



EVALUATION OF HYPERTENSIVE RETINOPATHY IN PATIENTS OF ESSENTIAL HYPERTENSION WITH HIGH SERUM LIPIDS: A CLINICAL STUDY CLINICAL OBSERVATIONAL STUDY

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Abstract

Background: Hypertension is an important systemic risk factor for retinal vascular changes. Dyslipidemia may further contribute to retinal microvascular dysfunction and vascular injury. The retina provides a directly observable microvascular bed in which changes associated with systemic hypertension can be clinically assessed [1–4].

Aim: To evaluate the clinical profile and severity of hypertensive retinopathy in patients with essential hypertension associated with high serum lipid levels.

Materials and Methods: This observational clinical study was conducted in the Department of Ophthalmology, VEH, Bidar, Karnataka, from October 2024 to April 2025. A total of 30 patients with essential hypertension and elevated serum lipid levels were included. All patients underwent detailed ophthalmological examination including visual acuity, anterior segment examination, intraocular pressure measurement and dilated fundus examination. Blood pressure measurements and serum lipid profile were recorded. Hypertensive retinal changes were graded clinically according to the severity of retinopathy.

Results: Among the 30 patients evaluated, hypertensive retinal changes were observed in a substantial proportion. Mild-to-moderate grades were more commonly observed than severe changes. Retinal arteriolar narrowing, increased arteriolar light reflex and arteriovenous crossing changes were among the common fundus findings. Patients with longer duration of hypertension and more marked lipid abnormalities tended to show more pronounced retinal vascular changes.

Conclusion: Hypertensive retinopathy is an important ocular manifestation of systemic hypertension. The coexistence of dyslipidemia may be associated with increased retinal vascular changes. Routine fundus examination and appropriate control of blood pressure and serum lipids may help in early detection and prevention of ocular and systemic vascular complications.

Keywords: Hypertension; hypertensive retinopathy; dyslipidemia; serum lipids; retinal vascular changes; fundus examination.

Introduction

Essential hypertension is one of the most common systemic disorders and is associated with significant cardiovascular, renal and ocular morbidity. The retina provides a unique opportunity to directly visualize the effects of chronic hypertension on the microvasculature. Retinal vascular changes have been studied as markers of hypertension-related microvascular injury and systemic vascular risk [1,5,6]. Hypertensive retinopathy develops as a consequence of structural and functional changes in the retinal arterioles. Common clinical findings include generalized or focal arteriolar narrowing, increased arteriolar light reflex, arteriovenous crossing changes, retinal hemorrhages, cotton-wool spots and, in severe cases, optic disc edema [1–4,7]. Clinical grading systems have historically been used to describe the severity of these changes, although their prognostic interpretation has evolved over time [8,9].

Dyslipidemia is another important cardiovascular risk factor. Abnormal lipid levels are associated with vascular dysfunction, and studies have demonstrated measurable alterations in retinal microvascular function in hypercholesterolemia and other metabolic disorders [10–12]. More recent imaging studies using optical coherence tomography angiography (OCTA) have also demonstrated retinal microvascular alterations in patients with hypertension and in patients with combined hypertension and dyslipidemia [13–16].

The coexistence of hypertension and dyslipidemia may therefore increase the burden of retinal vascular abnormalities. Hypertensive retinopathy has also been associated with cardiovascular risk in population-based studies, making retinal examination potentially useful as part of broader vascular risk assessment [6,17].

The present study was undertaken to evaluate hypertensive retinal changes among patients with essential hypertension and high serum lipid levels.

2. Aim

To evaluate the prevalence and severity of hypertensive retinopathy in patients with essential hypertension and high serum lipid levels.

3. Objectives

- To identify retinal vascular changes in patients with essential hypertension and dyslipidemia.
- To assess the severity of hypertensive retinopathy.
- To study the relationship between duration of hypertension and retinal changes.
- To observe the association between serum lipid abnormalities and hypertensive retinal changes.

4. Materials and Methods

4.1 Study Setting

VEH, Bidar, Karnataka.

4.2 Study Period

October 2024 to April 2025.

4.3 Study Population

Thirty patients diagnosed with essential hypertension and having elevated serum lipid levels were included in the study.

4.4 Inclusion Criteria

- Patients diagnosed with essential hypertension.
- Patients with elevated serum lipid levels.
- Patients willing to participate in the study.
- Patients undergoing ophthalmological examination during the study period.

4.5 Exclusion Criteria

- Patients with secondary hypertension.
- Patients with diabetes mellitus or significant diabetic retinopathy.
- Patients with pre-existing retinal vascular disorders unrelated to hypertension.
- Patients with significant media opacity preventing adequate fundus examination.
- Patients unwilling to participate.

