

# Analysis of Macular Thickness by Optical Coherence Tomography (OCT) after 1 Month in Post-Operative Patients of Cataract Surgery

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**Abstract:** ***Title:** Analysis of macular thickness by Optical Coherence Tomography (OCT) after 1 month in post-operative patients of cataract surgery **Purpose:** To validate a method of reporting post-cataract macular edema (ME) using OCT and early diagnosis of symptomatic pseudophakic Cystoid Macular Edema (CME) **Materials and Methods:** A prospective, observational study was carried out on 500 adult patients admitted for cataract surgery having no history of trauma or subluxation or pre-operative macular edema as determined by OCT. Pre-operative history taking, assessment of visual acuity (unaided, pinhole and best corrected), detailed anterior and posterior segment examination including Central Macular Thickness (CMT) was done in all the patients. Cataract surgery by Phacoemulsification or Manual Small Incision Cataract Surgery (M-SICS) was done. Patients were followed up on post-operative day 1, day 7 and 1st month. **Results:** The incidence of Pseudophakic CME or Irvine-Gass syndrome is 3.8% (19 out of 500), out of which 16 (84.21%) peaked at 1 month post-operatively. **Conclusion:** An asymptomatic increase in CMT occurs even after routine cataract surgery. There is a significant difference in the incidence of Pseudophakic CME following uncomplicated and complicated cataract surgeries; the peak incidence being noted at 1 month post-operatively. OCT is indispensable for the early diagnosis and management of Pseudophakic CME.*

**Keywords:** Macular thickness, Central Macular Thickness (CMT), Pseudophakic Cystoid Macular Edema, post-cataract macular edema, Optical Coherence Tomography (OCT)

## 1. Introduction

The central 1.5mm of the macula is termed the fovea, within which is a small, circular depression called foveola. The vision is most acute at the foveola, where only cones are found as each cone directly relays to a single ganglion cell. Hence, any pathology at the macula grossly affects visual acuity.

Pseudophakic Cystoid Macular Edema (CME) or post-cataract macular edema is a primary cause of reduced vision following cataract surgery. Macular edema after cataract surgery occurs primarily in the central region of the macula [1]. Many factors are thought to contribute to its incidence such as the type of cataract surgery, duration of surgery, posterior capsular intactness perioperatively, vitreous loss, postoperative inflammation, and some latent retinopathy like diabetes [2]. Preexisting conditions such as diabetes mellitus [3] and uveitis as well as intraoperative complications can raise the risk of developing CME postoperatively. The possible onset of macular alterations after uncomplicated cataract surgery must be taken into account as a potential later complication, because it can lead to a permanent loss of visual acuity [3].

Retinal thickness can be measured by Optical Coherence Tomography (OCT) which is a non-invasive diagnostic technique that can provide cross-sectional images of macula in vivo and quantify macular thickness variation with a precision of 10µm. It appears to be more objective and reproducible which indicates that OCT may be the best

choice to investigate macular changes after cataract surgery [2].

Analysis of macular thickness by OCT would help in early detection of symptomatic cases of macular edema following cataract surgery. This, in turn, would guide prompt treatment of the patient. In addition, visual prognosis can be anticipated pre-operatively to an extent and corresponding therapy started in patients predisposed to develop macular edema like the elderly, diabetics, those suffering from uveitis, patients with epiretinal membrane to mention a few. Screening prior to surgery with the OCT can also detect a lamellar macular hole, vitreomacular traction syndrome, and an occult fluid leak from central serous retinopathy as well as occult serous retinopathy or a subretinal nevus. Because patients with these pathologies will have less-than-perfect vision after cataract surgery, it is critical to factor them in when considering an implant and guiding patients' postoperative expectations [4]. This information can, in turn, be used to guide the decision of patients willing to opt for premium intraocular lenses. Thus, wherever the resources permit, analysis of macular thickness by OCT should be included routinely in pre-operative evaluation of patients posted for cataract surgery and also, post-operatively.

## 2. Objectives

- To validate a method of reporting post-cataract macular edema (ME) using optical coherence tomography (OCT)
- Early diagnosis and treatment of symptomatic macular edema

### 3. Materials and Methods

This was a prospective, observational study done with the approval from Institutional Ethics Committee and the protocol complied with the tenets of the Declaration of Helsinki. In the current study, 500 cases, admitted on the basis of inclusion and exclusion criteria discussed below and operated for cataract surgery between the period July 2016 to June 2018, were analysed by OCT for Macular Thickness.

