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Diagnosis of subclinical psoriatic arthritis in patients with psoriasis using CASPAR criteria: a sonographic study

Sherine Mahmoud El-Sherif^{1*} , Tamer Gaweesh² and Rasha Mahmoud Genedy³

Abstract

Background: We aimed at screening for subclinical psoriatic arthritis (PsA) among psoriatic patients without musculoskeletal complaints using ultrasonography of the lower limbs and finding the best predictor for its development.

Results: Subclinical inflammatory articular affection was found by ultrasound in 33 patients, among whom 26 had psoriatic nail affection. According to CASPAR criteria, those 26 patients could be diagnosed as PsA (subclinical). The only statistically significant difference between psoriatic patients with PsA and those without was the mean quadriceps tendon thickness as well as the presence of enthesophytes and bilateral quadriceps thickening. The best and only predictor for subclinical PsA was the presence of enthesophytes.

Conclusion: Ultrasound was more sensitive than clinical examination in detecting subclinical psoriatic arthritis which is highly prevalent in patients with psoriasis even in the absence of manifest arthritic complaints. The best and only predictor for subclinical PsA was the presence of enthesophytes.

Keywords: Subclinical psoriatic arthritis, Psoriasis, Musculoskeletal ultrasound, Enthesitis, Glasgow Ultrasound Enthesitis Scoring System

Background

Psoriasis is a chronic inflammatory skin disease that can be associated with psoriatic arthritis (PsA), with a prevalence ranging from 7.6 to 36% according to different populations. Moreover, psoriasis precedes the onset of arthritis which can be destructive, by an average of 7 years. These facts pose great challenges for the urgent need to identify psoriatic patients at increased risk of progression to PsA, which will provide a unique opportunity for early intervention (and possibly even prevention) [1–5].

Enthesitis is a key process in PsA most likely triggered by mechanical stress, and synovitis is secondary to the

liberation of proinflammatory cytokines from the entheses mostly starting in the lower limbs. Based on such a hypothesis, enthesitis should be a prevalent finding in early PsA [6]. Theories related to autoimmunity no longer explain the essence of the disease. Because a prime feature of entheses is stress dissipation, and since “normal” insertions are sites of microdamage, it was proposed that “tissue-specific factors” shared by the joint and skin are critical for disease expression [7]. Enthesitis consists of focal inflammatory lesions which evolve toward fibrous scarring and new bone formation at insertions also known as enthesiophytes. So enthesiophytes are a reaction to a previous bout of enthesal inflammation [8]. Furthermore, a more recent study revealed that enthesiophytes occur early in patients with psoriasis without joint involvement, suggesting that they potentially reflect a common process in psoriasis and PSA [9].

Asymptomatic patients with psoriasis often have subclinical inflammatory articular manifestations, which

*Correspondence: sherin.abdelfatah@alexmed.edu.eg

¹ Department of Physical Medicine, Rheumatology, and Rehabilitation, Faculty of Medicine, Alexandria University, Medaan El-Khartoom Square, Al-Azaritah, Alexandria, Egypt

Full list of author information is available at the end of the article

are often difficult to detect during a clinical examination (CE). Musculoskeletal ultrasound (US) is widely available and inexpensive, can scan repeatedly, and easily demonstrates fluid collections. It has the advantage over CE of being able to directly visualize the enthesis [8] and detect enthesitis [10]. The sonographic soft tissue changes associated with enthesitis include loss of normal fibrillar architecture, hypochoic changes, and associated thickening [8].

Despite the wide use of classification Criteria for Psoriatic Arthritis (CASPAR) [11], patients who meet the criteria have already clinically confirmed arthritis, which might not improve with treatment. Therefore, early detection of psoriatic patients with subclinical inflammatory articular manifestations by means of US could help with diagnosing subclinical psoriatic arthritis according to CASPAR criteria. This would have an impact on clinical decision-making, such as the use of aggressive treatment at an early stage to prevent damage and functional disability [12].

The aim of the present study was to screen for subclinical psoriatic arthritis among psoriatic patients without musculoskeletal complaints using ultrasonography of the lower limbs for detecting subclinical inflammatory articular manifestations and finding the best predictor for its development.

