

## Original Research Article

# Pseudophakic cystoid macular edema after uneventful small incision cataract surgery

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### ABSTRACT

**Background:** To study the clinical profile of patient undergone small incision cataract surgery. To measure the incidence of CME after manual SICS and phacoemulsification method of cataract extraction.

**Methods:** It's a hospital based prospective study carried in ophthalmology dept. patients with normal clinical profile with no history of hypertension, diabetes mellitus, or any ocular trauma or infection/inflammation are randomly selected for cataract surgery either phacoemulsification or manual SICS and were regularly followed till sixth week after cataract surgery. During follow up complete examination including visual acuity, anterior segment examination funduscopy and FFA done.

**Results:** Out of 115 patients, 59 were operated by phacoemulsification and 56 were operated by manual SICS. 59 were operated by phaco, 9 patients lost in follow up. Out of these, 2 patients developed CME. One was operated by phaco and the other by SICS (P value = 1.000) BCVA 6/9 or more after second follow up was seen in 42.45% of phaco patients and 40.56% of SICS patients which is statistically insignificant (P value = 0.343607).

**Conclusions:** With advent of modern cataract surgery, rapid visual rehabilitation and unaided best corrected visual acuity is achieved with negligible early and late postoperative complications and thereby cystoid macular edema.

**Keywords:** CME, Phaco, SICS

### INTRODUCTION

Pseudophakic cystoid macular edema, also known as Irvine-gass syndrome, was first reported by A. Ray Irvine, MD in 1953 and demonstrated angiographically by Gass and Norton in 1966, so it is known as Irvine-Gass syndrome, a newly defined vitreous syndrome following cataract surgery.<sup>1</sup>

Now a day's manual small incision cataract surgery (SICS) is rapidly being replaced by phacoemulsification, the newer technique for cataract surgery. Despite advances in technique and surgical materials, cystoid macular edema (CME) is the most frequent cause of reduced vision following uneventful modern cataract surgery, with a seemingly rare incidence of 0.1-2.35%.

The specific etiology of aphakic and pseudophakic macular edema is not fully understood. Many factors have been considered to contribute to its development, such as

- The type of cataract surgery,
- Light toxicity,
- Vitreomacular traction,
- Inflammatory mediators,
- Use of adrenergic drugs,
- Age,
- Vitreous loss,
- Integrity of posterior capsule,
- Hypertension and
- Diabetes.

The main triggering factors thought to be surgical trauma. Others are vitreous traction, rupture of blood-aqueous barrier.

These triggering agents cause diffusion of prostaglandins and other inflammatory mediators into the vitreous cavity, which induces a cascade of inflammatory events with subsequent rupture of the blood-retinal barrier and CME generation in some patients.

The change in procedure from large incision intracapsular cataract extraction to small-incision extracapsular phacoemulsification was associated with a clear decrease in the incidence of this complication.

This has been explained by less blood-aqueous barrier damage after phacoemulsification with intact continuous curvilinear capsulorhexis.<sup>2</sup>

Although microscopic light toxicity has been indicated to be a possible contributor to CME, a prospective randomized study did not support this finding.<sup>3</sup>

The age of the patient is another factor that need to be considered, there are studies demonstrating an increased incidence of CME in older patients.<sup>4</sup>

Changes occurring in vitreous body during surgery is another pathogenic mechanism that has been proposed as a cause of CME development. Rupture of posterior capsule as well as secondary capsulotomy (including YAG laser capsulotomy) are associated with a higher rate of CME.<sup>5</sup>

The aims and objectives of the research was to study the clinical profile of patient undergone small incision cataract surgery. To measure the incidence of CME after manual SICS and phacoemulsification method of cataract extraction.

## **METHODS**

### ***Study design***

It is a randomized prospective study at tertiary eye care hospital in ophthalmology department.

