

Systemic medication usage in glaucoma patients

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Objective: To study the prevalence of the systemic use of some common classes of medications by glaucoma patients and their relationship to the prevalence and severity of chronic open-angle glaucoma (COAG) and primary-angle closure glaucoma (PACG).

Design: Observational prospective single-centre cross-sectional study.

Methods: Glaucoma patients or their pharmacist provided an updated list of all systemic medications that they presently use. The relationship between glaucoma type and severity and medication use for diseases other than glaucoma was assessed by univariate statistics.

Results: We studied 514 glaucoma patients. They use a mean of 4.9 oral medications prescribed by a mean of 2.1 doctors. Antihypertensives, medications with anticholinergic properties, steroids, anticoagulants, and thyroid hormones were the most frequently prescribed groups of medications, used by 251 (49%), 178 (35%), 100 (19%), 218 (42%), and 108 (21%) patients, respectively. Steroid usage was associated with advanced visual field loss in COAG patients. Antihypertensives and medications with anticholinergic properties were not associated with severity of COAG and PACG, respectively, and these 3 groups were not associated with an increased prevalence of diagnosis of COAG or PACG.

Conclusion: Glaucoma patients take many systemic medications in addition to their topical glaucoma treatment.

Patients with glaucoma are frequently prescribed systemic medications for other medical conditions by physicians other than their ophthalmologist. There is evidence that systemic steroids, medications with anticholinergic properties, and antihypertensives may have a negative impact on a patient's glaucoma.^{1–6} Although possible adverse effects of these systemic medications on glaucoma are well documented, the actual prevalence of known glaucoma patients receiving these and other medications has not been studied. The relationship between the use of these medications and specific glaucoma diagnoses and staging of glaucoma severity has not yet been evaluated.

The primary aim of this study is to determine the prevalence of usage of systemic medications (antihypertensives, medications with anticholinergic properties, systemic steroids, and other medication classes) among our cohort of glaucoma patients. Secondary goals of the study included determining whether the prevalence of using certain classes of medications is associated with specific glaucoma diagnoses and the severity of the glaucoma diagnosis.

METHOD

This was an observational, descriptive, prospective, single-centre, cross-sectional study of consecutively recruited glaucoma patients presenting for appointments at the glaucoma practice of one of the authors (O.K.). Patients or their pharmacy provided a list of all the

medications that they currently used. Antihypertensives, systemic steroids, medications with anticholinergic effects, diabetic medications, statins, calcium channel blockers, anticoagulants, thyroid hormone replacements, and beta adrenergics were counted as individual classes. Systemic steroids included tablets, skin ointments, and nasal inhalers. Medications with anticholinergic properties included antidepressants, benzodiazepines, antipsychotics, antihistamines, antispasmodics, and medications used to treat Parkinson's disease. Beta adrenergic medications included "over-the-counter" drugs such as antihistamines, decongestants, and anti-allergy medications. For those medications that could not be grouped into one of the aforementioned classes, a miscellaneous medication class was tabulated. This category included acetaminophen, nonsteroidal anti-inflammatory drugs, cardiac medications, prostate medications, erectile dysfunction medications, cancer treatments, and vitamin supplements.

Patient charts were reviewed for demographic information and details concerning the specific diagnosis of glaucoma as well as its severity, according to the Canadian Ophthalmological Society Clinical Practice Guidelines.⁷ The number of prescribing physicians was also noted. The study was approved by the Research and Ethics Committee of the Jewish General Hospital, and written consent from all involved patients was obtained.

