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The effect of intracameral epinephrine on pupil size during phacoemulsification and its postoperative effect on specular findings and macular thickness

O efeito da adrenalina intracameral no tamanho da pupila durante a facoemulsificação e seu efeito pós-operatório em achados especulares e espessura macular

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ABSTRACT

Objective: *To evaluate pupillary size and vital signs following intraoperative intracameral adrenaline during phacoemulsification and postoperative effect of on co specular microscopy findings and macular thickness by OCT.* ***Methods****: A prospective interventional study carried out from December 2014 to December 2015 on 90 eyes. They were divided randomly into further 6 groups (15 each). The inclusion criteria consisted of no history of ocular pathologic conditions, trauma, previous ocular surgery, or recent ocular medication use. All patients were dilated preoperatively by phenylephrine 10% and operated under local peribulbar anesthesia. Then systemic monitoring regarding (pulse rate, blood pressure) and measurement of the horizontal pupil diameter by a caliper to the nearest 0.25mm pre and post intracameral adrenaline injection.* ***Results*** *: In our study there were great effect for intracameral epinephrine, with concentrations used, in dilatation and maintainance of papillary dilatation, The mean pre intracameral epinephrine was 4.53± 1.27 mm.The mean post epinephrine papillary diameter was 6.46± 1.00 mm. Three cases from group 1/10000 weren't dilated properly. Also three cases from group 1/9000 weren't dilated properly after intracameral epinephrine.* ***Conclusion:*** *Intracameral epinephrine even in higher concentrations is effective in papillary dilatation especially in cases with long duration and poorly dilated cases by usual topical mydriatics.*

Keywords: *Epinephrine/administration & dosage; Phacoemulsification; Pupil/drug effects*

RESUMO

Objetivo: Avaliar o tamanho pupilar e os sinais vitais após adrenalina intracameral intra-operatória durante a facoemulsificação, e efeito pós-operatório de achados microscópicos especulares e espessura macular por OCT. **Métodos**: Um estudo prospectivo intervencionista realizado de dezembro de 2014 a dezembro de 2015 em 90 olhos. Eles foram divididos aleatoriamente em mais 6 grupos (15 cada). Os critérios de inclusão consistiram em ausência de histórico de patologias oculares, trauma, cirurgia ocular prévia ou uso recente de medicação ocular. Todos os pacientes foram dilatados antes da cirurgia com fenilefrina 10% e operados sob anestesia peribulbar local. Em seguida, o monitoramento sistêmico em relação à pulsação e pressão arterial e a medição do diâmetro horizontal da pupila por um compasso de calibração para a injeção de adrenalina pré e pós-intracameral mais próxima de 0,25mm. **Resultados**: Em nosso estudo houve um grande efeito da epinefrina intracameral com as concentrações utilizadas na dilatação e na manutenção da dilatação papilar. A epinefrina pré-intracameral média foi de 4,53 ± 1,27 mm. O diâmetro papilar médio pós-epinefrina foi de 6,46 ± 1,00 mm. Três casos do grupo 1/10000 não foram dilatados adequadamente. Além disso, três casos do grupo 1/9000 não foram dilatados adequadamente após a epinefrina intracameral. **Conclusão:** A epinefrina intracameral, mesmo em concentrações mais altas, é eficaz na dilatação papilar, especialmente nos casos com longa duração e nos casos mal dilatados por midriáticos tópicos comuns.

Descritores: Epinefrina/administração & dosagem; Facoemulsificão; Pupila/efeito de drogas

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Introduction

The routines for cataract surgery have undergone a remarkable development over the past two to three decades.[1] Surgical techniques have improved constantly, and now require less extensive anesthesia,[2] decreased need for hospitalization[3] and fewer postoperative controls.[4]

Phacoemulsification technique has the advantage of early visual rehabilitation after cataract surgery and this is mainly attributed to the small incision size used. Still, it is remarkable that some perioperative routines have undergone very little change, despite the general improvement.[5] One of those more or less unchanged routines have been the routine for preoperative pupil dilatation. Regardless of surgical technique, adequate mydriasisis essential for all stages of cataract surgery. Pupil constriction during phacoemulsification or the irrigation/aspiration phase increases the chances of iris damage, incomplete cortical material removal, posterior capsule rupture, vitreous loss and difficulty with intraocular lens (IOL) implantation into the capsular bag.

