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What is metacarpophalangeal joint swelling in psoriatic arthritis? Ultrasound findings and reliability assessment

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ABSTRACT

Objective. *To evaluate by ultrasound (US) the frequency and reliability of peritenon extensor tendon inflammation (PTI) and intra articular synovitis (IAS) in metacarpophalangeal joints (MCPj) of psoriatic arthritis (PsA) patients.*

Methods. *27 PsA patients with clinical involvement of MCPj were consecutively included. Presence of PTI and IAS were evaluated by grey-scale (GS) and power Doppler (PD). Longitudinal and transverse 3–5 second videos of US examinations were recorded for reliability assessments by five readers. Consensus on positive US results was achieved when at least three readers agreed.*

Results. *Clinical swelling was present in 60 joints whereas US detected IAS and/or PTI in 75 MCPj. GS PTI in at least one MCPj was found in 19 patients and 41 joints, concurring with clinical swelling in 30/41. GS IAS in at least one MCPj was found in 23 patients and 63 joints, concurring with clinical swelling in 37/63. The inter-reader reliability was good for PD PTI and moderate for GS PTI.*

Conclusion. *Our study identifies that both IAS and PTI cause MCPj swelling, where PTI is almost as frequent as IAS as a cause of swelling. The reliability of PTI is at least as good as for IAS.*

Introduction

Psoriatic arthritis (PsA) is an inflammatory disease with joint, enthesis and axial involvement. Metacarpophalangeal joint (MCPj) swelling is a frequent finding of PsA, which is included in the different disease activity scores. The MCPj swelling is usually assumed to be caused by intra-articular synovitis (IAS). However, Mc Gonagle and colleagues argued that synovitis is a secondary feature to enthesitis in PsA (1). Following this line, recent ultrasound (US) reports demonstrated that the peritenon extensor tendon inflammation (PTI) may also be responsible of this finding. Additionally, it has been suggested that the PTI at MCPj level may play a key role in the differential diagnosis between rheumatoid arthritis and PsA (2, 3).

In spite of its clinical impact, there are few studies on PTI, and thus the present objectives were to investigate the frequency and reliability of the PTI pattern in PsA and its potential role in causing clinical swelling in MCPj in comparison to IAS.

Patients and methods

Patients

Consecutive PsA patients fulfilling the CASPAR criteria (4) with clinical involvement of at least one of the 2nd to 5th MCPj were included.

Clinical examination aimed to confirm the presence of MCPj involvement was performed by an expert rheumatologist before the US assessment. Patients <18 years and those with other possible explanations than PsA for MCPj swelling were excluded. Demographic data as well as clinical and laboratory data (age, sex, PsA disease duration, PsA pattern, C-reactive protein (CRP) mg/l and erythrocyte sedimentation rate (ESR) mm/h and the total number of examined swollen and tender joints) were collected. DAS28 CRP and ESR were calculated.

This study had the approval of the local ethics committee (Comité Etico Hospital Clínico Universitario de Valladolid, PI 15-275), and informed consent was obtained from all patients according to the Declaration of Helsinki.

US assessment

All US examinations were performed by an expert rheumatologist blinded to the clinical data. The dorsal aspect of 2nd to 5th MCPj of both hands were examined by US with the patient seated in front of the sonographer, with the hands lying in prone position on the examination table. Both longitudinal and transverse scans were performed moving the transducer from proximal to distal and from radial to ulnar sides of MCPj dorsal surface. Plenty of gel was used to avoid compression of the examined tissues.

The following pathological US findings were evaluated in grey-scale (GS) and power Doppler (PD): a) PTI, defined as an hypoechoic swelling surrounding the extensor digitorum tendon with or without PD signal (3, 5, 6), and b) IAS based on the OMERACT definition (7). A MyLab 70 XVG machine(Esaote

Table I. Clinical features of the patients. CRP C-reactive protein. ESR erythrocyte sedimentation rate. CRP, ESR and their respective DAS28 calculations were only available in 18 patients.

