Entheseal Power Doppler Ultrasonography: A Comparison of Psoriatic Arthritis and Fibromyalgia

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ABSTRACT. ***Objective.*** To compare the power Doppler ultrasonography (PDUS) pictures of peripheral entheses in patients with psoriatic arthritis (PsA) and fibromyalgia (FM).

Methods. Thirty patients with PsA and 30 with FM participating in a study aimed at identifying the clinical features that distinguish the 2 conditions underwent the PDUS assessment of 14 major peripheral entheses. All of the detected entheseal changes were recorded and scored, and the data were statistically analyzed by means of univariate analysis and receiver-operating characteristic curves.

Results. Four hundred twenty entheseal sites were assessed in each group of patients. At least 1 lesion was detected in each of the patients with PsA and in 80% of the patients with FM ($p = 0.01$), but inflammatory changes were present in respectively 70% and 23% ($p = 0.001$). A cutoff point of ≥ 3 involved sites had the greatest discriminating power in the patients with PsA, who were the only patients with bony erosions. PDUS signs of plantar fascia enthesopathy and Achilles tendon inflammation were highly specific of PsA.

Conclusion. PDUS assessment of the peripheral entheses distinguishes patients with PsA and patients with FM in terms of the number and distribution of the involved sites, and the presence of inflammatory changes. (J Rheumatol 2012;39 Suppl 89:29–31; doi:10.3899/jrheum.120238)

Key Indexing Terms:
PSORIATIC ARTHRITIS FIBROMYALGIA ULTRASONOGRAPHY ENTHESITIS

Enthesitis, a typical feature of psoriatic arthritis (PsA), may be responsible for symptoms that are indistinguishable from those of fibromyalgia (FM). Patients with PsA who complain of widespread extraarticular pain may well have polyenthesitis, FM, or both. Further, patients with unknown PsA characterized by polyenthesitis may easily be wrongly diagnosed as having FM. In a recent study, we found that somatic symptoms and tender point counts were the clinical features that better distinguished the 2 conditions[1].

Musculoskeletal ultrasonography with power Doppler (PDUS) might provide further helpful information for distinguishing the 2 disorders. It has been shown that PDUS is a valid and reliable means of evaluating spondyloarthritis enthesitis[2,3], and that it can detect clinically asymptomatic enthesitis in patients with psoriasis without PsA[4].

To verify whether PDUS can help distinguish psoriatic polyenthesitis and FM, we carried out a pilot study comparing the PDUS findings relating to 14 peripheral entheses in patients with PsA or FM.

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MATERIALS AND METHODS

Thirty patients with PsA and 30 with FM participating in the above-mentioned study[1] underwent PDUS assessments of the major limb entheses. The characteristics of the original study are fully described elsewhere[1]. Basically, we enrolled all of the consecutive adult patients aged ≥ 18 years attending the clinics for routine examinations during a 9-month period and who had PsA or FM according to the Classification Criteria for Psoriatic Arthritis[5] or the American College of Rheumatology criteria[6]. Our study was conducted in accordance with local regulations, and all the patients signed an informed consent form.

Entheseal involvement was measured clinically using the Maastricht Ankylosing Spondylitis Enthesitis Score[7]. However, given the small number of entheses evaluated by this method, the following bilateral entheseal sites were added: the lateral and medial epicondyles, the greater trochanters, the quadriceps tendons, and the plantar fascias at their calcaneus insertions. The 14 entheses bilaterally investigated by means of PDUS were common extensor tendons at their insertions in the lateral humeral epicondyles, the gluteus tendons at their insertions in the greater trochanters, the quadriceps tendons at their insertions in the superior pole of the patella, the patellar tendons at their proximal insertions in the inferior pole of the patella, the patellar tendons at their distal insertions in the tibial tuberosities, the Achilles tendons at their calcaneus insertions, and the plantar aponeuroses at their calcaneus insertions.

A rheumatologist experienced in musculoskeletal US and blinded to the clinical findings (DO) performed the PDUS using a Logiq5 machine (General Electrics Medical Systems, Milwaukee, WI, USA) equipped with a broadband high-frequency (8-15 MHz) transducer for gray-scale imaging. The following standardized equipment settings were used in all cases: B-mode frequency 12-15 MHz, PD pulse repetition frequency 750 Hz, Doppler frequency 6.7-7.5 MHz, and low wall filters. The focus was posi-

tioned at the level of the region of interest, and both longitudinal and transverse scans were recorded. Color gain was adjusted to just below the level that caused the appearance of noise artefacts. The color box was positioned at the level of the enthesis, enlarging the box to the upper part of the image. The patients were positioned in such a way as to allow optimal PDUS scanning of the various entheses.

