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Original Article

Opthalmology Section

Evaluation of Dryness of Eyes after Manual Small Incision Cataract Surgery with Corneoscleral Tunnel Incision

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ABSTRACT

Context: Damage to any component of the lacrimal function unit can destabilize the tear film and it can lead to ocular surface disease that expresses itself as dry eye. Many factors can cause dry eyes in patients after cataract surgeries, which increases their agony. In a developing country like ours, the most common, efficient and economical cataract surgery is the manual small incision cataract surgery which is done with a corneoscleral tunnel incision. The study population was from a region where agriculture was a predominant occupation. The environmental exposure to wind, sunlight and a high temperature causes dry eyes, which can be aggravated after cataract surgeries.

Aims: To evaluate the presence or absence of dry eyes, if present and to assess the severity of the dry eyes after manual small incision cataract surgery with a corneoscleral tunnel incision.

Settings and Design: A descriptive, cross-sectional study.

Material and Methods: 68 out of 71 patients who came for follow up after manual small incision cataract surgeries with corneoscleral tunnel incisions were examined and analyzed. The symptoms, marginal tear strip height, Schirmer's test-1and the tear film break-up time were recorded. The observations were analyzed and the dryness of the eyes, when it was present, was graded according to the DEWS 2007 report.

Statistical Analysis: Percentage.

Results: 66.2% patients had dry eyes. Among them, 53.32% had mild grade, 26.6% had moderate grade and 20% had a severe grade of dryness. 33.8% patients did not have dry eyes. 67.7% of the male patients and 64.9% of the female patients had dry eyes. This gender difference was statistically not significant (p value–0.3922). 68.4% of the patients with a superior incision and 63.3% of the patients with a temporal incision had dry eyes. This difference in the incision site was also statistically not significant (p value–0.9741). 60% of the patients in the early post-operative period and 75% of the patients in the late post-operative period had dry eyes. This difference was also statistically not significant (p value–0.1019).

Conclusion: After manual small incision cataract surgeries with corneoscleral tunnel incisions, there was dryness of eyes in a majority of the patients and a majority of them had the mild grade of dry eyes.

Key Words: Dry eyes, Small Incision cataract Surgery, Corneoscleral Tunnel Incision

INTRODUCTION

"Dry eye is a multifactorial disease of the tears and the ocular surface, that results in symptoms of discomfort, visual disturbance, and tear film instability, with potential damage to the ocular surface. It is accompanied by an increased osmolarity of the tear film and inflammation of the ocular surface [1]."

The causes of dry eyes are abnormalities of the tear film itself, like aqueous tear deficiency, mucin deficiency, lipid abnormalities and lid surfacing abnormalities, or epitheliopathies. Dry eye is thought to be a disturbance of the Lacrimal Functional Unit (LFU), an integrated system which comprises of the lacrimal glands, the ocular surface lids, and the sensory and the motor nerves that connect them [2]. A disease in or a damage to any component of the LFU can destabilize the tear film and this can lead to ocular surface disease that expresses itself as dry eye. The epithelial injury which is caused by dry eye stimulates the corneal nerve endings, leading to symptoms of discomfort, increased blinking and, potentially, compensatory reflex lacrimal tear secretion. Eventually, the chronic surface damage of the dry eyes leads to a fall in the corneal sensitivity and in a reduction of the reflex tear secretion.

Various aetiologies which may cause a reduced sensory reflex drive could be refractive surgery (LASIK for dry eye), contact lens wear and the chronic abuse of topical anaesthetics. Any irregularity of the otherwise smooth and uninterrupted ocular surface leads to dry eye by causing instability of the tear film and thereby, break up of the tear film quickly before the next blink. One or more of these causative factors can be involved in the pathogenesis of dry eye in patients post-cataract surgery [3].

In a developing countries like ours , the most efficient and the economical means of doing a cataract surgery is manual small incision cataract surgery with a corneoscleral tunnel incision. Now-a-days, even the base camp surgeries which are done under the National Program for Control of Blindness (NPCB) are manual small incision cataract surgeries with corneoscleral tunnel incisions.

The study population was from a region with a predominant agricultural occupation. The environmental exposure to wind, sunlight and high temperature predisposes to dry eyes, which can be aggravated after cataract surgeries.

So, we felt that there was a need to evaluate the dryness of the

eyes which manifests after the manual small incision cataract surgeries with corneoscleral tunnel incisions.