Extended phaco time, excessive fluid turbulence, iris touch, improper surgical maneuvers) can cause pupillary miosis. Although the preoperative use of mydriatic agents including anticholinergics and sympathomimetics can often achieve adequate mydriasis early during surgery, other mydriatic agents are often required to maintain pupillary dilation during the procedure.[6,7]

Pupil dilation is maintained by preoperative topical mydriatic eyedrops and to some extent by retrobulbar, peribulbar, or sub-Tenon anesthesia. When these methods do not maintain adequate pupil dilation, intraoperative intracameral epinephrine is used. Intracameral mydriatics (ICM) is a method to dilate the pupil prior to cataract surgery.[8]

Corneal endothelial cell damage is the most common cause of corneal edema[9], the current study was conducted to evaluate corneal endothelial cell changes using bisulfite preserved adrenaline at different concentrations.

Epinephrine maculopathy is a reversible change to the macula that occurs in aphakic eyes treated with topical epinephrine. The first symptom is transient blurred vision, which may be followed by decreased visual acuity, flame-shaped hemorrhages, and cystoid macular edema (CME). Onset of symptoms ranges from a few days after commencement of epinephrine therapy to several months thereafter.[10]

Cystoid macular edema is a significant cause of decreased vision after cataract surgery.[11] The accompanying intraretinal fluid accumulation is associated with retinal thickening and cyst formation, which can be identified on biomicroscopy, optical coherence tomography.

Methods

This is a prospective interventional study carried out from December 2014 to December 2015 on 90 eyes attending at department of Ophthalmology, Menoufia University and Research Institute of Ophthalmology, Giza undergoing phacoemulsification for IMSC. They were divided randomly into further 6 groups (15 each): Control Group: No intracameral epinephrine injection. 2nd Group: intracameral epinephrine 1:10000 for intraoperative miosis. 3rd Group: intracameral epinephrine 1:9000 for intraoperative miosis. 4th Group: intracameral epinephrine 1:8000 for intraoperative miosis. 5th Group: intracameral epinephrine 1:7000 for intraoperative miosis. 6th Group: intracameral epinephrine 1:6000 for intraoperative miosis.

Inclusion criteria consisted of no history of ocular pathologic conditions, trauma, previous ocular surgery, or recent ocular medication use. Systemically free patients. Presence of visually significant cataract, According to locus III classification grade less and II nuclear cataract will be taken and exclude grade III and more. Normal specular microscopy, OCT and FFA.

Exclusion criteria were diabetic, hypertensive and cardiac patients. Grade N III or more. Any abnormal intraocular pathology. Abnormal specular microscopy, OCT or FFA study.

All included patients underwent detailed medical and ophthalmic history, refraction using auto-refractometer, best corrected visual acuity (BSCVA) assessment using Log Mar units, anterior segment examination using slit lamp, intraocular pressure using Goldman applanation tonometer and posterior segment examination using slit lamp biomicroscopy with +90 D lens and indirect ophthalmoscope with + 20 D lens. Every patient will be subjected to specular microscopy using NIDEK CEM-530 , FFA using Zeiss Visucam Pro NM Fundus Camera, OCT macula with a Stratus 3 optical coherence tomographer (Carl Zeiss Meditec) before cataract surgery.

All patients were dilated preoperatively by phenylephrine 10% and operated under local peribulbar anesthesia. Then systemic monitoring regarding (pulse rate, blood pressure) and measurement of the horizontal pupil diameter by a caliper to the nearest 0.25mm pre & post intracameral adrenaline injection.

Then every follow-up after the procedure specular microscopy, FFA, OCT macula will be done (one week & 3 months). Specular microscopic pictures will give us data concerning corneal thickness, endothelial cell morphology, cell count, cell volume, standard deviation and minimum & maximum cell size. OCT will give us data about macular thickness.

All cases were operated upon using (INFINITI® Vision System).

- All collected data revised for completeness and accuracy.
- Pre coded data was entered on the computer using the statistical package of Medcalc biomedical statistical software version 15.8 (Medcalc software bvba, Belgium) and IBM SPSS v 21 (IBM Corp., NY, USA) to be statistically analyzed.
- Data was summarized using:
  - Mean and SD for quantitative variables
  - Number and percent for qualitative variable.
- Comparison between quantitative variable done using paired-samples t test for variables which where normally distributed and nonparametric Wilcoxon for quantitative variables, which were not normally distributed.
- P Value (Probability):
  - $p > 0.05$ means, it is not significant.
  - $p < 0.05$ means, it is significant.
  - $p < 0.01$ means, it is highly significant.

