Systematic and Steered Evaluation to Detect Early-onset Musculoskeletal Involvement in Psoriasis Patients

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Abstract

Introduction: The aim of this study is to evaluate a systematic and steered protocol to detect musculoskeletal involvement in psoriasis patients. **Materials and Methods:** We made a comparative, cross-sectional, observational, descriptive, and analytical study. We included Mexican mestizo patients over 18 years old with psoriasis. The evaluation protocol included three steps: first, a clinical evaluation (Toronto psoriatic arthritis Screening [ToPAS] questionnaire and inflammatory low back pain [ILB] searching by Assessment of SpondyloArthritis Society criteria); second, patients were categorized according to their symptoms, and third, an image evaluation (OMERACT and Madrid Sonographic Enthesitis Index [MASEI] musculoskeletal ultrasound evaluation and sacroiliac and lumbar magnetic resonance imaging) was performed. **Results:** We included 75 patients, 33 (44%) of whom were women. Mean age was 44.6 (standard deviation 14.5) years. We found 16 (21.3%) symptomatic patients. Group 1: nine of 11 patients had findings suggestive of inflammatory joint disease. Group 2: only one of seven patients with ILB had inflammatory changes in the sacroiliac joints. Group 3: from the remaining ToPAS and ILB-negative patients, 15 of 27 were detected to have enthesopathy, with a score of MASEI ≥ 20 by ultrasound. The interobserver kappa index for detecting enthesopathy by MASEI index was 0.37. Despite the loss of 33 patients, the systematic protocol detected 26 of 75 patients with musculoskeletal involvement. **Conclusion:** This systematic and steered approach is useful for hidden inflammatory musculoskeletal involvement in psoriasis patients.

Key words: Psoriasis. Psoriatic arthritis. Diagnosis.

Introduction

Psoriasis is a multisystem polygenic disease, inflammatory, chronic, and mediated by activated T-lymphocytes, predominantly involving the skin, joints, and entheses.

The prevalence of the joint involvement in psoriasis is not easy to determine due to the absence of visible inflammatory signs and subclinical involvement. Finally, it can cause permanent damage and affects from 7%

to 40% of patients with psoriasis. It is estimated that 25% of patients who suffer from articular involvement are underdiagnosed, although a systematic review estimated 15%¹. Early detection of joint conditions and treatment has been shown to improve the prognosis of patients with this inflammatory arthropathy^{1,2}.

Screening questionnaires have been used to identify psoriatic arthritis (PsA) in patients with psoriasis³. The use of clinical questionnaires and imaging methods as

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a systematic search of joint disease in patients with psoriasis with or without musculoskeletal symptoms has not been evaluated¹.

Our question is if the implementation of a systematic and steered evaluation protocol will be able to detect musculoskeletal inflammatory involvement in patients with psoriasis.

Materials and Methods

This project was approved by our IRB with the registry number DE12-005. It was a comparative cross-sectional, observational, descriptive, and analytical study. The study took place from July 2012 to October 2014. We included all Mexican mestizo patients over 18 years old with a clinical and/or histological diagnosis of psoriasis in any of its clinical varieties and at all the degrees of severity from the Dermatology Clinic at the University Hospital who agreed to participate in the study and sign the informed consent form. We excluded patients with a previous diagnosis of PsA and those who met criteria for some other autoimmune rheumatologic entity with musculoskeletal involvement. The patients who were unable to read or write were also excluded from this study.

The systematic search protocol is described below and diagrammed in [figure 1](#). The evaluation protocol included three steps: first, a clinical evaluation; second, the patients were categorized according to their symptoms, and third, an image evaluation.

History and physical examination

All patients underwent a complete medical history and physical examination with a dermatological and rheumatological review of systems.

The severity of psoriasis was recorded by the Psoriasis Area and Severity Index⁴. Furthermore, its impact on quality of life was recorded by the Psoriasis Disability Index⁵ and the Dermatology Life Quality Index⁶. Nail involvement was recorded by the Nail Psoriasis Severity Index⁷.

Clinical evaluation for joint and enthesal involvement

To determine the clinical suspicion of arthritis, the Toronto PsA Screening Questionnaire (ToPAS) was applied⁸. Positive ToPAS was defined as ≥ 8 score. To determine the presence of inflammatory low back pain (ILB), we used the international Assessment of SpondyloArthritis Society (ASAS) criteria⁹. Physical

examination was performed by a certificated rheumatologist (DEFA). The presence of probable enthesopathy was registered with the Maastricht Ankylosing Spondylitis Enthesitis Score¹⁰.