Methods

This was a cross-sectional study carried out on 36 psoriatic patients (28 males and 8 females) selected from the outpatient clinic of dermatology, main university hospital. The sample size was calculated using EPI-INFO, version 7. The estimated proportion of PsA among patients with psoriasis is 20% [2]. Using a precision of 10% and a 95% confidence interval, the minimum sample size was 35 cases. The inclusion criteria are as follows: age ≥ 18 years; no history of systemic treatment given for psoriasis (i.e., methotrexate, ciclosporin, or retinoids); only phototherapy sessions were given; no history of any inflammatory, microcrystalline, degenerative, or infectious musculoskeletal disease; no history of polytraumatism; and absence of past or present non-traumatic pain in any axial or peripheral musculoskeletal region. An equal number of controls ($n = 36$) free of any musculoskeletal or dermatologic disease were included to compare sonographic findings in the local general population with the patient group. All included patients signed informed consent for their enrolment in this study. The study was approved by the local ethics committee in the Faculty of Medicine (IRB No: 00007555-FWA NO: 00015712).

All patients and controls were clinically examined to rule out axial or peripheral articular or enthesal

affection. The severity of psoriasis was scored according to the Psoriasis Area and Severity Index (PASI) [13]. Also, psoriatic nail affection as well as body mass index (BMI) was assessed.

Ultrasonography of the lower limbs of both patients and controls was performed by an experienced radiologist using a 10-MHz linear array transducer (Siemens-Germany). The examination was done according to Glasgow Ultrasound Enthesitis Scoring System (GUESS score) [14] to the following 5 sites: the superior pole of the patella (quadriceps tendon insertion), the inferior pole of the patella (patellar ligament origin), and the patellar ligament insertion at the tibial tuberosity with the patient in the supine position with the knee flexed at 30°. The Achilles tendon and the plantar aponeurosis were examined with the patient lying prone. At those sites, the following items were evaluated: the thickness of the enthesis (beyond the normal values), the presence or absence of bony erosions, enthesophytes, and bursitis, and each item scored 1. This scoring was carried out bilaterally. The sonographic examination was also carried out on the controls to compare the distribution of any changes found in patients with the local general population.

Psoriatic patients with sonographic signs of inflammation, i.e., thickened enthesis or suprapatellar effusion, were selected. To diagnose those cases as (subclinical) PsA, CASPAR criteria were used. The presence of psoriatic nail dystrophy would allow those patients to score 3 (current skin psoriasis scored 2 and nail affection scored 1) [11].

Data were analyzed using IBM SPSS software package version 25. Quantitative data were presented as the mean and standard deviation, while qualitative data were presented as the number and percentage. We first compared between PsA and non-PsA groups as regards each ultrasound variable using the Mann-Whitney test for not normally distributed data and the independent t test for normal data. Relationships between categorical variables were evaluated by Fisher's exact test. Spearman's correlations were conducted to show the relationship between quadriceps tendon thickness and other parameters. Then, on the basis of this univariate analysis, all significant variables with P value ≤ 0.2 were entered in a stepwise multiple logistic regression analysis using the forward LR technique, to build the best model for developing subclinical PsA among psoriatic patients without musculoskeletal complaints. The dependent variable of this study was developing subclinical PsA which has two binary outcomes (non-PsA coded as 1 and PsA coded as 0). The predictor variables considered were the number of thickened tendons, thickness (in mm) of the quadriceps tendon, total GUESS score, enthesophytes

(absent = 0, present = 1), and bilateral quadriceps tendon thickening (absent = 0, present = 1).

P values ≤ 0.05 were considered statistically significant.

Results

The mean age of the included patients was 46.08 ± 13.24, the mean BMI was 29.74 ± 4.89, and the mean duration of skin psoriasis was 12.74 ± 10.24 years. There was no statistically significant difference between patients and controls as regards their age or BMI. The mean PASI was 13.31 ± 8.09. The US examined 360 entheses in the lower limbs of 36 patients and 100 entheses in 10 controls. Sonographic findings of these entheses are shown in Tables 1 and 2.

