

# Incidence of Cystoid Macular Edema in Patients after Cataract Surgery at a Tertiary Care Centre in Central India

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## ABSTRACT

**Introduction:** Cystoid Macular Edema (CME) is one of the causes of sub-optimal visual recovery after cataract surgery. Through this study, we intend to study the incidence, as well as the risk factors associated with the development of CME after cataract surgery. Purpose: To study the incidence of cystoid macular edema (CME) in patients after cataract surgery with Intra ocular lens implantation.

**Material and methods:** A total of 100 eyes of 100 patients, aged from 35 to 80 years were enrolled in the study. Patients with normal clinical profile with no history of hypertension, diabetes mellitus, or any ocular trauma or infection/inflammation were selected for cataract surgery. Patients were evaluated for macular thickness with the help of OCT pre-operatively and then again at 1, 4 & 6 weeks post-operatively. Similarly distance visual acuity was recorded post-operatively at 1, 4 & 6 week on Snellen's visual acuity chart. Correlation was done between post-operative macular thickness and visual acuity, and incidence of CME was assessed.

**Results:** All 100 patients were operated by either phacoemulsification or small incision cataract surgery with intra ocular lens implantation, 8 patients lost in follow up at 4<sup>th</sup> & 6<sup>th</sup> week. Out of 92 patients, 3 patients developed CME.

**Conclusion:** This study has shown a over all low incidence of CME after cataract surgery (3.26%). Statistically significant co relation is seen between vitreous loss & increased surgical time with CME. With advent of modern cataract surgery, there is good visual recovery with minimal incidence of cystoid macular edema in majority of cases.

**Keywords:** Cystoid Macular Edema (CME), Optical Coherence Tomography (OCT), Phacoemulsification (Phaco), Small Incision Cataract Surgery (SICS).

OCT findings. Angiographic CME is diagnosed in patients who are otherwise asymptomatic with respect to visual acuity, but have detectable leakage from the perifoveal capillaries on fluorescein angiography (FA).

Optical coherence tomography (OCT) is a non-invasive and accurate method to estimate the macular thickness and detect the presence of CME and to assess the benefit of various modes of treatment. Although the FA has been considered the diagnostic gold standard for pseudophakic CME, OCT is now the method of choice, being a non-invasive technique to evaluate and follow CME after cataract surgery.<sup>13</sup> An additional advantage of the use of OCT is that the thickening of macular area effectively measures the edema, and therefore correlates better with vision than the angiography.<sup>14</sup>

Various factors have been thought to be causative of CME, which include surgery induced disruption of blood aqueous barrier<sup>15,16</sup>, vitreous traction<sup>17,18</sup>, rupture of posterior capsule, light toxicity etc. These factors cause release of prostaglandins and consequent breakdown of blood - retinal barrier<sup>19,20</sup>, which eventually leads to cystoid macular edema. Current research aimed to study the incidence of cystoid macular edema (CME) in patients after cataract surgery with Intra ocular lens implantation.

## MATERIAL AND METHODS

This study was conducted at Department of Ophthalmology, Chirayu Medical College and Hospital, a tertiary care Institute at Bhopal, as a prospective, involving adult patients undergoing routine cataract surgery with intra ocular lens (IOL). This was a prospective study conducted to assess the incidence of post-operative CME in patients undergoing cataract surgery. Enrolment was for a period of 12 months, from 1st July 2018 to 30th June 2019. Permission was taken

## INTRODUCTION

Phacoemulsification using small incisions and implantation of a foldable intraocular lens (IOL) is currently the preferred technique which is efficient, and uneventful surgery is generally associated with good visual results.<sup>1-5</sup> However cystoid macular edema (CME) may develop which can result in suboptimal postoperative vision.<sup>6,7,8</sup> It can occur after uncomplicated surgery in patients with otherwise healthy eyes, after complicated surgery, or after surgery in patients with preexisting ocular diseases such as uveitis or diabetic retinopathy.<sup>9</sup>

In 1953 Irvine first reported CME following cataract surgery. It is demonstrated angiographically by Gass and Norton in 1966, so it is known as Irvine-Gass syndrome.<sup>10,11,12</sup>

Clinical CME is diagnosed in those patients who have detectable visual impairment as well as angiographic and/or

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from the Ethics Committee of the Institute. Written informed consent was obtained from the patients regarding modes of examination and treatment.

**Inclusion criteria**

- Age more than 35 years but less than 80 years
- No history of diabetes, hypertension.
- No history of any ocular surgery within last 6 months
- No evidence of CME prior to surgery or where the cataract had precluded visualization of the fundus preoperatively.

**Exclusion criteria**

- Any other ocular disease with potential to affect visual acuity.
- Inability to provide informed consent.
- Inability to follow up on required dates.

