Research Article

Early Detection of Spondyloarthropathy in Psoriatic Patients

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Abstract

Objective: To assess the ability of ultrasonography and MRI to detect arthritis, enthesitis, and spondylitis in patients with psoriasis and to cmpare those with clinical examination and conventional radiography. **Methods**: Fifty patients with psoriasis were examined by means of US, MRI, x-ray, and clinical assessment. Each joint of the ٢nd–٥th finger (metacarpophalangeal joints, proximal interphalangeal [PIP] joints, and distal interphalangeal [DIP] joints) and ١st–٥th metatarsophalangeal joints of both hands and feet were assessed with US for the presence of synovitis, bone erosions, bone proliferations, and power Doppler signals, as well as five entheseal sites in both lower limbs. Forty nine patients underwent STIR MRI of lumbosacral spine and sacroiliac joints. **Results**: Abnormal US findings were seen in ٩/٥٠ patients, while only ٣ patients had X-ray abnormalities. Thirty seven patients (٧٤٪) had GUESS ≥ ١ at a higher percentage than tenderness revealed by clinical examination (٤٦٪). Fourteen patients had inflammatory back pain (٢٨٪), Magnetic resonance imaging demonstrated evidence of inflammation in the spine in ٢١(٤٢٪) patients and sacroiliitis in ٢(٤٪) patients. **Conclusions:** Musculoskeletal US proved valuable as simple, non invasive tool in detecting synovium abnormalities in the fingers and toes of patients with suspected PsA than X-ray. There is high incidence of subclinical enthesopathy documented by ultrasonography in patients with psoriasis and PsA. The application of MRI to the spine or sacroiliac joints in psoriatic arthritis is especially helpful since MRI identifies lesions in the sacroiliac joints and the spine much earlier than can be detected on radiographs.

Key words: Ultrasonography, X-ray

Introduction

Psoriasis is a common inflammatory skin disease characterized by abnormal keratinocyte proliferation and differentiation, increased angiogenesis and inflammation (Hampton et al., ٢٠٠٧).

Psoriasis can be associated with a form of spondyloarthropathy, known as psoriatic arthritis (PsA) (Gisondi et al., ٢٠٠٨).

Psoriatic arthritis is a heterogeneous disease that occurs in ٥–١٧٪ of patients with psoriasis (O'Neill and Silman, ١٩٩٤).

The study of psoriatic arthritis is difficult and has lagged behind the study of other arthropathies (Helliwell and Taylor, ٢٠٠٥). Psoriasis may precede, occur simultaneously, or follow the onset of arthritis (Helliwell and Wright, ١٩٩٨). In the latter case, the patient may be mistakenly diagnosed as having an inflammatory arthritis other than PsA.

In addition to peripheral arthritis, people with psoriasis are also more likely to develop an inflammatory spinal disease similar to ankylosing spondylitis. The inflammatory spinal disease may be indistinguishable from ankylosing spondylitis but may differ from the classic disease in several respects (Helliwell and Taylor, ٢٠٠٥).

Initially, PsA was considered to be a mild, non-progressive disease compared with rheumatoid arthritis (RA). However, accu-

mulating evidence confirms that a substantial pro-portion of patients with PsA have persistent inflammation, develop progressive joint damage and disability and have reduced life-expectancy (Gladman et al., ١٩٩٥).

Improved therapy options and knowledge of the importance of early initiation of aggressive treatments to optimize long-term outcome in patients (Landewe et al., ٢٠٠٢). have led to an increasing focus on developing new sensitive diagnostic and monitoring tools.

Musculoskeletal ultrasound (MSUS) has become an established imaging technique for the diagnosis and follow up of patients with rheumatic diseases (Grassi and Cervini, ١٩٩٨).

US proved effective in demonstrating PsA involvement of joints and tendons and was more sensitive than clinical examination in detecting pathology (Milosavljevic et al., ٢٠٠٥). And it is more sensitive than plain radiography in detecting structural damage in joints (Kane, ٢٠٠٥).

