

Study of incidence of dry eye after manual small incision cataract surgery and phacoemulsification at a teaching hospital

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Abstract

Background: Dry eye is a clinical condition characterized by deficient tear production or excessive tear evaporation resulting in ocular discomfort. It is characterized by ocular irritation resulting from an alteration of tear film. After cataract surgery many patients complain of foreign body sensation, irritation redness & dry eye features. Present study was aimed to study incidence of dry eye after manual small incision cataract surgery and phacoemulsification at a teaching hospital. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in patients from age group of 45 – 75 years, posted for elective cataract surgery. The study parameter for documenting dry eye were Schirmer's test, tear break-up time (TBUT) test. **Results:** In present study, 140 patients (140 eyes) were considered for study. Majority were from 56-65 years age group (49.29 %), were female (54.29 %). Mean age of study participants was 67.98 ± 6.26 years. Majority underwent SICS (61.43 %) as compared to phacoemulsification (45.71 %). We noted that difference between results at 1 week follow-up & at 3 month follow up for values of dry eye incidence (35% vs 8.57 %), Tear film break-up time (8.02 ± 1.34 secs vs 8.02 ± 1.34 secs) and Schirmer's test (14.23 ± 6.12 mm vs 21.28 ± 0.64 mm) was statistically highly significant ($p < 0.001$). Small incision cataract surgery versus Phacoemulsification surgery at 1 months, difference between values of dry eye incidence (35.19 % vs 13.95 %), Tear film break-up time (11.84 ± 2.54 secs vs 7.73 ± 2.16 secs) and Schirmer's test (14.69 ± 3.29 mm vs 12.34 ± 4.19 mm) was statistically highly significant ($p < 0.001$). **Conclusion:** Cataract surgery can cause or aggravate dry eye and affect the dry eye test values in the postoperative period up to 3 months in phacoemulsification surgery, more than manual small incision cataract surgery. **Keywords:** Dry eye, cataract surgery, Phacoemulsification, Small incision, Schirmers test.

Introduction

Dry eye disease is a multifactorial disease of the tear film and ocular surface that results in symptoms of discomfort, visual disturbance, and tear instability with potential damage to the ocular surface. Dry eye is a clinical condition characterized by deficient tear production or excessive tear evaporation resulting in ocular discomfort. It is characterized by ocular irritation resulting from an alteration of tear film.¹

Phacoemulsification is the most commonly employed technique for cataract surgery worldwide. However, manual small incision cataract surgery is still widely performed as it offers distinct advantages; it is relatively inexpensive, smaller learning curve and shorter

operating time.² After cataract surgery many patients complain of foreign body sensation, irritation redness, blurring of vision which are unwanted effects after an uneventful surgery. These effects are worse in the elderly population and those with ocular surface disorder.³ Aging and surgical incisions are established culprits of postoperative dry eye. Moreover, preoperative and postoperative use of topical medications like non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids and preservatives in eye drops cause epithelial toxicity and delay the ocular surface healing after cataract surgery.^{4,5,6} Most common surgery performed in ophthalmic units being cataract surgery, and since senile cataract comprises most of the cataract surgery, the identification and management of ocular surface disease is therefore important. Present study was aimed to study incidence of dry eye after manual small incision cataract surgery and phacoemulsification at a teaching hospital.

Material And Methods

Present study was single-center, prospective, observational study, conducted in Department of Ophthalmology, Sri Lakshminarayana Institute of Medical Sciences, Osudu Agaram, Kudapakkam Post, Villianur, Puducherry. Study duration was of 6 months (July 2021 to December 2021). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Patients from age group of 45 – 75 years, posted for elective cataract surgery, willing to participate in present study

Exclusion criteria

- Patients with history of diabetes, complicated cataract, pre-existing ocular trauma or surgery
- Patients with pre-existing dry eyes (schirmers less than 10 mm), Sjogren's syndrome,
- Patients with pre-existing ocular diseases like glaucoma, uveitis, disorders of lid and nasolacrimal pathway, ocular allergies, pterygium and previous ocular surgeries.

Study was explained to patients in local language & written consent was taken for participation & study. All patients underwent preoperative history taking (symptoms, whether already diagnosed as having dry eye disease or if they are taking artificial tear substitutes), followed by detailed ocular examination, best-corrected visual acuity, slit lamp examination, dilated refraction and fundus examination, grading of cataract, intraocular pressure measurement by applanation tonometry, and sac syringing. All patients underwent slit lamp examination to rule out any ocular surface disorder. After fitness, patients underwent cataract surgery either by manual small incision cataract surgery or by phacoemulsification by senior ophthalmologist (>10 year's experience). Standard post-operative care was provided.

