CHANGES IN BLOOD AND INTRAOCULAR PRESSURE ON DIFFERENT STEPS OF CATARACT PHACOEMULSIFICATION

Javrishvili V., Aleksidze A., Shurgaia A., Todria M.

David Tvildiani Medical University; Javrishvili Eye Clinic «Oftalmij», Tbilisi, Georgia

Cataract is ranked as one of the leading causes of blindness (Pascolinni) and this burden tends to increase as the population ages. In cataract whose global prevalence of 15.5% rises to 45.9% in those over 75 years is expected to duplicate by 2020 (Asbow). Cataract is a problem associated with old age; as the average age of patients undergoing cataract surgery was >70 years, understandably, these patients have quite a lot of comorbidity, including systemic hypertension.

Similar trend is observed with glaucoma, which is the second leading cause of irreversible blindness (after diabetic retinopathy) in developed countries. Unsurprisingly, both diseases frequently coexist in the elderly population in a proportion that is likely to increase.

Phacoemulsification technique, as a major innovative step in cataract surgery, was first introduced by Kellman [1]. Since that time there has been ongoing stepwise development of this technique and now, cataract surgery is among most frequently performed surgeries in human ophthalmology in the developed world. The role of phacoemulsification in achieving success of such scale is hard to overestimate. In addition to its significant impact on visual acuity, phacoemulsification has been considered as a potentially intraocular pressure (IOP)-lowering procedure. While current evidence generally suggests a significant and persistent IOP in postoperative period, the specific ocular predictive findings predisposing to such benefit remain unclear and need further and more deliberate evaluation. Hypotensive effect of phacoemulsification is strongly correlated to safe and uncomplicated, smooth performance of this technique, which in turn is determined by stable and non-fluctuate level of IOP during every surgical procedure. Experienced phacosurgeons tend to use high vacuum levels to do surgery faster and therefore more cost effectively. At the same time, increased vacuum settings create turbulences in the anterior chamber and consequently leads to its instability. To avoid such unpleasant and disturbing distress-creating side effect, in normal course of phaco procedure, surgeons have to increase IOP by means of setting higher infusion height.

On the other hand, main factors determining IOP during surgery are: initial eye tension, intensity of inflow of balanced salt solution (BSS) in anterior chamber (highly depends on the height of the bottle) and outflow amount. High IOP is one of the main causative factors damaging inner surface of the cornea (endothelium), and developing postoperative corneal edema; role of high IOP as a factor negatively affecting intraocular microcirculation must not be underestimated.

Therefore, it seems reasonable, to assume that adequate level of preoperative IOP is one of crucial key factors benefiting normal and safe course of cataract phacoemulsification in both cataract and glaucoma patients.

The main goal of the study is to evaluate how intraoperative IOP might influence the rate of following complications of phaco procedure:

1. Damage of zonular apparatus and potential rupture of posterior capsule;

2. Shallowing of anterior chamber, jeopardizing integrity of posterior capsule;

3. Prolapse of iris in main corneal incision (for phaco handpiece) and paracentesis;

4. Stromal edema of the cornea leading to decreased visualization of anterior chamber structures

5. Increase of the risk of supra-choroidal expulsive hemorrhage

6. Bleeding from iris

Finally, “safe corridor” of preoperative IOP must be established. To accomplish the aim of the study is highly recommended the values of IOP during the basic phases of standard cataract surgery using phaco technique. We have to take in consideration also the role of high pre- and perioperative IOP on retinal blood microcirculation.

In the eye, the vascular pressure begins in the arteries and ends with the venous pressure in the ending stream. The pressure resistance is given by the blood elements and the vessel length by branching and by the vascular diameter. The pressure decreases from the arteries to the capillaries. The main source of resistance lies in the small arteries and arterioles. The intraocular veins as “starling’s resistors”: Their pressure before the outflow of the eye must be higher than the IOP ot the flow may collapse [4-6]. Consequently, the IOP significantly influences the intraocular vascular flow.

