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RESEARCH ARTICLE

Prevalence of dry eye in patients using topical antiglaucoma medications

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ABSTRACT

Aim: Topical antiglaucoma drugs may have adverse effects on the ocular surface. In this study, our aim was to report the frequency of dry eye and the use of artificial tear drops in patients diagnosed with glaucoma and using topical antiglaucoma drugs. We also evaluated factors affecting this association.

Methods: Based on the medical records, we selected patients admitted to the ophthalmology department between 2020 and 2021 who had been diagnosed with glaucoma. In this study, we included patients who were using topical antiglaucoma medications and were older than 40 years of age. Age, gender, type, and number of glaucoma medications used, dry eye diagnosis, and use of artificial tear drops and/or topical cyclosporine were recorded.

Results: We found that 346 (27%) of the 1,274 patients using topical antiglaucoma drugs had dry eyes and were using artificial tear drops. Gender (female) and the number of antiglaucoma medications used were associated with an increased risk of dry eye in these patients, while increasing age was not associated with dry eye.

Conclusion: Dry eye is common in patients using topical antiglaucoma medications and should be considered in the treatment of glaucoma.

Keywords: antiglaucoma medications, artificial tear drops, dry eye, glaucoma, ocular surface disease

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INTRODUCTION

Glaucoma is a major cause of irreversible blindness worldwide (1, 2). The global prevalence is reported to be 3.54% in people aged 40-80 years (3). Topical antiglaucoma drugs are the most common choice for the initial treatment of glaucoma (4). There are several drug options available to glaucoma patients, but many patients need more than one drug to control intraocular pressure (IOP) (5). Studies often report a high prevalence of dry eye and ocular surface disease (OSD) in glaucoma patients using topical antiglaucoma medications (6-8). Both preservatives and active drug molecules can affect the ocular surface. OSD has been reported to occur in more than half of the glaucoma patients who use topical antiglaucoma medications (9). OSD can cause burning, itching, foreign body sensation, blurred vision, and poor quality of life in glaucoma patients (10). OSD may reduce patient compliance and adherence, resulting in the failure of the treatment (11). It may also affect the success of the subsequent glaucoma filtration surgery (9). Artificial tear drops and lubricants are frequently used in the treatment of dry eye and OSD in glaucoma patients who use topical antiglaucoma medications (12). Most studies investigating dry eye disease in glaucoma patients have been conducted on a relatively low number of patients. The aim of this study was to investigate the frequency of dry eye, and the use of artificial tear drops in glaucoma patients who use topical antiglaucoma medications. We also evaluated the risk factors associated with dry eye disease in a large group of glaucoma patients.

MATERIAL AND METHODS

In this retrospective chart review of consecutive patients, we included glaucoma patients who were referred to our outpatient clinic between 2020 and 2021. From this group of patients, only those who were older than 40 years of age and on topical antiglaucoma medications were included in the study. Patients' medical records were evaluated retrospectively. Age, gender, type, and number of glaucoma medications used, dry eye diagnosis, and use of artificial tear drops and/or topical cyclosporine were recorded. The two-year period was chosen because the glaucoma medications are fully reimbursed for two years if a patient has glaucoma certified by an ophthalmologist. Certification examinations included a complete ophthalmic examination and applanation tonometry. Visual field testing, corneal pachymetry, and retinal nerve fiber layer thickness measurements using optical coherence tomography are also performed as necessary. Both Schirmer's test and tear break-up time measurements are performed in patients who report the typical symptoms of dry eye disease. Patients are diagnosed with glaucoma and/or dry eye based on the results of the examination and tests. All of the aforementioned procedures adhered to the principles of the Declaration of Helsinki, and the study received ethical approval from the local ethics committee (Protocol No: 2020/24 Date: 09.07.2020).

Statistical analysis

Statistical analysis was performed using SPSS version 20.0 (IBM Corporation, Armonk, NY). Quantitative data were expressed as means ± standard deviations, and qualitative data were expressed as proportions (%). The chi-square test was used to compare groups by gender. Independent-samples t-test was used to compare the gender groups for the presence of dry eye. Logistic regression analysis was also performed to determine the risk factors for dry eye in patients using topical antiglaucoma drugs.

RESULTS

A total of 1,274 patients were diagnosed with glaucoma in this period. The characteristics of these patients are summarized in Table 1. The mean age was 68.3±11.3 years. Of these patients, 638 (50.1%) were female and 636 (49.9%) were male. A total of 758 (59.5%) patients were using one medication for glaucoma, 340 (26.7%) patients were using two medications, and 176 (13.8%) patients were using three or more medications (Table 1). Of the 758 patients using one medication for glaucoma, 289 (38.2%) patients were on monotherapy, and 469 (61.8%) patients were using fixed combinations. Of the 1,274 patients using glaucoma medications, 346 (27.2%) had been diagnosed with dry eye and were using artificial tear drops and/or cyclosporine, and 928 (72.8%) did not have dry eye. Dry eye was more common in female patients (31.8%

Table 1. Characteristics of glaucoma patients.	
	n (%)
Age groups	
40-60 years	280 (22)
60-80 years	774 (60.8)
>80 years	219 (17.2)
Gender	
Male	636 (49.9)
Female	638 (50.1)
Number of antiglaucoma medications	
1	758 (59,5)
2	340 (26.7)
3 or more	176 (13.8)
Total	1274 (100)

n: number

vs. 22.5% p<0.001). Logistic regression analysis using age groups, gender, and number of medications showed that female patients were 1.6 times more likely to have dry eye disease (OR: 1.6 p<0.001). Increasing the number of medications from one to two or three was associated with an increased likelihood of having dry eye (OR: 1.8 p: 0.008 and OR: 2.1 p: 0.001, respectively). Increasing age was not associated with dry eye (p: 0.560).

