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Original Research Article

COMPARATIVE STUDY OF OCULAR SURFACE TEAR FILM ABNORMALITIES FOLLOWING MANUAL SMALL INCISION CATARACT SURGERY AND CLEAR CORNEAL PHACOEMULSIFICATION

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ABSTRACT

Background: Cataract remains the leading cause of avoidable blindness worldwide. More than 95% surgeries are done using microsurgical techniques like small incision cataract surgery (SICS) and Extra-capsular cataract surgery (ECCE) techniques with intra-ocular lens implantation (IOL). Modern cataract surgery with a small incision provides excellent clinical results, quick post-operative recovery, and a low risk of complications. **Aims and Objectives:** To analyze and compare the changes which can affect the tear film post Manual Small Incision Cataract Surgery and clear corneal Phacoemulsification.

Materials and Methods: This study was a prospective, comparative study conducted at MMIMSR, Mullana with 100 patients. Subjects were assorted into two groups of 50 patients each who were selected to undergo Manual SICS and phacoemulsification respectively post taking informed consent. Prior to surgery workup was done by slit lamp bio-microscopy. Dry-eye tests [DET] including tear meniscus height [TMH], tear film breakup time [TBUT] and schirmer test [ST], were done to rule out the pre-existing dry eye disorders, and repeated post operatively at 1 week, 1 month and 3 months. All the patients were also evaluated for dry eye symptoms with the help of questionnaire. An ocular surface disease index (OSDI) questionnaire was given to all patients before subjecting them to examination.

Results: Majority of subjects (59%) were above 60 years of age and only 41% of subjects were less than 60 years of age. Among the 100 subjects, 54% were females and 46% were males. Male:Female ratio was 1:1.2. Even while SICS and phacoemulsification use different techniques, they both significantly reduced TMH, TBUT, and ST values after one week, one month, and three months.

Conclusion: DED is a common condition that can be brought on or made worse by cataract surgery, having a significant impact on patients' QOL. We found that having cataract surgery has the potential to exacerbate dry eye and alter the results of dry eye tests. The negative intra-operative effects of cataract surgery on the ocular surface should be recognised by cataract surgeons, and precautions should be taken to reduce them.

Keywords: SICS, Phacoemulsification, Tear film, dry eye

INTRODUCTION

Cataract remains the leading cause of avoidable blindness worldwide.[1] A large number of cataract operations are performed each year worldwide, making it one of the most common and effective interventions currently used in medicine.[2] Currently about 6 million cataract surgeries are

conducted every year in India with a cataract surgical rate of 4800 surgeries per 10 lakh population. This has been steadily increasing from 4.9 million in the year 2007. More than 95% surgeries are done using microsurgical techniques like small incision cataract surgery (SICS) and Extra-capsular cataract surgery (ECCE) techniques with intra-ocular lens implantation (IOL). The visual results are far more superior to the conventional techniques used earlier.[3]

Modern cataract surgery with a small incision provides excellent clinical results, quick post-operative recovery, and a low risk of complications.[4] As a result, it is accompanied by rising expectations for both the surgeon and the patient.[5,6] Although millions of people worldwide have benefited from the technological advancements in cataract surgery over the past fifty years in terms of their quality of life (QOL), complications from cataract surgery can occur and can both be sight- and non-sight-threatening.[4]

While the majority of research, clinical, and technological advancements are geared toward preventing complications that could result in permanent loss of vision, it is critical that they also avoid and minimise adverse events that are not immediately sight-threatening because these can have a significant negative impact on patient quality of life. For instance, cataract surgery's harmful effects on the ocular surface can both directly induce and worsen dry eye disease (DED), as is the case with other eye conditions.[7,8] This is significant for both the accuracy of pre-operative assessments as well as the symptomatology and consequences of DED, such as an increased risk of infections. Prerequisites for surgical planning, tonometry, and biometric assessments include accurate topography, tonometry, and biometric measurements.[9,10] They need a strong, healthy pre-corneal tear film since it is the first part of the eye that corrects vision.[11]

The two most popular methods for performing cataract procedures, manual SICS and phacoemulsification, are equally efficient.[12] But many patients who have had cataract surgery describe irritation, pain, blurred vision, and a feeling of a foreign body, and only a few studies have shown that these symptoms worsen with time.[13,14]

An ocular surface problem called tear film abnormality, which is characterised by decreased tear production and/or increased tear evaporation, can cause symptoms such eye discomfort, gritty feeling, foreign body sensation, and vision disruption. It is one of the key elements influencing life quality, particularly for older age groups.

