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Microalbuminuria correlates with the prevalence and severity of coronary artery disease in non-diabetic patients

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Abstract

Background: *It has been shown that microalbuminuria is an independent risk factor for cardiovascular diseases in diabetetics, hypertensive patients and in the general population. However, few data has addressed the correlation of microalbuminuria with the severity of coronary artery disease (CAD). The aim of the study was to assess the association of microalbuminuria with the prevalence and severity of CAD.*

Methods: *The subjects, 79 men and 74 women aged 45–70 years, were classified as CAD--negative and CAD-positive according to the results of coronary angiography. The severity of CAD was scored on the basis of the number and the extent of lesions within the coronary arteries. Urine albumin excretion was measured in 24 h urine samples by method of nephelometry.*

Results: *Coronary artery disease occurred more frequently in males than in females and in smokers than in non-smokers. There were no significant differences in the prevalence of hypertension and hypercholesterolemia between two groups. Microalbuminuria was more prevalent in CAD-positive patients than in controls (62.9%* vs. *8.8%; $p \leq 0.001$). Patients with microalbuminuria compared with the controls had increased prevalence of one (15.3%* vs. *7.4%, $p \leq 0.001$), two (50%* vs. *22.2%, $p \leq 0.001$), and three vessel disease (29.2%* vs. *19.8%, $p \leq 0.001$). Microalbuminuria exhibited a significant correlation with the severity of CAD ($r = 0.40$; $p \leq 0.001$).*

Conclusions: *Patients with microalbuminuria have more severe angiographically detected CAD than those without microalbuminuria. The results indicate that microalbuminuria exhibits a significant association with the presence and severity of CAD.* (Cardiol J 2009; 16, 2: 142–145)

Key words: coronary artery disease, diabetes mellitus, microalbuminuria

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Introduction

Coronary artery disease (CAD) is a multifactorial disorder with several different risk factors [1]. Advancing age, male sex, hypertension, diabetes mellitus, cigarette smoking and dyslipidemia are the major and independent risk factors for CAD [1]. However, they do not entirely explain the variation in cardiovascular disease incidence and mortality between individuals and among populations [1]. Therefore, additional risk factors have been proposed to better identify patients potentially at risk for CAD, and urinary albumin is candidate.

It is reported that microalbuminuria is associated with all causes of cardiovascular morbidity and mortality in patients with diabetes [2, 3], hypertension [4, 5] and in the general population [6–10]. Some studies have also shown that this correlation is independent of renal function, hypertension, and diabetes [10, 11]. The association between albuminuria and cardiovascular events is well recognized [12], but few studies have addressed its correlation with the severity of CAD. This study was undertaken to investigate the relation between microalbuminuria and the prevalence and severity of angiographically confirmed CAD in nondiabetic patients.

Methods

The study population consisted of 79 men and 74 women at the mean age of 57 ± 11 years in whom CAD was suspected and who were consecutively referred and underwent their first coronary angiography at FatemeZahra hospital of university of Mazandaran between January–June of 2007. The individuals with a recent history of acute myocardial infarction, precutaneous transluminal coronary angioplasty and renal, infectious, and malignant disease or diabetes were excluded. Patients who were receiving atenolol, and angiotensin converting enzyme inhibitors and angiotensin receptor antagonists were not included in the study either, due to possible effect on urine albumin excretion. The data were collected on demographic and major cardiovascular risk factors including age, hypertension, diabetes mellitus, smoking and serum fasting glucose and lipids. Urinary albumin concentration was measured by method of nephelometry using the Behring protein kit. The ratio of urine albumin to creatinine was used to define microalbuminuria. Patients with albumin levels less than 30 mg/g of creatinine were defined as having normoalbuminuria, those with albumin levels 30–300 mg/g as having microalbuminuria. CAD was defined significant if there was ≥ 50% diameter stenosis in ≥ 1 major coronary artery. Diagnosis of diabetes mellitus was based on abnormal fasting blood glucose ≥ 126 mg/dL or the use of hypoglycemic agents. Patients who received medication for hypertension or those with systolic blood pressure ≥ 140 mm Hg and or diastolic blood pressure ≥ 90 mm Hg were classified as having hypertension. Hypertensive diabetic patients were defined as systolic ≥ 130/80 mm Hg. Patients who had smoked within one year of entry into the study were deemed as current smokers. Patients who used cholesterol lowering medication or had a total serum cholesterol level ≥ 200 mg/dL were classified as having hypercholesterolemia.

The study was approved by the local bioethical committee and all patients gave their informed consent.

