Modifications of Cardiovascular Risk Scores, But Not Standard Risk Scores, Improve Identification of Asymptomatic Coronary Artery Disease in Psoriatic Arthritis

To the Editor:

Patients with psoriatic arthritis (PsA) have an increased prevalence of cardiovascular (CV) risk factors and are at greater risk for subsequent major CV events compared with the general population¹. The standardized prevalence ratio for coronary artery disease (CAD) in patients with PsA ranges from 1.3 to 2.57². Similar to patients with rheumatoid arthritis (RA) and severe psoriasis, patients with PsA have been found to have a high risk of major adverse CV events, even after adjustment for traditional risk factors³. Previous studies have reported higher prevalence of coronary artery plaques both in psoriasis and in RA patients without a diagnosis of CAD, compared to controls^{4,5}. We have recently examined coronary artery plaque burden in patients with PsA, and have found that PsA is associated with accelerated coronary plaque formation, which was independent of metabolic disease⁶.

We read with interest the article in *The Journal* by Shen, *et al*⁷. They used screening for carotid plaques as a tool for CV disease risk assessment because carotid plaques are associated with future acute coronary syndrome, albeit in patients with RA⁸. They found that established CV risk scores underestimate the risk of carotid subclinical atherosclerosis. Because coronary computed tomography angiography (CCTA) has been shown to have accuracy comparable to invasive angiography⁹, it is perhaps a superior method of assessing CAD rather than using carotid artery ultrasound as a surrogate marker of subclinical atherosclerosis. We report the results of our study, in which we used CCTA findings as an outcome to test the performance of established CV risk algorithms.

CCTA is an established noninvasive CV imaging method that assesses CAD. It offers quantitative measurement of stenosing and nonstenosing coronary plaque burden with high accuracy and reproducibility⁹. Apart from its comparable accuracy to invasive angiography, it provides prognostic utility in asymptomatic high-risk patients¹⁰.

In our recently published study, 50 patients with PsA, fulfilling the CIASSification for Psoriatic ARthritis (CASPAR) criteria, with no history of CAD, were invited to participate⁶. Informed written consent was obtained from all study participants. The study was approved by our institutional Ethics and Medical Research Committee. CCTA was acquired on a 64-slice single-source CT. Images were analyzed by 4 experienced readers blinded to the subjects' clinical characteristics. Total plaque volume (TPV) was calculated by multiplying the sum of individual plaque slice areas by the slice increment. Also calculated were segment involvement score (SIS), the total number of segments with plaque per patient (range 0–15), and stenosis severity score (SSS), the sum of stenosis severity scores over 15 segments (range 0–60)⁶. Similar to the study by Shen, *et al*⁷, we calculated 4 commonly used risk algorithms in predicting CV events — the Framingham risk score (FRS), the Systematic Coronary Risk Evaluation (SCORE), QRISK2, and the Atherosclerotic Cardiovascular Disease (ASCVD) score. The European League Against Rheumatism (EULAR) recommends a multiplication factor of 1.5 to the calculated total CVD risk for patients with RA⁸, and we used similar multiplication factors of 1.5 for our patients with PsA to examine whether it improves the performance of CV risk scores. The quantitative plaque scores (TPV, SIS, and SSS) were compared between patients with higher risk and lower risk using the Mann-Whitney U test. Rank correlation was also used to analyze the relationship between the risk scores and SIS, SSS, and TPV.

Fifty patients (23 female/27 male) with a mean age of 58 ($\pm$ 8) years were assessed and there were no missing data. Demographics and clinical characteristics are described in Table 1. Laboratory and metabolic risk factor evaluation and a description of CCTA image analysis have been published in detail⁶. With standard cutoff values that are used for the general population, the study found that only 38%, 26%, 24%, and 54% of the patients with PsA were at high risk of CV disease, defined as FRS > 10%, SCORE > 5%, QRISK2 > 20%, and ASCVD > 7.5%, respectively.

Table 1. Demographic and clinical characteristics of psoriatic arthritis (PsA) patients.

Characteristics	PsA, n = 50
Age, yrs	58.42 ($\pm$ 8.33)
Males	27 (54)
Joint-related	
Age at PsA onset, yrs	37.14 ($\pm$ 12.14)
PsA duration, yrs	18.84 ($\pm$ 7.83)
TJC max, 0–68	12.75 ($\pm$ 7.05)
SJC max, 0–68	9.07 ($\pm$ 4.84)
CPDAI, 0–15	3.97 ($\pm$ 2.02)
CRP, mg/l	4.49 ($\pm$ 8.48)
ESR max, mm/h	25.02 ($\pm$ 21.52)
CRP max, mg/l	21.42 ($\pm$ 23.97)
No. deformed joints, 0–68	7.3 ($\pm$ 9.2)
Dactylitis	24 (48)
Enthesitis	21 (42)
Sacroiliitis	14 (28)
Deformed joints	34 (68)
Fused joints	18 (36)
Erosion	32 (64)
Osteolysis	10 (20)
Axial involvement	23 (46)
Mutilans	9 (18)
Skin-related	
Age at onset of psoriasis, yrs	32.5 ($\pm$ 13.98)
PASI, 0–72	2.2 ($\pm$ 3.13)
PASI max ever, 0–72	4.64 ($\pm$ 4.69)
BSA max ever, 0–100%	8.7 ($\pm$ 11.06)
DLQI, 0–30	2.8 ($\pm$ 4.09)
Nail involvement	42 (84)
Patient-reported data	
Alcohol, unit/week	9.12 ($\pm$ 8.92)
HAQ, 0–3	0.612 ($\pm$ 0.45)
BASDAI, 0–10	3.1 ($\pm$ 1.8)
BASFI, 0–10	3.21 ($\pm$ 2.37)
ASQoL, 0–18	5.71 ($\pm$ 4.68)
Current medications	
DMARD	31 (62)
Biologic	33 (66)
Combination	15 (30)

