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Ultrasound and Clinical Evaluation of Quadricipital Tendon Enthesitis in Patients with Psoriatic Arthritis and Rheumatoid Arthritis

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Abstract: Enthesitis is an inflammatory lesion of the tendon, ligament and capsular insertions into the bone, and it is a fundamental element in the diagnosis of spondyloarthropathies. Sonography is the method of choice for studying periarticular soft tissues because it is capable of detecting both the early (oedema, thickening) and late alterations (erosions and enthesophytes); it is also an inexpensive, biologically harmless and easily repeatable technique. The aim of this study was to compare the prevalence of quadricipital enthesitis in psoriatic arthritis (PsA) and rheumatoid arthritis (RA) patients, and to document any clinical and echostructural differences in this lesion between the two diseases. The results show that enthesitis is more frequent in PsA patients, more than half of whom are asymptomatic. Knee inflammation was found in the PsA patients with enthesitis regardless of the concomitant presence of joint effusion; none of the RA patients suffered from enthesitis alone. Quadricipital enthesitis is more frequent in male patients. There was no significant correlation between the presence of peripatellar psoriatic lesions and enthesitis. Sonographic examinations of patients with enthesitis revealed that those with RA had predominantly inflammatory lesions, whereas PsA patients also showed major new bone deposition.

Keywords: Psoriatic arthritis; Quadricipital enthesitis; Ultrasound examination

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Introduction

Psoriatic arthritis (PsA) is a chronic inflammatory arthropathy, a seronegative arthritic pathology characterised by its association with the cutaneous and/or ungual lesions typical of psoriasis, frequent inflammatory involvement of periarticular structures such as tendons or entheses, and the new formation of periostal bone [1–5].

Rheumatoid arthritis (RA) is a chronic inflammatory disease characterised by progressive polyarthritis that mainly affects the small joints and tendons, and may determine disabling deformities [6,7].

Entheses are the tendon, ligament and capsular insertions in the bone; they are metabolically highly active and extremely sensitive because of their high content of nerve terminals [8]. There are two types of enthesis: the 'fibrous' and the 'fibrocartilaginous' [9,10]. Quadricipital tendon enthesis can be classified as fibrocartilaginous [11]. From a histological point of view, fibrocartilaginous entheses can be divided into four overlapping zones:

1. The tendon or ligament consisting of parallel collagen fibres
2. Non-mineralised fibrocartilage consisting of collagen fibres and chondrocytes
3. Mineralised fibrocartilage in which calcium crystals can be observed
4. The bone: the collagen fibres of the mineralised fibrocartilage blend with those of the bone matrix. The collagen fibres that penetrate the bone most deeply are called Sharpey fibres [8].

The combination of inflammatory changes to the enthesis, characteristic of spondyloarthropathies, is defined as enthesitis.

Enthesitis is characterised by an early phase involving oedema, inflammatory infiltration and destructive fibrocartilage microlesions; the subsequent vascular proliferation in the subchondral bone and in the fibrocartilage determine bone erosions, reactive sclerosis and reactivation of endochondral ossification leading to enthesophytosis [8,12–15].

Enthesitis is clinically manifest by the onset of spontaneous pain and tenderness upon pressure or in obstructed movement, but is frequently asymptomatic [16]. Sonography is the method of choice for studying periarticular soft tissues because it is capable of detecting both the early (oedema, thickening) and late alterations (erosions and enthesophytosis); it is also an inexpensive, biologically harmless and easily repeatable technique [17].

The aim of the present study was to verify the prevalence of quadricipital tendon enthesitis in PsA and RA patients, and to identify by sonography any demonstrable morphostructural differences between the types of enthesitis associated with the two diseases. We also intended to verify whether there is any correlation between enthesitis and peripatellar psoriatic skin lesions.

Materials and Methods

Forty consecutive patients with PsA (mean age 51.7 years; 22 males, 18 females; M/F ratio = 1.2) classified according to Moll and Wright's criteria for PsA [3,4] and 40 consecutive patients with RA (mean age 50.3 years; 4 males, 36 females; M/F ratio = 0.1), classified according to the criteria of the American Rheumatism Association (ARA) [18], were evaluated clinically and by sonography in our outpatient departments between November 1997 and October 1998 (mean time since diagnosis 3 ± 2 years). Eighty healthy controls (27 males, 53 females; mean age 54.2 years) were evaluated in the same manner.