The prevalence of usage of systemic medications in our glaucoma patient cohort for conditions other than glaucoma as well as associations between systemic medication

Diagnosis	No. of Patients
POAG	241
Glaucoma Suspect	87
PACG	74
PXFG	55
PG ^s	25
AACG	10
OHTN	9
Inflammatory	8
NTG	3
Congenital	2

POAG, primary open-angle glaucoma; PACG, primary-angle closure glaucoma; PXFG, pseudoexfoliative glaucoma; PG, pigmentary glaucoma; AACG, acute-angle closure glaucoma; OHTN, ocular hypertension; NTG, normal tension glaucoma.

usage and specific glaucoma diagnoses and their severity as determined by visual field loss and optic nerve damage was investigated using *t* tests and χ^2 tests where appropriate. More specifically, we examined whether glaucoma patients with POAG use more antihypertensive medications or steroids when compared with glaucoma patients with other glaucoma diagnoses. We also explored whether glaucoma patients with PACG use more medications with anticholinergic properties compared with glaucoma patients with other glaucoma diagnoses. We further analyzed whether glaucoma patients with POAG who use 2 or more antihypertensive medications or 2 or more steroid medications show more advanced damage to the optic nerve or visual field compared with glaucoma patients using fewer of these medications. Finally, we investigated whether glaucoma patients with PACG who use 2 or more anticholinergic medications demonstrate more advanced damage to their optic nerve or visual fields compared with glaucoma patients using fewer of these medications. Results were statistically significant if the *p* value was < 0.05. All analyses were conducted using SAS/STAT for Windows (version 9.3, SAS Institute Inc.).

RESULTS

A total of 514 patients were enrolled in the study. Their mean age was 70.6 years, and their glaucoma had been known for a mean of 9.4 years. The patients' specific glaucoma diagnosis breakdown is listed in Table 1. The breakdown by glaucoma severity based on optic nerve and visual field involvement is listed in Tables 2 and 3.

Our glaucoma patients took a total of 2543 oral medications (including supplements), which represents a mean of 4.9 medications per patient (range: 0–27 medications). These medications were prescribed by a mean of 2.1 doctors per patient (range: 0–9 prescribing doctors).

Cup-to-disc ratio	No. of patients
< 0.65	226 (44%)
0.65–0.85	206 (40%)
> 0.85	82 (16%)

Mean deviation	No. of patients
> -6	298 (58%)
-6 to -12	105 (20%)
< -12	111 (22%)

The medication class counts are listed in Table 4. The total count of miscellaneous medications and supplements used was 1012. The class counts for the medications with anticholinergic properties are listed in Table 5. The breakdown of patients taking 1 or more than one antihypertensives, anticholinergics, and systemic steroids is shown in Table 6.

The medication classes chosen in Table 4 were included because the underlying disease for which the medication is indicated or the actual medications may be associated with glaucoma. Several other miscellaneous medication classes were included in the calculation of total medication usage but were not specifically included in Table 4 because the underlying illnesses for which they are indicated and the medications are not known to be related to the pathophysiology of the glaucomas.

The counts of total oral medication use and total drop use were studied with respect to patient age, and the results are presented in Table 7.

Although oral and topical medication use increased with age, when controlling for age, a relationship between increased medication use and glaucoma severity with respect to the optic nerve appearance and visual field status could not be demonstrated using Pearson's correlations and multivariate regression analysis.

No association was found between the frequency of usage of systemic steroids and antihypertensive medications and a diagnosis of POAG compared with all other glaucoma diagnoses. Similarly, there was no relationship between the number of patients with PACG using medications with anticholinergic properties compared with other glaucoma diagnoses. The results of these analyses are shown in Table 8.

Table 9 shows that patients with POAG who took 2 or more types of systemic steroids are more likely to have advanced visual field loss (i.e., < -12 dB) compared with POAG patients who took no systemic steroids. However, POAG diagnosis and the use of systemic steroids or

Medication class	Medication count	No. of patients
Glaucoma drops	627	509 (99%)
Antihypertensive	390	251 (49%)
Anticholinergics	271	178 (35%)
Anticoagulants	218	208 (42%)
Systemic steroids	201	100 (19%)
Thyroid medications	108	108 (21%)
Statins	95	95 (18%)
Diabetic medications	95	95 (18%)
Calcium channel blockers	89	87 (17%)
Beta-adrenergic agonists	41	38 (7%)
Carbonic anhydrase inhibitors	23	23 (4%)

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