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ORIGINAL ARTICLE

Evaluation of the relationship between dry eye and cataract surgery

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Abstract

Purpose: This study's aim is to evaluate the presence of dry eye in patients who had cataract surgery in the past 3 months and compare the results with the patients' healthy eyes.

Methods: Twenty patients were enrolled and both eyes were examined. Two groups were established, Group 1 was made up of eyes that had cataract surgery in the past 3 months and Group 2 of eyes that had not undergone the intervention. Dry eye presence was tested with tear film break-up time, Schirmer-1 test, Oxford scale, and Ocular Surface Disease Index (OSDI) score assessments.

Results: Median tear film break up-time measurement was lower and the difference was statistically significant (p=0.037). Median OSDI and Oxford scale scores were higher in Group 1 and median Schirmer 1 value was lower in Group 1; however, no statistically significant difference was detected (p=0.063, p=0.545, and p=0.825, respectively).

Conclusion: Between eyes with prior cataract surgery and those without, there were significant differences in the results of dry eye tests. We advise ophthalmologists to be aware that cataract surgery can trigger the development of dryness of the ocular surface and when any pathology detected on ocular surface after the surgery, it should not be neglected to prevent more serious consequences and to maintain ocular surface homeostasis.

Keywords: Cataract; cataract surgery; dry eye.

Dry eye is a multifactorial disease of the ocular surface which can result in ocular discomfort, tear film instability, and eventually ocular surface damage.[1] Ocular symptoms related to dry eye includes pain, irritation, decrease in vision, and tearing.

Cataract is another common disease of the eye and can be treated with phacoemulsification surgery which is performed worldwide and includes small incision and emulsification of the crystalline lens with ultrasonic force.[2]

With the widespread use of phacoemulsification surgery, the development of dry eye related symptoms after surgery has increased gradually and is becoming of interest to ophthalmologists.[3] The reported prevalence of dry eye following cataract surgery ranges from 8%[4] to 70%.[5]

The aim of this study is to evaluate the existence of dry eye in patients who had cataract surgery comparing their

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eyes which had undergone surgery with those which had not.

Materials and Methods

Twenty patients were enrolled in the study. Patients who had cataract surgery within 3 months in one eye were included in the study. Patients with any ophthalmologic or systemic diseases, patients with pre-existing ocular surface disease and patients who had cataract surgery in both eyes were excluded from the study. The eyes that had cataract surgery within 3 months were considered as Group 1 and the other healthy eyes of the same patients were defined as Group 2. All subjects underwent a detailed ophthalmological examination. Dry eye tests were performed on both eyes including tear film break-up time (T-BUT), Schirmer 1 test, corneal and conjunctival fluorescein staining and Oxford scoring, and Ocular Surface Disease Index (OSDI) score assessment.

Before the examination, all patients were required to complete the OSDI questionnaire which aimed to evaluate the visual disability due to dry eye. The questionnaire had three different parts to question ocular symptoms, vision related functions, and environmental triggers. It was performed by the same ophthalmologist (PK) on all the participants. The OSDI score was calculated according to the formula OSDI = (sum of scores) × 25/(number of questions answered). After the questionnaire, the T-BUT was measured by touching the inferior fornix with a fluorescein strip. The participant was instructed to blink and then hold his/her eyes open. The tear film was examined with a biomicroscope under the cobalt filter. The time to the first break in the corneal fluorescein layer was considered as T-BUT. It was repeated 3 times for each eye, and the average second was recorded. Corneal and conjunctival staining was evaluated by examining the corneal surface under a cobalt blue filter with a biomicroscope after fluorescein instillation, and the staining was recorded according to the Oxford scale. Furthermore, a Schirmer-1 test was performed with a 5×35 mm paper strip. The strip was placed at the junction of the middle and lateral third of the lower lid margin and after 5 min, the strip was removed and the wetting was recorded.

Clear corneal phacoemulsification surgery was performed with topical anesthesia. Patients with any intraoperative or post-operative complications were excluded from the study. Post-operative medications were topical moxifloxacin hydrochloride, 0.5% 8×1; dexametasone ophthalmic suspension, 1% 8×1 and nepafenac ophthalmic suspension, 0.3% 1×1 in tapering doses. No artificial tear drops were added.

Each subject provided written informed consent. This study was approved by the Buca Seyfi Demirsoy Training and Research Hospital Medicine Ethics Committee (date: August 31, 2022; number: 2022/108 101) and adheres to the tenets of the Declaration of Helsinki.

Statistical Analysis

For statistical purposes, "IBM The Statistical Package for the Social Sciences 25" was used. (SPSS Inc., Chicago, IL, USA). Data were analyzed using the Mann–Whitney U-test for non-parametric values. A normality test was performed before choosing Mann–Whitney U test. Categorical variables were expressed as frequency and percentage and numeric variables as median and min-max values. P-value under 0.05 was considered statistically significant.

