

# Two different chemoprophylaxis approaches after phacoemulsification surgery in one thousand patients in Iraq

Suzan Amana Rattan<sup>1</sup>, Najah Kadhum Mohammad<sup>2</sup>, Mahir Kadhim Mutashar<sup>3</sup>

<sup>1</sup>Department of Surgery, Al - Kindy College of Medicine/ University of Baghdad, AL - Nahdha square, Baghdad 10001, Iraq

<sup>2</sup>Department of Surgery, Baghdad College of Medicine/ University of Baghdad, Bab AL - Moadham square, Baghdad 10001, Iraq

<sup>3</sup>Eye Specialty Private Hospital, Al - Wazyrea, Baghdad 10001, Iraq

**Correspondence to:** Suzan Amana Rattan. Department of Surgery, AL - Kindy College of Medicine, University of Baghdad, AL - Nahdha square, Baghdad 10001, Iraq. [suzanophthalmologist@gmail.com](mailto:suzanophthalmologist@gmail.com)

Received: 2018-03-16 Accepted: 2018-07-27

## 前房注射 0.1% 莫西沙星联合结膜下注射曲安奈德预防超声乳化术后感染

Suzan Amana Rattan<sup>1</sup>, Najah Kadhum Mohammad<sup>2</sup>, Mahir Kadhim Mutashar<sup>3</sup>

(作者单位:<sup>1</sup>10001 伊拉克, 巴格达, AL-Nahdha square, 巴格达大学 Al-kindy 医学院手术室;<sup>2</sup>10001 伊拉克, 巴格达, Bab AL-Moadham square, 巴格达大学医学院手术室;<sup>3</sup>10001 伊拉克, 巴格达, Al-Wazyrea, 眼专科私立医院)

通讯作者: Suzan Amana Rattan. [suzanophthalmologist@gmail.com](mailto:suzanophthalmologist@gmail.com)

### 摘要

**目的:** 评估前房注射 0.1% 莫西沙星联合结膜下注射 4 mg 曲安奈德预防白内障超声乳化术后感染和炎症的疗效, 并与局部滴药组比较。

**方法:** 共纳入 1000 例, 平均年龄 38 ~ 70 岁, 全部行超声乳化术的患者分为两组, 两组在年龄、术前眼压 (IOP) 和中心黄斑厚度 (CMT) 方面无显著差异, 分别为  $P=0.6$ ,  $P=0.9$  和  $P=0.8$ 。对照组患者 500 例, 术后 1mo 每日 4 次局部应用 0.5% 盐酸莫西沙星和 0.1% 地塞米松滴眼液。研究组在手术结束时, 前房注入 0.1% 莫西沙星 0.4 mL 联合 4 mg 曲安奈德结膜下注射。随访时间为术后 1d、1wk、1mo 和 3mo。检查 4 次前房反应, 测量 3 次眼压, 最后一次测量 CMT。

**结果:** 该临床试验研究中两组人群分别应用不同的预防方法, 两组无眼内炎病例发生。通过两样本  $t$  检验, 术后 1d, 研究组前房细胞显著低于对照组, 而术后 1wk、1mo 和 3mo 两组间无统计学差异。在第 3mo 随访时, 两组间眼压和中心黄斑厚度无明显差异。对照组炎症发生率为 9.6%, 研究组为 4%。对照组在 1mo 时

眼压升高  $\geq 10$  mmHg 患者占 2.4%, 显著高于研究 (0.8%)。

**结论:** 白内障术后联合应用前房内莫西沙星和结膜下曲安奈德可有效预防感染和炎症, 并且大多数 (480 例) 患者不需其它任何外用药物, 这为患者节省了成本, 并帮助降低无法实施局部用药的病人并发症的几率与依从性差的患者术后不良药物反应。

**关键词:** 盐酸莫西沙星; 曲安奈德; 超声乳化

**引用:** Rattan S, Mohammed N, Mutashar M. 前房注射 0.1% 莫西沙星联合结膜下注射曲安奈德预防超声乳化术后感染. 国际眼科杂志 2018;18(10):1757-1762

### Abstract

• **AIM:** To evaluate the effectivity of the combination of intracameral moxifloxacin 0.1% with subconjunctival triamcinolone acetonide 4 mg as prophylaxis of infection and inflammation after phacoemulsification in comparison with topical medication treated group.