Results

The eyes were assessed for eligibility (n= 138). Eyes were excluded from the study (n=48) due to [not meeting inclusion criteria (n=13) & no need for intracameral epinephrine (n=35)]. Only 90 eyes of 82 patients who completed the preoperative visit and all postoperative visits were included in the data analysis.

Percentage of males to females was 48.9 to 51.1% (Table 1). The mean age 60.38±5.84 years (range from 49-72 years).

Table 1
Gender frequency

	Frequency	Percent	Valid percent
Female	44	48.9	48.9
Male	46	51.1	51.1
Total	90	100.0	100.0

The mean pre incision pupil dimeter was 7.40±0.89 mm. The mean pre intracameral epinephrine pupil diameter was 4.53 ± 1.27 mm. The mean post epinephrine pupil diameter was 6.46 ± 1.00 mm. Table 2 show The mean ± SD of pupillary diameter pre incision, pre epinephrine, post epinephrine in each group. P value was calculated using (repeated measures analysis of variants, ANOVA) test: p<0.001 showing statistically significant effect of intracameral epinephrine injection on pupillary diameter. p=0.895 showing statistically non-significant difference between different groups.

Table 2
Mean ± SD of horizontal pupil diameter in mm pre incision, pre intracameral epinephrine, post intracameral epinephrine in each group

	Group											
	Control Group		10000 U Group		9000 U Group		8000 U Group		7000 U Group		6000 U Group	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Pupil diameter Mm pre incision	7.87	.44	7.577	.86	7.37	.72	7.27	1.10	7.07	.82	7.27	1.10
Pre_epinephrine_pupillarydiameter_Mm	7.03	.64	4.200	.77	4.03	.44	4.10	.60	3.97	.61	3.87	.60
Post_epinephrine_pupil_diameter_Mm			6.733	.82	6.13	1.23	6.63	.92	6.40	1.02	6.40	1.04

The mean of pre intracameral epinephrine systolic blood pressure was 126.83±7.21mmHg. The mean of systolic blood pressure post intracameral epinephrine was 127.80±7.67. The mean of pre intracameral epinephrine diastolic blood pressure was 75.83±5.52mmHg. The mean of diastolic blood pressure post intracameral epinephrine was 76.13 ± 5.49 mmHg. The mean of pre intracameral epinephrine pulse rate was 71.17 ± 4. 34 bpm. The mean of pulse rate post intracameral epinephrine was 71.08±4.59 bpm. P value was calculated using (repeated measures analysis of variants, ANOVA) test: p=0.863 showing non-significant change in heart rate. p=0.917 showing non-significant difference in heart rate between groups. p=0.033 showing significant change in systolic blood pressure. p=0.353 showing non-significant difference in systolic blood pressure between groups. p=0.321 showing non-significant change in diastolic blood pressure. p=0.414 showing non-significant difference in diastolic blood pressure between groups. Table 3 shows the mean of pulse rate, systolic blood pressure and diastolic blood pressure pre and post intracameral epinephrine in each group.

The mean of pre operative CCT was 531.48 ± 32.63 µm. The mean 1week post operative was 534.00 ± 31.77 µm. The mean 3 months post operative was 531.42 ± 31.89 µm. The mean of pre operative endothelial cell count 2744.45 ± 422.85 cell/mm^3. The mean 1 week post operative 2568.22 ± 417.95 cell/mm^3. The mean 3 months later was 2566.43 ± 416.35 cell/mm^3. The mean pre- and 1week postoperative endothelial cell pleomorphism were 62.23 ± 4.35% and 62.67 ± 4.13% respectively. The mean endothelial cell pleomorphism 3 months postoperative was 62.18 ± 2.38%. The mean pre- and 1 week postoperative endothelial polymegethism values were 31.33%± 5.78% and 33.04% ± 4.81%, respectively. The mean 3 months postoperative endothelial polymegethism was 32.41%± 4.62%. P value was calculated using (repeated measures analysis of variants, ANOVA) test: p<0.001 showing statistically significant decrease in Endothelial cell count. p=0.844 showing non-significant change of endothelial cell count in different groups. p=0.021 showing significant change in CCT. p=0.091 showing non significant change in CCT between different groups. p<0.53 showing non significant change in endothelial cell pleomorphism. p<0.12 showing non significant change in endothelial cell polymegathism. Table 4 shows the mean of CCT & Endothelial cell count pre, 1week, 3 months post operative in each group.