Patients	27
Men (%)	17 (63)
Women (%)	10 (37)
Age (years ± SD)	56±11
Disease duration (months ± SD)	109±101
Type of psoriasis	
First degree relative (%)	1 (3.7)
Skin psoriasis (%)	10 (37.1)
Nail psoriasis (%)	1 (3.7)
Skin and nail psoriasis (%)	15 (55.5)
Type of psoriatic arthritis	
Peripheral (%)	21 (78)
Axial and peripheral (%)	6 (22)
CRP mg/l (mean ± SD)	8.3±8.2
ESR mm/h (mean ± SD)	21.9±19.3
DAS28 CRP (mean ± SD)	3.6±0.9
DAS28 ESR (mean ± SD)	3.9±1.2

S.p.A., Genoa, Italy) with a 13 MHz linear transducer was used. For PD the following settings were chosen: pulse repetition frequency 750 Hz, wall filter 3, persistence 4 and Doppler frequency 7.1 MHz. Colour gain was set just below the level of noise.

For the reliability exercise, video clips of MCPj in both longitudinal and transverse scan were taken. A total of 16 videos per patient were obtained (2nd to 5th MCPj of both hands), and each joint was scored as presence or absence of PTI and IAS. The intra- and inter-reader assessments were performed by five expert readers, from 5 different hospitals including 4 different countries. A similar score given by at least three of the readers was defined as the true PTI or IAS presence or absence.

Statistical analysis

The SPSS software (IBM SPSS statistics v. 20.0) was used for statistical analysis. Quantitative variables (clinical, laboratory, and US parameters) are given as mean (SD). Upon univariate analysis, the Student's *t*-test for independent samples was used to compare continuous variables and the Chi-squared test to compare categorical variables. For intra- and inter-reader reliability purposes Cohen's Kappa test was used and values were interpreted as 0–0.20 poor, 0.20–0.40 fair, 0.40–0.60 moderate, 0.60–0.80 good and 0.80–1 excellent agreement.

Results

Twenty-seven PsA patients were included. Clinical characteristics are attached in Table I.

A total of 216 MCPj were evaluated clinically and scanned by US. Clinical MCPj swelling was present in 60 joints (28%) whereas US detected IAS and/or PTI in 75 MCPj (35%) (Fig. 1-2).

Nineteen patients (70%) had in at least one MCPj PTI as the only US pathology. GS PTI was found in 41 joints, concurring with clinical swelling in 30 of the 41 joints (73%). GS IAS in at least one MCPj was found in 23 patients (85%) with a total of 63 joints affected, concurring with clinical swelling in 37 of the 63 joints (59%). PTI and IAS were both present in 29 of the 75 US affected joints (39%). MCPj swelling was present in 17 joints without US affectation. Figure 2 shows the frequency of clinical and US results, and the agreement and discrepancies between clinical and US examinations.

There was moderate to excellent reliability in the intra-reader exercise, while the inter-reader reliability showed good results for PD PTI and moderate for GS PTI. The reliability for assessing PTI was somewhat better than for IAS (Table II).

Discussion

The present work provides new insight regarding US in PsA, where PTI was found to be almost as frequent as IAS as the cause of MCPj swelling, and that the two features were concomitant (mix pattern) in 39% of the US detected inflamed joints. IAS is located within the