• **METHODS:** A total one thousand patients with age range from 38 to 70 years old who scheduled for phacoemulsification were divided into 2 groups of no statistically significant differences in age, preoperative intraocular pressure (IOP) and central macular thickness (CMT),  $P=0.6$ ,  $0.9$  and  $0.8$  respectively. The surgeries were done by 2 surgeons each one planned to use one method of prophylaxis at Eye Speciality Private Hospital, Baghdad, Iraq. For the 1<sup>st</sup> group of patients (500) a topical moxifloxacin hydrochloride 0.5% and dexamethasone 0.1% eye drops were prescribed four times a day for 1mo postoperatively. For the 2<sup>nd</sup> group intracameral (IC) diluted moxifloxacin at 0.1% with subconjunctival (SC) triamcinolone 4 mg in 0.4mL were administered at the conclusion of the surgery. Follow up visits were on the first postoperative day, 1wk, 1mo, and 3mo postoperatively. Anterior chamber (AC) reaction was examined during the 4 visits while IOP was measured during the last 3 and CMT was measured only in the last one.

• **RESULTS:** The current clinical trial study compared 2 samples with 2 different prophylaxis methods. No endophthalmitis case reported in both group. By a 2-Sample  $t$ -test, the IC-treated group (group 2) had statistically significant lower AC cells at the 1<sup>st</sup> day postoperative visit than the other group while there were

no statistically significant differences at 1wk, 1 mo and 3mo visits between the 2 groups. There was no statistically significant difference at 3mo visits in IOP and CMT between the two groups. A breakthrough inflammation rate with the topical medication was 9.6% while in the other group (IC treated) was 4.0%. A significant IOP elevation  $\geq 10$  mmHg at 1mo in 2.4% within the topical medication group which was higher than the rate in the other group (0.8%).

• **CONCLUSION:** In addition to the safety and effectivity of the combination of intracameral moxifloxacin and subconjunctival triamcinolone in preventing infection and inflammation after cataract surgery. The majority (480) of our included patients didn't require any topical postoperative medication that is cost saving for the patient, helped patients who were unable to administer topical medication, and decreased chance of complication related to patient poor adherence to postoperative medication.

• **KEYWORDS:** moxifloxacin hydrochloride; triamcinolone acetate; phacoemulsification

DOI:10.3980/j.issn.1672-5123.2018.10.01

**Citation:** Rattan S, Mohammed N, Mutashar M. Two different chemoprophylaxis approaches after phacoemulsification surgery in one thousand patients in Iraq. *Guoji Yanke Zazhi (Int Eye Sci)* 2018;18(10):1757-1762

## INTRODUCTION

Post cataract surgery bacterial endophthalmitis is a rare but the most devastating complication with poor visual outcome<sup>[1-2]</sup>. The incidence of endophthalmitis varies substantially. Within literature the reported incidence rate range from 0.04% to 0.2% of cases<sup>[1-3]</sup>. Other causes of significant postoperative vision loss are persistent inflammation and cystoid macular edema (CMT)<sup>[4-5]</sup>.

Many options for prophylaxis were prescribed including topical and subconjunctival antibiotic and povidone iodine preparation that installed on the ocular surface before the surgery.

The preferred pattern of chemoprophylaxis varied world widely. The use of preoperative povidone iodine is universal. Most European surgeons prefer the use of intracameral (IC) antibiotics whereas topical fluoroquinolone that prescribed perioperatively is the most common pattern in the US<sup>[3]</sup>.

In spite of the fact that the use of IC antibiotics is considered off-label in the US, however, there use is increasing.

Many retrospective studies confirmed the efficacy of IC cefuroxime for the prophylaxis against endophthalmitis since 2006<sup>[6-7]</sup>.

Moxifloxacin ophthalmic solution (Vigamox 0.5%) was administered in the anterior chamber (AC) as a way to prevent endophthalmitis after cataract surgery, the safety and effectiveness were reported 1<sup>st</sup> in an animal model at 2005<sup>[8]</sup>. Many further authors reported their results with IC Vigamox with a different concentration that used for patients after cataract surgery as a prophylaxis of endophthalmitis<sup>[9-11]</sup>.

