Tear Film Instability in Pseudophakic Eyes Following Phacoemulsification Cataract Surgery

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ABSTRACT

Objective — *To find out tear film levels by Schirmer's test and tear film break up time (TBUT) in postoperative pseudophakic patients who underwent phacoemulsification cataract surgery.*

Study design — *Descriptive case series.*

Place & Duration of study — *Ophthalmology Services, B.H.Y Hospital Karachi, from January 2019 to September 2019..*

Methodology — *Pseudophakic patients who underwent phacoemulsification cataract surgery were included. Schirmer test and tear film break up time (TBUT) were used to assess the tear film level in pre and postoperative period.*

Results — *Eighty patients with an age ranging from 40 to 70 years were included. In the follow up phase, symptoms of dry eye were aggravated after cataract surgery. Corneal and conjunctival staining remained positive by the third month of follow up. Similarly, 56% of the patients had tear film break up time of less than 8 seconds and Schirmer test also showed dry eye in more than 65% of the patients.*

Conclusion — *Dry eye may develop or worsen after cataract surgery.*

Key words — *Tear film, Pseudophakic, Schirmer test, Epiphora, Tear film break up time.*

INTRODUCTION:

Dry eye, being a multifactorial disease, involves the ocular surface and tear film level and results from a disturbance of an integrated system linking the lids, ocular surface, lacrimal glands, sensory and motor nerves. It is caused by an abnormality of the tear film components comprising of aqueous, mucin and lipids. Lid surface abnormalities and over evaporation leads to an increase in the tear film osmolarity causing inflammation of the ocular surface, discomfort, tear film instability and visual disturbances.[1] Corneal nerve endings are stimulated by epithelial injury caused by dry eye, leading to discomfort, frequent blinking and compensatory reflex lacrimal tear secretion which ultimately leads to decreased corneal sensitivity and reduction of the reflex tear secretion.[2]

There are number of factors that can lead to dry eye, such as age, systemic hypertension, diabetes mellitus, female gender, excessive use of contact lens and drugs.[3] The common complaints in dry eye syndrome include irritation, foreign body sensation, reflex lacrimation, punctate keratitis, persistent epithelial defect, filamentary keratopathy, superior limbic keratoconjunctivitis and reduced visual acuity. Anterior segment surgical interventions like photorefractive keratectomy (PRK), refractive surgery (LASIK), contact lens wear, chronic use of topical anaesthetics, post- cataract surgery cause dry eye and aggravate the symptoms in pre-existing dry eye.[4] In a developing country, environmental factors such as wind, sunlight and high temperature predispose

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to dry eyes, which is further aggravated after cataract surgery.[5]

Dryness and irritation are common complains after cataract surgery that many patients present with. Many studies showed that povidone iodine used before surgery for sterilization could possibly disturb the tear film stability causing ocular surface damage and leading to dry eye in a time dependent manner in addition to incision related transection of corneal nerves, peroperative use of microscopic light causing phototoxic damage, constant irrigation of corneal epithelium and use of benzalkonium chloride preservative containing topical eye drops after surgery resulting in a dose dependent increase in inflammatory cytokines in the tear film.[6,7] Another study reported that an aspirating speculum could aggravate dry eye after cataract surgery.[8]

Cataract surgery is the commonest eye surgery performed. Sutureless cataract surgery is the preferred method today. A clinically significant proportion of cataract surgery patients experience some degree of dry eye symptoms after surgery. Dry eye is highly prevalent, yet largely under diagnosed condition that can substantially affect quality of life. This study was conducted to find out tear film instability in pseudophakic patients who had phacoemulsification cataract surgery.

METHODOLOGY:

This case series was study conducted in Eye OPD at B.H.Y Hospital from January 2019 to September 2019. Patients with pre-existing ocular diseases such as glaucoma or uveitis, disorders of the lid or nasolacrimal pathway, previous ocular surgery, ocular allergies, pterygia, or blepharitis were excluded from the study. Detailed history was taken. Special emphasis was given on inquiring about dry eye symptoms and signs such as feeling of dryness, grittiness, and burning which characteristically worsened by the end of the day, stringy discharge, crusting of the lids and transient blurring of vision.

Complete ophthalmic examination was also done. Examination was directed at observing for signs of posterior blepharitis, meibomianitis and conjunctival keratinization. Visual acuity and refraction were assessed. General slit lamp examination including ocular adnexa and anterior segment, fundus examination with slit lamp biomicroscopy using 90 D lens or indirect ophthalmoscope with 20 D lens. If fundus was not visible then an ultrasound B scan was performed.

Tear meniscus height was evaluated by reading the scale of slit lamp microscope without using fluorescein (in the normal eye meniscus is about 1mm in height), while in dry eye it becomes thin or absent; fluorescein staining of conjunctiva and cornea was also done. Tear film stability was assessed using fluorescein TBUT using the following method. A fluorescein-impregnated strip wet with non-preserved saline solution was placed in the inferior fornix and the patient was asked to blink several times. Using a cobalt blue filter and slit lamp microscopy, we determined the time required for the first area of tear film break-up to appear after a complete blink. A break up time of less than 10 second was abnormal. We evaluated the ST-II without corneal anesthesia. The test lasted 5 minutes, and the length of wet paper was directly read off the scale on the paper itself. Less than 10 mm of wetting after 5 minutes without anesthesia was considered abnormal. All these variables were assessed on the 10th day, 45th day and at 3 months after cataract surgery. Data was analyzed in SPSS (version 21). Frequency with percentage was calculated for gender, TBUT (tear-film break up time) and Schirmer test (ST) results.