### ***Inclusion criteria***

- Patients of age more than 35 years having no history of diabetes, hypertension or undergone any ocular surgery within last 6 months,
- Uneventful surgical procedure performed by a team of selected senior specialists in cataract surgery,
- No evidence of CME prior to surgery or where the cataract had precluded visualization of the fundus preoperatively,
- No other ocular disorder.

### ***Exclusion criteria***

- Eventful cataract surgery,
- Below age of 35 years,
- Subjects who are unable to provide informed consent and to come for follow up for 6 weeks.

### ***Methodology***

This prospective study was conducted at ophthalmology department of tertiary hospital of south Gujarat during year 2014-2015.

### ***Preoperative work up***

- Patient's demographic details, visual assessment done,
- Complete slit lamp biomicroscopy examination is done for anterior and posterior segment,
- Fundoscopy done with 78D,
- B scan is done for mature cataract,
- One day before surgery antibiotic drops with NSAID drops started,
- On the day of surgery patient's pupil were dilated with three types of eye drop (1) Tropicacyl 0.8% w/v + phenylephrine 5.0% w/v (2) Non-steroidal anti-inflammatory drug drops (3) cyclopentolate 1.0% eye drops.

### ***Postoperative work up***

After 6 to 8 hours, pad and bandage was removed and started antibiotic-steroid combination and NSAID drops.

Follow-up after cataract surgery for evidence of CME from first week to weekly follow up till 6 weeks. The ocular findings recorded during each follow-up period included

- Best corrected visual acuity,
- Tonometry,
- Slit lamp biomicroscopy,
- Fundoscopy with 78D,
- FFA at second week and sixth week to rule out subclinical CME.

### ***Statistical method***

Chi-square and t-test were applied.

## **RESULTS**

The study was conducted in the department of ophthalmology over a period of 1 year in which 115 patients were examined preoperatively and postoperatively for development and treatment of CME.

Out of 115 randomly selected patients of no history of hypertension, DM, ocular trauma or inflammation, 51

were male and 64 were females. 9 patients were lost in follow up. Their nuclear grading, type of surgery as follow

**Table 1: Distribution of the subjects under study as per age.**

Distribution of the subjects under study as per age		
Age	No. of patients	Percentage
<40 years	3	2.06
40 to 60 years	49	42.6
>60 years	63	54.78

**Table 2: Distribution of subjects under study as per gender.**

Distribution of subjects under study as per gender		
Gender	Frequency	Percentage
Male	51	44.34
Female	64	55.65
Total	115	100

**Table 3: Distribution of study population as per maturity of cataract (LOCS grading) and type of procedure.**

Distribution of study population as per maturity of cataract (LOCS grading) and type of procedure			
Grading	Procedure		Total
	PHACO	SICS	
Ns 3 or less	49	27	76
Ns 4 or more	10	29	39
Total	59	56	115

In Table 5, the two tailed P value 1.000, which suggest that there is no significant association exists between the grading of cataract to CME (Here P value is calculated with help of Fisher’s exact test).

Chi square value is 0.0755. P value is 0.962; here the result is not significant in Table 6.

**Table 8. Distribution of BCVA in PHACO and SICS group after every follow-up.**

Distribution of BCVA in PHACO and SICS group after every follow-up						
Procedure	First follow-up (first post op day to second week)		Second follow-up (second week to fourth week)		Third follow-up (fourth week to sixth week)	
	BCVA 6/9 or more	BCVA <6/9	BCVA 6/9 or more	BCVA <6/9	BCVA 6/9 or more	BCVA <6/9
PHACO	35	17	45	7	45	7
SICS	31	23	43	11	45	9

**DISCUSSION**

As per Table 1, Majority of patients in the study belonged to age group >60 years (54.78%) mean age was 62+8

**Table 4: Frequency of CME in mature and immature cataract.**

Frequency of CME in mature and immature cataract			
Grading	CME (+)	CME (-)	Total
Ns 3or less	1	68	69
Ns 4 or more	1	36	37
Total	2	104	106

