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Barriers To Glaucoma Medication Compliance Among Veterans: Dry Eye Symptoms and Anxiety Disorders

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Abstract

OBJECTIVE—To identify barriers to compliance of medical treatment for glaucoma among veterans.

Methods—Glaucoma patients from the Miami Veterans Affairs Eye Clinic (n=74) filled out a 63-question survey regarding dry eye symptoms, concurrent systemic disease, and medications. The association between glaucoma medical compliance was defined as self-reported adherence to drop regimens >75% of the time.

RESULTS—Eighty percent of veterans (n=59) reported compliance with glaucoma therapy. Dry eye symptoms (as defined by Dry Eye Questionnaire 5 (DEQ5) score ≥6) were reported by 39% (n=29) and their presence was associated with decreased compliance (63% vs. 89%, p=0.007). Anxiety and posttraumatic stress syndrome (PTSD) were also associated with significant noncompliance, (64% vs. 83%, p=0.05 and 58% vs. 84%, p=0.02, respectively). Other studied factors including demographics, depression (p=0.11), and glaucoma regimens did not play a significant role in glaucoma medication compliance.

CONCLUSIONS—Dry eye symptoms, PTSD, and anxiety were associated with decreased compliance to medical treatment of glaucoma. Identifying and treating underlying ocular surface disease and anxiety disorders may lead to increased adherence to glaucoma treatment.

Glaucoma, the second most common cause of world blindness, is an optic neuropathy that most commonly presents clinically with loss of peripheral visual field.[1,2] Sixty million people are estimated to have glaucomatous optic neuropathy.[1,2] Glaucoma carries with it a 9% risk of bilateral blindness and a 27% risk of unilateral blindness over 20 years.[3] Glaucomatous visual loss is incurable but its progression can be mitigated with proper intraocular pressure (IOP) control which is the only modifiable risk factor proven to prevent the progression of glaucoma.[4] Current first line therapy for glaucoma consists of daily drop regimens.

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Compliance with topical therapies can significantly decrease the risk of blindness from glaucoma, but given its slow and asymptomatic progression many patients are not motivated to comply.[4–7] There are still many unknowns as to what factors contribute to noncompliance. Glaucoma severity, complexity of treatment regimen, and demographics (including gender, age, and race)have shown mixed results in their effects on compliance.[7–13] Medication cost has also been found as a barrier in some populations.[9,11,14]

Our study population at the Department of Veteran Affairs (VA) has access to healthcare and medication coverage, but is uniquely challenged with higher levels of anxiety disorders, particularity posttraumatic stress disorder (PTSD).[15–19] Little is known regarding barriers to glaucoma treatment adherence among veterans, and as such, the objective of our study was to fill this knowledge gap by characterizing glaucoma compliance among veterans and identifying barriers to compliance.

Methods

Study population

The Miami Veterans Affairs (VA) eye clinic serves veterans with specific eye problems along with those needing surveillance due to medical conditions (e.g. diabetes). Patients on glaucoma medications who were seen in the Miami VA comprehensive eye clinic were invited to complete a 63-question survey at the time of their visit. This questionnaire inquired about patient information regarding compliance with glaucoma therapy, demographics, dry eye symptoms, medical conditions, and glaucoma treatment regimens. The questionnaire was self-administered, but assistance was available to those with literacy or vision issues. Inclusion criteria included the use of topical glaucoma medication. Exclusion criteria included any previous history of incisional glaucoma surgery. Of 77 patients meeting the inclusion criteria over an 8 week time period, 74 (96%) filled out the survey.

Determination of compliance

Patients were asked how frequently they missed taking their glaucoma medications. “Compliance” was defined as missing the medication less than 25% of the time, while missing 25% or more of the scheduled drops was considered to be “noncompliance.”

Determination of dry eye symptoms

The dry eye questionnaire 5 (DEQ5) was used to ascertain the presence and severity of ocular surface symptoms. The DEQ5 is a dry eye specific questionnaire consisting of five questions regarding the severity of eye discomfort, dryness, and tearing over a one-month recall period.[20] The score ranges from 0 to 22 with zero reflecting no ocular surface symptoms and 22 reflecting a large number of symptoms. Per established guidelines, mild or greater dry eye symptoms were defined as a DEQ5 score of 6 or more.[20]

Compliance difficulties

Difficulties with compliance including forgetfulness, intolerable side effects of glaucoma drops, self-reported poor quality of vision, and impact of drops on daily tasks were evaluated in the survey.