Table 3
Mean and SD of pulse rate, systolic blood pressure and diastolic blood pressure pre and post intracameral epinephrine in each group

	Group											
	Control Group		10000 U Group		9000 U Group		8000 U Group		7000 U Group		6000 U Group	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Systolic_BP_pre	126.00	7.37	127.33	7.99	127.67	7.29	127.33	7.04	126.67	7.24	126.00	7.37
Diastolic_BP pre	75.00	5.67	76.00	6.04	76.67	5.88	77.00	5.28	75.33	5.16	75.00	5.67
Pulse rate/ minute	71.80	4.06	70.80	4.96	70.60	4.70	70.93	4.06	71.13	4.70	71.80	4.06
Systolic_bloodpressure_post			129.33	7.99	129.00	8.49	128.00	7.75	126.67	7.24	126.00	7.37
Diastolic_blood_pressure_post			76.67	5.88	76 67	5.88	77.00	5.28	75.33	5.16	75.00	5.67
Pulse rate post			70.60	4.70	70 87	5.78	70.93	4.06	71.20	4.69	71.80	4.06

Table 4
Mean an SD of CCT & Endothelial cell count preoperative , 1week, 3 months post operative in each group

	Group											
	Control Group		10000 U Group		9000 U Group		8000 U Group		7000 U Group		6000 U Group	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
CCT UM	538.53	15.82	536.00	15.74	521.67	55.49	537.13	15.56	538.53	15.82	517.07	47.02
Cell count/Mm3	2904.67	477.13	2904.67	477.13	2505.00	289.85	2904.67	477.13	2505.00	298.85	2742.73	264.11
CCT 1 week	539.67	16.31	537.13	15.56	524.07	52.08	538.87	23.24	539.80	17.47	524.47	45.18
Cell count / Mm3 1 week	2695.33	474.93	2710.67	473.61	2331.13	253.88	2737.40	461.73	2370.07	309.62	2564.73	339.25
CCT 3 months	537.13	15.56	539.67	16.31	524.07	52.08	532.07	18.56	538.53	15.82	517.07	47.02
Cell count 3 months	2695.33	474.93	2695.33	474.93	2331.13	253.88	2737.40	461.73	2370.07	309.62	2569.33	331.38

The mean of CMT pre operative was 259.95 ± 8.71ìm. The mean 1 week post operative was 534.00 ± 31.77ìm. The mean 3 months post operative was 259.60 ± 8.25ìm. P value was calculated using (repeated measures analysis of variants, ANOVA) test: p=0.256 non-significant change in CMT. p=0.923 non-significant difference between different groups. Table 5 shows the mean of CMT preoperative, 1 week, 3 months post operative. No patients had severe complications during or after surgery.

Table 5
Mean and SD of CMT preoperative, 1 week, 3 months post operative

	Group											
	Control Group		10000 U Group		9000 U Group		8000 U Group		7000 U Group		6000 U Group	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
OCT central macular thickness	259.47	10.03	259.47	10.03	260.40	7.97	261.13	8.28	259.47	10.03	259.80	7.73
OCT 1 week	258.73	8.32	258.73	8.32	260.40	7.97	261.13	8.28	259.47	10.03	259.60	6.67
OCT 3 months	258.73	8.32	258.73	8.32	260.40	7.97	261.13	8.28	259.47	10.03	259.13	7.48

Discussion

The use of intracameral mydriatic agents of various formulations in phacoemulsification has gained acceptance.[12-14] These agents are important, especially in cases of inadequate pupil size during phacoemulsification in complicated cases (i.e, pseudoexfoliation, long surgery time, floppy iris). Epinephrine must be tried before mechanical pupil dilation methods because the latter have disadvantages, including iris trauma and sphincter rupture; in addition, mechanical dilation has financial ramifications, time consuming, and requires creation of additional incisions.[15]

