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Association between psoriasis and coronary calcium score

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ABSTRACT

Background: Emerging data suggests that chronic inflammatory disease, such as psoriasis, may be associated to coronary artery disease (CAD). **Objective**: Analyze the association between psoriasis and subclinical atherosclerosis using coronary calcium score (CAC). **Methods**: We investigated 221 participants with psoriasis and 718 age- and sex-matched controls without prior known CAD. All participants completed a questionnaire and underwent laboratory tests and a CAC exam. Logistic regression models adjusted for Framingham risk score (FRS) and C-reactive protein (hs-CRP) were built. CAC was included in the models as a binary variable with different cut off values. **Results**: Body-mass index, race, hypertension, HDL, LDL and hs-CRP were significantly associated with psoriasis presence and severity. Psoriasis severity was significantly associated with CAC ($p = 0.04$), particularly for very high CAC (>400) ($p < 0.01$). The OR for severe psoriasis and CAC >400 was 2.45 (95%CI: 1.26–4.75) in unadjusted models. In a model adjusted for the FRS, this association was no longer significant, but a trend was noted ($p = 0.09$). No significant changes in the association were noted after the inclusion of hs-CRP in the model. **Conclusion**: Psoriasis is associated with higher CAC values, mainly in individuals with severe psoriasis. The current findings also suggest the potential involvement of other mechanisms beyond classical cardiovascular risk factors and inflammation in this association.

Introduction

Psoriasis is a common chronic inflammatory disease with prevalence of 2–4% among adults in the U.S. and Europe [1,2]. Its presentation is most commonly mild and limited to skin lesions; however, more severe cases can include extensive skin and joint involvement, resembling other chronic inflammatory diseases, such as rheumatoid arthritis and systemic lupus erythematosus [3]. While substantial data supports the association of both rheumatoid arthritis [4] and lupus [5] with early atherosclerosis development and increased incidence of cardiovascular disease [6] and mortality [7], this association is less clear for psoriasis. A recent systematic review found that patients with psoriasis had a higher prevalence of cardiovascular risk factors and an increased rate of cardiovascular events. Moreover, other emerging data suggest that cardiovascular risk in these patients might be independent of traditional cardiovascular risk factors [8].

Coronary artery calcium (CAC) is a well-validated marker of subclinical coronary atherosclerosis, which is strongly associated with future cardiovascular events [5]. Furthermore, CAC provides risk information that is incremental to traditional risk factors [6]—thus improving risk discrimination beyond clinical risk scores, such as Framingham [7,8]. Interestingly, a recent study has demonstrated that the Framingham risk score may underestimate the extent of disease in patients with psoriasis [9]. However, only one small cross-sectional study evaluated the association of psoriasis and CAC score, demonstrating higher CAC score in patients with psoriasis compared to controls [10]. Nevertheless, due to the small sample size the study was not powered to adjust for CAD risk factors. Thus, it remains unclear if psoriasis provides additional cardiovascular risk beyond traditional risk factors [11,12]. Therefore, in the present study, we have evaluated whether psoriasis is independently associated with subclinical atherosclerosis as detected by CAC.

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Methods

The Coronary Artery Calcium in Psoriasis (CALIPSO) Study is a cross-sectional study evaluating the frequency of cardiovascular risk factors, and subclinical atherosclerosis in patients with psoriasis compared to controls. An internal review board approved the study, and all participants signed an informed consent.

Each participant had been diagnosed with psoriasis at least three years prior to entering the study. An expert dermatologist in a referral outpatient clinic evaluated the cases of psoriasis. Disease involvement of each participant was assessed by calculation of the standardized Psoriasis Area Severity Index (PASI) [13]. Psoriasis cases were classified as mild or severe based on the use of systemic medication for psoriasis treatment: mild cases were defined as individuals who were not using systemic treatment for psoriasis and had a PASI score below 7 at the initial evaluation, while severe cases were defined as patients currently on systemic medications or with a PASI score greater than 7 at the initial evaluation. Each patient with psoriasis was age and gender matched to up to four selected participants with no history of psoriasis from the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil), an ongoing cohort study evaluating factors associated with cardiovascular disease and diabetes in a multicentre sample of six sites in Brazil [14].

All study participants underwent a structured clinical evaluation that included screening for current presence of cardiovascular disease with specific questions about angina, myocardial infarction, and revascularization (percutaneous or surgical) and a 12-lead rest electrocardiogram. Patients with and without psoriasis were excluded from the sample if they had prior history of cardiovascular disease, as well as if they presented ischemic ECG abnormalities. Similarly, patients with other systemic diseases were excluded.

Sample size

The sample has a power of 80% to detect an odds ratio (OR) of 3.7 using the group of individuals free of psoriasis as the reference; and considering a frequency of altered calcium score of 0.59 in patients with psoriasis and of 0.28 in psoriasis free individuals. The frequency of altered CAC was based on previous studies in literature [10]. We considered a α of 0.05. Sample power was calculated using SPSS Sample Power.

