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Original Research Article

Assessment of Tear Film Status in Patients Undergoing Small Incision Cataract Surgery at A Tertiary Care Centre

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Conflict of interest: Nil

Abstract:

Aim: Dry eye spoils the results of a well performed cataract surgery by causing discomfort to the patient. Cataract surgery is known to cause dry eye disease due to various reasons. In this study our aim was to find the incidence of post-surgery dry eye in patients undergoing SICS and to assess the pre-operative and post-operative tear film status.

Settings and Design: This was a prospective observational study of one and a half year duration conducted in the ophthalmology department of a tertiary care centre.

Materials and Methods: With a sample size of 195 patients, the pre-operative and post-operative tear film status was checked with OSDI score, Schirmer's test, Tear film break-up time and Tear meniscus height at post-operative day 1, 7, 21,45 and 90.

Statistical Analysis: Numerical data was recorded as means and standard deviations. Descriptive data was recorded as counts and percentages. Means were compared using paired sample t tests and $p < 0.05$ was considered significant.

Results: The incidence of dry eye post cataract surgery was 32.8%. The highest severity of dry eye as per the tear film parameters and OSDI scores was found at day 7 post-operatively, which subsequently improved in further follow up visits. Maximum patients had moderate dry eyes.

Conclusion: Dry eye is an important symptom found post operatively after cataract surgery. Pre-operative assessment of the tear-film status, patient education about the nature and course of this entity and proper post-operative care to relieve the symptoms can reduce the patients' distress and help in their recovery.

Keywords: Dry Eye, Schirmer's Test, Small Incision, Cataract Surgery [SICS], TBUT, OSDI.

Introduction

Dry eye disease, sometimes referred to as dysfunctional tear syndrome, often produces distress to the patient as well as the clinician. It is defined as a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.[1] Dry eye causes damage to the cornealepithelium, stimulates the corneal nerve endings, resulting in discomfort, increased blinking, and compensatory lacrimal tear secretion. Patients of dry eye syndrome are more likely to be elderly, suffer from connective tissue disease, have a history of allergy or antihistamine use, have undergone cataract surgery, or have diabetes. [2-4]

Cataract is the cause of blindness in 20 million people worldwide. Cataract surgery is the most successful treatment available for cataract. However, even after successful cataract surgery many patients suffer from symptoms of blurring, foreign body sensation, irritation and redness. Many studies have attributed these symptoms to dry eye disease which is aggravated by cataract surgery. [5,6] In developing countries, Manual small incision cataract surgery (SICS) remains the most popular technique for operating large patient load in minimum time with relatively lower cost and lesser complications. In this study we aimed to assess the tear film status in patients before and after cataract surgery and study the effect of surgery on tear film status.

Materials and Methods

This was a prospective observational study carried out in duration of one and a half years in a tertiary care center with a sample size of 195. The study included patients with pre-senile and senile cataracts, who underwent uneventful cataract surgery by SICS and who agreed for regular follow up post operatively. Patients with pre-existing ocular surface disease, tear film instability due to known or unknown cause, intra-operative complications or cataract associated with glaucoma, long standing inflammation or history of trauma were excluded.

After obtaining clearance from the institutional ethics committee and a written informed consent from the participants, the following investigation process was followed:

1. Complete ocular examination including visual acuity on Snellen's chart, slit lamp examination and fundus examination by indirect ophthalmoscopy.

2. Tear film assessment pre- operative and post operatively on day 7, 21, 45 and 90 by: (a) OSDI score (b) Tear film break up time (c) Tear meniscus height and (d) Schirmer's test

a) OSDI (Ocular Surface Disease Index) is the most popular questionnaire used for assessment of tear film status based on 3 parameters- symptoms, vision related parameters and environmental triggers. The patients' response is rated on 0-4 scale. [7] The OSDI score ranges from 0-100 with higher scores representing greater disability. The vision related parameters were excluded since many factors are responsible for vision loss post cataract surgery.

b) Tear film break-up time (TBUT): The patient was seated on a slit lamp and the eye was stained with fluorescein dye strip. The patient was asked to blink2-3 times and then instructed to look straight ahead without blinking. The interval between the last blink and the appearance of the first corneal dark spot was measured in seconds. TBUT <10 seconds indicates tear film instability.

c) Tear meniscus height (TMH): was measured at the slit lamp (Haag Streit model) with a narrow vertical beam of light of 0.3and 1.0mm from the lower lid margin to the top of the tear meniscus.

d) Schirmer's test: to test Tear film quantity. It was performed with the help of a 5x35mm strip of the Whatman-41 filter paper. The strip was folded 5mm from one end and kept in the lower fornix of both eyes at the junction of lateral one-third and medial two-thirds. After 5 minutes, the strips were removed and the length of filter paper wetted was noted in mm.

