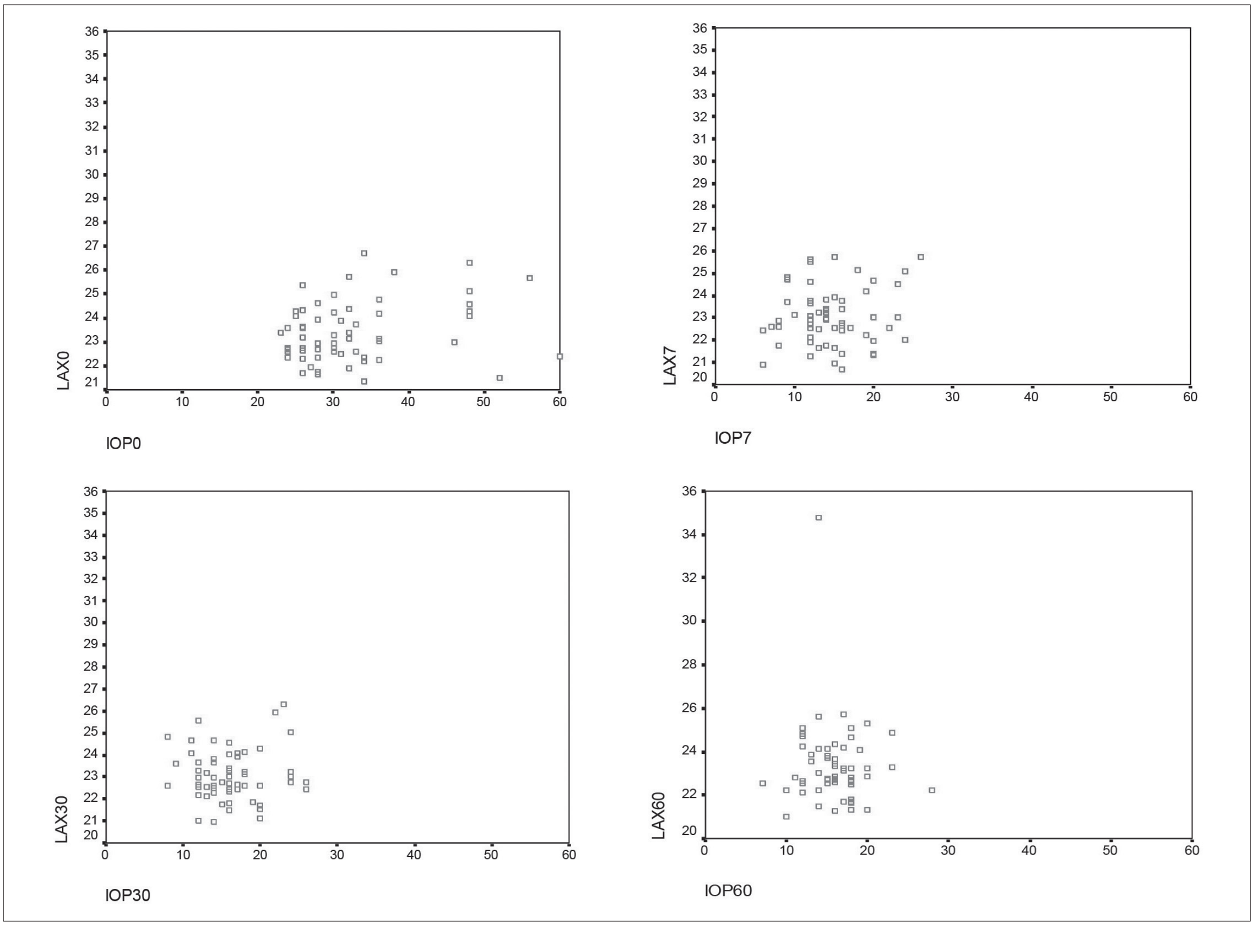

Figure 2. Intraocular pressure and axial length relationship through time

AL parameter is presented through time and confirmed by AL sequential measurements in postoperative period. IOP was obviously lowered after operation providing estimation of the magnitude of AL decrease with IOP lowering (Figure 2).