The starling resistor was invented by English physiologist Ernts Starling and used in and isolated heart preparation during work which should later lead to the “Frank-Starling law of the heart”. The device consisted of and elastic fluid-filled collapsible tube mounted inside a chamber filled with air. The static pressure inside the chamber was used to control the degree of collapse of the tube, so providing a variable resistance. This resistor was used to simulate total peripheral (vascular) resistance [7-8].

Under normal conditions, the main arterial pressure (MAP) can be estimated using the systolic blood pressure (CBP) and diastolic blood pressure (DBP). According to know equiation MAP = DBP =1/3 (SBP-DBP). The mean ocular perfusion pressure (MOPP) is calculated as MOPP = 2/3MAP –IOP [9].

Potential situation in surgical practice: Patient SBP of 120 mmHg and DBP 70mmHg has IOP of 20 mmHg, then MAP = 87mmHg and patients MOPP = 38 mmHg. Surgery starts and the level of infusion is 100 cm, which creates 74 mmHg pressure in the irrigating line. If there is no function of aspiration (or leakage of surgical wounds), this pressure is higher than the arterial input pressure ultimately causing complete stop of ocular flow during this surgical step.

From this abovementioned standpoint the another aim of the study is to prospectively investigate whether the cancelation of cataract surgery on the day of operation owed to suspected increased risk of intraocular complications in patients with high blood pressure is justified. We have also tried to access whether there was a higher risk of developing ocular complications during phaco procedure under local anesthesia in patients who have high blood pressure.

Some studies were published to determine the correlation between sharp visual loss and transient steep increase of IOP [10-12]. Moreover, the relationship between the IOP during phacoemulsification and the subsequent non-arteritis anterior

ischemic optic neuropathy was assumed [13]. Drastic changes in the IOP and its acute elevation may induce compression of the nerve fibers (especially in primary glaucoma eyes) and may create irreversible damage to the visual field [14].

Material and methods. All measurements were carried out during all basic phases of standard phaco surgery in humans. All surgeries were performed under local instillation (tetracaine) and peribulbar anesthesia (lidocaine) by one surgeon. Intraoperative IOP measurements were performed by his assistant. All procedures were performed using the phacoemulsifier Stellaris (manufacturer Bausch & Lomb). The main incision size was 2.75 millimeters, coaxial handpiece, two service paracentesis of 1.1mm bimanual irrigation aspiration. The height of the bottle was 90cm. Duovisc was a common viscoelastic device (OVD) and the quick-chop phacoemulsification technique was generally used. The group consisted of 285 patients, median age was 72±4.2 years. There were 162 females and 123 males. Patients had no clinically significant eye pathologies.

Immediately before surgery, routine blood pressure measurement was done on the right arm with the blood pressure cuff at a height equal to the level of the patient's heart. Five blood pressure readings were taken from patient in total:

1. In the pre-assessment period two weeks before.
2. On arrival on the day of surgery, before instillation of dilating drops.
3. In the anesthetic room before surgery.
4. Intraoperatively and
5. Postoperatively – 30 minutes after transfer to the recovery room.

IOP measurements were performed in the supine position following draping. The ophthalmotonus was measured using the sterile contact end of the electronic applanation tonometer Tonopen XL (Reichard/Medtronic). The IOP was measured in each patient:

1. Prior to surgery.
2. Following the filling of the anterior chamber with OVD.
3. Following hydro dissection.
4. During phacoemulsification
5. During irrigation aspiration.
6. During Intraocular lens (IOL) implantation.
7. During evacuation of OVD with BSS.
8. At the end of surgery.

Results and discussion. Contact measurements of the ophthalmotonus did not create any corneal surface complications with following severe intraocular infections (corneal ulceration, endophthalmitis, vitreitis) during the follow-up period of cataract surgery. The primary and ultimate levels of IOP were 18-32 mmHg (average 19 mmHg) and 7-17 mmHg (average 9mmHg), respectively. The IOP levels fluctuated between 6 and 61 mmHg intraoperatively. The intraocular pressure following the injection of OVD intra-camerally, following hydro dissection and during evacuation of visco material, was lower compared with that prior to surgery. On the other hand, we find out statistically reliable elevation of IOP at the beginning of phacoemulsification within the process of phacoemulsification, at the end of phacoemulsification and during irrigation-aspiration of cortical remnants.