Image assessment

Blinded to clinical evaluation, certified ultrasonographers performed an articular and enthesal ultrasound with an Esaote® My Lab 70 XVG with a linear transducer at 6–18 MHz. Power Doppler adjustments were standardized with a pulse repetition frequency of 700 MHz, a gain of 50 dB, and a low filter wall.

The ultrasound findings of joint involvement were described in the terminology proposed by the Outcome Measures in Rheumatology (OMERACT) group¹¹. The ultrasound variables included: bone erosion, synovial fluid, synovial hypertrophy, tenosynovitis, and enthesopathy.

The Madrid Sonographic Enthesitis Index (MASEI) was used to generate a global scale to reflect the severity and extension of enthesal abnormalities in all sites scanned on both sides in each subject. Total MASEI score was categorized as follows: inflammatory MASEI: changes including enthesal thickening, structural changes, bursitis, and vascularization and damaged MASEI: chronic damage including calcifications, enthesophytes, and erosions¹². A cutoff of ≥ 20 MASEI was used to determine the significant presence of enthesopathy. Furthermore, the presence of power Doppler signals (PDUSs) in any entheses was evaluated.

The articular ultrasound was made by one ultrasound certified rheumatologist, and the enthesal ultrasound was evaluated by two ultrasound certified rheumatologists.

The sacroiliac and lumbar spine magnetic resonance imaging (MRI) was performed on a 1.5T MR imaging system (GE, Wisconsin, USA). The basic protocol consisted of coronal and axial oblique fast spin-echo T1-weighted sequences to detect structural changes, and coronal and axial oblique short inversion time inversion recovery or fat-saturated fast spin-echo T2-weighted sequences to detect acute inflammatory changes.

Evaluation protocol

After the history and physical examination, the patients were divided into three groups: Group 1, the patients with a positive ToPAS questionnaire; Group 2, the patients with ILB; and Group 3, the patients with a negative ToPAS and an absence of ILB. The patients could belong to Groups 1 and 2 synchronously.

Figure 1. Evaluation protocol

*Entesopathy MASEI > 20, **in any entheses

ToPAS: Toronto Psoriatic Arthritis Screening Questionnaire, ILB: inflammatory low back pain, MASEI: Madrid Sonographic Enthesitis Index

Finally, the patients in Group 1 with positive ToPAS underwent a musculoskeletal ultrasound. The patients in Group 2 with ILB underwent both sacroiliac and lumbar spine MRI. Moreover, the patients in Group 3 with negative ToPAS questionnaire and negative ILB underwent an enteseal ultrasound.

examination with a dermatological and rheumatological review of systems.

Table 1 summarizes the demographic characteristics of the entire cohort. In figure 1, we describe the groups according to the presence (or absence) of symptoms. We found 16 (21.3%) symptomatic patients.

Statistical analysis

Statistical analysis was performed using SPSS version 20.0 (SPSS, Chicago, IL, USA). Quantitative variables were presented as the mean (standard deviation [SD]) and median (interquartile range), depending on their Gaussian distribution. Categorical variables were presented as absolute frequencies and percentages. Kappa statistic and correlation coefficients (Spearman's rho) for analysis between two enteseal ultrasound evaluators were used. A value of $p < 0.05$ was considered statistically significant.

Results

We included 75 patients, 33 (44%) of whom were women. Mean age was 44.6 (SD 14.5) years. All 75 patients underwent a complete medical history and physical

Evaluation protocol

Group 1: from this group, only 11/12 patients were evaluated. One patient did not attend the appointment. Nine patients had findings suggestive of inflammatory joint disease (Table 3).

Group 2: seven patients with ILB were detected. An MRI was conducted on all seven patients. Only one patient had inflammatory changes in the sacroiliac joints (Table 4).

Group 3: of the remaining patients, there were 59 negative to ToPAS and ILB. Of these, only 27 of 59 patients were available to perform an enteseal ultrasound (Fig. 1). We detected entesopathy in 15 patients, with a MASEI score of ≥ 20 . The interobserver kappa index for detecting entesopathy by MASEI index was 0.37. Comparison of the rest of the ultrasound findings is described in table 2.