**Table 5: Frequency of CME and type of cataract surgery.**

Frequency of CME and type of cataract surgery			
Procedure	CME (+)	CME (-)	Total
PHACO	1	68	69
SICS	1	36	37
Total	2	104	106

**Table 6: Frequency of CME vs age of the patient.**

Frequency of CME vs age of the patient			
Age	CME (+)	CME (-)	Total
35-40 years	0	3	3
40-60 years	1	46	47
>60 years	1	55	56
Total	2	104	106

**Table 7: Frequency of CME vs gender of patient.**

Frequency of CME vs gender of patient			
Gender	CME (+)	CME (-)	Total
Male	0	47	47
Female	2	57	59
Total	2	104	106

P value is 0.20255 suggests no significant correlation between the gender and occurrence of CME There are no statistical data available or study carried out on occurrence of CME in either gender. Chi square value is 0.8969 and P value is 0.343607.

years. Cataract is an age-related change in natural lens, so majority of our patients are of old age. As per table 2, Overall proportion of male patients in the study was 44.39% whereas of female patients was 54.55%

Ramakrishnan S et al revealed that 200 eyes of 200 patients were randomized into 2 groups, one receiving nepafenac and the other receiving ketorolac preoperatively.<sup>6</sup> There were 91 males (45.5%-ABD 109 females (54.5%). As per table 3 no. of cataract surgery performed suggests that majority of immature cataract were preferred for phacoemulsification (42.60%) while mature cataract was preferred for SICS (48.69%).

Jaggernath J et al showed that both PHACO and SICS are safe and effective techniques to rehabilitate cataract patients, SICS being more useful for intumescent and hard cataracts and is the preferred technique for less-resourced settings.<sup>7</sup> Small incision cataract surgery is comparable to phacoemulsification in almost all aspects except post-operative astigmatism.

The Table 4 shows the comparison of density of cataract with occurrence of CME. Here in this table we have shown that one patient with immature cataract and one with mature cataract develops CME. Rate of CME in mature cataract is 2.56% and in immature cataract is 1.31%. However, these findings are statistically insignificant.

Jurecka T et al studied about retinal thickness and macular volume after the cataract surgery reached the maximum in months 1 and 2 in all examined areas.<sup>8</sup> Since month 3 on, there was a progressive decrease of abnormal retinal thickness and macular volume. An increase in retinal thickness was proved to be most prominent in the inner macular area. An increase in macular volume and retinal thickness in inner and outer macular area were statistically significant in months 1, 2 and 3 (Student t-test,  $p < 0.001$ ; [ $p = 0.01$  for the data in month 3]), while an increase in retinal thickness in foveal area was statistically significant in months 1 and 2 (Student t-test,  $p < 0.05$ ). Six months after the surgery, the difference was not statistically significant in any of the examined areas.

Three patients (3%) developed CME after the phacoemulsification, but in one patient (1%) only the clinical CME with some degree of a visual loss 1 month after the surgery (BCVA= 0.5) was diagnosed.

There was a positive statistical correlation between the real phacoemulsification time and the increase in macular volume and retinal thickness in fovea and inner macular area in week one, and in months one and two after the surgery (Spearman's correlation test,  $p < 0.05$ ). A positive statistical correlation was also found between the overall duration of the surgical procedure and the increase in macular volume and retinal thickness in all areas one month after the surgery (Spearman's correlation test,  $p < 0.05$ ).

There are many studies that suggest long surgery time will cause development of CME. Remaining lens matter and exposure of light of microscope for longer time may develop CME post operation. The age of the patient is

another factor that needs to be considered. Some authors have found a positive correlation with age, demonstrating an increased incidence of CME in older patients.

From the Table 5, chi square calculation gives the two tailed p value equals to 1.000, which suggest that there is no statistical significant association present between both the procedure, phacoemulsification and SICS vs presence of CME.