Regarding the combination therapy, a trans-zonular intravitreal injection of triamcinolone, moxifloxacin and vancomycin (TMV) has been used as prophylaxis against endophthalmitis and postoperative inflammation<sup>[12]</sup>.

The current study aimed to evaluate the effectivity and safety of a combination of diluted IC moxifloxacin at 0.1% and subconjunctival (SC) triamcinolone acetate 4 mg/0.4 mL as prophylaxis of endophthalmitis and postoperative inflammation in five hundred phacoemulsification surgeries and compare its results with a same number of patients who treated by topical moxifloxacin hydrochloride (0.5%) and dexamethasone (0.1%) eye drops that prescribed four times a day for 1mo postoperatively.

## SUBJECTS AND METHODS

**Study Design and Populations** The current nonrandomized clinical trial included a total 1000 patients with visually significant cataract scheduled to have phacoemulsification surgery at an Eye Specialty Private Hospital in Baghdad, Iraq during 18mo period from 1<sup>st</sup> of October 2016 to 1<sup>st</sup> of February 2018 by 2 surgeons. The study protocol had been approved by the scientific and ethical committee of Al-kindy College of Medicine, University of Baghdad, Iraq. The current two methods of prophylaxis of postoperative endophthalmitis and inflammation were discussed with the patients and informed consent was obtained about the treatment and the enrollment in the current study.

The patients were divided into two equal groups. For 500 patients (group 1) topical moxifloxacin hydrochloride 0.5% (Vigamox, Alcon) and dexamethasone 0.1% (Maxidex, Alcon) eye drops were prescribed four times a day for 1-month postoperatively while for the remaining 500 patients (group 2), IC diluted moxifloxacin 0.1% and SC triamcinolone acetate 4 mg/0.4 mL was the combination that planned to be used for the prophylaxis.

**Inclusion Criteria for Both Groups** The patients with visually significant cataract who included in the current study should have no current or previous intraocular inflammation, no history of glaucoma or topical corticosteroid responsiveness. All the included patients had normal preoperative fundus examination and normal preoperative macular OCT. For group 2 any patient who used a topical antibiotic, nonsteroidal anti-inflammatory drug (NSAID) or corticosteroid up to 1wk before the planned day of surgery was excluded.

All patients who had these inclusion criteria were included in the current comparison whether phacoemulsification surgery was complicated or not.

The 2 surgeons follow the same protocol for the preoperative evaluation including slit lamp, Goldmann applanation tonometry (AT900, Haag-Streit Diagnostics, Switzerland), dilated fundus examination and macular OCT (Optovue, RTVue-100, Fremont, CA).

The mean age of patients in group 1 was 59.4 $\pm$ 9.04y, 300 were female and 200 were male, 160 with type 2 diabetes mellitus (DM) without retinopathy and the preoperative intraocular pressure (IOP) range were from 10 to 25 mmHg with mean 14.49 $\pm$ 3.11 mmHg.

**Table 1 Patients demographics, preoperative, intraoperative and postoperative ocular characteristics** mean±SD

Data of patients	T topical prophylaxis group 1 (n=500)	IC moxifloxacin + SC T triamcinolone prophylaxis group 2 (n=500)	P
Age	59.4±9.04	59.7±8.84	0.60
Preop. IOP	14.49±3.11	14.47±3.10	0.90
Preop. CMT	243.15±30.76	242.13±31.92	0.80
3-months IOP	12.49±2.63	12.41±2.38	0.60
3-months CMT	245.9±31.0	246.04±29.0	0.97
1-day AC reaction	0.59±0.19	0.57±0.17	0.03
1-week AC reaction	0.55±0.15	0.54±0.14	0.40
1-month AC reaction	0.21±0.29	0.19±0.27	0.80
Significant IOP elevation at 1mo	12/500 (2.4%)	4/500 (0.8%)	0.04
Breakthrough inflammation at 14–21d	48/500 (9.6%)	20/500 (4%)	0.00
Intraoperative complication			0.70
PCR	15 (3%)	13 (2.6%)	
With vitreous loss	12	10	
Without vitreous loss	3	3	
Endophthalmitis rate	No case 0/500	No case 0/500	

Preop; Preoperative; IOP; Intraocular pressure; AC; Anterior chamber; PCR; Posterior capsule rupture; IC; Intracameral; SC; Subconjunctival; CMT; Central macular thickness.