Table 1. Clinical and demographic variables

Variable	n = 75
Age years, mean (SD)	44.6 (14.5)
Female, n (%)	33 (44)
Weight kg, mean (SD)	82.06 (20.46)
Height cm, mean (SD)	164.2 (10.2)
BMI, mean (SD)	30.4 (6.4)
Time since psoriasis diagnosis years, median (IQR)	6 (8)
Plaque psoriasis, n (%)	64 (85.3)
Nail involvement, n (%)	36 (48)
Limb involvement, n (%)	38 (50.6)
Scalp involvement, n (%)	22 (29.3)
Diabetes mellitus, n (%)	10 (13.3)
Hypertension, n (%)	13 (17.3)
Dyslipidemia, n (%)	16 (21.3)
Cutaneous treatment, n (%)	70 (93.3)
Systemic treatment, n (%)	22 (29.3)
Methotrexate use, n (%)	16 (21.3)
Biologic therapy use, n (%)	6 (8)
PASI, median (IQR)	5.4 (8.4)
PDI, mean (SD)	0.94 (0.08)
NAPSI, median (IQR)	4 (15)
ToPAS, median (IQR)	5 (3)
ToPAS score >8, n (%)	12 (16)
IBP, n (%)	7 (9.3)
MASES, median (IQR)	0 (0)

SD: standard deviation, BMI: body mass index, IQR: interquartile range, PASI: Psoriasis Area Severity Index, PDI: Psoriasis Disability Index, NAPSI: Nail Psoriasis Severity Index, ToPAS: Toronto Psoriatic Arthritis Screening, IBP: inflammatory back pain, MASES: Maastricht Ankylosing Spondylitis Enthesitis Score

The image evaluation (ultrasound [US] and MRI) as well as the detailed description of patients with symptoms are described in the supplementary material.

Discussion

Despite the loss of 33 patients in the study, the systematic protocol detected 26 of 75 patients with musculoskeletal involvement (See Step 3 in Figure 1). The

evaluation contributed to the early detection of inflammation in psoriasis patients with and without symptoms.

Evaluation in patients without musculoskeletal symptoms: this is, to the best of our knowledge, the first report of a systematic evaluation protocol of psoriasis patients with and without musculoskeletal symptoms. In a systematic review, to determine the prevalence of underdiagnosed PsA, 394 studies with high heterogeneity (I (2) = 96.86%) were evaluated, and a prevalence of 15.5% was found¹³.

There are several reports of musculoskeletal involvement detection using different imaging methods. Recently, Faustini et al. evaluated 55 asymptomatic patients with psoriasis and found that 47% had at least one hand inflammatory lesion by MRI¹⁴. We find a similar prevalence (55%) of asymptomatic disease in patients with psoriasis. Unlike the previous study, in the evaluation of this study, we consider enthesitis as the first musculoskeletal site affected after the skin in patients with psoriasis¹⁵. In 2008, Raza et al. reported the detection and treatment response of joint disease in asymptomatic patients with psoriasis by scintigraphy scanning. They found a prevalence of joint disease of 70%¹⁶. Furthermore, the use of other methods has been evaluated by Takata, et al. They found 18 (33%) patients with psoriasis vulgaris, the evidence of subclinical PsA, by positron emission tomography/computed tomography using 18 F-fluorodeoxyglucose¹⁷.

There are reports that underestimate the prevalence of enthesopathy in patients with psoriasis. Oguz, et al. found ultrasound abnormalities in 30% of patients with psoriasis, but no significant difference compared to controls¹⁸.

Naredo, et al. observed that synovitis and enthesopathy by US were significantly more frequent in psoriatic patients than in healthy controls. Enthesal PDUS was found in 10 (7.4%) of psoriatic patients, whereas no controls showed this finding. PDUS has been shown to be specific for peripheral enthesitis in spondyloarthritis¹⁹.

Evaluation of patients with musculoskeletal symptoms: in our study, even though the goal was not to evaluate the diagnostic performance of ToPAS, it was useful to discriminate symptomatic from asymptomatic patients. In previous studies, ToPAS had a 76.6%, 29.7%, and 0.554 sensitivity, specificity, and area under the ROC, respectively³. Positive ToPAS was present in 12/75 (16%) psoriasis patients. Subsequently, we confirmed joint inflammation in 11/12 of those positive ToPAS patients by ultrasound. This possibly allows us to consider the ToPAS as an initial screening tool in

Table 2. Enthesal abnormalities by ultrasound

MASEI score results	First evaluator	Second evaluator	p	k	Correlation coefficient*
Enthesopathy MASEI > 20, n (%)	6 (22.2)	15 (55.6)	0.013	0.37	
Power Doppler signal in any entheses, n (%)	13 (48.1)	16 (59.3)		0.77	
Total MASEI, median (IQR)	16 (8)	21 (11)			0.62
Inflammatory MASEI, median (IQR)	13 (7)	19 (5.4)			0.57
Damage MASEI, median (IQR)	2 (5)	3 (6)			0.63

MASEI: Madrid Sonographic Enthesitis Index, IQR: interquartile range

*Spearman's Rho

patients with psoriasis. We were not able to validate ToPAS 2 in our study, which has performed well in the axial domain²⁰. To the best of our knowledge, this is the first study where musculoskeletal effects have been confirmed by imaging in patients with positive ToPAS. To assess diagnostic and therapeutic implications, it is necessary to consider supplementing the enthesal imaging evaluation of these patients.