Riaz Y et al eight trials in this review with a total of 1708 participant.<sup>9</sup> Trials were conducted in India, Nepal and South Africa. Follow up ranged from one day to six months, but most trials reported at six to eight weeks after surgery. Overall the trials were judged to be at risk of bias due to unclear reporting of masking and follow-up. No studies reported presenting visual acuity, so data were collected on both best-corrected (BCVA) and uncorrected (UCVA) visual acuity.

Most studies reported visual acuity of 6/18 or better (rather than 6/12 or better). So, this was used as an indicator of good functional vision. Seven studies (1223 participants) reported BCVA of 6/18 or better at six to eight weeks (pooled risk ratio (RR) 0.99 95% confidence interval (CI) 0.98 to 1.01) indicating no difference between the MSICS and phacoemulsification groups. Three studies (767 participants) reported UCVA of 6/18 or better at six to eight weeks, with a pooled RR indicating a more favourable outcome with phacoemulsification (0.90, 95% CI 0.84 to 0.96). One trial (96 participants) reported UCVA at six months with a RR of 1.07 (95% CI 0.91 to 1.26). Regarding BCVA of less than 6/60: there were only 11/1223 events reported. The pooled Peto odds ratio was 2.48 indicating a more favourable outcome using phacoemulsification but with wide confidence intervals (0.74 to 8.28) which means that we are uncertain as to the true effect.

In the Table 7, P value is 0.20255 suggests no significant correlation between the gender and occurrence of CME. There are no statistical data available or study carried out on occurrence of CME in either gender.

From the Table 8, second follow up shows BCVA in both phacoemulsification and MSICS is statistical insignificant. We have compared the BCVA of all the patients undergone surgery.

Majority of patients have shown BCVA 6/9 and more till the end of forth week. In PHACO, there were seven patients that show vision less than 6/9 whereas in MSICS there were 9 patients having BCVA less than 6/9. Reason for this was 6 out of 9 patients were having high astigmatism while 2 had macular scar and one had large chorioretinal atrophic patch involving macula. While out of 7 patients undergone PHACO, 4 were of macular scar, 3 were having retinal pigment epithelium defect with familial drusen. Gogate PM et al reports in his article reports clinical outcomes up to 6 weeks.<sup>10</sup>

Three hundred eighty-three of 400 (95.75%) patients completed the 1-week follow-up, and 372 of 400 (93%) patients completed the 6-week follow-up. One hundred thirty-one of 192 (68.2%) patients in the phacoemulsification group and 117 of 191 (61.25%) patients in the small-incision group had uncorrected visual acuity better than or equal to 6/18 at 1 week (P= 0.153). One hundred fifty of 185 (81.08%) patients of the phacoemulsification group and 133 of 187 (71.1%) patients of the small-incision group (P= 0.038) were better than or equal to 6/18 at the 6-week follow-up for presenting visual activity. Visual acuity improved to >or = 6/18 with best correction in 182 of 185 patients (98.4%) and 184 of 187 (98.4%) patients (P= 0.549), respectively. Poor outcome (postoperative visual acuity <6/60) was noted in 1 of 185 (0.5%) in the phacoemulsification group and none in the small-incision group. The mode of astigmatism was 0.5 diopters (D) for the phacoemulsification group and 1.5 D for the small-incision group, and the average astigmatism was 1.1 D and 1.2 D, respectively. There was an intra-surgeon variation in astigmatism. The phacoemulsification group had 7 posterior capsular rents compared with 12 in the small-incision group, but the phacoemulsification group had more corneal edema on the first postoperative day.

## CONCLUSION

With advent of modern cataract surgery, rapid visual rehabilitation and unaided best corrected visual acuity is achieved with negligible early and late postoperative complications and thereby cystoid macular edema. Post-operative CME can be reduced by the aid of SICS, properly selected NSAID, limiting the duration of microscopic light exposure, minimal intraoperative complications and avoidance of triggering factors.

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