Original Article

An Age Based Differential Response of Dry Eye Disease on Topical Lubrication

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ABSTRACT

Objective: To compare the OSDI (Ocular Surface Disease Index), SIT (Schirmer I Test), FBUT (Fluorescein Break Up Time), and FLCS (Fluorescence Staining) scores of dry eye patients at various ages.

Study Design: A randomized controlled trial study

Place and Duration of Study: This study was conducted at the Al Ibrahim Eye Hospital Karachi from February 2023 to January 2024.

Methods: 90 eyes from 90 patients with mild to moderate dry eye were incorporated & split into three groups: young (20-39 years, n = 29), middle-aged (40-59 years, n = 30), and elderly (> 60 years, n = 31). Patients received a 28-day course of topical medications that lubricated the ocular surface and encouraged repair. At 7, 14, and 28 days, patients were checked in. Examinations were done on the OSDI, SIT, FBUT, and FLCS scores.

Results: The OSDI scores in three groups varied at each time point (all P 0.001); however, no group's score varied across time points. A time effect was discovered (F = 80.87, P 0.001), and SIT were different between the three groups (F = 350.61, P 0.001). Middle-aged and elderly groups had lower SIT at 14 and 28 days' post-treatment than young group (all P 0.001). SIT was lower in the elder group at 7, 14, and 28 days (all P 0.001). For all time points, the FLCS score was lower at 28 days (P 0.001).

Conclusion: Patients with dry eyes are prescribed a 28-day course of topical medications that lubricate the ocular surface and promote corneal repair. These medications have been shown to increase tear production, film stability, and corneal integrity. Age has an impact on how mild to moderate dry eye is treated, with tear secretion being the most crucial component.

Key Words: Age, dry eye Index of ocular surface illness, Schirmer I examination, Breakup time of fluorescein, Corneal fluorescence darkening index

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INTRODUCTION

Today, dry eye is understood to be an ocular surface disease characterized by tear film homeostasis loss, ocular symptoms, tear film instability and hyperosmolarity, inflammation, and ocular surface damage[1]. To maintain a normal ocular surface, tear film is kept normal by a well regulated ocular surface tissue components Importantly, the ocular surface restored to normal and intact condition in response to well regulated components of the tear film. Whenever the chain breaks it disrupts the structure and possibly the function of the tear film from which it originated, resulting in asymptomatic dry eye[2, 3].

Some of these methods include; The Schirmer I test (SIT), Ocular Surface Disease Index (OSDI) score, Fluorescein break up time (FBUT), and the corneal fluoroscein staining (FLCS) score[2,4]. It is widely expected that with growing numbers of people aging, the number of patients with dry eye, an age-related degenerative disease, will also rise in global public health[5-7]. But, further studies should be conducted in order to estimate, if there are differences between the indicators and symptoms of individuals with dry eye in age-related groups before and after therapies[8]. DESpite the semi-rigorous nature which authors claim may contribute to the variability of results, paradoxically there is a call for systematic stratified studies, the DEWS II Epidemiological Report indicates the discrepancies between male and female in connection with the indications of dry eye with age.

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METHODS

A randomized controlled trial was conducted at Al Ibrahim Eye Hospital Karachi included 90 eyes from 90 people who had mild to moderate dry eye who attended our outpatient clinic between February 2023 to January 2024. All patients were examined for other ocular surface diseases by slit lamp examination and fundus diseases by fundus examination.

In order to qualify, patients had to meet the following criteria: First, the patients reported episodes of dry eye, which could manifest as grittiness or foreign body sensation Second, the patients did not receive any other dry eye therapy in the previous month Third, the patients ranged between the ages 18 and 78 and excluded patients who have some mental and psychological disorders. Patients with other ophthalmic diseases who need to use local ones or systemic other medicines that may infiltrated tear secretion were excluded; [3] those with eyelid metabolism disorders and conjunctival sac relaxation, ectropion, or blepharospasm; [4] those who are pregnant or nursing, or who are taking hormones;[6] those with syndrome Sjögren or Stevens-Johnson syndrome, abnormal thyroid function,

If the patients had both eyes fulfilling inclusion criteria, the right eye was taken as study eye and only one eye from each patient was taken for this study. Based on the age of the patients, the patients were categorized into three groups. The young group had patients age between 20 to 39 years totaling 29, 29 eyes; middle aged patients age between 40 to 59 years was 30, 30 eyes; elderly patients age 60 years and above was 31, 31 eyes. To complete the overall OSDI, SIT, FBUT, and corneal FLCS scores at TD 0, all patients underwent an examination by the same researcher–physician–ophthalmologist.