MATERIALS AND METHODS

We conducted a descriptive cross sectional study with purposive sampling in 71 eyes after getting the approval of the Institutional Ethical Committee (IEC). The patients who came for follow up were randomly picked up and a written informed consent was taken from them in their languages (Kannada) or English, in the presence of eye witnesses. A case study proforma was designed for each patient and the data was collected. Demographic information like name, age, sex, address of the patient and in patient (I.P) and out patient (O.P.) numbers were collected.The information on the date of the surgery, the post-operative duration and the eye which was operated on, were obtained. The symptoms which were relevant to the dry eyes were noted, wherever necessary the symptoms were elicited on furthur questioning. Slit lamp examination, marginal tear strip height, Schirmer's test-I and tear film break-up time were evaluated in this order. The data were collected from the patients who came for follow up, following manual small incision cataract surgeries with corneoscleral tunnel incisions, to the Out Patients Department (OPD), Department of Ophthalmology, Mandya Institute of Medical Sciences, Mandya from May 24, 2010 to July 24, 2010.

The following data were collected in this order:

1. The patients' symptoms were thoroughly evaluated and recorded and the symptoms which were relevant to the dry eyes were analyzed.
2. The marginal tear strip height was recorded by using a slit lamp.
3. The Schirmer's test-I was done and the readings of all the patients were noted and analyzed.

   It was done to assess the basal and the reflex secretions of the tears. It was done by placing the Schirmer's strip, which is made up of the Whatman no. 41 filter paper with its dimensions, 5mm x 35mm. The initial 5mm of the Schirmer's strip was folded and kept in the junction of the lateral one third and the medial two third of the lower fornix of the operated eye and it was kept insitu for 5 minutes. The wetting of the strip at the end of 5 minutes was noted by using the scale which was present on the strip.

4. The tear film break-up time assessment was done and the readings were analyzed. It was done to assess the stability of the pre-corneal tear film i.e., the mucin component of the tear film. First, the tear film was stained by using sterile fluorescein strips. Under a slit lamp, the time interval between the appearance of a dark spot on the cornea after a complete blink and the next blink was noted by using a stop watch.

All the above tests were done on each patient and the data were graded, based on the guidelines of the 2007 Report of The International Dry Eye Workshop (DEWS) [1]. The grading was done as has been shown in [Table/Fig-1].

Severity	Scoring
Mild	< 3
Moderate	3-4
Severe	> 4

[Table/Fig-2]: Final grading.

We considered the discomfort, severity and the frequency of the symptoms, the tear film break-up time and the Schirmer's test-I score from the classification and the final grading was done by adding the scores of the three mentioned tests, as has been shown in [Table/Fig-2].

The assessment period was divided into two categories. The immediate post-operative period ie., the 2nd week to the 6th week and the late post-operative period ie., 6 weeks to 2 years.

We included all the patients who underwent uneventful and uncomplicated manual small incision cataract surgeries with corneoscleral tunnel incisions.

We excluded the patients with surgical complications, pre-existing dry eyes, Sjogren's syndrome, rheumatoid arthritis and other autoimmune disorders and patients with pre-existing ocular diseases like glaucoma, uveitis, disorders of the lid or the nasolacrimal pathway, ocular allergies, pterygium and previous ocular surgeries.

This was a descriptive, cross sectional study with purposive sampling in 71 eyes, which had undergone manual small incision cataract surgeries with corneoscleral tunnel incisions. Percentage was used as a parameter for the assessment. This study was done after getting the approval of the institutional ethical committee.

RESULTS

The study population was from the Mandya district in south Karnataka, an area which has agriculture as a predominant occupation. The data of 71 patients were collected according to the case study form. 3 patients were operated for developmental cataracts and they were below 20 years of age. The rest of the 68 patients were in the age group of 40-80 years. We considered the data of these 68 patients for analysis.

The symptomatology analysis showed that of the 68 patients, 20 patients had complained of symptoms which were related to dry eyes and that the rest of the 48 patients had no symptoms which were related to dry eyes.

The Schirmer's test-I analysis showed that the lowest value of the Schirmer's test-I was 1mm and that the highest was 35mm. [Table/Fig-3].

The tear film break-up time analysis showed that the tear film break-up time ranged from a minimum of the immediate breakup of the tear film to a maximum of 23 seconds [Table/Fig-4].