Cataract surgery: it was done by manual SICS technique by a single surgeon.

A superior straight tunnel incision was made in all cases, after CCC from the side port and hydro-dissection, the nucleus was delivered by irrigating Vectis, and a PMMA lens implanted after cortical clean-up. No sutures were used in the tunnel.

Observation Chart

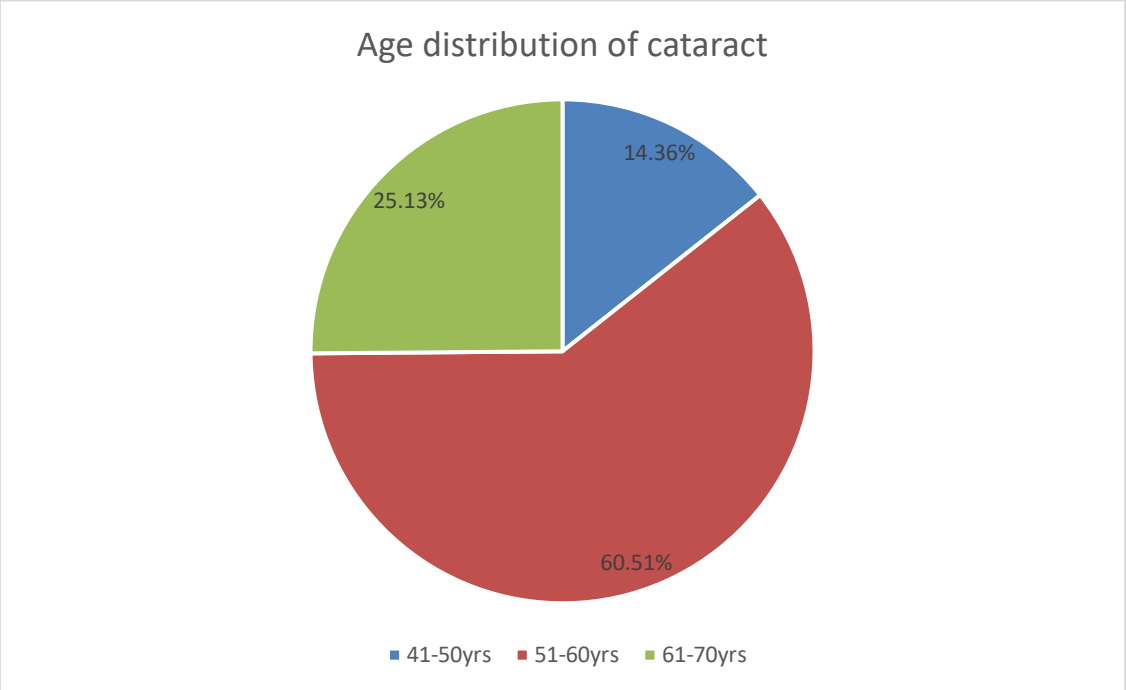

Figure 1: Age distribution of cataract patients

Table 1: Age Distribution of Dry-Eye and Non-Dry Eye Patients

Group	N	Mean Age in yrs	Std. Deviation	P value
Dry eye	64	55.44	6.156	0.073
Non-Dry eye	131	57.14	6.200	
Total	195	56.58	6.222	

Table 2: Gender Distribution of Dry-Eye and Non-Dry Eye Patients

Sex	Group		Total No (%)	P value
	Dry eye No (%)	Non-Dryeye No (%)		
Male	41 (64.1)	70 (53.4)	111 (56.9)	0.159
Female	23 (35.9)	61 (46.6)	84 (43.1)	
Total	64 (100)	131 (100)	195 (100)	