#### Inclusion Criteria

Adult patients attending O.P.D. of G. T. Sheth Eye Hospital, P. D. U. Government Medical College, Rajkot and diagnosed as having cataract

#### Exclusion Criteria

- Traumatic cataract
- Subluxated cataract

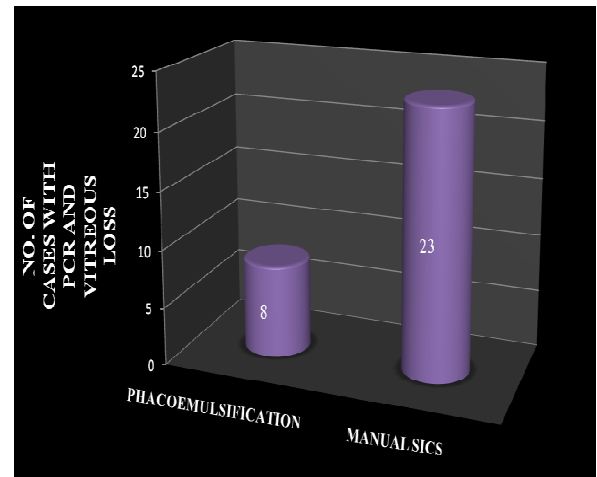
All the cases underwent a detailed history taking pre-operatively and a detailed pre-operative as well as post-operative (1st day, 7th day and 1st month) ocular examination. It consisted of assessing Unaided Visual Acuity (VA), Pinhole VA and the Best Corrected Visual Acuity (BCVA). Anterior segment examination was done with a Slit Lamp Biomicroscope; and after dilating the patient's pupil, posterior segment examination was done with Binocular Indirect Ophthalmoscopy and OCT for Central Macular Thickness (CMT).

In the current study, increase in Central Macular Thickness more than or equal to 40µm [5] and/or loss in Visual Acuity (unaided) by 2 or more lines on the Snellen's Visual Acuity Chart than expected Visual Acuity [6], [7] or a visual acuity of 6/12 or worse [8] (in the absence of other causes of decreased visual acuity) was considered as having pseudophakic Cystoid Macular Edema (CME).

An informed valid consent was taken and the cases underwent cataract surgery either by Phacoemulsification or by Manual Small Incision Cataract Surgery (M-SICS) without selection bias. All the patients were started on Ofloxacin 0.3% + Dexamethasone 0.1% combination eye drops 2 hourly for 7 days post-operatively, followed by four times daily for 1 month and then tapered off weekly.

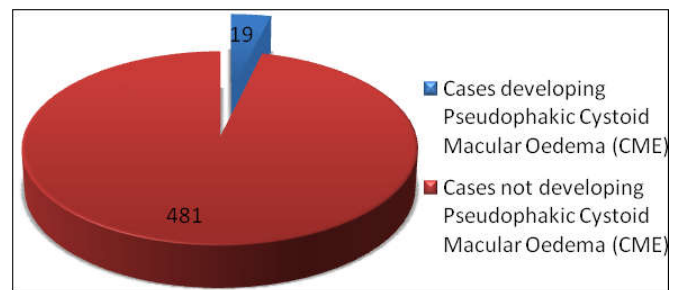
### 4. Results and Analysis

In the current study, 294 (58.8%) patients undergoing cataract surgery were males and 206 (41.2%) were females. The peak age group of patients undergoing cataract surgery was 61-70 among both the sexes. Out of 500, 302 (60.4%) cataract surgeries done were by M-SICS technique and the remaining 198 (39.6%) were by Phacoemulsification technique.



**Chart 4.1:** Incidence of Posterior Capsular Rupture (PCR) and Vitreous Loss by Phacoemulsification and M-SICS

In the current study, the difference in the incidence of PCR and Vitreous Loss by Phacoemulsification and M-SICS is not significant ( $p=0.10$ ) at  $p<0.05$ .



**Chart 4.2:** Incidence of pseudophakic Cystoid Macular Edema (CME)

In the current study, the incidence of Pseudophakic CME or Irvine-Gass syndrome is 3.8% (19 out of 500), out of which 16 (84.21%) peaked at 1 month post-operatively.

Furthermore, the incidence of pseudophakic CME in uncomplicated cases is found to be 0.86% and that in complicated cases is 48.39%, implying a significant difference in the occurrence of pseudophakic CME between complicated and uncomplicated cataract surgery ( $p$  value  $<0.00001$  at  $p<0.05$  for both the techniques).

2 out of 71 diabetic cases and 1 out of 46 cases having diabetes mellitus and hypertension developed Pseudophakic CME, which was statistically insignificant ( $p=0.83$  at  $p<0.05$ ).

In the current study, both the sexes showed an increase in the Central Macular Thickness (CMT) but it was asymptomatic and not significant on any of the post-operative follow-ups;  $p=0.99$  on the 1st post-operative day,  $p=0.98$  on the 7th post-operative day and  $p=0.99$  at the 1st post-operative month. ( $p<0.05$ ). The mean pre-operative CMT in male cases was 259.85µm and that in female cases was 248.86µm. The mean pre-operative CMT irrespective of the sex was 255.32µm. The mean post-operative CMT on the 1<sup>st</sup> day was 262.17µm, that on the 7<sup>th</sup> day was 266.98µm and that at the 1<sup>st</sup> month was 270.92µm.

Also, there was no significant difference in the change in mean CMT ( $p=0.99$  on the 1<sup>st</sup> and 7<sup>th</sup> post operative day;  $p=0.97$  at 1 month post-operatively) post-operatively in diabetic and non-diabetic patients, considering  $p<0.05$ .

