A Prospective Study of Dry Eye in Patients after Manual Small Incision Cataract Surgery

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Abstract

Introduction: Dry eye is a multifactorial disease of the tears and ocular surface with symptoms of discomfort, visual disturbance, etc. with potential damage to the ocular surface. Additionally, it is followed by increased tear film osmolarity and ocular surface inflammation. Schirmer's I and tear film breakup time is performed to determine the dryness level as mild, moderate, and severe.

Aim : The research aims to establish the incidence of dry eye in patients after small incision cataract surgery.

Material and Method: 100 patients who met inclusion criteria were enlisted for cataract surgery. Every patient was asked about symptoms related to dry eye and then they underwent Schirmer's test 1 and tear film breakup time test. After this, patients were subjected to surgery with a 6-7 mm superior incision. On 1st, 7th and 30th day after operation schirmer's and tear film breakup time test was again performed. The dryness of the eyes was then analysed and graded in accordance with the 2007 DEWS classification.

Result: Out of 100 samples, 16% had dry eye preoperatively which increased to 89% postoperatively on 1st day. Out of these 89 patients having dry eye postoperatively, 35 were male and 54 were female. Gradually it reduced after 7th day and 30th day postoperatively. The mean age of the patients was 66.15 years with SD 6.10. The schirmer's test I and tear film breakup time p values were clinically significant< 0.0001.

Conclusion: After manual small incision cataract surgery, moderate to severe dryness was observed. This dryness stabilized gradually after 1st week of surgery and improved significantly further after one month with the use of lubricants, antibiotic and steroid combination.

Keywords: *Dry eye, SICS, Tear film, post –operatively, ocular Surface, Cataract.*

Introduction

Cataract is defined as any opacity in the lens or its capsule whether congenital, developmental or acquired which causes visual impairment. In India, cataract is one of the leading cause of visual impairment. Small incision cataract surgery (SICS) with corneoscleral tunnel is the most routinely performed surgery for the cataract in countries such as India .Many patients have reported of dry eye and post-operative pain symptoms following

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surgery[1]. One or more of the above contributing factors may be implicated in dry eye pathogenesis after cataract surgery .In addition, the use of topical eye drops, reduced corneal sensitivity and surgical inflammation such as a large incision created in the eye and exposure to light from microscope during surgery are considered to be responsible for post-operative dysfunction of the tear film[2,3] This study analyzes changes in tear films and production of tears after cataract surgery.

Material and Method

- **Settings:** All the examination was conducted at the Department of Ophthalmology in Shalinitai Meghe Hospital & Research Center, Wanadongri, Nagpur.
- **Research Design:** Prospective observational study.
- **Duration:** 6 months
- **Sample Size:** A total of 100 patients undergoing small incision cataract surgery.
- The study will be adhered to the tenets of the declaration of Helsinki, and it will be approved by the institutional ethics committee of SMH & RC.
- Informed consent will be obtained from all subjects after the nature and possible consequences of the study is explained to them.
- **Inclusion criteria:** Patients having unilateral or bilateral age-related cataract with or without dry eyes symptoms.
- **Exclusion Criteria:**
    1. Cataract other than senile cataract
    2. Glaucoma
    3. Sjogren's syndrome
    4. Uveitis
    5. Contact lens users
    6. Patients with constant ocular medication
    7. Patients who have had previous eye surgery
    8. Patients suffering from pterygium, ocular allergies and blepharitis.
    9. Disorders of lid and naso lacrimal pathway.

Pre-operatively all patients were asked about symptoms related to dry eye such as eye discomfort, which include soreness, itchiness, gritty sensation, blurring of vision, redness improving with blinking, and excessive tears. After this, observations were noted according toslit lamp examination, Schirmer's test 1, tear film breakup time. After all the inquiries, with a superior incision of 6-7 mmall the patients underwent cataract surgery.

Schirmer's test I: This test tests the secretion of tears over a given time span. Schirmer test I is performed with standardized stripes without topical anesthesia (total tear secretion). The strip is folded at the notch and placed at the junction of the lower eyelids in the middle and lateral thirds and allowed to remain there for 5 minutes with patient's eyes gently closed. The amount of wetting is measured after the filter paper is removed. More than 10 mm of wetting after 5 minutes is considered normal, 8-10 mm of wetting is considered mild dryness, 5-7 mm of wetting is considered moderate dryness, and less than 5 mm of wetting is considered severe dryness at the end of 5 minutes.