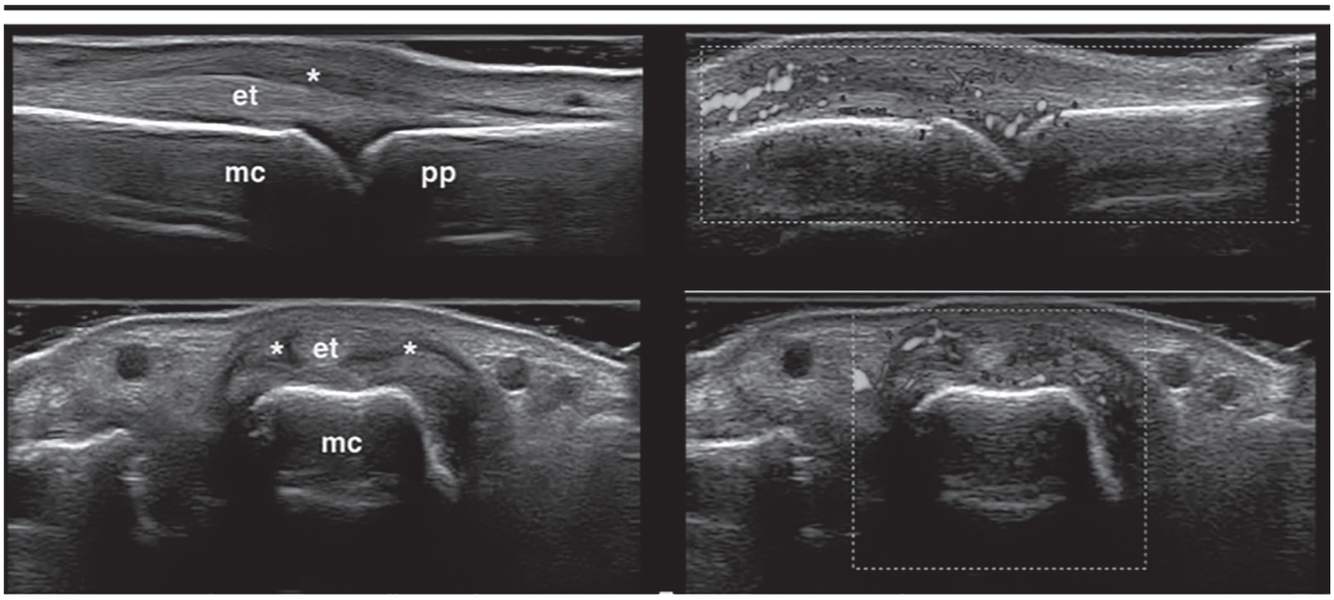

Fig. 1. Sonographic PTI pattern. Longitudinal (upper images) and transverse (lower images) views of the dorsal aspect of a metacarpophalangeal joint of a Psoriatic Arthritis patient with presence of both PTI (peritenon extensor tendon inflammation, defined as an hypoechoic swelling surrounding the extensor digitorum tendon with or without PD signal) and IAS (intra articular synovitis, defined as an abnormal hypoechoic intraarticular tissue that is nondisplaceable and poorly compressible and which may exhibit Doppler signal). Left images show grey-scale mode, right images power Doppler mode. mc: metacarpal bone; pp: proximal phalanx; et: extensor tendon; star: hypoechoic swelling surrounding the extensor digitorum tendon.

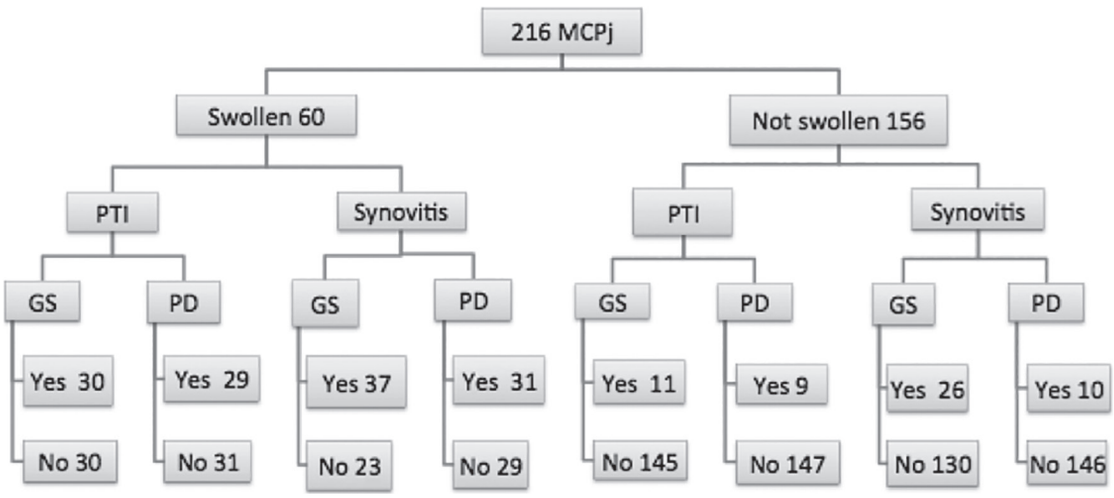

Fig. 2. Agreement between clinical and ultrasound assessments.
Distribution of clinical and sonographic findings of all the 216 evaluated joints.
MCPj: metacarpophalangeal joint;
PTI: peritenon extensor tendon inflammation;
GS: grey scale;
PD: power Doppler.