In our study there was great effect for intracameral epinephrine, with concentrations used, in dilatation and maintainance of papillary dilatation, The mean pre intracameral epinephrine was 4.53± 1.27mm, The mean post epinephrine papillary diameter was 6.46± 1.00 mm. Three cases from group 1/ 10000 weren't dilated properly. Also three cases from group 1/ 9000 weren't dilated properly after intracameral epinephrine. Two cases from each of the other three groups weren't dilated properly. Our results are comparable with the results of the study[6], (The sixty study cases were assigned randomly into 5 groups with different concentrations of epinephrine injection (1:25,000, 1:50,000, 1:100,000, 1:200,000, or 1:400,0000, respectively),The mean pupil diameter post intracameral epinephrine was 8.00 ± 0.6mm, p<0.05 showing statistically significant effect of intracameral epinephrine injection on pupillary diameter. Another paper for the same researchers[8] was published after that (42 eyes received phacoemulsification, the study group 30 eyes received I/A solution containing adrenaline, the control group 12 eyes didn't receive adrenaline on I/A solution) . The mean pupillary diameter before I/A in the study group was 8.00 ± 0.63mm, while for control group it was 5.96±1.34mm. P<0.001 showing statistically significant effect of adding epinephrine to I/A solution. In 2007 carried out a prospective, randomized, double-blinded study[16] of 140 patients with age-related cataracts, scheduled for unilateral phacoemulsiûcation. The first part of the study involved 90 patients divided into two groups. Patients in both groups were given 150 ll ICMs at the beginning of the procedure. In Group 1, 0.6 lg D ml epinephrine was added to the irrigating balanced salt solution. No epinephrine was added to the irrigation solution used in Group 2. The second part of the study involved 50 patients, all of whom were given topical mydriatics (TMs) and then similarly divided into two Groups and treated as in the ûrst study setting. Results: With ICMs, pupil sizes generally increased during the procedures. Remarkably, this increase was signiûcantly greater without epinephrine (13 ± 19% versus 4 ± 14%; p ¼ 0.02). In the TMs setting, pupil sizes decreased intraoperatively in both groups; signiûcantly more without epinephrine (5 ± 4%) versus (12 ± 7%); p < 0.001). In 2003[7] a paper was published as a prospective, randomized, double-masked study in which the patients were randomly assigned either of two treatments. Traditional topical mydriatics with 3 drops each of cyclopentolate 1% and phenylephrine 10% with 15 minutes interval plus 150µl of preservative-free xylocaine 1% intracamerally at the beginning of the procedure, or intracameral mydriatics with placebo eye drops and 150µl of a preservative-free mixture of cyclopentolate 0.1%, phenylephrine 1.5% and lidocaine 1% intracamerally. Pupil sizes were recorded. After injection of intracameral mydriatics, the pupils reached 95±3% of their maximum size after 20 seconds. In the intracameral mydriatics group, the pupil size after viscoelastic injection was 6.7±1.0mm, which was about 1 mm smaller than with topical mydriatics, but when using intracameral mydriatics the pupils continued to enlarge throughout the procedure as opposed to when topical mydriatics were used. In 2009 a paper[17] compared the efficacy of a solution of epinephrine 0.025% and lidocaine

0.75% in fortified balanced salt solution ("epi-Shugarcaine") and the other group was injected by (cyclopentolate 0.1%, phenylephrine 1.5%, and lidocaine 1%). The study was designed as a pair-eye single-masked prospective study involving 84 eyes of 42 patients. Topical tropicamide was given to both treatment groups. The pupils were statistically significantly larger with epi-Shugarcaine; 0.528mm larger 1 minute after instillation and 0.34 mm larger at the end of the procedure.

