Original Research Article

Comparative evaluation of dry eye before and after manual small incision cataract surgery

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Abstract

Background: Dry eye is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance and tears film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface[1]. Many changes are observed in the eye after cataract surgery, one of them being onset of dry eye or change in the status of pre-existing dry eye. Thus inspite of a perfect cataract surgery and a good snellen visual acuity the patients may remain dissatisfied. **Aims and objectives**: To evaluate the proportion of dry eye before and after manual small incision cataract surgery. To assess the severity of dry eye symptoms using Ocular Surface Disease Index (OSDI) scores. To evaluate changes in tear secretion using Schirmer's test 1(ST-1). To evaluate changes in tear film stability using tear film break up time (TBUT). **Materials and Methods:** The study was a Quasi experimental study conducted on 110 eyes of 110 patients. The study was conducted for a period of 18 months. Complete ocular surface examination was done which included questionnaire using OSDI, Schirmer test – I, and tear film break up time which were measured in all the patients on the preoperative day and after 1 week, 3 weeks and 6weeks post operatively. **Results:** All the dry eye tests conducted on the eyes undergoing cataract surgery showed deterioration following surgery. All the parameters peaked at 3 weeks post operatively. **Conclusion:** Cataract surgery can lead to or aggravate dry eye disease. All the patients should be evaluated before and after SICS to prevent and manage dry eye effectively so that the patient will not have poor quality of life and vision due to dry eye disease.

Key Words: Dry Eye Disease, Ocular Surface Disorder Index, Schirmer's test-1, Small Incision Cataract Surgery, Tear break up time, Tear Film.

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INTRODUCTION

Dry eye disease (DED) is a growing public health concern causing ocular discomfort, fatigue and visual disturbance that interferes with quality of life (QOL), including aspects of physical, social, psychological functioning, daily activities and workplace productivity.[2]

Incidence of dry eye in India amongst eye out patient department patients has been estimated to be around 0.46% with a male: female ratio of 1:1.22.[3.] Many changes are observed in the eye after cataract surgery, one of them being onset of dry eye or change in the status of pre-existing dry eye.[4] 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. Thus inspite of a perfect cataract surgery and a good near and distant visual acuity the patients may remain dissatisfied. In the current study, we used various parameters to assess the status of dry eye and changes in the pattern of dry eye among patients who underwent a manual small incision cataract surgery.

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METHODS AND MATERIALS

110 eyes of 110 consecutive patients who were above the age of 50 years with Senile cataract undergoing Small Incision Cataract Surgery at the Department of Ophthalmology, Krishna Institute of Medical Sciences, Karad were enrolled in this study. Patients with cataract of any etiology other than age like traumatic cataract, complicated cataract, drug induced cataract, etc were excluded from the study. Patients with pre-existing ocular conditions like glaucoma, uveitis, pterygium were excluded from the study. Patients who received concomitant medications that could cause dry eye such as antihistamines, antidepressants, birth control pills, decongestants, and who had autoimmune diseases were excluded. Patients were also excluded if they developed intra operative complications during present surgery. Detailed medical and ophthalmic history of all patients were noted. All patients underwent a full ophthalmological examination including slit lamp examination, dilated fundus examination. Sac syringing was done and intraocular pressure was noted. Physician's fitness was taken pre-operatively for all patients. Ocular Surface Disease Index (OSDI) scores

The effect of dry eye on quality of life was evaluated using the *OSDI scores*.

OSDI is a 12 item Questionnaire. The three sub scales of OSDI are Vision related function, ocular symptoms and environmental triggers

OSDI Score = (Sum of scores for all answered questions) x 25 / (Total no of answered questions).

