Original Research Article

A study on the prevalence of increased left ventricular mass and proteinuria in newly diagnosed hypertensive patients

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Abstract

Introduction: Hypertension is a major cause of morbidity and mortality. The heart, arterial vessels, brain, kidney and retinal vasculature are major target organs adversely affected by high blood pressure. In adults there is a continuous incremental risk of target organ damage across levels of both systolic and diastolic blood pressure. Cardio vascular disease risk doubles for every 20mmHg systolic and 10mm Hg diastolic rise in blood pressure.

Aim of the study: To study different cardiac geometry in newly diagnosed hypertensives and to correlate proteinuria and LV mass in hypertensives.

Materials and methods: Fifty newly registered patients at Government Dharmapuri Medical College Hospital from October 2016 - April 2017 were included in the study. In all these patients, history of substance abuse, comprehensive clinical examination and appropriate imaging and bio-chemical evaluation done.

Results: Patient distribution between stage I and stage II hypertensives were almost equal. Among the distribution of patients with pulse pressure gradient, 20 patients (40%) had pulse pressure in the range of 41-50, 15 patients (30%) had pulse pressure in the range of 51-60. 7 (14%) and 8 (16%) had pulse pressure below 40 and above 60 respectively. In the study, 18 patients (36%) had urine protein in Mircoproteinuria range as detected by early morning spot urine protein - creatinine ratio. Among 18 patients with Micro- Proteinuria, 15 patients (83%) had abnormal cardiac geometry. Among 26 patients with abnormal cardiac geometry, 15 patients (58%) had micro proteinuria. There is significant association between microproteinuria and abnormal cardiac geometry in patients with essential hypertension.

Conclusion: A significant association was seen between widened pulse pressure and LVH Majority of patients with pulse pressure above 50 had LVH. While most of the patients with pulse pressure < 50 had normal geometry. Majority of patients (70%) with proteinuria and LVH were in stage-II hypertension. Patients were almost equally distributed between stage I and II Hypertension. Majority of patients had normal cardiac geometry in stage I while stage II patients had LVH of whom majority had microproteinuria.

Key words

Left ventricular hypertrophy, Proteinuria, Micro albuminuria, Hypertension.

Introduction

Hypertension currently is defined as a usual BP of 140/90mm Hg or higher, or BP levels from which the benefits of pharmacological treatment have been definitively established in randomized placebo-controlled trials Studies have shown continuous positive relationships between the risk of coronary artery disease and stroke deaths with systolic or diastolic BP down to values as low as 115/75 mm of Hg. CAD is the most common cause of death from hypertension. Essential hypertension is a heterogeneous disorder [1]. The probability of developing a morbid cardiovascular event with a given arterial pressure may vary by as much as twenty fold depending on whether associated risk factors are present or not. Most untreated adults with hypertension will develop further increase in their arterial pressure with time. Furthermore it has been documented that untreated hypertensive are associated with a shortening of life by 10-20 yrs. usually related to an acceleration of an atherosclerotic process with rate of acceleration in part related to the severity of the hypertension [2]. Even individuals with relatively mild disease left untreated for 7-10 years have a high risk of developing significant complication. Nearly 36% will exhibit atherosclerotic complication and more than 50% will have end organ damage related to hypertension itself e.g. Cardiomegaly, retinopathy and renal insufficiency. Thus even in its mild form, hypertension is a progressively lethal disease if left untreated. Natural history of the disease for long range is available from series Natural course must come from data collected prior to the availability of effective treatment. Two such long series have been reported one by Perera19 (1995) and other by Bechgaard. (Perera followed 500 patients with causal diastolic pressures of 90 mm Hg (or) higher, 150 from before onset and 350 from an uncomplicated phase until their death [3]. Microalbuminuria and proteinuria are common in hypertensive disease. It may accelerate the decline of renal function and also amplify the risk of vascular disease. Micro albuminuria is also an independent risk factor for cardiovascular disease; even in general population micro albuminuria predicts a small fall in creatinine clearance during 7years of follow up in patients with essential hypertension [4]. Micro albuminuria has been defined as urine albumin excretion of 30 -300 mg/24 hr. OR 20-200µg/minute OR Albumin- creatinine ratio 30 – 300 µg/ mg of creatinine OR Protein Creatinine ratio > 30mg/ g in the first voided morning sample. Control of hypertension is the single most effective intervention for those with proteinuria.