Data are n (%) or mean $\pm$ SD. TJC: tender joint count; SJC: swollen joint count; CPDAI: Composite Psoriatic Disease Activity Index; CRP: C-reactive protein; ESR: erythrocyte sedimentation rate; PASI: Psoriasis Area and Severity Index; BSA: body surface area; DLQI: Dermatology Life Quality Index; HAQ: Health Assessment Questionnaire; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; ASQoL: Ankylosing Spondylitis Quality of Life score; DMARD: disease-modifying antirheumatic drug.

However, after applying a multiplication factor of 1.5, the percentage of high-risk patients was 48%, 44%, 44%, and 72%, respectively. We found a significant linear relationship between TPV and established CV risk scores: FRS, $r = 0.31$ ($p = 0.02$); SCORE, $r = 0.34$ ($p = 0.01$); QRISK2, $r = 0.21$ ($p = 0.13$); ASCVD, $r = 0.33$ ($p = 0.02$). However, the traditional cutoff values used to define high CV risk had suboptimal performance in our cohort of patients with PsA. Table 2 shows the underestimation by 4 CV risk scores of coronary plaque burden using CCTA; however, their performance significantly improved after applying the multiplication factor of 1.5.

Table 2. Comparative performance of CV risk scores against 3 quantitative measurements of coronary artery plaque.

Risk Scores	Total Plaque Volume			Segment Involvement Score			Segment Stenosis Scale		
	High Risk	Low Risk	p	High Risk	Low Risk	p	High Risk	Low Risk	p
FRS	1.7 ± 2.6, n = 19	1.07 ± 1.5, n = 31	0.22	2.7 ± 2.2, n = 19	1.6 ± 1.8, n = 31	0.050	5.1 ± 6.4, n = 19	3.2 ± 3.4, n = 31	0.39
m-FRS	1.8 ± 2.4, n = 24	0.8 ± 1.5, n = 26	0.009	2.9 ± 2.0, n = 24	1.2 ± 1.6, n = 26	0.001	5.5 ± 5.8, n = 24	2.3 ± 3.0, n = 26	0.03
SCORE	2.2 ± 2.9, n = 14	0.9 ± 1.4, n = 36	0.08	2.9 ± 2.2, n = 13	1.7 ± 1.8, n = 37	0.07	6.0 ± 7.1, n = 13	3.1 ± 3.5, n = 37	0.22
m-SCORE	2.1 ± 2.6, n = 22	0.7 ± 1.07, n = 28	0.003	3.1 ± 2.1, n = 22	1.2 ± 1.4, n = 28	< 0.001	5.8 ± 5.9, n = 22	2.3 ± 3.1, n = 28	0.01
QRISK2	1.4 ± 1.4, n = 12	1.3 ± 2.2, n = 38	0.30	3.0 ± 2.3, n = 12	1.7 ± 1.8, n = 38	0.06	6.6 ± 7.2, n = 12	3.0 ± 3.5, n = 38	0.09
m-QRISK2	1.5 ± 1.4, n = 22	1.2 ± 2.4, n = 28	0.04	2.7 ± 2.1, n = 22	1.5 ± 1.7, n = 28	0.01	5.3 ± 5.9, n = 22	2.8 ± 3.5, n = 28	0.06
ASCVD	1.7 ± 2.5, n = 27	0.8 ± 1.0, n = 23	0.20	2.3 ± 2.0, n = 27	1.6 ± 1.9, n = 23	0.12	4.7 ± 5.7, n = 27	2.9 ± 3.5, n = 23	0.28
m-ASCVD	1.6 ± 2.2, n = 36	0.4 ± 0.7, n = 14	0.001	2.5 ± 2.1, n = 36	0.85 ± 1.0, n = 14	0.007	4.7 ± 5.3, n = 36	1.7 ± 2.0, n = 14	0.04

Results are presented as mean ± SD. The standard cutoff values were used to define high risk of CV disease for the general population: FRS > 10%, QRISK2 > 20%, SCORE > 5%, and ASCVD > 7.5%. The EULAR recommended modifications (multiplication factor by 1.5) were also applied for 4 CV risk scores and labeled as m-FRS, m-SCORE, m-QRISK2, and m-ASCVD. CV: cardiovascular; FRS: Framingham risk score; SCORE: Systematic Coronary Risk Evaluation; ASCVD: Atherosclerotic Cardiovascular Disease score; EULAR: European League Against Rheumatism.

To our knowledge, this is the first study to evaluate the performance of established CV risk scores against coronary artery plaque burden using CCTA in PsA patients without symptoms of CAD. We conclude that there is suboptimal performance of established CV risk scores; however, multiplication factor of 1.5 accurately categorizes patients with PsA at high risk of CVD. As recommended by EULAR for RA, we suggest that a similar multiplication factor of 1.5 be used in patients with PsA, to improve the performance of CV risk scores.

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