synovial part of the joint whereas PTI affects the peri-articular tendon and the transverse ligament, which is an enthesis related to the retinaculum structure.
The enthesis is the insertional part of a tendon, ligament, joint capsule or fascia to the bone (8). The traditional concept of enthesitis refers to inflammatory changes in the tendinous insertion. However, this changes has also been described in other regions called "functional enthesis" sharing strong anatomical, biomechanical and histological similarities to classical enthesis (9-11). To support this concept, the extensor tendon with its band system (12, 13) at MCPj level has been explored (9, 10, 14), and it has been reported that a sesamoid fibrocartilage exists in the contact area between the tendon, the dorsal aspect of MCPj and the stabilising ligaments wrapping around the tendon (14). The PTI presently described may be caused by inflammation in these structures, since the paratenon is linked to the sagittal band or Landsmeer's transverse ligament (15), an enthesis related to the retinaculum structure.
We detected a PTI US pattern in 70% of patients, similar to the results of Gutierrez *et al*. (65.8%) (3) but slightly higher than Zabotti *et al*. (54.1%) (5). However, Zabotti *et al*. scanned only the two most symptomatic joints per patient, which may cause under-diagnosis, since we detected PTI pattern in 27% of non-swollen MCPj and this is also supported by a previous study (6).
Presently, clinical swelling of MCPj had a moderate agreement with the US presence of PTI or IAS, with a higher agreement with PTI (73%) than with IAS (59%). This may be explained by the higher sensitivity and accuracy of US to detect PTI and IAS than clinical examination, however there were 17 swollen MCPj without confirmation on US.
There is no general agreement on the definition of PTI, but it is described as "an hypoechoic swelling surrounding the extensor digitorum tendon with or without PD signal" (3). To apply this definition when performing US, it has to be shown that use of the definition gives good reliability of the US assessments. To our knowledge, this is the first multi-observer study that explores the reliability of US in scoring PTI in PsA. The reliability exercise was done by reading video clips, since this permits a multiplanar view and is closer to real scanning. We demonstrated a good to excellent intra-observer reliability and a moderate to good inter-observer reliability among experienced sonographers, which supports the use of evaluation of the two different US pathologies in PsA patients.
Our study has some limitations. The sample size is low, however the present frequency of PTI was as previously described. In addition, the long disease duration in our patients could underestimate the real prevalence of PTI, since some studies find a tendency of higher prevalence of PTI in early PsA (3, 5). The reliability exercise was based on videos, and not real scanning. However, a high-level machine was used, and the videos produced were close to real time scanning. In addition, the reliability exercise included only sonographers with the highest level of competence (EULAR competency assessment level 2) and they had long experience in evaluation of these US lesions.
In conclusion, our study identified two different US lesions, IAS and PTI, causing clinical MCPj swelling. PTI was found to be almost as frequent as IAS. This study supports PTI to be a characteristic finding of PsA patients, and US assessments were demonstrated to be reliable. However, future studies are necessary to explore the added value of assessing PTI for diagnosis, prognosis and treatment in PsA.

Table II. Lesions prevalence and intra- and inter-reader reliability. GS grey-scale. PD power Doppler. IAS Intra articular synovitis. PTI peritenon extensor tendon inflammation. MCPj metacarpophalageal joint. Prevalence of PTI and IAS in GS and PD is expressed in therms of number and percentaje of MCPj with the lesion from the entire sample (216 MCPj) with agreement of at least three of the five readers.

	PTI PD	PTI GS	IAS PD	IAS GS
Mean prevalence (% of 216 MCPj)	38 (17.6)	41 (18.9)	41 (18.9)	63 (29.16)
Intra-reader reliability				
Range	0.611-0.969	0.684-0.931	0.676-0.810	0.518-0.889
Mean kappa	0.826	0.784	0.743	0.637
Inter-reader reliability mean kappa	0.685	0.590	0.680	0.567

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