The OSDI scores ranged from 0 to 100 and patients were graded as follows :

Normal: 0

Mild: 1-33

Moderate: 34-67

Severe: 68-100

After completing the questionnaire, dry eye was diagnosed using the following tests:

SHIRMER'S TEST-1: Schirmer's test 1 was done. It was done by using 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 theeye and it was kept insitu for 5 minutes. The patient was asked to keep their eyes open. The wetting of the strip at the end of 5 minutes was noted by using the scale which was present on the strip. The patients were graded as follows:

- Normal: 10-25mm
- Borderline : 5-10 mm
- Hyposecretive: <5mm

TEAR BREAK UP TIME (TBUT)

The TBUT measures the interval between the last complete blink and the first appearance of a dry spot or disruption of the tear film. The tear film was stained by using sterile fluorescein strips. The fluorescein strip was moistened with saline and applied to the inferior cul-de-sac. 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.. The test was repeated three times, and the average was calculated to see whether the patient had dry eye. An average score of 10 seconds or more was classified as normal; a TBUT shorter than 10 seconds indicated the presence of dry eye.

Small incision cataract surgery with posterior chamber intraocular lens implantation was done in all patients. Patients were assessed on the preoperative day and after 1 week, 3 weeks and 6weeks post operatively.

RESULTS

110 eyes of 110 consecutive patients were studied from January 2015 to June 2017.Majority of patients belonged to the age group of 61-70 years (46.36%). The mean age among patients was 65.10 ±8.18 years. 56.36% of patients were women.

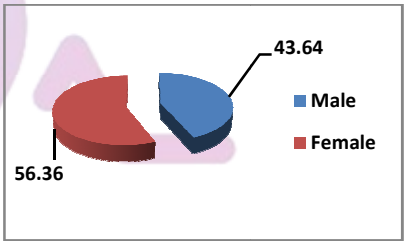

Figure 1: Distribution according to sex

Table 1: Distribution according to age

Age Group	Males	Females	Total	Percentage
50-60	15	23	38	34.54
61-70	20	31	51	46.36
71-80	10	7	17	15.45
>80	3	1	4	3.63
Total	**48**	**62**	**110**	**100**

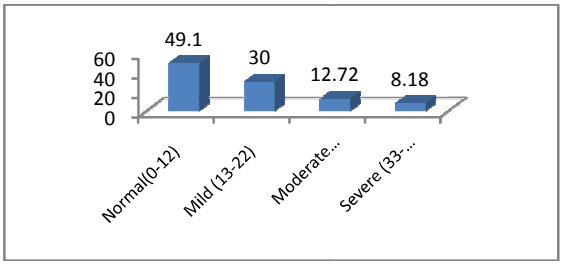

Figure 2: Distribution according to severity of Symptoms by OSDI pre-operative

The mean OSDI score pre-operative among patients was 16.66 ±12.17

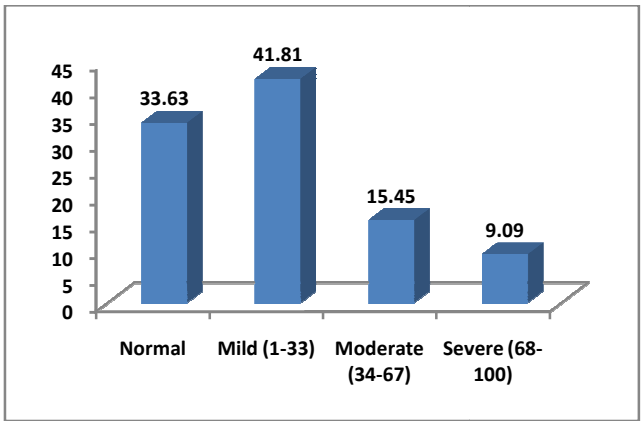

Figure 3: Distribution according to severity of Symptoms by OSDI after 1 week

(*P=0.042; P value<0.05 Statistically Significant when compared to pre-operative by Student t test) The mean OSDI score after 1 week among patients was 28.36 ±19.43

