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Is Balancing Blood Pressure Night Dips Effective in Preventing Glaucoma Progression? A Pilot Study

Gil Peretz and Miriam Zalish*

Department of Ophthalmology, Kaplan Medical Center, Rehovot, affiliated to the Hebrew University, Jerusalem, Israel

***Corresponding author:** *Dr. Miriam Zalish, MD, Department of Ophthalmology, Kaplan Medical Center, Rehovot, affiliated to the Hebrew University, Jerusalem, Israel, Tel: +972505472827, E-mail: zalishm@yahoo.com*

Abstract

Purpose: To evaluate the effectiveness of reducing extreme blood pressure (BP) night dips in preventing glaucoma progression under normal intraocular pressures (IOPs).

Methods: This case series included progressing glaucoma patients treated in our facility between 1995-2014. These patients had either normal tension glaucoma (NTG) or primary open angle glaucoma (POAG) with normalized IOP, and were being maintained with IOPs of ≤ 12 mmHg. All patients were instructed to undergo a 24-hour BP Holter monitor assessment. The family physicians of patients for whom extreme BP night dips were documented were asked to reduce them to a physiological level. A long term follow-up was then conducted in order to document further glaucoma progression.

Results: Nine patients aged 57-81 years were included, 6 with normalized pressure POAG and 3 with NTG. They were all being treated for systemic hypertension. Duration of follow-up after the 24-hour BP monitor assessment ranged from 1 to 7.3 years (median 6.25 years). Seven of the 9 patients were classified as extreme night dippers, and 5 of those 7 (71%) showed no further glaucoma progression after their night dips were normalized. The glaucoma that progressed in 2 patients (1 with NTG and the other with POAG) continued to do so in spite of additional medical treatment.

Conclusion: Balancing BP night dips in progressing OAG patients with IOPs of ≤ 12 mmHg may be effective in preventing further glaucoma progression.

Keywords

POAG, NTG, IOP, Night dips

Introduction

Much has been written about the relationship between intraocular pressure (IOP) and glaucoma. An elevated IOP has been found to be a risk factor for both glaucoma development and progression, and IOP reduction has been useful in at least slowing disease progression [1-4]. Some glaucoma patients continue to progress in spite of having low IOP levels, and this applies to treated patients with primary open angle glaucoma (POAG) as well as treated patients with normal tension glaucoma (NTG). This progression has been explained by mechanisms other than IOP reduction. One theory involved decreased ocular perfusion. It was shown that low blood pressure (BP) levels, and especially low nocturnal BPs (night dips), are related to visual field deterioration among patients with glaucoma and other optic neuropathies, and this applied to both systolic and diastolic BPs [5-12]. The patients that are considered in the highest risk are "extreme" dippers (i.e., > 20% reduction in BP during the night compared to daytime BP) [13]. Most of the relevant studies suggested that reducing night dips may be another way to prevent visual field deterioration among those patients, but prospective interventional studies are lacking [14]. To the best of our knowledge, there are no publications in the literature on studies that assessed whether reducing night dips lowered the risk of visual field progression among OAG and NTG patients who are considered as being extreme night dippers.

Methods

We did a retrospective chart review of an interventional case series of patients treated at our Glaucoma Unit between 1995-2014. The diagnosis of glaucoma was made by our glaucoma specialists and it was based on the presence of a glaucomatous optic neuropathy in at least one eye, and a glaucomatous visual field (VF) according to a 24-2 or 30-2 Swedish interactive thresholding algorithm (SITA) standard automated perimetry (SAP) examination (SITA-SAP, Humphry visual field analyzer; Carl Zeiss Meditec Inc., Dublin CA). Inclusion criteria were open anterior chamber angles, no identifiable secondary causes for glaucoma, and progressive glaucoma with IOPs ≤ 12. Patients were categorized as having POAG if their IOPs were > 21 mmHg and NTG if their IOPs were < 21 mmHg at the time of glaucoma diagnosis. Only the glaucomatous eyes from each patient were included in this case series. Glaucoma was considered progressing if 3 adjacent points were considered progressing with a p-value < 0.05 in the glaucoma change probability analysis in 3 consecutive visual fields (a method based on the EMGT study [15]). All patients included in this case series were instructed to perform a 24-hour BP Holter monitor assessment in order to determine the presence of night dips. Physiologic night dips were diagnosed if nocturnal mean BP measurements (either mean systolic, mean diastolic, or mean BP) were between 10-20% lower than BP measurements during waking hours. Extreme night dips were diagnosed if nocturnal values were > 20% lower than values during waking hours [13]. The family physicians were advised to lower the extent of the night dips by changing the medical treatment or the time of administration only for the patients with extreme nocturnal BP dips. We then conducted a long-term follow-up of these patients in order to determine whether

