Original Article

A Clinical Study To Assess Association Of Hypertensive Retinopathy In Patients Having Cerebral Stroke

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Abstract

Aim: The aim of the study was to determine the prevalence and document the various grades ofhypertensive retinopathy in patients of stroke with hypertension.

Methods: The Descriptive cross-sectional study was conducted at Dr. D. Y. Patil Medical college, Pune from September 2020 to October 2022 and 100 patients were included in the study.

Results: Among the study population, 66.00% of them were male, 34.00% of them were female. Among the study population with grade, 32.00% of them had moderate, 31.00% of them had mild, 25.00% of them had none and 12.00% of them had severe grade. Among the study population, the mean age was 54.38 ± 9.27, the mean duration was 10.02 ± 5.17 and the mean SBP was 141.04 ± 16.31, the mean DBP was 84 ± 17.25. Among the study population, 61.00% of them had LVH, 54.00% of them had Putamen, 65.00% of them had Internal Capsule, 22.00% of them had thalamus, 10.00% of them had Cerebellum, 11.00% of them had pons, 3.00% of them had Lobar, 31.00% of them had With Ivh.

Conclusion: We found that Independent of other vascular risk factors, Hypertensive retinopathy is associated with an increased long-term risk of stroke, in people with hypertension who do not have diabetes. People with hypertensive retinopathy are also more likely to get a cerebral infarction even when their blood pressure appears to be under control.

Keywords: hypertension, retinopathy, prevalence, stroke

INTRODUCTION

Hypertensive retinopathy is a spectrum of retinal signs related pathologically to retinal microvascular damage from elevated blood pressure.[1] It is well documented that hypertensive retinopathy is associated with cardiovascular

morbidity and mortality.[2-4] Therefore, prevalence and spectrum of hypertensive retinopathy in the population reflects the status of hypertension control and the associated risks for cardiovascular events. In clinical management of hypertensive patients, hypertensive retinopathy can be used in cardiovascular risk assessment[4] and can be an indication for initiating anti-hypertensive therapy, even in persons with pre-hypertension or stage one hypertension.[5,6]

Despite the overwhelming evidence that hypertension represents the first risk factor for stroke and that prevention of stroke benefits the most from blood pressure lowering,[7,8] it still remains difficult to predict among those with hypertension who will develop a stroke. Therefore, it is still pertinent to unravel other risk factors or signs that may provide additional information. A fundus (retinal) examination to determine the presence and severity of retinopathy signs has been recommended as a means to determine the presence of end-organ damage in persons with hypertension and to stratify risk.[9,10] However, the value of a retinal examination remains unclear as different classifications of hypertensive retinopathy (e.g., Keith Wagner Barker classification) are difficult to use in clinical practice,[11] and a clinical ophthalmoscopic examination has low reliability and reproducibility.[12]

Given that the presence of retinal microvascular changes is a major vascular risk factor in addition to conventional cardiovascular risk factors, a population-based study found that hypertensive retinopathy was a risk factor associated with stroke in patients who had hypertension but no history of diabetes. This finding was based on the fact that hypertensive retinopathy was found to be a risk factor for stroke in these patients.[13] People who had retinal haemorrhages, cotton wool spots, or microaneurysms had a three to four times increased risk of developing an incident clinical stroke within three years. This was the case even after researchers accounted for the effects of blood pressure, smoking cigarettes, lipids, and other risk factors.[14]

Studies that are based on histology suggest that the lesions of hypertensive retinopathy result in retinal ischemia and the breakdown of the blood–retina barrier. These lesions are caused by small vessel arteriolosclerosis, which is caused by persistently elevated blood pressure.[13] Visualization of the cerebral vasculature requires the use of expensive interventional technologies, whereas visualisation of the retinal vasculature can be accomplished using an advanced non-interventional method. This method involves imaging the fundus, which is accurate, relatively inexpensive, and does not expose the patient to radiation.[15] Since the prevalence of hypertension and stroke is increasing, researchers decided to correlate the severity of hypertensive retinopathy with the risk of stroke in patients with hypertension. If a patient has high blood pressure, we might be able to help them control it better, which would lower their risk of having a stroke.

The aim of the study was to determine the prevalence and document the various grades ofhypertensive retinopathy in patients of stroke with hypertension.

MATERIALS AND METHODS

The Descriptive cross-sectional study was conducted at Dr. D. Y. Patil Medical college, Pune from September 2020 to October 2022 and 100 patients were included in the study.

INCLUSION CRITERIA:

- All fresh admission at our hospital of patients of stroke with hypertension in the age group of 40-70 years.

EXCLUSION CRITERIA:

- CHD
- Glaucoma
- Connective tissue disease

- Diabetes mellitus
- Uveitis
- Any media opacity precluding fundal view like mature cataract, traumatic cataract, complicated cataract
- Any prior history of vitreoretinal surgeries, laser

METHODOLOGY

Prior to the screening and evaluation all the patients were explained about the study and a written and informed consent was taken from each of the patient. A detailed ocular, systemic, general, medical, personal history was taken.

Uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA) was assessed using Snellen's visual acuity chart. Examination of orbit and adnexa with extraocular movements and detailed slit lamp biomicroscopy of anterior segment was done. Posterior segment examination was done after achieving dilatation of pupil by tropicamide 1% eyedrops and indirect ophthalmoscope with 20D volk lens. Hypertensive retinopathy, if present was graded using Mitchell-wong classification. Intraocular pressure was measured digitally Data of blood and urine investigations were collected as fasting lipid profile, blood urea, serum creatinine and special investigations like CT brain, MRI brain, Carotid doppler reports were collected. Blood pressure measurement was done by sphygmomanometer.

MITCHELL-WONG CLASSIFICATION OF HYPERTENSIVE RETINOPATHY	
GRADE	**SIGNS**
NO RETINOPATHY	**No detectable retinal signs**
MILD RETINOPATHY	**one or more of the following arteriolar signs: Generalized arteriolar narrowing, focal arteriolar narrowing, arteriovenous nicking, arteriolar wall opacity (Silver wiring)**
MODERATE RETINOPATHY	**one or more of the following retinal signs: Haemorrhages (blot and dot or flame shaped), microaneurysms, cottonwool spots, hard exudates.**
SEVERE RETINOPATHY	**Moderate retinopathy plus optic disc swelling.**

ETHICS COMMITTEE CLEARANCE: Ethics committee clearance was obtained prior to the start of study. Written and informed consent was taken from all patients before undertaking the study.

STATISTICAL ANALYSIS

All the Data was entered in MS Excel sheet. Results was analyzed in SPSS (software statistical package for social science) v26.0. The mean and standard deviation were used to summarize quantitative data. Proportions were used to summarize qualitative data.

RESULTS

Table 1: Sex, grade and family history descriptive analysis in the study population

Sex	**Frequency**	**Percentages**
Female	34	34.00%
Male	66	66.00%
Grade		
Mild	31	31.00%
Moderate	32	32.00%
None	25	25.00%
Severe	12	12.00%
Family H/O		
Absent	54	54.00%
Present	46	46.00%

Among the study population, 66.00% of them were male, 34.00% of them were female. Among the study population with grade, 32.00% of them had moderate, 31.00% of them had mild, 25.00% of them had none and 12.00% of them had severe grade. Among the study population, 46.00% of them had family history.

Table 2: Age, duration and SBP and DBP descriptive analysis in the research population

Parameter	**Mean ± SD**	**Median**	**Minimum**	**Maximum**
Age	54.38 ± 9.27	55.00	40.00	70.00

Duration	10.02 ± 5.17	9.50	1.00	25.00
SBP	141.04 ± 16.31	130.00	120.00	180.00
DBP	84 ± 17.25	80.00	17.00	110.00

Among the study population, the mean age was 54.38 ± 9.27, the mean duration was 10.02 ± 5.17 and the mean SBP was 141.04 ± 16.31, the mean DBP was 84 ± 17.25.

Table 3: Proteinuria in the research population: a descriptive analysis

Proteinuria	**Frequency**	**Percentages**
1+	5	5.00%
2+	27	27.00%
3+	3	3.00%
Nil	51	51.00%
TRACE	14	14.00%

Among the study population with proteinuria, 27.00% of them were 2+, 5.00% of them were 1+, 3.00% of them were 3+.

Table 4: Descriptive analysis of parameter in the study population

LVH	**Frequency**	**Percentages**
Absent	39	39.00%
Present	61	61.00%
Localized Bleed In CT	**Frequency**	**Percentages**

Absent	100	100.00%
Putamen	Frequency	Percentages
Absent	46	46.00%
Present	54	54.00%
Internal Capsule	Frequency	Percentages
Absent	35	35.00%
Present	65	65.00%
Thalamus	Frequency	Percentages
Absent	78	78.00%
Present	22	22.00%
Cerebellum	Frequency	Percentages
Absent	90	90.00%
Present	10	10.00%
Pons	Frequency	Percentages
Absent	89	89.00%
Present	11	11.00%
Lobar	Frequency	Percentages

Among the study population, 61.00% of them had LVH, 54.00% of them had Putamen, 65.00% of them had Internal Capsule, 22.00% of them had thalamus, 10.00% of them had Cerebellum, 11.00% of them had pons, 3.00% of them had Lobar, 31.00% of them had With Ivh.

Table 5: Descriptive analysis of Total cholesterol, Triglycerides, HDL, LDL, Blood urea (mg/dl), Serum creatinine (mg/dl), FBG (mg/dl), Hba1c (%) in the research population

Parameter	Mean ± SD	Median	Minimum	Maximum
Chol	239.38 ± 51.64	233.50	117.00	353.00
TGL	164.92 ± 30.63	161.00	95.00	268.00
HDL	39.7 ± 5.88	40.00	21.00	51.00
LDL	124.88 ± 32.11	120.50	71.00	187.00
Blood Urea (Mg/Dl)	32.14 ± 9.67	28.00	24.00	63.00
Sr Cr (Mg/Dl)	1.27 ± 1.02	0.90	0.50	4.60
FBG (Mg/Dl)	99.85 ± 6.25	99.50	90.00	110.00
HbA1c (%)	5.48 ± 0.64	5.40	4.50	6.50

Among the study population, the mean cholesterol was 239.38 ± 51.64, the mean TGL was 164.92 ± 30.63, the mean HDL was 39.7 ± 5.88, the mean LDL was 124.88 ± 32.11, the mean blood urea was 32.14 ± 9.67, the mean sr. creatinine was 1.27 ± 1.02, the mean FBG was 99.85 ± 6.25, mean HBA1C was 5.48 ± 0.64.