The International Dry Eye Workshop [DEWS] of 2007 definition of dry eye describes it as a multifactorial disease of the ocular surface and tears that causes visual disturbance, discomfort, tear film instability with potential ocular surface damage, increased tear film osmolality, and inflammation of the ocular surface.[15] In India, 0.46% of out-patients had dry eye, with a M:F ratio of 1:1.22.

Since the lacrimal film and a smooth ocular surface make up the initial refractive medium, they are crucial for creating a clear image.[16] One of the frequent results observed in daily practise is an aberrant tear film on the ocular surface. It is in charge of affecting people's general health and lowering their quality of life, particularly in older people. Henrik Sjogren first used the term "keratoconjunctivitis sicca" (KCS) in 1933.[17]

Dry eye is due to tear deficit or excessive tear evaporation and causes destruction to the interpalpebral ocular surface and is linked with discomfort in eye, according to the NEI/ Industry workshop definition.[18] A different description said that "Dry Eye is a disorder of the ocular surface caused by various abnormalities of the external eye's natural function and defence system, resulting in an instability of tear film in open eye state."[19] Both the concepts have highlighted the importance of ocular surface and tear film.

Aims and Objectives

To analyze and compare the changes which can affect the tear film post Manual Small Incision Cataract Surgery and clear corneal Phacoemulsification.

1. To check for tear film changes post Manual SICS (MSICS)
2. To check for tear film changes post Clear Corneal Phacoemulsification
3. To compare the changes in tear film following MSICS and Phacoemulsification.

MATERIALS AND METHODS

The present study was a prospective, comparative study, which was conducted at MMIMSR, Mullana. 100 patients who fit the inclusion criteria, were chosen for this study. Subjects were assorted into two groups of 50 patients each who were selected to undergo Manual SICS and phacoemulsification respectively post taking informed consent. Prior to surgery workup was done by slit lamp bio-microscopy. Dry-eye tests [DET] including tear meniscus height [TMH], tear film breakup time [TBUT] and schirmer test [ST], were done to rule out the pre-existing dry eye disorders, and repeated post operatively at 1 week, 1 month and 3 months. All the patients were also evaluated for dry eye symptoms with the help of questionnaire. An ocular surface disease index (OSDI) questionnaire was given to all patients before subjecting them to examination. OSDI questionnaire is a 12-item questionnaire used worldwide to accurately assess symptoms of ocular irritation related to dry eye and vision.

Study design

Prospective comparative study

SOURCE OF DATA

Patients with age $\geq$ 40 years who had undergone surgery for cataract in the Department of

Ophthalmology, MMIMSR, Mullana were included in this study.

Study Duration

Data was collected from January 2021 to June 2022.

Inclusion Criteria

1. Cases with age related cataract, male and female, who were found to have a normal lid anatomy along with normal blinking mechanism and without any symptoms of dry eye
2. People with age 40 years and over

Exclusion Criteria

1. Pre-hand positive dry eye or any ocular surface disorder
2. Diabetes Mellitus
3. Previously prolonged use of topical drugs
4. Surgeries taking long time and complicated surgeries
5. History of prior ocular surgery
6. Patients with conditions such as viral keratitis, blepharitis, pterygia or ocular allergies
7. Cause of cataract other than age e.g drug induced, traumatic cataract
8. Patients who had undergone corneal refractive surgery
9. Use of Contact lens

Study Methods

After obtaining the patients' informed consent, the 100 cases were chosen for this study and these were randomly split into two groups. Amongst these, 50 cases had undergone manual SICS and 50 underwent clear corneal phacoemulsification.

Evaluation of participants

The systemic and ocular histories were documented in detail. Snellen's chart was used to measure visual acuity. The anterior segment was examined using slit lamp biomicroscopy. The pupil was dilated with eyedrops containing tropicamide (0.8%) and phenylephrine (5%) and the posterior segment was examined under indirect ophthalmoscopy and +90 D biomicroscopy while the pupil was dilated. For surgery, after dilation of the pupil with eyedrops containing tropicamide (0.8%) and phenylephrine (5%) all procedures were performed under peribulbar block.

Each patient gave their consent before a thorough history of their condition was taken. Each subject underwent a thorough visual examination.