MRI is very sensitive for early detection of sacroiliitis in SpA. Williamson and coworkers (٢٠٠٤) showed that MRI-diagnosed sacroiliitis was present in ٣٨٪ of a group of unselected PsA patients and was not necessarily associated with a clinical history of inflammatory back pain or positive sacroiliac provocation tests. The MRI changes included bone oedema, sacroiliac erosions and the more chronic changes of periarticular fat accumulation and sclerosis.

Material and Methods

Fifty patients (٢١F and ٢٩M; mean age ± SD of ٤٤.٨ ± ١٧.٥ years) with skin psoriasis were included in this study. They were consecutively recruited from the outpatient clinic of Dermatology Department El-Minia University Hospital. Patients were diagnosed by a dermatologist and suspecious cases were confirmed by skin biopsy.
According to the presence or absence of arthritis we subdivided our study population into:

- Group (A): ″ Patients with arthritis on clinical examination″ Eleven patients are represented in this group (٢٢٪).
- Group (B): ″ Patients without arthritis on clinical examination″ Thirty nine patients (٧٨٪).

Clinical assessment was performed in all patients by a rheumatologist. All patients were subjected to full history taking, complete clinical examination including general and locomotor examination. The skin lesions were evaluated using the psoriasis area and severity index (PASI) score.
Plain x ray to both hands, wrists, feet, lumbar spine, and sacroiliac joint in different radiologic positions

- Ultrasonographic examination to the following:
* Bilateral ٢^{nd}–٥^{th} metacarpo-phalangeal (MCP), proximal inter-phalangeal (PIP), and distal inter-phalangeal (DIP) joints and ١^{st}–٥^{th} metatarsophalangeal (MTP) joints examined, and scored according to the scoring system proposed by Szkudlarek and colleagues (Szkudlarek et al., ٢٠٠٣). B-mode and power Doppler US was performed using Picus ٤D by means of a ٧-١٢.٥ MHz linear array transducer.

In all PsA patients, ultrasonographic examination of the joints was done within two days of clinical evaluation. The time required for examination of both hands and feet was ~ ٣٠ min.

Joint effusion, synovitis, bone erosions, and power Doppler signal in the synovial membrane of the preselected joints were evaluated and classified on ٤-grade semiquan-titative scales.

* Sites of enthesopathy in the lower limbs including superior and inferior poles of the patella, tibial tuberosity, Achilles tendon enthesis, and plantar aponeurosis enthesis, and scored according to Glasgow Ultra-sound Enthesitis Scoring System (GUESS) (Balint and Sturrock, ٢٠٠١).

Each tendon was scanned in both the longitudinal and transverse planes. Knee

enthesis examination was performed with the patient in the supine position and the knee flexed at ٧٠ degrees. The Achilles tendon and the plantar aponeurosis were examined with the patient lying prone and the feet hanging over the edge of the examination table at ٩٠ degrees of flexion.

- MRI: Lumbar spine and sacroiliac joint.

All patients recruited in our study were undergo MR imaging which performed with SiGNA profilex ٠.٢ tesla GE medical systems machine using spine phased-array coil. Imaging was done in supine position after routine patient preparation, including patient instruction to remove all metallic objects.

١- Sacroiliac joints: Coronal oblique STIR plane parallel to the anterior sacrum.
٢- Lumber spine: Sagittal STIR plane was the main plane of imaging.

- STIR sequence using the following parameters (TR: ٤٠٠٠ ms; TE: ٣٠ ms; FOV ٣٢; Slice thickness ٤mm, spacing ٠.٥; Inv. Time ٦٠ sec; echo train length ١٥)

Imaging analysis:

Images were analyzed for detection of structural changes including (erosion, sclerosis and ankylosis) and inflammatory changes including (bone marrow edema and effusion) of the sacroiliac joints. Regarding the erosion, subcondral sclerosis and bone marrow edema the changes were reviewed at both iliac side and sacral side of the joint.

Results

Demographic and clinical data of our study population are illustrated in table (١).

