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Effect on determinants of dry eye after phacoemulsification

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ABSTRACT

Purpose: Quantitative analysis of determinants of dry eye among patients undergoing phacoemulsification surgery.
Design: This was a single-centered hospital-based, prospective observational study.
Materials and Methods: Sixty eyes of sixty patients suffering from senile cataract undergoing phacoemulsification surgery were evaluated after randomly selecting them and were followed up postoperatively on day 1 and week 4 to evaluate the dry eye parameters selected for the study.
Results: A total of 60 eyes of 60 patients were chosen with a mean age of 63.96 ± 6.95 (mean ± SD) years. The mean baseline Schirmer's test I, tear break-up time, lissamine test, and OSDI values were 25.45 ± 4.68 mm, 14.15±2.79 s, 1.26 ± 0.44 s, and 7.28 ± 3.13 respectively, whereas post-operatively day 1 the values were 14.75 ± 4.32 mm, 8.91 ± 2.93 s, 3.11 ± 0.78, and 22.85 ± 6.80 respectively. On 4 week follow-up, the value were 22.60 ± 4.54 mm, 13.30 ± 2.79 s, 1.43 ± 0.67, and 12.13 ± 5.45 respectively.
Conclusion: Dry eye after cataract surgery is mainly because of tear film stability. The study points to the fact that patients experience increase in dry eye symptoms postoperatively. We also observed a very predictable trend of dry eye in our study, wherein the incidence increases immediately in the early postoperative period, followed by a gradual decrease in dry eye parameters approaching their preoperative baseline value.

1. Introduction

Dry eye is an ocular surface disease characterized by loss of homeostasis of the tear film, and accompanied by bothersome ocular symptoms. The etiology is multifactorial which includes inflammation, and neurosensory abnormalities which cause tear film instability.[1] Dry eyes negatively affect surgical outcomes and reduce patient satisfaction and quality of life after cataract surgery.[2] Dry eye disease depends on multiple factors such as demographic profile, procedural differences,[3–5] and several host factors including the type of procedure, type of ophthalmic solution being used during surgery,[6] intra and post-operative medications,[7] total cumulative dissipated energy (CDE) used during phacoemulsificationand time since surgery.[8] Thus, there is a need to study this disease so that we can introduce countermeasures to make the patient's experience as comfortable and at ease as possible.

2. Materials and Methods

Our study was a hospital-based, single-center, observational and prospective study. The study was done as per the ethical standards maintained by the declaration of Helsinki. Each patient before enrollment was explained about the study and a well-written and informed consent was taken.

Patients having senile cataracts and without pre-existing dry eye disease who underwent phacoemulsification surgery

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were randomly selected by chit method. A complete ophthalmic examination was done for each patient. Four parameters were used for evaluating dry eye which included: Tear secretions were examined using Whatman filter paper no. 41 for Schirmer's test I, fluorescein dye followed by a slit-lamp examination to determine the tear film break up time, lissamine dye for lissamine green staining, and a questionnaire used for ocular surface disease index (OSDI) which is a subjective tool for evaluating dry eye.

The patients after a baseline follow-up were assessed for dry eye post-operatively at 1 week and 4 weeks respectively. The patients experiencing dry eyes were prescribed lubricant eye drops post-operatively.

3. Results

In the study, a total of 60 eyes of 60 patients were enrolled in the study. The following results were observed.

The mean demographic age was noted to be 63.96 ± 6.95 (mean ± SD) years. The study showed a greater weight age for male patients of 63.34% and for females 36.66%. Among the total patients, 81.66% belonged to rural areas and 18.34% from urban areas.

A mean baseline schirmer's test I value was 25.45 ± 4.68 (mean ± SD) mm. Which changed to 14.75 ± 4.32 mm (p value<0.001) at 1 week and at 4 weeks changed to 22.60 ± 4.54 mm (p value<0.001).(Table 1)

Also, the mean baseline tear break-up time was 14.15 ± 2.79s. At 1 week postoperatively the value changed to 8.91 ± 2.93 s (p<0.001) and at 4 weeks the value reached 13.30 ± 2.79 s (p<0.001).(Table 2)

Lissamine green staining test had a mean baseline value of 1.26 ± 0.44. At 1 week post-operatively the value became 3.11 ± 0.78 (p<0.001) and at 4 weeks the value became 1.43 ± 0.67.(Table 3)

The mean baseline value for OSDI was 7.28 ± 3.13. At 1 week postoperative the value was 22.85 ± 6.80 and at 4 weeks the value was 12.13 ± 5.45, both of them were significant (p<0.001).(Table 4)

All the parameters chosen to evaluate dry eye strongly point out the trend of increasing dryness of eyes in the immediate postoperative period. This was followed by near normalization of values and returning to their baseline values as time progressed from day 1 post-operatively.

4. Discussion

Dryness in the eyes post-operatively is a well-known problem faced by patients. Despite surgical results reaching near perfection, post-operative ocular surface dryness is a very major cause of patient dissatisfaction. To address this problem various studies have been conducted to evaluate it.

Li XM et al[9] noted that after cataract surgery, the incidence of dry eye increased. This was also seen in our study where determinants like OSDI which indicated that most patients developed dry eye symptoms after surgery and TBUT (tear break up time) & ST I (Schirmer's test I) which decreased in patients after cataract surgery again pointing to dry eye disease after surgery.