Dry Eye Evaluation Included

- Tear meniscus height (TMH)
- Schirmer's test (ST)
- Tear film breakup time (TBUT)

These tests were performed prior to surgery in order to rule out any pre-existing dry eye problems, and they were repeated one week, one month, and three months thereafter. Standard Schirmer test strips of No. 41 Whatmann filter paper were used for the test, which was conducted at the junction of the medial two-thirds and lateral one-third of the lower lid margin. The patient was permitted to blink and no anesthetic was administered. After five minutes, measurements were made to determine how moist the strip was. Less than or equal to 10 mm was regarded to be suboptimal values for the study.

>15 mm	Normal
10 – 15mm	Mild dryness
6 – 10 mm	Moderate dryness
<5 mm	Severe dryness

TMH was evaluated on slit lamp. TBUT was determined after using Fluorescein strip containing Fluorescein sodium 1 mg which was moistened with saline to dye the cornea. The strip was touched in the inferior fornix after which the patient instructed to blink so that the stain would spread evenly. The first dry patch, or fluorescein discontinuity, was noticed, and the time it took from the blink to the dry spot's appearance was recorded using a stopwatch. Three readings on average were noted. In the previously created proforma, all the values were recorded.

Follow up Period

All patients were followed up in the following schedule: after 7 days, after 1 month and after 3 months with regards to tear film parameters. Patients who failed to complete the full time of the follow up period were excluded from the study.

RESULTS

Majority of subjects (59%) were above 60 years of age and only 41% of subjects were less than 60 years of age. The mean age & Standard deviation of Phaco and MSICS group was 62.18 ± 8.85 and 63.72 ± 9.84 years respectively (p = 0.412). Both the groups had similar age distribution with majority of subjects. Among the 100 subjects, 54% were females and 46% were males. Male:Female ratio was 1:1.2. [Table 1]

All evaluated preoperative dry eye parameters namely tear meniscus height [TMH], tear film breakup time [TBUT] and schirmer test [ST] for both the groups were comparable as shown in Table 2.

Tear meniscus height for SICS group was 0.22 ± 0.08 on day 7, 0.34 ± 0.08 on day 30, 0.53 ± 0.08 at 3months while in phaco group it was 0.51 ± 0.10 on day 7, 0.59 ±0.09 at 1month, 0.75 ± 0.08 at 3 months. This fall from preoperative levels was found to be significant statistically (p <0.001). The groups showed a decrease which was noticed in both groups. The final meniscus height values were significantly lower than that of preoperative levels even after 3 months. The values were higher in the phaco group than the SICS group at 1week, 1month and 3 months. [Table 3]

Schirmer test show falling trends from Pre-op values to 5.24 ± 1.64, 8.7 ± 1.8, 13.04 ± 1.5 for SICS group at postoperative 1week, postoperative 1month and postoperative 3 months respectively post-surgery. In phaco group values were 7.76 ± 2.03, 13.3 ± 2.1, 16.56 ± 1.63 at postoperative 1week, postoperative

1month and postoperative 3 months respectively, with lowest values at 1 week in both the groups. The values were significantly more in the phaco group than the SICS group at postoperative 1week, postoperative 1month and postoperative 3 months. (Table 3)

Fluorescein tear breakup time values were 3.62 ± 1.19, 6.02 ± 1.06, 8.42 ± 1.47 at Postoperative 1week, post-operative 1month and postoperative 3 months in Small Incision group respectively. Whereas in Phaco the values came out to be 7.48 ± 1.13, 9.18 ± 0.77, 13.00 ±1.46 at 1 week after surgery, postoperative 1 month and postoperative 3 months respectively. In both the groups values showed a fall from preoperative values. The values were significantly higher in the phaco group than the SICS group at 1week, 1month and 3 months. The mean scores for ocular surface disease index (OSDI) questionnaire pre-operatively was similar for both the groups, showing absence of dry eye symptoms prior to surgery in all subjects, as shown in Table 3.

