



THE SPECTRUM OF RETINAL VASCULAR DISORDERS IN PREHYPERTENSIVE AND HYPERTENSIVE PATIENTS

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ABSTRACT

BACKGROUND: Retinal microvascular disorders are varied in hypertension and is the prime cause for visual morbidity in young, working age group individuals.

AIM AND OBJECTIVE: Assessment of prevalence of ocular manifestations in prehypertension and hypertension and to direct them towards further evaluation and follow up.

MATERIALS AND METHODS: The ocular disorders are evaluated in 500 prehypertensive and hypertensive patients attending Ophthalmology department in Kanyakumari medical college hospital. Estimation of visual acuity, anterior segment examination, slit lamp examination, intraocular pressure, dilatation and funduscopy, visual field analysis are done.

RESULTS: The various pattern of retinal disorders are hypertensive retinopathy (38.4%), retinal vein occlusion (3.4%), retinal artery occlusion (0.6%), ischaemic optic neuropathy(0.2%), age related macular degeneration (1.4%).

CONCLUSION: Prime importance is to diagnose the early retinal vascular disorders in patients with high blood pressure. Periodical ocular examination following a standard protocol is a must, to preserve vision.

KEYWORDS : Hypertension, Retinopathy, Visual morbidity

I. INTRODUCTION

Prehypertension and hypertension are a major public health challenge due to its strong association with increased risk of cardiovascular and cerebrovascular events.¹ Worldwide an estimated 600 million people have high blood pressure. It is estimated that the global prevalence of high blood pressure will increase to 1.56 billion by 2025. In India, 23.10% men and 22.60% women over 25 years suffer from hypertension, according global health statistics by WHO in 2012.

High blood pressure is a major risk factor for the development of retinal microvascular diseases such as hypertensive retinopathy, retinal vein occlusion, retinal arteriosclerosis and ischemic optic neuropathy.² High blood pressure also increases the risk of development of diabetic retinopathy and its progression. Besides these, hypertension also plays an important role in pathogenesis of chronic simple glaucoma and age related macular degeneration.

Hypertensive eye disease is a common cause of blindness in people of working age group and its impact includes difficulty with employment, ability to drive and social interaction. Awareness regarding the ocular involvement will encourage the people to seek timely and adequate eye care. The present study is therefore undertaken to create awareness as well as to evaluate the ocular morbidity.

II. MATERIALS AND METHODS

The present study is a hospital- based, non- interventional, cross-sectional study. For this study, 500 prehypertensive and hypertensive patients attending Ophthalmology out patient department in Kanyaumari Medical College Hospital are chosen. Informed consent was obtained from all the selected individuals, who fit into the criteria. By way of providing proforma, the required data was collected.

Ophthalmic examination:

Visual acuity testing – The presenting distant visual acuity (VA) for both eyes was measured separately using a standard Snellen's chart properly illuminated at a distance of 6m. Each participant had an anterior segment examination, using a torch, to detect the signs of conjunctival disease and corneal disease. Slit lamp examination of cornea was done to determine the position, depth and site of corneal abnormality and lens opacities. Recording of intraocular pressure – Schiottz indentation tonometer was used to record the intraocular pressure of the anaesthetized cornea. Retinoscopy was performed after pupillary dilatation to elicit the refractive status of the eye. Fundus examination was carried out using direct ophthalmoscope. Visual field analysis-- done using automated static perimeter.

Gonioscopy – To determine the type of angle in the anterior chamber of the eye.

The following definitions are used for the study

1. Visual impairment – WHO Definitions

Category of visual impairment	Visual acuity with best possible correction	
	Maximum less than	Minimum equal to or better than
Low Vision		
1	6 /18	6 /60
2	6 /60	3 /60
3	3 /60	1 /60
Blindness		
4	1 /60	Light perception (PL)
5	No perception of light (NPL)	

2. Glaucoma: An intraocular pressure of more than 21 mm Hg associated with optic disc cupping and /or visual field defects.
3. Cataract: was defined as the presence of lens opacity of such magnitude as to cause a corrected visual acuity of <6/18.
4. Hypertensive retinopathy grading: Scheie classification: Grade 0 – no change; Grade 1 – arteriolar narrowing; Grade 2 - obvious arteriolar narrowing with focal irregularities; Grade 3 – Grade 2 with retinal hemorrhage/ exudates; Grade 4 – Grade 3 with papilledema.