**Procedure**

A total of 100 eyes of 100 patients, with age between 35 and 80 years, diagnosed to have cataract were enrolled in this prospective study over a 1 year period. Permission was obtained from ethical committee of the institute. An informed consent was obtained from patients willing to participate in the study. Best corrected visual acuity was recorded on Snellen’s distant visual acuity chart at 6 meters. Examination was done for all patients to rule out any co-existing ocular pathology Slit lamp evaluation was done to detect any anterior segment abnormality and for grading of cataract. IOP was measured by Goldman applanation tonometer. Detailed fundus examination was done with slit lamp bioicroscopy using +90 D lens and indirect ophthalmoscopy

All subjects were investigated for absence of any evidence of macular edema with the help of Optical Coherence Tomography (Primus OCT; Carl Zeiss Meditec, Dublin) before cataract surgery. The foveal thickness and total macular volume were measured on the preoperative day. Cataract surgery was performed by either phacoemulsification or small incision cataract surgery with intra ocular lens implantation. Surgeries were performed by senior surgeons experienced in phacoemulsification & SICS.

Postoperative 1st week, 4th week & 6<sup>th</sup> week, distance visual acuity was recorded carefully on Snellen’s visual acuity chart. Objective and subjective refraction was done in both dilated and undilated pupil. Slit lamp evaluation was again carried out to rule out any anterior segment abnormality. Similarly OCT readings of foveal thickness and total macular volume were recorded 1 week, 4<sup>th</sup> week & 6<sup>th</sup> week post operatively. Visual acuity was converted to equivalent decimal value for simplification in statistical analysis.

Each eye was dilated with Tropicamide 1% before recording the images and scans were performed with a minimum pupillary diameter of 5 mm. The internal fixation target was used owing to its higher reproducibility. Fast macular thickness protocol & Radial scan were used.

**STATISTICAL ANALYSIS**

Statistical analysis was performed using a commercially available statistical software package (IBM SPSS Statistics

developed by IBM).Univariate comparison of risk factors between eyes with and without CME was done using Chi-square test. A *p*-value < 0.01 was considered to indicate a statistically significant association between a risk factor and the risk of developing post operative CME.

**RESULTS**

The study was conducted in the department of ophthalmology over a period of 1 year in which 100 eyes of 100 patients were examined preoperatively and postoperatively for development and treatment of CME.

Out of 100 randomly selected patients of no history of hypertension, DM, ocular trauma or inflammation, 49 were male and 51 were females. 8 patients were lost in follow up. As per Table 1, Majority of patients in the study belonged to age group >60 years (55%). Mean age was 62 years. Cataract is an age-related change in natural lens, so majority of our patients are of old age.

As seen in table 2, no. of cataract surgery performed suggests that majority of immature cataract were operated by phacoemulsification (76.6%) while advanced cataract were preferred for SICS (86.1%)

As shown in Table 3 (Figure1), 1 out of 51 cases operated by Phacoemulsification developed CME(1.96%) while 2 out of 41 cases operated by SICS developed CME(4.87%). Chi square value is 0.61 and p value is .43(not significant at *p*<.01), which suggest that there is no statistical significant association present between both the procedure, phacoemulsification and SICS vs presence of CME.

Table 4 shows 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 advanced & mature cataract developed CME. Rate of CME in advance cataract is 6.06% and in immature cataract was 1.69%. Chi square value is 1.27 and p value is .25(not significant at *p*<.01), However, these findings are not statistically

Age	Nos	Percentage
<40 (35-40)	2	2
40-60	43	43
>60	55	55
Total	100	100

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

Grade of cataract	Phaco	SICS	Total
<=3	49	15	64
>3	5	31	36
Total	54	46	100

**Table-2:** Distribution according to maturity of cataract

Type of surgery	CME present	CME absent	Percentage
Phaco	1	50	1.96
SICS	2	39	4.87
Total	3	89	3.26