Table (١): Demographic and clinical data of our study population

	Range	Mean±SD
Age (years)	١٧ - ٧٥	٤٤.٨ ± ١٧.٥
Duration of psoriasis (years)	٠.٥ - ٤٠	٨.٧ ± ٨.٧
Duration of rheumatic complaint	٠ - ١٥	١.٩ ± ٣.٣
PASI score	٠.٤ - ٣٦.٧	٦.٩ ± ٧.٨
Nail score	٠ - ٢٤	٤.٨ – ٦.٥
RAI	٠ - ٣٠	٤.٢ ± ٦.٤
HAQ	٠ – ١.٥	٠.٢ ± ٠.٣
Enthesopathy index	٠ - ١١	١.٨ ± ٢.٨

Group A patients were ٨(١٦٪) males and ٣(٦٪) females, who had duration of psoriasis of ٧.٠٥±٧.٨ years, a PASI score of ١٠.١±٧.٣, RAI of ١١.٨±٧.٩, HAQ of ٠.٥ ±٠.٤, and enthesopathy index of ٤.١±٣.٨. Inflammatory LBP was present in ٦/١١ patients and ٢/١١ patients had clinical sacroiliitis.

Peripheral joint examination by US revealed abnormal findings suggestive of PsA in ٧/١١ patients in the form of joint effusion in ٤ patients, in one patient the joint effusion was the only US abnormality, ٤ patients had synovitis, ٤ had erosions, and ٥ showed an increased vascularity on PDS, three patients also had one or more X-ray abnormalities.

The clinical characteristics of Group B subjects are reported in Table ٢ as mean ± SD. They were ٢١ men and ١٨ women, with a slightly but not significantly lower PASI score compared with Group A

patients (p= ٠.٠٦). Their disease duration was comparable to that of Group A.

Two patients showed abnormal US findings in the form of synovitis, erosions and increased vascularity on PDS, with no X-ray abnormalities.

Table (٢): The clinical characteristics of patients with and without arthritis

	Group (A)	Group (B)	P value
Age (years)	٤٢.٤٦±٢٠.٨٣	٤٥.٤٤±١٦.٦٣	٠.٦٢
PASI	١٠.١٥±٩.٧٤	٦.٠٧±٧.٠٤	٠.٠٦
Mean duration of psoriasis (yrs)	٨.١٤±٧.٦٧	٨.٨٦±٩.٠٤	٠.٨١
Nail Score	٧.٩١±٨.٨١	٣.٩٢±٥.٥٨	٠.١١
HAQ	٠.٤٩٩±٠.٤٣	٠.٠٧٦±٠.٢٢	٠.٠٠*
RAI	١١.٨٢±٧.٩٩	٢.١٠±٣.٨١	٠.٠٠٠*
Enthesopathy index	٤.٠٩±٣.٨١	١.١٨±٢.٠٨	٠.٠١*
LBP	٦ (٥٤.٥٪)	٨ (٢٠٪)	٠.٠٥*
Clinical sacroiliitis	٢ (١٨.٢٪)	٦ (١٥.٤٪)	٠.٩٩

T-test was done
Group (A): ″ Patients with arthritis on clinical examination″
Group (B): ″ Patients without arthritis on clinical examination″

In both groups MCP joints were the most frequently involved joint by US (٨ patients) followed by MTP joints (٤ patients) and PIP joints (٣ patients) and lastly DIP joint (١ patient).

When the PDS findings in patient joints were compared to clinical assessment (swollen and/or tender joints), PDS identified a total of ٢٤ joints with Doppler signal, ١٧ of which were clinically normal.

Enthesitis was detected by US in thirty seven patients (٧٤٪) at a higher percentage than tenderness revealed by clinical examination (٤٦٪). Group (A) patients had higher mean GUESS (٦±٤.٤) than group (B) ٣.٦±٣.٤ (mean ± SD). There was a statistically significant association between arth-ritis and clinical enthesitis (Table ٣ and figure ١).