According to the GUESS score, those with quadriceps tendon thickness above 6.1 mm were considered thickened. As for the proximal and distal patellar ligaments, 4 mm or above was considered thickened. Regarding the Achilles tendon and plantar fascia, the thicknesses above 5.29 and 4.4 mm, respectively, were considered thickened. The mean sonographic thickness of the proximal and distal patellar tendons as well as the plantar fascia was significantly higher in patients than in controls (*P* ≤ 0.05). As for the quadriceps tendon and Achilles tendons, they were still thicker in patients than in controls but have not reached statistical significance. Tendon thickening was found at 98 sites (27.22% of the total examined sites) among 29 patients (23 males and 6 females).

Enthesophytes were seen in 50 sites (13.89% of the total examined sites) among 22 patients. All of the 22 patients with enthesophytes had thickened entheses. Representative US images of pathological findings in psoriatic patients are shown in Fig. 1. The sites most commonly thickened were the distal patellar tendon (41.84% from total thickened tendons) followed by the quadriceps tendon (25.52%), then the proximal patellar tendon (20.41%). Enthesophytes were most commonly seen at the Achilles tendon (48% of total enthesophytes detected) followed by the quadriceps tendon (40%) (Table 2). Suprapatellar bursitis (knee effusion) was found in 21 patients (58.33%), and infrapatellar bursitis was found in 10 patients. On the other hand, none of the controls had knee effusion or infrapatellar bursitis. No erosions were seen at any site in both patients and controls. The total GUESS score in those patients ranged between 0 and 11 with a mean of 5.53 ± 3.19.

The number of patients with articular inflammatory findings by US was 33 distributed as 17 (combined knee effusion and thickened entheses), 4 (knee effusion only), and 12 (thickened entheses only). Psoriatic nail affection was found in 27/36 patients (75%) and among 26 patients from those 33 with articular inflammatory findings. According to CASPAR criteria, those 26 patients (20 males and 6 females) scored 3 and hence could be diagnosed as subclinical PsA. Those 26 patients had either enthesitis alone (11 patients) or synovitis alone

Table 1 Sonographic characteristics of the studied sample as regards thickness of examined tendons

Thickness in mm	Patients (n = 36) Mean ± SD (median)	Controls (n = 36) Mean ± SD (median)	<i>P</i>
Quadriceps tendon	5.75 ± 0.73 (5.65)	5.47 ± 0.43 (5.5)	0.051
Proximal patellar tendon	3.71 ± 0.52 (3.58)	3.39 ± 0.48 (3.3)	0.008*
Distal patellar tendon	4.04 ± 0.52 (3.98)	3.23 ± 0.58 (3.2)	0.000*
Achilles tendon	4.02 ± 0.56 (4.05)	3.75 ± 0.6 (3.6)	0.052
Plantar fascia	3.35 ± 0.67 (3.2)	2.85 ± 0.5 (2.9)	0.00*

* *P* ≤ 0.05 was considered significant and was based on the independent *t* test

Table 2 Frequency of sonographic abnormalities at the studied sites

	Thickened enthesis		Enthesophytes	
	No. of affected sites (n = 98)	No. of affected patients (n = 29)	No. of affected sites (n = 50)	No. of affected patients (n = 22)
Quadriceps tendon (≥ 6.1 mm)	25 (25.51%)	15 (51.72%)	20 (40%)	12 (54.55%)
Proximal patellar tendon (≥ 4 mm)	20 (20.41%)	12 (41.38%)	2 (4%)	2 (9.09%)
Distal patellar tendon (≥ 4 mm)	41 (41.84%)	25 (86.21%)	0 (0%)	0 (0%)
Achilles tendon (≥ 5.29 mm)	3 (3.06%)	3 (10.34%)	24 (48%)	14 (63.64%)
Plantar fascia (≥ 4.4 mm)	9 (9.18%)	6 (20.69%)	4 (8%)	3 (13.64%)

