MYOCARDIAL PERFUSION IMAGING IN PATIENTS WITH PSORIASIS

Chrissa Sioka[1], Andreas Fotopoulos[1], Christos Moulias[2], Paraskevi V Voulgari[3], Ioannis D Bassukas[2]

[1]Nuclear Medicine Physician, Department of Nuclear Medicine, Medical School, University Hospital of Ioannina, Ioannina, Greece

[2]Dermatologist, Department of Skin and Venereal Diseases, Medical School, University Hospital of Ioannina, Ioannina, Greece

[3]Rheumatologist, Dheumatology Clinic, Department of Internal Medicine, Medical School, University of Ioannina, Ioannina, Greece

Abstract

Introduction: Psoriasis is associated with higher prevalence of cardiovascular risk factors, a higher lifetime risk of a major adverse cardiovascular events and a higher cardiovascular mortality rate, especially in patients with severe disease and/or psoriatic arthritis.

Purpose: The aim of this study was to evaluate the rate of myocardial ischemia in patients with psoriasis subjected to MPI.

Methodology: Twelve patients with moderate to severe psoriasis that had MPI were compared to 395 MPIs randomly retrieved from our MPIs pool data. All patients had a 99mTc tetrofosmin stress – rest single photon emission computer tomography (99mTc - SPECT). Summed scores were calculated for stress (SSS), rest (SRS) and their difference (SDS=SSS-SRS).

Results: No significant difference in the frequency of abnormal MPI SPECT outcomes between patients with vs. without psoriasis was noted (6/12 vs. 214/395 respectively; p=0.778). From the evaluation of SSS, SRS and SDS, only the SDS scores of inadequately compensated myocardial ischemia at rest were significantly lower in patients with psoriasis (p=0.012).

Conclusions: The SDS scans were significantly lower in patients with psoriasis indicating compromised reversibility of myocardial ischemia at rest.

Keywords: myocardial perfusion imaging, myocardial ischemia, psoriasis

Purpose

Psoriasis is a chronic, recurrent, multifactorial inflammatory skin disorder with a complex co-morbidities profile, which includes increased coronary artery disease (CAD) risk [1].

The higher prevalence of cardiovascular risk factors is translated into a higher CAD burden [2], a higher lifetime risk of a major adverse cardiovascular event (MACE) and a higher cardiovascular mortality rate, however, the latter only in patients with severe disease and/or psoriatic arthritis [3].

Whenever feasible, coronary angiography (CA) remains the gold standard for the diagnosis of CAD. Alternatively, non-invasive cardiovascular imaging methods are important for the prediction of future MACE in patients with CA contraindications. Among them myocardial perfusion imaging (MPI) single photon emission computed tomography (SPECT) is probably the modality with the highest impact to detect a silent myocardial ischemic region [4].

To date, MPI data has been only occasionally reported in patients with psoriasis [5,6]. Aim of this retrospective study was to evaluate the myocardial status in patients with moderate-to-severe psoriasis utilizing MPI.

Methodology

By comparing the medical records of the Nuclear Medicine and Dermatology Departments we identified 12 MPIs study outcomes in 12 patients with a history of moderate-to-severe psoriasis.

Since the prevalence rate of all psoriasis cases in the reference population is approximately 3% [7], we additionally retrieved randomly MPI results of 395 patients without psoriasis which formed the control group independent of their medical history, cardiac or other diseases. Thus, this yielded the study population of 407 patients, that included the approximately 3% (12/407) of the patient group and 97% (395/407) of the control group. Our assumption was that randomly selected that large control group of patients with other medical conditions could better balance any variations in patient characteristics between the 2 groups.

All MPIs (in patients and control individuals) were performed using a 1-day imaging protocol Images were visually evaluated by two nuclear medicine specialists, applying a 5-point severity scoring scale from normal (score=0) to absent (score=4) perfusion to a 17 segments polar map.

