ORIGINAL ARTICLE

ASSOCIATION OF HYPERTENSIVE RETINOPATHY WITH ANGIOGRAPHIC SEVERITY OF CORONARY ARTERY DISEASE DETERMINED BY SYNTAX SCORE

Syed Abid Habib, Muhammad Saad Jibran, Sher Bahadar Khan, Adnan Mehmood Gul
Cardiology Unit, Lady Reading Hospital, Peshawar-Pakistan

Background: Hypertension is a leading cause of morbidity among developing and developed countries. Hypertensive Retinopathy is a micro vascular complication of long standing hypertension while CAD is a macro vascular complication. The main objective of the study was to determine the association between worsening grade of hypertensive retinopathy with angiographic severity of coronary artery disease (CAD) measured by Syntax Score. **Methods:** This was a cross sectional study which was conducted after approval from IRB. All patients with history of hypertension, who underwent coronary angiography, were included in the study. After a detailed history and physical exam, all included patients were subjected to fundoscopy. Patients were categorized into 4 groups according to Keith et al classification of hypertensive retinopathy: No HR, Mild HR, Moderate HR and Severe HR. Patients were also categorized into three groups on the basis of angiographic severity of CAD by syntax score (SS): Mild CAD (SS<22), Moderate CAD (SS: 22–32) and Severe CAD (SS>32). Data was analysed in SPSS Version 20.0. Categorical and continuous variables were described as frequencies/percentages and Mean±SD respectively. **Results:** A total of 370 patients were included in the study out of which 205 were males with a mean age of 55.3±10.07 years. Mean duration of hypertension was 8.1±2.7 years with a mean SBP of 130.1±37.2 mmHg and mean DBP of 90.3±17.3 mmHg. Patients with no HR, mild HR, moderate HR and severe HR had a mean SS of 11.7±4.5, 17.1±3.9, 26.3±5.1 and 37.9±5.1 respectively. Significant association was found between HR and severity of CAD with a chi square value of 285.53 (p<0.001). PORs for worsening grade of HR with severity of CAD increased from 0.341 (p<0.001) for mild HR to 2.33 (p<0.001) times for severe HR. **Conclusion:** A higher grade of hypertensive retinopathy is significantly associated to a higher angiographic severity of CAD by syntax score.

Keywords: Coronary Artery Disease; Syntax Score; Hypertensive Retinopathy

Citation: Habib SA, Jibran MS, Khan SB, Gul AM. Association of hypertensive retinopathy with angiographic severity of coronary artery disease determined by syntax score. J Ayub Med Coll Abbottabad 2019;31(2):189–91.

INTRODUCTION

Cardiovascular disease is the leading cause of morbidity and mortality with a prevalence of 422 million and 17.9 million deaths worldwide.[1] In addition to the conventional risk factors used for risk stratification, monitoring and early treatment of patients with hypertension, hypertensive pathophysiological changes in the retina have been proposed for identifying at-risk individuals for cardiovascular disease.[2–5] In fact, some studies have shown that HR is an independent risk factor for incident coronary artery disease in patients with hypertension.[6] Since micro- and macro-vascular diseases share the same pathophysiological pathways, studies have shown that signs of retinopathy are independently associated with coronary artery calcification.[7]

The purpose of this study was to investigate the relationship between worsening grades of hypertensive retinopathy and angiographic severity of CAD assessed by Syntax Score. We found that there was little data available on the subject and whether higher grades of HR were associated with higher grades of angiographic severity of CAD.

MATERIAL AND METHODS

This cross-sectional study was conducted from 1st July, 2016 to 31st of January, 2018 in cardiology department, LRH after approval from IRB. All patients with history of hypertension who underwent coronary angiography for indications set forth by international guidelines were included in the study. Patients were excluded if they had history of CLD, CKD, cardiomyopathy, congenital heart disease, malignancy, cataracts, diabetic retinopathy, panretinitis or retinitis pigmentosa. Written informed consent was taken from all the included patients for participation in study. After a detailed history and physical exam, all included patients were subjected to fundoscopy with Reisters ophthalmoscope by two residents of cardiology unit under the supervision of a consultant ophthalmologist of our hospital. Angiographic severity of CAD was assessed in cardiac cath lab after angiography. Angiography was performed by an experienced interventional cardiologist under Semins Artis 2005

machine. Angiographic severity of CAD was determined by using the Syntax Scoring System.[8] Patients were categorized into 4 groups on the basis of grade of hypertensive retinopathy using the Keith *et al* classification, i.e., no HR (mild generalized arteriolar narrowing), mild HR (focal arteriolar narrowing and arteriovenous nipping), moderate HR (signs of grade 2 retinopathy plus retinal haemorrhages, exudates and cotton wool spots) and severe HR (signs of grade 3 plus papilledema). We also classified the patients on the basis of severity of CAD by syntax score into 3 groups, i.e., mild (SS<22), moderate (SS: 22–32) and severe (SS≥33) CAD. We also calculated the PORs for severity of CAD with worsening grade of HR. All data was collected on a predesigned *pro forma*. Categorical and continuous variables were described as frequencies/percentages and Mean±SD respectively. Data was analysed in SPSS Version 20.0.