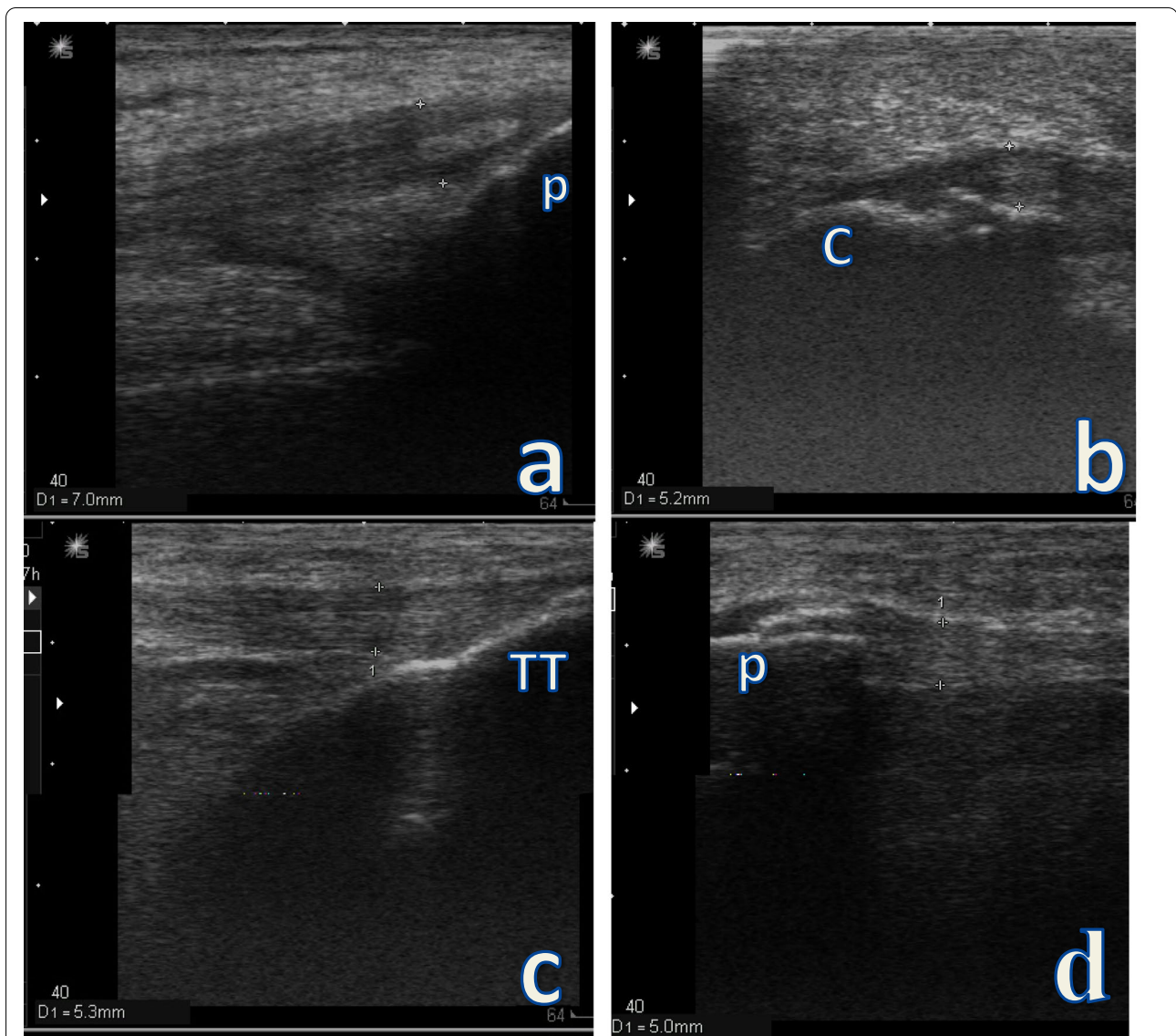


Fig. 1 **A** Longitudinal US of the quadriceps tendon in a patient with psoriasis without musculoskeletal complaints of increased thickness (7 mm) and with mild suprapatellar effusion. **B** Longitudinal US of the plantar fascia of increased thickness (5.2 mm) and enthesophyte in another patient with the same clinical condition. **C, D** Longitudinal US of distal and proximal patellar ligaments with increased thickness (5.3 and 5 mm, respectively) as well as enthesophytes at ligament insertion. p patella, C calcaneus, TT tibial tuberosity

(3 patients) or both combined (12 patients) together with current skin psoriasis (scored 2) and nail affection (scored 1). The remaining 7 from the 33 with articular inflammatory findings scored only 2 and hence could not be diagnosed as PsA.