Summed stress scores (SSS), summed rest scores (SRS), and summed difference scores (SDS) was valued for semiquantitative visual analysis. Summed scores over the 17 myocardium segments (range: 0–64) were evaluated separately for stress and rest images. In addition, their difference (SDS: SDS = SSS – SRS), was additionally calculated.

SSS scores ≥ 4 were considered to indicate myocardial ischemia – (‘pathologic’ MPI), graded further as mild (4≤SSS<9), moderate (9≤SSS<14) and severe for SSS≥ 4.

Results 1

There was no significant difference in the frequency of abnormal MPI outcomes between patients with vs. without psoriasis (6/12 vs. 214/395 respectively; p = 0.778, Fisher's exact test) or the distributions of the different MPI assessed degrees of myocardial ischemia (p = 0.756, χ^2-test).

From the three parameters of the MPI evaluation (SSS, SRS and SDS), only the SDS scores differed between patients with and without psoriasis, with SDS being significantly lower in patients with psoriasis (p = 0.012, Mann-Whitney U-test; Table and Figure).

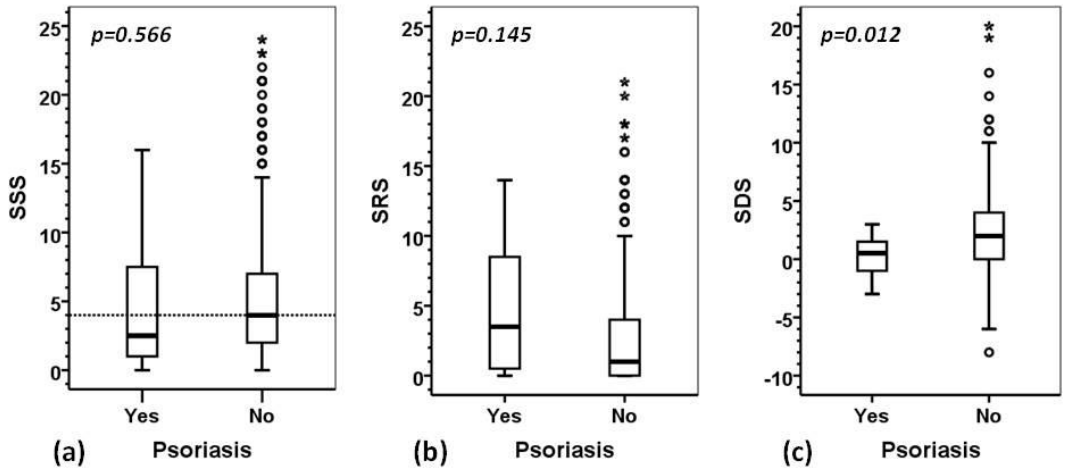

Figure. Box-plot diagrams of SPECT MPI summed scores of patients with vs. without psoriasis (p: significance; Mann-Whitney U-test). (a) SSS: Ischemia scores at stress. Dashed line: score limit for ischemia. (b) SRS: Ischemia scores at rest. (c) SDS: Scores of reversibility of stress ischemia (SDS = SSS - SRS).

Results 2

Moreover, the above impact of psoriasis on the SDS scores was substantiated further by analyzing the impact of age, sex and psoriasis on the MPI scores with regression models. Of these three factors, male sex was the most important and universal predictor of myocardial ischemia (Table).

However, psoriasis remains a significant independent predictor of the SDS (p = 0.023).

Finally, older age was a significant predictor only of a higher degree of resting perfusion defects (SRS score; p = 0.016).

Table. Parameters (standard errors) of best-fit regression models of the effect of age (> 65 vs. ≤ 65), sex (male vs. female) and psoriasis (yes vs. no) on the summed ischemia severity scores by SPECT MPI and on the diagnosis of a pathologic MPI test outcome (p = significance level).