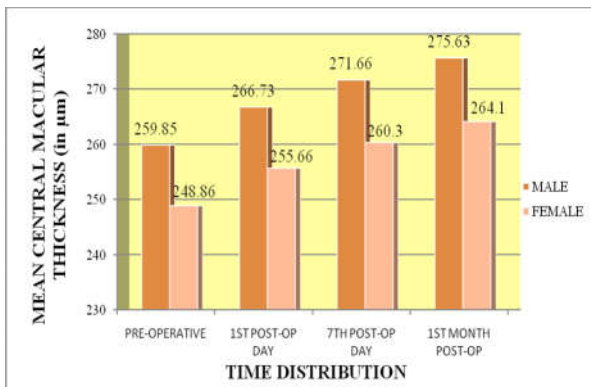


Chart 4.3: Mean Central Macular Thickness (CMT) pre-operatively and post-operatively (1<sup>st</sup> day, 7<sup>th</sup> day and 1<sup>st</sup> month)

### 5. Discussion

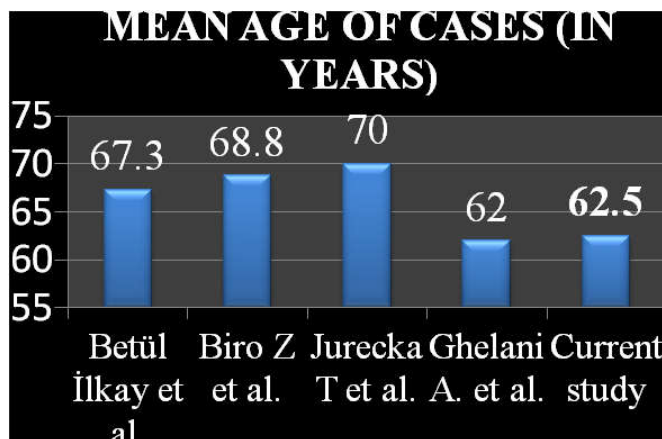


Chart 5.1: Comparison of mean Age of Cases in various studies

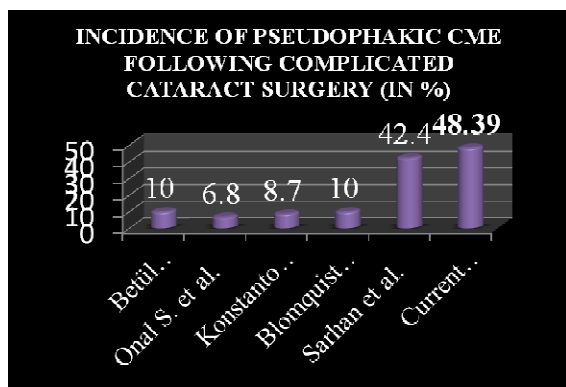


Chart 5.2: Comparison of the incidence of Pseudophakic CME in complicated cases in various studies

The current study also notes that the techniques of modern cataract surgery i.e., Phacoemulsification and Manual SICS are safe with respect to complications like Posterior Capsular Rupture (PCR) and vitreous loss ( $p=0.1$ ).

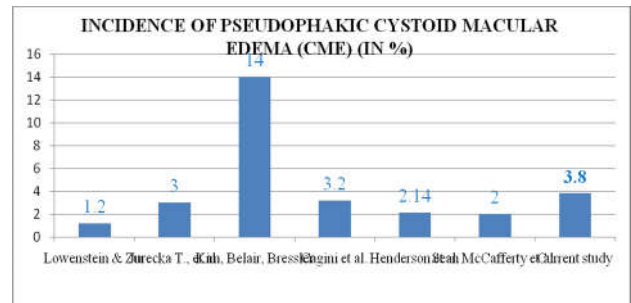


Chart 5.3 Comparison of the incidence of Pseudophakic CME in various studies

The peak increase in Central Macular Thickness occurs at 1 month post-operatively, which is consistent with the studies conducted by Tsilimbaris M et al [9] and Jurecka T et al [10].

In the current study, development of pseudophakic Cystoid Macular Edema (CME) cannot be attributed to the technique of cataract surgery ( $p=0.23$ ) at  $p<0.05$ , which is consistent with the results of the studies conducted by Ghelani A. et al. [11] Kaur N. et al. [12] and Majeeth et al [13].

### 6. Conclusion

The following can be concluded from this study:

- The mean pre-operative CMT in male cases was 259.85µm and that in female cases was 248.86µm
- There is an asymptomatic increase in CMT even after routine cataract surgery
- The incidence of Pseudophakic CME or Irvine-Gass syndrome is 3.8%
- The peak incidence (84.21%) of Pseudophakic CME/Irvine-Gass syndrome is noted at 1 month after cataract surgery
- There is a significant difference in the occurrence of Pseudophakic CME between complicated and uncomplicated cataract surgery; incidence of Pseudophakic CME in uncomplicated cases is found to be 0.86% and that in complicated cases is 48.39%
- OCT is essential for the early diagnosis and treatment of Pseudophakic CME

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## Author Profile



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