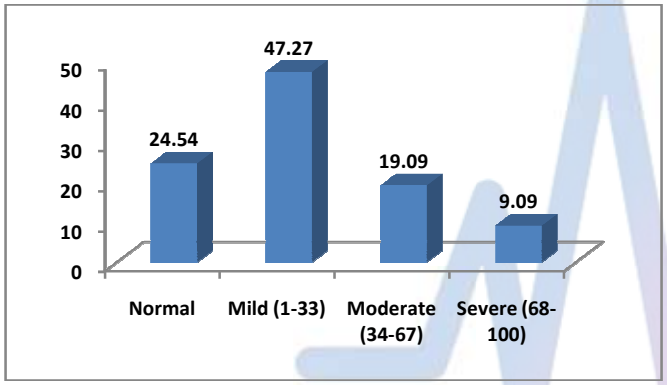

Figure 4: Distribution according to severity of Symptoms by OSDI after 3 weeks

(*P=0.039; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)The mean OSDI score after 3 week among patients was 32.99 ±19.74

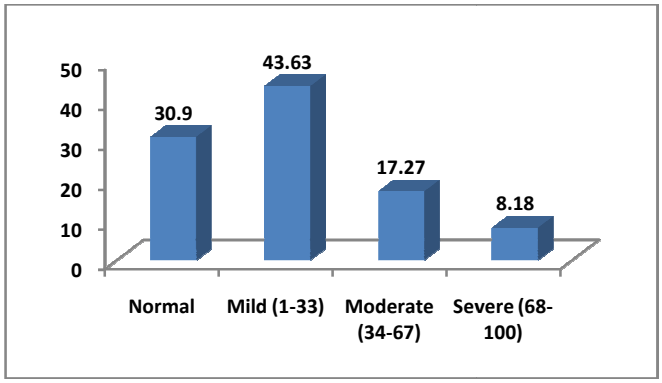

Figure 5: Distribution according to severity of Symptoms by OSDI after 6 weeks

(*P=0.031; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean OSDI score after 6 weeks among patients was 22.52 ±16.15

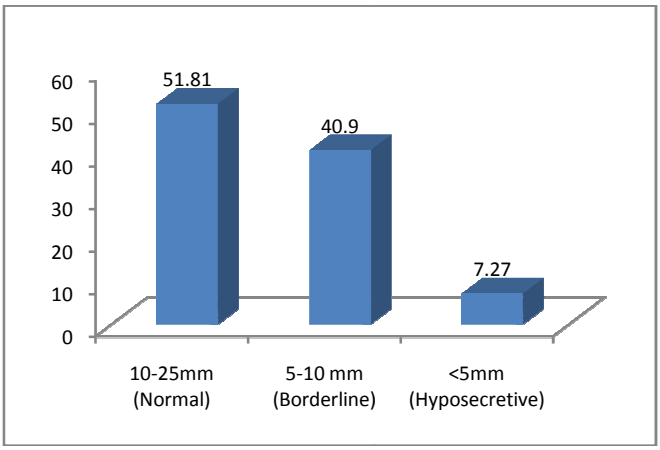

Figure 6: Distribution according to Schirmer's Test values pre-operative

The mean Schirmer test value pre-operative among patients was 12.10 ±7.67 mm.

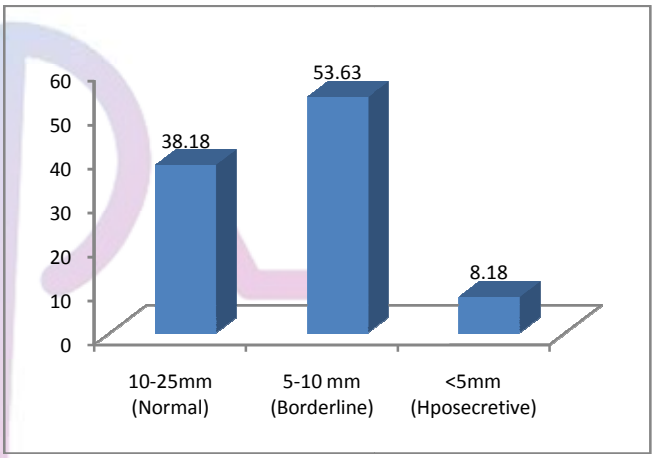

Figure 7: Schirmer's Test values after 1 week postoperatively

(*P=0.021; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean Schirmer test value after 1 week among patients was 9.39 ±7.31 mm