**Table-3:** Incidence of CME

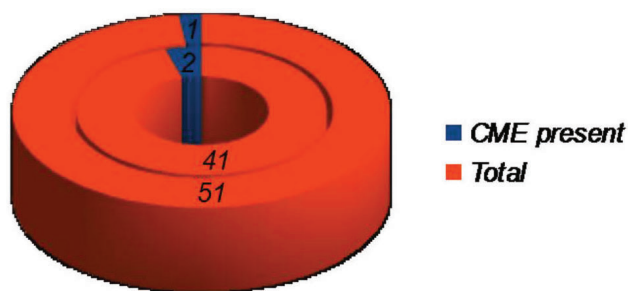


Figure-1: CME as per procedure

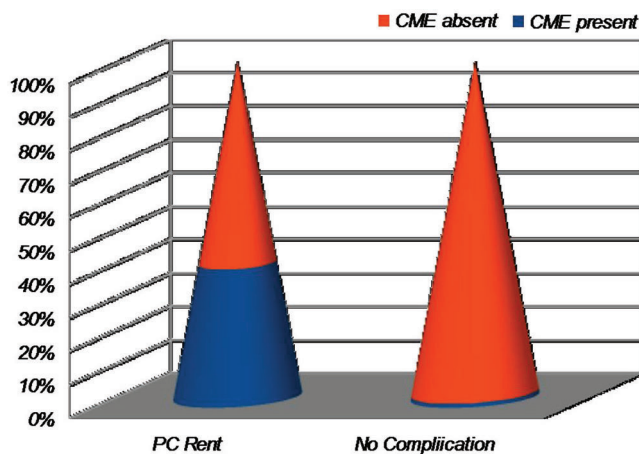


Figure-2:

significant

As shown in Table 5 (Figure 2), the phacoemulsification group had 2 posterior capsular rents compared with 3 in the small-incision group, but the phacoemulsification group in advanced & hard cataract had more corneal edema on the first postoperative day. All PC rent were managed by anterior vitrectomy followed by In Sulcus implantation of 3 piece IOL. 2 out of 3 CME occurred in our study are present in cases which were complicated by PC rent, one in each Phaco & SICS group, Chi square value is 22.62 and p value is less than .00001 (significant at  $p < .01$ ), that shows the statistically significant co relation between vitreous loss & increased surgical time with CME.

**DISCUSSION**

Jaggernath J et al showed that both PHACO and SICS are safe and effective techniques to rehabilitate cataract patients, SICS being more useful for hard cataracts and is the preferred technique for less-resourced settings.<sup>21</sup> Small incision cataract surgery is comparable to phacoemulsification in almost all aspects except post-operative astigmatism. Jurecka T et al studied about retinal thickness and macular volume after the cataract surgery, which reached the maximum in months 1 and 2 in all examined areas.<sup>22</sup>

In 1999, a publication showing data collected in 4 hospitals of four countries by the International Cataract Surgery Outcomes Study, showed a prevalence of CME as a complication of cataract surgery with phacoemulsification of 0.3% in the United States, of 1.4% in Canada, of 0.0% in Denmark and of 0.6% in Spain.<sup>23,24,25,26</sup> Overall, the prevalence of CME

was found to be 1.2%-2% in extra capsular operations, so this compares favourably with our study.

Higher incidence of CME with harder cataracts, found in our study, may be related to increased operative time and intra-operative iris trauma.<sup>27</sup>

There are many studies that suggest long surgery time as a cause for development of CME.<sup>28</sup> Residual lens matter and exposure to light of microscope for longer time may lead to development of CME after cataract operation.

Out of 100 patients 98 patients complete the 1 week follow up and 92 patients complete the 4<sup>th</sup> & 6<sup>th</sup> week follow up. Majority of patients have shown BCVA 6/9 and more till the end of 4<sup>th</sup> & 6<sup>th</sup> week. In PHACO, there were 2 patients showing BCVA less than 6/9. On fundus examination & OCT 1 out of these patients had CME and 1 patient showed high astigmatism. In SICS there were 5 patients having BCVA less than 6/9, 2 out of 5 patients were having CME and 3 patients were having high astigmatism. For the Phaco group the average astigmatism was 0.5 D and that is 1.5 D for the small-incision group. There was an intra-surgeon variation in astigmatism.

With the advent of newer and more sensitive technologies like OCT, the incidence of CME after uneventful cataract surgery has been found to be greater than was previously thought. In a study by Lobo et al<sup>29</sup>, 97% of eyes showed evidence of some retinal thickening compared with controls at some point during follow up after routine cataract surgery. Increase in retinal thickness reached a peak at 6 weeks postoperative (41% of eyes). A downward trend in retinal thickness was noted after 12 weeks. During the first 12 weeks, macular leakage was seen in 88% of eyes; this percentage decreased to 68% at 30 weeks. Earlier FFA was considered as gold standard for diagnosis of CME. But FFA is an invasive test, with side effects ranging from nausea (up to 20%) to its rarest complication, anaphylaxis and death. Therefore it is important to have alternative non invasive methods such as OCT. OCT is a quantitative measurement and enables the detection of minimal changes in retinal thickness and volume even after uncomplicated cataract surgery

Conclusion: In modern cataract surgery, the incidence of vision threatening complications has been significantly reduced, regardless of the the technique used (Phaco/SICS). OCT is a newer, non-invasive test that is very sensitive and enables the detection of even very small changes in retinal thickness and volume. It can be used as a routine test even after uncomplicated cataract surgery, to detect CME, especially in patients who had a longer surgery time and/or severe post operative inflammation.

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