CYSTOID MACULAR EDEMA IN POST CATARACT SURGERY PATIENTS; A COMPARISON OF THREE DIFFERENT SURGICAL PROCEDURES

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ABSTRACT

Objective: To determine the frequency of post cataract cystoid macular edema (CME) in three different types of cataract surgical procedures.

Methodology: This was a cross sectional study. Total 222 patients having age related cataract were enrolled. Pre-operative optical coherence tomography (OCT) was performed to measure central macular thickness. Patients were then randomly allocated to three groups on the basis of type of surgical procedure; group A underwent phacoemulsification, group B, manual small incision cataract surgery (MSICS) and group C, extra capsular cataract surgery (ECCE). Post-operative OCT was done 06 weeks after surgery and the macular thickness was compared to pre-operative values for diagnosis of CME. The CME was then compared among the three groups.

Results: Male were 115 and female were 107. Mean age of the patients was 53.38 + 7.44 years, (41 to 70 years). A total of 27 (12.16%) patients had CME following cataract surgery, 04 (5.12%) in group A , 06 (7.79%) in group B, 17 (25.37%) patients in group C had CME after surgery. Chi-square test was utilized for comparison of CME among the groups.

Conclusion: The frequency of CME following cataract surgery was low. Phacoemulsification and MSICS gave almost similar, lower rates results while ECCE was found to have higher rates of CME.

Key Words: Cystoid macular edema, Manual small incision cataract surgery, Phacoemulsification, Extracapsular cataract surgery, Central macular thickness.

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INTRODUCTION

Post cataract surgery cystoid macular edema, also called the Irvine-Gass Syndrome, was described initially by Irvine in 1953 and later on explained by Gass and Norton in 1966[1]. The basic pathology in CME is the accumulation of cyst like fluid spaces in the middle layers of the neurosensory retina i.e. the outer plexiform and inner nuclear layers. This process starts with the engorgement of the Muller cells after which they burst, amalgamate and coalesce resulting in the cystoid like appearance of the retina[2].

CME is a non-specific complication of different types of ocular diseases. Among the etiologies, one is cataract extraction[2]. The pathogenesis of CME in these patients is not fully understood although inflammatory reaction due to surgical trauma is generally considered as the etiology. Vitreomacular tractions (VMT), light rays' toxicity from the surgical microscope during the procedure and high vascular permeability are other proposed pathogenic mechanisms in post cataract surgery CME[3]. Risk factors identified for the development of CME are rupture of the posterior capsule per-operatively associated with or without vitreous prolapse, pre-operative presence of macular pucker or epi-retinal membrane, uveitis of any type, vascular occlusions especially veins or previous retinal detachment procedures[4]. Another factor is diabetes mellitus which increases the risk of post-operative CME in patients without diabetic macular edema (DME) or worsens it if already present[5].

Different studies have given different incidence rates for CME in post cataract surgery patients with or without above mentioned risk factors and in different types of surgical procedures for cataract extraction. In a consecutive analysis of CME rates in post phacoemulsification cataract extraction with sample population who were using prostaglandin analogues and with the help of spectral domain optical coherence tomography (SD-OCT),

it was found that on clinical examination none of the patients had CME. However, 02 out of 48 patients had CME on the SD-OCT which makes it 3.3% of the total[6]. In another study, comparing the rate of CME between femtosecond laser assisted cataract surgery (FLACS) and manual phacoemulsification, the incidence was 0.2 % in manual phacoemulsification procedure while the FLAC group had 0.8% CME[7]. Similarly, another study showed the rate of CME as 0.98% in phacoemulsification group and 1.18% in FLACS group[8]. Regarding the ECCE, the rate of CME was 32.2%[9]. However, in this study, they had used fundus fluorescein angiography (FFA) for diagnosis of CME. In another study, while using SD-OCT, the CME was diagnosed in about 41% of the patients who underwent phacoemulsification[10].

Post-operative CME is one of the main causes of decreased vision following uneventful cataract surgery. The basic aim of our study was to determine the frequency of CME post-operatively in three different types of cataract procedures i.e. ECCE, MSICS and phacoemulsification and then to compare the surgical procedures associated with CME in patients who are diagnosed as cases of post cataract surgery CME using SD-OCT.

METHODOLOGY

This cross sectional study was conducted at the Department of Clinical Ophthalmology, Medical Teaching Institute Hayatabad Medical Complex, Peshawar from April 2019 to December 2019. Using "Open EPI", p; proportion of CME = 3.3%[6], confidence interval = 95% and keeping level of significance = 5%, the sample size came out to be 50 patients minimum in each group with total sample size of a minimum of 150 patients. To avoid loss to follow up and missing data, extra patients were included in each group in this study, thus total number of patients were 222. Non-probability consecutive sampling technique was used for enrollment of patients. Inclusion criteria were all those patients who underwent uneventful ECCE, MSICS or phacoemulsification cataract surgery for uncomplicated age related cataract. Exclusion criteria were patients having pre-operative risk factors for developing CME after surgery, uveitis, traumatic cataracts, use of prostaglandin analogues, previous retinal detachment surgery and epi retinal membrane. CME was defined as 10% or more increase in thickness of central macula compared to pre-operative thickness or cystic changes on SD-OCT[1]. Patients having per-operative complications like posterior capsular rupture with or without vitreous prolapse, those with post-operative complications like hyphema, iris prolapse or any other complication requiring revision surgery and patients who were left aphakic.

