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Research Article

A Prospective study of Dry Eye after manual Small Incision Cataract Surgery in rural population of Bagalkot

Abstract

Aim: To find the occurrence of 'Dry Eye' and to assess the severity of the dry eye after manual small incision cataract surgery with corneoscleral tunnel incision.

Material and Method: A total of 81 patients were selected who came for manual small incision cataract surgery. Each patient was questioned pre-operatively about 'dry eye' symptoms and examined with Schirmer's test 1 and tear film break up time. Following this, the patients underwent small incision cataract surgery with a superior incision of 6-7mm depending on the grade of cataract. Schirmer's test 1 and tear film break up time test were repeated on post-operative day 1st, 7th & 30th day. Dryness of the eye was analysed and graded as per DEWS classification 2007.

Result: In the total sample, 96.6% patient had dry eye. Among them 13.79% had mild grade and 20.8% had moderate and 62.06% had severe grade. 37.93% were male and 65.5% were female. The mean age of patient was 58.18 with SD of 8.62. The difference in tear film break up time before and 7 days after cataract surgery was found to be clinically significant with p value 0.0001, which stabilises and becomes clinically insignificant after 30 days (p value 0.215). The difference in Schirmer's test before and 7 days after cataract surgery was also found to be clinically significant with p value <0.01 and which becomes clinically insignificant after 30 days with p value 0.111.

Conclusion: Tear film instability is a complication seen in early post-operative period of manual small incision cataract surgeries with corneoscleral tunnel. Such post-operative patients develop moderate to severe dryness of eye which improves after 1 month.

Introduction

According to The International Dry eye Workshop the dry eye condition can be defined as a multifactorial disease of the tears and ocular surfaces that results in symptoms of discomfort, visual disturbances, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surfaces [1].

Dry eye is due to disturbance in lacrimal function unit, which comprises of the lacrimal gland, ocular surface, lid and the sensory and the motor nerves that connect to them. Damage to any component of the lacrimal function unit can destabilize the tear film and lead to ocular surface disease and visual disturbance [2].

Cataract is the most common cause of visual impairment in

India. According to WHO cataract attributes to 51% blindness in India [3]. Most common surgery done for cataract in developing country like India is small incision cataract surgery with corneoscleral tunnel. The incidence of dry eye after small incision cataract surgery range from 33.8% to 66.2% [4,5]. This study is done to evaluate the changes in tear film and tear production after small incision cataract surgery.

Material and Method

It is a longitudinal prospective study with sampling size of 81 patients, who came for manual small incision cataract surgery. Most of the patients in this study were from rural areas of Bagalkot.

- The Ethical committee had approved this study and written informed consent was taken from individual patients in their own language (Kannada).

- **Inclusion criteria:** Patients having unilateral or bilateral age related cataract with or without dry eye symptoms.

- **Exclusion criteria:**

1. Other than senile cataract
2. Pre-existing ocular diseases
3. Using contact lens
4. Patients on chronic ocular medication
5. Patients who underwent refractive surgery
6. Patients having ocular allergies, pterygium and blepharitis.

All the patients, pre-operatively were questioned about dry eye related symptoms like pricking, burning, and itching sensation and the observations were noted, following which slit lamp examination was done, Schirmer's test-1, tear film break up time were evaluated. After all the investigations, the patient underwent small incision cataract surgery with a superior incision of 6-7mm.

The Schirmer's test was done to assess the basal and reflex secretions of the tears. It was done by placing the schirmer's strip, which was made up of Whatsmann no.41 filter paper with dimensions 5x35mm. The initial 5mm of the strip was folded and kept in the junction of the lateral 1/3rd and medial 2/3rd of the lower fornix of the operated eye for 5min. The wetting of the strip was noted using the scale present on the strip.

The tear film break up time assessment was done to assess the stability of the tear film. The tear film was stained by using sterile fluorescein strips 1% and under the slit lamp using cobalt blue filter, the time interval between the appearances of a 1st dark spot on the cornea after a complete blink was noted using a stop watch.