RESULTS

A total of 370 patients were included in the study out of which 205 were males with a mean age of 55.3±10.07 years. Mean duration of hypertension was 8.1±2.7 years with a mean SBP of 130.1±37.2 mmHg and mean DBP of 90.3±17.3 mmHg. Other baseline variables are given in table-1. Patients with no HR, mild HR, moderate HR and severe HR had a mean SS of 11.7±4.5, 17.1±3.9, 26.3±5.1 and 37.9±5.1 respectively as shown in Table II. PORs for worsening grade of HR with severity of CAD increased from 0.341 (p<0.001) for mild HR to 2.33 (p<0.001) times for severe HR as shown in table-3.

Table-1: Baseline Characteristics

Age (in years)	**55.3±10.07**
30–60 years	260 (70.3%)
>60 years	110 (29.7%)
Sex	
Male	205 (55.4%)
Female	165 (44.6%)
History of Smoking	85 (23%)
Family History of CAD	55 (14.8%)
Duration of HTN (in years)	8.1±2.7
CCBs	49.2%
Beta Blockers	7%
ACEIs/ARBs	33%
Combination Therapy	10%
SBP	130.1±37.2
DBP	90.3±17.3

Table-2: Association of HR grade with severity of CAD

Hypertensive Retinopathy	**CAD on Vessel Basis**				**Syntax Score**	**Severity of Syntax Score**
	No	SVD	DVD	TVD		
No	15	65	20	5	11.7±4.5	Mild (<22)
Mild	15	60	30	0	17.1±3.9	Mild (<22)
Moderate	15	10	60	20	26.3±5.1	Mod (22-32)
Severe	0	0	5	50	37.9±5.1	Severe (≥33)
Total	45	135	115	75		
Chi square Value 285. 53 (p<0.001) Likelihood Ratio 279.42 (p<0.001) Linear-by-linear association 129.92 (p<0.001)						

Table-3: PORs for severity of CAD with worsening grade of HR

Grade of HR	**POR**	**Exp: (POR)**	**Adjusted PR**	**CI**	***p*-value**
Mild	0.341	0.96	0.32	0.31–1.21	0.001
Moderate	0.627	1.86	1.16	1.21–2.52	0.001
Severe	0.927	2.52	2.33	1.81–3.52	0.001

DISCUSSION

Hypertension is a major public health concern worldwide especially in the low-income developing countries where the proportion of hypertensive individuals is increasing over the past 2 decades and the majority of hypertensive individuals in these countries are either undiagnosed or have poorly controlled blood pressure.[9] It affects all the major organs of the body especially the cardiovascular system.[10–12] When it damages the retinal micro-vascular circulation, it results in hypertensive retinopathy.[13] The association between HR and CAD has been well established in numerous studies elsewhere. But data on severity of CAD correlation with worsening grades of HR is fairly limited.

The ARIC study found a 3-year incident CHD risk in women and a 3-year incident CVA risk in patients with micro-vascular changes in the retina irrespective of other baseline factors like DM, smoking or blood pressure.[14,15]

We found in our study that there was an obvious association between grade of HR and severity of CAD. In our study, we found that patients with mild HR either had no CAD or mild CAD whereas patients with severe HR were more likely to have severe CAD on angiography which is a gold standard for assessing coronary artery disease. We used the Syntax Score to assess the severity of CAD which is a recent advancement in interventional cardiology that takes into account not only the number of vessels involved in CAD but also the complexity of the lesion, level of calcification and the anatomical location of the lesion thereby giving a more appropriate assessment of CAD.

CONCLUSION

A higher grade of hypertensive retinopathy is significantly associated with a worsening severity of CAD on coronary angiography assessed by Syntax Score.

AUTHORS' CONTRIBUTION

SAH & MSJ: Conceived the idea, planned the study, collected data, did the statistical analysis and drafted the manuscript. SBK & AMG: Critically supervised the whole process and did critical review of drafted manuscript

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Submitted: 14 August, 2018	*Revised: 20 January, 2019*	*Accepted: 3 February, 2019*

Address for Correspondence:

Muhammad Saad Jibran, Cardiology Unit, Lady Reading Hospital Peshawar-Pakistan
Cell: +92 322 895 7703
Email: saadjibran25@gmail.com