	Age	p	Sex	p	Psoriasis	p
SSS[1]	0.46 (0.48)	0.340	5.12 (0.46)	0.000	-1.29 (1.34)	0.330
SRS[1]	0.91 (0.38)	0.016	3.79 (0.36)	0.000	0.81 (1.04)	0.436
SDS[1]	-0.45 (0.34)	0.180	1.35 (0.32)	0.000	-2.11 (0.93)	0.023
MPI[2]	-0.33 (0.23)	0.183	1.64 (0.23)	0.000	-0.41 (0.65)	0.534

SSS: Summed Stress ischemia Score;
SRS: Summed Rest ischemia Score;
SDS: Ischemia reversibility score (SDS = SSS - SRS); MPI: pathologic myocardial perfusion by MPI SPECT (SSS ≥ 4).
[1]SPECT MPI ischemia score: Generalized linear model
[2]Myocardial ischemia (pathologic MPI): Logistic regression model

Discussion

The main outcome of this study is a comparable prevalence of myocardial ischemia (around 50%) in patients with and without psoriasis, even though the former patients were significantly older at the time of the MPI conduction. However, the compromised myocardial oxygenation of the patients with moderate-to-severe psoriasis seems to be already established in a younger age.

Employing MPI Zutt et al [6], found a comparable rate of ischemia (56%) in 50 prospectively examined much younger psoriasis patients (average 49.3 years, i.e. about 20 years younger compared to the present cohort) with a similar disease burden.

In this context, it is worth noting that Yalcin et al [5], reported no pathologic MPI results in 28 much younger patients (average age: 41.2 years) with rather mild psoriasis at the time of examination.

The rationale for a correlation between psoriasis and atherosclerotic disease is not well understood. Although the increased prevalence of main risk factors for cardiovascular disease, in patients with psoriasis likely contributes to the elevated risk for atherosclerosis, the role of chronic inflammation in the pathogenesis of both disorders may also be a key factor [8].

Our present MPI findings demonstrated that older patients with moderate-to-severe psoriasis exhibited significantly less reversible ischemia at rest, compared to the control group. In the light of these observations, the question arises whether therapies with a systemic anti-inflammatory impact, like anti-tumor necrosis factor alpha antibodies (anti-TNFa) agents, might attenuate and eventually prevent the evolution of myocardial ischemia as a function of disease duration and severity and ultimately reduce the MACE risk [8].

Conclusions

We found a similar rate of myocardial ischemia during stress in patients with moderate-to-severe psoriasis compared to control patients, but with less reversibility of ischemia at rest.

These findings are preliminary and their exact etiology still unclear.

The main limitation of this retrospective study is the small number of index patients.

References

1. Boehncke WH, Schön MP. Psoriasis. Lancet. 2015; 386(9997):983-94.

2. Fernández-Armenteros JM, Gómez-Arbonés X, Buti-Soler M, et al. Psoriasis, metabolic syndrome and cardiovascular risk factors. A population-based study. J Eur Acad Dermatol Venereol. 2019; 33(1):128-135.

3. Raaby L, Ahlehoff O, de Thurah A. Psoriasis and cardiovascular events: updating the evidence. Arch Dermatol Res. 2017; 309(3):225-228.

4. Varadaraj G, Chowdhary GS, Ananthakrishnan R, et al. Diagnostic Accuracy of Stress Myocardial Perfusion Imaging in Diagnosing Stable Ischemic Heart Disease. J Assoc Physicians India. 2018; 66(8):40-44,

5. Yalcin H, Balci DD, Ucar E, et al. Myocardial perfusion is preserved in patients with psoriasis without clinically evident cardiovascular disease. J Eur Acad Dermatol Venereol. 2009; 23(7):798-802.

6. Zutt M, Rudolph H, Kaune KM, et al. Myocardial scintigraphy - a method for detecting cardiac comorbidity in psoriasis patients?. J Dtsch Dermatol Ges. 2016; 14(10):1007-1014.

7. Bassukas I, Mavridou K, Evangelou T, Gaitanis G. The prevalence of psoriasis among elderly individuals: more questions than answers. Ageing Research. 2011;2(1),e1.

8. Reich K. The concept of psoriasis as a systemic inflammation: implications for disease management. J Eur Acad Dermatol Venereol. 2012; 26 Suppl 2:3-11.