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Professional paper

Tear Film Status in Glaucoma Patients

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A B S T R A C T

The purpose of this study was to determine the prevalence of ocular surface disease symptoms and the state of the tear film among patients with glaucoma who are receiving topical intraocular pressure lowering monotherapy. 62 responders were divided in 2 groups: 32 glaucoma patients and 30 healthy individuals. Tear film break-up time (TBUT), Schirmer 1 testing and ocular surface disease questionnaire were performed in both groups. 50% glaucoma patients and 25% control group participants had dry eye symptoms. Advanced disorder in TBUT was found in seven 21.9% glaucoma patients and was not found in the control group. Basal tear secretion measured by Schirmer 1 testing was found reduced in 87% of glaucoma patients and in 16.7% control group patients. Glaucoma patients on topical intraocular pressure lowering monotherapy showed a significantly higher prevalence of ocular surface disease symptoms, significantly reduced basal tear secretion and destabilisation of tear film in comparison with healthy volunteers.

Key words: *glaucoma, ocular surface disease, antiglaucoma medication, tear film, preservatives*

Introduction

Glaucoma is a chronic condition and one of the leading causes of blindness in the world. Medical therapy constitutes the usual first line treatment for glaucomatous patients who often use topical therapy for many years[1]. However, adverse effects associated with topical medication may have a negative effect on patient adherence to medical treatment, doctor-patient relationship, and patient quality of life[2]. Topically administrated medication affects the structure and the integrity of the ocular surface.[1] Side effects of eye drops could be due to the active component or preservatives[2].

Ocular surface disease (OSD) and glaucoma are both prevalent in the elderly and are common comorbidities in the same patient. Topical intraocular pressure lowering therapies for glaucoma have been found to aggravate OSD by inducing symptoms such as dryness and irritation[3]. There is evidence that almost 11% of patients ages of 40 to 59 is affected with ocular surface disease[4].

The most commonly used preservative is benzakonium chloride[2]. This detergent effect in combination with partial distribution of mucous gland cells is responsible for the the induced instability of the lacrymal film, involving a decrease of the tear break-up time. This results in symptoms like irritation. An immunologic reaction with an increased presence of lymphocytes, macrophages, and Langerhans cells is reported following to the chronic application of preservatives. This inflammation can results in subconjunctival fibrosis[2] It has been recongnized recently that long-term topical treatments for open-angle glaucoma may constitute a significant risk factor of failure of glaucoma filtering surgery[5].

The purpose of this study was to determine the prevalence of ocular surface disease symptoms and the state of the tear film among patients with glaucoma who are receiving topical intraocular pressure lowering therapy.

Subjects and Methods

This was a prospective study conducted at Department of Ophthalmology, Zagreb University Hospital Center, Zagreb, Croatia, and was approved by appropriate institutional review boards. All 62 participating patients provided written informed consent. 32 glaucoma patients with clinical diagnosis of primary open-angle glaucoma in both eyes underwent the study. The control group consisted of 30 healthy participants who were mostly accompanying persons, selected randomly from the waiting room. All glaucoma and healthy participants underwent a

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complete ophthalmological examination. Excluded from the study were participants with any abnormality having dry eye treated with the use of punctual plugs, punctual cautery, cyclosporine, topical ocular corticosteroids, using artificial tears not discontinued prior to first study visit, having keratorefractive ocular laser procedures, corneal surgery, patients with progressive retinal or optic nerve disease, with severe central visual field loss, patients with any history of infectious or inflammatory ocular conditions, patients having ocular trauma within 6 months, any systemic medications on a chronic basis that have not been on a stable dosing regimen for 1 month prior to the study, and history of intolerance or hypersensitivity to any component of the test articles.

All recruited glaucoma participants were receiving topical antiglaucoma medication treatment of 1 antiglaucoma drug (monotherapy) for 6 months or longer. Demographic information, a medical history and medication usage were recorded. Measurement of basal tear secretion was performed by Schirmer test 1:60 seconds after eye drop of topical anesthetic tetracain clorid 0.5%, the tear film was sponged with a cotton swab, a standard test strip was placed in the outer third of the lower eyelid and removed after five minutes. The length of the moistened strip was measured. Normal finding is 10 mm and more, moderate disorder is 6–9 mm and advanced disorder is less than 6 mm.