The study parameter for documenting dry eye were Schirmer's test, tear break-up time (TBUT) test. Schirmer's test was done to test basal and reflex tear secretion using a specialized Schirmer's strip prepared from Whatman filter paper no. 41 measuring 40×5 mm, marked 0 to 35 mm. Depending on the wetting of the strip, the results of Schirmer's test were graded as: >10 mm, normal (grade 0); 5-10 mm, mild (grade 1); 3-4 mm, moderate (grade 2); 0-2 mm, severe (grade 3). TBUT was assessed to test tear film stability and meibomian gland disorder and the grading was done depending upon the time between the last blink and the appearance of a dry spot. TBUT less than 10 s was abnormal and graded as: >10 s, normal (grade 0); 3.1-6 s, moderate (grade 2); 6.1-10 s, fair (grade 1); <3 s, poor (grade 3).

Findings noted at baseline, at 1 week, 1 month and 3 months of follow up were analysed. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-

square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

Results

In present study, 140 patients (140 eyes) were considered for study. Majority were from 56-65 years age group (49.29 %), were female (54.29 %). Mean age of study participants was 67.98 ± 6.26 years. Majority underwent SICS (61.43 %) as compared to phacoemulsification (45.71 %).

Table 1: General characteristics

Characteristics	No. of patients	Percentage
Age groups (in years)		
45-55	22	15.71%
56-65	69	49.29%
66-75	49	35.00%
Mean age (mean \pm SD)	67.98 ± 6.26	
Gender		
Male	64	45.71%
Female	76	54.29%
Type of Surgery		
Phacoemulsification	54	38.57%
SICS	86	61.43%

In present study, we noted that difference between results at 1 week follow-up & at 3 month follow up for values of dry eye incidence (35% vs 8.57 %), Tear film break-up time (8.02 ± 1.34 secs vs 8.02 ± 1.34 secs) and Schirmer's test (14.23 ± 6.12 mm vs 21.28 ± 0.64 mm) was statistically highly significant ($p < 0.001$).

Table 2: Incidence of dry eye, Tear film break-up time and Schirmer's test results at 1 week, 1 month and 3 months postoperatively after cataract surgery.

Characteristics	Preoperative	Postoperative follow up			p-value
		1-week	1-month	3-months	
Dry eyes	NIL	49 (35 %)	31 (22.14 %)	12 (8.57 %)	<0.001
Tear film break-up time (TBUT) (in sec)	15.8 ± 0.31	8.02 ± 1.34	12.02 ± 1.23	8.02 ± 1.34	<0.001
Schirmer's test (in mm)	23.84 ± 6.44	14.23 ± 6.12	18.91 ± 2.60	21.28 ± 0.64	<0.001

When we compared small incision cataract surgery with Phacoemulsification surgery at 1 months, difference between values of dry eye incidence (35.19 % vs 13.95 %), Tear film break-up time (11.84 ± 2.54 secs vs 7.73 ± 2.16 secs) and Schirmer's test (14.69 ± 3.29 mm vs 12.34 ± 4.19 mm) was statistically highly significant ($p < 0.001$).

Table 3: Tear film break-up time and Schirmer's test results at 1 month after surgery.

Surgical procedure	Small incision cataract surgery	Phacoemulsification	P value
Dry eyes	19 (35.19 %)	12 (13.95 %)	<0.001
Tear film break-up time (TBUT) (in sec)	11.84 ± 2.54	7.73 ± 2.16	<0.001
Schirmer's test (in mm)	14.69 ± 3.29	12.34 ± 4.19	<0.001

Discussion

Cataract surgery is known to modify tear film & ocular surface both qualitatively & quantitatively. Manual small-incision cataract surgery (manual SICS) and phacoemulsification techniques have different characteristics in site and depth of incision. In former, a straight incision is made on the sclera superiorly which penetrates the cornea at the Schwalbe line level, whereas phacoemulsification an incision which is made on clear cornea at the temporal site.⁷ Various factors play an important role in outcome of the patients with or without dry eye that undergo cataract surgery.

The etiology of dry eye syndrome has been attributed to a number of causes and factors that include old age, gender, disorders affecting the connective tissue, metabolic disorders like diabetes and hypertension, contact lens usage, drugs like antihistamines, anticholinergics, antidepressants, oral contraceptives and topical eye drops containing preservatives, and ocular diseases like blepharitis, chronic conjunctivitis, meibomitis, and pterygium.^{8,9}

Jitendra K et al.,¹⁰ studied 110 eyes of 110 patients before and after manual small incision cataract surgery. The majority of the study participants were aged between 51- 60 years (51%). 30% of the eyes showed lower TMH at 3 months post operative visit. 8 % the eyes recorded lower tear film break up time (TBUT) values at 3 months postoperative follow up, which was statistically significant ($P < 0.01$). There was a statistically significant difference in ocular surface changes with Rose Bengal staining between preoperative and postoperative 1 week, 1 month, and 3 months follow up ($P < 0.002$).