Table (٣): Significance of enthesopathy index in group A and group B

Enthesopathy Index Mander et al., (١٩٨٧)	**Group (A)**	**Group (B)**	X^2	P
٠	٣ [٢٧.٣٪]	٢٤ [٦١.٥٪]	٤.٠٦	٠.٠٤٤*
≥١	٨ [٧٢.٧٪]	١٥ [٣٨.٥%]		

Chi square test was done.
* Significant P-value <٠.٠٥

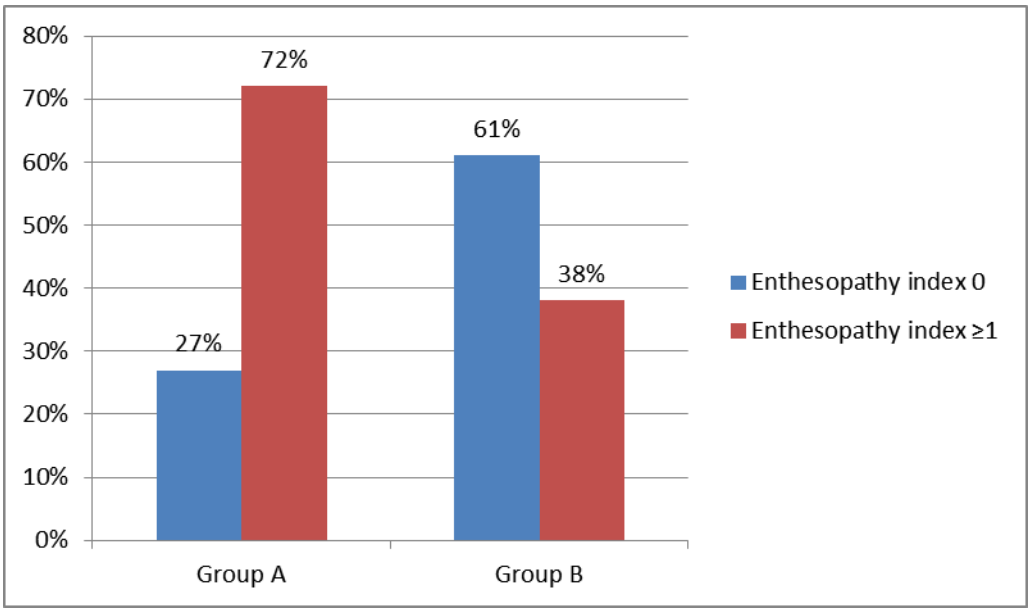

Figure (١): Percentage of enthesopathy index in group A and group B

Group (A): ″ Patients with arthritis on clinical examination″
Group (B): ″ Patients without arthritis on clinical examination″
GUESS score was not correlated with age, duration or severity of psoriasis according to the PASI index (r = ٠.٠٢, P = ٠.٩) (Table ٤).

Table (٤): Correlation between GUESS and other clinical data

	GUESS score	
	r	p
Age	٠.٢	٠.٢
Duration of psoriasis	٠.٠٢	٠.٩
PASI score	٠.٠٢	٠.٩
Nail score	٠.١٤	٠.٣
Enthesopathy index	٠.٣٢	٠.٠٣*
RAI	٠.٣	٠.٠٣*
HAQ	٠.٣	٠.٠٢*

