Subclinical atherosclerosis in non-dialysis chronic renal patients

Borges Wagner Ramos*1, Fernandes Andre Mauricio Souza2, Duraes Andre Rodrigues2, Aras Junior Roque3,4 and Lima João5

1Vascular Surgeon, Department Vascular and Endovascular Surgery, Ana Neri Hospital, Federal University of Bahia, Brazil
2Cardiologist, Cardiology Service, Ana Neri Hospital, Federal University of Bahia, Brazil
3Cardiologist, Chief of the Cardiology Service, Ana Neri Hospital, Federal University of Bahia, Brazil
4Professor, Post Graduate Program, Medicine and Health, Faculty of Medicine of Bahia, Federal University of Bahia, Brazil
5Cardiologist, Texas, USA

Abstract

Background: Nowadays cardiovascular diseases are the main cause of morbidity-mortality. Atherosclerosis is one of the most important in this class of diseases.

Goal: Identifying subclinical atherosclerosis in a population of non-dialytic patients with chronic kidney disease.

Methods: From November 2012 to December 2013, we selected 40 patients with stage 3 or 4 of CKD (cronic kidney disease) who did not need hemodialysis. CACS (coronary artery calcium score) and MTCA (miointimal thickness of carotid artery) were calculated and their mean and standard deviation, median and quartiles. To verify the association between the variables we used the Fisher exact test and the Spearman correlation p<0.05.

Results: The distribution of the CACS was not as expected and the median increased with age groups. The CACS was null in: 50% of the sample in all patients below 45 years of age, 50% of those between 45-49 years of age and 50-54 years of age, 53.8% in those 55-59 years of age and 25% of those 60-65 years of age, however p=0.102. The median MTCA was 0.9 mm with interquartile range of 0.7-1.2 mm. In percentile 75 for age and sex were: 80% of 45 year olds, 25% of 45-49 year olds, 66.7% of 50-54 year olds, 69.2% of 55-59 year olds and 50% of 60-65 year olds, though p value was 0.602. We found a moderate positive correlation between age and CACS (r=0.458 p=0.03) and between age and MTCA weak (r=0.346 p=0.029) when performed correlation of age with the values of CACS and MTCA. The correlation between MTCA and CACS was strong(r=0.807) p<0.001.

Conclusion: Non-invasive tests in CKD non-dialytic patients can identify subclinical atherosclerosis through the CACS and MTCA. This may change the clinical management, evolution and prognosis.

Introduction

Cardiovascular diseases (CVD) are the leading cause of morbidity and mortality today. Atherosclerosis is the most important causal factor if it is taken apart and is characterized as a progressive multifactorial disease caused by both genetic and acquired factors with lipid accumulation and development of arterial fibrosis and [1,2] chronic kidney disease (CKD) participates in activation of the renin-angiotensin-aldosterone hormonal system and the sympathetic nervous system, causing complex metabolic and hormonal changes that accelerate the process of atherosclerosis. Increased blood pressure and blood volume increases pre and post load, generates myocardial hypertrophy, ventricular dysfunction, and increases free radicals contributing to both, accelerating endothelial myocardial damage as renal [3,4].

The risk of CVD among CKD patients is higher than in the general population with a high prevalence of coronary artery disease (40%) and mortality is 10 to 20 times in this population, especially those who do hemodialysis, accounting for 50% of deaths in patients [5,6]. Evaluation and research for subclinical atherosclerosis by imaging methods (calcium score in coronary tomography, ultrasound or angiography) can be used for the identification and stratification of atherosclerotic risk, considering that the burden of atherosclerotic plaque correlates with the risk of coronary events, especially in CKD dialytic patients [6].

The objective of this study is to identify subclinical atherosclerosis and classify the frequency distribution of coronary calcium scores (CACS) and percentiles of myointimal thickness of the carotid artery (MTCA) in non-dialysis CKD patients.

Methods

It is a cross-sectional study in patients with non-dialysis CKD patients without cardiovascular symptoms related to ischemia in outpatients Ana Nery Hospital in Salvador, Federal University of Bahia, (ANH/Correspondence to: Dr. Wagner Ramos Borges, Vascular Surgeon, Department Vascular and Endovascular Surgery, Ana Neri Hospital, Federal University of Bahia, Brazil, Tel: + 55 71 9206 8592; E-mail: wagner2076@bol.com.br

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The evaluation of MTCA was performed using ultrasound device General Electric Nemo 5, linear transducer 7-12 MHz, in longitudinal section, the mode B. The measurement was performed manually in the distal common carotid (1-2 cm proximal to the carotid bifurcation) in the anterior or posterior wall of the artery, the distance between two lines represented by the echogenic lumen-intima and media-adventitia interface. Benchmark >0.8 mm indicating early thickening. The table of values of the MTCA "Atherosclerosis Risk in Communities Study" was used as reference. MTCA (median value) was analyzed according to sex and age groups and expressed in percentis [10]. Descriptive statistics were performed in order to show the general and specific characteristics of the sample by calculating the mean and standard deviation, median and quartiles. To verify the link between nominal variables we used the Fisher exact test and to identify correlation between quantitative variables we used the Spearman correlation. It was considered significant when \( p < 0.05 \). The analysis was performed using the Statistical Package for Social Science (SPSS Inc., Chicago, IL, USA, Release 16.0.2, 2008). This study was approved by the Ethics Committee in Research of ANH/BFU under the number 08029912.9.0000.0045.