Servet Cetinkaya et al[10] stated that in their study the ocular surface disease index questionnaire scores increased post-operatively after the first postoperative follow-up. The mean postoperative 1st week and 1st month break-up time (TBUT) values were 7.03 ± 0.97s & 7.42 ± 0.79s respectively which were significantly lower than the preoperative TBUT baseline value of 11.65 ± 2.31s, and the mean baseline preoperative Schirmer test I value 6.39 ± 1.42 changed to 4.45 ± 0.95 on week 1 and 4.50 ± 1.00 at first month which were significantly lower than the baseline. Comparing this to our study the mean baseline tear break-up time was 14.15 ± 2.79s. At 1 week postoperatively the value changed to 8.91 ± 2.93 s and at 4 weeks the value reached 13.30 ± 2.79 s and the mean baseline schirmer's test I value was 25.45 ± 4.68 (mean ± SD) mm. Which changed to 14.75 ± 4.32 mm at 1 week and at 4 weeks changed to 22.60 ± 4.54 mm.

Zamora MG, Caballero EF et al[11] noted in their study that all dry eye tests were significantly worse after surgery post-operatively. Ocular Surface Disease Index increased from 10.98 ± 5.05 to 12.80 ± 5.77 at 7 days (p < .001), and to 11.09 ± 4.63 at 1 month (p = .90). Average break-up time values were significantly lower at 1 week (6.98 ± 2.79 s), and 1 month (7.05 ± 2.86 s) post-operatively than the preoperative value (8.78 ± 2.97 s) (p < .001). The mean postoperative first month Schirmer test I value (8.32 ± 3.58 mm) was significantly lower than the preoperative value (9.05 ± 3.63 mm) (p < .001). Also, in our study, all dry eye tests were significantly worse after surgery. The mean baseline value for OSDI was 7.28 ± 3.13. At 1 week postoperatively the value increased to 22.85 ± 6.80 and at 4 weeks the value decreased to 12.13 ± 5.45 nearing mean baseline value and both of them were significant (p<0.001). The mean baseline tear break-up time was 14.15 ± 2.79s. At 1 week post-operatively the value changed to 8.91 ± 2.93s and at 4 weeks the value reached 13.30 ± 2.79s. The mean baseline schirmer's test I value was 25.45 ± 4.68 (mean ± SD) mm which changed to 14.75 ± 4.32 mm at 1 week and at 4 weeks changed to 22.60 ± 4.54 mm.

B. Bista et al[12] noted that patients undergoing phacoemulsification had pre-operative baseline Schirmer test, tear break up time, and lissamine green staining scores of 31.94 ± 4.142, 19.94 ± 2.064, and 0.18 ± 0.18 respectively which changed to 27.60 ± 5.824, 17.64 ± 4.462 and 0.40 ± 0.639 at fourth weeks which points to the increased incidence of dry eyes post-surgery which is a trend that was also observed in our study. The pre-operative baseline schirmer's test I, tear break-up time, and lissamine green staining scores of 25.45 ± 4.68, 14.15 ± 2.79s, and

Table 1: Schirmer's test I, in millimeters

	N	Mean	SD	Median	95%CI	P value
Baseline Variables	60	25.450	4.681	25.00	-	
1 week	60	14.750	4.328	14.500	9.816-11.58	p<0.001
4 week	60	22.600	4.541	22.000	2.595-3.105	p<0.001

The p-value is <0.001. The resultis significant.

Table 2: Tear break-up time, in seconds

	N	Mean	SD	Median	95%CI	P value
Baseline Variables	60	14.150	2.791	14.000	-	
1 week	60	8.917	2.930	8.500	4.68-5.787	p<0.001
4 week	60	13.300	2.794	13.000	0.700-0.999	p<0.001

The p-value is <0.001. The result is significant

Table 3: Lissamine green staining test

	N	Mean	SD	Median	95%CI	P value
Baseline Variables	60	1.267	0.446	1.000	-	-
1 week	60	3.117	0.783	3.000	-2.067 to1.633	p<0.001
4 week	60	1.433	0.673	1.000	-0.374 to 0.0415	0.115

The p-value is<0.001. The result is significant at 1 week
The p-value is 0.115 at 4 weeks showing non-significance

Table 4: Ocular surface disease index

	N	Mean	SD	Median	95%CI	P value
Baseline Variables	60	7.283	3.136	8.000	-	-
1 week	60	22.850	6.809	27.000	-20.43 to -16.7	p<0.001
4 week	60	12.133	5.454	12.500	-5.982 to -3.718	p<0.001

The p-value is <0.001. The resultis significant.

1.26 ± 0.44 respectively which changed to 22.60 ± 4.54 mm, 13.30 ± 2.79 s and 1.43 ± 0.67 at fourth week.

The above discussed points that our results show a similar trend as other studies thus reinforcing our results. The main drawback of our study is the small sample size. To overcome this a large study with a greater sample size will have to be conducted to appreciate the results better.

5. Conclusion

Every patient in our study had a statistically significant increase in dry eye parameters postoperatively. Also, a very predictable trend of incidence of dry eyes was observed, wherein the incidence increases immediately in the early postoperative period followed by a gradual decrease of the dry eye parameters to their pre-operative baseline values. Thus, pointing to the fact that the dry eye decreases as time increases post-operatively. This makes it very important for the ophthalmologist to review the patient after surgery to address dry eye disease as it is one of the subtle parameters that make the patient distressed even after flawless cataract surgery.

6. Source of Funding

None.

7. Conflict of Interest

Nil.

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