The highest IOP was recorded at the start of phacoemulsification (from 40 to 62 mmHg) (Table 1). Maximum pressure of higher than 40 mmHg was measured in 99% of the cases, higher than 50 mmHg - 85% of cases and higher than 60 mmHg - in 32% of the cases.

Prior to and during implantation of the IOL the main value of IOP was 17 mmHg. The systolic blood pressure of patients ranged from 125 to 190 mmHg (average 160 mmHg) and diastolic blood pressure was among 74mmHg to 105 mmHg (average 85 mmHg). The MOPP at the beginning of the surgery was 47.2-67.5 mmHg (average 54.2 mmHg), and 0.6-41.0 (average 18.7) during maximum elevation of the IOP (Table 2).

Table 1. IOP values in all standard steps of phacoemulsification

Age of patient	IOP before surgery	IOP after OVD filling	IOP after Hydro dissection	IOP at the beginning of phaco-emulsification	IOP during phaco procedure	IOP in epi-nucleus removal	IOP during aspiration-irrigation	IOP before IOL implantation	IOP after IOL implantation	OVD removal	IOP at the end of surgery
N=1; 85	18	16	6	57	29	37	31	12	13	12	14
N=2; 86	16	6	12	45	28	41	8	11	18	9	9
N=3; 87	28	30	7	50	38	28	22	17	11	14	8
N=4; 70	21	8	13	59	27	34	16	14	50	23	7
N=5; 81	17	22	24	60	15	16	17	13	12	19	8
N=6; 71	17	15	15	55	23	44	62	17	13	25	9
N=7; 68	27	5	32	52	14	28	35	20	17	12	15
N=8; 80	17	56	4	56	20	53	22	17	28	10	13
N=9; 73	16	7	9	43	33	34	27	22	17	14	8
average	18.0	16.0	10.0	54.0	25.0	35.0	21.0	18.0	18.0	15.0	9.0

Table 2. Blood pressure values prior to surgery and calculations of eye perfusion (in mmHg)

Age of patient	Systolic blood pressure	Diastolic blood pressure	IOP before surgery	MOPP (starting IOP)	Maximal IOP during surgery	MOPP
N=1 ; 85	145	95	16	60.1	56	18.7
N=2; 86	148	72	15	48.9	49	15.5
N=3; 87	162	90	29	52.9	50	26.8
N=4; 70	160	85	19	55.0	58	10.3
N=5; 81	150	88	20	46.8	56	11.4
N=6; 71	125	78	21	47.9	62	0.2
N=7; 68	155	90	26	48.5	53	25.4
N=8; 80	165	102	17	63.6	52	28.3
N=9; 73	175	97	16	67.2	44	42.2

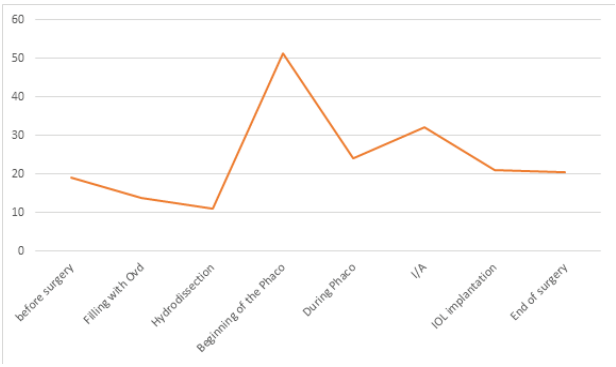

Fig. IOP progression changes (in average values) measured on standard steps of phacoemulsification (OVD-Ophthalmic viscoelastic device, I/A – irrigation aspiration, IOL – intraocular lens)

Zhao et al. [8], and Khng et al. [15] were the pioneers performing IOP evaluation in simulated measurements invivo and in cadaver eyes, respectively. Zhao and coauthors measured IOP under simulated conditions during standard phacoemulsification, while by Khng et al IOP measurements were carried out on four cadaver eyes by the pressure transducers placed in the vitreous cavity. It is worth to emphasize that the doubts arising how this experimental models are comparable to clinical conditions of patients undergoing phaco procedure.