Results

The median age of the patients was 66.5 (range 54–78). There were 11 (55%) men and 9 (45%) women. Group 1's median Schirmer 1 value was 17.0 (range, 10–30) and Group 2's was 20.0 (range, 10–30) mm, (p=0.825). Group 1's median T-BUT value was 10.0 (range, 3–16) and Group 2's was 13.0 (range, 6–18) seconds, (p=0.037). Group 1's median Oxford scale (superficial punctate staining of the cornea and conjunctiva) was 0.00 (range, 0–2) and Group 2's was 0.00 (range, 0–2), (p=0.545). Group 1's median OSDI score was 25.0 (range, 8.3–93.7) and Group 2's was 17.65 (range, 4.1–66.6), (p=0.063).

Discussion

The relationship between cataract surgery and dry eye disease has been evaluated by many researchers. Ishrat et al.[6] reported clinical signs of dry eye disease in 9% of patients 1 month after surgery; however, Miyake and Yokoi[7] documented it in 31% of patients after 1 month. Dasgupta and Gupta[8] found that 3 months after surgery, 100% of patients showed abnormalities in T-BUT, Schirmer 1 tests and dry eye symptoms. In addition to these findings, Choi et al.[9] reported that at 3 months, 27% of patients suffered from dry eye. Iglesias et al.[10] reported that after cataract surgery, 32% of the patients continued suffering from dry eye symptoms until 6 months. Oh et al.[11] also found a significant reduction in T-BUT in the post-operative period of the cataract surgery; however, Schirmer Test 1 was within the normal range. In addition to these finding, they also reported that, even 3 months post-operatively, both T-BUT and Schirmer Test 1 values showed improvements; however, both of them remained lower than the baseline.

In our study, patients were requested to complete the questionnaire for eyes separately. Patients who could not complete the test properly were excluded from the study. In a study by Palamar et al.,[12] patients with pseudophakic bullous keratopathy in one eye were evaluated and OSDI scores were compared with the other healthy eyes of the same patients.

It is well known that, in the development of dry eye disease, inflammation plays a crucial role.[13] It was shown that during the cataract surgery, brutal ocular surface irritation can stimulate inflammatory responses by the production of free radicals, proteolytic enzymes, and cyclooxygenase.[14,15] These components can irritate and damage the ocular surface and may lead to tear film abnormalities and dry eye disease.

The damage of the corneal nerves can cause dry eye after cataract surgery. Both the mechanical impact of the incisions, and the neurogenic inflammation resulting in alterations in the action of the corneal nerves and reductions in corneal sensitivity,[16] could be contributing factors.

The use of drops with preservations such as benzalkonium chloride during and post-surgery could contribute to dry eye. Li et al.[17] reported that 3 months after cataract surgery, a decrease in the number of goblet cells were detected and they also suggested that peri-operative use of eye drops is the major factor responsible. Jee et al.[18] evaluated the effect of preservatives on patients with cataract surgery. They found that 2 months after the surgery, patients who received preservative-free drops had better T-BUTs, goblet cell counts, Schirmer I test, corneal fluorescein staining, and OSDI questionnaire scores.

In a study by Han et al.,[19] the relationship between Meibomian gland dysfunction and cataract surgery was evaluated and they suggested that cataract surgery seems to affect the function of the Meibomian glands. Furthermore, they emphasized that these changes of the Meibomian glands remained until 3 months post-operation, suggesting that Meibomian gland dysfunction and tear film instability may be the leading factors of persistent dry eye symptoms after cataract surgery.

During cataract surgery, the ocular surface' exposure to repeated cycles of drying and irrigation could potentially harm the ocular surface and contribute to development of dry eye. He et al.[20] reported that cataract surgery with the use of hydroxypropyl methylcellullose for coating the surface resulted in better tear film assessment measures when compared with balanced salt solution irrigation.

In a study by Cho et al.,[21] the duration of microscopic light exposure during cataract surgery was associated with worse dry eye symptoms, T-BUT, and Schirmer I test in patients with no prior history of dry eyes.

Conclusion

Factors that can contribute to the development of dry eye after cataract surgery include preservatives in eye drops that are used during and after surgery, decreased corneal sensation due to surgical incision, surgically induced ocular inflammation, damage in Meibomian gland functions, and surgical factors such as irrigation and exposure to light from the operating microscope.

In our study, we found significant differences between eyes with prior cataract surgery and those which were healthy, in the results of dry eye tests. However, our study has some limitations. The main limitation was the small sample size, also there was no picture of the patients' eyes demonstrating the ocular surface changes. Tests such as mean goblet cell density and conjunctival impression cytology could not be performed.

In summary, we advise ophthalmologists to be aware that cataract surgery can trigger the development of dryness of the ocular surface and when any pathology is detected on the ocular surface after the surgery, it should not be neglected to prevent more serious consequences and to maintain ocular surface homeostasis.

Ethics Committee Approval: This study was approved by Buca Seyfi Demirsoy Training and Research Hospital Ethics Committee (31.08.2022; number 022/108 101).

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