In accordance with the Outcome Measures in Rheumatology Clinical Trials (OMERACT) definitions of enthesopathy[8], the recorded changes were tendon hypoechogenicity at the bony insertions, tendon thickening at the bony insertions, intratendinous calcifications, enthesophytes, bony erosions, bony cortex irregularities, and the presence of a Doppler signal at the bony insertion. The lesions were scored using a 4-point semiquantitative scale (0 = absent; 1 = mild; 2 = moderate; 3 = severe), with the exception of bony cortex irregularities, which were only scored as present or absent. Tendon hypoechogenicity and a PD signal at the enthesis were considered indicative of active inflammation, and bony erosions were considered indicative of previous or chronic inflammation.

Statistical analysis. Given the pilot nature of our study, the sample was not sized for a powerful statistical analysis, and so its results should be interpreted cautiously.

The descriptive statistics included the mean values and SD of the continuous variables, and the percentages and proportions of the categorical variables.

The univariate analyses were made using Student's t test, and the chi-squared test or Fisher's exact test, as appropriate. A receiver-operating characteristic (ROC) curve was used to identify the number of PDUS-revealed involved entheses with the highest specificity and sensitivity for PsA.

For all the analyses, a p value of 0.05 was considered statistically significant. The data were analyzed using SPSS software for Windows (release 12.0, SPSS Inc., Chicago, IL, USA), version 17.0.

RESULTS

The 30 patients with PsA (13 women and 17 men) had a mean age of 51.6 years (SD 10.7) and mean disease duration of 9.8 years (SD 7.4). The 30 patients with FM (all women) had a mean age of 52.3 years (SD 10.8) and mean disease duration of 5.9 years (SD 5.1). The differences in sex ratios and disease duration were highly significant ($p < 0.001$) and inherent to the conditions. The comparable mean body mass index (BMI) values were 25.2 (SD 5.3) in the patients with PsA and 24.9 (SD 3.7) in the patients with FM. Twenty-three patients with PsA were taking disease-modifying drugs, including tumor necrosis factor-α (TNF-α) blockers in 11 cases.

A total of 420 entheseal sites per group of patients were examined by PDUS. The mean global scores in the patients with PsA and those with FM were 11.4 (SD 7.8; maximum 29) and 5.1 (SD 4.8; maximum 19; $p < 0.001$), respectively. Table 1 shows the prevalence of the PDUS findings. All of the patients with PsA had at least 1 lesion, which was inflammatory in 70% of cases. As many as 80% of the patients with FM showed at least 1 PDUS change, but only 7 (about 23%) showed signs of inflammation. The ROC analysis of the number of involved entheses revealed that ≥ 3 involved sites had the best power to discriminate PsA and FM (area under the curve 0.766, 95% CI 0.695-0.824; $p = 0.001$; sensitivity 72% and specificity 76%). All of the 7 patients with FM who had inflammatory changes had a PD signal at 1 enthesis, but none of them presented bone erosions.

Table 2 shows the distribution of entheseal involvement. Most of the entheseal sites showed signs of enthesopathy significantly more often in the patients with PsA, with the exception of both epicondyles, the right great trochanter, the left quadriceps tendon, the right patellar tendon at its distal insertion, and the left Achilles tendon. The most striking difference was in both plantar fascia insertions: left insertion 33.3% in PsA and 3.3% in FM ($p = 0.003$), right insertion 43.3% in PsA and 0% in FM ($p = 0.001$). PDUS signs of inflammation were also significantly more frequent in the patients with PsA, with the exception of both great trochanters, both patellar distal insertions, and both plantar aponeuroses. The most significant difference was in the Achilles tendons ($p = 0.004$ for both).

Ten entheseal sites per patient were examined clinically and by PDUS. Of the 300 examined sites in the patients with PsA, 25 were clinically positive but negative for PDUS inflammatory changes, 39 were clinically negative and PDUS positive, and 18 were positive using both methods. In the patients with FM, 112 sites were clinically positive and PDUS negative, 8 were clinically negative and PDUS positive, and only 4 were positive using both methods.

DISCUSSION

The purpose of our pilot study was to compare PDUS-revealed entheseal involvement in patients with PsA and patients with FM. In the 14 examined entheses, the PDUS changes were significantly more frequent and more severe in the patients with PsA. However, because the presence of at least 1 lesion at 1 site was quite common in patients with FM (80%), this was not useful for distinguishing the 2 disorders, but the number of involved sites, their distribution, and type of lesions were.