Table 3: Mean Tear Film Parameters at Pre and Post Op Visits

Day	OSDI (Mean ± SD)	Schirmer's Test Mean ± SD	TBUT Mean ± SD	TMH Mean ± SD
Pre surgery	7.7±1.9	24.6± 3.3	14.6±1.9	0.91±0.3
1	8.3±1.8	23.3±3.06	13.75±1.97	0.44±0.5
7	26.6±3.6	12.73±4.6	9.1±2.85	0.38±0.5
21	25.5±3.0	13.31±4.1	10.13±2.58	0.39±0.5
45	23±3.2	14.9±2.7	11.08±2.01	0.47±0.5
90	18.2±3.7	17.27±1.9	12.7±1.84	0.83±0.4

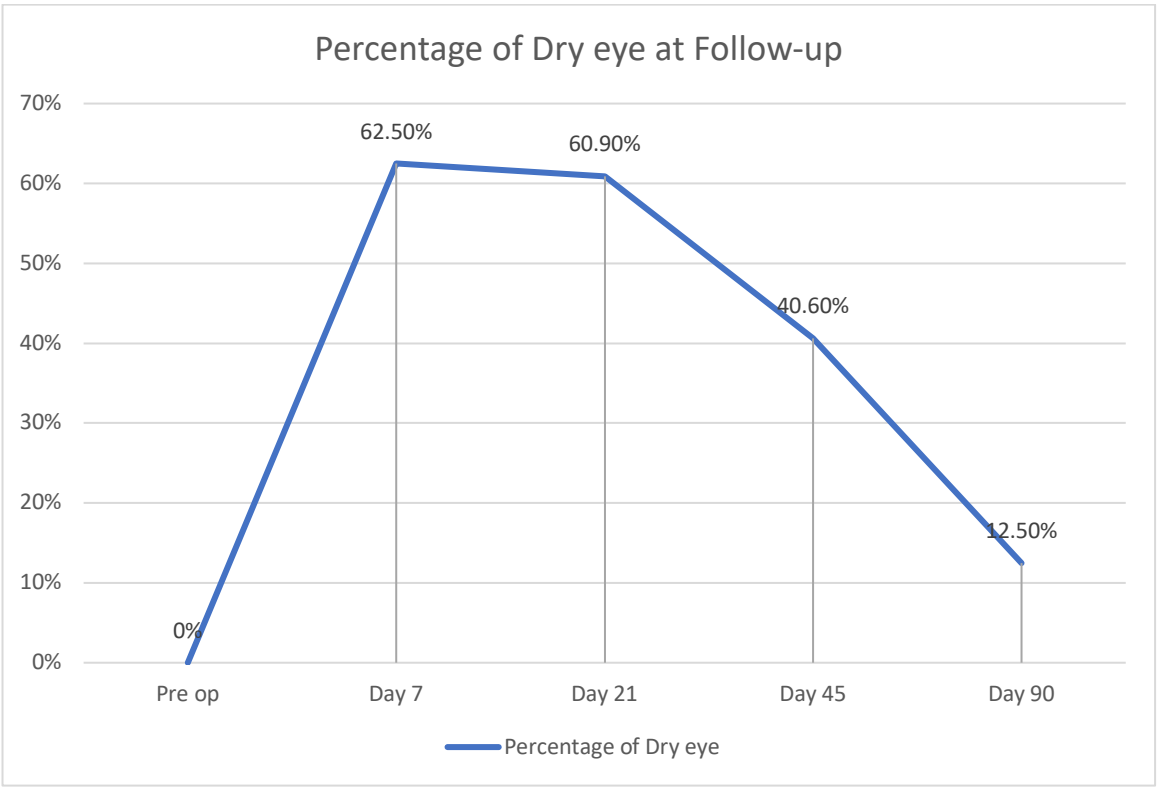

Figure 2: Percentage of Dry Eye Patients Found in Follow-Up

Various parameters showed the following trend at different follow -up

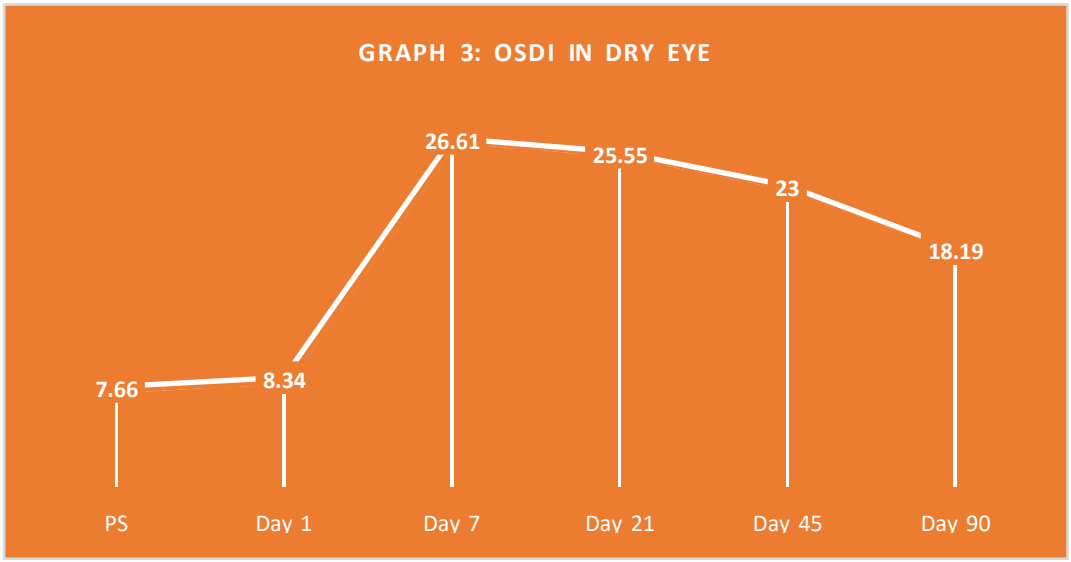

Figure 3: OSDI in dry eye

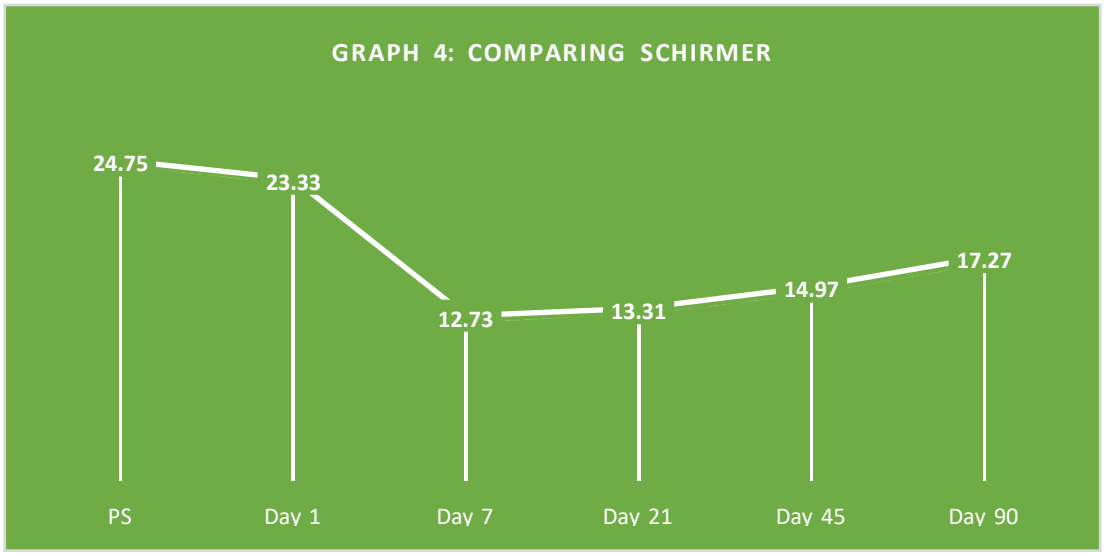

Figure 4: Comparing schirmer

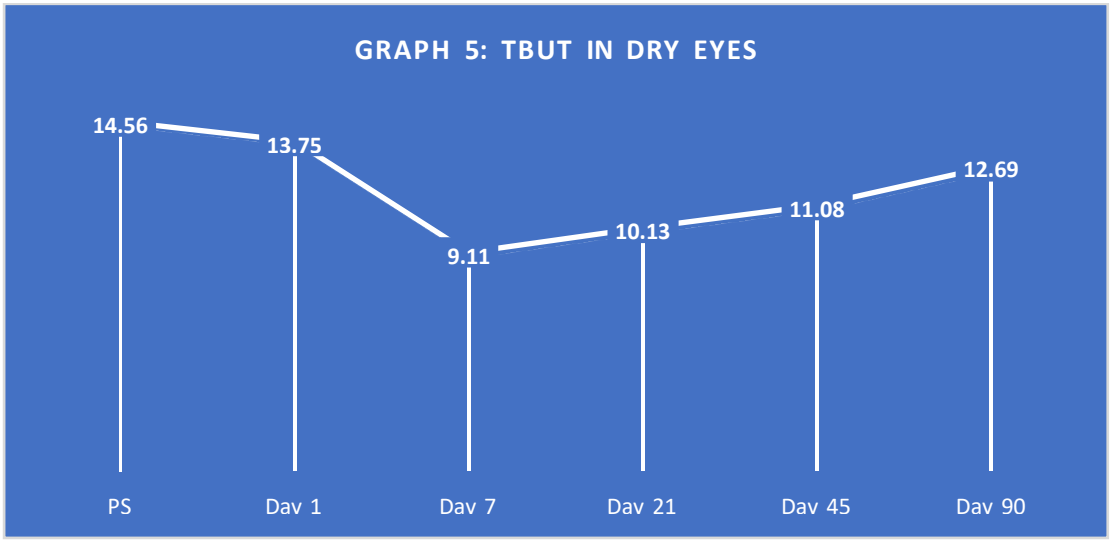

Figure 5: TBUT in dry eyes