The work of Hagsek et al. (2018), was to be the first to evaluate the results of the fluctuations of IOP and calculated MOPP during different steps of conventional phacoemulsification.

According to our investigation, the ocular pressure during the surgery undergoes meaningful changes, bringing to its highest levels during the phacoemulsifing the lens nucleus. These sharp spikes of IOP could be the main causative factor hindering the eye blood perfusion (even to levels closing the blood circulation in ocular micro vessels). Fortunately, such transitory increases of IOP even occurring several times, especially after injecting viscoelastic material and machine-induced sharp rise of IOP due to extensive irrigation with BSS, takes the time usually under 40-50 seconds and has no serious clinically significant consequences. Any longer time-consuming deteriorations in blood flow of the intraocular structures, especially in optic nerve head, could be one of the reasons of its irreversible damage (partial even total optic nerve atrophy) and undesirable postoperative visual outcomes leading to patients' dissatisfactions. Moreover, there are many patients who need cataract surgery and at the same time have compromised optic nerves, such as in advanced glaucoma or different types of optic neuropathies.

Very high IOP were also noted by Khng et al [15] by the probe in the vitreous body in the cadaver eyes on the following steps of the phaco surgery: during the filling of the anterior chamber with OVD and during Hydro dissection. Data show the IOP exceeded 16mmHg up to 85% during surgery. Increased blood pressure intraoperatively was thought to be a response to pain. Fichman et al. [16] asked 600 of his cataract patients who underwent topical anesthesia to rate their of discomfort during surgery. 80% among them were complaining mild discomfort, 8% - moderate and 3% - severe pain. He also monitored the blood pressure of 100 patients and only 1% of had raised blood pressure.

There is an increased risk of 2.5 times of having the cataract surgery in hypertensive patients, especially those between 60-69 years of age. Compared to non-hypertensives, as reported in the studies Szmyd l. and Schwarz B. [17]. However, being hypertensive does not seem to be a risk for rising blood pressure in this study.

The changes of blood pressure in patients undergoing cataract procedure are not well studied. Moreover, correlation between IOP and blood pressure on one hand and between blood pressure level and frequency of severe intraoperative complication during different stages of the procedure needs further elaboration. Intraoperative rise in blood pressure has been associated with ocular complications such as suprachoroidal hemorrhage, retinal vascular occlusion and can be fatal from stroke or myocardial infarction. Other intraoperative complications, hindering the smooth flow of cataract surgery due to uncontrolled blood pressure could be sharp elevation of IOP, prolapse of iris, impossibility to perform main steps of phacoemulsification, causing operation to be postpone. Blood pressure readings of patients going to phaco procedure were measured on 5 stages: 1. preoperatively at the day of surgery; 2. injection of OVD, 3. Phaco fragmentation of nucleus, 4. I/A of BSS, implantation of IOL, 5. postoperatively.

At the same time, the frequency of intraoperative complications such as: 1. Rupture of posterior capsule and increased risk of damage of Zinn's ligaments; 2. shallowing of anterior chamber; 3. Herniation of the iris through incision sites; 4. Stromal corneal edema causing decreased visualization; 5. Increase of the risk of suprachoroidal expulsive hemorrhage; 6 bleeding from iris; was monitored.

Comparing the t-test results of raised systolic and diastolic blood pressures measured intra- and postoperatively, was highly statistically significant in case of systolic and significant in case of diastolic pressure, respectively. There was a 15% rise in systolic and 9.2% increase in diastolic blood pressures between the intraoperative and preoperative readings (Table 3).

Table 3. Blood pressure values prior to surgery and on the different stages of phacoemulsification

Systolic blood pressure						
Age of patients	BP before surgery	After injection of OVD	Phacoemulsification of the nucleus	Aspiration/ Irrigation	Implantation of IOL	postoperatively
N=1; 85	145	155	160	165	174	150
N=2; 86	148	165	165	172	180	155
N=3; 87	162	160	166	170	175	165
N=4; 70	160	158	165	172	177	165
N=5; 81	150	148	160	175	170	155
N=6; 71	125	135	156	165	168	120
N=7; 68	155	160	164	170	175	140
N=8; 80	195	160	165	170	165	145
N=9; 73	170	160	155	175	175	165
Diastolic blood pressure						
N=1; 85	95	100	105	106	105	100
N=2; 86	72	80	85	86	90	75
N=3; 87	90	100	104	105	104	90
N=4; 70	85	106	106	105	100	88
N=5; 81	88	98	107	100	95	90
N=6; 71	78	85	97	105	102	75
N=7; 68	90	102	100	108	105	91
N=8; 80	102	105	110	112	104	95
N=9; 73	97	100	95	100	95	95