The differences between those with subclinical PsA (26 patients) and those without (10) are shown in Tables 3 and 4. The only statistically significant difference between both groups was the mean quadriceps tendon thickness which was significantly higher in those with subclinical PsA as well as the presence of enthesophytes and bilateral

quadriceps tendon thickening which were more common in patients with subclinical PsA. Enthesophytes were found in 19/26 patients with subclinical PsA and in 3 of the remaining 10 with a statistically significant difference in distribution. As for bilateral quadriceps tendon thickening, it was found in 10 patients all of whom had subclinical PsA. Also, the mean GUESS score and mean number of thickened tendons per patient were much higher in those with subclinical PsA yet have not reached statistical significance. Sixteen patients out of the 26 with subclinical PsA (61.54%) had at least one site with bilateral tendon

Table 3 Comparison between psoriatic patients with subclinical PsA and those without

	Subclinical PsA		P
	Not diagnosed (n = 10) Mean ± SD (median)	Diagnosed (n = 26) Mean ± SD (median)	
Age	41.6 ± 15.29 (39.5)	47.8 ± 12.26 (49)	0.27
BMI	30.64 ± 5.16 (27.74)	29.54 ± 4.93 (28.52)	0.68
Disease duration	13.35 ± 10.71 (10)	12.5 ± 10.26 (8)	0.83
PASI	11.38 ± 5.97 (7.8)	13.75 ± 8.55 (13.6)	0.57
Total number of thickened tendons	1.81 ± 1.81 (1.5)	3.08 ± 2.19 (2.5)	0.09
Total number of enthesophytes	0.8 ± 1.4(0)	1.62 ± 1.3 (2)	0.13
Mean US thickness of enthesis			
• Quadriceps tendon	5.32 ± 0.45 (5.23)	5.92 ± 0.76 (5.95)	0.006*
• Proximal patellar tendon	3.77 ± 0.47 (3.65)	3.69 ± 0.55 (3.55)	0.7
• Distal patellar tendon	4 ± 0.48 (3.86)	4.06 ± 0.57 (4)	0.8
• Achilles tendon	3.84 ± 0.53 (3.78)	4.1 ± 0.57 (4.05)	0.22
• Plantar fascia	3.33 ± 0.77 (3.1)	3.35 ± 0.65 (3.25)	0.95
GUESS score	4 ± 3.77 (3.5)	6.12 ± 2.79 (6)	0.07

* P ≤ 0.05 was considered significant and was based on the Mann–Whitney test

PsA Psoriatic arthritis, BMI Body mass index, PASI Psoriasis Area and Severity Index, GUESS Glasgow Ultrasound Enthesitis Scoring System

Table 4 Distribution of bilateral quadricipital thickening and enthesophytes among psoriatic patients diagnosed with PsA and those without

		Subclinical PsA		Total	P value
		Not diagnosed (n = 10)	Diagnosed (n = 26)		
Enthesophytes	Absent	7 (50%)	7 (50%)	14	0.026*
	Present	3 (13.6%)	19 (86.4%)	22	
Bilateral quadricipital thickening	Absent	10 (38.5%)	16 (61.5%)	26	0.035*
	Present	0 (0%)	10 (100%)	10	

* P was based on Fisher's exact test

PsA Psoriatic arthritis

Table 5 Correlation between quadricipital tendon thickness and other variables

	Quadricipital tendon thickness	
	r	P
Age	0.28	0.09
Disease duration	−0.07	0.68
BMI	0.07	0.73
PASI	−0.21	0.3
Total number of thickened tendons per patient	0.6	0.000*
Total number of enthesophytes per patient	0.52	0.001*
Total GUESS score	0.67	0.000*