Table 1: Distribution of cases with respect to Age and Gender

Age (in year)	MSICS		PHACO		p-value (Chi-square Test)
	Frequency (n=50)	Percentage (%)	Frequency (n=50)	Percentage (%)	
<51	6	12	5	10	0.778
51-60	13	26	17	34	
61-70	20	40	20	40	
>70	11	22	8	16	
Gender					
Female	30	60	24	48	0.229
Male	20	40	26	52	

Table 2: Preoperative mean values of DET

Parameters (Pre-operative)	TMH (mm) mean ± SD	ST (mm) mean ± SD	TBUT (sec) mean ±SD	OSDI (Score) mean ±SD
MSICS	0.83±0.14	16.26 ± 1.31	14.30 ± 1.79	5.54 ± 1.96
PHACO	0.86±0.14	18.06 ± 1.80	14.20 ± 1.55	4.68 ± 2.02

Table 3: Comparison of parameters in SICS and Phaco

Parameter	Time	MSICS		PHACO		p-value
		Mean	SD	Mean	SD	(ANOVA Test)
TMH	Pre-operative	0.83	0.14	0.86	0.14	0.246
	1 Week	0.22	0.08	0.51	0.1	<0.001
	1 Month	0.34	0.08	0.59	0.09	<0.001
	3 Months	0.53	0.08	0.75	0.08	<0.001
Schirmer test	Pre-operative	16.26	1.31	18.06	1.8	<0.065
	1 Week	5.24	1.64	7.76	2.03	<0.001
	1 Month	8.7	1.8	13.3	2.1	<0.001
	3 Months	13.04	1.5	16.56	1.63	<0.001
TBUT	Pre-operative	14.3	1.79	14.2	1.55	0.766
	1 Week	3.62	1.19	7.48	1.13	<0.001
	1 Month	6.02	1.06	9.18	0.77	<0.001
	3 Months	8.42	1.47	13	1.46	<0.001
OSDI Score	Pre-operative	5.54	1.96	4.68	2.02	0.33

DISCUSSION

The most common cause of blindness is a cataract, and cataract surgery is one of the most successful and well-known ophthalmic procedures. More than 95% surgeries are done using microsurgical techniques like Small incision cataract surgery (SICS) and Extra-capsular cataract surgery (ECCE) techniques with intra-ocular lens implantation (IOL). The visual results are far more superior to the conventional techniques used earlier.[3] Although millions of people worldwide have benefited from the technological advancements in cataract surgery over the past fifty years in terms of their quality of life (QOL), complications from cataract surgery can occur and can both be sight- and non-sight-threatening.[4] Despite the positive outward results of surgery, many patients report discomfort. Dry eye symptoms after cataract surgery may be caused by either pre-existing dry eye or dry eye brought on medically.

Fundamental to ocular function is a normal and steady tear film. Damage to the ocular surface and dry eyes are brought on by tear film instability brought on by decreased production or increased evaporation. One unstable tear film splits into dry spots often in between blinks, causing evaporation and results in corneal and conjunctival epithelial exposure. It is also linked to inflammation and increased osmolarity of the tear film.[15]

It's uncertain how common DED is following cataract surgery. Clinical signs of DED were described in 9% of patients by Ishrat et al,[8] and 31% by Miyake and Yokoi 20 at 4 weeks following surgery, respectively. In a prospective study of 100 patients, Dasgupta and Gupta 21 discovered that

100% of patients displayed abnormalities in tear break up time (TBUT), Schirmer I tests, and DED symptomatology at 12 weeks after surgery. However, a prospective study by Choi et al,[22] found that at 3 months, 27% of patients still had persistent DED symptoms as measured by the Ocular Surface Disease Index (OSDI) questionnaire. Regarding the length of DED episodes following cataract surgery, Iglesias et al,[23] reported that 32% of patients had symptoms up to 6 months after surgery in a prospective research involving 86 patients. However, in 96 patients in a retrospective research by Cetinkaya et al,[24] and 50 patients in a prospective analysis by Kohli et al,[25] the signs and symptoms of DED appeared to return to pre-operative levels at 3 months.