The highest blood pressure readings were recorded preoperatively and were even higher on the different stages of phacoemulsification – after injection of OVD phacofragmentation of nucleus, irrigation-aspiration of lens material, implantation of IOL. Half an hour after surgery in recovery room patient's blood pressure start to decline up sub- or normal values.

There was 15.2% rise (mean values) in systolic blood pressure during different steps of phaco procedure and increase of 6.9% in diastolic pressure, respectively.

It is worth to stress that in cases of sharp intraoperative IOP spikes there was prolapse of iris, shallowing of anterior chamber, impossibility of IOL implantation and other main steps of phacoprocedure evident triggering factors of which was rise of systolic and diastolic blood pressure (85% of complicated cases due to BP rise). Variability in responses maybe due to blood pressure measurements taken at different steps intraoperatively. The also reflect the range in response of BP between individuals during cataract surgery.

Conclusion. Both IOP and MOPP measured during phaco procedure are different on main steps of surgery. Spikes of high IOP during operation may jeopardize the intraocular blood flow due to decreased inflow of blood in the different ocular structures – optic nerve, retina and choroid. At the same time, there was high coincidence rate between raised values of systolic and diastolic BP, sharp rise of IOP and undesirable intraoperative complications such as: shallowing of anterior chamber, herniation of iris through incision site, stromal corneal edema frequently leaded to necessity of surgery postpone. All abovementioned are negatively influencing the visual outcomes of phacoemulsification and shows the evidence in favor of accurate drug induced normalization of blood pressure and IOP preoperatively.

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SUMMARY

CHANGES IN BLOOD AND INTRAOCULAR PRESSURE ON DIFFERENT STEPS OF CATARACT PHACOEMULSIFICATION

Javrishvili V., Aleksidze A., Shurgaia A., Todria M.

David Tvildiani Medical University; Javrishvili Eye Clinic «Oftalmij», Tbilisi, Georgia

The main goal of the study is to evaluate how intraocular pressure (IOP) and statistically significant changes in systolic and diastolic pressure might influence the rate of complications of phaco procedure. Non-randomized open study. The group consisted of 285 patients, median age was 72±4.2 years The patients were observed all over the course of surgery. All patients received standard post-surgery treatment. The operations were conducted by one and the same surgeon, using one and the same medications and equipment. Key assessment parameters: IOP before, during and after the surgery, cataract, blood pressure, phacoemulsification. Conclusion. Both IOP and mean ocular perfusion pressure (MOPP) measured during the phaco procedure are different on the main steps of surgery. Spikes of high IOP during operation may jeopardize the intraocular blood flow due to decreased inflow of blood in the different ocular structures – optic nerve, retina and choroid. At the same time, there was high coincidence rate between raised values of systolic and diastolic BP, sharp rise of IOP and undesirable intraoperative complications such as: shallowing of anterior chamber, herniation of iris through incision site, stromal corneal edema frequently leaded to necessity of surgery postpone. All above mentioned are negatively influencing the visual outcomes of phacoemulsification and shows evidence in favor of accurate drug induced normalization of blood pressure and IOP preoperatively.

Keywords: blood pressure, intraocular pressure, mean ocular perfusion pressure, phacoemulsification, cataract.

РЕЗЮМЕ

ИЗМЕНЕНИЯ АРТЕРИАЛЬНОГО И ВНУТРИГЛАЗНОГО ДАВЛЕНИЯ НА РАЗНЫХ ЭТАПАХ ФАКОЭМУЛЬСИФИКАЦИИ КАТАРАКТЫ У ПАЦИЕНТОВ

Джавришвили В.Г., Алексидзе А.Т., Шургая А.Т., Тодрия М.И.