Group 2 patients had a mean age of 59.7±8.84y, 320 were female and 180 were male, 140 with good controlled diabetes and preoperative IOP mean was 14.47±3.10 mmHg range was from 9.5–20.6 mmHg.

**Methods** One thousand phacoemulsification surgeries were done at the same hospital by 2 surgeons. For every 500 patients, one method of prophylaxis was used. The patient's demographics, preoperative, intraoperative, and postoperative characteristics were shown in Table 1.

All phacoemulsification surgeries were done by infinity vision system (Alcon Laboratories, Inc). The rate of posterior capsular rupture (PCR) was 3% and 2.6% for groups 1 and 2 respectively.

For group 1 a topical moxifloxacin 0.5% and dexamethasone 0.1% eye drops were prescribed four times a day started from the 1<sup>st</sup> postoperative day for the 1-month duration.

For group 2 intraoperative IC moxifloxacin (Auromox) and SC triamcinolone (Aurocort) were administered at the conclusion of surgery.

Auromox (0.5%) is a sterile clear yellow pale colored preservative free isotonic ophthalmic solution with PH 6.0 to 7.5 and osmolarity 620–320 mOsm. The sterile Auromox vial contains 1 mL moxifloxacin hydrochloride 5.45 mg equivalent to 5 mg of moxifloxacin. This product is manufactured by Aurolab an Indian pharmaceutical company. Auromox available in many countries including Iraq.

Each vial enough for 15 different patients by using sterile needle and 5 mL syringe. By the sterile hand's, the surgeon drew the whole 1 mL of moxifloxacin 0.5% and diluted with 4 mL of balanced salt solution (BSS) to get 5 mg in 5 mL (0.1%) then drew 0.2 mL for every patient.

Routine phacoemulsification surgeries were done, stromal hydration of the main incision by BSS till insured that it was sealed, 200 mg in 0.2 mL of moxifloxacin solution was

administered in the anterior chamber through the side port.

Aurocort is a preservative-free triamcinolone acetonide (40 mg/1 mL), with long acting depot preparation of triamcinolone in 1 mL vial also the product of Aurolab company and commercially available in our country.

The whole 1 mL was drawn and diluted with 3 mL of BSS and SC injection of 4 mg in 0.4 mL of triamcinolone was given (as a final step in the surgery) 6 mm from the limbus usually an inferotemporal site that is easily accessible and the plaque that formed will be not visible within palpebral fissure. Every single vial of Aurocort can give protection against inflammation in 8 different patients. Postoperatively only oral analgesic was prescribed for the patients and no other topical eye drops except for 20 patients who had a breakthrough inflammation at 14–21d postoperatively.

The principal investigators at preoperative and postoperative evaluation were ophthalmologist and optometrist who didn't involve in the study.

**Statistical Analysis** Minitab 16 software used for data statistical analysis, data were expressed in mean ± SD, for each group the preoperative baseline versus the corresponding postoperative data were compared by paired-sample *t*-test, while for the comparison of the 2 independent groups we used two-sample *t*-test and the results considered statistically significant if  $P < 0.05$ .

## RESULTS

The current clinical trial study involved 2 groups each with 500 phacoemulsification surgery patients.

For each group, the baseline data that included age, IOP and central macular thickness (within the central 1 mm) were compared with the other group and the results showed that there was no statistically significant differences between the 2 groups,  $P = 0.6, 0.9$  and  $0.8$  respectively.

For all patients, the follow-up visits were at 1d, 1wk, 1mo,

and 3mo postoperatively. No single endophthalmitis case reported in both groups. IOP was measured for each patient at the last 3 visits by Goldman applanation tonometry to avoid corneal contact at the 1<sup>st</sup> postoperative visit.