Pearson correlation

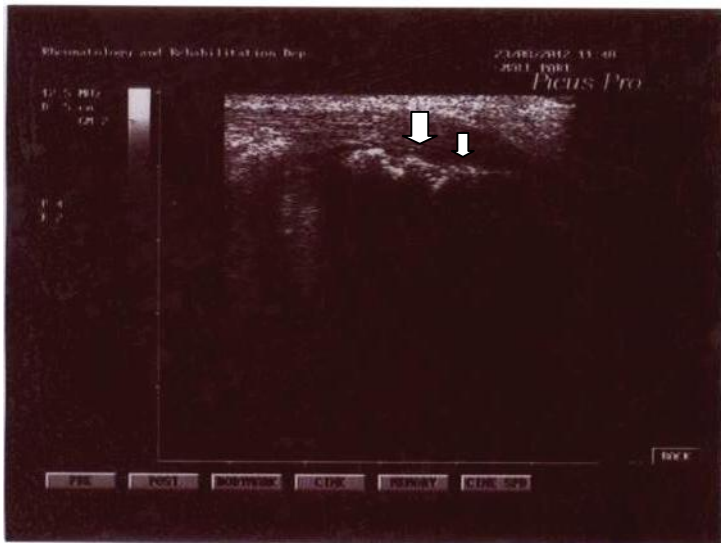

Fig. (٢): Right tendoachillis showing multiple erosions and retroclacaneal bursitis

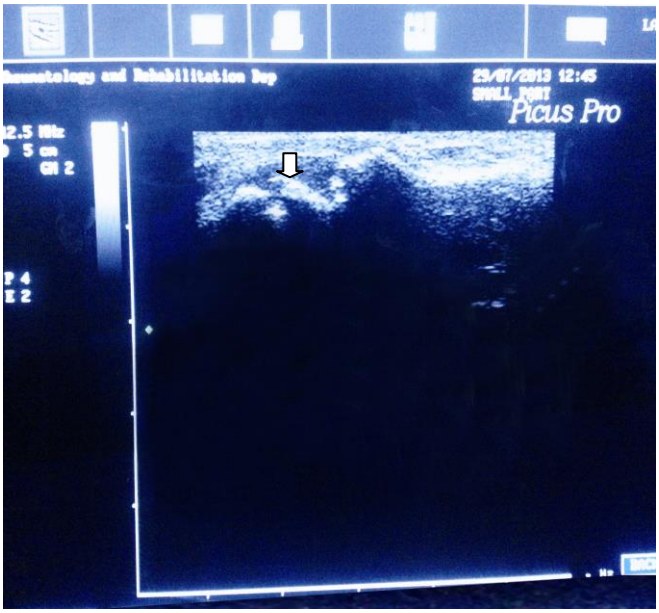

Fig. (٣): Rt MCP joint showing erosion

Fourteen patients had inflame-matory back pain (٢٨٪), ٨ males and ٦ females; their mean age was ٣٨.١ ± ١٤.٧ years. Clinical features of sacroiliitis were found in ٨/٥٠ (١٦٪) patients. Limitation of lumber mobility in ٢ planes was found in ١٠ (٢٠٪) patients.

There was a statistically significant difference between group A & B as regard presence of LBP, Schober test, lateral flexion test, and sacroiliitis by MRI (Table ٥)

Table (٥): Axial affection in group A & B

		Group A	Group B	X^2	P value
Schober test	**Normal**	٥ (٤٥.٥٪)	٣٢ (٨٢.١٪)	٥.٩٧	٠.٠٢*
	Abnormal	٦ (٥٤.٥٪)	٧ (١٧.٩٪)		
Lateral flexion test	**Normal**	٥ (٤٥.٥٪)	٣٣ (٨٤.٦٪)	٧.٢١	٠.٠١*
	Abnormal	٦ (٥٤.٥٪)	٦ (١٥.٤٪)		
MRI diagnosed sacroiliitis	**Normal**	٨ (٧٢.٧٪)	٣٩ (١٠٠٪)	١١.٣٢	٠.٠٠٨*
	Abnormal	٣ (٢٧.٣٪)	٠		
MRI - LSS	**Normal**	٦ (٥٤.٥٪)	٢٣ (٥٩٪)	٠.٦٩	٠.٥
	Abnormal	٥ (٤٥.٥٪)	١٦ (٤١٪)		
X ray-LLS	**Normal**	٨ (٧٢.٧٪)	٣٥ (٨٩.٧٪)	٢.٠٦	٠.١٧
	Abnormal	٣ (٢٧.٣٪)	٤ (١٠.٣٪)		

Chi square test was done.
*Significant P-value <٠.٠٥
LSS = Lumbosacral spine

Magnetic resonance imaging demonstrated evidence of inflamemation of the central part of the vertebral end plates as well as vertebral corners in ٢١(٤٢٪) patients, of whom ٨(٣٨.١٪) had inflammatory LBP. Among those patients ٧(٣٣.٣٪) had abnormal Schober test and ١٤(٦٦.٧٪) are normal (p=٠.٠٠٨).