DISCUSSION

Hemorrhagic stroke (HS) secondary to hypertension accounts for up to 15% of cases in all types stroke and carries a mortality rate about 38% within the first year. Retinopathy changes in the eye due to hypertension is a chronic process, resulting pathophysiological changes that occur in the retinal, choroidal and optic nerve circulation are all in response to elevated blood pressure (BP) resulting in retinopathy changes in these structures.[10] As for the pathogenesis of hypertensive HS, caused tiny lipohyalinotic aneurysms formation called Charcot-Bouchard aneurysm along the lenticulostriate arteriole supplying the basal ganglia region which when rupture, resulting in intra parenchymal hemorrhage.[16]

Among the study population, the mean age was 54.38 ± 9.27 years. This was corroborated by the study conducted by Mondal et al where they found that the mean years of the participants with hypertensive retinopathy was 55.10 years.[17] Shrestha et al observed that the duration of hypertension greater than five years is positively correlated with the retinal complications. In cerebral vascular accident cases, it was clearer since the etiology behind the screen was uncontrolled hypertension.[18] We found that the mean duration of hypertension in patients with retinopathy and stroke was 10.02 ± 5.17 years. Onga et al highlighted that even in treated patients with well-controlled hypertension, hypertensive retinopathy can be the predictor for the long- term risk of stroke, regardless of hypertension. For the purpose of determining stroke risk, retinal photography of hypertensive retinopathy indications may be helpful.[19]

In our study, we found that the mean systolic and diastolic blood pressure was increased in the stroke patients who were with diagnosed with retinopathy. Nearly 66% of the study subjects were males. This was corroborated by the study conducted by Kayange et al where they found that Men were more likely than women to have a stroke, and this

difference was statistically significant. They also discovered a link between hypertensive retinopathy and frequent stroke.[20] Majority of them had mild to moderate grade of hypertension. This was supported by the study conducted by Beshari etal where they found that Patients with mild hypertension had a prevalence rate of retinopathy of 25.3%, moderate hypertension of 34.5%, and severe hypertension of 84.6%. Grade I retinopathy affected 42.36% of the patients, grade II affected 20%, and grade III affected 2.35%. They also observed that a familial history is a strong risk factor for hypertensive retinopathy patients. We also noted nearly a similar finding in our study. Nearly half of the subjects had the family history of hypertension.[21] In a study conducted by Bakker et al, they found that Proteinuria was absent in 77.4% of cases, but it was present in 7.14 % of recurrent cases, 10.60 % of incident cases, and 4.8 % of persistent cases.[22] Bruno etal studied that nearly half of stroke patients with hypertension had LVH.[23]
In our study, we found that nearly 60% of the participants were having LVH. A statistically significant correlation between elevated serum triglyceride levels and systolic blood pressure and retinopathy was observed. Controlling these variables may aid diabetic individuals in preventing the evolution and onset of diabetic retinopathy.[24] In our study we found that there was elevation in LDL, TC, triglycerides level and reduction in HDL level.
Laurromet et al found that the mean HbA1c for our 680 patients with hypertension was 8.7 ± 1.7% at admission and ranged from 8.7 ±1.8 to 9.0 2.2% over the preceding years. In our study we found that the HBA1C was 5.48 ± 0.64.[25] This difference was due to the severity of hypertension and duration of hypertension was relatively low in our study samples. The association between fasting blood glucose and the risk of stroke was nonlinear. When fasting blood glucose levels were between 70 and 100 mg/Dl, the incidence of stroke decreased to its lowest level.85 In our study, we noted that the fasting blood glucose was comparatively lesser. However, we noted that the blood pressure was higher with significant increase in Hb1AC levels.

CONCLUSION

We found that Independent of other vascular risk factors, Hypertensive retinopathy is associated with an increased long-term risk of stroke, in people with hypertension who do not have diabetes. People with hypertensive retinopathy are also more likely to get a cerebral infarction even when their blood pressure appears to be under control. These results imply that a fundus evaluation may be helpful in determining the associated risk of stroke in patients with hypertension. For the purpose of determining stroke risk, retinal evaluation for hypertensive retinopathy may be helpful. We also noted that the risk of stroke was associated more with the mild to moderate grades since it was more common among mild and moderate grades of hypertensive retinopathy. Therefore, we recommend annual assessment of hypertensive retinopathy patients to reduce the risk of stroke and prevent the ophthalmological complications associated with it.

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