Materials and methods

Fifty newly registered patients at Government Dharmapuri Medical College Hospital from October 2016 - April 2017 were included in the study. In all these patients, history of substance abuse, comprehensive clinical examination and appropriate imaging and bio-chemical evaluation done.

Inclusion criteria

- Newly detected patient with systolic BP > 140 mm hg and/or diastolic BP > 90 mmHg in at least 2 visits.
- Age more than 40 years.

- No clinical or lab evidence of heart failure, renal failure, coronary artery disease, valvular heart disease, secondary hypertension, hyperlipidemia, overt proteinuria, urinary tract infection.

Blood Pressure

BP recordings were taken with well-calibrated mercury sphygmomanometer and proper cuff size was selected so that bladder encircled at least 2/3rd of arm about one inch above the right cubical fossa. Two measurements were taken on two different occasions while sitting comfortably with back supported. Phase of Korotkoffs sound was taken as diastolic BP.

Echo Cardio Graphic Examination

Echocardiography examination was performed at Department of Cardiology GRH, Chennai by an observer, unbiased of patient status. Two–dimensional guided M-mode echocardiography was done standard parasternal and apical view observed with patient supine in left lateral position. The left ventricular in cavity dimension (LVIDD) Inter ventricular septal thickness (IVSD) and left ventricle posterior wall thickness. (LVPWD) in diastole were measured. All measurements were done on frozen image. All patients had good quality images suitable for measurement and interpretation [5].

Calculation

Relative wall thickness.

Septal wall thickness + Posterior wall thickness / LV end – diastolic diameter

LV mass was derived using formula by devereux and associates

LV mass (grams) =0.8 x 1.04 [(IVSD + LVIDD + PWTD) 3 – (LVDD) 3] +0.6

IVSd - inter ventricular septal thickness at end - diastole.

LVIDd - Left ventricular mass internal dimension at end - diastole

PWTd - Posterior wall thickness at end – diastole. Left Ventricular mass index was inferred by calculating LV mass for body surface area taken as. $1.73m^2$

Proteinuria Measurement

The morning spot urine sample protein – creatinine ratio has been measured using turbid metric method (sylph salicylic acid method) after ruling out overt proteinuria and cellular deposits. This method has an analytical sensitivity of 10mg/l.

Concentric LV hypertrophy was considered If RWT > 0.43 and LVH

Eccentric LV hypertrophy was considered If RWT < 0.43 and LVH.

Concentric remodeling was considered

If RWT > O.43 and normal LVMI [6].

Results

Patient distribution between stage I and stage II were almost equal (**Table – 1**).

Table – 1: Staging of hypertension according to JNC – 7 classification.

Stage of hypertension	Frequency	%
I (140-159) / (90-99)	24	48%
II ≥ 160/ ≥100	26	52%
Total	**50**	**100%**

Among 50 Patients, 26 patients (52%) had abnormal geometry, of which 11 patients had concentric remodelling, 8 patients had eccentric hypertrophy and 7 patients had concentric hypertrophy. 24 patients (48%) had normal geometry, having normal relative wall thickness and LV mass (**Table – 2**).

Table – 2: Distribution of different cardiac geometry in patents with essential hypertension.

Cardiac geometry	Frequency	%
Normal Geometry	24	48
Concentric Hypertrophy	7	14
Concentric Remodelling	11	22
Eccentric Hypertrophy	8	16
Total	**50**	**100**

In the study, 18 patients (36%) had urine protein in Mircoproteinuria (**Table – 3**).

Table – 3: Distribution of urine protein creatinine ratio in micro – proteinuria range in patients without overt proteinuria.