DISCUSSION

Trabeculectomy is commonly performed in patients with open angle glaucoma when medical therapy fails to control IOP. This procedure appears to be the best surgical method for preventing progressive optic disc damage [5]. Results of Early Manifest Glaucoma Trial indicate that IOP reduction of 25% from baseline reduces disease progression risk by 50%. For each mmHg IOP reduction, progression risk decreases for 10%. It is accepted that normal IOP was estimated based on the measurement in more than thousand people as the mean IOP ± 2(3) standard deviation. Normal IOP in healthy adult population is 15–16 mmHg ± 3 mmHg, in the interval 10–21 mmHg [10]. In this study mean preoperative IOP 32.5 ± 8.64 mmHg was most decreased on the seventh postoperative day (14.72 ± 4.68 mmHg), and then slightly elevated in next two months, to a value of 15.93 ± 3.46 mmHg at the end of monitoring. This fluctuation was within European Glaucoma Society Guidelines recommendations. Observing average reduction of 16.57 ± 5.18 mmHg from baseline, we achieved reduction of 50.98% ($p < 0.0001$). Equal efficiency was achieved in both glaucoma types (POAG, XFG).

Based on the International Glaucoma Association recommendation for results based on average statistical estimates of surgical success, trabeculectomy outcome was classified as failure (target IOP not achieved), complete failure (loss of light perception), complete success (IOP achieved without therapy) and qualified success (IOP achieved with topical therapy). Analyzing IOP in operated patients, as an indicator of surgical efficacy, we concluded complete success in our group for two months without topical anti-glaucoma medication.

Detailed assessment of the effect of the surgical procedure requires monitoring over a longer period, at least a year after surgery with the aim of prognostic conclusions according to Scandinavian Trabeculectomy Study (POAG, XFG). They reported a total success of 82% one year after surgery, 70% after two years, 64% after three, and 52% after four years of follow-up with a better treatment rate of POAG than of XFG [11]. The first published national experience of surgical success in POAG in Britain was carried out in 2000 under patronage of the National Health Service and Public Health Department, presented 92% success rate in one-year follow-up [12].

However, despite the fact that IOP is the only parameter in evaluation of antiglaucoma surgery effectiveness, we should not the influence of glaucoma surgery on the refractive outcome and visual acuity due to the changes in the anterior and posterior eye segment. Actual ophthalmic trends introduce the term refractive glaucoma surgery. As in cataract surgery, patients expectations and demands have been increased in terms of achieving a good refractive outcome, faster postoperative recovery, less complications, without compromising the quality of life. In the past, surgeons focused mainly on effective IOP control. Today, patients rarely accept blurred vision due to astigmatism, hypotony, or discomfort caused by filtration bleb. Modern glaucoma surgeons deal with the modification of surgical techniques to achieve more diffuse pads, minimal astigmatism, and wound healing modulation with faster recovery.

In this study, the best-corrected pre/postoperative visual acuity was tested at Snellen chart over time (seventh, 30th, 60th day). World Glaucoma Association recommends that two methods can be used in the estimation of visual acuity: ETDRS, and Snellen charts, that is used in our routine clinical practice [13].

The average preoperative visual acuity in both glaucoma types was approximately four lines at Snellen chart. On the seventh postoperative day, there was a significant visual acuity decrease in both glaucoma types to 0.2 according to the Snellen chart ($p < 0.0001$). On the 30th day visual acuity was improved for one line (0.3 Snellen) and in 60 days in both groups returned to approximate preoperative acuity of 0.37 (four lines at Snellen chart). To prevent hypotonia, inflammation, shallow anterior chamber and other complications, topical mydriatic (cycloplegic) solution Homatropine 2% was administered two weeks after surgery. This could explain visual acuity reduction in the first postoperative week due to wide pupils and cycloplegia. There was no bleeding or choroidal effusion as complications that could affect visual acuity.

By analyzing demographic characteristic in OAG, a uniformed relationship between sex (46.67% female *vs*. 53.33% male) and years of life was observed. XFG is a rare type of glaucoma, more common in elderly people, that corresponds with results in our group. Out of all the patients, 70% of them presented with POAG at the average age of 66.67 years, and 30% of the patients presented with XFG at the average age of 73.06 years. World studies report that XFG prevalence shows geographic, racial, ethnic variations. Australia, Sweden, Finland, Norway, Russia, Greece, Turkey, Iran, Saudi Arabia, Tunisia reported an XFG incidence of 13–21% in people over 60. Lower rate than 6% in patients over 70 is recorded in Germany, Britain, Japan, Austria, Switzerland, and Denmark. The prevalence increases with age from 2.8/100,000 at 50, to 205.7/100,000 in 79 years [14, 15, 16]. Respondents' age has a positive correlation with glaucoma type (XFG). According to our results, XFG was observed at a significantly older age, which was 77 years for females and 70.55 for males, in contrast to 70.62 years for females and 62.71 years for males in POAG. In Serbia, half of all glaucoma occurs in people over 65, while the other half is the working age population between 40–65 years [10]. According to the results of multicenter clinical study in Russia, blindness occurs at the age of 75, therefore scientists point out the importance of surgical therapy on time, despite the transient change of visual acuity.