Data collection

All participants answered an extensive questionnaire regarding previous and family history of hypertension, diabetes, dyslipidaemia, coronary heart disease, angina, myocardial infarction, revascularization (percutaneous or surgery), education, smoking. Anthropometric parameters were measured using standard equipment and techniques [15]. A standard 12-lead ECG was performed. Blood samples were collected after a 12-h overnight fast. A standard 75-g oral glucose tolerance test was administered to all participants without previous diagnosis of diabetes. Hypertension was defined as the presence of one of the following: medical history of hypertension diagnosis, use of anti-hypertensive treatment, systolic blood pressure ≥140 mm Hg, or diastolic blood pressure ≥90 mm Hg. Diabetes was defined as the presence of one of the following: medical history of diabetes diagnosis, use of oral hypoglycaemic treatment or insulin, fasting plasma glucose ≥126 mg/dl, or 2-h oral glucose tolerance test ≥200 mg/dl. Dyslipidaemia was defined as the presence of one of the following: medical history of dyslipidaemia diagnosis, use of lipid-lowering treatment, HDL cholesterol <40 mg/dl, LDL cholesterol ≥160 mg/dl, or triglycerides >150 mg/dl. We also calculated the Framingham Risk Score for coronary heart disease (CHD), which estimates the 10-year risk of myocardial infarction or CHD-related death based on age, sex, smoking status, systolic blood pressure, total cholesterol, and HDL cholesterol [16].

The following methods were used for each laboratory test. Fasting Glucose was estimated by a hexokinase method. Total cholesterol, HDL cholesterol, and triglycerides were evaluated by enzymatic colorimetric assays, with glycerol phosphate peroxidase

Table 1
General characteristics of patients with psoriasis and age- and sex-matched psoriasis-free participants.

	All	No psoriasis	Mild psoriasis	Severe psoriasis	*p*
	n = 939	*n* = 718	*n* = 71	*n* = 150	
Age (years)	55.8 (8.3)	55.8 (8.1)	55.9 (8.7)	55.6 (9.1)	0.92
Body mass index (kg/m^2)	28.0 (5.1)	27.4 (4.7)*	29.1 (6.0)	29.9 (6.0)	<0.001
Women (%)	467 (49.7)	362 (50.4)	32 (45.1)	73 (48.7)	0.66
Race					<0.001
White	264 (28.1)	92 (13.1)	53 (79.1)	119 (79.3)	
Brown	183 (19.9)	155 (22.0)	9 (13.4)	19 (12.7)	
Black	418 (44.5)	414 (48.9)	1 (1.5)	3 (2.0)	
Other	74 (7.5)	55 (7.6)	8 (12.0)	9 (6.0)	
Education					0.61
<11 years	162 (17.3)	126 (17.6)	14 (19.7)	22 (14.8)	
≥11 years	775 (82.7)	591 (82.4)	57 (80.3)	127 (85.2)	
Hypertension (%)	390 (45.6)	327 (45.5)	18 (25.3)	37 (24.7)	<0.001
Diabetes (%)	192 (20.5)	147 (20.5)	10 (14.1)	35 (23.3)	0.28
Dyslipidaemia (%)	585 (62.4)	445 (62.1)	48 (67.6)	92 (61.3)	0.63
Metabolic syndrome	477 (50.9)	372 (51.8)	33 (47.1)	72 (48.3)	0.59
Smoking (%)	141 (15.1)	114 (15.9)	13 (18.8)	14 (9.7)	0.11
HDL-C mg/dl	54.3 (15.4)	55.9 (15.5)*	51.8 (15.5)	47.8 (12.7)	<0.001
LDL-C mg/dl	128.9 (34.5)	132.3 (34.4)*‡	122.5 (33.5)	115.5 (31.6)	<0.001
Triglycerides mg/dl	140.6 (88.5)	138.0 (81.1)	154.6 (89.5)	146.5 (117.1)	0.21
Hs-CRP mg/dl	3.2 (4.8)	2.9 (4.5)	4.0 (4.8)	4.3 (5.8)	<0.001
FS CHD 10 years (%)	8.5 (6.1)	8.5 (6.0)	8.4 (5.1)	8.8 (7.0)	0.83
CAC = 0	552 (58.8)	423 (58.9)	36 (50.7)	93 (62.0)	0.04
CAC 1–100	243 (25.9)	192 (26.7)	21 (29.6)	30 (20.0)	
CAC 101–400	98 (10.4)	74 (10.3)	11 (15.5)	13 (8.7)	
CAC > 400	46 (4.9)	29 (4.0)	3 (4.2)	14 (9.3)	

*P < 0.05 for the difference between participants without psoriasis and those with severe psoriasis; †participants without psoriasis are different from patients with severe psoriasis P < 0.05; ‡participants without psoriasis are different from patients with mild psoriasis P < 0.05; #FS CHD 10 years: Framingham Score for Coronary Heart Disease in 10 years.