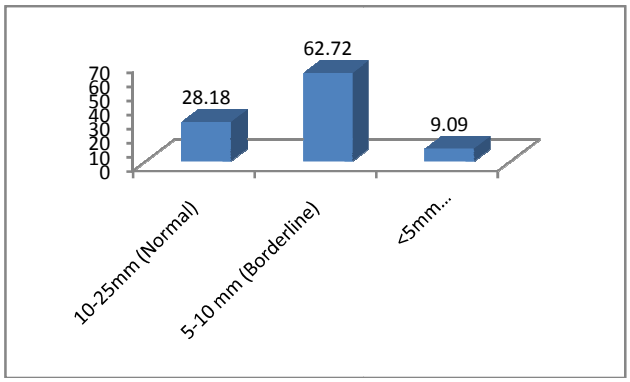

Figure 8: Schirmer's Test values after 3 weeks postoperatively

(*P=0.016; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean Schirmer test value after 3 week among patients was 8.65 ±6.81 mm

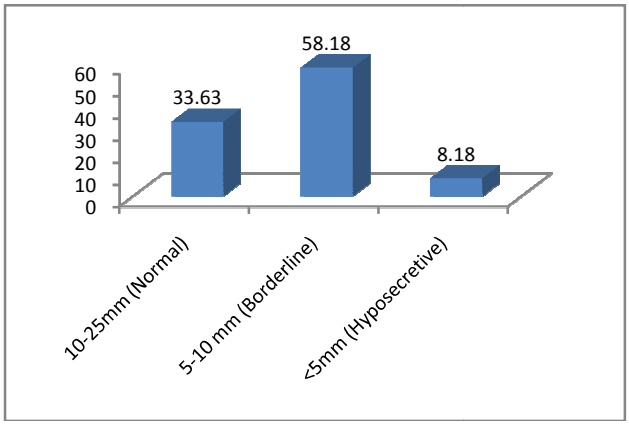

Figure 9: Schirmer's Test values after 6 weeks postoperatively (*P=0.039; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean Schirmer test value after 6 week among patients was 11.07 ±7.37 mm

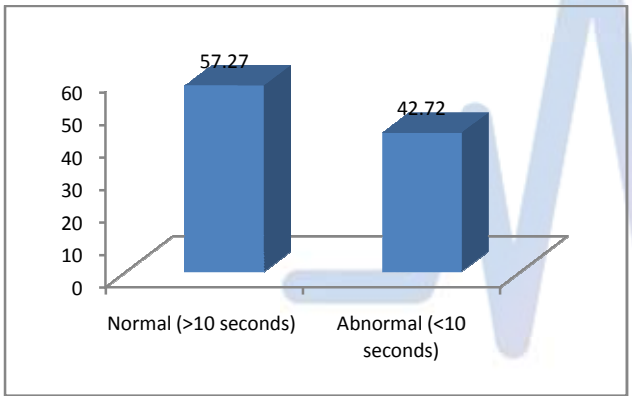

Figure 10: Distribution according to Tear Break Up Time values pre-operatively

The mean tear break up time pre-operative among patients was 12.01 ±4.43 seconds.

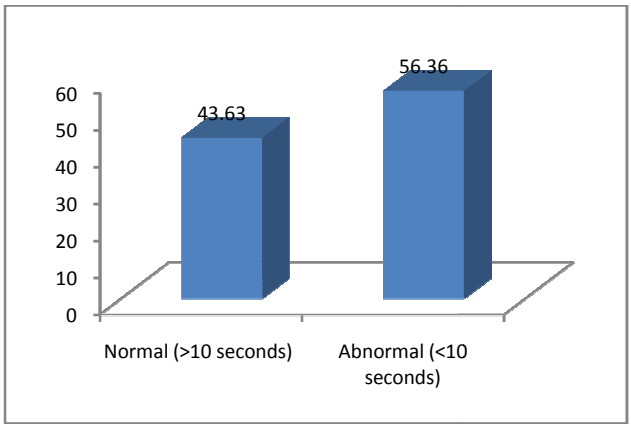

Figure 11: Tear Break Up Time values 1 week post-operatively (*P=0.026; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean tear break up time after 1 week among patients was 6.89 ±2.56 seconds