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Table 1: Epidemiologic characteristics of the study patients.

	NTG Group	POAG Group	All
Number of patients	3	6	9
Number of eyes	4	12	16
Age (years)	61	67.2	65.11
Gender	3 males	1 male, 5 females	4 males/5 females
Hypertension	3/3	6/6	9/9
Number of glaucoma medications*	2.42	2.6	2.5

*Some patients had filtration surgery and/or laser trabeculoplasty

NTG: Normal Tension Glaucoma, POAG: Primary Open Angle Glaucoma

they were still progressing after this intervention. The ethical review board of our institution approved this retrospective study, and the tenets of the Declaration of Helsinki were followed. Informed consent was waived.

Results

Nine patients (16 glaucomatous eyes) were included in the study. Epidemiological characteristics are described in table 1. Three patients were diagnosed as having NTG, and 6 as having POAG. All patients were being treated medically for systemic hypertension, and they were all considered as progressing by at least 3 consecutive visual fields while maintaining IOPs of ≤ 12 mmHg. After undergoing a 24-hour BP Holter monitor assessment, 7 patients were considered as being extreme dippers and 2 were considered physiologic dippers (the latter included 1 patient with NTG and 1 with POAG). The family physicians of the 7 extreme dippers were asked to normalize their patients' night dips, and those patients were followed for a period of 1-7.3 years (mean 5.26 years, median 6.25 years). Five of those 7 extreme dippers (71%) did not progress any further during follow-up. The remaining 2 that did progress (1 with NTG and 1 with POAG, one eye in one patient and both eyes in the other) continued to do so even when medical treatment to further lower the IOP had been added.

Discussion

Lowering of the IOP is recognized as the mainstay of glaucoma treatment, but we occasionally encounter patients whose visual field defect continues to progress even though their IOPs are low and are considered to have been normalized. It was proposed that a reduction in optic nerve perfusion might play a role in such situations. Many studies have shown that glaucoma patients who demonstrate systemic BP night dips are prone to visual field deterioration, especially extreme night dippers, patients who are treated for systemic hypertension, and NTG patients [5,8,12,13,16]. All the patients in the current series were being treated for systemic hypertension and most of them were diagnosed as being extreme night dippers.

We recommended that all glaucoma patients who were progressing under IOPs of ≤ 12 mmHg undergo 24-hour BP Holter monitor assessment. These patients were using an average of 2.5 topical medications and some even had undergone filtration surgery and/or laser trabeculoplasty. We believe that compliance and side effects affect our ability to add more IOP-lowering medications to patients at this stage of glaucoma treatment.

Five of our 7 (71%) patients who were diagnosed as extreme dippers did not progress after their family physicians reduced their night dips by changing their hypertension medications or the time of administration. This result is in agreement with other studies that suggest that extreme night dips in BP might play a role in glaucoma progression. To the best of our knowledge, however, this is the first report that actually investigates the long-term effect of reducing night dips on glaucoma progression. Two of those 7 (29%) patients continued to progress even though their night dips were reduced, and their progression persisted even when other topical IOP-lowering medications were added, suggesting that other mechanisms of glaucomatous injury might be responsible for these therapeutic failures. Two of our 9 (11%) patients who were progressing under IOPs of ≤ 12 mmHg were physiologic dippers, and further reduction of their IOP stopped their glaucoma progression. We therefore feel more confident to provide additional IOP-lowering interventions to patients who are not extreme night dippers.

