

The Occurrence of Carotid Calcification in Regular Hemodialysis Patients Henry Adam Wellington*¹, Rachel Amelia Munroe² & Samuel Nathaniel Carter²

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Abstract

Introduction: Chronic kidney disease (CKD) can develop into End Stage Renal Disease (ESRD) which requires regular hemodialysis. Vascular classification, a complication of ESRD, contributes to cardiovascular disease in CKD patients and associated with mortality in these patients. Increased Carotid Intima-Media Thickness (CIMT) is considered as a marker of classification process.

Method: This study was a cross-sectional study at Rasyida Kidney Hospital Medan. Subjects was taken by consecutive sampling that met the inclusion criteria. A carotid ultrasonography was done to measure the thickness of carotid artery as a vascular classification. CIMT value > 1 mm indicates a carotid classification.

Result: The results showed that CKD was most common in men, as many as 35 patients (50,7%). Based on the carotid ultrasonography examination performed, the prevalence of carotid classification were 28 (40,6%) subjects. In subjects with carotid classification, majority of patients were men, as many as 16 (57,1%). Subjects with hypertension and overweight-obesity Body Mass Index (BMI) were associated with the prevalence of carotid classification ($p= 0,009$; $p= 0,039$).

Conclusion: The prevalence of carotid calcification is more common in men. Hypertension and overweight-obesity patients are associated with the prevalence of carotid classification

Introduction

The high incidence of Chronic Kidney Disease (CKD) can increase the risk of End Stage Renal Disease (ESRD) which contributes to the risk of cardiovascular disease and early mortality.¹ Study of Nord-Trondelag County (HUNT II) in Norway reported the incidence of CKD as many as 10,2% of total population. In the Asia Pacific region, many countries had similar incidence of CKD. The incidence of CKD in Japan as many as 12,9-15,1% of total population and 7,2-13,7% in Korea.²

Vascular calcification is common among CKD patients and contributes to cardiovascular disease. The prevalence increases in the progressive decline of kidney function.³ CKD can leads to abnormalities in mineral and bone metabolism. A state of hyperphosphatemia and hypercalcemia in progressive decline of kidney function will cause deposition of calcium phosphate salts in blood vessels and soft tissue.⁴ A non-invasive imaging method such as carotid ultrasonography can be done to assess the presence of vascular calcification.⁵ Based on this background, the authors were interested in assessing the prevalence of carotid calcification in regular hemodialysis patients.

Methods

An analytical research method with cross-sectional design was done in this study. The research was conducted at Rasyida Kidney Hospital Medan in June to August 2018. The study sample was chosen by consecutive sampling method. The subject will be examined by ultrasonography to assess the Carotid Intima-Medial Thickness (CIMT). The CIMT value > 1 mm was considered to have carotid classification.

Results

The research subject in this study were 69 subjects with the majority of the subjects were men, as many as 35 (50,7%) subjects. The median age was 55 (26-78) years old. Most of research subject had hypertension as comorbid disease as many as 53 (76,8%) subjects. From the carotid ultrasonography examination, the prevalence of carotid classification were 28 (40,6%) subjects (Table 1).

Table 1 The characteristic of research subject

Characteristic	Frequency (n=69)
Sex, n (%)	
Men	35 (50,7%)
Women	34 (49,3%)

Age, median (min-max), years old	55 (26-78)
Comorbid disease, n (%)	
Hypertension	53 (76,8%)
Diabetes	16 (23,2%)
Body Mass Index, median (min-max), kg/m ²	
Type 2 obesity	2 (1,4%)
Type 1 obesity	5 (3,6%)
Pre-obesity	18 (13%)
Overweight	14 (10,1%)
Normal	26 (18,8%)
Underweight	4 (2,9%)
Carotid ultrasonography interpretation, n (%)	
Classification	28 (40,6%)
No classification	41 (59,4%)

We analyzed the research subject characteristic as a risk factor of carotid calcification. Based on the results of statistical analysis (Table 2), hypertension and Body Mass Index category had relationship to the incidence of carotid calcification (p= 0,009; p=0,039).

Table 2 The relationship of research subject characteristics to carotid classification

Risk factor	Calsification	No Calsification	P value
Sex, n (%)			0,378*
Men	16 (57,1%)	19 (46,3)	
Women	12 (42,9%)	22 (53,7)	
Age, median (min-max), years old	54,5 (26-69)	57 (31-78)	0,437&
Hypertension, n (%)			0,009*
Yes	26 (92,9)	27 (65,9)	
No	2 (7,1)	14 (34,1)	
Diabetes, n (%)			0,145*
Yes	9 (32,1)	7 (17,1)	
No	19 (67,9)	34 (82,9)	
BMI category, n (%)			0,039*
Overweighth-obesity	20 (71,4)	19 (46,3)	
Underweight- normal	8 (28,6)	22 (53,7)	

*Chi Square, &Mann-Whitney

Discussion

Ghonemy et al was made a research in Egypt and found the majority CKD patients were men, as many as 62,2% subjects.⁶ Our research result was consistent with this findings. We found the majority of CKD patients were men, as many as 35 (50,7) subjects. The data from Indonesian Renal Registry showed that men were the most CKD patients who undergo hemodialysis in Indonesia.⁷ Testosterone in men has a negative effect on kidney function and structure that triggers glomerulosclerosis.⁸

The prevalence of carotid calcification in this research were 28 (40,6) subjects with men were the most gender who experienced carotid calcification as many as 16 (57,1%) patients. Ossareh et al showed the mean CIMT in their research was $0,96 \pm 0,25$ mm in hemodialysis patients. We have similar result because our positive CIMT result for calcification was > 1 mm. They also found that the men groups had significantly higher CIMT results compared to the women (p= 0,01)⁹ and so did our finding. Vascular calcification can be caused by an active process involving numerous and from passive deposition of phosphate and calcium. In CKD, phosphat can not be excreted by kidney so the patients had hyperphosphatemia. Some calcification inhibitors are reduced in CKD such as Fetuin-A, matrix Gla (MGP) protein, and Klotho leads to active process of calcification (transformation of osteoblast-like cells in vascular smooth muscle cells).¹⁰

Hypertension can cause remodelling of vascular smooth muscle cells and can be an independent risk factor for atherosclerosis. Based on our research, we found that hypertension statistically significant as a risk factor of the carotid calcification incidence (p=0,009). Arad et al found that CKD patients with hypertension as comorbid disease had a risk factor of vascular calcification and this finding was statistically significant (p<0,0001).¹¹ Ossareh et al found that there was no relationship between CIMT and BMI.⁹ This result was inconsistent with our findings which showed the BMI had relationship to carotid calcification.

Conclusion

The prevalence of carotid calcification in regular hemodialysis patients is more common in men. Hypertension and overweight-obesity patients are associated with the prevalence of carotid calcification.

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