In our study, we used specular microscopy to evaluate the effect of intracameral epinephrine on corneal endothelial cell count, central corneal thickness (CCT) and endothelial cell morphology .We found that the mean of pre-operative CCT was 531.48±32.63ìm . The mean 1week post operative was 534.00± 31.77ìm. The mean 3 months post operative was 531.42± 31.89ìm . The mean of pre operative endothelial cell count 2744.45±422.85 cell/mm^3.The mean 1 week post operative 2568.22± 417.95 cell/mm^3.The mean 3 months later was 2566.43±416.35 cell/mm^3. P <0.001 showing statistically significant decrease in endothelial cell count, p=0.844 showing non-significant change of endothelial cell count in different groups. p=0.021 showing significant change in CCT p=0.091 showing non significant change in CCT between different groups. The mean pre- and 1week postoperative endothelial cell pleomorphism were 62.23±4.35% and 62.67±4.13% respectively. The mean endothelial cell pleomorphism 3 months postoperative was 62.18±2.38%. The Mean pre- and 1 week postoperative endothelial polymegethism values were 31.33%±5.78% and 33.04%±4.81%, respectively. The mean 3 months postoperative endothelial polymegethism was 32.41%±4.62% p<0.53 showing non-significant change in endothelial cell pleomorphism. p <0.12 showing non-significant change in endothelial cell polymegathism. So using of intracameral epinephrine with these concentrations used in the study didn't affect cornea more than corneal affection that could occur in other cases in which no intracameral epinephrine was used. In another study[18], 71 eyes of 71 patients scheduled for phacoemulsification were randomly assigned to two groups: one group (31 eyes) received bolus intracameral adrenaline (1:10,000) and the other group (30 eyes) received adrenaline infusion (1:1,000,000). Pre- and one month postoperatively, a complete ophthalmologic examination as well as endothelial evaluation using ConfoScan III was performed; effective phaco time (EPT) and mydriasis during surgery were also compared between the study groups. The two study groups were not significantly different in terms of demographic characteristics, lens opacity and EPT. Endothelial cell density was 2737±321 cell/mm in the bolus group vs 2742±426 cell/mm in the infusion group preoperatively (p=0.1). One month postoperatively, the rate of cell loss was 7.21% in the infusion group versus 8.87% in the bolus group (p= 0.13). Pupil diameter was >6 mm in 48% of eyes in the infusion group *vs* 33% of eyes in the bolus group (p=0.5). In 2009another paper[19] was published as a retrospective study comprised 70 patients with age-related cataracts who had undergone phacoemulsification cataract surgery with intraocular lens (IOL) implantation without any surgical complications. In the adrenaline group, patients with intraoperative intracameral adrenaline use were included. The intracameral adrenaline was composed of 1 mL of 1:100,000 Dilution adrenalin with Sodium bisulfate preservative. The control group included patients who underwent surgery without any intracameral adrenaline use. There were 36 patients in the adrenaline group and 34 patients in the control group. Corneal endothelial density, endothelial cell morphology, and endothelial cell area were measured via specular microscopy both preoperatively and 3 months after surgery. The 2 groups were compared with regard to changes in specular microscopy measurements. The mean (± standard deviation) age was 66.51 ± 8.32 years in the adrenalin group and 67.58 ± 7.83 years in the control group. The difference in age between the 2 groups was not significant (p = 0.611). The preoperative mean corneal endothelial cell density was 2,270 ± 286 cells/mm in the adrenalin group and 2,226 ± 260 cells/mm2 in the control group, and the difference between the 2 groups was not statistically significant (p=0.550). In the adrenalin group, the postoperative mean corneal endothelial cell density was 2,191 ± 268 cells/mm. Although the postoperative mean cell density was lower than the preoperative mean cell density, the difference between the 2 measurements was not statistically significant (p=0.117). In the control group, the postoperative mean corneal endothelial cell density was 2,169 ± 272 cells/mm^2, and the difference between the preoperative and postoperative measurements was not statistically significant (p=0.161). Comparisons of postoperative specular microscopy measurements between the adrenaline and control groups with regard to cell density, cell sizes, and cell shapes showed that there were no statistically significant differences in comparison of all parameters between the 2 groups, So our results are comparable to their results. In 2013another published paper[20] about intracameral mydriatics in phacoemulsiûcation cataract surgery – a 6-year follow-up. A total of 45 patients were examined 6 years after phacoemulsiûcation cataract surgery. The patients had previously participated in a prospective randomized double-blind study including 60 patients, operated with either ICM or TM. The follow-up included best-corrected visual acuity (BCVA), intraocular pressure (IOP), grade of posterior capsule opaciûcation (PCO), YAG laser capsulotomy rate, pupil size, corneal thickness and endothelial morphology. At 6 years, there were no statistical differences in BCVA, IOP and pupil size. The corneal thickness and endothelial cell loss did not differ signiûcantly between the groups. At the 6-year follow-up, the total endothelial cell loss was 16.5 ± 14.6% in the TM group versus 15.0 ± 15.4% in the ICM group, p=0.7. Furthermore, the endothelial cell morphology (HSF, DE and CV) showed no statistical differences between the two groups. The median PCO fraction was 9% (0.8; 22) in the TM group versus 7.5% (0; 17) in the ICM group, p=0.8. The median PCO severity grade was 0.12 (0.02; 0.31) versus 0.10 (0; 0.39), p=0.7. Two patients in each group had YAG laser capsulotomy, p = 1.0. No differences in postoperative BCVA, IOP, pupil size, PCO or YAG rate were observed between the groups. Endothelial cell loss, endothelial morphology and corneal thickness were also equivalent.