In the 1960s, the first literature review of reduced visual acuity after trabeculectomy was found in Watson's work, as consequence of iris position change. According to his observations, it lasted for six weeks. Detailed analysis by Cunliffe et al. [7] implies reduction of uncorrected and best-corrected visual acuity three weeks after surgery in subjects without cycloplegic. Although surgery benefits in glaucoma control, studies have indicated that it affects corneal curvature, ocular biometry and leads to visual acuity deterioration [17, 18]. The study by Cunliffe et al. [7] showed 94% of eyes worsen with uncorrected acuity a week following the surgery. This was due to a "myopic shift" in refraction, secondary to anterior chamber depth changes, which became shallow because they did not receive cycloplegic, so ciliary body rotated forward, accommodated, and moved to myopic refraction. Only 1 mm change in anterior chamber depth results in 2 diopter change in refractive sphere. Visual acuity starts to return to pre-operative levels in variable period, so to determine changes in our patients; we continued research of obtained parameters ACD and AL.

ACD is an important factor in visual acuity change in early postoperative period because it decreases on the fifth day with spontaneous reforming until the second week, if the cycloplegic drops were not applied. Raitta tried to reform anterior chamber by viscoelastic Na-hyaluronate in aim to prevent shallowing, because the rotation and movement of ciliary body are progressing with the spasm, which increases "myopic shift" [7]. Our postoperative protocol includes homatropine solution for two weeks after surgery to avoid athalamia. This is in aim of achieving better surgical outcome, preservation of filtration bleb integrity which could be bad especially in presence of iridocorneal contact [7, 19]. Shallower AC preoperatively is common finding in XFG, indicates zonular instability and increased incidence of postoperative complications.

Our biometric parameters analysis showed that average ACD varies during the monitoring period, from preoperative 2.79 ± 0.65 mm, its value increases the most at the seventh day (3.89 ± 1.42) then decreases on the 30th (3.59 ± 1.25) and on the 60th day (3.08 ± 1.02) almost to preoperative level ($p < 0.0001$). Deepening of AC was due to cycloplegic application (about 15 days) according to protocol thus providing stable chamber at the end of follow-up.

The most systematic review of all relevant articles in biometric changes published on PubMed from 1989–2016 was analyzed by Alvani et al. [6] who selected 25 comparable studies including 690 individuals which met similar inclusion criteria. All studies revealed ACD reduction immediately after surgery, which gradually deepened and reached its preoperative levels on day 14 in 87–91% of participants. ACD reduction was not significant after that period in majority of cases. ACD change of small amount in short period independently from measuring method: A-scan, ultrasound biometry, pachymetry, or optical biometry, was also noticed by Husain et al. [20] and Chen (2014) [21, 22].

Other ocular biometric change after trabeculectomy is axial length (AL) decrease due to improvement of ocular blood flow [5]. As choroidal thickness is dynamic parameter influenced by IOP oscillations, large IOP decrease might lead to significant CT/AL changes. Alvani et al. [21] analyzed eight studies that evaluated AL, all of them reported significant AL reduction postoperatively at all follow up points for 0.1–0.9 mm that became stable after three months. These studies were different in terms of follow up period, intra-operative antimetabolites application, method of AL measurement [6, 16, 20, 23]. Nemeth and Horoczi [24] noticed AL reduction four days after trabeculectomy for the first time. Cashwell and Martin [25] examined records of 62 patients and measured AL before and after surgery by ultrasound biometry, then reported the mean AL reduction of 0.423 ± 0.61 mm that lasts for 22.5 months. Studies of this kind differ in measurement method and antimetabolites application. A high percent of patients with antimetabolite had lower IOP and frequently experienced greater amounts of biometric changes [23–26]. For first time, Kook et al. [27] reported a significant AL reduction after trabeculectomy with mitomycin C (MMC), for 0.83 ± 1 mm at the follow up period of three months. Notice that different AL measurement methods explain disparity between studies results. Ultrasonic methods led to more pronounced AL reduction than noncontact techniques [20].

Our study was performed without MMC and showed that preoperative value of 23.41 ± 1.26 mm AL decreased at the seventh day (23.02 ± 1.27 mm) and 30th (23.09 ± 1.16 mm), then raised on the 60th, almost to preoperative (23.36 ± 1.89 mm) ($p = 0.043$; $p < 0.05$). This AL reduction for 0.39 ± 1.27 mm is very similar to Cashwell and Martin's results. Most studies confirmed AL changes causes and showed: high preoperative IOP, low postoperative IOP, young age, antimetabolite application, myopic refraction, surgical complications (choroidal detachment, hypotony maculopathy) were significantly associated with prolonged AL reduction [23, 27].