Approval was obtained from the ethics committee of the hospital before commencing the research. Patients were enrolled from the outpatient department (OPD) who needed cataract surgery. The purpose and benefits of the research were explained to the study participants and consent was taken from them. This was then followed by thorough history taking, slit lamp examination and routine tests to detect confounders and bias.

All the patients were subjected to baseline pre-operative SD-OCT (Heidelberg SPECTRALIS®) and record was saved in computer one day prior to the surgery. Patients were operated for cataract surgery the next day using different types of surgical techniques based on random allocation to the 3 groups. The type of surgery was recorded. Patient undergoing phacoemulsification with Intra-ocular Lens implantation were labelled as group-A, those undergoing MSICS with Lens implantation were allocated to group-B and patients who underwent conventional ECCE with lens implantation were placed in group-C. Any intra-operative surgical complication as per exclusion criteria led to exclusion of the patient from the study.

A follow up SD-OCT was done at 06 weeks post cataract surgery and then compared with baseline pre-operative SD-OCT. The diagnosis of CME was made as per operational definition. The patients' old record was checked and they were examined on slit lamp. The frequency of CME in different types of surgeries was calculated. Only those patients who completed the final follow-up visit at 06 weeks were included in the study.

All the data was collected by the investigator himself and all the mentioned information including the demographic data (age, gender and address) were documented in a pre designed proforma.

Data was statistically analyzed with SPSS software version 20. Frequency and percentages were determined for categorical variables which included gender, type of cataract surgery and CME. Mean + S.D. were determined for continuous variables which included age, pre-operative central macular thickness, post-operative central macular thickness, and mean change in central macular thickness. T-test was applied to compare continuous variables between two groups. ANOVA single factor test was applied for the comparison among the 3 groups. Post-hoc test with Bonferroni correction was used to further compare the continuous variables between two groups. Chi-square test was applied to compare CME in different types of cataract surgery. The type of surgery was stratified among sex and age to see the effect modifiers. Results were shown as tables and charts/graphs.

RESULTS

Total number of patients was 222 which included 51.80% (115/222) males. Mean age of the patents was 53.38 + 7.44 years, ranging from 41 to 70 years. Mean age + SD of the group A was 55.78 + 7.43 years (42-70

years), group B, 54.93 + 7.37 years, (42-69 years) and that of group C was 55.65 + 7.77 years, (41-70). No statistically significant difference was shown within the groups among males and females with respect to age. Analysis also showed insignificant difference among the three groups regarding age of the patients (P-value=0.754). Mean pre-operative central macular thickness of the patients was 186.93 + 3.67 um, with almost no difference among the 3 groups as shown in table 1.

Mean post-operative central macular thickness of the patents was 208.61 + 26.9 um as shown in table 1, 2 and 3. There was statistically insignificant difference among males and females with-in the groups with respect to post-operative central macular thickness. There was statistically significant difference between the three groups with regards to post-operative central macular thickness of the patients (P-value <0.0008) as shown in table 1. A post-hoc test revealed that there was no significant difference between group A and B (P-value=0.82) (Table 2). However, the difference was statistically significant between group A and C (P-value=0.0006) (Table 3), and group B and C (P-value=0.0001) with respect to post-operative central macular thickness. (Table 4)

Mean change in central macular thickness of the patents was 20.70 + 23.60 um as shown in table 1. There were statistically significant differences among the three groups with regards to variation in central macular thickness of the patients (P-value <0.0009) (Table 01). A post-hoc test revealed that there was insignificant difference between group A and B and significant between B and C as shown in table 03.

A total of 27 (12.16%) out of 222 patients had cystoid macular edema following cataract surgery; 4 (5.12%) patients in group A, 06 (7.79%) patients in group B, and 17 (25.37%) patients in group C as shown in table 5. Group C had statistically significant higher incidence of CME as compared to group A and B (P-value=0.0005) a shown in table 7 and 8 respectively. It is also interesting to note that the base-line pre-operative central macular thickness was similar in patients who developed CME and those without.