Of the PsA patients, 9/22 males and 8/18 females had active cutaneous psoriasis; the other PsA patients presented ungual psoriasis (diagnosed by a dermatologist). PsA patients were not divided into disease subsets (according to Wright and Moll) because not all of the PsA clinical variants were represented [4].

Clinical Evaluation

The clinical examination involved determining the presence or absence of pain (spontaneous, under pressure applied by the hand, or with obstructed movement from knee extension) at the level of the quadricipital entheses, the presence of effusion on the joint, and the presence of any psoriatic lesions in the peripatellar extensor region.

Ultrasound Evaluation

Ultrasound (US) examination was performed by an experienced sonographer (blind to diagnosis) using a Toshiba SAL 240 with a 7.5 MHz linear electronic probe and a Kitecho gel pad. The quadricipital enthesis was evaluated by axial and longitudinal scans of the supine patient, with the knee extended at rest, with quadricipital contraction and, subsequently, in 30° flexion in order to increase the distension of the tendinous fibres and thus avoid the 'empty tendon' artefact [19]. The following sonographic findings of enthesitis were considered: heterogeneous hypoechogenicity and thickening of the enthesis; gross irregularity of the patella (more than 2 mm); enthesophytes of more than 5 mm; erosions [20,21]. At least one criterion was necessary for the ultrasonographic diagnosis of enthesitis. Furthermore, all patients were evaluated for the presence of articular effusion in the suprapatellar recess (a hypoechoic fluid collection of more than 4 mm with quadriceps muscle contraction) [22].

Statistical Analysis

The χ^2 test was used to compare the percentages between three groups. Fisher's exact test and the χ^2 test were used to compare the percentages between the two groups.

Results

Eighteen (45%) of the patients with PsA had sonographic signs of quadricipital enthesitis, a significantly higher frequency ($P < 0.001$) than the 7.5% found in the patients with RA (Fig. 1). However, US examination showed a higher prevalence of articular effusion in RA

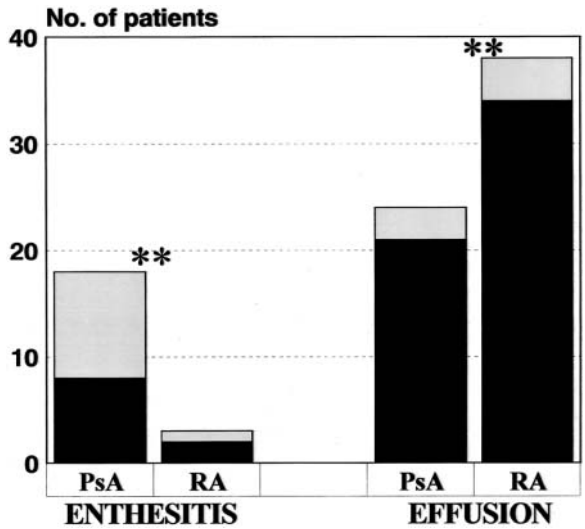

Fig. 1. Prevalence of quadricipital tendon enthesitis and knee effusion in PsA and in RA patients with ultrasound examination. (**P <0.001) ■ = symptomatic ▒ = asymptomatic.

(38/40, 95%, P <0.05) than in PsA (24/40, 60%, P <0,001) (Fig. 1). In the patients with sonographic alterations, clinical examination revealed articular effusion in 87% of PsA and in 90% of RA, whereas quadricipital enthesitis was found in only 45% of PsA and in 66% of RA (Fig. 1).

Another statistically significant observation (P <0.01) was that quadricipital enthesitis may be the only manifestation of inflammatory involvement of the knee in PsA patients regardless of the presence of articular effusion, but no cases of isolated enthesitis were observed among the RA patients (Fig. 2).