Before surgery all the patient were instilled 'Tropicacylplus' eye drops [tropicamide (0.8%)+ phenylephrine hydrochloride (5%)+ with benzalkonium chloride preservative 0.01%] 3times over an hour to dilate the pupil .After Peribulbar block with 4ml Lignocaine (2%) with 1:100000 adrenaline + 2ml Bupivacaine (0.75%) + 150 units hyaluronidase. A 6-7mm superior partial thickness incision was taken and a 3 planar self-sealing



DRY EYE GRADING 2007 BY INTERNATIONAL DRY EYE WORKSHOP

DRY EYE SEVERITY LEVEL	1	2	3	4 (MUST HAVE SIGNS AND SYMPTOMS)
DISCOMFORT, SEVERITY AND FREQUENCY	MILD AND /OR EPISODIC UNDER ENVIRONMENTAL STRESS	MODERATE EPISODIC OR CHRONIC STRESS OR NO STRESS	SEVERE FREQUENT OR CONSTANT WITHOUT STRESS	SEVERE AND/OR DISABLING AND CONSTANT
TEAR FILM BREAK -UP TIME (IN SEC)	VARIABLE	<10	<5	IMMEDIATE
SCHIRMER SCORE (mm/min)	VARIABLE	<10	<5	<2

SEVERE:>4
 MODERATE:3 -4
 MILD:<3

tunnel was made and side port incision was taken at 9 O'clock position. The end of surgery side port was hydrated and subconjunctival Gentamycin and dexamethasone was given at inferior fornix and eyes were patched for one day. The duration of surgery was approximately 20-30mins. Postoperatively all patients received topical TobaDM eye drops (tobramycin+dexamethasone) hourly for 1week which was then tapered weekly over a duration of 1month and Ocuflur eye drops (flubiprofen) 4times a day for 1 month.

Slit lamp examination, Schirmer's test-1, tear film break up timewere repeated at 1st, 7th, 30th postoperative day. The dryness of the eyes was analyzed and graded according to the DEWS classification 2007.

Statistical analysis

Data were analysed using ANOVA with Post hoc Bonferroni test in comparing the different results of the tear break up time and the schirmer's test at the three post-operative period. A p value less than 0.05 was considered statistically significant. SPSS version 15 software was used for analysis.

Result

Most of the patients were from rural population of Bagalkot district in North Karnataka. 81 patients were between 40-80yrs age. The mean age of the study population was 58.18 with SD 8.62. Among them 19(23.45%) patients had dry eye and 62(76.54%) patients didn't have dry eye before surgery (Figures 1,2).

After applying the comprehensive grading system of dryness of eyes, 96.6% patient had dry eyes postoperatively. Among them 13.79% have mild grade and 20.8% have moderate and 61.72% have severe grade (Figure 3, Table 1).

The gender variation showed 30(37.93%) male patients and 51(62.9%) are female patients had dryness of eye (Figure 4).

The mean schirmer's test value was 18.21mm with SD 6.15mm with lowest value was 8mm and the highest value was 30mm preoperatively. After 1 week postoperatively the mean

schirmer's test value decreased to 10.14mm with SD 4.09mm, having lowest value 2mm and highest value 18mm. After one month postoperatively the mean value of schirmer's test became 14.62mm with SD 4.15, with minimum value of 7mm and maximum value of 25mm (Figure 5).

In this study schirmer's test value >10mm was taken as normal and 10 -5mm as mild grade and 5-2mm consider as moderate grade and < 2mm as severe grade.

The Schirmer's test analysis shown 74.07% patients had normal value and 12.34% had mild grade and 7.4% had moderate and 6.17% had severe grade preoperatively. However after 1week 29.62% had severe grade, 45.67% had mild grade, 12.34% had moderate and 12.34% had severe grade. The differences in schirmer's test values between preoperative and postoperative 1week was clinically significant with p value <0.01. After one month postoperative period the schirmer's test values shown 69.13% normal, 24.69% had mild grade, 4.9% had moderate and 1.2% had severe grade. The difference

Table 1: Grading of dryness of eyes among the patients preoperative and postoperative.