* P ≤ 0.05 was considered significant and was based on Spearman's test

BMI Body mass index, PASI Psoriasis Area and Severity Index, GUESS Glasgow Ultrasound Enthesitis Scoring System

thickening, and 14 patients (53.85%) had bilateral enthesophyte distribution. Bilateral tendon thickening was found among 10 patients at the quadricipital tendon and 15 and 7 patients at distal and proximal patellar tendons, respectively. As for bilateral enthesophyte distribution, it was found among 7 and 8 patients at quadricipital and Achilles tendons, respectively.

Quadricipital tendon thickness was then correlated with different factors that could affect it as shown in Table 5. The total GUESS score as well as the total number of thickened tendons or enthesophytes per patient was found to be statistically positively correlated with mean quadricipital tendon thickness and moderate strength. That is, as those variables increased, the mean quadricipital thickness increased too.

Based on findings of univariate analysis, 6 variables proved to be significantly different between the 2 groups (PsA and non-PsA) and had P values < 0.2 : the presence of enthesophytes ($P=0.02$) and quadriceps tendon thickness ($P=0.006$), bilateral quadriceps tendon thickening ($P=0.03$), GUESS score ($P=0.07$), the total number of thickened tendons ($P=0.09$), and the total number of enthesophytes ($P=0.13$). Considering multi-collinearity, 5 variables were thus introduced in a stepwise multiple regression to select variables according to their influence on developing subclinical PsA. The results revealed 2 variables to be significant predictors of subclinical PsA: the presence of enthesophytes and thickened tendon per patient as well as increasing quadriceps thickness was associated with an increased likelihood of developing subclinical PsA (OR=6.3, 4, 5.1, respectively). Results revealed that the presence of enthesophytes was the best and only predictor for developing subclinical PsA (OR=6.33, 95% CI=1.27–31.56) which indicates that the presence of enthesophytes had about 6.33-fold higher odds of developing subclinical PsA (Table 6).

Discussion

Psoriatic arthritis is an enthesitis-associated disorder rather than primary synovitic arthropathy. Several criteria have been set for diagnosing these cases, but none of them was statistically derived from a large prospective study as were the CASPAR criteria. CASPAR criteria included the presence of inflammatory articular disease (joint or enthesal) together with ≥ 3 points to be fulfilled to diagnose PsA [11]. Since all our patients were clinically free of any inflammatory articular affection, hence, our aim was to sonographically search for lower limb inflammatory joint or enthesal findings in those asymptomatic and drug-naïve psoriatic cases to find those with subclinical PsA who might be clinically recognized thereafter. The lesion of greater interest for this purpose was enthesitis. Enteses of the lower limbs were chosen in our study because they are the most involved in clinical practice and described as “more specific” for spondyloarthritis patients (SpA). The US helped depict inflammatory articular findings in 33 patients, 26 of whom had concomitant psoriatic nail affection. Those 26 patients

could be diagnosed by the CASPAR criteria as subclinical PsA as they fulfilled ≥ 3 points. Current psoriasis scored 2 which was present in all our patients and typical psoriatic nail dystrophy scored 1. The remaining 7 of those 33 with articular inflammatory findings scored only 2 because they had no psoriatic nail affection. Those 26 patients (72.22%) with subclinical PsA had enthesitis or joint effusion detected sonographically instead of clinically. The US helped reveal a high frequency of abnormal findings in asymptomatic lower limb enteses in SpA [14]. Another study carried out on psoriatic patients found at least one inflammatory lesion on the hand MRI of 47% of the studied patients [15]. This has recently been proposed that there are three clinically quiet stages after psoriasis onset and before clinically detected PsA; nevertheless, there is still a significant gap in our knowledge on how this disease should be handled at its initial stages [16].