DISCUSSION

Medical therapy using topical antiglaucoma drugs is the most common initial treatment for glaucoma (4). OSD and dry eye are often observed in patients using topical antiglaucoma drugs (9). An important factor in this association is that the prevalence of both diseases increases with age (13,14). On the other hand, both glaucoma drugs and preservatives in these medications were reported to affect the ocular surface and cause dry eye and OSD (9). Fechtner et al. evaluated ocular surface disease index (OSDI) scores of patients using topical antiglaucoma drugs and reported that 48.4% of these patients have some degree of OSD (15). Erb et al. reported that 52.6% of glaucoma patients using antiglaucoma drugs had dry eye in their study (6). In our study, 346 (27.2%) of 1,274 glaucoma patients were diagnosed with dry eye and used artificial tear drops, which is lower than the corresponding rates in the previous studies. This value is also higher than the prevalence of dry eye in the general population of similar age groups, which is about 14% (14). Previous studies investigating OSD in glaucoma often used symptom questionnaires to diagnose dry eye and included all the patients with mild, moderate, and severe symptoms. Our results indicate the proportion of patients who were diagnosed with dry eye and used artificial tear drops, which may be the reason for the difference in the prevalence between previous studies and the present study. It may be more appropriate to compare the frequency of moderate and severe symptoms with the corresponding frequencies in our study. In the study by Fechtner et al., the proportion of patients with moderate and severe OSD was 27,1% which is similar to our results (15).

Dry eye disease is known to be more prevalent in women and hence female gender is a risk factor for dry eye (14,16). We also found that dry eye is more common in the female patients compared to the male patients in our glaucoma patient group. In the logistic regression analysis, the female gender was also associated with an increased likelihood of having dry eye in glaucoma patients. Erb et al. reported that dry eye is more prevalent in female glaucoma patients (6). Costa et al. also reported in their study that female gender is a risk factor for the use of artificial tear drops (8).

The preferred initial treatment for glaucoma is monotherapy with one medication to control the IOP (4). However, monotherapy is insufficient to control IOP in a large group of patients, and at least 50% of patients require two or more drugs to achieve the target IOP at the follow-up (17). About 40% of the patients in our study were using two or more antiglaucoma drugs, and an increased number of glaucoma medications was associated with an increased risk of dry eye. This finding was also reported in the previous studies (6,8,15). Erb et al. reported that dry eye was found more frequently when three or more IOP-lowering medications were used to treat glaucoma (6). Fechtner et al. also reported that OSDI scores in glaucoma patients increased significantly as the number of antiglaucoma medications increased (15). The number of antiglaucoma medications was also found to be a

risk factor for the use of artificial tear drops in another study (8). Preservatives in antiglaucoma drugs were frequently reported to be involved in the pathogenesis of dry eye in glaucoma patients (12,18). However, some studies reported that there isn't enough evidence to show a significant difference in the efficacy and safety between preservative-containing and preservative-free drugs (19,20). All participants in the present study were using glaucoma drugs with preservatives, either Benzalkonium chloride (BAK) or Purite. We couldn't draw a direct conclusion on the effect of preservatives in this study, but the finding of increased risk of dry eye associated with an increased number of glaucoma drugs may suggest an association between dry eye and preservatives because patients on multiple drugs are exposed to a higher amount of preservatives than patients on monotherapy.

We did not find an association between age and dry eye in glaucoma patients using antiglaucoma drugs. Fechtner et al. also reported that OSDI scores did not change significantly with age in glaucoma patients using topical antiglaucoma drugs (15). Another study reported a positive correlation between age and dry eye in glaucoma patients, but this study included patients under 40 years of age, who have a lower prevalence of dry eye (6). This difference between this study and ours may be due to the fact that our study included only patients over the age of 40. A high proportion of patients in our study (60%) were relatively old, between 60 and 80 years. This may be the reason for the findings related to age and dry eye in our study. A study including patients of all ages using topical antiglaucoma medications may be more effective in showing the effect of age, but this is complicated by the lower prevalence of glaucoma in people under the age of 40.

There are some limitations of this study. Firstly, this is a retrospective study, which may limit data analysis and lead to possible biases. We did not include patients younger than 40 years, who have a lower prevalence of glaucoma and dry eye. Also, all patients in this study were using glaucoma drugs containing preservatives, and the findings represent patients using glaucoma drugs containing preservatives.

In conclusion, we found that 27% of the patients using topical antiglaucoma drugs had dry eye and used artificial tear drops in this study, which included a large group of glaucoma patients older than 40 years. This prevalence is lower than previously reported values. Gender (female) and the number of antiglaucoma medications used were associated with an increased risk of dry eye disease in glaucoma patients, while age was not associated with the risk of dry eye. Prevention and appropriate treatment of this condition are necessary to maintain patient compliance.

Ethical approval

This study has been approved by the Niğde Ömer Halisdemir University Non-invasive Clinical Research Ethics Committee (approval date 09.07.2020, number 2020/24). Written informed consent was obtained from the participants.

Author contribution

Concept: EK, KRZ; Design: EK, KRZ; Data Collection or Processing: MÇK, GYB; Analysis or Interpretation: EK, KRZ; Literature Search: MÇK, GYB; Writing: EK. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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