Grading	Number of patient		Percentage	
	Pre op	post op	Pre op	post op
Mild	10	11	12.34%	13.58%
Moderate	4	17	4.9%	20.98%
Severe	1	50	1.2%	61.72%
Total	15	78	18.5%	96.6%

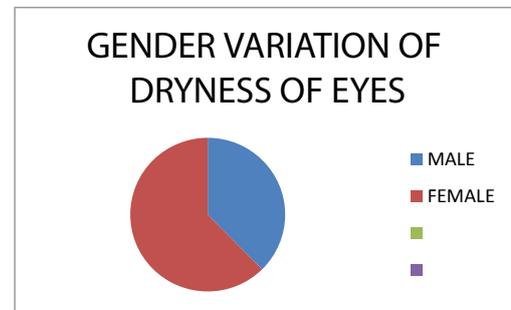


Figure 4: Pie graph showing gender variation of dryness.

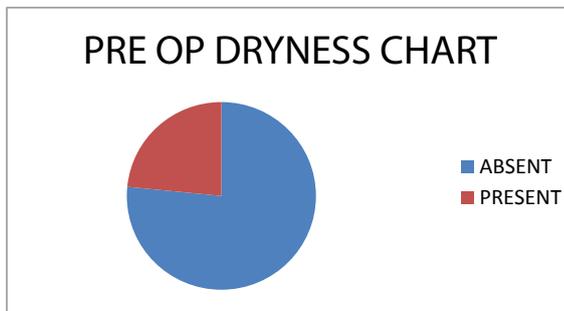


Figure 1: Pie chart showing preoperative dryness in percentage.

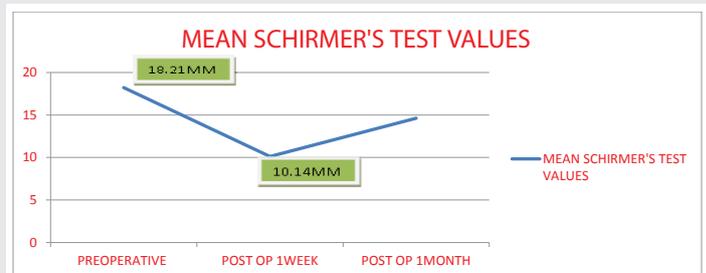


Figure 5: Line graph showing mean schirmer's test 1preoperative and postoperative.

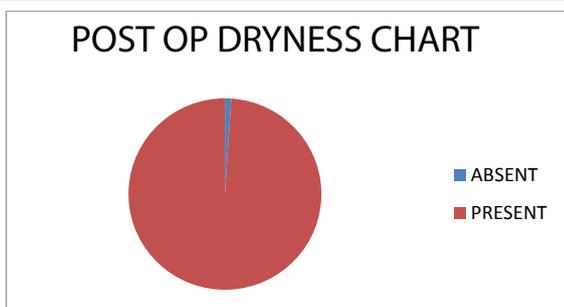


Figure 2: Pie chart showing postoperative dryness in percentage.

between preoperative values and postoperative 1month value was clinically not significant with p value 0.111 (Figure 6).

The mean tear break up time (TBUT) of this study population preoperatively was 11.10 second with SD 5.40 with minimum value of 5second and maximum value of 25second, which decreased to 5.82 with SD 3.96 at 1st postoperative day and on 1week postoperative it further decreased to 3.43 with SD 2.79 with maximum value of 15 second and minimum value of 0 second. After postoperative 1 month it became 10.40sec with SD 4.5, with minimum value of 3second and maximum of 15 second (Figure 7).