Therapeutic method: For 28 days, patients in each group were given poly-ethylene glycol eye drops 04 times a day and vitamin A Palmitate ophthalmic ointment once at night. At seven days, fourteen days, and 28 days after intervention, patients were observed.

Observational index: The same ophthalmologist evaluated all patients to accomplish their OSDI score, SIT, FBUT, and corneal FLCS rating. All 12 correctly answered questions, with scores ranging from 0 to 100, are included in the OSDI score [10]. For SIT, soak a 5 mm x 35 mm standard filter paper strip And fold one end to 5 mm, leave the other end hanging naturally, insert it between the middle and outer third of the lower eyelid. After five min the filter paper was removed and dry eyes can be diagnosed when the wetted length of the filter paper in the rolled up position was less than 10 mm [11].

For FBUT the fluorescein test strip was instilled in the lower eyelid conjunctival sac in the patient. This study has therefore used the cobalt blue light from the slit lamp microscope, the blinking of the patient and gazing forward while using the stopwatch. The duration between the point at which the patient's eyes were opened after the last blink until the first randomly distributed, dry spot on the cornea was measured. Whenever the average time is less than 10 seconds, there is a likelihood that the eye is dry[11].

When rating corneal FLCS, a sterile fluorescein test strip was gently placed into the inferior fornix of the patient's conjunctival sac. Iris staining scores for corneal lesions ranged from 0 to 3 points of points The scores of 0 indicates no staining, 1-point staning was punctate, 2 points denoted spotty staining while 3 points indicated ulcers, filaments or filament fusion[12].

Statistical analysis

SPSS version 23.0 was used to conduct the analysis (IBM Corp.). Values are shown as both the mean and standard deviation or as numbers (percentage). For comparing categorical data between clusters, the chi-square test had been used, while multiple methods had been used to analyze continuous variables. These methods included the one-way analysis of variance (ANOVA). Using a two-way ANOVA, we tested the significance of the OSDI, SIT, FBUT, and FLCS scores before the Bonferroni test. A statistically significant variation was deemed to exist when P 0.05 was obtained.

RESULTS

Before the intervention, there was no significant difference in gender, dry eye length of time, diabetes background, smoking record, OSDI score, SIT, FBUT, or FLCS score between the three groups (P > 0.05). (Table 1).

Table No. 1: Basicinformation

Variables	Young group (n=29)	Middle-age group (n 30)	Elder group (n 31)	PValue
Male, n (%)	14(48.28)	14(46.67)	16(51.61)	0.925
Dry eye duration (month) (means ± SD)	4.37 ± 2.73	4.28 ± 2.30	4.56 ± 2.80	0.912
Diabetes history, n (%)	05(17.24)	8(26.67)	7(22.58)	0.683
Smoking history, n (%)	08(27.59)	6(20)	6(19.35)	0.783
OSDIScore (means±SD)	26.00±5.47	26.10±5.55	25.84±5.24	0.979
SIT (mm/5min) (means ± SD)	04.59 ± 01.24	04.50 ± 01.17	4.42 ± 1.29	0.872
FBUT (s) (means ± SD)	04.31 ± 01.34	04.13 ± 01.55	4.00 ± 1.39	0.682
FLCS score(means±SD)	03.10 ± 1.94	03.23 ± 1.87	3.45 ± 1.71	0.794
The OSDI is an index of ocularsurfacedisease;SIT is the SchirmerItest;FBUT is the fluoresceinbreakuptime;and FLCS is t cornealfluorescencestaining.				

The OSDI score was not statistically distinct between the fractions, as shown in Table 2, and there was a considerable time effect (F = 427.21, P 0.001) that was discovered. Time and collaboration was also significant (F = 7.01, P 0.001). At each time point before and after intervention, there were significant statistical variations between the three groups in terms of within-group comparisons (all P 0.001).

