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ANALYSIS OF EFFECTS OF BLOOD PRESSURE IN IOP IN PRIMARY OPEN ANGLE GLAUCOMA

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Abstract:

Introduction: *Glaucoma is commonly defined as optic neuropathy characterized by progressive loss of retinal ganglion cells (RGCs) which is associated with characteristic structural damage to the optic nerve and visual field loss.*

Aims and objectives: *The basic aim of the study is to analyze the effects of blood pressure in IOP in primary open angle glaucoma.*

Material and methods: *This study was conducted in the hospital of Skardu during 2018 with the permission of ethical committee of hospital. There were total 100 patients which were selected for this study. At enrollment, individuals were ≥50 years of age and were treated with antihypertensive medications for at least 1 year before the beginning of the study.*

Results: *The data were collected from 100 selected patients. After adjusting for age, sex, diabetes, type of antihypertensive drug used and time since diagnosis and IOP, there was no direct relationship between values of SBP or MABP and occurrence of glaucoma. However, an increase of confirmed POAG probability was observed among patients with DBP >90 mmHg; patients with DBP values higher than 90 mmHg were 2.2 times more likely to have confirmed POAG (p-value: 0.08). The type of antihypertensive treatment did not modify the relationship between BP and POAG.*

Conclusion: *It is concluded that increase in BP is associated with an elevated IOP, leading to increased risk of glaucoma. In addition, the microangiopathy of hypertension can result in end organ damage including the retina and optic nerve.*

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INTRODUCTION:

Glaucoma is commonly defined as optic neuropathy characterized by progressive loss of retinal ganglion cells (RGCs) which is associated with characteristic structural damage to the optic nerve and visual field loss. Risk factors related to glaucoma include intraocular pressure (IOP), age, family history, clinical appearance of the optic nerve, race, and potential vascular disease. Although the mechanism of RGC death is not fully understood, elevated IOP is considered the most important risk factor [1]. Several large randomized clinical trials showed a relationship between IOP and glaucoma development and progression. Besides the mechanical effect of raised IOP on the optic nerve head (ONH), several vascular factors have also been identified as risk factors. Such factors can lead to hypoperfusion of the ONH and may thus play an important role in the pathogenesis and progression of primary open-angle glaucoma (POAG) [2].

Recently, a bimodal relationship was described between BP and the risk of glaucoma, indicating that patients with either high or low BP have a higher risk of developing POAG. The OPP could be reduced during the decrease or elevation of BP, and this may result in ischemic injury of the retinal ganglion cells in the absence of an adequate mechanism of auto regulation [3]. Additionally, in patients with systemic hypertension and glaucoma, vascular dysfunction does not allow the activation of ocular blood flow autoregulation mechanisms, increasing susceptibility to POAG [4].

While some studies report that systemic hypertension is a risk factor for glaucoma, other studies indicate that low systemic BP is a risk factor for the development and progression of glaucoma. A direct and clear relationship between glaucomatous damage and BP level has not been established. Moreover, the association between BP and IOP is inconsistent [5].

Aims and objectives

The basic aim of the study is to analyze the effects of blood pressure in IOP in primary open angle glaucoma.

MATERIAL AND METHODS:

This study was conducted in the hospital of Skardu during 2018 with the permission of ethical committee of hospital. There were total 100 patients which were selected for this study. At enrollment, individuals were ≥50 years of age and were treated with antihypertensive medications for at least 1 year before the beginning of the study.

Inclusion criteria

Subjects with previous intraocular surgery (trauma retinal detachment, complicated cataract surgery, macular degeneration or maculopathy), congenital ocular pathology (eg, coloboma) or severe associated comorbidities (renal failure, congestive heart failure, sleep apnea, autoimmune diseases with biological therapy) were excluded.

Data collection

The participants underwent a complete ophthalmological examination, including visual acuity measurement, refraction, slit lamp examination, IOP and pachymetry measurement. The IOP measurement was obtained from the average of three values by Goldmann tonometry. The POAG diagnosis was confirmed using visual field (VF) test.