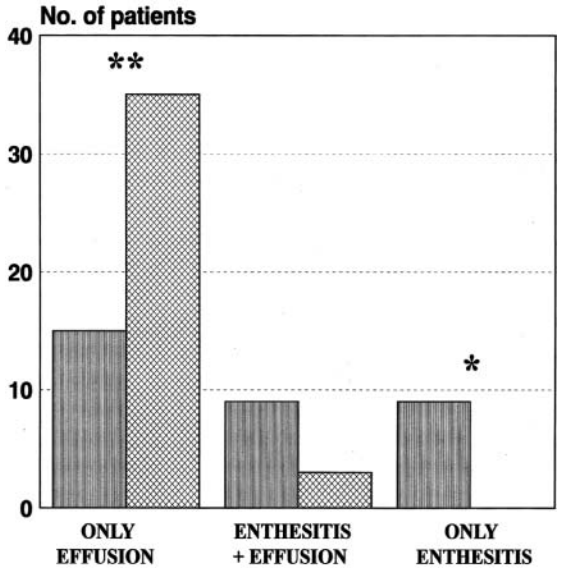

Fig. 2. The RA patients (▓) showed a prevalence of articular effusion, with no case of isolated quadricipital enthesitis; in PsA patients (▒), enthesitis may represent the only manifestation of inflammatory knee involvement. (*P <0.01 **P <0.0001).

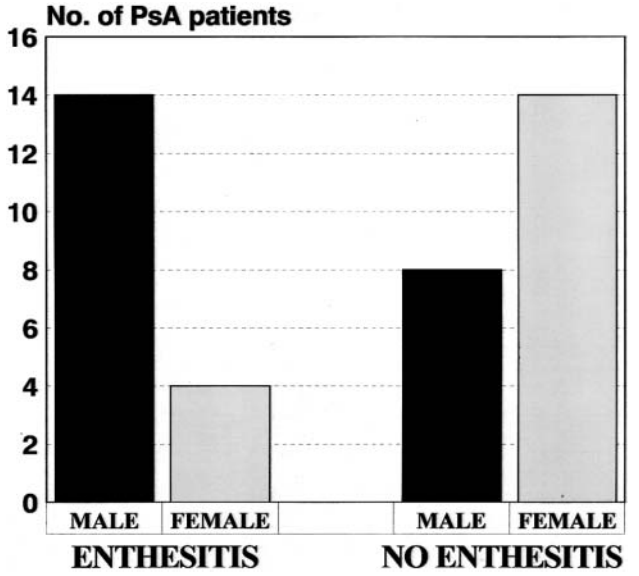

Fig. 3. PsA patients: quadricipital tendon enthesitis was more frequent in male than in females.

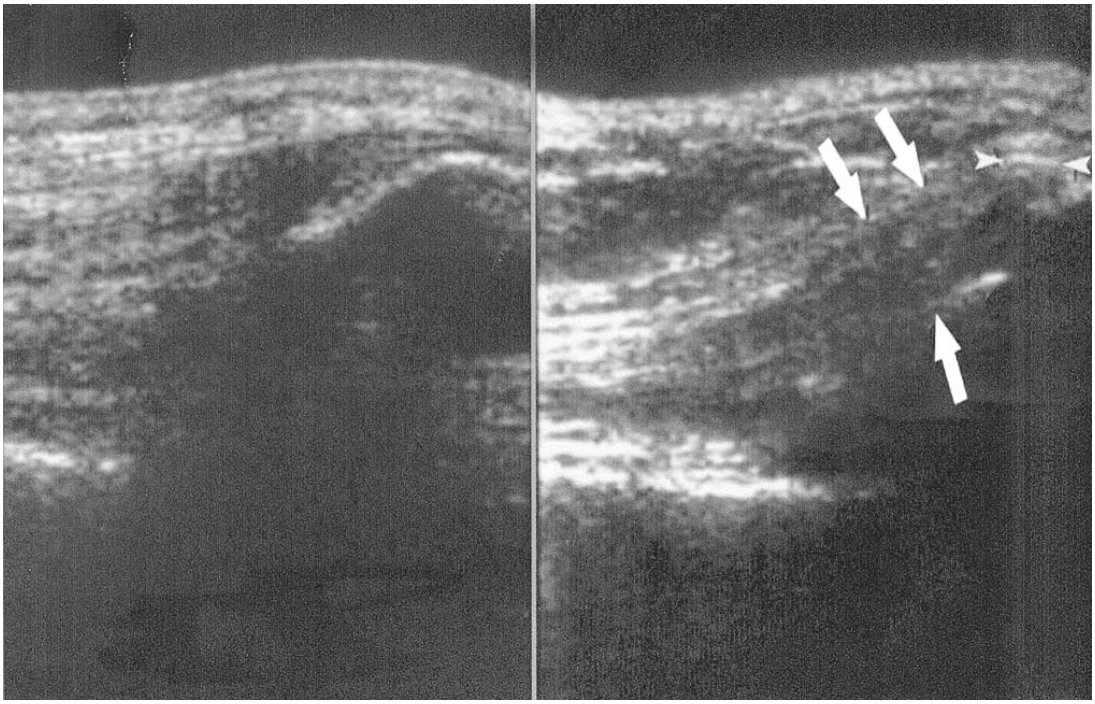

Fig. 4. Suprapatellar longitudinal scan over quadricipital enthesis. 7.5 MHz linear probe. Left: Normal enthesis. Right: Heterogeneous hypoechogenicity and thickening of the enthesis (arrows) with enthesophyte (arrowheads).