Enthesitis is the first manifestation of psoriatic arthritis but may be asymptomatic and detected only by imaging. Ozçakar et al. found that the percentage of asymptomatic sonographic enthesopathy in psoriatic patients was 56%, but this was based on tendoachilles examination only, which could be much higher if more enteses were examined [17]. In our study, US examined 360 enteses in both lower limbs. The most common abnormality detected was enthesal thickening in 29 patients (80.55%), followed by enthesophytes in 22 patients (61.11%), and finally bursitis (suprapatellar \pm infrapatellar) which was detected in 21 patients (58.33%). Defining enthesitis by US is quite difficult because of the numerous structures that can be involved in the inflammatory process. In order to ensure a consensus, a Delphi exercise was conducted and obtained a good to a high agreement ($\geq 80\%$) on the inclusion of increased tendon thickness and enthesophytes. No agreement was obtained, however, for the inclusion of bursitis although its inclusion has been suggested by others [18].

From the clinical point of view, 10% of patients with psoriasis develop PsA over a decade [19], but from the sonographic aspect, more could be affected and with earlier onset. Another study by Tinazzi et al. followed 30 patients with psoriasis for 13 months to detect who will develop PsA and 7 out of those (23.33%) developed frank PsA, but this was still on the clinical level [20]. Another study found this frequency of PsA as high as 40% using more sophisticated techniques [21]. Yet a more recent study found that 47% of patients with psoriasis showed at least one inflammatory lesion on hand MRI and the risk to develop psoriatic arthritis among such population was as high as 60% [16]. Another study by Wang et al. carried out on 852 psoriatic patients using US detected enthesiophytes in 43.5% and joint effusion in

Table 6 Results of stepwise logistic regression analysis

		OR	Sig	95% CI for EXP(B)	
				Lower	Upper
Enthesophytes	Present	6.333	0.024	1.271	31.568
	Absent	1			

Variable(s) entered on step 1: enthesophytes

Dependant variable: PsA vs non-PsA

48%, and the quadriceps tendon was the most frequently affected site [12]. The higher percentage in the present study (72.22%) might be because the scanned joints were those of the lower limbs which are more affected than the upper limbs with the inflammatory changes. Also, all of our cases were drug-naive, where none of them has received any DMARDs or retinoids. Hence, there is an urgent need to define the predictive factors for the identification of future PsA in patients with psoriasis. In the study by Tinazzi et al. [20], the baseline thickness of the quadriceps tendon was the best independent predictor. Consequently, we compared the baseline characteristics of those 26 patients with subclinical PsA and the remaining 10. The only significant difference between both groups was in quadriceps tendon thickness by US as well as the presence of enthesophytes and bilateral quadriceps tendon thickening. As for the GUESS score and the total number of thickened tendons per patient, they were much higher in the group of subclinical PsA yet have not reached statistical significance. Quadriceps tendon thickening (≥ 6.1 mm) in our study was found in 15 patients, 13 of whom had subclinical PsA. This thickening was bilateral in only 10 patients all of whom had subclinical PsA. Quadriceps tendon thickness was then correlated with different factors. It was found to be significantly correlated with the total GUESS score, number of thickened tendons per patient (mean = 3.08), and number of enthesophytes per patient (mean = 1.62). This correlation was positive and of moderate strength. That is as those variables increased, the mean quadriceps tendon thickness increased. This common occurrence of subclinical enthesitis in patients with psoriasis is strong evidence for the primacy of this lesion. It is the primary pathology that triggers secondary joint synovitis through the release of proinflammatory mediators [22]. Also, the high prevalence of nail changes is a natural sequelae to the extensive level of enthesitis nail interdigitation at the DIP joint [22]. Given that entheses are sites of high joint stressing, it further supports the emerging concept that the link is a mechanical rather than an autoimmune one [23]. In other words, it is an aberrant response to mechanical stresses or autoinflammatory reaction that induces a primary innate immune response, resulting in tissue damage. Similarly, trauma may be responsible for skin lesions in psoriasis, which is a classic example of the Koebner response phenomenon [21].

In one study carried out on psoriatic patients with and without musculoskeletal complaints, enthesitis was found in 33.3% of the asymptomatic group and in 46.7% of the symptomatic group. Serum cartilage oligomeric matrix protein (COMP) level was also measured in both groups but without statistically significant difference

between them [24]. This elevated level of COMP in psoriatic patients suggests that there is joint involvement and cartilage breakdown even in asymptomatic cases.