Cases that did not meet all criteria were classified as suspected glaucoma. In addition, VF defects that were not explained by any other disease, like asymmetry across the horizontal midline, visual defects located in the mid-periphery or clustered in neighboring test points, were defined as compatible with the disease. BP was measured in sitting position after 5 minutes of rest, using a sphygmomanometer.

Statistical analysis

Suspected and confirmed cases of glaucoma were included in data analysis. The BP values were classified according to the high and low values of SBP and DBP. Comparisons were made using a SBP cutoff value of 110 mmHg due to the small number of participants in the study with SBP <90 mmHg in this group of hypertensive patients. The SPP, DPP and OPP were categorized into groups of 10 mmHg.

RESULTS:

The data were collected from 100 selected patients. After adjusting for age, sex, diabetes, type of antihypertensive drug used and time since diagnosis and IOP, there was no direct relationship between values of SBP or MABP and occurrence of glaucoma. However, an increase of confirmed POAG probability was observed among patients with DBP >90 mmHg; patients with DBP values higher than 90 mmHg were 2.2 times more likely to have confirmed POAG (*p*-value: 0.08). The type of antihypertensive treatment did not modify the relationship between BP and POAG.

Table 1: Distribution and relationship between POAG diagnoses according to the blood pressure level

Blood pressure	Confirmed POAG N (%)	Suspected POAG N (%)	No POAG (%)	OR (95% CI) confirmed/no GPAA[a]	OR (95% CI) suspected/no GPAA[a]
SBP, mmHg					
<110	16 (24.6)	29 (22.1)	(18.8)	1.6 (0.7–3.3)	1.5 (0.8–2.5)
111–120	17 (26.1)	37 (28.2)	(33.0)	1	1
121–140	21 (32.3)	52 (39.7)	(39.4)	0.9 (0.5–1.9)	1.2 (0.7–1.9)
>140	11 (16.9)	13 (9.9)	(8.8)	2.0 (0.8–4.5)	1.2 (0.6–2.4)
DBP, mmHg					
<60	11 (16.9)	19 (14.5)	(11.2)	1.3 (0.6–2.7)	1.6 (0.9–2.8)
61–80	40 (61.5)	81 (61.8)	(68.3)	1	1
81–90	7 (10.8)	27 (20.6)	(15.2)	0.6 (0.2–1.6)	1.3 (0.8–2.2)
>90	7 (10.8)	4 (3.0)	(5.2)	2.2 (0.9–5.5)*	0.5 (0.1–1.5)
MABP, mmHg					
<80	11 (16.9)	18 (13.7)	(10.9)	1.2 (0.6–2.7)	1.3 (0.7–2.5)
81–90	20 (30.8)	36 (27.5)	(28.1)	1	1

DISCUSSION:

In terms of the association between BP and glaucoma, nocturnal hypotension may exacerbate the progression of visual field loss in patients with glaucoma [6]. When a nocturnal BP dip coincides with an IOP spike, a substantial OPP reduction is thought to produce an intermittent insult that increases the risk of disease progression [7]. DOPP is especially useful for displaying the lowest OPP values and is regarded as an independent risk factor for OAG [8]. A recent study suggested that nocturnal BP could be a modifiable risk factor for glaucoma severity and progression. Nocturnal hypotension is caused primarily by sleep, presumably owing to sympathetic withdrawal [9]. However, physiologic nocturnal hypotension is regarded as a protective mechanism during sleep; therefore, artificial regulation of nighttime BP should be considered with caution [10]. Several studies demonstrated that both high and low BP are associated with increased risk of POAG [11].

CONCLUSION:

It is concluded that increase in BP is associated with an elevated IOP, leading to increased risk of glaucoma. In addition, the microangiopathy of hypertension can result in end organ damage including the retina and optic nerve. Hypertension must be treated because it is one of the most important risk factors for cardiovascular morbidity and mortality. But excessive BP lowering in glaucoma patients may cause a drop in OPP and subsequent ischemic injury. In particular, DOPP is useful for displaying the lowest OPP values and is regarded as an independent risk factor for OAG.

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