Chi-square and two-tailed t-tests were used to examine baseline differenced between two proportions or means using SPSS software (version 13). All p-values are two-tailed and differences were considered significant if p-values were ≤ 0.05.

Results

Anthropometric and clinical characteristics of participants

The results of angiography showed that there were 45 CAD-negative patients (normal or stenosis < 50%) and 108 as CAD-positive patients (stenosis > 50%). Among the patients with CAD, 17 had one--vessel, 54 two-vessel and 37 three-vessel disease. The mean age was similar between the two groups of patients (Table 1). Coronary artery disease occurred more frequently in males than in females and in smokers than in non-smokers. There were no significant differences in the prevalence of hypertension and hypercholesterolemia between the two groups. Microalbuminuria was more prevalent in CAD patients than in controls.

Microalbuminuria and the severity of coronary artery disease

The patients were divided into two groups according to the absence (negative) and presence (positive) of microalbuminuria. The severity of CAD was scored on the basis of the number and the extent of lesions in the coronary arteries as normal, one, two and three-vessel disease. The distribution of CAD severity in the groups with and without microalbuminuria was presented in Table 2. The results show thatin patients with microalbuminuria compared with the controls the prevalence of one, two, and three vessel disease was increased. Microalbuminuria exhibited a significant correlation with the severity of CAD ($r = 0.40$; $p \leq 0.001$).

Table 1. Patients' demographics and prevalence of coronary artery disease (CAD) risk factors.

Variables	CAD (negative)	CAD (positive)	P
N	45	108	
Age (years)	58 ± 9.8	58 ± 11	0.950
Sex (male/female)	18/27	62/46	0.053
Smokers	4.4% (2)	11.2% (12)	0.235
Hypertension	35.6% (16)	38.8% (42)	0.699
Hypercholesterolemia	33.3% (15)	35.1% (38)	0.826
Microalbuminuria	8.08% (4)	62.9% (68)	< 0.001
		One-vessel: 125 ± 20	0.00010
Urine albumin [mg/g]	48 ± 10	Two-vessel: 132 ± 11	0.00010
		Three-vessel: 148 ± 18	0.0001
Diuretics	86%	89%	
Beta-blocker (metoprolol)	70%	84%	
Calcium-c-b	66%	68%	
Aspirin	25%	100%	

P values for all data between the two groups were not significant

Table 2. Prevalence of one-, two-, and three-vessel coronary artery disease (CAD) in the presence and absence of microalbuminuria.

CAD severity	MA–	MA+	P
Normal CAD	50.6% (41)	5.6% (4)	–
One-vessel	7.7% (6)	15.3% (11)	0.001
Two-vessel	22.2% (18)	50.0% (36)	0.001
Three-vessel	19.8% (16)	29.2% (21)	0.001

MA– and MA+ presence and absence of microalbuminuria

Discussion

The results of the present study showed that microalbuminuria was more prevalent in CAD patients compared to controls. In addition, the patients with microalbuminuria had much greater atherosclerotic burden in the form of multi-vessel disease than those without microalbuminuria. The results are in accordance with the previously reported findings [4–10].

It is proposed that microalbuminuria indicates early and possibly reversible glomerular damage [4]. In general, microalbuminuria is associated with hypertension, diabetes mellitus and renal dysfunction. Microalbuminuria predicts cardiovascular events and renal insufficiency in hypertensive patients [3–5, 13]. In diabetic patients, microalbuminuria is associated with four-six fold increase in risk of cardiovascular mortality [6, 14, 15]. This correlation was also confirmed in the apparently healthy general population [7–9, 11]. However, some studies have shown that the association of microalbuminuria with CAD is independent of hypertension, diabetes and renal function [10].

The mechanism whereby microalbuminuria accelerates atherosclerosis is uncertain. Abnormal vasodilatation [16], endothelial dysfunction [17, 18], inflammation [19], insulin resistance or abnormal coagulation may be involved [19, 20]. It seems that aggressive treatment of microalbuminuria is beneficial in CAD patients. Ibsen et al. showed that a decrease in baseline albuminuria, which was more significant with losartan than with atenolol, is accompanied with significant reduction in cardiovascular events [21, 22]. Asselbergs et al. [23] have shown that in normotensive patients followed for 4 years, fosinopril was associated with a significant trend toward a lower rate of cardiovascular mortality and hospitalization.

In conclusion, the results of the present study indicate that microalbuminuria is associated with the prevalence and severity of CAD. However, due to cross-sectional nature of this study a causal relationship cannot be established. Prospective studies are needed to determine with certainty the degree of risk of CAD associated with microalbuminuria.

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