The prevalence of IBP in our study population was only 7/75 (9.3%), and only one had an MRI with sacroiliitis. However, IBP by ASAS criteria could be underdiagnosed in psoriasis patients over 40 years old because of other non-inflammatory LBP causes. It is known that the discriminative value of IBP according to the ASAS criteria is low, with sensitivity, specificity, and balanced accuracy values of 64, 50, and 57%, respectively. Arnbak et al. reported that the prevalence of IBP relative to axial spondyloarthritis according to the ASAS criteria ranged from 10% for "pain worst in the morning" to 79% for "morning stiffness²¹." We balanced this disadvantage using MRI in all patients with IBP, and we corroborated axial involvement by MRI only in (1/7) 14.2% of patients with IBP. In the other six patients, we found other non-inflammatory causes of lumbar pain (degenerative disc disease and facet joint arthrosis). Thom et al. reported that people with psoriasis and PsA had a significantly higher prevalence of axial pain, as measured using the Berlin criteria, compared with people without the disease (31.1% vs. 18.9%)²². This higher prevalence could not be compared in our study due to differences in the questionnaires used, the studied population, and other musculoskeletal comorbidities.

Early PsA: a continuum of skin and joint manifestations. The presence of enthesitis could be underdiagnosed unless ultrasound is used as demonstrated

in our study. As shown in [figure 1](#), in Group 3, we found that more than half of the patients with asymptomatic psoriasis had evidence of some abnormality in the musculoskeletal ultrasound of their entheses. Although we accept that our study has the weakness of having lost 32/59 (54.2%) of its patients in this group only for performing the ultrasound, all patients were evaluated clinically. According to Gisondi et al., they observed that the thickness of all tendons examined in asymptomatic psoriasis patients was significantly higher than controls²³. It has been reported by Aydin et al. that the ultrasound appearances of subclinical enthesitis in psoriasis differ from subclinical enthesitis in PsA, with PsA patients having more PD. They found a significant difference between PD positivity in at least one enthesal site in PsA (36.2%) versus psoriasis (9.5%)²⁴. We did not compare the thickness of the tendons between asymptomatic patients and ToPAS positive patients because we performed different ultrasound protocols.

In our study, it seemed that the presence of enthesopathy and psoriasis was able to occur simultaneously in a high number of psoriasis patients. Since the frequency of enthesitis detected by ultrasound is greater than symptomatic synovitis, we might think that cutaneous psoriasis and enthesitis have some similar pathophysiological mechanisms.

The patient's follow-up: the patients with a positive ToPAS score (≥ 8) underwent a joint ultrasound. The ultrasound study was only performed on 11 of the 12 patients because one of the patients did not attend their appointment. In the group with ToPAS a score of < 8, 32 patients missed their appointments for the echography study. It is possible that those patients were not interested in the study because they were fully asymptomatic by ToPAS and also did not have