MRI diagnosed sacroiliitis was present in ٢(٤٪) patients, both had inflammatory BP (p=٠.٠١٧). Of the abnormal scans, one patient had subchondral bone marrow oedema bilaterally and the other had effusion of one sacroiliac joint. Another patient had bilateral sacroiliitis grade ٣ on plain radiography, but he didn't proceed to MRI. There was no association between clinical features of sacroiliitis and MRI changes.

All patients with radiologic sacroiliitis are in group A and have GUESS ≥ ١.

a) b)

Fig. (٧):
a) MRI sacroiliac joint (coronal STIR sequence) showing bone marrow oedema bilaterally (asymmetric involvement), **b)** Normal plain X ray of the same patient.

Discussion

The heterogeneous clinical manifestations and course of PsA make diagnosis particularly elusive. Since PsA arises most frequently after or concomitantly with psoriasis, and since early diagnosis and treatment can prevent progression and disease-related disability, dermatologists and rheumatologist need to be alert to its early changes and to be aware of its clinical and imaging characteristics (De simone et al., ٢٠١١)

The present study was conducted on ٥٠ patients with psoriasis. Thirty seven patients had rheumatic complaints (٧٤٪), ١١ patients had arthritis on examination (٢٢٪), in ٧ out of ١١ patients US showed findings consistent with synovitis in at least one finger and/or toe. Four patients had US but no X-ray finding. X-ray evaluation disclosed structural damage in ٣ patients who also had US abnor-malities and whose disease duration was more than ٢ years. A larger number of abnormalities (erosions, synovitis, effusion, and PDS) that were eventually diagnosed as PsA were found on US examination than on plain radiographs.

The findings of our study confirm previous reports of the ability of US to depict inflammatory and destructive changes in the fingers and toes of PsA patients (Milosavljevic et al., ٢٠٠٥; Wiell et al., ٢٠٠٧).

The results of our study are also in agreement with that of De simone et al., (٢٠١١) who investigated ٥٢ patients with psoriasis and joint pain for the presence of ultrasonographic abnormalities in fingers and toes. They found US findings suggestive of PsA in ٣٦/٥٢ patients, ١١ also had one or more X-ray abnormalities. They found patients with positive findings at higher percentage than our study because they selected patients with joint pain, while we investigated patients with psoriasis, not PsA.

Our study found that entheseal abno-rmalities can be documented by ultra-sonography in ٧٤٪ of patients with psoriasis, while clinical examination detected enthesitis in only ٤٦٪. The results of our study are in agreement with De Filippis et al., (٢٠٠٥) who found that entheseal abnor-malities not detected at clinical examination were present in ٣٣٪ of patients with psoriasis who underwent US examination.

Similarly and in agreement with that of Bandinelli et al., (٢٠١٣) who investigated

٩٢ patients with early psoriatic arthritis for the presence of clinical or ultrasonographic abnormalities at entheseal sites of lower limbs using Glasgow Ultrasound Enthesitis Scoring System (GUESS) and Power Doppler (PD) US. They found that all patients had GUESS>١ and ٤٠.٢٪ showed positive PD signal on entheses, versus ٢٩.٣٪ on clinical examination. They also found that GUESS and PD did not correlate with PASI or other clinical characteristics, which was similar to our findings.

Although our study was conducted on patients with psoriasis, not PsA, our results were in concordance to that of Bandinelli and coworkers who investigated patients with psoriatic arthritis.