III. Results Analysis

Table – 1: Distribution of subjects by age and sex

Age group (years)	Prehypertension		Hypertension		Total number
	Female (n)	Male (n)	Female (n)	Male (n)	
30-40	25	25	48	32	130
41-50	70	30	65	35	200
51-60	33	17	70	50	170
Total	128	72	183	117	500

Among 500 subjects who are examined, 200 are prehypertensive and 300 are hypertensive subjects

Table – 2: Association of ocular diseases in patients with high blood pressure

Ocular disease	Prehypertension		Hypertension	
	No: of subjects	Percentage (%)	No: of subjects	Percentage (%)
Refractive error	53	10.6	43	8.6
Glaucoma	7	1.4	35	7.0
Cataract	32	6.4	80	16.0
Retinal disease	78	15.6	142	28.4

Various ocular diseases diagnosed are retinal disorders (44.0%), cataract (22.4%), refractive error (19.2%), glaucoma (8.4%).

Table – 3: Association of retinal disorders in prehypertensive and hypertensive subjects

Retinal Diseases	Prehypertension		Hypertension	
	No: of patients	Percentage (%)	No: of patients	Percentage (%)
Hypertensive retinopathy	68	13.6	124	24.8
Branch retinal vein occlusion	7	1.4	10	2.0
Branch retinal artery occlusion	1	0.2	2	0.4
Anterior ischaemic optic neuropathy	-	-	1	0.2
Age related macular degeneration	2	0.4	5	1.0

The most common retinal pathology is hypertensive retinopathy diagnosed in prehypertensive (13.6%) and in hypertensive patients (24.8%).

Table 4: Various grades – Scheie classification of hypertensive retinopathy among patients

Hypertensive retinopathy	PHT (n)	HT (n)	Total	Prevalence (%)
Grade 1	46	7	53	10.6
Grade 2	18	18	36	7.2
Grade 3	4	97	101	20.2
Grade 4	-	2	2	0.4

Grade I retinopathy is common among prehypertensives (23%) and Grade III retinopathy in hypertensive patients (33.6%)

IV. DISCUSSION

500 patients attending ophthalmology out patient department with ocular complaint, have been clinically examined to find the causative factors in the visual apparatus. Among them, 200 are prehypertensive and 300 are hypertensive patients. 30 prehypertensive subjects did not have any significant changes in the visual apparatus and therefore advised regular follow up with fundus examination.

For clinicians, the retina is an easily visible part of central nervous system, the only place in the body where blood vessels of the arteriolar level are visible, making the tissue window for inspecting a part of central nervous and cardiovascular system. The retina reflects many of the changes in the central nervous system, such as increased intracranial tension and in the cardiovascular system, the vascular changes in hypertension and diabetes.³

In our study, by ophthalmoscopy, retinal changes are noted in 78 prehypertensive patients (15.6%) and 142 hypertensive patients (28.4%). **Hypertensive retinopathy** is diagnosed among 68 prehypertensive patients and 124 hypertensive patients. Diffuse arteriolar narrowing is the hallmark of hypertensive retinopathy, more common in chronic hypertension. Elevation of systemic arterial blood pressure causes both focal and generalized retinal arteriolar constriction presumably mediated by autoregulation. A prolonged duration of high blood pressure can be associated with a breakdown of the inner blood-retinal barrier, with extravasation of plasma and red blood cells. Retinal haemorrhages, cotton-wool spots, intra-retinal lipid, and in severe cases, the development of macular star configuration of intra-retinal lipid can be seen.⁴ In severe hypertension, closure of retinal capillaries can be observed. When the choroidal vessels are severely affected by elevated blood pressure, as in acute hypertension, fibrinoid necrosis of choroidal arterioles can cause the occlusion of areas of choriocapillaries, with a subsequent breakdown of the outer blood-retinal barrier. In severe cases, the optic nerve can be involved.

