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## Original Research Article

## Study of changes in macular thickness following uneventful cataract surgery

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## ABSTRACT

**Introduction:** Worldwide, cataract accounts 47.8%. Phacoemulsification cataract surgery had good results. Current study aimed to identify the macular thickness following uneventful phacoemulsification & small incision cataract surgery method (SICS) comparison with visual acuity.

**Materials and Methods:** In total (n=50) patients, 50% undergone SICS for one eye with bag polymethacrylate intraocular lens implantation and 50% undergone phacoemulsification method in one eye with in bag acrylic type of foldable IOL. Postoperatively patients followed on day 7, week 2 and week 4 and upto 3 months. The complete ophthalmological examination and OCT of macula was done at follow-up.

**Results:** Subclinical macular oedema noted in one case at 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> week follow-up, but it was reduced at 3<sup>rd</sup> month. There was statistical (p<0.05) significant difference observed in macular thickness between the preoperative & post operative 1<sup>st</sup> week, post-operative 2<sup>nd</sup> week & post-operative 4<sup>th</sup> week followup in Phaco group. Eyes with SICS procedure also shown statistical (p<0.05) significant difference as above pre and postoperative follow-ups without affecting the final visual outcome.

**Conclusion:** Post operatively, there was increased macular thickness without affecting the final visual outcome following phacoemulsification procedure. Subclinical macular edema noted at 1<sup>st</sup> week and reduced at 3<sup>rd</sup> month.

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## 1. Introduction

Cataract is a important cause of avoidable blindness and visual impairment worldwide. Surgeries are associated with postoperative risks like macular edema. Cystoid macular oedema following cataract surgery is one such manifestation. The incidence of CME may be decreased in phacoemulsification surgery, as 0% and 9%.<sup>1-3</sup> The incidence of angiographic leakage after uneventful cataract is exists between 9.1% and 20.4%.<sup>2-4</sup>

Phacoemulsification with foldable posterior chamber intraocular lens (PCIOL) is standard surgery with less complications. Clinical diagnosis of CME is confirmed by optical coherence tomography and FA. With modern techniques i.e. Phacoemulsification, incidence of macular edema is less than previous techniques.<sup>1-4</sup>

Hence, current study aimed to compare macular thickness following uneventful phacoemulsification surgery and SICS procedure and it's correlation with visual acuity.

## 2. Materials and Methods

This prospective study conducted at department of ophthalmology Narayana medical college and hospital, Nellore, Andhra Pradesh.

50 patients underwent cataract surgery of age ranging from 35-78 (28 males+22 females).

The optical coherence tomography was measured to know macular thickness in all patient using spectral domain.

## 2.1. Inclusion criteria

Patients who are willing to undergo uneventful cataract surgery; cataract which allows pre-operative OCT.

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## 2.2. Exclusion criteria

Patients those have mature, complicated, traumatic cataract, retinal pathology.

## 2.3. Pre-operative examination

Procedures like Visual acuity check by Snellen chart; Slit lamp biomicroscopy of fundus; OCT fast macular scan, Fundus photography; Retinal thickness analysis, line scans through the fovea and retinal map analysis were carried out.

Other examinations like Intraocular pressure (IOP); Patency of the naso-lacrimal duct by syringing; Axial length using the IOL master and General examination were carried out to all patients.

**Surgical procedure:** In phaco-procedure, after superotemporal scleral tunnel incision, a foldable acrylic intraocular lens was inserted in capsular bag. Whereas in manual SICS procedure, the nucleus removed using the sandwich technique and 6.0 mm PMMA single intraocular lens implanted in bag. Patients were followed upto three months.

**OCT:** All eyes were dilated before OCT examination with 1% tropicamide and 5% phenylephrine hydrochloride. Retinal thickness was measured for each scan. Retinal architecture for retinal edema, cystoid spaces, hard exudates and sub retinal fluid were also examined.

The mean differences in both groups were analysed through student's 't' test. 95% confidence interval (p value < 0.05) was considered as statistically significant.

## 3. Results

Out of the 50 patients, (26 [52%] males and 24[48%] females admitted with mean age was  $61 \pm 11.5$  years(40-75 years).

The mean age of patients in SICS procedure and phacoemulsification procedure was  $60.75 \pm 11.5$  years and  $62.2 \pm 10.4$  years respectively without significant difference.

In total 50 patients, 80% didn't observed any systemic illness, 20% suffered from hypertension.

### 3.1. Duration of surgery

In phaco procedure, Mean phacoemulsification time was  $1.15 \pm 0.3$  minutes and total mean surgical time was  $9.8 \pm 1.2$  (9.2 to 10.3) minutes.

In SICS procedure, the mean surgical time observed as  $9.8 \pm 0.50$  (9.5 to 10.2) minutes, which was less than phaco procedure.

### 3.2. Visual acuity

The mean difference between pre-operative visual acuity in SICS group and in phacoemulsification group shows statistically significant,  $p < 0.001$ .

The mean difference between the post-operative visual acuity in SICS group and in phaco procedure doesn't show any statistically significant,  $p=0.11$ .

### 3.3. Macular thickness

Statistical analysis of 5 mean values like pre-operative, postoperative 1<sup>st</sup> visit; 2<sup>nd</sup> visit; and 4<sup>th</sup> week visit and post-operative 3<sup>rd</sup> month follow-up in SICS procedure carried out through one-way ANOVA. The difference shown significancy ( $p=0.01$ ). Whereas to measure the intergroup differences, Tukey's method post-hoc test performed. There was significant ( $p<0.01$ ) difference noted between the intergroup macular thickness values.