Table No. 2: OSDI score among three groups.

Variables(means±SD)	Young group (n = 29)	Middle-age group (n = 30)	Elder group (n = 31)	Mixed ANONA (P value)		
				Group effect	Time effect	Interaction effect
Before treatment	26.07±5.47	26.10±5.55	25.84± 5.24	0.057	< 0.001	0.001
7 days after treatment	23.31±4.98	20.30±4.47	21.32 ± 4.20*			
14 days after treatment	19.10±4.14*	15.97±3.82*#	17.74 ± 3.68*			
28 days after treatment	14.97±3.91*#&	10.67± 2.92*#&	13.26 ± 3.74*#&			

OSDI, ocular surface disease index
*P < 0.05, compared with OSDI score before treatment
#P < 0.05, compared with OSDI score 7 days after treatment
&P < 0.05, compared with OSDI score 14 days after treatment

An important time impact was also discovered (F = 80.87, P 0.001), as well as a statistically significant difference in SIT between the three groups (F = 350.61, P 0.001). Groups and time interacted significantly (F = 10.70, P 0.001) in this study. Both the middle-aged group and the elder group's SIT at 14 and 28 days post-treatment were lower than those of the young group (all P 0.001). Elderly patients had lower SIT at 7, 14, and 28 days post-treatment (all P 0.001) than middle-aged patients. There had been statistically significant variations between the three clusters at each time point before and after treatment in terms of within-group comparisons (all P 0.001) (Table 3).

Table No. 3: SIT among three groups.

Variables(means±SD)	**Young group (n = 29)**	**Middle-age group (n = 30)**	**Elder group (n = 31)**	**Mixed ANONA (P value)**		
				Group effect	**Time effect**	**Interaction effect**
Before treatment	4.59±1.24	4.50±1.17	4.42±1.29	< 0.001	< 0.001	< 0.001
7 days after treatment	6.55±1.40	6.10±1.52	5.10±1.51*			
14 days after treatment	8.41±1.94*	7.40±1.83*#	6.23±1.56*			
28 days after treatment	9.72±1.77*#&	8.10±1.45*#&	6.97±1.45*#&			

SIT, Schirmer I test
*P < 0.05, compared with SIT before treatment
#P < 0.05, compared with SIT 7 days after treatment
&P < 0.05, compared with SIT 14 days after treatment
aP<0.05, compared with young group
bP<0.05, compared with middle-age group

According to Table 4, there was no statistically significant difference in FUBT between the groups (F = 2.66, P = 0.08), but there was a significant time effect (F = 56.63, P 0.001). Additionally, there was an important interface between time and groups (F = 4.58, P 0.001). In neither the middle-aged group nor the elder group, there were any appreciable differences between FUBT at 28 days after treatment and FUBT at 14 days after treatment. It is observed that other time points, prior to and after procedure, also showed statistically significant variations between the three groups (all P 0.001).

Table 4: FUBT among three groups.

Variables(means±SD)	Young group (n = 29)	Middle-age group (n = 30)	Elder group (n = 31)	Mixed ANONA (P value)		
				Group effect	Time effect	Interaction effect

Before treatment	4.31±1.34	4.13±1.55	4.00±1.39	0.076	< 0.001	< 0.001
7 days after treatment	5.21±1.61	4.83±1.68*	4.42±2.01*			
14 days after treatment	5.86±1.87*	5.33±1.69*#	5.00±1.93*			
28 days after treatment	6.93±1.83*#&	5.73±2.02*#&	5.13±1.98*#&			
FBUT, fluorescein break up time *P < 0.05, compared with FBUT before treatment #P < 0.05, compared with FBUT 7 days after treatment &P < 0.05, compared with FBUT 14 days after treatment						

Table 5 demonstrates that there was no statistically significant difference in FLCS score between the groups (F = 1.23, P = 0.30), and that there was a significant time effect (F = 49.625, P 0.001). Time and group interactions were not significant (F = 1.533, P = 0.170). Regarding differences within groups, the FLCS score was lower at 28 days post-treatment than it was at 7, 14, and 28 days post-treatment (all P 0.001).

Table 5: The FLCS score among three groups.