Data collection

The VA ophthalmology service initiated this study as a quality improvement project. Miami VA Institutional Review Board review and approval was later obtained to perform a chart review and link patient data to the questionnaires. The study was conducted in accordance with the principles of the Declaration of Helsinki. Data from the questionnaire was collected at the time of the respondents' visit and entered into a standardized database. The Veterans Affairs administrative database was used to collect other data such as patient demographics, including age, gender, ethnicity, and race.

Statistical analysis

All statistical analyses were performed using SPSS 22.0 (SPSS Inc., Chicago, IL) statistical package. Frequencies and descriptive analyses were performed. Categorical values were compared using chi square analysis; continuous variables were compared using the independent student's t test (for normally distributed variables) and Mann-Whitney test (for non-normally distributed variables). Logistic regression analysis, with compliance as the dependent variable, was used to evaluate the association between various factors on compliance.

Results

Study population and compliance

Of the 74 patients who filled out surveys, 80% (n=59) of patients reported administering their drops more than 75% of the time. This was defined as the compliant group.

Demographics and compliance

Our population primarily consisted of males with a mean age of 69 (SD 9.3). Demographic factors were not found to affect compliance as seen in Table 1.

Dry eye symptoms and compliance

Thirty-nine percent (n=29) of patients reported mild or greater dry eye symptoms (DEQ5≥6). These patients had reduced compliance with glaucoma medications compared to those without symptoms. Sixty-three percent (n=17) of patients with dry eye symptoms were compliant with medications versus 89% (n=42) of patients with no dry eye symptoms (p=0.007). Table 2 demonstrates the dry eye symptom sub-scores, based on the 5-Item Dry Eye Questionnaire.

Comorbidities and compliance

The average number of systemic medications prescribed to our patients was 8.8 (SD 5.8). No relationship was seen between the total number of medications prescribed and compliance.

A diagnosis of PTSD or anxiety was associated with decreased compliance (p=0.02). (Table 3)

Glaucoma regimens and compliance

Differing glaucoma regimens did not play a significant role in compliance among our sample population (Table 4). The mean number of glaucoma medications used by our patient population was 2.0 (SD 0.88). The most commonly used drops were latanaprost and the combination timolol/dorzolamide, 70% (52) and 46% (34) respectively. Those receiving assistance installing their drops had similar compliance (n=49, 82%) to those who self-administered their drops (n=11, 79%; p=0.39). Those using drops in both eyes were more compliant than those only using drops in one eye (compliance of n=49, 88% versus n=10, 56%, respectively (p=0.003)).

Compliance difficulties

Interestingly, while forgetfulness was the most common factor endorsed as a barrier to compliance, this issue was not found to be associated with noncompliance in our study population (P=0.57). Patients that reported forgetting to refill their drops or leaving their drops at home when traveling were found to be less compliant. Patient perceived quality of vision did not affect compliance. Additionally, those that felt that the use of glaucoma drops interfered with work were found to be less compliant (Table 5).

Mental health and dry eye symptoms

Patients who endorsed PTSD and anxiety were more likely to complain of dry eye symptoms. Fifty-eight percent of those with PTSD (n=7/12; P=0.004) and 57% with anxiety (n=8/14; P=0.007) endorsed mild or greater dry eye symptoms (DEQ5≥6) as compared to 34% and 32% without PTSD or anxiety, respectively. In a multivariate logistic regression analysis considering the effect of PTSD, anxiety, depression, and dry eye symptoms (DEQ5≥6) on compliance, both the presence of PTSD and dry eye symptoms remained significant predictors for noncompliance. PTSD portended a 4.9 times increased risk of noncompliance (95% confidence interval 1.08–21.83, P=0.039), while dry eye symptoms portended a 6.3 times increased risk (95% confidence interval 1.69–23.16, P=0.006).

Discussion

Our study reveals that the majority of veterans being treated for glaucoma are compliant. Barriers to compliance were dry eye symptoms and underlying anxiety disorders (specifically PTSD and generalized anxiety disorder). Forgetfulness, despite being the most commonly endorsed barrier to compliance was not found to be associated with noncompliance.

Dry eye symptoms are known to be more prevalent among glaucoma patients. Population based studies show a 15% prevalence of dry eye symptoms.[21,22] In contrast, dry eye symptoms have been reported in a higher frequency among glaucoma patients seen in general ophthalmic clinics (39–60%).[23–27] In our study, 39% of patients reported mild or greater dry eye symptoms, this is consistent with previously published literature.