The sub-clinical macular oedema noted at 1<sup>st</sup> visit, 2<sup>nd</sup> visit and 4<sup>th</sup> week follow-up. But, it was reduced at third month follow-up.

In phaco group, One-way ANOVA, thee differences were not found significant ( $p=0.09$ ). On Tukey's method post-hoc test, significant ( $p<0.05$ ) differences observed between the intergroup macular thickness value.

When both procedures SICS and phacoemulsification groups were compared, a subclinical macular oedema noted up to the 4<sup>th</sup> week in SICS group.

## 4. Discussion

The macular area was important part, is sensitive to any type of insult, leads to deterioration of visual acuity. Even though surgical advances in cataract surgery Cystoid macular oedema is remains as a complication.

WHO estimates that the current global prevalence of blindness is 0.57% (0.2%–1%), with more than 82% of all blindness occurring in individuals aged 50 and older. In our study, there was no significant difference observed in age of both groups. The present study results were similar to study by Ghosh et al.<sup>5</sup>

Nakayama et al<sup>6</sup> study reveals that macular thickening, increase in aqueous flare and cells were identified in diabetic eyes & progressive macular thickening identified followed 6 months with decreased visual acuity due to macular oedema.

Jurecka et al, study observed a positive correlation between phacoemulsification surgical time and increase in macular volume & retinal thickness at 1<sup>st</sup> week follow-up and in the 1<sup>st</sup> and 2<sup>nd</sup> month follow-up.<sup>7</sup> Whereas, our study doesn't shown positive correlation. The cause for this rise in thickness may be subclinical breakdown of the blood retinal barrier.

In our study the phacoemulsification time and axial length doesn't correlate with macular thickness changes. Study by Jagow et al.<sup>8</sup> also reveals no correlation.

Current study, the visual acuity was same in all follow-up visits. But studies by Gogate et al., Ruit et al., and Ghosh et al., demonstrates that visual outcome was identical with 6 month visit.<sup>5,9,10</sup>

**Table 1:** Comparison of visual acuity at different time intervals

	SICS group	Phaco group	P value
Age –years	was 60.75 ± 11.2 years	62.2 ± 10.4.	Not sig
Duration of surgery	10.2 ± 1.18 [9.6 to 10.5 min]	9.8 ± 1.2 (9.2 to 10.3) min	Not sig
Visual acuity-Pre op	0.22 ± 0.16 (0.15-0.26) decimals (~6/36p)	0.30 ± 0.2 (0.25 to 0.36) decimals (~6/18p)	p <0.001
Visual acuity-post op	0.63 ± 0.17 (0.57 to 0.70) decimals (~ 6/9)	0.65 ± 0.2 (0.62- 0.70) decimals (~ 6/9p).	p < 0.11

**Table 2:** Mean macular thickness at different time intervals

Macular thickness	Phaco group	SICS group
pre-operative	160.5 ± 12.5 (155.5-161.5) μ.	166.5 ± 15.7 (156.5-170.5) μ
1 <sup>st</sup> week	169.85 μ ± 12.4(168.5-172.5) μ	176.44μ ± 13.8 (170.5-180.4)μ.
2 <sup>nd</sup> week follow-up	170.24μ ± 11.4 (169.5-174.5) μ.	171.42μ ± 13.8 (165.55-177.5)μ
4 <sup>th</sup> week follow-up	165.52 μ ± 12.5(164.5-169.5) μ	167.8μ ± 12.5 (163.5-171.5).
3 <sup>rd</sup> month follow-up	162.5 ± 12.8(160.5-165.5) μ.	168.5 ± 15.5 (160.5-172.5)μ.

Polito et al,<sup>11</sup> Danis et al.,<sup>12</sup> studies were used fast macular thickness map procedure to measure macular thickness. Whereas our study also used the same protocol to measure macular thickness.

Study by Sourdille et al.,<sup>13</sup> shows the changes in macular thickness after uneventful cataract surgery and compared with OCT findings with flare and cells. Brio et al.<sup>14</sup> study shows the changes in foveal & perifoveal thickness after phacoemulsification. Changes of macular thickness were observed at post operative day 1, day 30, and day 60 and in perifoveal 3.0 and 6.0 mm sectors. Current study also observed similar changes in the phacoemulsification. In the phaco group, there was significant subclinical change in the macular thickness at 1<sup>st</sup> week.

Ghosh et al, study demonstrates the central subfield mean thickness in SICS procedure as 192.8±17.9 μm, which was not significant than phacoemulsification as 192.1 ± 27.4 μm at 1<sup>st</sup> postoperative day follow-up. Increase in macular thickness did not affect the final visual outcome. Our study results also similar to Ghosh et al. When both groups compared, subclinical macular oedema observed up to 4<sup>th</sup> week in SICS group.

Similarly, Mendes et al.,<sup>15</sup> Biro et al.,<sup>14</sup> and Ghosh et al.,<sup>5</sup> didn't shown clinical macular odema in their study.

**5. Conclusions**

Sub-clinical macular edema was developed after uncomplicated cataract surgery higher at 1<sup>st</sup> week visit and can less at 3<sup>rd</sup> month follow-up. OCT showed macular edema without altering architecture of the macula. Subclinical edema is longer in eyes of SICS group when compare to phacoemulsification group without any effect on visual acuity.

**6. Source of Funding**

Nil.

**7. Conflict of Interest**

The authors declare that there is no conflict of interest.

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