Urine protein – creatinine ratio	Frequency	%
Positive	18	36%
Negative	32	64%
Total	**50**	**100%**

Positive – Urine PCR > 30 mg/g of Creatinine
Negative – Urine PCR < 30 mg/g of Creatinine

Range as detected by early morning spot urine protein - creatinine ratio.
Among 18 patients with micro proteinuria both concentric hypertrophy and concentric remodeling have 33.3% prevalence. Both normal geometry and eccentric hypertrophy had 16.7% (**Table – 4**).

Table – 4: Associations between urine protein creatinine ratio and cardiac geometry in hypertension.

Cardiac geometry	Urine PCR		Total
	Positive	Negative	
Normal geometry	3	21	24
Concentric hypertrophy	6	1	7
Concentric remodelling	6	5	11
Eccentric hypertrophy	3	5	8
Total	18	32	50

Discussion

Study was conducted in 50 newly detected hypertensive in the age group of 40-70-years with 60% females and 40% male. Most of the patients were in 40-50 years of age group [7]. Among 30 males, 14 were smokers (46%) Out of 50 patients, 27 (54%) were having a body mass index consistent with overweight (23-30), 23(46%) were having normal BMI.As per JNC-7 staging of hypertension, 24 (48%) of patients were in stage I and 26 (52%) were in stage – II. Out of 50 patients, 26 (52%) had unfavorable cardiac geometry [8]. Among patients with unfavorable cardiac geometry, 11 patients (22%) had concentric remodelling, 8 (16%) had eccentric hypertrophy and 7 (14%) had concentric hypertrophy. The urine protein creatinine ratio was in micro albuminuria range in 18 (36%) patients of which 15 (83%) had abnormal cardiac geometry, 3 (17%) had normal cardiac geometry; showing a significant association between proteinuria and left ventricular hypertrophy in patients with essential hypertension [9]. Out of 30 males in the study, 14 (48%) patients with smoking habit out of which 9 (64%) had proteinuria. A significant association was seen between proteinuria and smoking [10]. A significant association was seen between widened pulse pressure and abnormal cardiac geometry. Incidence of LVH was more in patients with widened pulse pressure. 11(73%) out of 15(30%) of patients with pulse pressure in the range of 51-60 and 5(62.5%) of 8(16%) with pulse pressure >60 had LVH respectively while LVH was seen in 2 patients (29%) and 8 patients (40%) in patients with pulse pressure range of <40 and 41-50 respectively [10]. Majority of patients in the pulse pressure range of < 40 and 41-50 had normal geometry [11]. Among 26 patient with stage II hypertension, 20 (77%) had LVH while 6 (25%) of patients with stage I hypertension had LVH. In patients with proteinuria, 12 (80%) of LVH was in stage II; in patients without proteinuria, 8 (72%) of LVH was in stage II hypertension [12]. Among 27 overweight patients, (70%) 19 had LVH. out of 18 patients with proteinuria, 14 (78%) were overweight. Among 24 patients with stage I hypertension, 18 (75%) had normal cardiac geometry and only 5 (21%) had micro proteinuria. Among 26 patients with stage II hypertension, 19 (73%) had LVH of which 13 (68%) had micro proteinuria [13].

Conclusion

Among the fifty patients with newly diagnosed hypertension in the age group of 40-70 years majority were in fifth decade. Among the fifty patients, 26 had left ventricular hypertrophy and 24 had normal cardiac geometry. In patients with LVH, majority had concentric remodelling, while

eccentric hypertrophy and concentric hypertrophy occurred with almost equal incidence [14]. Among 18 patients with micro proteinuria, 15 had left ventricular hypertrophy showing significant association between proteinuria and left ventricular hypertrophy. Smoking showed significant association with proteinuria. A significant association was seen between widened pulse pressure and LVH Majority of patients with pulse pressure above 50 had LVH. While most of the patients with pulse pressure < 50 had normal geometry. Majority of patients (70%) with proteinuria and LVH were in stage-II hypertension [15].

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