The direct relationship between IOP reduction, CT increase and AL reduction has been demonstrated in several studies. In a study by Husain et al. [20], each 1 mmHg decrease in IOP led to a 0.01 mm AL reduction in POAG. Patients with OAG are more sensitive to AL changes and experience more axial fluctuations during the first three months after trabeculectomy compared to patients with angle closure glaucoma [6, 28]. Some authors suggest that AL reduction can be predicted after three months by formula: AL reduction (mm) = -199 + 0.006 × IOP reduction + 0.008 × final IOP [23, 29]. Our scatter plot illustrates simultaneous change of AL and IOP and showed significant correlation in IOP and AL decrease through time ($r = 0.255$; $p = 0.049$; $p < 0.05$) with implication to visual acuity.

Trabeculectomy, non-penetrating surgery and drainage devices usually cause AL, ACD or keratometry changes that last more than one year, but significant enough to affect visual acuity, IOL power calculation accuracy and refractive outcomes after combined or cataract surgery. After trabeculectomy, every 0.1 mm change in AL leads to an average 0.25 diopter change in IOL power in emmetropic eye. This error was to 0.18 diopter in a very long eye (30 mm) and increases to 0.38 diopter in very short eye (20 mm). Other parameter, ACD change of 0.12 mm would result in a change of 0.06 diopter in refractive error for posterior chamber IOL [5, 6, 28–31].

CONCLUSION

Trabeculectomy is the most common surgical procedure for glaucoma management, which may significantly influence ocular biometry and may last more than one year. ACD and AL change can be significant enough to affect visual acuity, the accuracy of IOL power calculation and refractive outcomes after combined or future cataract surgery. Our biometric parameters analysis showed significant postoperative difference in ACD (for 1.1 mm during time interval) and AL decrease (0.39 ± 1.27 mm on the seventh day) with spontaneous recovery two months after operation. There was a difference in the postoperative visual acuity compared to the preoperative (worsening for two lines at Snellen chart) with spontaneous recovery at the end of follow up. As our continuous effort is to develop new procedures and improve actual, to avoid problems associated with glaucoma filtering surgery, we must strive to improve our surgical outcome, modify surgical technique, and develop strategies to optimize visual acuity and accuracy of IOL power calculation in order to achieve the best results for our patients.

NOTE

These results were presented in Marija Radenković's master thesis and parts of these results were presented at the XVIII Congress of Serbian Ophthalmologists held on September 21–24, 2017 in Aranđelovac, Serbia.

Conflict of interest: None declared.

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Биометријске промене ока после трабекулектомије

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САЖЕТАК

Увод/Циљ Трабекулектомија је конвенционална филтрациона процедура у хируршком лечењу глаукома. Чак и после успешно изведене трабекулектомије пацијентима може бити редукована видна оштрина. Студије из 1991. показују да промене видне оштрине настају услед промене закривљености рожњаче и дубине предње коморе. Промена дубине предње коморе за 1 *mm* резултује променом за око две диоптрије у рефрактивној сфери. Истовремено са променама на предњем сегменту, ефекат антиглаукомних операција се може манифестовати и на задњем сегменту ока: дебљини хороидеје, дужини ока и окуларној перфузији. Биометријом се потврђује смањење дужине ока после трабекулектомије, израженије код преоперативно виших вредности очног притиска и у првој постоперативној недељи, са спонтаним враћањем на преоперативне вредности годину дана после интервенције. Студија је спроведена на Клиници за очне болести у Нишу на 60 оперисаних пацијената са глаукомом отвореног угла, ради утврђивања разлике пре/постоперативних вредности биометрије.

Методе У овом раду коришћена је ретроспективно-проспективна биометријска анализа пацијената оперисаних од глаукома.

Резултати Дубина предње очне коморе се значајно разликује током посматраног периода праћења – за 1,1 *mm* у првој недељи ($p < 0{,}0001$) у целокупној групи и по типовима глаукома. Просечна вредност дужине ока се значајно разликује током посматраног периода праћења – краћа је за 0,39 *mm* у првој постоперативној недељи ($p < 0{,}05$).

Закључак Анализом биометријских параметара утврђена је постоперативна разлика у вредностима биометрије са спонтаним опоравком. Постоји разлика постоперативне видне оштрине пацијената у односу на преоперативну са спонтаним опоравком на крају праћења.

Кључне речи: глауком; трабекулектомија; биометрија; дубина предње коморе; дужина ока