Tear film break up time: With minimal stimulation, fluorescein strips (Omni Strips Fluro; Ophthalmic Strips U.S.P.) are moistened with non-preservative saline and are inserted in the conjunctival sac, undetected by patients. Individuals will then be instructed to blink for a few seconds several times to ensure an appropriate mixing of stain. The tear film is then examined with a broad beam and a blue cobalt filter. The interval between the last complete blink and the appearance of the first corneal black spot or line is measured using a stopwatch. A TFBUT value more than 10 seconds is considered normal, a value of 8-10 seconds is considered mild dryness, a value of 5-7 seconds is considered moderate dryness, and a value less than 5 seconds is considered severe dryness.

The eye drops, 'Tropicacylplus' which consists of tropicamide (0.8%) plus phenylephrine hydrochloride (5%) were instilled 3 times over an hour before surgery for the dilatation of pupil.With4ml of Lignocaine (2%) with 1:100000 adrenaline plus 2ml of Bupivacaine (0.75%) plus 150 units of hyaluronidase, a peribulbar block was given and then a superior partial thickness incision of 6-7 mm was made. Then a self-sealing tunnel was made and side port incision was taken at 9'o clock. At the end of the surgery, side port was hydrated and subconjunctival Gentamycin and dexamethasone were administered at lower fornix and eyes patched for one day. The surgery lasted for about 20-30minutes. After surgery all patients received topical 4quinD eye drops (Moxifloxacin + dexamethasone) hourly for 1 week

which was then tapered weekly over a duration of 1month and Nepatop eye drops (Nepafenac) 3 times a day for 1 month and carboxymethyl-cellulose 4 times a day for 1 month. Slit lamp examination, Schirmer's-1, tear film breakup time were repeated at 1st, 7th, 30th day after surgery. The dryness of the eyes was analysed and graded in accordance with the 2007 DEWS classification.

Results

Mostly the patients were from rural population of Wanadongri in Nagpur district . 100 patients were between 55- 80 years age. The mean age of the patients was 66. 15 years with SD 6.10. Among these patients, 26 (26%) patients had dry eye and 74 (74%) patients didn't have dry eye before surgery. Out of these 26 patients having dry eye 9 were male and 17 were female.

After implementation of the grading system of eye dryness, 89 (89%) patients had dry eyes postoperatively. Among them 25% had mild grade, 22% had moderate grade and 42% had severe grade of dryness. Out of these 89 patients having dry eye postoperatively, 35 were male and 54 were female.

Table 1: Grading of dryness of eyes among the patients (preoperative & postoperative)

Grading	Number of the patients		Percentage	
	Pre op	Post op	Pre op	Post op
Mild	16	25	16 %	25 %
Moderate	8	22	8 %	22 %
Severe	2	42	2 %	42 %
Total	26	89	26 %	89 %

The mean Schirmer's 1 value was 16.78 mm with SD 5.54 mm preoperatively. After 1st day of surgery, the mean Schirmer's test value decreased to 7.03 with SD 5.17. After 1 week of surgery, the mean Schirmer's test value improved to 7.15 mm with SD 5.08mm. After one month of surgery, the mean value of Schirmer's test became 10.45mm with SD 5.97 mm. The Schirmer's test minimum value was 4mm and maximum value was 30mm. The difference of values between preoperative Schirmer's test with that of post-operative 1st day, 1st week and 1 month is significant with p value less than 0.0001.

