Research Article

Study of the Carotid Intimal Medial Thickness in Patients of Chronic Kidney Disease

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Abstract: The aim of the study was to assess the carotid intimal medial thickness in patients suffering from chronic kidney disease and to find its correlation with respect to staging of chronic kidney disease. Study was conducted in the Department of Medicine, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P.) India. The study comprised 105 patients of Department of Medicine between March 2012 and November 2013. Out of 105 patients 70 were the patients of chronic kidney disease and 35 were age and sex matched controls (non chronic kidney disease). Hypertension was present in 62.5% and dyslipidemia was present in 30% in cases. The mean carotid intimal medial thickness of chronic kidney disease patients was $0.90 + 0.23$ where as that of control was $0.63+.23$ and this difference was statistically significant, p value <0.0001. In the present study chronic kidney disease patients have significantly more carotid arterial wall thickness in comparison to age matched controls. The carotid intimal medial thickness does not differ in different stages of chronic kidney disease.

Keywords: Carotid intimal medial thickness, Chronic kidney disease, Hypertension, Dyslipidemia

INTRODUCTION

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR) [1,2]. Stages of CKD are stratified by both estimated GFR and the degree of albuminuria, in order to predict risk of progression of CKD. The responses to reduction in nephron numbers are mediated by vasoactive hormones, cytokines, and growth factors. Eventually, these short-term adaptations of hypertrophy and hyperfiltration become maladaptive as the increased pressure and flow predisposes to sclerosis and dropout of the remaining nephrons. Reduction in renal mass from an isolated insult may lead to a progressive decline in renal function over many years [3]. Stages of CKD with GFR are: Stage 1- Kidney damage with normal or ↑ GFR (≥90 mL/min/1.73 m^2), Stage 2- Kidney damage with mild ↓ GFR (60-89), Stage 3- Moderate ↓ GFR (30-59), Stage 4- Severe ↓ GFR (15-29), Stage 5- Kidney failure (GFR<15) [4].

Intimal thickening of the carotid artery is considered a marker of systemic atherosclerosis. Because of the difficulty in measuring intimal thickness alone by ultrasonography, the combined intima-media thickness (IMT) is measured [5]. Carotid intima-media thickness assessed by ultrasonography of carotid arteries is a safe, nonexpensive, feasible and accurate method [6].

MATERIALS AND METHODS

The present study is conducted in the Department of Medicine, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P.) India. The study comprised 105 patients admitted in wards or OPD of Department of Medicine between March 2012 and November 2013. Out of 105 patients 70 were the patients of CKD of different etiologies and 35 were age and sex matched controls which were not known cases of CKD and were apparently healthy.

Inclusion Criteria

Patients suffering from chronic kidney disease of all etiologies were taken and patients with persistent decrease in GFR <60ml/min/1.73m^2.

Exclusion Criteria

Patients with acute kidney injury.

In all the cases written inform consent was obtained from each subjects and detailed clinical history including complains, past history, personal history, family history was taken. All the selected patients were subjected to routine investigations like CBC, RBS, Blood urea, Serum creatinine, Urine Routine and Microscopy, serum billirubin, SGPT, USG abdomen and Lipid profile.

RESULTS

The study includes 105 patients (70 cases and 35 controls). Of 70 cases 42 were males and 28 were females and maximum numbers of CKD patients were in age group between 30 and 60 (table 1). Hypertension was present in 62.5%, dyslipidemia was present in 30%, 17.15 were diabetics and 15.7% were smokers in cases. 57.55% of total controls had dyslipidemia, Hypertension was present in 28.5%, 14.2% patients were diabetic and 28.5% were smokers (table 2). The CIMT of maximum number of CKD patients was between 0.9-1.0mm and the CIMT of maximum number of controls was between 0.5-0.6mm (table 3). The mean CIMT of CKD patients was 0.90 + 0.23 where as that of control was 0.63+.23 and this difference was statistically significant, p value <0.0001 (table 4). The mean CIMT of CKD patients having dyslipidemia was significantly more in comparison to the mean CIMT of controls having dyslipidemia (table 5). The CIMT of CKD patients having no risk factor was significantly more than CIMT of controls (p value<0.0018). CIMT of CKD patients was significantly increased when numbers of risk factors were increased. CIMT of control was not significantly increased when numbers of risk factors were increased (table 6). CIMT was not significantly different in different stages of CKD, p value 0.433 (table 7).

