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Original Research Article

Assessment of dry eye in glaucoma

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ABSTRACT

Aims: This study intends to assess the prevalence of dry eye in glaucoma patients.
Materials and Methods: A prospective study of enrolled consecutive topically treated glaucoma patients. The patients presenting with systemic or ocular conditions that could interfere with ocular surface status were excluded. Tear meniscus height (TMH), Schirmer I and II, tear breakup time (TBUT) tests were used to assess dry eye disease. Data was analysed using BDSS Statistics software, Version 1.0.
Results: In our study of 60 patients, 41 subjects had abnormal TMH in right eye and 40 abnormal in left eye. 49 subjects had abnormal Schirmer I in Right eye and 44 subjects had abnormal Schirmer I in Left eye. Schirmer II test was done, out of 60 subjects, 47 subjects had abnormal results in RE and 41 subjects had abnormal results in LE. TBUT test was done 49 subjects had abnormal results in RE and 43 subjects had abnormal value in LE.
Conclusion: The patients on topical antiglaucoma medications with preservatives are more prone to develop dry eye accounting for 84.49%.

1. Introduction

Dry eye is a common eye disorder characterized by inadequate synthesis of tear film to moisturise the ocular surface.[1] It is a multifactorial disease characterised by ocular discomfort, visual disturbances, and tear film insufficiency.[2]

The DEWS (Dry Eye Workshop) classified dry eye as caused by decreased tear secretion or by increased evaporation (either by intrinsic or extrinsic causes). There are many causes of dry eye: one of the causes is the prolonged use of preserved topical medication, causing toxic effect on the ocular surface.[1]

Glaucoma is a progressive optic neuropathy and the primary treatment for this disease is anti-glaucoma medication therapy.[3,4]

The probable correlation of dry eye in glaucoma is due to possible role of preservatives used in ocular hypotensive drug mainly benzalkonium chloride, beta adrenoblocker.

Glaucoma patients are therefore at increased risk to develop ocular surface disease (OSD) as glaucoma patients are usually treated for long duration with preserved topical drugs.[5] Glaucoma treatment can cause alteration on the surface of the eye by disturbing the tear secretion and severity of dry eye depends on the concentration and duration of exposure.

Ocular surface inflammation may manifest as early as 3 months after initiation of antiglaucoma therapy. Prevalence of Dry eye in POAG (primary open angle glaucoma) vary from 11% to 100% depending on age, sex, ocular hypotensive medication.[6]

Lifestyle factors can also help in management of dry eye symptoms in glaucoma, product supplements containing omega 3 fatty acids can decrease dry eye symptoms.

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Thus, we intend to take up this study in our setup to determine the association of dry eye in glaucoma in Kolar district.

2. Materials and Methods

This prospective study includes consecutive 60 glaucoma patients of either sex and all aged above 40 years visited in tertiary care institute in Karnataka under the Department of Ophthalmology between May 2021 to May 2022 who underwent detailed glaucoma and dry eye evaluation after 1 year. The necessary permission from the Ethical and Research Committee was obtained for the study.

A total of 108 eyes of 60 patients fulfilling the inclusion criteria will be included in this prospective study. Each patient will be assessed by detailed history and ocular examination of both the eyes using torch light and slit lamp bio-microscopy of the anterior segment; and fundus examination using Indirect ophthalmoscopy after pupil dilatation using mydriatics, (i.e., tropicamide) and assessment of Intraocular pressure by Applanation Tonometer and evaluation of tear film abnormalities by tear meniscus height (TMH), Schirmer test I, Schirmer test II and TBUT (Tear break up time).

Inclusion criteria for the glaucoma patients were: 1) Age above 40 years. 2) Diagnosed with glaucoma and 3) On topical antiglaucoma drugs. Exclusion criteria were: 1) Use of topical medications other than antiglaucoma drugs 2) ocular infections 3) Lid abnormality such as ectropion, entropion, trichiasis and blepharitis 4) Prior lid or ocular surgery.

Tear meniscus height was measured by slit lamp biomicroscopy. After normal blinking, the lower meniscus height was read off the scale on the reticule of the slit lamp. A value of <0.25 mm will be considered abnormal.

Schirmer test I was performed without topical anaesthesia under natural lighting. A standardized filter paper will be used. About 5mm of the Schirmer strip was bent and placed in the lower fornix at the junction of middle and lateral thirds of the lower fornix, the eyes were left closed for 5 min and the distance moistened will be measured on the scale on the filter paper itself. A reading of <10mm will be considered abnormal. Schirmer test II was done with topical anaesthesia, remaining procedure is similar to Schirmer test I. The value of < 6mm will be considered abnormal and for Tear breakup time a fluorescein -impregnated strip was wetted with non-preserved saline and placed in inferior fornix. The patient was then asked to blink for three times and then to look straight ahead without blinking. The tear film will be observed with the slit lamp biomicroscope using cobalt blue filter under wide beam illumination. The interval between the last blink and appearance of the first corneal dry spot will be measured as TBUT. A value <10 sec will be regarded as abnormal.