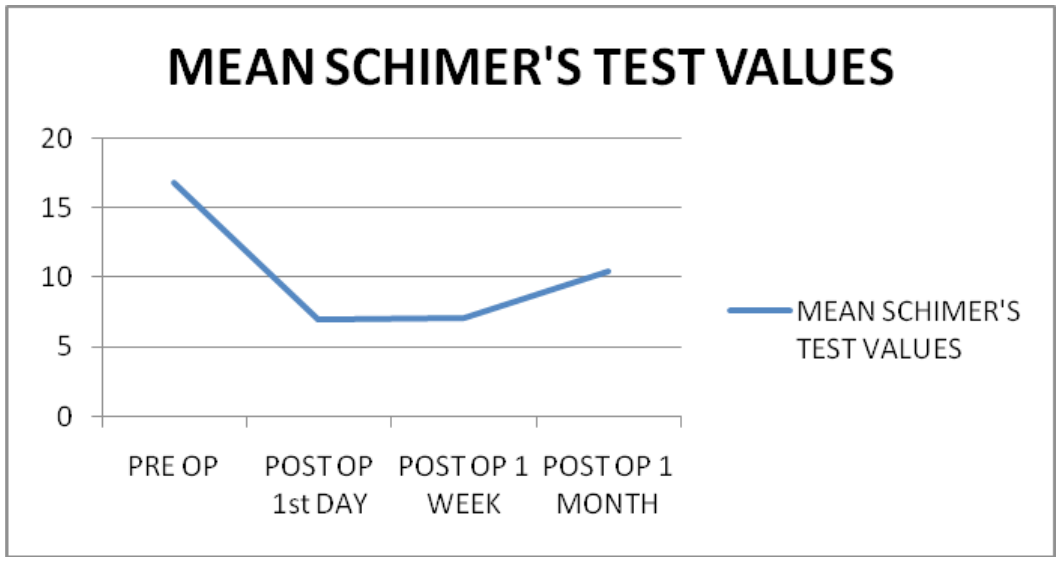

Figure 1: Line graph showing mean Schimer's test value (preoperative & postoperative)

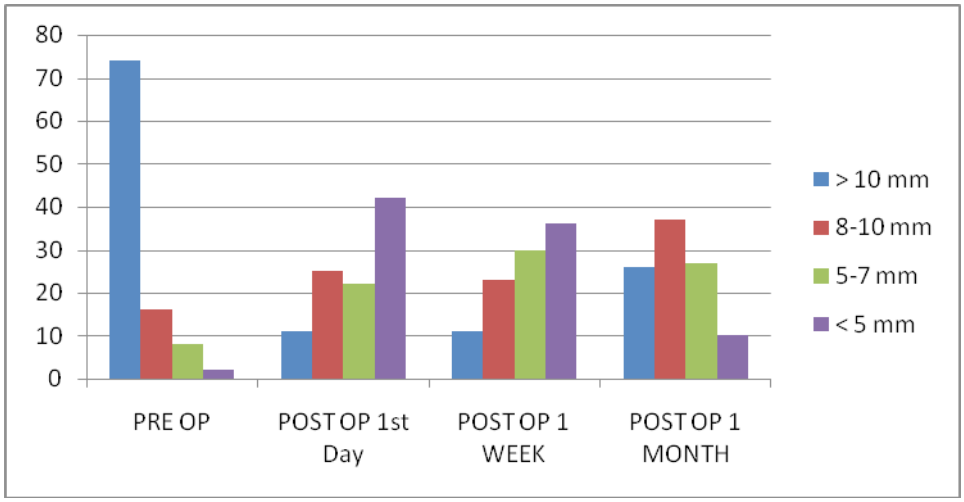

Figure 2: Bar graph showing Schimer's test value among patients preoperatively & postoperatively (1st day, 1 week & 1 month) in percentage

In this study, Schirmer's 1 value>10 mm was taken as normal, 8-10 mm as mild grade and 5-7 mm considered as moderate and < 5 mm as severe. The Schirmer's test analysis shows that 74% patients had normal value, 16% patients had mild grade of dryness, 8% patients had moderate grade of dryness and 2% patients had severe grade of dryness preoperatively. After 1week of surgery, 36% patients had severe grade of dryness, 30% had moderate grade and 23% had mild grade. After a period of one month, the Schirmer's test analysis shows that 26% patients had normal value, 37% had mild, 27% had moderate and 10% had severe grade of dryness.

In TBUT study, the mean tear breakup time (TBUT) preoperatively was 17.89 seconds with SD 6.98. The mean TBUT decreased to 7.24 seconds with SD 5.40 at 1st post-operative day and after 1week postoperatively the mean TBUT increased to 7.84seconds with SD 5.22. After one month postoperatively, the mean TBUT further increased to 13.23 seconds with SD 7.48. The maximum value of mean TBUT was 28 seconds and minimum value was 2 seconds. The difference of values between pre-operative TBUT with that of post-operative 1st day, 1st week and 1 month is significant with p value < 0.0001.