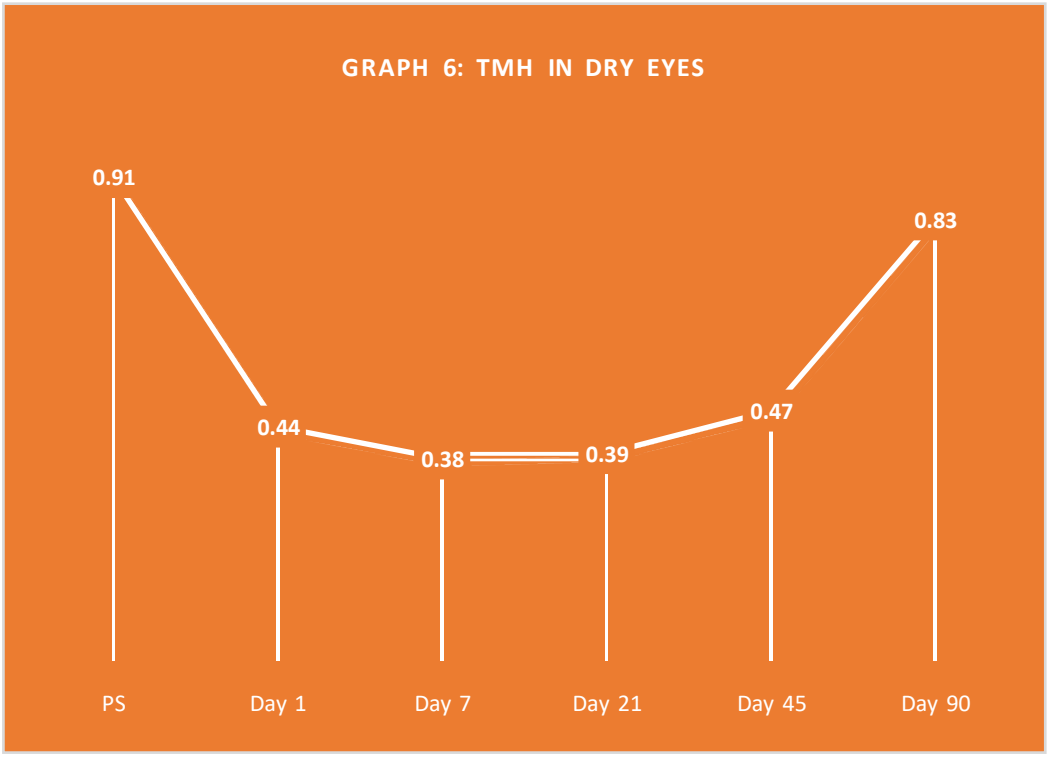

Figure 6: TMH in dry Eyes

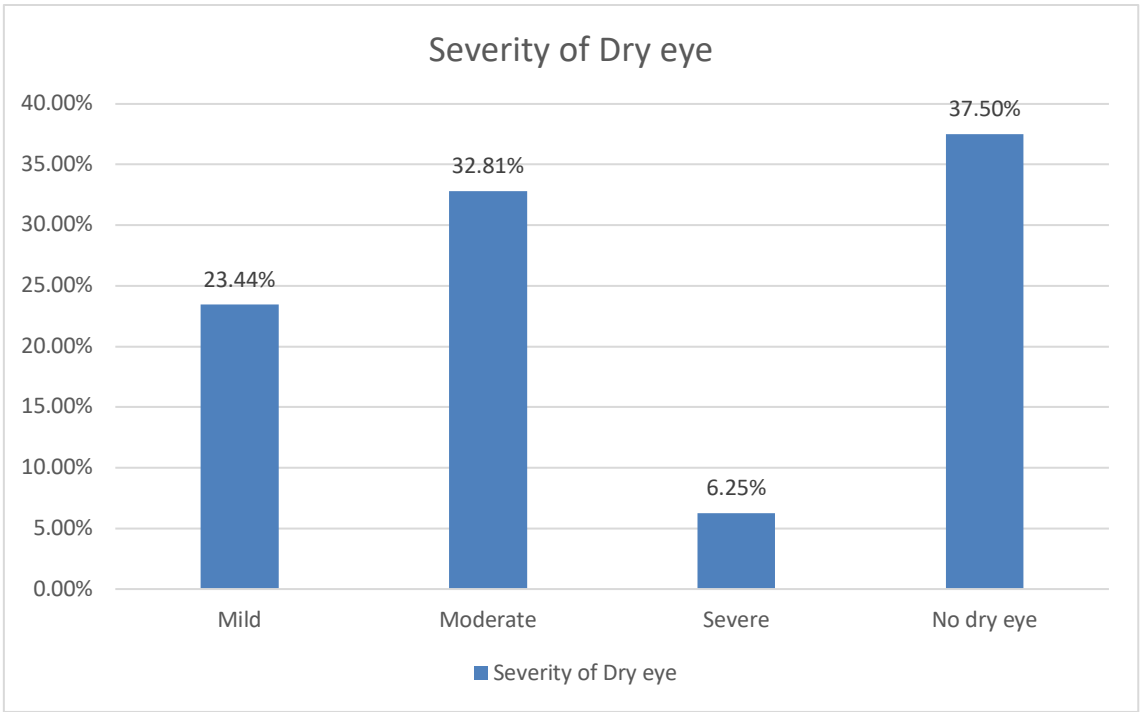

Figure 7: Severity of dry eye

The chart shows that most patients suffered from moderate dry eyes (32.81%), followed by mild dry eyes (23.44%), only 6.25% were affected by severe dry eyes

Results

There were 195 patients included in the study, 111 males (56.9%) and 84 females (43.1%). The mean age was 56.23± 1.78 years. The pie chart shows the distribution of cataract patients according to age. 60.5% patients were in the 51-60 years age group. The mean age distribution of dry-eye and non-dry eye patients is shown in Table 1

The above table shows the mean age of the patients in the dry-eye and non-dry eye groups. The