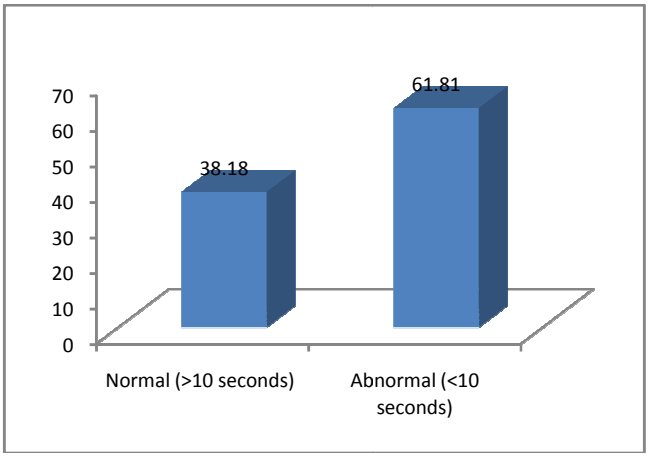

Figure 12: Tear Break Up Time values 3 weeks post-operatively (*P=0.013; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean tear break up time after 3 week among patients was 5.75 ±2.54 seconds

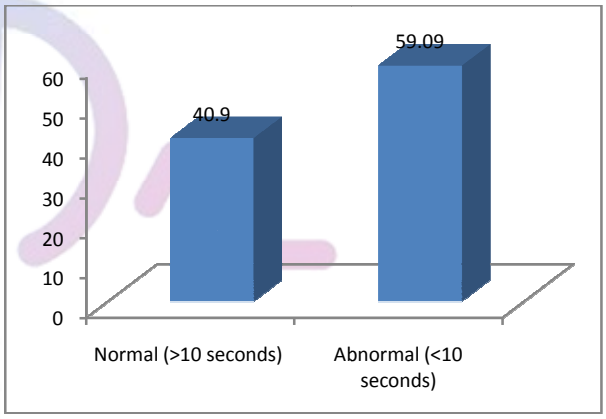

Figure 13: Tear Break Up Time values 6 weeks post-operatively (*P=0.022; P value<0.05 Statistically Significant when compared to pre-operative by Student t test)

The mean tear break up time after 6 week among patients was 8.12 ±3.45 seconds.