Quadricipital enthesitis was more frequent in the male patients with PsA (14/22, 63,6%) (Fig. 3) and in the males of the control population (3/27, 11%). However, this prevalence was significantly higher in male PsA patients (P <0.001) than in controls; furthermore, the prevalence of quadricipital enthesitis was lower in female RA patients (1/36) than in female PsA patients (4/18) (P = 0.05).

Only four cases of enthesitis were found among the healthy controls (three males and one female), a prevalence that was significantly less (P <0.0001) than that observed in the PsA patients but not significantly different from that observed in the RA patients.

An association between psoriatic skin lesions (at any site) and quadricipital enthesitis was observed in 8/17 patients (47%), only four of whom presented psoriasis in the peripatellar extensor region (all with isolated enthesitis and no effusion).

Sonographic examinations of the 18 PsA patients with enthesitis revealed that 17 had irregular bone profiles, nine had enthesophytosis and nine had tendinous fibre thickening and hypoechogenicity (Fig. 4). In the three RA patients with quadricipital enthesitis, sonography revealed an irregular bone profile in one case and hypoechogenicity in two. None of the patients showed any signs of erosions (Table 1).

Table 1. Sonographic features of quadricipital enthesitis in PsA and RA patients

	PsA	RA
Enthesophytes > 5 mm	9	0
Irregularities > 2 mm	17	1
Thickening/hypoechogenity	9	2
Erosions	0	0

Discussion

Inflammatory involvement of the enthesis is a very important criterion for the diagnosis of spondyloarthropathy [2,12,16]. Validated criteria for the diagnosis of PsA are still needed; however, in the literature the prevalence of enthesis during the course of PsA is high [1,12,16,] and this alteration could be considered among the diagnostic critera, as suggested by other authors [12–23].

The results of our study show that the frequency and entity of enthesitis in PsA patients is significantly higher than in RA patients; moreover, quadricipital enthesitis may be the only manifestation of inflammatory involvement of the knee in PsA patients regardless of the presence of synovitis. Quadricipital enthesitis is rare in RA patients, and it is always associated with joint synovitis. Thus enthesitis, in PsA, can be considered a clinical sign of arthritis that is almost as important as joint synovitis, as noted by other authors [23].

The prevalence of enthesitis was higher in the males of both PsA and control populations, a gender difference that may be due to factors such as heavy physical work, sports, greater body weight, or possible dysmetabolism. However, it is worth noting that this prevalence was significantly higher in the male PsA subjects than in the healthy controls, and that the presence of quadricipital enthesitis was significantly lower in the females with RA than in those with PsA.

The presence of psoriatic skin lesions (at any site) does not seem to be associated with the presence of enthesitis. Further studies could verify whether the presence of psoriatic skin blotches increases the probability of finding inflammatory alterations in the articular and periarticular structures closest to the lesion.

Sonography is proved to be a highly sensitive means of revealing articular and periarticular alterations, particularly as more than half of the PsA patients with enthesitis were asymptomatic.

The structural alterations detected by sonography were different in the two diseases: the patients with RA showed a prevalently inflammatory component consisting of oedema, thickening and focal hypoechogenicity, whereas those with PsA also showed major new bone depositions leading to the formation of enthesophytes (which were only observed in our PsA subjects). Power Doppler sonography should also be considered in future studies for its ability to show the inflammatory neovascularisation that characterises the most precocious phases of enthesitis.

Therefore, in the case of suspected PsA we believe that it is important to perform systematic multijoint sonographic examinations that include the articular and periarticular structures of the knee (in particular the quadricipital entheses – and the proximal and distal patellar enthesis and anserine bursa) even if a physical examination fails to reveal any electively tender areas, swelling or positivity to patella ballottement.

Further studies are needed in order to determine whether sonography could be useful in differentiating the various types of polyarthritides.

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