Tear film break-up time (TBUT, fluorescein break up time) is a method of determining the stability of the tear film and checking for evaporative dry eye. Fluorescein dye was instilled by wetting a dry fluorescein-impregnated paper strip with a drop of saline and placing on the bulbar cornea for a brief moment. After 1 or 2 blinks, the tear film took on a uniform fluorescent green appearance. Patient was asked not to blink within 60 seconds. The time elapsed between a complete blink, and the appearance of the first dark spot or streak, was measured and taken to be break up time. Five successive measures were taken and the mean value was calculated. Normal finding is 10 seconds and more, moderate disorder is 6–9 seconds, advanced disorder is less than 5 seconds.

All participants completed the ocular surface disease questionnaire, with 5 questions designed to provide a rapid assessment of OSD related to chronic dry eye, its severity, and its impact on the patient's ability to function. Affirmative answers to 4 of 5 questions were recognized as finding of ocular surface disease symtoms.

Statistics

All data were grouped into categories. Descriptive statistics were generated from those scores, with mean ±SD reported. Subjective data were analyzed by a χ^2-test. P values of <0.05 were taken to be significant. Objective data were analyzed.

Results

Sixty-two participants were recruited, thirty two patients with open angle glaucoma (glaucoma group) – fifteen men and seventeen women, mean age 62.7 years, and thirty healthy respondents (control group). – fourteen men and sixteen women, mean age 57.9 years. There was no statistically significant difference between two groups, regarding sex and age. Cardiac diseases, blood pressure medication, rheumatic diseases, sleeping and pain relief medications, were equaly distributed between both groups, with no statistically significant difference between groups (Table 1). Sixteen glaucoma patients (50%) and six in the control group (25%) had dry eye symptoms, according to ocular surface disease questionnaire answers.

The number of eyes with abnormal values of tear break-up time (TBUT) was higher in glaucoma group in comparison with control group. The number of eyes with normal finding of tear film break-up time of 10 seconds was nine (28%) in glaucoma group towards twenty (66.7%) in the control group. Moderate disorder in TBUT was present in sixteen (50.1%) glaucoma patients and in ten (33.4%) of the control group patients. Advanced disorder in TBUT was found in seven (21.9%%) glaucoma patients and was not found in the control group (Table 2).

Basal tear secretion measured by Schirmer 1 testing was found reduced in 87.0% of glaucoma patients: statistically relevant higher number of glaucoma subjects had advanced disorder in comparison with control group (59.4% towards 16.7%). There was no statistically signifi-

TABLE 1
DEMOGRAPHIC AND MEDICAL CHARACTERISTICS OF GLAUCOMA PATIENTS AND CONTROL GROUP

	Glaucoma group	Control group
Mean age (years)	62.7	57.9
Range age (years)	51–70	42–67
Men	17	15
Women	15	15
Cardiac disease/ Blood pressure medication	15 (48.0%)	17 (51.0%)
Sedation /Sleeping medication	24 (77.8%)	20 (75.0%)
Rheumatism and pain relief medications	24 (74.8%)	25 (85.0%)
Subjective symptoms of dry eye	16 (50.0%)	8 (26.7%)
Total	32	30

TABLE 2
TEAR FILM BREAK-UP TIME (TBUT) IN GLAUCOMA PATIENTS AND IN THE CONTROL GROUP

Tear film break-up time (TBUT) in seconds	Glaucoma Group	Control Group
Normal finding (10 and more)	9 (28.0%)	20 (66.7%)
Moderate disorder (7–9)	10 (31.3%)	5 (16.7%)
Moderate disorder (4–6)	6 (18.8%)	5 (16.7%)
Advanced disorder (less than 4)	7 (21.9%)	0 (0%)

There is a statistically relevant higher number of glaucoma subjects with TBUT of less 4 (advanced disorder). There is a statistically relevant higher number of the control group subjects with TBUT of 10 or more (normal finding) X2 = 12.879, $p<0.05$.

TABLE 3
FINDING OF SCHIRMER 1 TESTING IN GLAUCOMA PATIENTS AND IN THE CONTROL GROUP

Shirmer 1 testing (mm)	Glaucoma group	Control group
Normal finding (10 and more)	4 (12.5%)	16 (53.3%)
Moderate disorder (6–9)	9 (28.1%)	9 (30.0%)
Advanced disorder (less than 6)	19 (59.4%)	5 (16.7%)

Statistically relevant higher number of glaucoma subjects had Schirmer value of less than 6. Statistically higher number of patients from the control group had Schirmer value of 10 or more. x2= 15.318, $p<0.05$.

cant difference in moderate disorder (28.1% towards 30.0% in the control group). Statistically significant higher number of patients from the control group (53.3%) had Schirmer testing value of 10 seconds and more in comparison to glaucoma group (12.5%) (Table 3).