In this study tear break up time of more than 10 second was taken as normal and between 10 -5 second as mild and <5 second as moderate and immediate appearance of dark spot as severe. Preoperatively 58.06% had >10 second, 22.22% had between 10- 5 second, 12.34% had < 5 second and 7.4% had immediate appearance of dark spot. However post-operative 1week only 3.4% had normal value that is > 10 second, 27.10% had between 10-5 second, 41.90% had < 5 second and 28.39% had immediate appearance of dark spot. The difference of values between preoperative TBUT and postoperative 1week was clinically significant with p value of 0.0001. After one month the TBUT became stable with 62.96% had > 10 second,

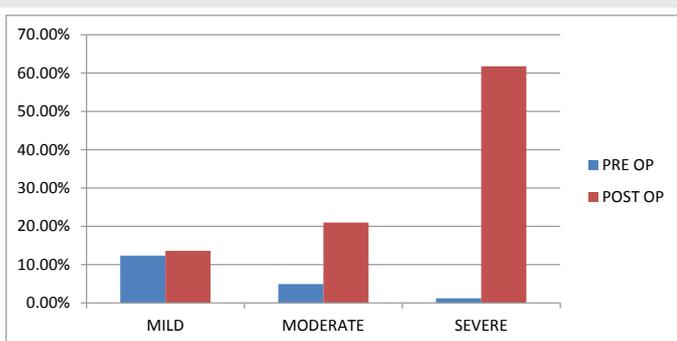


Figure 3: Bar graph showing grading of dryness.

22.22% had between 10-5 second, 7.4% had < 5 second and 7.4% had immediate appearance of dark spot, the difference of TBUT preoperative and postoperative 1 month was clinically insignificant with p value 0.215 (Figure 8).

Discussion

In this study we assessed the dryness of the eyes after small incision cataract surgeries. The reasons for dryness following cataract surgery are

1. Damage to the cornea and the conjunctiva epithelium due to chronic use of eye drops containing preservative like benzylkonium chloride after cataract surgeries [6,7].
2. Ocular surface irregularity following surgery leads to faster tear film break up time [6].
3. Decreased mucin production from conjunctiva destabilise the tear film.

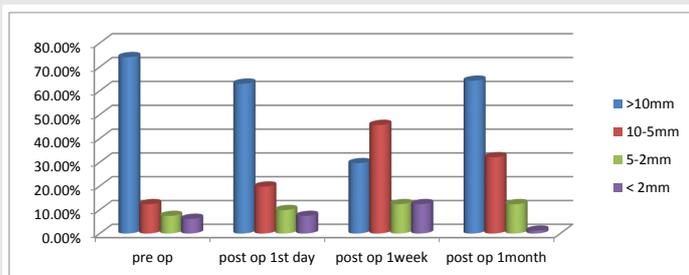


Figure 6: Bar graph showing schirmer's test 1 value preoperatively and postoperatively (1st, 7th & 30th) among patients in percentage.

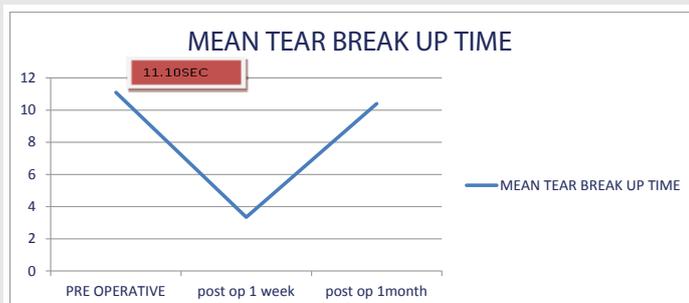


Figure 7: Line graph showing mean tear break up time preoperative and postoperative.

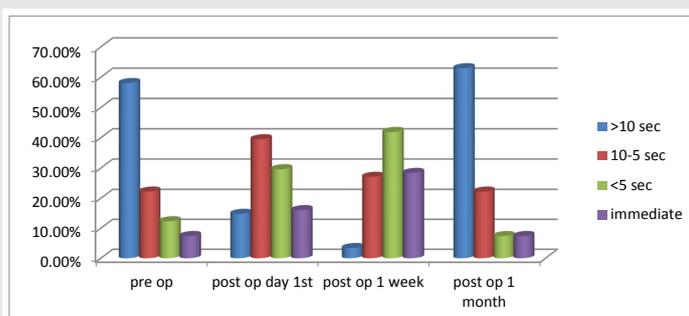


Figure 8: Bar graph showing tear break up time preoperatively and postoperatively among the patients in percentage.

4. Decreased corneal sensation due to damage to the long ciliary nerve disrupts the lacrimal gland loop resulting in reduced tear secretion [8].