Dry eye severity level	1	2	3	4 (Must have signs and symptoms)
Discomfort, severity & frequency	Mild and/or episodic; occurs 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 (s)	Variable	≤10	≤5	Immediate
Schirmer score (mm/5 min)	Variable	≤10	≤5	≤2

[Table/Fig-1]: Grading of 2007 - the International Dry Eye Workshop (DEWS).

The marginal tear strip height analysis showed that all the patients had a marginal tear strip height between 0.5mm to 1mm. So, it is not considered for grading.

The comprehensive grading of the dryness showed that of the 68 patients, 45 (66.2%) patients had dry eyes and that 23 (33.8%) patients did not have any dry eyes. [Table/Fig-5], [Table/Fig-6], [Table/Fig-7].

The gender comparision of the dryness of the eyes showed that 31 patients were males and that 37 patients were females. The p value was 0.3922 [Table/Fig-8], [Table/Fig-9].

The incision site comparison of the dryness of the eyes showed that of the 68 patients, 38 patients had a superior incision and that 30 patients had a temporal incision during the cataract surgery, the p-value being 0.9749 [Table/Fig-10], [Table/Fig-11].

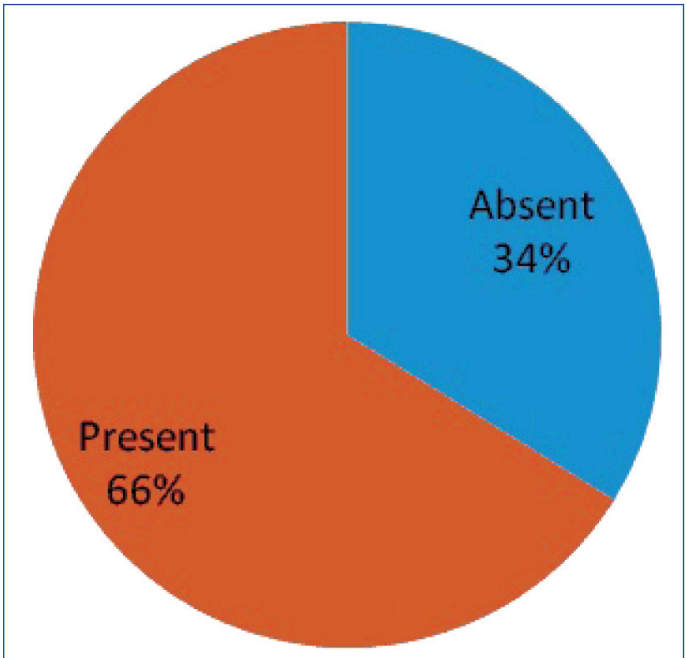
The comparison of the dryness of the eyes based on the post-operative duration (POD) showed that of the 68 patients who came for follow up, 40 patients were in the early post-operative period (ie., 2 to 6 weeks after the cataract surgery) and that 28 patients were in late post-operative period (6 weeks to 2 years after the cataract surgery). The p-value was 0.01019 [Table/Fig-12], [Table/Fig-13].

Schirmer's test I value	Number of patients	Percentage
>15mm	57	83.82%
<10mm	5	7.35%
<5mm	5	7.35%
<2mm	1	1.47%

[Table/Fig-3]: Schirmer's test analysis result.

Tear film break-up time value	Number of patients	Percentage
>15s	21	30.9%
<10s	5	7.4%
<5s	31	45.6%
Immediate	11	16.2%

[Table/Fig-4]: Tear film break-up time result analysis.



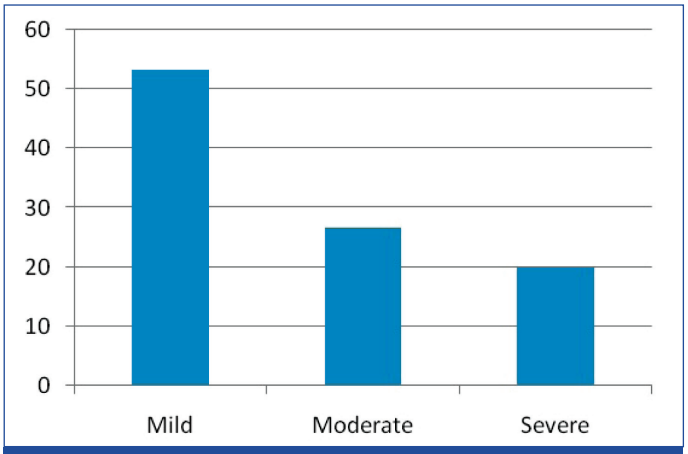
[Table/Fig-5]: Dryness of eyes.