A statistically significant reduction in the mean IOP at 3mo postoperative visit from the baseline data  $P = 0.000$  (by paired  $t$ -test) in both groups and the mean reduction at 3mo was  $1.99 \pm 2.49$  mmHg and  $2.07 \pm 2.33$  for groups 1 and 2 respectively.

Among topical medication group there were 12/500 patients (2.4%) developed  $\geq 10$  mmHg elevation documented at a 1-month visit with 2 patients required topical IOP lowering agent while only four patients (0.8%) developed clinically significant IOP  $\geq 10$  mmHg within group 2 documented at 1-month visit and the highest one was 26 mmHg for them we didn't add any IOP lowering medication and there IOP was near the baseline level at 3-months visit. Therefore, SC triamcinolone treated group had a statistically significant lower chance of developing  $\geq 10$  mmHg elevation of IOP than topical dexamethasone-treated group  $P = 0.04$ .

The AC reaction was estimated by slit lamp and the grading was done according to the Standardization of Uveitis Nomenclature (SUN) Working Group [13].

The mean AC cells were found to be less in group 2 ( $P = 0.03$ ) at the 1<sup>st</sup> postoperative day visit. For the remaining visits; no difference between both groups, it was at Grade 0.5+ to 1+ in a 1-week visit while at 1mo visit it was less than 5 cells (Grade 0.5+) and 3mo postoperatively the AC was almost clear (Grade 0).

A breakthrough inflammation was noticed at 14 - 21d postoperatively in 48/500 patients (20 of them had DM and 5 had PCR) in group 1 for them, the frequency of topical dexamethasone 0.1% was increased and a topical Ketorolac tromethamine 0.5% eye drops were prescribed 3 times a day for 2wk. This breakthrough inflammation rate was not related to diabetes as Chi-Square test showed  $P = 0.13$  while it was related to PCR as  $P = 0.002$ .

In the 2<sup>nd</sup> group, 20/500 patients (4%) developed a breakthrough inflammation. All patients with inflammation had uncomplicated surgeries and 4 of them were diabetic. Again the breakthrough inflammation was not related to diabetes ( $P = 0.4$ ) by Chi-Square test. In this group of patients, the condition resolved by topical Ketorolac tromethamine 0.5% eye drops four times a day and tropicamide 1% eye drops 3 times a day were administered for 2wk. When comparing the inflammation rate the 2<sup>nd</sup> group had a statistically significant lower chance to develop breakthrough inflammation than 1<sup>st</sup> group ( $P = 0.00$ ).

There was no statistically significant difference between the baseline central macular thickness and the 3mo postoperative data for both groups ( $P = 0.09$  and  $0.21$  respectively). And there was no statistically or the clinically significant difference between 3mo central macular thickness data for both groups ( $P = 0.97$ ).

## DISCUSSION

As major concerns to ophthalmic surgeons after cataract surgery are bacterial endophthalmitis, inflammation and

CME; many different chemoprophylactic agents had been evaluated.

The current prospective study evaluated the use of intracameral commercial available in Iraq preservative free moxifloxacin hydrochloride vial 0.5% (Auromox) in the concentration of 0.2 mg in 0.2 mL that was administered through the side port at conclusion of cataract surgery and was followed by the subconjunctival administration of a preservative-free triamcinolone 4 mg in 0.4 mL for the prophylaxis against infection, inflammation and cystoid macular edema in 500 cataract surgeries and compared its affectivity with other group of patients for them topical medications were used as a different chemoprophylactic method.

IC moxifloxacin and SC triamcinolone acetate in their current concentration were shown to be effective as no endophthalmitis case was reported and as safe as no toxic reaction noticed. Provided that the reported minimum inhibitory concentration (MIC<sub>90</sub>) value for moxifloxacin was 0.10 to 32 mg/mL [14-16], the concentration that used in the current study was 200 mg in 0.2 mL so the anterior chamber concentration of moxifloxacin was 12.5 (more than 10) times the MIC<sub>90</sub> of susceptible bacteria. For the concentration-dependent antibiotics like moxifloxacin were microbiological cure had been documented for the cases in which the inhibitory quotient (peak drug concentration/MIC<sub>90</sub>) at that site exceeds  $10^{17}$ .