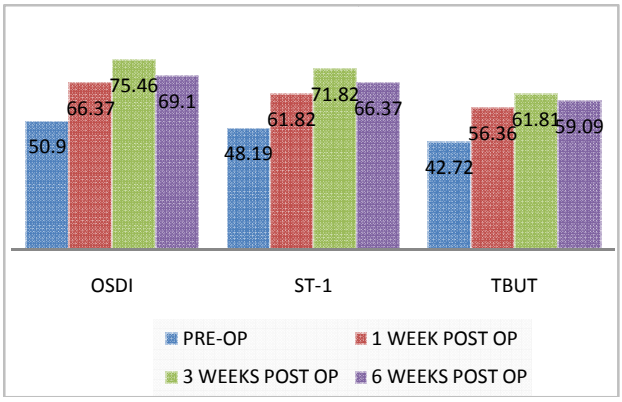

Figure 14: An overview of dry eye pattern using diagnostic criterias

DISCUSSION

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. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface, as described in the International Dry Eye Work Shop, 2007 [1].Dry eye produces discomfort and reduced vision when the tear film becomes chronically unstable and repeatedly breaks up into dry spots between blinks, exposing the corneal and conjunctival epithelium to evaporation (Parson, *et al*., 2007[5]).Cataract surgery is the most successful and classic surgery, which has given good visual acuity to many patients. Cataract operations have substantially increased from 16 lakh in 1992-93 to 59.1 lakh in 2009-10 according to the annual report 2010-11 of National Programme for Control of Blindness.[6]The etiology of dry eye following cataract surgery is characterized by presence of either pre-existing dry eye or surgically-induced dry eye. Various factors might affect the ocular surface environment after cataract surgery. Most important is corneal desensitization[7]. Superficial punctate keratitis, recurrent filamentary keratitis, secondary infections including conjunctivitis, infective keratitis, persistent or recurrent epithelial defects, stromal keratolysis and corneal ulceration have been reported in dry eye patients after cataract surgery notably conventional extracapsular cataract extraction (ECCE) by Ram *et al* in 2002[7]The intra operative factors that cause dry eye are long exposure to microscope light, prolonged surgical time, vigorous irrigation of the tear film, usage of excessive cautery and large incision at the limbus causing denervation of the corneal nerves leading to reduced corneal sensation which leads to reduced lacrimal gland tear production, which in turn leads to dry eye. Use of light filters, decreased exposure time, appropriate irrigation and gentle handling of the ocular surface tissue, using minimal cautery may decrease dry eye after cataract surgery [4]. Post operative factors that cause dry eye are use of steroid, NSAIDs and antibiotic eye drops which contain preservatives like Benzalkonium chloride which leads to increased evaporation of the tear film [8,9]The present study was undertaken to evaluate the proportion of dry eye before and after manual small incision cataract surgery with corneo scleral tunnel.All the patients satisfying the inclusion criteria visiting the Ophthalmology OPD in the Krishna Institute of Medical Sciences, Karad were enrolled in the study. The sample size was 110 patients.Patients with and without pre-existing dry eye were examined. Complete ophthalmic examination was done and patients were categorized according to the severity of dry eye.In our study, the minimum age was 50 years and the maximum age observed was 82 years. Maximum number of cases observed were in the 61-70 age group

- We observed maximum worsening of OSDI scores,ST-1 and TBUT at three weeks in the post operative period.
- As per OSDI scores, a comparison done pre-operatively and six weeks post operatively shows a rise in the number of patients with dry eyes and this difference is statistically significant with a p value =0.041
- When Schirmer's test-1 values were compared pre and post operatively after six weeks the difference was statistically significant with a p value=0.021 indicating a worsening of dry eye after SICS
- In comparison of the TBUT values, the difference pre and six week post operatively was a p value- 0.022, which was statistically significant.
- In a study conducted by Ram, *et al*.[10,11,] aggravation of dry eye symptoms and signs after cataract surgery was observed.In our study we observed aggravation of dry eye after cataract surgery with worsened at three weeks post operative.
- Cho YK, Kim MS *et al*[4]study showed that advanced age and female sex were common risk factors for dry eye disease.In our study also we observed that females were more affected than males.
- Cho YK, Kim MS *et al*[4] evaluated dry eye after cataract surgery through TBUT,ST-1, tear meniscus height. Patients were divided according to symptoms in two different group, previous dry eye group and non dry eye group. Significant aggrevation of dry eye symptoms was observed in non dry eye group after surgery.Our study evaluated dry eye using OSDI scores, ST-1, TBUT. We found aggrevation of dry eye in both dry eye and non dry eye groups.
- Kavitha CV *et al*[13]concluded that there was dryness after manual cataract surgery with corneo scleral tunnel incision which correlates with our study.
- C.W. Roberts *et al*[14]also showed worsening of dry eye symptoms who had undergone manual small incision cataract surgery which is in agreement with our study.

CONCLUSION

All dry eye tests conducted on eyes undergoing cataract surgery showed deterioration following surgery. Early

detection of changes in the tear film status after cataract surgery and starting appropriate treatment aids in better post operative results with regard to quality of life of the patient.The mean values of OSDI scores, ST-I and TBUT were below normal at 1 week, 3 weeks and 6weeks post operative follow up. The lowest value was recorded at 3 weeks post operatively.Cataract surgery can cause or aggravate pre existingdry eye. A counselling should be done before surgery about dry eye symptoms and need for tear substitute suppliments.

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