Медицинский университет Давида Твилдиани; Глазная клиника Джавришвили "Офтальмидж", Тбилиси, Грузия

Цель исследования - оценка изменения кровяного и внутриглазного давления на разных этапах факоэмульсификации. Проведено нерандомизированное открытое исследование 285 пациентов, средний возраст которых составил 72±4,2 года. Наблюдение осуществлялось в течение всей операции. Пациенты проходили стандартное послеоперационное лечение. Операции проводились одним и тем же хирургом, с одними и теми же медикаментами, на одном оборудовании. Основные параметры оценки: внутриглазное давление (ВГД) до, во время и после операции, катаракта, артериальное давление, факоэмульсификация.

Согласно проведенным исследованиям, как ВГД, так и среднее глазное перфузионное давление, измеренное во время процедуры факоэмульсификации, различаются на основных этапах операции. Всплески высокого ВГД во время операции могут поставить под угрозу внутриглазной кровоток ввиду снижения притока крови в различные структуры глаза - зрительный нерв, сетчатка и сосудистая оболочка. Отмечена взаимосвязь между повышенными значениями систолического и диастолического АД, резким повышением ВГД и нежелательными интраоперационными осложнениями, такими как: обмеление передней камеры, грыжа радужки в месте разреза, стромальный отек роговицы, что часто приводит к необходимости отсрочки операции. Вышеизложенное негативно влияет на визуальные результаты факоэмульсификации и свидетельствует в пользу медикаментозной нормализации артериального давления и ВГД до операции.

რეზიუმე

არტერიული და თვალშიგა წნევის ცვლილებები ფაკოემულსიფიკაციის ოპერაციის სხვადასხვა ეტაპებზე

ვ.ჯავრიშვილი, ა.ალექსიძე, ა.შურგაია, მ.თოდრია

დავიდ ტვილდაინის სამედიცინო უნივერსიტეტი,
ჯავრიშვილის თვალის კლინიკა "ოფტალმიჯი", თბილისი, საქართველო

კვლევის მიზანს წარმოადგენდა არტერიული და თვალშიგა წნევის ცვლილების შეფასება ფაკოემულსიფიკაციის ოპერაციის სხვადასხვა ეტაპებზე. ჩატარდა არარანდომიზებული ღია კვლევა. კვლევაში

მონაწილეობდა 285 პაციენტი, რომელთა საშუალო ასაკი შეადგენდა 72±4.2 წელს. პაციენტებზე დაკვირვება ხდებოდა ოპერაციის მიმდინარეობის მთელი დროის განმავლობაში.

ყველა პაციენტს უტარდებოდა სტანდარტული ოპერაციისშემდგომი მკურნალობა. ოპერაციებს ატარებდა ერთი და იგივე ქირურგი, ერთი და იმავე მედიკამენტების და აპარატურის გამოყენებით.

შეფასებული იყო შემდეგი პარამეტრები: თვალშიგა წნევა ოპერაციამდე, მის დროს და მის შემდეგ, კატარაქტა, არტერიული წნევა, ფაკოემულსიფიკაცია.

კვლევის შედეგად დადგენილია, რომ როგორც თვალშიგა, ასევე თვალის საშუალო პერფუზიული წნევა, რომელიც იზომება ფაკოემულსიფიკაციის პროცედურის დროს, განსხვავდება ოპერაციის სხვადასხვა ეტაპებზე. ოპერაციის დროს თვალშიგა წნევის ძლიერი ცვლილებები საშიშროებას უქმნის თვალშიგა სისხლის ნაკადს სისხლის ნაკადის შემცირებით თვალის სხვადასხვა სტრუქტურებში - მხედველობით ნერვში, ბადურაში და ძარღვოვან გარსში. აღინიშნა ურთიერთკავშირი სისტოლური და დიასტოლური არტერიული წნევის მომატებული მაჩვენებლების, თვალშიგა წნევის მკვეთრი მომატების და არასასურველ ინტრაოპერაციულ გართულებებს შორის, რაც ხშირად იწვევდა ოპერაციის გადადების აუცილებლობას.