In our study, the mean of CMT pre operative was 259.95± 8.71 ìm. The mean 1 week post operative was 534.00± 31.77 ìm. The mean 3 months post operative was 259.60± 8.25 ìm. p= 0.256 non-significant change in CMT. p=0.923 non-significant difference between different groups. In 2010 a study[21] was made to evaluate changes in central macular thickness using optical coherence tomography after uneventful cataract surgery combined with intracameral epinephrine use. This prospective case series comprised eyes of consecutive patients who had uneventful phacoemulsification and in-the-bag intraocular lens (IOL) implantation between August 2005 and January 2006. The eyes were randomly assigned to 1 of 2 groups. In 1 Group, 0.2mL epinephrine (1:5000 solution) was injected just after the clear corneal incision was created. The other group (control) did not receive epinephrine. Optical coherence tomography was performed in all eyes preoperatively as well as postoperatively at 1 day, 1 week, and 1, 3, and 6 months. The epinephrine group comprised 73 eyes (73 patients) and the control group, 76 eyes (86 patients). In both groups, the increase in retinal thickness from preoperatively to 1, 3, and 6 months postoperatively was statistically significant (p<0.05); the difference was not statistically significant at 1 day or 1 week in either group (p>.005). There were no statistically significant

differences between the 2 groups in mean retinal thickness throughout the follow-up (p>0.05). Clinically significant macular edema occurred in 3 eyes in the epinephrine group and 3 eyes in the control group. Similar results have later been reported also for intracameral epinephrine from randiomized case series[22] of a total of 158 uneventful cataract procedures half of the eyes were given 0.2ml of 0.02% epinephrine as an intracameral injection. No difference was seen in central macular thickness with optical coherence tomography at any time point up to 6 months after surgery. In both treatment groups, the increase in macular thickness from preoperatively to 1, 3, and 6 months postoperatively was significant. In this rather large series, clinically significant macular edema was noted in 3 eyes in the epinephrine group and 3 eyes in the control group. The authors concluded that intracameral injection of 0.2ml of 0.02% epinephrine did not increase the risk for macular edema after uneventful phacoemulsification.

In our study, the mean of pre intracameral epinephrine systolic blood pressure was 126.83±7.21mmHg. The mean of systolic blood pressure post intracameral epinephrine was 127.80±7.67. The mean of pre intracameral epinephrine diastolic blood pressure was 75.83±5.52 mmHg. The mean of diastolic blood pressure post intracameral epinephrine was 76.13±5.49 mmHg. The mean of pre intracameral epinephrine pulse rate was 71.17±4.34 bpm. The mean of pulse rate post intracameral epinephrine was 71.08±4.59 bpm. p = 0.863 showing non-significant change in heart rate. p = 0.917 showing non-significant difference in heart rate between groups. p = 0.033 showing significant change in systolic blood pressure. p = 0.353 showing non-significant difference in systolic blood pressure between groups. p=0.321 showing non-significant change in diastolic blood pressure. p=0.414 showing non-significant difference in diastolic blood pressure between groups. Our results are comparable to results of paper[23] conducted byinvolving 90 patients intracameral mydriatics are safe on cardiovascular system. Also the study[6], we mentioned before in this chapter, found that intracameral epinephrine is safe on pulse rate and blood pressure.

Conclusion

To conclude from our study, we reached an understanding that intracameral epinephrine even in higher concentrations is effective in papillary dilatation especially in cases with long duration and poorly dilated cases by usual topical mydriatics. It is also safe on cardiovascular system, cornea and macula and doesn't affect visual outcome when it is used. However, a longer duration of follow up is recommended for any further studies which will help to further validate the results.

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