Limitations of our series include the low number of patients and its retrospective nature. Had this been a prospective study, we would have requested a second Holter assessment after the medical interventions were carried out by the family physician in order to verify the reduction of the night dips. Larger prospective studies are needed to establish our observation. In conclusion, we believe that normalizing extreme night dips in progressing glaucoma patients with low IOPs may be effective in stopping progression. We recommend further lowering of the IOPs in progressing glaucoma patients who are not extreme night dippers.

References

1. (1998) The effectiveness of intraocular pressure reduction in the treatment of normal-tension glaucoma. Collaborative Normal-Tension Glaucoma Study Group. Am J Ophthalmol 126: 498-505.
2. Musch DC, Gillespie BW, Niziol LM, Lichter PR, Varma R (2000) Intraocular pressure control and long-term visual field loss in the Collaborative Initial Glaucoma Treatment Study. Ophthalmology 118: 1766-1773.
3. Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JL, et al. (2002) The Ocular Hypertension Treatment Study: a randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma. Arch Ophthalmol 120: 701-713.
4. Leske MC, Heijl A, Hyman L, Bengtsson B, Dong L, et al. (2007) Predictors of long-term progression in the early manifest glaucoma trial. Ophthalmology 114: 1965-1972.
5. Charlson ME, de Moraes CG, Link A, Wells MT, Harmon G, et al. (2014) Nocturnal systemic hypotension increases the risk of glaucoma progression. Ophthalmology 121: 2004-2012.
6. Graham SL, Drance SM, Wijsman K, Douglas GR, Mikelberg FS (1995) Ambulatory blood pressure monitoring in glaucoma. The nocturnal dip. Ophthalmology 102: 61-69.
7. Kaiser HJ, Flammer J, Graf T, Stümpfig D (1993) Systemic blood pressure in glaucoma patients. Graefes Arch Clin Exp Ophthalmol 231: 677-680.
8. Hayreh SS, Zimmerman MB, Podhajsky P, Alward WL (1994) Nocturnal arterial hypotension and its role in optic nerve head and ocular ischemic disorders. Am J Ophthalmol 117: 603-624.
9. Hayreh SS, Podhajsky P, Zimmerman MB (1999) Role of nocturnal arterial hypotension in optic nerve head ischemic disorders. Ophthalmologica 213: 76-96.
10. Costa VP, Harris A, Anderson D, Stodtmeister R, Cremasco F, et al. (2014) Ocular perfusion pressure in glaucoma. Acta Ophthalmol 92: e252-266.
11. Ramli N, Nurull BS, Hairi NN, Mimiwati Z (2013) Low nocturnal ocular perfusion pressure as a risk factor for normal tension glaucoma. Prev Med 57: 47-49.
12. Graham SL, Drance SM (1999) Nocturnal hypotension: role in glaucoma progression. Surv Ophthalmol 43: 10-16.
13. Tokunaga T, Kashiwagi K, Tsumura T, Taguchi K, Tsukahara S (2004) Association between nocturnal blood pressure reduction and progression of visual field defect in patients with primary open-angle glaucoma or normal-tension glaucoma. Jpn J Ophthalmol 48: 380-385.
14. Mozaffarieh M, Flammer J (2007) Is there more to glaucoma treatment than lowering IOP? Surv Ophthalmol 52: 174-179.
15. Heijl A, Leske MC, Bengtsson B, Bengtsson B, Hussein M (2003) Measuring visual field progression in the Early Manifest Glaucoma Trial. Acta Ophthalmol Scand 81: 286-293.
16. Meyer JH, Brandi-Dohrn J, Funk J (1996) Twenty four hour blood pressure monitoring in normal tension glaucoma. Br J Ophthalmol 80: 864-867.