DISCUSSION

This study was done to evaluate the dryness of the eyes after manual small incision cataract surgeries with corneoscleral tunnel incisions.

Grading	Number of patients	Percentage
Mild	24	53.33%
Moderate	12	26.66%
Severe	9	20%
Total	45	100%

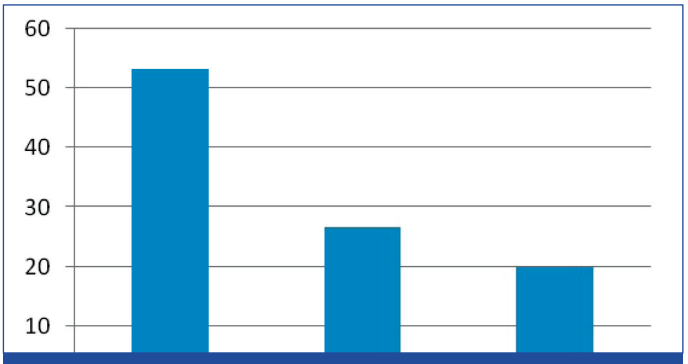
[Table/Fig-6]: Grading of dryness of eyes among patients.



[Table/Fig-7]: Grading of dryness.

Grading	Number of patients	
	Males	Females
Absent	10(32.3%)	13(35.1%)
Mild	12(38.7%)	12(32.4%)
Moderate	7(22.6%)	5(13.5%)
Severe	2(6.5%)	7(18.9%)
Total	31(100%)	37(100%)

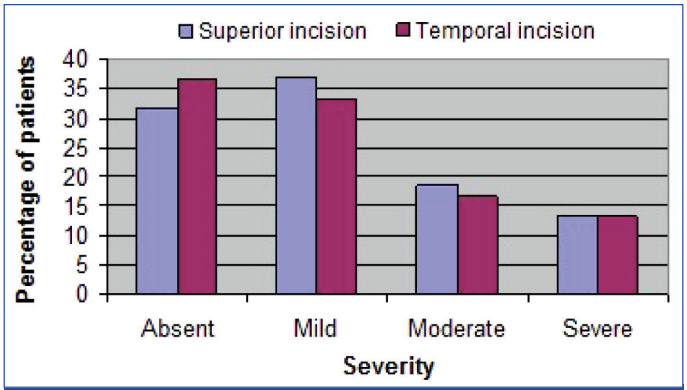
[Table/Fig-8]: Gender comparison of dryness of eyes.



[Table/Fig-9]: Gender comparison.

Grading	Number of patients	
	Superior incision	Temporal incision
Absent	12(31.6%)	11(36.7%)
Mild	14(36.8%)	10(33.3%)
Moderate	7(18.4%)	5(16.7%)
Severe	5(13.2%)	4(13.3%)
Total	38(100%)	30(100%)

[Table/Fig-10]: Incision site comparison of dryness of eyes.



[Table/Fig-11]: Incision site comparison.

Grading	Number of patients	
	Early post operative period	Late post operative period
Absent	16(40%)	7 (25%)
Mild	15(37.5%)	9 (32.1%)
Moderate	7(17.5%)	5 (17.9%)
Severe	2(5%)	7 (25%)
Total	40(100%)	28 (100%)

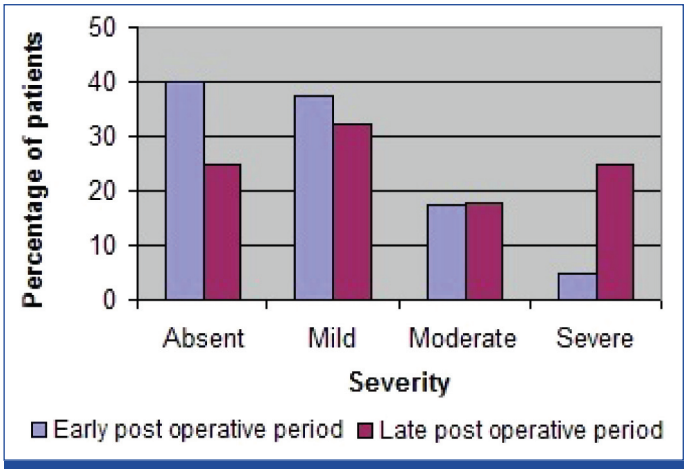
[Table/Fig-12]: Comparison of dryness of eyes based on post-operative duration.