Dry eye was considered as primary outcome variable. Tear meniscus height, Schirmer's test, tear breakup time were considered as secondary outcome variables. Age and gender were considered as Primary explanatory variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram etc. BDSS Corp. Released 2020. Co Guide Statistics software, Version 1.0, India: BDSS corp.

3. Result

A total of 60 subjects were included in the final analysis. The mean age group of study population was 62.78±9.68 years. Among the study population, males were 39 (65%) and females were 21 (35%) (Figure 1). Most patients suffered from POAG (25 subjects), 16 patients presented with PACG, followed by secondary open angle glaucoma (2 patients), secondary angle closure glaucoma (3 patients), and (10 patients) with normal tension glaucoma and (1 patient) neovascular glaucoma. Examined patients were regularly followed for 1 year.

Grading of dry eye severity is done as per American Academy of Ophthalmology Cornea/External Disease 2020–2021 BCSC Basic and Clinical Science Course.

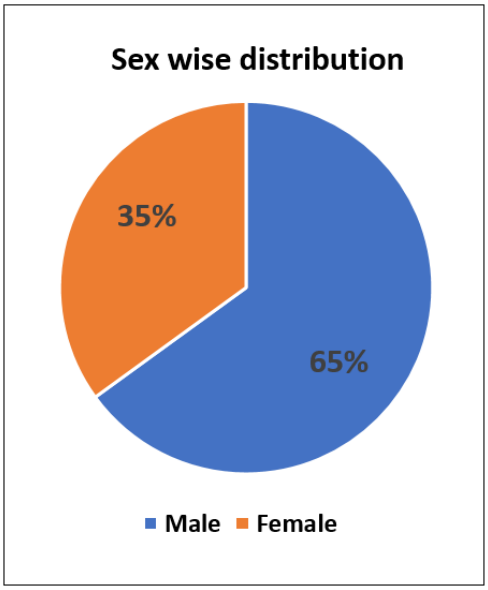

Fig. 1: Pie diagram of Gender in the study population (N=60)

4. Discussion

This study assessed dry eye disease in glaucoma patients on topical hypotensive drops using four clinical tests (tear meniscus height, tear breakup time and Schirmer's test I and II). The mean ± SD age was 62.78±9.68 (range, 45–87)

Table 1: Descriptive analysis of Tear Meniscus height (mm) - Both eyes in the study population (N=108)

Tear Meniscus height (mm) - Right eye	RE (58)	LE (50)
Abnormal (< 0.25 mm)	41 (70.68%)	40 (80%)
Normal (> 0.25 mm)	17 (29.31%)	10 (20%)

Table 2: Descriptive analysis of Schirmer's I (mm) -Right eye in the study population (N=58)

Schirmer's test I - Right eye	Frequency	Percentage
Severe dry eye	6	10.34%
Moderate dry eye	30	51.72%
Mild dry eye	13	22.41%
Normal eye	9	15.51%

Table 3: Descriptive analysis of Schirmer's I (mm) - Left eye in the study population (N=50)

Schirmer's test I - Left eye	Frequency	Percentage
Severe dry eye	6	12%
Moderate dry eye	30	60%
Mild dry eye	8	16%
Normal eye	6	12%

Table 4: Descriptive analysis of Schirmer's II (mm) – Right eye (N=58)

Schirmer's test II - Right eye	Frequency	Percentage
Normal	11	18.96%
Abnormal	47	81.03%

Table 5: Descriptive analysis of Schirmer's 2 (mm) - Left eye (N=50)

Schirmer's test II - Left eye	Frequency	Percentage
Normal	9	18.00%
Abnormal	41	82.00%

Table 6: Descriptive analysis of T BUT (Sec) - Right eye (N=58)

Tear break up - time test (Right eye)	Frequency	Percentage
Grade III	8	13.79%
Grade II	35	60.34%
Grade I	6	10.34%
Normal	9	15.51%

Table 7: Descriptive analysis of T BUT (Sec) - Left eye (N=50)

Tear break up - time test (left eye)	Frequency	Percentage
Grade III	6	12.00%
Grade II	31	62.00%
Grade I	6	12.00%
Normal	7	14.00%

years.