difference noted was not significant with a p= 0.073. Pearson's chi square test was used to compare the means. The gender distribution of dry-eye disease in post- op patients is given in table 2 .The table shows the distribution of male and female patients in the dry-eye and non-dry eye group. The difference was not found to be significant.

The mean values of the tear film assessment are shown in table 3. It was noted that the mean OSDI score went up from 7.7±1.9 pre-surgery to 26.6±3.6 on day 7 after which it declined on further follow-ups. The same trend was found with Schirmer's test in which the reading decreased from 24.6±3.3 to 12.73 ±4.6 on day 7 and the TBUT that dipped on day 7 to 9.1±2.85. The TMH was also lowest on day 7. In conclusion, all the parameters showed that the severity of dry eye was maximum on day 7 post operatively and improved gradually on follow-up visits. This table shows the mean values of the tear film assessment parameters on pre op and post op visits. PS (pre-surgery).

Figure 2 shows the percentage of patients having dry eye at follow-up visits. The highest incidence is found at day 7 that is 62.50%, which drops gradually to 12.50% by day 90. Figure shows that the percentage of patients with dry eye rose sharply from 0 pre-operatively to 62.50% on day 7, and then gradually declined further during follow-up visits to 12.50% at the last follow-up. The chart shows that most patients suffered from moderate dry eyes (32.81%), followed by mild dry eyes (23.44%), only 6.25% were affected by severe dry eyes. The highest incidence of dry eye was obtained at 7th day follow up which was about 62.5%.