HariPriya *et al* [18] used the moxifloxacin hydrochloride vial (Auromox) 0.5% in 314638 eyes and reported 3.5 fold reduction in endophthalmitis rate the concentration that used 0.5 mg in 0.1cc where no mixing or dilution required but the safety and affectivity were also provided by our concentration of Auromox as long as the surgeon performed the dilution at the time of the operation so contamination or error in dilution or concentration didn't occur and the single vial of Auromox 0.5% was used for fifteen different patients.

Our current concentration of IC moxifloxacin was similar to that used by Arshinoff *et al* [19] who reported a single endophthalmitis case in 3430 when used diluted a self-preserved commercially available moxifloxacin eye drop in concentration 100 mcg in 0.1 mL while no endophthalmitis case reported in 4601 when the authors used 0.2-0.4 mL and regarded this concentration to be safer than 500 mcg in 0.1 mL because the last is more dilute. Regard the effect of our combination (IC moxifloxacin with SC triamcinolone) on postoperative inflammation at 1<sup>st</sup> postoperative day visit, the mean AC reaction was significantly lower than the topical medication prescribed group, this result agreed with Arbisser *et al* [11], while no difference within the remaining postoperative visits between both groups.

The breakthrough inflammation rate within the IC moxifloxacin and SC triamcinolone treated group was 4% that was lower than the rate in our topical medication treated group (9.6%). The rate of inflammation was not significantly different in diabetic patients from nondiabetic in both groups, as good controlled diabetes without retinopathy not significantly alter the postoperative inflammatory

behavior<sup>[20-21]</sup>.

The inflammation rate in IC and SC treated group (4%) is less than that reported by TMV that was 9.2% at 14-21d<sup>[12]</sup>. The difference may be related to the criteria of included patients, different concentration of triamcinolone that had been used and the different approach for administration. Also, this inflammation rate is less than the reported rate with the other potent topical corticosteroid that prescribed postoperatively by the most surgeon to reduce post-cataract surgery inflammation<sup>[22]</sup>.

Our results showed that both approaches the topical and subconjunctival triamcinolone in the current concentration were effective in controlling postoperative inflammation but the subconjunctival approach had the lowest rate of breakthrough inflammation and higher control of AC reaction than potent topical corticosteroid.

At 3mo the AC almost clear in all patients and no single case of breakthrough inflammation at a 3mo visit. IOP changes in the current study showed a statistically significant reduction of the mean IOP at a 3mo postoperative visit from the baseline  $P=0.000$  in both groups.

In the IC and SC treated groups, a 0.8% (4/500) of the patients showed the elevation of IOP of  $\geq 10$  mmHg at the 1mo post-operative visit. This rate of IOP elevation was comparable to that reported by transzonular triamcinolone acetate 3 mg in 0.2 mL approach (0.9%) by Tyson *et al*<sup>[12]</sup> but less than our reported rate (2.4%) within the topical steroid-treated group. Our results regard IOP elevation rate with topical dexamethasone 0.1% eye drops agreed with that reported with another topical steroid including difluprednate 0.05% (2.8% with IOP change  $\geq 10$  mmHg)<sup>[23]</sup> and prednisolone 1% (2.4% with IOP  $\geq 10$  mmHg)<sup>[24]</sup> that were prescribed after cataract surgery to prevent postoperative inflammation.

The current study provided that the subconjunctival approach of triamcinolone 4 mg in 0.4 mL had less risk of IOP elevation than other approaches. The visible subconjunctival white plaque was almost disappeared by an 8wk postoperative visit. There was no postoperative toxic reaction (TASS) that was rare but reported in a small number of the patient who received intracameral vancomycin as prophylaxis against endophthalmitis after uneventful cataract surgery<sup>[25]</sup>.

Macular thickness change after uncomplicated cataract surgery was evaluated by OCT with heterogeneous results some reported increase<sup>[26]</sup> in retinal thickness while a decrease was reported by others<sup>[27]</sup>.