Pre-existing DED in cataract patients is common,[26,27] and one study in a prospective series of 120 patients with cataracts reported that 80% had at least one abnormal test suggestive of ocular surface disease (OSD) prior to surgery. This complicates the matter further.[28] These results are consistent with a multi-center prospective analysis of 136 patients, which found that 63% of patients had TBUTs of less than 5 seconds and 77% had positive corneal staining before cataract surgery.[26]

It is crucial to keep in mind that DED following cataract surgery might present and overlap with prolonged post-surgical discomfort, which occurs after various surgical events such as laser refractive surgery, dental implants, and genitourinary operations.[27] In a study of 119 patients, Sajnani et al,[27] found that 34% of patients experienced post-operative discomfort six months after surgery. Women, people with autoimmune diseases, people with non-ocular chronic pain syndromes, and people who take antihistamine, anti-reflux, anti-insomnia, anxiolytic, and anti-depressant medications had higher rates of post-operative discomfort. Additionally, it has been demonstrated that the manifest symptomatology of DED depends on a variety of variables, with Szakats et al,[29] suggesting that the reporting of DED symptoms following cataract surgery may depend more on patient satisfaction than on objective tests for dry eye. It is crucial to keep in mind, however, that any discomfort experienced after cataract surgery may be linked to other pathologies of the anterior segment, such as blepharitis, keratitis, and uveitis.[30-32] These studies show that, despite its importance, the link between DED and cataract surgery is multifaceted and complex.

Following a variety of ocular procedures like LASIK and photo refractive keratectomy, surgically caused dry eye may appear. Various mechanisms for medically caused dry eye have been identified in the literature. Study by De Paiva et al. compared dry eye after LASIK surgery which involves damage to corneal nerves by a microkeratome and there is also photoablation of the anterior stromal nerves. Most crucial mechanism amongst these is the denervation of corneal nerves which occurs at the incision wound that is responsible for the disruption of circuit of lacrimal functional unit. Both procedures cause damage to the corneal innervation, but the superior-hinge flap is thought to do more harm than good. Therefore, using a nasal and wide hinge is better than superior approach. The incision during cataract surgery is quite small in width, it penetrates the entire cornea which is different from LASIK. Therefore, the two operations may result in different degrees of corneal denervation.[33-35]

The two preferred and most often used methods of cataract surgery nowadays are phacoemulsification and manual small incision cataract surgery. Their individual contributions to the comparative modification of tear function and ocular surface have not received enough research.

In the present study, 59% of subjects were above 60 years of age and only 41% of subjects were less than 60 years of age. Among the 100 subjects, 54% were females and 46% were males with Male: female ratio of 1:1.2. Both the groups had similar age distribution with the mean age in Phaco and MSICS groups was 62.18 ± 8.85 and 63.72 ± 9.84 years respectively.

In this study, we did evaluation of dry eye status in a quantified manner because there is no gold standard diagnostic test for dry eye.

After conventional extracapsular cataract extraction, Ram et al. noticed dry eye features such as filamentary keratopathy, persistent epithelial defects, infective keratitis, and stromal keratolysis. This is because the cornea was denervated by the lengthy incision and suture-induced surface irregularity. Several factors, including corneal denervation, the destruction of goblet cells in the conjunctiva, preservatives in routine used eyedrops like benzalkonium chloride, prolonged exposure to microscopic light, damage caused by ultrasound to the cornea, and a variety of environmental factors may be to blame for dry eye after cataract surgery.[13,14,36-38]

Phacoemulsification was thought to have less of an impact on the natural tear film and ocular surface because of smaller incision sizes, early wound stabilisation, and reduced postoperative inflammation. In a study of 49 patients without dry eyes who underwent phacoemulsification surgery, Chao et al. provided support for this theory. The author found that none of the patients later developed dry eye disease.[37] They also reported a brief decrease in physiological tear production that started one week after the procedure and gradually returned to normal baseline levels by the third month.

In our study the TMH levels were lowest at 1 week, whereas it showed improvement at 1 month and 3 months. There was a decline from preoperative values in TMH levels which was statistically significant ($p < 0.01$). In both the groups, there was a diminishing tendency visible. Even three months later, the final TMH readings were much lower than the preoperative values. At one week, one month,

and three months, the values were comparable between the two groups. In a study, Cho et al. discovered that the TMH value in the non-dry eye group decreased at follow-up from the preoperative values.[37] Gharaee et al. noticed a decline in TMH value at the 3-month postoperative follow up visit.[36] These results were similar to our study. In contrast, Sitompul et al. observed no such difference of significance in the TMH values in follow-up in either the SICS or Phaco groups.

Both the SICS and Phaco groups' when evaluated for corneal staining show similar picture with different post and preoperative levels. However, the staining at 3 months weren't dissimilar to the preoperative values. The staining was maximum at 1 week and then steadily subsided over the following 3 months, reaching a minimum towards later. Ram et al,[14] and Liu et al,[38] gave a description much similar to this. Liu et al described an elevated staining scores in the 1st week, then dropped in follow up.