ყოველივე ზემოაღნიშნული უარყოფითად მოქმედებს ფაქოემულსიფიკაციის შედეგებზე და მეტყველებს არტერიალური და თვალშიგა წნევის მედიკამენტოზურ ნორმალიზაციის აუცილებლობაზე ოპერაციამდე.

ROLE OF DIACARB (ACETAZOLAMIDE) PREMEDICATION IN PREVENTION OF CATARACT PHACOEMULSIFICATION COMPLICATIONS

Javrishvili V., Aleksidze A.T, Shurgaia A.T, Todria M.

David Tvildiani Medical University; Javrishvili Eye Clinic «Oftalmij», Tbilisi, Georgia

Cataract is an age-related disease and it is one of the main causes of blindness all over the world. Cataract incidence increases with age and while its frequency is 2.9% in the population aged under 55, incidence reaches 40% in the population over 75 years.[1] Most widespread method of cataract is phacoemulsification of the opacified lens and its replacement with the new, transparent artificial lens. Similar to all surgical interventions, phacoemulsification can be accompanied with complications. The complications are diverse and are classified in four main categories: 1. complications associated with anesthesia, such as damage of the optic nerve (0.09-0.79%), retrobulbar hemorrhage (0.03-0.32%) and impairment of eye pupil integrity (0.009-0.13%); 2. Surgical complications, such as prolapse of vitreous body, supra-chorioid hemorrhage (0.07%), detachment of Descement's membrane, intra-operative myosis, posterior capsule rupture (0.5-16%) and zonular dialysis; 3. Early post-surgical complications, such as anterior chamber narrowing, corneal leukoma, iris prolapse, post-surgical entophthalmia and uveitis; 4. Late post-surgical complications, such as refractive disorders and posterior capsule opacification, i.e. secondary cataract [2]. The most widespread complication is associated with the surgical factor and this is rupture of the posterior capsule [3]. In this study the emphasis is made on the prolapse of vitreous body, chamber narrowing, iris prolapse, corneal leukoma and bleeding from iris.

Diacarb is diuretic, frequently used against hypertension. Its active ingredient is Acetazolamide, it is used in Georgia, Russia, Lithuania and Latvia with the name Diacarb. Acetazolamide is carbonic anhydrase inhibitor, reduces excretion of hydrogen in kidneys and increases excretion of water, sodium, potassium and bicarbonate. It is also used for treatment of glaucoma, though regular consumption of high doses causes electrolyte imbalance.

Most of the above listed pre-, intra- and post-surgery complications are associated with the fluctuations of intraocular pressure in the course of surgical operation. Goal of our study was assessment of the role of Diacarb, as hypotonic agent in management of these complications.

Material and methods. 400 patients were selected for the study. They were divided into control group including 300 patients and Diacarb group composed of 100 patients. The patients were aged from 57 to 84 years. Control group included 183 females and 117 males while in the treated group there were 57 females and 43 males.

In the treated group the patients were prescribed single oral dose of Diacarb a one day before the surgery. Before surgery all patients were subjected to standard ophthalmologic examination. All operations were conducted by one and the same surgeon. Operations were conducted by means of phacoemulsification machine Stellaris. For anesthesia there was used tetracaine (topically) and lidocaine (retrobulbar anesthesia). Main incision was of 2.75 mm width and was made on meridian corresponding to 12 o'clock while paracentesis – 1.1 mm, at meridians corresponding to 3 and 9 o'clock, irrigation and aspiration was provided bimanually, irrigation bottle was at 100 cm height from the patient's level. Duovisc was used as main viscoelastic. After the surgery all patients were instilled antibiotics.

Results and discussion. As a result of study it was found that in control group 42 (14%) of three hundred patients had complications, while in Diacarb group complications had 11 (11%) patients of 100. Prolapse of vitreous body developed only in one (0.33%) patient of 300 in control group while in the treated group such complication was not indicated at all (0%). Rate of chamber narrowing was approximately equal in both groups (3.33% control group vs. 3% Diacarb group). Iris prolapse was found in 12 (4%) patients of control group and 3 (3%) in Diacarb group. Cornea opacification was identified in 10 (3.3%) patients of control group and 2 (2%) in treated group. Iris bleeding is a very rare complication and in this case it has developed only in