Regarding enthesophytes, they were found in 19/26 patients with subclinical PsA and in 3/10 of the remaining patients ($P < 0.05$). Entesophytes may be the end stage of inflammation or may relate to other pathologies such as trauma or degenerative changes [9]. Nevertheless, all patients with enthesophytes in this study had enthesal thickening. Also, it was found to be the best and only predictor for developing subclinical PsA in our study. A definition was proposed that included tendon thickening as signs of acute US enthesitis and included erosions, and enthesophytes as signs of chronic enthesitis [17]. Moreover, in 2005, the Outcome Measures in Rheumatology (OMERACT) US Task Force included the presence of enthesophytes in the definition of enthesopathy. There is extensive evidence to suggest that the stimulus for the formation of bony spurs is mechanical due to microtrauma. Therefore, enthesopathy is more common in the lower than the upper limbs and most typical of the plantar fascia and Achilles tendon [25].

The total GUESS score in our patients ranged between 0 and 11 with a mean of 5.53 ± 3.19 , which is comparable to another study (7.9) studying cases without musculoskeletal complaints as well. PsA varies in its clinical presentation from mono-oligoarthritis to symmetric polyarthritis, but in longstanding disease, the symmetric pattern is the most prevalent [26]. In fact, this asymmetry may be a relative asymmetry as the clinical examination is an insensitive tool for identifying articular involvement. The use of US in this study highlighted this symmetry where 16 patients out of the 26 with subclinical PsA (61.54%) had at least one site with bilateral tendon thickening and 14 patients (53.85%) had at least one site with bilateral enthesophyte. Also, bilateral quadriceps tendon thickening was found in 10 patients, all of whom were finally diagnosed as PsA.

The identification of predictors of PsA development in psoriatic patients is a recognized unmet need which needs further exploration.

Conclusion

US was more sensitive than clinical examination in detecting lower limb subclinical inflammatory articular manifestations in psoriatic drug-naive patients without arthritic complaints. Hence, it is more sensitive in detecting subclinical psoriatic arthritis and helps identify patients at risk of developing PsA. Entesophytes were found to be the best and only predictor for developing subclinical PsA in our study.

Limitations

A major limitation of this study was the small sample size of psoriatic patients, but this could not be overcome because of the inclusion criteria requiring the absence of any musculoskeletal complaint together with the inclusion of drug-naive patients only.

Future research

Comparison between sonographic musculoskeletal findings among psoriatic patients before and after initiation of treatment, to see the ability of treatment of skin disease in controlling the subclinical arthropathy and delaying its evolution into inflammatory articular phase.

Abbreviations

PsA: Psoriatic arthritis; CE: Clinical examination; US: Ultrasound; CASPAR: Classification Criteria for Psoriatic Arthritis; PASI: Psoriasis Area and Severity Index; BMI: Body mass index; GUESS: Glasgow Ultrasound Enthesitis Scoring System; COMP: Cartilage oligomeric matrix protein; OMERACT: Outcome Measures in Rheumatology.

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Authors' contributions

S.M.S.: clinical examination, statistical analysis, and writing the manuscript. T.G.: sonographic examination and revision of the manuscript. R.M.G.: dermatological assessment and revision of the manuscript. The authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This work had been approved by the ethical committee in the Faculty of Medicine, Alexandria University, Egypt (IRB No: 00007555-FWA NO: 00015712), and all patients had signed written informed consent. The present work had been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Department of Physical Medicine, Rheumatology, and Rehabilitation, Faculty of Medicine, Alexandria University, Medaan El-Khartoom Square, Al-Azaritah, Alexandria, Egypt. ²Department of Diagnostic Radiology, Faculty of Medicine, Alexandria University, Medaan El-Khartoom Square, Al-Azaritah, Alexandria, Egypt. ³Department of Dermatology, Faculty of Medicine, Alexandria University, Medaan El-Khartoom Square, Al-Azaritah, Alexandria, Egypt.

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