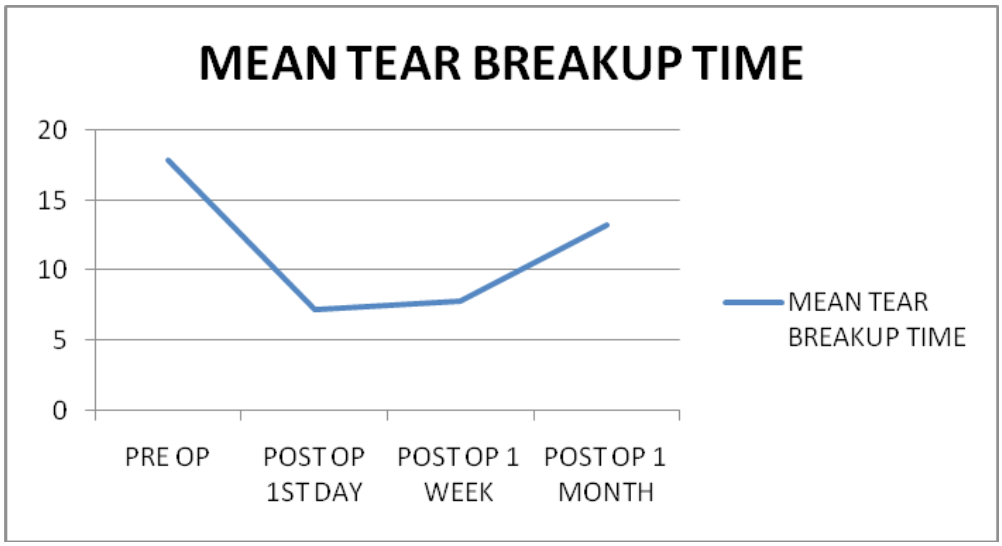

Figure 3: Line graph showing mean TBUT (preoperative & postoperative)

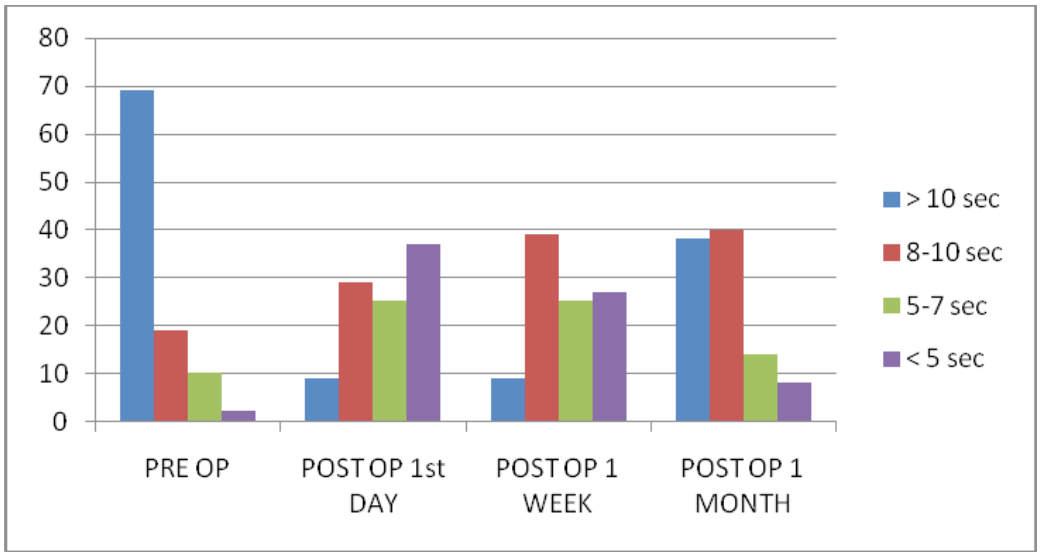

Figure 4: Bar graph showing TBUT among patients preoperatively & postoperatively (1st day, 1 week & 1 month) in percentage

In this study, tear breakup time of more than 10 seconds was taken as normal, between 8-10 seconds as mild, 5-7 seconds as moderate and less than 5 seconds as severe. Preoperatively 69% patients had tear breakup time more than 10 seconds, 19% patients had between 8-10 seconds, 10% patients had between 5-7 seconds and 2% patients had less than 5 seconds. However postoperatively after 1 week, only 9% patients had normal value that is more than 10 seconds, 39% had between 8-10 seconds, 25% had between 5-7 seconds and 27% had less than 5 seconds. After one month postoperatively, 38% patients had normal TBUT, 40% had between 8-10 seconds, 14% had between 5-7 seconds and 8% had less than 5 seconds.