Furthermore, the presence of dry eye symptoms was associated with decreased compliance. To our knowledge this is the first study to demonstrate such a correlation and it substantiates previous studies that have proposed that dry eye symptoms associated with glaucoma treatment leads to noncompliance.[24,25,28]

The etiology of dry eye symptoms in glaucoma patients has been associated with the preservatives used in glaucoma drops, the most common being benzalkonium chloride (BAK). BAK preserved ophthalmic solutions have been shown to cause inflammation,[29] tear film instability,[30] and disruption of the corneal epithelium.[31] Clinically, preserved glaucoma drops can cause foreign body sensation, burning, stinging, and dry eye sensation.[32–36] Furthermore, BAK has been shown to be neurotoxic, leading to decreased corneal innervation with corresponding decreased corneal sensitivity.[37] The extent of the neurotoxic effects of BAK has been shown to be time and dose dependent that can ultimately lead to a neurotrophic keratitis in a subset of patients who are chronically treated.[31,37] The development of a neurotrophic cornea would further explain the lack of correlation between clinical signs and symptoms observed in patients treated for glaucoma.[38] It has been shown that the use of preservative free glaucoma drops can alleviate these effects and it has been proposed that their use will increase compliance.[33–36,39,40]

In addition to dry eye symptoms, we found that a diagnosis of an underlying anxiety disorder, specifically PTSD and generalized anxiety disorder led to decreased compliance. Anxiety disorders, particularly PTSD, are known to be more common among veterans. Population based studies found that 8% of the general population will suffer from PTSD sometime in their life, whereas up to 20% of combat veterans are affected.[16,41] This is consistent with our findings of 16% of veterans in our study carried a diagnosis of PTSD. PTSD as a barrier to compliance does not appear to be unique to glaucoma treatment, it has also been identified as a barrier to compliance with systemic medications.[42] A current theory as to why PTSD adversely influences medication compliance is based on PTSD-specific cognitive and behavioral symptoms. Avoidance is one of the key components in making the PTSD diagnosis and it is thought that PTSD patients may avoid following medical regimens because it reminds them of their initial trauma or of their mortality in general.[43]

Previous studies have considered mental health variables and glaucoma compliance. A recent study among veterans with glaucoma and PTSD analyzed the medication in possession ratio (MPR) and the follow-up ratio (FUR) as a way of measuring medical compliance. They found that patients with PTSD tended to have more follow-ups with their ophthalmic care providers than others but this did not translate into increased medications in possession.[44] Their study was inconclusive as to the effect that PTSD has on glaucoma drop compliance. Additionally, a Greek study[45] evaluated the role of anxiety and depression on glaucoma treatment compliance. Depression was associated with noncompliance while anxiety did not significantly affect compliance.[45] In contrast, in our study, we found that anxiety was associated with noncompliance while depression trended towards significance.

Of note, in our study, and similar to previous publications[46,47], dry eye symptoms and anxiety disorders correlated with one another. However, in a multivariate analysis, both PTSD and dry eye symptoms remained independent risk factors for noncompliance.

Prior studies have investigated potential modalities to improve compliance in patients with mental illness. Cognitive behavioral therapy, computer automated reminders, and increasing patient education are strategies that have been shown to improve compliance among this patient population.[48–50] Based on these findings, we recommend that ophthalmologists spend time educating patients and stressing the importance of treatment compliance. Another important strategy is collaboration with other medical providers, including mental health workers, in those with compliance issues. Further research is needed to assess what factors can improve compliance in populations with a high burden of anxiety and depression.

As with all studies, this work has limitations, which need to be considered when interpreting the study results. First, this study used patient self-reporting to ascertain both the independent variables (anxiety, PTSD, dry eye symptoms) and the dependent variable (compliance). Second, we did not measure tear film parameters in this study. While it is well known that symptoms and signs of dry eye are not well correlated,[38,46] glaucoma patients are known to have abnormalities in both and our study design does not allow comment on how objective findings of dry eye may influence compliance. Finally, information from our patient population of elderly male veterans may not be generalizable to other, non-veteran populations. Further studies will be needed to re-evaluate our findings in female glaucoma populations and in other ethnic groups.

In conclusion, this study found that dry eye symptoms and mental disorders were associated with noncompliance to topical glaucoma medication regimens. These findings stress the importance of considering a patient's ocular surface symptoms and mental health status when prescribing glaucoma drops. Our study highlights the need for further collaboration with mental health workers and need for future research to assess what factors can improve compliance in this population such as treatment of treatment of anxiety/depression, dry eye symptoms, and a more thorough discussion of why compliance is important in glaucoma.