Statistical Analysis:

All analysis was performed on IBM SPSS version 20 software. Cross-tabulation and frequency distribution was used to prepare tables. Quantitative data was expressed as means and standard deviations, whereas categorical data was expressed as numbers and percentages. Comparison of proportions was done using Chi square test. Means at follow ups were compared using paired sample t test. P value of < 0.05 was considered significant.

Discussion

Dry eye is a disturbance of the tear film attributed to multiple causes, which leads to distressful symptoms. Among the many causes of dry eye are surgical procedures like surface refractive surgeries, phaco-emulsification and manual small incision cataract surgery (SICS). Many studies have demonstrated that cataract surgery indeed has an effect on the pre-corneal tear film leading to post-operative discomfort and sub-optimal vision despite a well performed procedure.

The reported incidence of this problem is variable. In the present study it was found to be 62.5% at 7th day follow up among patients undergoing manual SICS. In a study by Saba Ishrat et al [8], the reported incidence was 42% while Chakraborty et al[9] reported the incidence as 59%. The dry eye diagnosis was based on tear film parameters and both SICS and phacoemulsification surgeries were performed in the first study, while the second focussed on SICS only, but the diagnostic criteria were different. Several other studies [10-12] have also used tear film parameters such as TBUT, Schirmer's test and OSDI scores to evaluate dry eye like the current study, but the inclusion criteria, geographical location and ethnicity of the study population and the surgical technique were not uniform. Kasetsuwan et al [13] conducted their study that followed up patients at days 0, 7, 30 and 90, and reported that the severity of dry eye peaked at postoperative 7 days. This is in sync with our observations that the severity of dry eyes based on OSDI and tear film parameters was highest at day 7. However other studies such as the one by Dodia et al [14] evaluated the incidence of dry eye at postoperative day 1, 7, and 45 and reported the peak incidence at day 1. In the past it has been reported that the severity of post-surgical dry eye is usually mild. [15,16] The current study found a moderate level of dry eye in a majority (32.8%) of patients, but this was based on Schirmer's test values. Jayshree et al [17] reported a preponderance of severe dry eye among their study patients.

We noted that all the dry eye indicators OSDI score, Schirmer's test, TBUT and TMH were raised at the first post op day, peaked at 1 week and gradually declined in the next follow up visits. This finding was consistent with other studies by Garg et al [18] and Kasetsuwan et al which showed peaking of dry eye indices at one week post-operatively, followed by gradual recovery over one to three months. A majority of studies reveal that the post-operative dry eye is a transient entity which recovers slowly over 3-6 months. [19-21] We followed our patients up to 3 months and noted a decline in the dry eye rates till the last follow up.

A number of factors such as the type of surgery (SICS or phaco-emulsification), duration of surgery, pre-op and post op medications used and the exposure to microscope light have been implicated in the development of post-operative dry eye. Neurosensory damage to the cornea due to transection of corneal nerves during surgical incision is believed to cause reduced tear production and resultant dryness. [22] Epithelial toxicity due to pre-operative and post-operative medications also causes dry eye symptoms. [22-25]

Study Limitations: This study did not take into account the effect of factors such as the socio-economic status and occupation of the patients, which could impact post-operative recovery and tear film status.

Study strength: All the procedures were performed by the same surgeon using the same technique, so the variations due to type of incision and instrumentation were avoided.

Conclusion

This study found that despite a good screening for dry eye pre-operatively, about 32% patients developed transient dry eye symptoms post operatively, which subsided gradually. This shows that cataract surgery can produce dry eye symptoms.

Thus the importance of dry-eye work up as a part of routine pre-operative examination for cataract surgery is highlighted. Good patient counselling before surgery, including informing the patient about possible dry eye symptoms will go a long way in reducing patient anxiety and distress to the surgeon later- on.

Declarations:

Availability of data and material: Department of Ophthalmology LN Medical College and JK Hospital Bhopal, MP.
Code availability: Not applicable.
Consent to participate: Consent taken.
Ethical Consideration: There are no ethical conflicts related to this study.
Consent for publication: Consent taken.

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