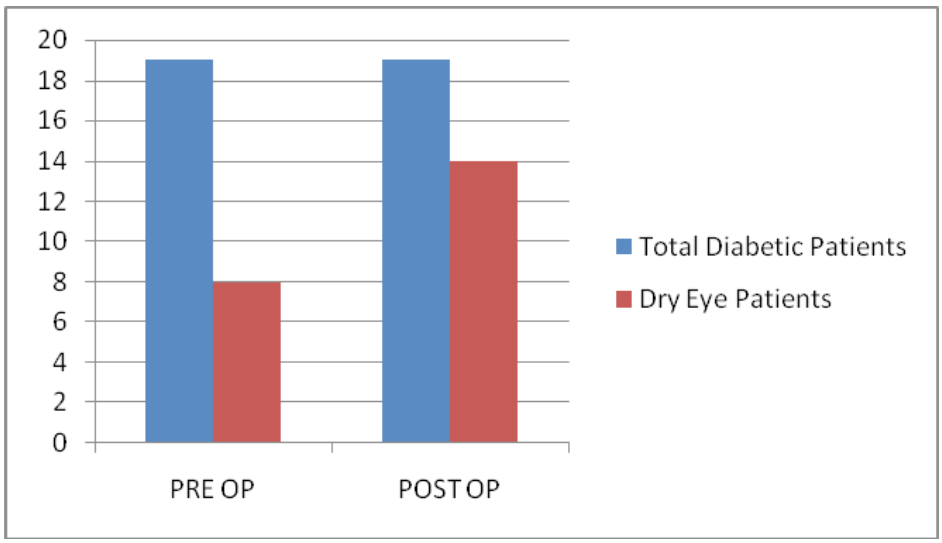

Figure 5: Bar graph showing increase in dry eye patients having diabetes mellitus

In our study, we found that out of 100 patients, 19 were diabetic. 8 of these 19 patients had dry eye pre-operatively which increased to 14 patients post-operatively. Hence it can be seen that diabetic patients are more prone to have dry eye[14].

Discussion

In this study, after manual small incision cataract surgery, the dry eye syndrome was assessed. The causes of dryness after small incision cataract surgery are as follows:

1. Damage to corneal nerve due to the act of cutting during cataract surgery via keratome leads to dry eye syndrome.[4]
2. Damage to corneal epithelium as a result of topical anesthesia and eye drops containing preservatives like benzylkonium chloride.[5]
3. Post operative dry eye on account of exposure to light from the operating microscope during surgery.[5]
4. Irregularity of the ocular surface after surgery contributing to faster tear film breakup time.[6]
5. Destabilized tear film because of decrease in mucin production.
6. Injury to the long ciliary nerve causes reduction of corneal sensation leading to decreased tear secretion.[7]

Here in this study, the Schimer's test was used for measuring tear secretion and TBUT was used for testing tear film instability. Tear secretion and tear film instability were significantly reduced in the 1st post-operative day. After one week of surgery, there was a gradual improvement in dry eye syndrome and it improved significantly after one month of surgery[8-10.] Jayshree MP et al[11], also found the same results as she also had seen significant improvement in dry eye after one month post-operative. We observed that this improvement in dry eye syndrome could have been because of the use of a combination of antibiotic and dexamethasone (0.01%), nepafenac and carboxymethyl-cellulose in patients post-operatively. Jae Kyeong Song et al. and Henriksson JK et al., in their respective studies found that there is improvement in dry eye by the use of carboxymethy-cellulose and dexamethasone (0.01%) respectively [12,13]

Kasetsuwam N et al., had studied the symptoms of dry eye after surgery. He found reduction in dry eye symptoms 7 days post-operatively and significant improvement 30 days after surgery [15] Similar results were seen in our study as well.

The main reason behind decreased tear secretion and tear film instability after 1st post-operative day was the recovery process of corneal nerves [4] The cornea has about 44 corneal nerves bundles entering the cornea and is one of the most highly innervated organs [11] Distortion of the corneal nerves reduces the tear flow and blink rate and induces hyperosmolarity of tear film and tear film instability. After surgery, new neurite cells emerge releasing neural growth factors to regenerate the corneal axon [11] This explains the dry eye syndrome that was observed after the cataract surgery and it improved after 1 month.

The other reasons for decreased tear secretion and tear film instability are exposure to microscopic light, ocular surfaces irritation, post-operative topical eye drops containing preservatives, reduction in mucin production, reduction of corneal sensation [6]Owing to vigorous irrigation of the tear film and intraoperative manipulation of the ocular surface, the goblet cell density and mucin production are reduced.[6]

Limitation: Shorter follow up time may affect incidence in our study.

Conclusion

After small incision cataract surgery with corneoscleral tunnel, moderate to severe dryness was observed on 1st day post–operatively. This dryness stabilized gradually after 1st week of surgery and improved significantly further after one month. Thus to prevent post-operative dry eye, the use of lubricants, antibiotic and steroid combination is recommended.

Ethical Clearance: Taken from institutional ethics committee.

Source of Funding: Self.

Conflict of Interest: Nil.

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