Table-1: Age and sex wise distribution of CKD patients

Age group (yrs)	Males	Females	Total	%
<20	1	6	7	10
21 – 30	5	2	7	10
31 – 40	11	1	12	17.1
41 – 50	6	10	16	22.8
51 -60	5	3	8	11.4
61 – 70	8	3	11	15.7
71 – 80	5	2	7	10
> 80	1	1	2	2.8
Total	42	28	70	100

Table-2: CKD patients according to presence of risk factors for atherosclerosis

Risk factors	No. Of patients (n=70)	No. Of Controls (n=35)
Tobacco, smoking	11 (15.7%)	10 (28.5%)
Diabetes	12 (17.1%)	5 (14.2%)
Dyslipedemia	21 (30%)	20 (57.5%)
Hypertension	44 (62.5%)	10 (28.5%)

Table-3: Distribution of patients according to CIMT

CIMT in mm	Cases (n=70)	Controls (n=35)
0.3 -0.4	1	8
0.5 – 0.6	10	13
0.7 – 0.8	16	9
0.9 – 1.0	24	4
1.1 – 1.2	16	1
1.3-1.4	3	0

Table-4: Mean CIMT of case and controls

	Cases (n=70)	Controls (n=35)	P value
Mean CIMT	0.90 $\pm$ 0.23	0.63 $\pm$ 0.23	<0.0001

Table-5: Mean CIMT of CKD patients and controls with respect to dyslipidemia

	Cases (n=70)	Controls (n=35)	P value
Mean CIMT (mm)	1.08±0.19	0.67±0.22	<0.0001

Table-6: CIMT with respect to risk factors in CKD patients vs controls

Mean CIMT value	No risk factor	1 risk factor	2 risk factor	3 risk factor	P value
Cases (mm)	0.75 $\pm$ .18 (n=16)	0.87 $\pm$ 0.25 (n=28)	0.99 $\pm$ 0.25 (n=19)	1.07 $\pm$ 0.19 (n=7)	0.002
Controls (mm)	0.50 $\pm$ 0.1 (n=5)	0.65 $\pm$ 0.18 (n=16)	0.68 $\pm$ 0.12 (n=13)	0.5 $\pm$ 0.00 (n=26)	0.126
P value	0.0018	.0007	<.0001	0.0002	

Table-7: Mean CIMT with respect to staging

	Stage 3 (n=13)	Stage 4 (n=11)	Stage 5 (n=46)	P value
CIMT value (mm)	0.96 $\pm$0.24	0.91 $\pm$ 0.23	0.87 $\pm$0.22	0.433

DISCUSSION

The main aim of the study was to assess the CIMT in patients suffering from chronic kidney disease and to find its correlation with respect to staging of CKD. According to CKD fact sheet 2010, incidence of chronic kidney disease increases with age because risk factors for CKD also increase with age. By the report of Hida M et al [7], 50-70 yrs age group was most commonly affected and this is also revealed in this study. Hypertension was present in 62.5% of CKD patients. It has been cited by Ridao et al 2001 [8], US RDS, 2010 that hypertension is present in 70-80% of CKD patients dyslipidemia was seen in 30% of CKD patients.

In adults increased CIMT as assessed by ultrasonography is a valid predictor of cardiovascular events. According to Brady TH et al [9], children with CKD are known to be at increased cardiovascular risk. According to Sunil Kumar K et al [10] CIMT was found to higher in ESRD (End Stage Renal Disease) patients than in age matched control. In this study the mean CIMT of CKD patients was 0.90±0.23 which was significantly higher than age matched controls (CIMT 0.63±0.23, p value <0.0001). According to U querfeld, Ali Anarath [11] and the 4C study group, the CIMT was highest in dialysis patients but found significantly increase in all stage of CKD and after transplantation. In this study also, the mean CIMT of all the stages was significantly increased but did not have significant difference among them (p value <0.0433). This is also seen in our study.

CONCLUSIONS

In the present study CKD patients have significantly more carotid arterial wall thickness in comparison to age matched controls. The CIMT does not differ in different stages of CKD.

CKD patients are at high risk of developing the cardiovascular complications. Increased cardiovascular risk can be determined by measuring the carotid arterial wall thickness. So, a clinician should advise the CKD patients for serial measurement of CIMT so that cardiovascular complication risk can be assessed.

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