The dry eye sensation frequently occurs after cataract surgeries. The aetiology of the dry eyes following cataract surgeries may be due to any of these mechanisms [4]:

1. The chronic use of eye drops after cataract surgeries can lead to toxic changes in the cornea and the conjunctiva due to the presence of preservatives in them, especially benzylkonium chloride [4-6].
2. The tear film instability in the operated eyes can result either from a surface irregularity at the site of the incision, which causes the tear film to break up faster than usual, or the mucin production from the conjunctiva may be decreased.
3. The exposure to light from the operating microscope might also be associated with post-operative dry eyes [4].
4. The decreased corneal sensation disrupts the cornea lacrimal gland loop, resulting in reduced tear secretion [7]. The corneal sensation is the function of the long ciliary nerves and these long ciliary nerves enter the limbus predominantly at the 9 o' clock and the 3 o'clock positions [7,8]. The incision wound can result in severing of the corneal nerves as a result of the corneal section, which causes a decreased corneal sensation.
5. The environmental exposure to excessive wind, sunlight and a high temperature increases the dry eye status [9].

In our study, we found that after manual small incision cataract surgeries with corneoscleral tunnel incisions, 66.2% of the patients had dry eyes, which was relatively high. Among the patients who had dryness of the eyes, a majority (53.33%) had mild grade, 26.66% had moderate grade and 20% had the severe grade of dryness.

The findings of the analysis of the symptoms, the Schirmer's test and the tear film break-up time were consistent with those of a study which was conducted by Srinivasan R et al., in which the tear film break-up time was reduced in pseudophakic eyes after phacoemulsification [10]. This indicated that there was a tear film instability in the operated eyes. It could result from a surface



[Table/Fig-13]: POD camparison.

irregularity at the site of the incision or from the decreased mucin production from the conjunctiva, as has been mentioned above.

Significantly reduced tear film break-up times and Schirmer's test-I scores were found on the post-operative day 30 in a study which was done by Liu Z et al., [11]. In our study also, we found that the dry eyes were more prevalent in the late post-operative period, but the difference was not statistically significant, with a p-value of 0.1019.

When we compared the dryness between the incision sites, we found that it was marginally more in the superior incisions than in the temporal incisions, but it was statistically insignificant, with p-value of 0.9749. This was in agreement with the findings of a study which was done by Cho KY et al., [12].

We expected that there would be more reduction in the dry eye test values in the temporal incision group because we assumed that there would be a greater decrease in the sensation 'due to cutting' of the large trunks of the corneal nerves which entered the limbus predominantly at the 9 o' clock and the 3 o'clock positions. But there was a lesser incidence of the dry eyes in the temporal incisions in our study.

When we compared the dryness of the eyes post-operatively in males and females, we found that the dryness in the female patients was less than that in the malepatients and this difference was not statistically significant, with a p-value of 0.3922. Most of the studies have reported a higher prevalence of the dry eyes in females than in males in the general population [9,13,14]. But our study showed a marginal increase in the dryness post-operatively in males. This could probably be because of the more exposure to sunlight, high temperature and excessive wind [15]. This region being a predominant agricultural area and males being more involved in agricultural work, the dryness could be more prevalent in males.

As in our study, we found that after manual small incision cataract surgeries with corneoscleral tunnel incisions there was dryness of the eyes in 66.2% of the patients, we included medications to treat these dry eyes as a routine in our preoperative and post operative medication regimens. Calvin W Roberts et al., [16] showed that the administration of cyclosporine ophthalmic emulsion 0.05% twice daily for one month prior to the cataract extraction and one month following the surgery could reduce the occurrence of dry eyes after a cataract surgery. Eric D Donnenfeld MD et al., [17] says that with the use of multifocal IOLs, the problems which are related to dry eyes are magnified by the inherent decrease in the

contrast sensitivity with this lens type and that because of this, he prescribes transiently preserved tears substitutes four times a day. Improving the visual acuity and the quality of the vision starts with optimizing of the tear film.

There were some limitations in our study, as the pre-operative readings of the symptoms and the dry eye test values were not recorded. So, we could not correlate the pre-operative and the post-operative status following the manual small incision cataract surgery with corneoscleral tunnel incisions. This requires further studies.

CONCLUSION

After manual small incision cataract surgeries with corneoscleral tunnel incisions, there was dryness of the eyes in more number of patients and a majority of them had mild grade of dry eyes.

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