Table 3. Articular ultrasound findings

Patient	Bone erosion	Synovial fluid	Synovial hypertrophy	Tenosynovitis	Enthesopathy	IM: enthesal thickening	IM: structural changes	IM: bursitis	IM: vascularization	DM: calcifications	DM: onthesophytes	DM: erosions
F, 58 year PP DLQI: 1 Dx: 6 years BMI: 28 PASI: 2.8 NAPSI: 0	Left humerus, right and left epicondyle	Suprapatellar right knee, lateral and medial right knee recess, lateral left knee recess	Medial right knee recess, lateral left knee recess	—	—	—	Suprapatellar right knee, epicondyle right elbow	—	Epicondyle right elbow	Epicondyle left elbow	Trochanter of the right femur, suprapatellar left knee, epicondyle both elbows	—
M, 37 year PP Dx: 2 years BMI: 26.8 PASI: 15.1 NAPSI: 29	—	—	—	—	—	—	—	—	Infrapatellar left knee	Trochanter of the right femur	—	—
F, 65 year PP DLQI: 5 Dx: 8 years BMI: 32 PASI: 3.8 NAPSI: 0	Distal interphalangeal fifth finger left hand	Suprapatellar right knee	Suprapatellar left knee	—	—	—	Right supraspinatus	—	—	Suprapatellar left knee, right supraspinatus	—	—
M, 25 year PP DLQI: 6 Dx: 10 year BMI: 28.2 PASI: 27.8 NAPSI: 20	Left calcaneus	—	Right and left tibiotalar	—	—	—	Infrapatellar right and left knee, right knee, right calcaneus	—	Infrapatellar right knee, right and left tibiotalar, right calcaneus	Left calcaneus	Left calcaneus	—
M, 58 year PP DLQI: 3 Dx: 6 month BMI: 32.5 PASI: 8.2 NAPSI: 12	Right calcaneus	Suprapatellar right knee, lateral recess and suprapatellar left knee, MTP 1 and 3, IPD 1, IPP 1 of right foot, MTP 1, 2, and 3 of right foot, and left and right carpus	MTP 1, IPP 1, IPD 2, and MTP 3 of the right foot, right carpus, right and left tibiotalar, IPD 5 of the right and left hand	—	—	—	Suprapatellar right knee, right and left calcaneus, right epicondyle	—	Suprapatellar right knee, right and left tibiotalar, IPD 1, MTP 3 of the right foot, right and left calcaneus, right and left carpus	—	Suprapatellar right knee, left calcaneus	—

(Continue)

Table 3. Articular ultrasound findings (*Continued*)

Patient	Bone erosion	Synovial fluid	Synovial hypertrophy	Tenosynovitis	Enthesopathy	IM: enthesal thickening	IM: structural changes	IM: bursitis	IM: vascularization	DM: calcifications	DM: enthesophytes	DM: erosions
F, 56 year Nail P BMI: 25.2 PASI: 0 NAPSI: 11	Lateral right and left epicondyle	–	–	–	–	–	Right supraspinatus, lateral right and left epicondyle	–	Lateral right and left epicondyle	–	Right calcaneus	–
M, 63 year PP DLQI: 28 Dx: 5 years BMI: 30.5 PASI: 6.3 NAPSI: 0	Lateral left epicondyle	MTP 2 and 3 of the right foot, MTP 2 and 3 of the left foot	MTP 2 and 3 of the right foot and MTP 2 and 3 of the left foot	–	–	–	Lateral right and left epicondyle	–	Infrapatellar right knee	Right trochanter, left supraspinatus, lateral right epicondyle	–	–
F, 64 year PP DLQI: 1 Dx: 5 years BMI: 30.3 PASI: 5.9 NAPSI: 15	Right trochanter, left lateral epicondyle, suprapatellar right and left knee	5 MTP of the right and left foot	–	–	–	–	Right and left trochanter, suprapatellar left knee, right and left calcaneus, lateral right epicondyle	–	Infrapatellar left knee, right calcaneus, lateral right and left epicondyle	–	Suprapatellar right knee, right calcaneus, lateral right epicondyle	–
M, 49 year PP DLQI: 5 Dx: 1 year BMI: 37.2 PASI: 4.2 NAPSI: 3	Right carpus	Suprapatellar right knee, MTP 1 and 2 of the right foot, MTP 1 of the left foot	–	–	–	–	Infrapatellar right knee	–	MTP 1 of the left foot	–	–	–
F, 27 year Psoriasis DLQI: 2 Dx: 1 year BMI: 18.8 PASI: 0 NAPSI: 12	–	–	–	–	–	–	–	–	–	Infrapatellar right knee	–	–

F: female, M: male, PP: plaque psoriasis, DLQI: Dermatology Life Quality Index, Dx: time since diagnosis, BMI: body mass index, PASI: Psoriasis Area and Severity Index, NAPSI: Nail Psoriasis Severity Index, IM: inflammatory MASEI, DM: damage MASEI, MASEI: Madrid Sonographic Enthesitis Index

Table 4. MRI findings.