After different type of ophthalmic surgeries like LASIK, blepharoplasty etc, patients develop dry eyes which may lead to suboptimal visual outcome. After post LASIK the dry eye incidences varies from 47.02%-52.9%, which decrease to 20% after 6 months. However the incidence of dry eyes after blepharoplasty is 10.9% which last up to 2weeks. Also that dry eye is frequently seen in patients who underwent cataract surgery.

In this study the tear secretion measured by Schirmer's test and tear film instability was tested by TBUT, which were significantly reduced in the 1st post-operative period and improved thereafter.

The main mechanism behind reduction of tear secretion and tear film instability in the 1st post-operative period was due to recovery process of the corneal nerves. The cornea is one of the most highly innervated organs with about 44 corneal nerves bundles entering the cornea. So disruption of normal corneal nerves reduces the tear flow and blink rate and cause instability of the tear film and tear film hyperosmolarity. On postoperative healing, new neurite cells appear and neural growth factors are released to regenerate the corneal axon. This may explain the dry eye, which was observed early after cataract surgery but improved after 1 month.

The other reasons for tear film instability and decreased tear secretion are exposure to microscopic light, vigorous intraoperative irrigation of the tear film, inflammatory factors in the tear film due to ocular surfaces irritation, manipulation of ocular surface and usage of postoperative topical eye drops containing preservatives. Vigorous irrigation of the tear film and manipulation of ocular surface intraoperatively may reduce the goblet cell density and decreased the mucin production leads to tear film instability. The preservative use in the topical eye drops mainly Benzalkonium chloride induces the tear film instability by damaging the corneal and conjunctival epithelium which causes the ocular surface irregularities.

Venugopal K et al., did a study on evaluation of dryness of eyes after manual small incision cataract surgery in 2012 among 71 patients, they found 53.33% had mild grade, 26.66% had moderate grade and 20% had severe grade of dry eye which was significant on early postoperative period, 6 where as in our study most of patient had severe grade of dry eye (61.72%) which was significant on post-operative 1 week. This differences may be due to different surgical techniques, preoperative dryness eye of 23.39% in our study, which was not mention Venugopal K et al., study and studying patients from rural areas with farming as their primary occupation, who were more prone to sunlight exposure for several hours on daily basis [5].

In our study female patient had more dry eye compare to male patient postoperatively which was clinically significant with p value 0.001, but Venugopal K et al., had shown that male

had more dry eye than female but their comparison wasn't clinically significant studies have shown dry eye is more prevalent in female compared to male in general population [9-11].

Liu Z et al., found that significant reduction in TBUT and schirmer's test among 79 patients on 1st post-operative day. Schirmer's test became normal on 7th postoperative day and tear film stabilised on 30th postoperative day. But we found both schirmer's test and tear film significantly reduced on 7th postoperative day and almost return to their preoperative value on 30th postoperative day. The possible explanation for this variation is different topical ocular drops, duration of regimens and difference in surgical techniques used. In our study we took all superior incision of 6-7mm [12].

Li et al., did a research on pathogenic factors responsible for dry eye in patients after cataract surgery. On impression cytology they found that reduction of goblet cells and squamous metaplasia in the bulbar conjunctiva after 3 months following cataract surgery. They suggested prolonged usage of eye drops is the reason behind dryness [13].

Kasetsuwan n et al., in 2013 conducted a study among 91 patients to evaluate the incidence and pattern of dry eye after cataract surgery and reported that dry eye is significant on 7th day after surgery and there is rapid improvement after 30th days postoperatively, which is almost similar to our study [14].

In our study there was a significant reduction both in the tear break up time and schirmer's test after 7 days following cataract surgery which was severe in grade. The major limitation of this study is the comparison between the site and size of incision with degree of dryness were not done.

Conclusion

Moderate to severe dryness of eye was seen in 1st week post-operative period after manual small incision cataract surgeries with corneoscleral tunnel, which stabilises after 1month. We recommend post-operative lubricants along with antibiotic and steroid combination to prevent postoperative dry eye.

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