The current study evaluated the central 1 mm macular thickness by OCT and showed no clinical or statistically significant changes at 3mo postoperatively from baseline data in both approaches with the mean difference was  $2.99 \pm 1.9$  mm and  $3.75 \pm 1.66$  mm respectively for groups 1 and 2. Our result agreed with Pardianto *et al*<sup>[28]</sup> who reported an insignificant increase in CMT  $P=0.068$  as measured 2mo postoperatively and compared with preoperative data.

Variation in results of the previous report of macular thickness post cataract surgeries may relate to difference in postoperative treatment regimen that prescribed or difference in OCT devices

that used for macular thickness evaluation also a possible cause was the patients who included in this study were those with normal macular appearance by slit lamp and with normal baseline macular OCT and any patient with suspicious or abnormal OCT were excluded from our study. Our result was the same for non-diabetic patients and diabetic patients with no maculopathy.

The current study cannot precisely reflect the endophthalmitis rate after cataract surgery because of the small number of patients who included in each group. To get a prospective study with a large number of patients operated at the same center, at the same standard conditions by the same surgeon we require a longer period of time that would delay our study. Our future work will be with a larger sample and also to show the effectivity of such combination in the pediatric population.

## REFERENCES

- 1 Miller JJ, Scott IU, Flynn HW Jr, Smiddy WE, Newton J, Miller D. Acute-onset endophthalmitis after cataract surgery (2000-2004): incidence, clinical settings, and visual acuity outcomes after treatment. *Am J Ophthalmol* 2005;139(6):983-987
- 2 Vaziri K, Schwartz SG, Kishor K, Flynn HW Jr. Endophthalmitis: state of the art. *Clin Ophthalmol* 2015;9:95-108
- 3 Packer M, Chang DF, Dewey SH, Little BC, Mamalis N, Oetting TA, Talley-Rostov A, Yoo SH. Prevention, diagnosis, and management of acute postoperative bacterial endophthalmitis. *J Cataract Refract Surg* 2011;37(9):1699-1714
- 4 Lobo C. Pseudophakic cystoid macular edema. *Ophthalmologica* 2012;227(2):61-67
- 5 Sigler EJ, Randolph JC, Kiernan DF. Longitudinal analysis of the structural pattern of pseudophakic cystoid macular edema using multimodal imaging. *Graefes Arch Clin Exp Ophthalmol* 2016;254(1):43-51
- 6 Barry P, Seal DV, Gettinby G, Lees F, Peterson M, Revie CW. ESCRS study of prophylaxis of postoperative endophthalmitis after cataract surgery: preliminary report of principle results from European multicenter study. *J Cataract Refract Surg* 2006;32(3):407-410
- 7 Endophthalmitis Study Group, European Society of Cataract & Refractive Surgeons. Prophylaxis of postoperative endophthalmitis following cataract surgery: results of the ESCRS multicenter study and identification of risk factors. *J Cataract Refract Surg* 2007;33(6):978-988
- 8 Kowalski RP, Romanowski EG, Mah FS, Yates KA, Gordon YJ. Intracameral vigamox<sup>®</sup> (Moxifloxacin 0.5%) is nontoxic and effective in preventing endophthalmitis in a rabbit model. *Am J Ophthalmol* 2005;140(3):497-504
- 9 Espiritu CR, Caparas VL, Bolinao JG. Safety of prophylactic intracameral moxifloxacin 0.5% ophthalmic solution in cataract surgery patients. *J Cataract Refract Surg* 2007;33(1):63-68
- 10 Matsuura K, Miyoshi T, Suto C, Akura J, Inoue Y. Efficacy and safety of prophylactic intracameral moxifloxacin injection in Japan. *J Cataract Refract Surg* 2013;39(11):1702-1706
- 11 Arbisser LB. Safety of intracameral moxifloxacin for prophylaxis of endophthalmitis after cataract surgery. *J Cataract Refract Surg* 2008;34(7):1114-1120
- 12 Tyson SL, Bailey R, Roman JS, Zhan T, Hark LA, Haller JA. Clinical outcomes after injection of a compounded pharmaceutical for prophylaxis after cataract surgery: a large-scale review. *Curr Opin Ophthalmol* 2017;28(1):73-80
- 13 Jabs DA, Nussenblatt RB, Rosenbaum JT. Standardization of Uveitis