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Table 1

Demographics and Glaucoma Therapy Compliance

Group	Population (n=74)	Compliant n (%)	*P* Value
Age, n (%)			0.38
<Age 65	20 (27%)	15 (20%)	
≥Age 65	54 (73%)	44 (59.5%)	
Gender, n (%)			0.47
Male	72 (97%)	57 (79%)	
Female	2 (2.7%)	2 (100%)	
Race, n (%)			0.08
White	30 (40.5%)	26 (87%)	
Black	41 (55%)	31 (76%)	
Other	1 (1.4%)	0 (0%)	
Ethnicity, n (%)			0.70
Hispanic	12 (16%)	10 (83%)	
Non-Hispanic	60 (81%)	47 (78%)	

Table 2

Dry Eye Questionnaire 5 (DEQ5) Sub-Scores

Dry Eye Severity[a,b]	**DEQ5 scores mean (SD)**	**Compliant n(%)**
DEQ5	5.6 (4.5)	—
DEQ5 Sub-Scores		
Discomfort[a]	1.2 (1.1)	38(76%)
Dryness[a]	0.99 (1.0)	34(79%)
Tearing[a]	1.1 (1.3)	29(88%)
Nighttime discomfort[b]	0.65 (0.48)	34(83%)
Nighttime dryness[b]	0.55 (0.50)	36(75%)

[a]Score based on 5-item Dry Eye Questionnaire (frequency 0–4): 0-never, 1-rarely, 2-sometimes, 3-frequently, 4-constantly.

[b]Score based on 5-item Dry Eye Questionnaire (intensity 0–5): 0-never, 1-not at all intense, 5-very intense.

Table 3

Comorbidities and Glaucoma Therapy Compliance

Comorbidity	Population (n=74)	Compliant: with disease	Compliant: without disease	*P* Value
Diabetes, n (%)	39 (53%)	30 (76%)	29 (83%)	0.53
Hypertension, n (%)	43 (58%)	37 (86%)	22 (71%)	0.11
PTSD, n (%)	12 (16%)	7 (58%)	51 (84%)	0.02
Anxiety, n (%)	14 (19%)	9 (64%)	50 (83%)	0.05
Depression, n (%)	16 (22%)	11 (69%)	47 (82.5%)	0.11
Allergies, n (%)	1 (1.4%)	1 (100%)	58 (74%)	0.61
Sleep apnea, n (%)	12 (16%)	10 (83%)	49 (79%)	0.73

PTSD=post traumatic stress disorder

Table 4

Glaucoma Regimens and Glaucoma Therapy Compliance

Regimen	Population (n=74)	Compliant n (%)	*P* Value
# of glaucoma medications, n (%)			0.97
≤ 2 medications	49(66%)	39(80%)	
> 2 medications	25(34%)	20(80%)	
Medication frequency, n (%)			0.12
≤ 2 times/day	66(89%)	55(82%)	
> 2 times/day	8(11%)	4(50%)	

Table 5

Compliance Barriers and Glaucoma Therapy Compliance

Barriers to Compliance	Population (n=74)	Compliant and endorse barrier	Compliant and deny barrier	*P* Value
Reported Difficulties Glaucoma Treatment Compliance, n(% compliant)				
I forget to take the drops	66 (89%)	59 (89%)	0 (0%)	0.57
I do not need the drops	10 (13.5%)	7 (70%)	52 (81%)	0.41
Travelling and leaving drops at home	6 (8.1%)	2 (37%)	57 (84%)	0.003
The drops run out too fast	6 (8.1%)	3 (50%)	56 (82%)	0.06
Afraid of being dependent on drops	5 (6.8%)	3 (60%)	56 (81%)	0.26
Forget to refill the drops	5 (6.8%)	1 (20%)	58 (84%)	0.001
Too busy with obligations	4 (5.4%)	2 (50%)	57 (81%)	0.13
I don’t like to take my drops in public	3 (4.1%)	2 (67%)	57 (80%)	0.59
Too busy at work to take drops	3 (4.1%)	2 (67%)	57 (80%)	0.57
The cost of the drops	2 (2.7%)	1 (50%)	56 (81%)	0.29
Reported Side Effects Glaucoma Drops, n (% compliant)				
Eyes burn or sting with drops	16 (22%)	13 (81%)	46 (79%)	0.86
The drops make my vision blurry	8 (11%)	5 (63%)	54 (82%)	0.20
Vision Quality, n (% compliant)				
Poor Vision	35 (47%)	27 (77%)	32 (82%)	0.60
Impact of Glaucoma Treatment on Daily Tasks, n (% compliant)				
Reading	45 (61%)	33 (73%)	26 (90%)	0.09
Television	31 (42%)	23 (74%)	36 (84%)	0.31
Driving	26 (35%)	20 (77%)	39 (81%)	0.66
Walking	23 (31%)	16 (70%)	43 (84%)	0.14
Housework	21 (28%)	14 (67%)	45 (85%)	0.08
Working	21 (28%)	13 (62%)	46 (87%)	0.02
Personal grooming	20 (27%)	13 (65%)	46 (85%)	0.055
Talking to people	15 (20%)	11 (73%)	48 (68%)	0.49