Patients	MRI
F, 55 years. DLQI 14, Dx: 25 years Plaque psoriasis, BMI: 26.9, PASI 4.4, NAPS I 8	Hyperintense area on the right iliac toward the lower end of the joint, subchondral type. In lumbar assessment: disc protrusions with dehydration at L4-L5, L5-S1
M, 35 years. DLQI 1, Dx: 2 years Plaque psoriasis, BMI 23.6, PASI 4.6, NAPS I 41	No inflammatory changes in the sacroiliac joints. In lumbar assessment: changes in intensity of intervertebral disc L5-S1 in relation to changes dehydration and bulging annulus with partial breakage
M, 37 years, DLQI 11, Dx: 2 years Plaque psoriasis, BMI: 26.8, PASI 15.1, NAPS I 29	No inflammatory changes in the sacroiliac joints. Lumbar evaluation: decreased signal intensity of the L5-S1 intervertebral disc in relation to changes dehydration and subsequent small protrusion and central component partially obliterating the previous epidural space
M, 37 years, DLQI 5, Dx: 5 years Plaque psoriasis, BMI: 24.4, PASI 3.5, NAPS I 17	No inflammatory changes in the sacroiliac joints. Intervertebral disc L5-S1 with loss of height and signal intensity changes regarding dehydration
F, 27 years, DLQI 3, Dx: 10 years Nail psoriasis, BMI: 23.2, PASI 0.6, NAPS I 27	No inflammatory changes in the sacroiliac joints. Disc degeneration and protrusion of the fibrous ring at L4-L5 and L5 S1
M, 58 years, DLQI 6, Dx: 9 years Plaque psoriasis, BMI: 28.6, PASI 4.8, NAPS I 28	The sacroiliac joints bilaterally present sclerosis and increased space in the right sacroiliac joint. The left sacroiliac joint with increased intensity in their articular margins to consider acute inflammatory changes. In the lumbar evaluation: decrease in signal intensity of the L5-S1 intervertebral disc in relation to changes by dehydration plus image with rupture disc protrusion annulus fibrosus
F, 27 years, DLQI 2, Dx: 1 year Nail psoriasis, BMI: 18.8, PASI 9, NAPS I 12	No inflammatory changes in the sacroiliac joints Rectification of the lumbar lordosis in the first lumbar segments to consider changes component of muscle spasm

F: female, M: male, DLQI: Dermatology Life Quality Index, Dx: time since diagnosis, BMI: body mass index, PASI: Psoriasis Area and Severity Index, NAPS I: Nail Psoriasis Severity Index, MRI: magnetic resonance imaging

IBP. If this was the reason, it is unlikely to affect our results about the prevalence of enthesitis. The low patient response to evaluations has been addressed in other studies before, with patient losses as high as 80%²⁵.

Ultrasound reliability: Naredo et al.¹⁹ demonstrated a good interobserver reliability for assessing synovitis and enthesopathy in previous studies. Kendall's W coefficient was 0.64 for the assessment of synovial fluid and synovial hypertrophy signals and 0.85 for the PD signal. In our study, we observed that the interobserver kappa index for detecting enthesitis by MASEI index was 0.33, while the kappa index for the PD signal was 0.77. This interobserver reliability is slightly lower than reported in other centers with greater ultrasound experience. However, there is a good correlation with the PD signal in our study.

Limitations

Nonetheless, we did not perform this study with control patients to establish if the enthesal abnormalities were different to what we found in psoriasis patients, nor did we compare enthesal ultrasounds among the three groups.

In our opinion, the evaluation of patients with psoriasis for MSK involvement should be predominantly clinical, but periodic ultrasound evaluation could be recommended if the ToPAS clinical tool cannot be used first. The use of other imaging methods will be more expensive (PET scan, scintigraphy, and MRI).

Future agenda

The implication of the inflammatory changes evidenced by ultrasounds in asymptomatic patients could be addressed in future studies. As noted before, an early diagnosis accounts for a better prognosis in all inflammatory arthropathies. However, what would be the best way to treat these asymptomatic patients? How would the follow-up be recommended? With the use of ultrasounds? Even though the enthesitis (by Power Doppler) is a prognostic lesion, what is the prognostic value of the other enthesal lesions demonstrated? In the context of a patient with already diagnosed PsA, could the presence of enthesitis be an anti-TNF indication? What would be the treatment of these patients be? Could the systemic treatment of a psoriasis patient prevent the development of MSK involvement? Is this the reason why patients with less

skin involvement (ergo less treatment) develop more MSK involvement?

Conclusion

This systematic and steered approach is useful for hidden inflammatory MSK involvement in psoriasis patients. Enthesitis is a very common finding by ultrasound in psoriasis patients. We propose a close follow-up of patients with psoriasis with enthesal abnormalities by ultrasound for early diagnosis of PsA. The prognostic and treatment implications should be addressed in future studies.

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Conflict of interest

The authors declare they have no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of the patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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