Discussion

The only proven and accepted method of preserving visual function in glaucoma patients is to reduce intraocular pressure level[1]. Chronic use of most intraocular pressure lowering eye drops is often associated with various adverse reactions: allergies, contact dermatitis, punctate keratitis and dry eye symptoms[7]. Changes in ocular surface caused by antiglaucomaous eye drops were observed as a decresae in BUT at 20 weeks after introduction of eye drop timolol[8]. Reduction of basal tears secretion in glaucoma patients was reported in many studies[9,10]. Recent studies were investigating the effect of topical glaucoma medication on tear film stability[11,12] and corneal sensitivity[13,14]. 40% of glaucoma patients using 2or 3 topical intraocular pressure lowering medications exibit symptoms of ocular surface diesease[15]. Another study found a prevalence rate of nearly 60%.[16] and high correlation between clinical signs and symptoms, including Schirmer testing, conjuctival and corneal staining with fluoresceine and lysamine green and evaluation of tear break-up time. Destabilisation of tear film and ocular surface symptoms have been observed with essentially all intraocular pressure lowering therapies and most likely are attributable to the nearly ubiquitous preservative benzalkonium chloride[16,17] There are many evidences that ocular surface sindrom in glaucoma patients worsens with the number of intraocular pressure medication used[18].

Results of this study show a high prevalence of ocular surface impairment in glaucomatous patients using only one antiglaucoma medication. The frequency of both, symptoms and objective signs of ocular surface irritation, were higher in patients treated with antiglaucoma eye drops compared to healthy individuals. Although the prevalence of ocular surface syndrome has been reported to be approximately 14–15% in the general population,[19] we have demonstrated in the current study that the prevalence of symptomatic ocular surface syndrome is 25% in the control group and nearly 50% in glaucoma group. The reason for this finding lies probably in relatively higher mean age of our control group (57.9 years) as it is well known that older patients have reduced tear film.[4] Also is importaint to have in mind that side effects are often very difficult to identify because they mostly occur in a delayed or poorly specific manner. Therefor mild symptoms should not be underestimated, neglected, or denied, because they may very well be the apparent manifestations of more severe, potentially threatening subclinical reactions that may later cause major concerns[20]. The film stability, measured by TBUT, as Advanced disorder in TBUT was found in seven (21.9%) glaucoma patients and was not found in the control group. Basal tear secretion measured by Schirmer 1 testing was found reduced in 87% of our glaucoma patients.

Conclusion

Results of this study demonstrate that patients with glaucoma receiving topical intraocular pressure lowering monotherapy have a significantly higher prevalence of ocular surface disease symptoms, significantly reduced basal tear secretion and destabilisation of tear film in comparison with healthy volunteers.

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STANJE SUZNOG FILMA GLAUKOMSKIH PACIJENATA

SAŽETAK

Cilj studije je bilo određivanje pojavnosti simptoma suhog oka i stanja suznog filma u glaukomskih bolesnika koji su liječeni antiglaukomskim lijekovima u obliku kapljica. Glaukomski pacijenti su primali samo jednu vrstu kapi. U istraživanju je sudjelovalo 62 ispitanika koji su bili podijeljeni u dvije skupine: 32 glaukomska ispitanika i 30 zdravih ispitanika kontrolne skupine. Vrijeme pucanja suznog filma (TBUT Tear film break-up time), Schirmer 1 test i standardizirani upitnik o simptomima suhog oka provedeni su u obje skupine ispitanika. 50% glaukomskih ispitanika i 25% ispitanika kontrolne skupine imali su simptome suhog oka. Uznapredovala disfunkcija suznog filma (skraćeno vrijeme pucanja suznog filma – TBUT) ustanovljena je samo u skupini glaukomskih ispitanika (21,9%). Reduciranu bazalnu sekreciju mjerenu Schirmer 1 testom imalo je 87% ispitanika glaukomske skupine i 16,7% ispitanika kontrolne skupine. Glaukomski pacijenti liječeni monoterapijom u obliku kapi imali su značajno više simptoma povezanih sa suhoćom površine oka, sniženu bazalnu sekreciju suza kao i disfunkciju suznog filma u odnosu na kontrolnu skupinu zdravih ispitanika.