DISCUSSION

Cataract is considered to be the most common cause of preventable blindness globally. The surgical procedure for removal of cataract is among the most frequently performed surgeries. Phaco-emulsification, MSICS and conventional ECCE are widely accepted and safe procedures for cataract extraction[11]. Most of the cataract surgeries are uneventful and result in res-

Table 1: Overall central macular thickness

Groups	Group A (Phacoemulsification)	Group B (MSICS)	Group C (ECCE)	Mean	P value
Pre-operative					
CMT (um)	186.78+3.85	186.66 + 3.55	187.41 + 3.58	186.93 + 3.67	0.425
Post-operative CMT (um)	203.97+24.8	203.16 + 21.38	220.28 +31.32	208.61 + 26.9	<0.0008
Mean change in CMT (um)	13.41+17.0	17.55 + 17.97	32.80 + 30.77	20.70 + 23.60	<0.0009

CMT: Central macular thickness

Table 2: Central macular thickness; group A versus group B

Groups	Group A (Phacoemulsification)	Group B (MSICS)	P value
Post-operative CMT (um)	203.97 + 24.8	203.16 + 21.38	0.82
Mean change in CMT (um)	13.41 + 17.0	17.55 + 17.97	0.142

Table 3: Central macular thickness; group A versus group C

Groups	Group A (Phacoemulsification)	Group C (ECCE)	P value
Post-operative CMT (um)	203.97 + 24.8	220.28 + 31.32	0.0006
Mean change in CMT (um)	13.41 + 17.0	32.80 + 30.77	< 0.0004

Table 4: Central macular thickness; Group B versus Group C

Groups	Group B (MSICS)	Group C (ECCE)	P value
Post-operative CMT (um)	203.16 + 21.38	220.28 + 31.32	0.0001
Mean change in CMT (um)	17.55 + 17.97	32.80 + 30.77	0.0003

Table 5: Cystoid macular edema

	Group A			Group B (MSICS)			Group C (ECCE)			Total		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Cystoid Macular Edema	2	2	4/78 (5.12%)	2	4	6/77 (7.79%)	10	7	17/67 (25.37%)	14	13	27/222 (12.16%)

Table 6: Cystoid macular edema; group A versus group B

	Group A			Group B			P value
	M	F	Total	M	F	Total	
Cystoid Macular Edema	2	2	4/78 (5.12%)	2	4	6/77 (7.79%)	0.49

Table 7: Cystoid macular edema; group A versus group C

	Group A			Group C			P value
	M	F	Total	M	F	Total	
Cystoid Macular Edema	2	2	4/78 (5.12%)	10	7	17/67 (25.37%)	0.0005

Table 8: Cystoid macular edema; group B versus group C

	Group B			Group C			P value
	M	F	Total	M	F	Total	
Cystoid Macular Edema	2	4	6/77 (7.79%)	10	7	17/67 (25.37%)	0.004

toration of full potential of the eyes. However, CME is responsible for suboptimal visual rehabilitation in majority of cases after uneventful cataract surgery[12]. There are varying reports in literature about the incidence rates of CME following surgical removal of the cataract, regarding the technique used and cut-off limit for macular edema. OCT is one of the most widely used non-invasive tool to detect macular edema[13]. The mean pre-operative central macular thickness in our study was 186.93 + 3.67 um. This is similar with the study conducted by Kaur N. et al[14]. Chaudhary C. et al. found 238.01 + 24.37 um mean pre-operative macular thickness in their study. This difference in central macular thickness might be related to the different types of OCT machines being used. Different machines calculate central macular thickness at varying depths, thus giving different results[15]. Kaur N et al. found similar increase in central macular thickness following surgical extraction of the cataract[14]. In this study, the rate of CME was least in phacoemulsification group (5.12%) as compared to MSICS (7.79%) and ECCE (25.37%). Although the difference between phaco-emulsification and MSICS did not reach statistically significance, yet ECCE was found to be associated with significantly higher incidence of CME[15]. Similar incidence was found in studies conducted in similar populations comparing phacoemulsification and MSICS. Packer M et al. calculated post phacoemulsification CME incidence to be 0.1% which is lower than our results in similar group[16]. Subranamiam ML et al. observed that 08 eyes (9.87%) demonstrated angiographic CME at one-week and six-weeks follow-up visits while 2 eyes showed evidence of clinical CME (2.46%)[17]. Incidence of 25.37% was found in our study ECCE group. This is in comparison with the study conducted by Solomon LD who investigated angiogenic CME using Fundus Fluorescein Angiography (FFA) following ECCE[9].

There were some limitations of the study. Many patients had significant media opacities due to cataract, which interfered with the quality of OCT scan. Moreover, the population was studied for a limited time of 06 weeks post-operatively. This barred us from studying the long-term effects of different cataract surgical procedures on the incidence of CME. Further, longer duration studies will be useful for further investigation in this regard.

CONCLUSION

It was safe to conclude that incidence of CME following cataract surgery was low. Phacoemulsification and MSICS gave almost similar and lower rates of CME than ECCE.

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CONTRIBUTORS

SARK conceived the idea, prepared initial manuscript and made plan for execution of the project. WJ, MI and MZUDK helped in correction of initial draft after literature search, acquisition and interpretation of data and writing of results and discussion. All authors contributed significantly to the published manuscript.