The capacity of PDUS signs of enthesopathy in 3 or more entheses to differentiate the 2 groups was good. However, as the specificity of this feature for a diagnosis of PsA was only 76%, this finding alone requires caution.

Evaluation of the distribution of PDUS-revealed entheseal involvement yielded some interesting results. Signs of enthesopathy at the epicondyles, quadriceps tendons, and Achilles tendons were frequent in both conditions, whereas the other sites were much more frequently affected in the patients with PsA. In particular, plantar fascia insertion involvement was seen in almost 40% of the patients with PsA but in only 1 patient with FM. Because the mean BMI and age of the 2 groups were comparable, this finding seems to be related to the underlying rheumatic condition.

The type of changes detected by PDUS was also capable of discriminating the 2 disorders. Inflammatory lesions (defined as tendon hypoechogenicity or a PD signal at a tendon insertion or bony erosion) were much more specific of PsA than FM. At least 1 inflammatory sign in at least 1 enthesis was observed in 70% of the patients with PsA, but only 23% of the patients with FM. In terms of inflammato-

Table 1. PDUS findings in patients with PsA or FM.

PDUS Findings	Patients with PsA, n (%)	Patients with FM, n (%)	p	Sites in Patients with PsA, n (%)	Sites in Patients with FM, n (%)	p
Enthesopathy	30 (100)	24 (80)	0.01	172 (41)	87 (20.7)	0.001
Inflammatory lesions	21 (70)	7 (23.3)	0.001	71 (16.9)	13 (3.1)	0.001
Hypoechogenicity	13 (43.3)	2 (6.7)	0.01	18 (4.3)	2 (0.5)	0.001
Erosions	6 (20)	0 (0)	0.01	7 (1.7)	0 (0)	0.001
Entheseal PD signal	15 (50)	7 (23.3)	0.03	36 (8.6)	7 (1.7)	0.001

PDUS: power Doppler ultrasonography; PsA: psoriatic arthritis; FM: fibromyalgia.

Table 2. Prevalence of enthesopathy and inflammatory lesions (hypoechogenicity or entheseal power Doppler signal or erosions) at entheseal sites in patients with PsA or FM.

Entheseal Sites	Enthesopathy, n (%)			Inflammatory Lesions, n (%)		
	PsA	FM	p	PsA	FM	p
Epicondyles	21 (35)	20 (33.3)	0.9	10 (16.7)	2 (3.3)	0.03
Great trochanters	14 (23.3)	4 (6.7)	0.02	4 (6.7)	1 (1.7)	0.3
Quadriceps tendons	41 (68.3)	27 (45)	0.02	11 (18.3)	4 (6.7)	0.1
Patellar tendons (proximal)	11 (18.3)	1 (1.7)	0.006	5 (8.3)	0 (0)	0.07
Patellar tendons (distal)	18 (30)	8 (13.3)	0.03	4 (6.7)	2 (3.3)	0.7
Achilles tendons	38 (63.3)	27 (45)	0.07	35 (58.3)	2 (3.3)	0.001
Plantar aponeuroses	23 (38.3)	1 (1.7)	0.001	4 (6.7)	1 (1.7)	0.3

PsA: psoriatic arthritis; FM: fibromyalgia

ry changes, bony erosions were never found in the patients with FM, whereas they were present in 20% of the patients with PsA; hypoechogenicity was much more frequent in the patients with PsA (43% vs 7%); and although a PD signal at the tendon insertion was the most frequent inflammatory lesion in the patients with PsA (50 of them), all 7 patients with FM who had PDUS signs of inflammation showed this change in only 1 enthesis. The last finding conflicts with the data of a recent study[4] in which a PD signal was never detected in the nonpsoriatic patients. One possible explanation is that PD assessments are influenced by the scanning technique and patient position, and are subject to considerable interobserver variability.

The relatively low concordance between clinical and PDUS enthesitis in the patients with PsA is another intriguing finding. Of the 82 sites found involved by at least 1 method, only 18 (22%) were positive by both. This suggests that enthesitis may often be asymptomatic, but also indicates that a more reliable definition of enthesitis might be warranted. Because the concordance rate in the patients with FM was 13.3%, an enthesis positive at both assessments was more indicative of PsA.

In addition to the relatively small number of patients, this study has some other limitations. Most of the patients with PsA had a long disease duration; the results might be very different in patients with recent-onset disease. Further, the high percentage of patients with PsA who were taking disease-modifying drugs probably had a strong influence on the inflammatory lesions.

Our PDUS examinations of 14 major limb entheses distinguished patients with PsA and patients with FM in terms of the number and distribution of the involved sites, and the presence of inflammatory changes.

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