A descriptive, cross-sectional study done by Venugopal et al. in the rural South India described a high incidence of 66.2% dry eyes post MSICS.[39] No differences on the basis of gender were found in this study.

Regardless of the kind of surgery, all of our study participants (n=100) demonstrated statistically significant declines in tear secretion and tear stability as demonstrated by dry eye test findings at 3 months ($P < 0.05$) compared to their preoperative values. Yusuf R et al found that both phacoemulsification and manual SICS cause dry eye, but the parameters come back to a normal state after a month, more rapidly in Phacoemulsification cases. At 3 months, both phacoemulsification and manual SICS are at comparable levels. However, preoperative levels of the same parameters are not completely reached, even at a 3 month follow up.[16] Similar comparison research by Egyptian author by Saif et al. Same observation was done by Indian authors Shankar et al, Mohana et al in which all the mean values in tests were showing a tendency to improve, however did not recover completely to their pre-operative levels by the end of 3rd month.[40-42]

A study by Cho YK et al observed that all the dry eye tests after cataract surgery were worse in non-dry eye group as well.[43] Saba Ishrat et al in their study on incidence and pattern of dry eye after cataract surgery, concluded that the dry eye was noticeably higher in Small Incision Cataract Surgery than phaco due to unstability of tear film.[8]

Pallamreddy S L et al did a study on Changes that can be observed in the Tear film after a surgery like Manual SICS and came to a conclusion that patients undergoing SICS, with no dry eye in the preoperative period, showed lower values of tear film indices like TMH, TBUT and Rose Bengal at 1 week and still lower values at 1 month. There was noticed occurrence dryness of eyes in a variety of the patients in which mild grade of dry eye was evident in the majority of them.[44]

Chao et al concluded that there was a temporary decline in physiological tear levels post one week after phacoemulsification, which was followed by a gradual return to normal baseline levels by the third month.[37]

Smooth ocular surface and lacrimal film are a pre-requisite for the formation of a clear image, as they are considered to form the first refractive medium. Hence, Cataract surgery modifies tear film in a both quantitative & qualitatively sense 14 Conventional cataract procedure by virtue of its large incision, causes corneal denervation which further produces corneal desensitization, disturbing the lacrimal functional unit.[17] The subjective effect is that there is tear film changes with an array of symptoms like congestion, watering, grittiness, tiredness and transient blurring of Vision.[45] Therefore, despite a seemingly good visual outcome, when recorded by Snellens chart, the overall patient satisfaction is deficient.

In contrast, Marc Schargus et al in their study on Comparable effects seen over the tear film parameters measured after performing femtosecond laser-assisted surgery and conventional cataract concluded that Neither (LCS) laser assisted cataract surgery nor conventional cataract surgery affected objective tear film parameters significantly during a 3-month postoperative period. Hence, both surgical techniques can be equally used to treat patients without prior dry eye symptoms.[46]

CONCLUSION

DED is a common condition that can be brought on or made worse by cataract surgery, having a significant impact on patients' QOL. A sizable portion of patients may arrive at the cataract pre-assessment clinic with pre-existing DED, and because clinical symptoms and patient signs sometimes conflict, diagnosing and treating this condition effectively presents difficulties for clinicians. To guarantee that patients receive the proper pre-operative DED treatment prior to cataract surgery and to ensure that precise measurements are collected in terms of biometry and corneal topography/tomography for surgical planning, pre-operative evaluation for pre-existing DED is crucial.

Phacoemulsification and SICS both have a nearly similar effect on the results of a dry eye test. Following surgery, all dry eye test results revealed worsening. We found that having cataract surgery has the potential to exacerbate dry eye and alter the results of dry eye tests. Even while SICS and phacoemulsification use different techniques, they both significantly reduced TMH, TBUT, and ST values after one week, one month, and three months. The negative intra-operative effects of cataract surgery on the ocular surface should be recognised by cataract surgeons, and precautions should be

taken to reduce them. In order to preserve tear film homeostasis and prevent long-term negative effects on the ocular surface, post-operative management of DED is essential. Hence, the patients should be made aware of the potential worsening of dry eye symptoms prior to surgery. Therefore, it is crucial for ophthalmologists to evaluate dry eye in the follow-up visits following surgery to guarantee optimal care, vision quality, and ultimately the patients' quality of life.

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