- Nomenclature (SUN) Working Group. Standardization of uveitis nomenclature for reporting clinical data. Results of the First International Workshop. *Am J Ophthalmol* 2005;140(3):509-516
- 14 Chalita MR, Höfling-Lima AL, Paranhos A Jr, Schor P, Belfort R Jr. Shifting trends in vitro antibiotic susceptibilities for common ocular isolates during a period of 15 years. *Am J Ophthalmol* 2004; 137(1): 43-51
- 15 Callegan MC, Ramirez R, Kane ST, Cochran DC, Jensen H. Antibacterial activity of the fourth-generation fluoroquinolone gatifloxacin and moxifloxacin against ocular pathogens. *Adv Ther* 2003; 20(5): 246-252
- 16 Miller D, Flynn PM, Scott IU, Alfonso EC, Flynn HW Jr. In vitro fluoroquinolone resistance in staphylococcal endophthalmitis isolates. *Arch Ophthalmol* 2006;124(4):479-483
- 17 Wilhelmus KR. Evaluation and prediction of fluoroquinolone pharmacodynamics in bacterial keratitis. *J Ocul Pharmacol Ther* 2003;19(5):493-499
- 18 Haripriya A, Chang DF, Ravindran RD. Endophthalmitis reduction with intracameral moxifloxacin prophylaxis: analysis of 600000 surgeries. *Ophthalmology* 2017;124(6):768-775
- 19 Arshinoff SA, Modabber M. Dose and administration of intracameral moxifloxacin for prophylaxis of postoperative endophthalmitis. *J Cataract Refract Surg* 2016;42(12):1730-1741
- 20 Kruger AJ, Schauersberger J, Petternel V, Amon M. Inflammation after phacoemulsification in patients with type 2 diabetes mellitus without retinopathy: prospective study. *J Cataract Refract Surg* 1999;25(2): 227-232
- 21 Liu Y, Luo L, He M, Liu X. Disorders of the blood-aqueous barrier after phacoemulsification in diabetic patients. *Eye (Lond)* 2004;18(9): 900-904
- 22 Notivol R, Amin D, Whitling A, Wells D, Kennedy M, Cockrum PC. International TobrDex Study Group. Prophylactic effectiveness of tobramycin-dexamethasone eye drops compared with tobramycin/vehicle eye drops in controlling post-surgical inflammation in cataract patients: prospective randomized, double-masked, two-arm, parallel-group, placebo-controlled, multicenter study. *Clin Drug Investig* 2004;24(9): 523-533
- 23 Korenfeld MS, Silverstein SM, Cooke DL, Vogel R, Crockett RS. Difluprednate Ophthalmic Emulsion 0.05% (Durezol) Study Group. Difluprednate ophthalmic emulsion 0.05% for postoperative inflammation and pain. *J Cataract Refract Surg* 2009;35(1):26-34
- 24 Lane SS, Holland EJ. Loteprednol etabonate 0.5% versus prednisolone acetate 1.0% for the treatment of inflammation after cataract surgery. *J Cataract Refract Surg* 2013; 39(2):168-173
- 25 Witkin AJ, Shah AR, Engstrom RE, Kron-Gray MM, Baupal CR, Johnson MW, Witkin DI, Leung J, Albin TA, Moshfeghi AA, Battle IR, Sobrin L, Elliott D. Postoperative hemorrhagic occlusive retinal vasculitis: expanding the clinical spectrum and possible association with vancomycin. *Ophthalmology* 2015;122(7)1438-1451
- 26 Hann JV, McKee HD. Correlations between optical coherence tomography measurement of macular thickness and visual acuity after cataract extraction. *Clin Exp Ophthalmol* 2007;35(1):105; author reply 105-106
- 27 Ching HY, Wong AC, Wong CC, Woo DC, Chan CW. Cystoid macular oedema and changes in retinal thickness after phacoemulsification with optical coherence tomography. *Eye (Lond)* 2006;20(3):297-303
- 28 Pardianto G, Moeloek N, Reveny J, Wage S, Satari I, Sembiring R, Srisamran N. Retinal thickness changes after phacoemulsification. *Clin Ophthalmol* 2013;7:2207-2214