RESULTS:

A total of eighty patients were included in this study. There were 30 (37.5%) males and 50 (62.5%) females with age between 40 years to 70 years. During the follow up period symptoms of dry eye such as grittiness, burning, feeling of dryness, stringy discharge, transient blurring of vision, were aggravated. Corneal and conjunctival staining was negative in most (n=70 -87.5%) of the patients before the surgery. Positive corneal and conjunctival tests were noted in 32 (40%) patients at 1.5 month follow up but gradually settled down by the 3rd month of follow up in most of the patients but remained positive in 12 (15%) patients. Tear meniscus height remained < 1mm during the follow up period. Before surgery all patients had tear film break up time of >10 sec. Follow up results are shown in table I. Before surgery, all the patients had >15 mm wetting of filter paper. Results in postoperative period are given in table II.

DISCUSSION:

The tear film-cornea interface forms the impregnable refracting surface of the eye and any anomalous change may result in a dissatisfactory ocular performance. In patients with normal ocular surface prior to cataract surgery, dry eye may occur due to a number of surgically induced factors, which are self-limiting and may return to normal in 1 to 3 months as seen in this study as well as in the previous studies.[9,10] Another investigator found a deterioration in corneal sensitivity and tear film

Table I: Tear Film Break-up Time in Postoperative Period			
Tear Film Break-Up Time	**First follow up (10th day)**	**Second follow up (45th day)**	**Final Follow up (90th day)**
< 8 sec,	54 (67.5%)	49 (61.255)	45 (56.25%)
< 10 sec	11 (13.75%)	10 (12.5%)	9 (11.25%)
> 10 sec	15 (18.75%)	21 (26.25%)	26 (32.5%)

Table I: Postoperative Period Schirmer Test			
Wetting of filter paper	**First follow up (10th day)**	**Second follow up (45th day)**	**Final Follow up (90th day)**
< 10mm	62 (77.5%)	56 (70%)	53 (66.25%)
> 10mm	18 (22.5%)	24 (30%)	27 (33.75%)

disruption immediately after phacoemulsification.[11] Li et al also documented the incidence of dry eye to be increased dramatically after cataract surgery.[9]

Two clinical tests, Schirmer's test and TBUT (with flourescein), are used commonly for dry eye diagnosis. Schirmer test, an objective diagnostic test for dry eye, has been used since a long time.[12] Economical feasibility of the strips and easy use has made Schirmer test the most commonly applied clinical test for dry eye diagnosis though it can not be repeated. Whereas, TBUT test is repeatable, less invasive and more reliable than the Schirmer test, but fluorescein instillation destabilizes the tear film.[13] For accurate assessment of tear stability, tear film can be measured without flourescein.[1]

Phacoemulsification is currently the preferred procedure for cataract surgery. However, its effects on tear film stability are seldom studied. This current study recorded changes in both TBUT and Schirmer test. Studies have been conducted which report cases of dry eye increasing progressively with age, thus delaying the return of tear film after phacoemulsification.[14] Some studies also show a high number of dry eye cases in females compared to males, which is consistent with the present study. It seems to be related to the menopause related estrogen deficiency and a subsequent change in hormonal status of the lacrimal gland leading to dry eye in females.[15]

In this study 66% of the patients showed >10 mm of wetting in Schirmer test at the end of the 3 months. When compared, Schirmer scores and TBUT before and after surgery, they also showed decrease in both up to 2 months post operation. Li et al also demonstrated similar results when followed up to 3 months.[9]

Corneal irrigation and ocular surface manipulation during cataract surgery, disturbs the tear film stability and may reduce goblet cell density, causing reduced TBUT postoperatively.[16] In this study also, TBUT values decreased postoperatively. Surgical procedures on the cornea may also cause denervation, resulting in infrequent blinking and decreased tear production leading to impaired epithelial metabolism, permeability and epithelial wound healing.[17,18] During the healing process, neural growth factor is secreted to regenerate the sub epithelial corneal axon. This circle is completed approximately within 30 days and this recovery of the nerves may explain why dry eye signs and symptoms are prominent early after surgery and improve thereafter.[19] This is in accordance with our study.

Symptomatic analysis findings showed that the Schirmer's test and the tear film break-up time were consistent with a study conducted by Srinivasan R et al stating that the tear film break-up time was reduced in pseudophakic eyes after phacoemulsification.[20] This indication pointed towards the presence of surface irregularity at the site of the incision or decrease in the mucin production from the conjunctiva. Significantly reduced tear film break-up times and Schirmer's test-I scores were found 1 month postoperatively by Liu Z et al.[21] Park et al also discussed about abnormal meibomian gland function as the cause of dry eye after cataract surgery.[22] In this study a comparison between postoperative dry eye and vision was not assessed. Further investigations are required to establish these findings and to evaluate the long term effects.

CONCLUSIONS:

Cataract surgery may cause or aggravate dry eye which may negatively impact the quality of life. Preoperative counseling of the patient should be done to create awareness regarding the possible occurrence of dry eye symptoms.

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