In our study most of the patients have moderate dry eye followed by mild dry eye, followed by severe dry eye. These results are compared with study done by Ramli et al. that reported higher percentage of abnormal tests in the glaucoma group than the control (corneal staining 63% vs 36%, p = 0.004 and Schirmer 39% vs 25%, p = 0.049).[7]

In normal individuals as the age advances, aging changes occurs in the lacrimal glands such as periductal fibrosis, inter acinar fibrosis, and acinar cell atrophy causes disturbance in tear dynamics results in age-related dry eye.[8]

Glaucoma is chronic disease require long term treatment with antiglaucoma medications. Mechanisms of dry eye in glaucoma patients are likely a combination of decrease tear production due to chronic irritation and increased tear evaporation from Meibomian gland and lacrimal gland dysfunction, further worsened by topical anti-glaucoma medications.[9]

The most commonly used preservative in antiglaucoma medications, benzalkonium chloride (BAK), which is a quaternary ammonium compound, causes alteration in ocular surface by decrease in the stability of the precorneal tear film and also causes reduction in the density of goblet cells.[10]

Study done by Camp et al.[11] also observed that an increased number of glaucoma medications exacerbated eye dryness, leading to poor QOL

The chronic use of antiglaucoma medication results in disruption of the corneal epithelium and a reduction in corneal sensitivity, which subsequently results in disruption of the tear film and thinning of the mucus, aqueous, and lipid layers.[12]

Ocular surface diseases in glaucoma patients can reduce glaucoma medication compliance, and will ultimately reduce the quality of life (QOL).[13]

These finding can be explained by the likelihood of increased adverse effects of the medications and/ or their preservative (BAC) on the ocular surface and the quality of tear film, which could be dose and drug number dependent.[14,15]

Therefore, based on our findings and those study reports, we can conclude that anti glaucoma medication causes changes in the ocular surface resulting in dry eye.

These findings support the use of preservative-free regimens or tear substitutes to minimize the adverse effects of antiglaucoma eye drops on ocular surface. Considering the age and ocular medications related risks for DED, it is important to consider DED evaluation as part of glaucoma treatment.

5. Conclusion

The patients on topical antiglaucoma medications with preservatives are more prone to develop dry eye accounting for 84.49%.

6. Source of Funding

None.

7. Conflict of Interest

Nil.

References

1. Baudouin C, Pisella PJ, Fillacier K, Goldschild M, Becquet F, Jean MDS, et al. Ocular surface inflammatory changes induced by topical antiglaucoma drugs: human and animal studies. *Ophthalmology*. 1999;106(3):556–63.
2. Maurya RP. Dry eye disease: An overview. *Indian J Clin Exp Ophthalmol*. 2018;4(4):433–4.
3. Actis AG, Rolle T. Ocular surface alterations and topical antiglaucomatous therapy: a review. *Open Ophthalmol J*. 2014;8:67–72.
4. Kastelan S, Tomic M, Soldo K, Salopek-Rabatić J. How Ocular Surface Disease Impacts the Glaucoma Treatment Outcome. *Biomed Res Int*. 2013;2013:696328. doi:10.1155/2013/696328.
5. Wong ABC, Wang MTM, Liu K, Prime ZJ, Danesh-Meyer HV, Craig JP. Exploring topical anti-glaucoma medication effects on the ocular surface in the context of the current understanding of dry eye. *Ocul Surf*. 2018;16(3):289–93.
6. Brjeschii VV, Radhuan M. Glaucomul și Sindromul de Ochi Uscat. *Inf Oftalmol*. 2014;7(2):37–49.
7. Ramli N, Supramaniam G, Samsudin A, Juana A, Zahari M, Choo MM. Ocular surface disease in Glaucoma: effect of polypharmacy and preservatives. *Optom Vis Sci*. 2015;92(9):222–6.
8. The definition and classification of dry eye disease: report of the definition and classification subcommittee of the International dry eye workshop. *Ocul Surf*. 2007;5(2):75–92.
9. Nijm LM, Benito-Llopis LD, Rossi GC, Vajaranant TS. Understanding the Dual Dilemma of Dry Eye and Glaucoma: An International Review. *Asia Pac J Ophthalmol (Phila)*. 2020;9(6):481–90.
10. Erb C, Gast U, Schremmer D. German register for glaucoma patients with dry eye. I. Basic outcome with respect to dry eye. *Graefes Arch Clin Exp Ophthalmol*. 2008;246(11):1593–601.
11. Camp A, Wellik SR, Tzu JH, Feuer W, Arheart KL, Sastry A, et al. Dry eye specific quality of life in veterans using glaucoma drops. *Cont Lens Anterior Eye*. 2015;38(3):220–5.
12. Wong TT, Zhou L, Li J, Tong L, Zhao SZ, Li XR, et al. Proteomic profiling of inflammatory signaling molecules in the tears of patients on chronic glaucoma medication. *Invest Ophthalmol Vis Sci* . 2011;52(10):7385–91.
13. Stringham J, Ashkenazy N, Galor A, Wellik SR. Barriers to glaucoma medication compliance among veterans: dry eye symptoms and anxiety disorders. *Eye Contact Lens*. 2018;44(1):50–4.
14. Kaštelan S, Tomić M, Soldo KM, Salopek-Rabatić J. How ocular surface disease impacts the Glaucoma treatment outcome. *Biomed Res Int*. 2013;2013:696328. doi:10.1155/2013/696328.
15. Chen H, Lin C, Tsai Y, Kao C. Association between Glaucoma medication usage and dry eye in Taiwan. *Optom Vis Sci*. 2015;92(9):227–32.

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