Results

From November 2012 to December 2013, 180 patients with CKD Clinic of Nephrology of the ANH/BFU were evaluated. Of these, we selected 40 patients with stage 3 or 4 without hemodialysis who accepted to join the study by signing the consent form before the interview and investigation exams. The clinical characteristics are shown in Table 1.

### Table 1. Clinical and laboratory characteristics in 40 patients with non-dialysis CKD evaluated by the CACS and MTCA.

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>9 (47.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>21 (52.5%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>(not white)</td>
<td>28 (70%)</td>
</tr>
<tr>
<td>Hypertension**</td>
<td>34 (85%)</td>
</tr>
<tr>
<td>Diabetes mellitus*</td>
<td>20 (50%)</td>
</tr>
<tr>
<td>Smoking***</td>
<td>09 (22.5%)</td>
</tr>
<tr>
<td>Dyslipidemia****</td>
<td>14 (35%)</td>
</tr>
<tr>
<td>Average age (years)</td>
<td>54.6 ± 8.94</td>
</tr>
<tr>
<td>Median MTCA (mm)</td>
<td>0.9 (q1=0.7 q3=1.2)</td>
</tr>
</tbody>
</table>

*As VI Brazilian Guidelines on Hypertension of the Brazilian Society of Cardiology; **Patients with prior diagnosis and treatment; ***Smoking: Patients active smokers at the time of the survey. All other denied smoking even passively; ****As V Brazilian Guidelines on Dyslipidemia and Prevention of Atherosclerosis Society

The distribution was not as expected and CACS increased together with the median age groups (Table 2). The CACS was null in 50% of the samples: in all patients below 45 years of age, 50% of those aged between 45-49 years and 50-54 years, 53.8% for those aged between 55-59 years and 25% for those between the ages of 60-65 years (Table 3), but \( p = 0.102 \) (not statistically significant). The median MTCA was 0.9 mm with range q1-q3 0.7-1.2 mm. Were in the 75th percentile for age and sex: 80% of 45 year olds, 25% of 45-49 year olds, 66.7% of 50-54 year olds, 69.2% of 55-59 year old and 50% of 60-65 year old, but p value was 0.602 (not statistically significant) Table 4). However when we performed the correlation of age with the values of CACS and MTCA there was a moderate positive correlation between age and CACS \( r = 0.458 \) \( p = 0.03 \) and between age and MTCA \( r = 0.346; p = 0.029 \). The correlation between MTCA and CACS was strong \( r = 0.807; p = 0.001 \) (Table 5 and 6).

Discussion

CKD is characterized by atherogenic cardiovascular risk factors acting together in the production of vascular lesions leading to the stage of final kidney disease and causing cardiovascular and cerebral disease [3,4]. We found in this study, high frequency of subclinical atherosclerosis in non-dialytic CKD patients through the evaluation of MTCA and CACS. Cardiovascular risk factors were prevalent and may have contributed to these findings, particularly in the age group above 45 years, where there was a predominance patient with hypertension and diabetes.

The MTCA is a safe, low cost and easy accessibility, identifying patients with subclinical atherosclerotic or obstructive arterial disease. Groot et al. [11] showed that up to 0.8 mm thick myointimal would be considered normal and above this is early arterial thickening. In our population of non-dialysis CKD found a high prevalence of...
The age, sex and ethnicity are important factors that influence the CACS and the MTCA. Although we had the participation of many age groups and almost equal by sex, even with a small sample size, 70% of the population was considered as black. Our results indicate that in the 40 selected patients, 16 had significant calcification and intimal thickening at different ages. Some studies show that the best specificity to detect the risk of coronary events is in the evaluation of CC ranges between 35-55 years or with 60 years [23].

50% of the patients were diabetic and these are categorized as equivalent than those with coronary disease at high risk for most current classifications risks factors of the society. Raggi et al. [24] comparing type 2 diabetic and nondiabetic patients with a null calcium score, reported that both had the same survival. Despite the CACS shows its importance in risk stratification for coronary events in the general population, further prospective studies are needed to define its prognostic significance in diabetics.

**Conclusion**

The use of non-invasive tests in non-dialytic CKD patients can identify subclinical atherosclerosis through the CACS and MTCA. However, more studies are needed with larger samples to determine whether there is interference in the clinical management, disease evolution and prognosis.

**References**

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