The Rotterdam Study has reported that among individuals without hypertension, those with narrowed retinal arterioles had a higher risk of hypertension in the subsequent 3-10 years. A recent study, has shown the association between higher blood pressure and retinal arteriolar narrowing detectable in healthy children aged 6–8 years, reinforcing the concept that early onset high blood pressure has an

adverse effect on the microcirculation.⁵ In the Cardiovascular Health Study, the findings suggest that both wider venular caliber and narrower arteriolar caliber may be markers of early subclinical cardiovascular disease. New imaging methods have allowed the measurement of other architectural changes in the retinal microvasculature. Hypertension has been associated with an increase in the retinal arteriolar length-to-diameter ratio, increased retinal venular tortuosity, reduced branching angle at arteriole bifurcations, and reduced microvascular density.⁶ Some of these retinal changes have also been shown to be associated with increased cardiovascular risk.

Secondary ocular complications of chronic systemic arterial hypertension include retinal vascular occlusive disease, macroaneurysm formation and non arteritic anterior ischaemic optic neuropathy. **Branch retinal vein occlusion** (3.4%) is seen at supertemporal branch vein, at arteriovenous crossing point, vein sandwiched between the artery and the retina. Abnormalities of blood constituents may promote thrombus formation.⁷ Retinal hemorrhages confined to the distribution of retinal vein are characteristic. Vision loss is due to macular edema or vitreous hemorrhage. Antihypertensives and laser photocoagulation therapy is beneficial and improves vision. Regular prophylactic aspirin is prescribed to have protective effect against arterial occlusion in the other eye and against stroke

Branch retinal artery occlusion (0.6%) diagnosed in the right eye reflects the greater possibility of cardiac or aortic emboli travelling to right carotid artery, similar findings has been suggested by Sanborn GE et al.⁸ Fundus shows areas of superficial retinal whitening in the distribution of the temporal vessels, due blockage of axoplasmic flow in the nerve fiber layer. No proved treatment exists and about 80% of eyes recover to 6/12 or better central acuity.

In **anterior ischaemic optic neuropathy** diagnosed in one hypertensive patient (0.2%), is due to reduced perfusion pressure or increased resistance to flow within the optic nerve head. The non arteritic form of the disease occurs in a relatively younger age group.⁹ Treatment of underlying disease and low dose aspirin should be prescribed to prevent involvement in the fellow eye.

Hypertension also plays an important role in pathogenesis of age related macular degeneration. **Age related macular degeneration** (1.4%) leads to a variety of pigmentary and atrophic changes in the macular region, causing progressive impairment of central vision in patients over the age of 50 years.¹⁰ Drusen consist of discrete deposits of the abnormal material located between the basal lamina of the RPE and the inner collagenous layer of Bruch's membrane. Various researchers have implicated atherosclerosis, oxidative damage, phototoxicity, inflammation, genetics & diet as risk factors. Taking a high dose of antioxidant vitamin and mineral combination gives limited benefit and modifies progression in high risk patients. Subjects should be made aware of the importance of regular central visual acuity testing for early diagnosis. Laser therapy, refraction and low vision aids are useful in maximizing visual function to perform daily activities.

V. CONCLUSION

Preventing sight threatening retinopathy from developing and progressing is considered the best approach to preserve vision. High blood pressure is a stress-related, modern, lifestyle disease which can be prevented by suitable stress-relaxation techniques, healthy diet and exercise. Early detection, careful follow-up and prompt treatment are key stages in the successful management of retinal disorders so that deterioration of visual function can be avoided. By these means vision can be preserved for a better living condition.

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