4.6 Clinical and Ophthalmological Examination

A detailed history regarding duration of hypertension, treatment status and associated systemic risk factors was obtained. Blood pressure was recorded using a standard sphygmomanometer. Serum lipid profile including total cholesterol, triglycerides, HDL and LDL cholesterol was recorded.

Ophthalmological examination included best-corrected visual acuity, anterior segment examination, intraocular pressure measurement and dilated fundus examination. Retinal findings were documented and graded according to the clinical severity of hypertensive retinopathy.

4.7 Assessment of Retinal Changes

The study assessed clinically visible retinal vascular changes including arteriolar narrowing, increased arteriolar light reflex, arteriovenous crossing changes, retinal hemorrhages, cotton-wool spots and optic disc edema. These findings represent established clinical manifestations of hypertensive retinal vascular injury [1,2,8].

5. Results

A total of 30 patients were evaluated during the study period. The patients represented different age groups and both sexes. Mild and moderate hypertensive retinal changes were the most frequently observed findings.

The common fundus changes included arteriolar narrowing, increased arteriolar light reflex and arteriovenous crossing changes. Retinal hemorrhages and cotton-wool spots were observed less frequently. Severe changes such as optic disc edema were uncommon.

Patients with a longer duration of hypertension generally demonstrated more prominent retinal vascular changes. Similarly, patients with more marked lipid abnormalities tended to have greater retinal vascular changes.

Table 1. Distribution of Patients According to Age

Age group	Number of patients
40–49 years	7
50–59 years	11
60–69 years	8

≥70 years	4
Total	30

Table 2. Common Fundus Findings

Fundus finding	Number of patients
Arteriolar narrowing	18
Increased arteriolar light reflex	15
AV crossing changes	13
Retinal hemorrhages	5
Cotton-wool spots	3
Optic disc edema	1

6. Discussion

Hypertensive retinopathy represents the effect of prolonged elevated blood pressure on the retinal microcirculation. Retinal arteriolar narrowing and arteriovenous crossing changes are among the commonly encountered clinical manifestations [1–4]. The present study similarly identified arteriolar narrowing, increased arteriolar light reflex and arteriovenous crossing changes as the most frequent fundus findings.

In the present study, mild-to-moderate retinal vascular changes were more frequent than advanced changes. This finding is consistent with the clinical spectrum of hypertensive retinopathy, in which early vascular changes may predominate while severe manifestations such as optic disc edema are less frequent [2,8,9].

The study also observed that patients with longer duration of hypertension generally had more prominent retinal vascular changes. Previous literature supports an association between the duration and severity of hypertension and retinal microvascular injury [5,7]. Contemporary studies using OCTA further demonstrate that hypertension can be associated with reduced retinal vessel density and other microvascular alterations, even beyond what is visible on conventional fundus examination [13,14].

Dyslipidemia may have an additional adverse effect on the retinal circulation through endothelial dysfunction and atherosclerotic or microvascular mechanisms. Evidence from studies of hypercholesterolemia has demonstrated impaired retinal microvascular function, while population-based research has also examined associations between lipid measures and retinal microvascular signs [10,11]. More recent work in patients with hypertension and dyslipidemia has reported reductions in retinal microvascular density and vascular flow on OCTA [15,16].

The observation in the present study that more marked lipid abnormalities tended to accompany greater retinal vascular changes is therefore biologically plausible. However, because the present study included only 30 patients and the source data do not provide inferential statistical testing, this observation should be interpreted as an association observed within the study population rather than proof of causality.

Hypertensive retinopathy may also have systemic relevance. A meta-analysis of six population-based cohorts found that mild and moderate hypertensive retinopathy were associated with higher cardiovascular disease risk among people with hypertension [17]. Thus, retinal findings may provide

clinically useful information about systemic vascular health, although retinal examination should complement rather than replace standard cardiovascular risk assessment.

7. Study Limitations

- The study included a relatively small sample of 30 patients.
- The study was observational and conducted at a single clinical setting.
- The source data do not report detailed statistical testing or effect estimates for the relationship between lipid parameters, duration of hypertension and retinopathy severity.
- Retinal assessment was based on clinical fundus examination; advanced quantitative retinal imaging such as OCTA was not reported in the study.

8. Conclusion

Hypertensive retinopathy is a clinically important manifestation of essential hypertension. In patients with associated dyslipidemia, retinal vascular abnormalities may be more prominent, particularly in those with prolonged hypertension and poorly controlled cardiovascular risk factors.

Routine fundus examination should therefore form an important part of the evaluation of patients with hypertension. Early detection of retinal changes can serve as a useful indicator of systemic vascular damage and may encourage better control of blood pressure and lipid abnormalities. The findings of this study support the need for larger, analytically designed studies to clarify the relationship between lipid abnormalities, duration of hypertension and severity of hypertensive retinopathy.

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