Variables(means±SD)	Young group (n = 29)	Middle-age group (n = 30)	Elder group (n = 31)	Mixed ANONA (P value)		
				Group effect	Time effect	Interaction effect
Before treatment	3.1 ± 1.94	3.23 ± 1.87	3.45 ± 1.71	0.299	< 0.001	0.170
7 days after treatment	2.76 ± 1.90	3.07 ± 1.43	3.13 ± 1.78*			
14 days after treatment	2.41 ± 1.78*	2.73 ± 1.78*#	2.94 ± 1.71*			
28 days after treatment	1.10 ± 0.82*#&	1.70 ± 1.32*#&	2.32 ± 1.50*#&			
FLCS, corneal fluorescence staining *P<0.05,comparedwithFLCSscorebeforetreatment #P<0.05,comparedwithFLCSscore7daysaftertreatment &P<0.05,comparedwithFLCSscore14daysaftertreatment						

DISCUSSION

According to subsequent observational studies, the pervasiveness of dry eye has risen exponentially, and there is a significant correlation between increasing age and associated symptoms, diagnostic markers of dry eye, aqueous tear inadequacy, and meibomian gland impotence[13, 14]. As a result, dry eye is described as being multifactorial and associated with aging to yield long term impacts on the global health the chronic condition with the rate of exposure to various environmental and biological factors affecting hormonal regulation and tear film balance[15, 16]. More patients will develop dry eyes as the proportion of older people increases, and people live longer. Therefore, the optimal understanding of aged dry eye and the status has become essential to improve the current situation and promote therapeutic approaches[17].

Indeed, the mean OSDI scores, SIT, FBUT, and FLCS scores of the OSDI scores in three groups at 28 days after therapy had been significantly better than those at the start of therapy and at 7 days following treatment suggesting that extended treatment of dry eyes is better. At every time point at least before and after hospitalization there had been real differences among the three groups at different statistical levels. Regarding the possibility that aggregate dose resulting from progress in science and technology and risk decisions may differ by generation, the middle age group's OSDI scores at each assessment point were, on balance, smaller than those of the other groups but the difference was not statistically significant[18].

The best method to assess the tear production is SIT and the patients' evidences of ocular surface distress and cosmetic facial appearance of eyes can be made better with enhanced tear production. SIT was lower in older group in this investigation at 7, 14 and 28 days after therapy than in middle aged group. As for the patients which are over 60, the overall prognosis and rate of recovery for tear insufficiency cause is even more impressive of the patients which are below 60 years[18]. The research here postulate that the cause is that sex hormones may indirectly influence tear production through effects on the ocular surface environment, and also as people age, the level of the hormone gradually drops, and this has some acclerate effect on tear production[19, 20]. Data obtained in the tear secretion test indicate that hormone replacement therapy is beneficial for the efficiency of lacrimal excretion and its dependence on age[21]. Referring to inter-group differences in clinical efficacy of dry eye, the tear break-up time, specifically in SIT, are referred to as tear specific functions where specific discrete components a number of these units often have been found to be dysphonic. Encapsulated lobules are

glandular structures of the standard lacrimal gland, where acinar cells occur predominantly at a concentration of 80%. These authors have concluded from an animal study that there is a pathway of acinar alterations from being purely serous to serous-mucinous acinus that transforms, gradually and due to age, into being mucinous acinus. The other pathological changes includes: excessive of structural failure, mast cell infiltration, periductal fibrosis, acinar atrophy and chronic inflammation are observed in this gland as one ages. For mice 3–5 months of age, 20–24 months of age, the functional ability of the acini to synthesize proteins and excrete them steadily decreased or disappeared[23]. Morphological and secretory alterations are responsible for tear production declines with age.

CONCLUSION

Patients with dry eyes are given a 28-day course of topical medications that lubricate the ocular surface and promote repair. These medications can relieve symptoms, encourage tear production, enhance tear film stability, and aid in the restoration of corneal and ocular surface integration. A persistent therapy is required for this chronic, long-term eye disease. Patients with light to moderate dry eye are impacted by age, and tear production is the most major factor. To safeguard the ocular surface, dry eye should be identified and treated as soon as possible.

Author's Contribution:

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