Gupta M et al.,¹¹ studied 50 eyes of 50 patients underwent clear corneal phacoemulsification with IOL implantation. In all age group, S1T and FTBUT, conjunctival staining showed lowest values at 1st week ($p < 0.05$) and by 12th week values has come near to base line value ($p < 0.05$). Results showed only 38% of cases in 45-55 age group, 50% in 56-65 age group and all the cases showed dry eye in 66-75 age group at 12th week. Conclusions: We have concluded that phacoemulsification surgery affects the tear film stability and the production of tears postoperatively and causes dry eye more in the older age group.

Abhinav K et al.,¹² studied 390 patients underwent cataract surgery, overall post-surgery residual dry eye incidence of 22.1% (95% CI 17.94 to 26.17) at the end of 3 months follow up was noted. Of these 31% had mild, 67% had moderate and 2% had severe dry eye. A higher incidence was seen in SICS as compared to phacoemulsification. A statistically significant association was noted between dry eye and diminution of vision ($p = 0.001$).

Garg P et al.,¹³ studied 120 patients with senile cataract, mean age of the patients was 59.25 ± 9.77 years and 73 (60.8%) were men. Postoperatively, Schirmer's test values ranged from 12-35 mm and 8-24 mm at first and second follow-ups, respectively. Mean TBUT was 13.16 ± 2.45 and 9.64 ± 2.20 seconds, while Lissamine green staining score was 3 in 67 (55.8%) and 1 in 67 (55.8%) subjects at first and second follow-up, respectively. OSDI values ranged from 1-30 and 10-33 with a mean of 25.97 ± 5.34 and 11.96 ± 7.47 respectively at first and second follow-up. At first follow-up, 89.1% of the 56 patients who underwent phacoemulsification were found to have grade 2 dry eye ($p < 0.001$), while 92.2% of the 64 patients who underwent small-incision cataract surgery (SICS) had grade 2 dry eye ($p < 0.001$). At second follow-up, grade 0 dry eye was observed in 92.2% of the patients who underwent phacoemulsification and 82.1% of the patients who underwent SICS ($p < 0.001$).

Prabtani RM et al.,¹⁴ compared incidence of dry eye between phacoemulsification and manual small incision cataract surgery. The values of various tear film tests Schirmer's test, tear film break up time and tear meniscus height showed no significant difference between both groups (Chi square test P Value = 0.605, 0.832, 1). There was no significant difference in incidence of dry eye in manual small incision cataract surgery and phacoemulsification (Chi square test p value = 0.317). There is high incidence of dry eye 33.33 seen in diabetic patients.

In study by Saba Ishrat et al.,¹⁵ 96 patients, including 35 (36.5%) men and 61 (63.5%) women with the mean age of 63.1 (± 8.3) years were studied. Dry eyes were found in 42% eyes ($p < 0.001$) of patients at 1 week follow-up. 15 % and 9% of the eyes were dry at 1 month and 3 months after surgery, respectively. There were 34 (53.1%) and 8 (22.2%) dry eyes in SICS and phacoemulsification groups, respectively at one-week postoperative follow-up which was a statistically significant difference. Majority of eyes (27/42, 64.3%) had mild dryness. There were significant differences in TBUT at 1 week, 1 month and 3 months postoperatively. At 1 week review, the SICS group had mean TUBT of 10.0 (± 0.55) sec as compared to 13.9 (± 0.70) sec in phacoemulsification group ($p < 0.001$).

Phacoemulsification is the most preferred technique of cataract surgery nowadays being quick, safe and giving good visual outcome. However, as with other corneal surgeries, it may cause ocular surface and normal tear function disruption post-operatively.¹⁶ The incidence of dry eye syndrome among patients undergoing cataract surgery has been shown to be dependent on a host of factors including type of procedure, type of ophthalmic solution being used, intraoperative medication, coexistent systemic disorders, operating microscope light exposure and cumulative dissipated energy (CDE) used during the procedure, and time since surgery.^{17,18,19}

Conclusion

Cataract surgery can cause or aggravate dry eye and affect the dry eye test values in the postoperative period up to 3 months in phacoemulsification surgery, more than manual small incision cataract surgery. Preoperative ophthalmological evaluation of patients before phacoemulsification or SICS for dry eye is necessary to prevent further damage to the ocular surface and early prompt management if any worsening seen post-operatively, so as to prevent a poor quality of life and vision due to dry eye syndrome.

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