The findings of our study are supported by that of Gisondi et al., (٢٠٠٨) who found that the mean GUESS score was significantly higher in patients with psoriasis as com-pared with controls. Similarly, Ozcakar et al., (٢٠٠٥) found that the mean thickness of the Achilles' tendon was signi-ficantly higher in patients with psoriasis (without clinical sign of enthesitis) than in healthy volunteers. Achilles sonographic abnor-malities in ٣٥ of ٥٩ patients with psoriasis (٥٩.٢٪) were also reported by De Simone et al.,. (٢٠٠٣). However, they included ١٥ patients with PsA in their study.

Our study, found that MRI changes in sacroiliac joint were present in ٢ out of ١١ patients with PsA (١٨.٢٪) who had no X-ray changes. Another patient had bilateral sacroiliitis on plain radiography, but he didn't proceed to MRI. All ٣ patients had peripheral arthritis and enthesitis by ultrasonography. The presence of inflammatory back pain and restricted spinal movements were the most significant clinical features associated with sacroiliitis on MRI.

The results of our study are in agreement with that of Williamson et al.,. (٢٠٠٤) who investigated ٦٨ patients with psoriatic arthritis for the presence of MRI changes in SIJ. They found that the frequency of MRI-diagnosed sacroiliitis was high (٣٨٪). Although they invited ١٤٤ patients with PsA to participate in the study, only ٦٨ (٤٧٪) proceeded to MRI of the sacroiliac joints. These patients were not selected for the presence of clinically apparent sacroiliitis or axial disease, but there may have been some bias caused by patients with back pain being more likely to consent to MRI.

Similarly, Ibrahim and El-Shazly (٢٠١١) found that MRI changes in sacroiliac joint were present in ٦ out of ١٨ patients with PsA with asymptomatic sacroiliac involvement (٣٣.٣٪).

The frequency of sacroiliac joint involvement by MRI in our study population was very low. This may be due to small number of studied patients. Moreover, bone marrow edema may disappear with treatment.

Sacroiliac provocation and stress tests are widely used in clinical practice but their reliability has been questioned (Dreyfuss et al., ١٩٩٦). In our study, the presence of positive sacroiliac pain provocation tests did not expect sacroiliitis on MRI. In patients with psoriatic arthritis, these tests may also be confounded by presence of skin lesions over the sacrum and large joint arthritis in hips and knees. This agrees with Williamson et al., (٢٠٠٤) who found that neither a clinical history of inflammatory back pain nor the presence of positive sacroiliac pain provocation tests predicted sacroiliitis on MRI. The lack of association between clinical and MRI findings implies that sacroiliac symptoms and signs relate to abnormalities that are not detected on MRI, and that there may be sources of pain other than marrow oedema and cartilage erosion.

Psoriatic nail involvement was reported to be associated with the development of psoriatic arthritis (Veale and Fitzgerald, ٢٠٠٢), but there was no association between nail involvement and sacroiliac involve-ment in our study. This agrees with Ibrahim and El-Shazly (٢٠١١).

There have been no MRI studies of the rest of the spine specifically in PsA, but in

ankylosing spondylitis Braun and coworkers (٢٠٠٣) determined that MRI bone oedema at vertebral margins was an indicator of disease activity.

In the present study MRI of LSS demonstrated evidence of inflammation of the central part of the vertebral end plates as well as vertebral corners in ٢١(٤٢٪) patients, this was significantly correlated with the presence of inflammatory LBP, however it was not correlated with the presence of arthritis, duration or severity of psoriasis.

Direz et al., (٢٠١٠) studied ٩٣ patients with non-radiographic axial spondyloarthritis (NRASpA) without active sacroiliitis on MRI and concluded that spinal MRI may allow the diagnosis of SpA in about ٢٥٪ of patients.

Further longitudinal studies are needed in this area to confirm if these lesions in the spine appear earlier than sacroiliitis or not. And if it is subclinical or predisease status, how many patients will develop PsA, and the clinical characteristics of this group of patients.

Conclusions

Musculoskeletal US proved valuable as simple, non invasive tool in detecting synovium abnormalities in the fingers and toes of patients with suspected PsA than X-ray. There is high incidence of subclinical enthesopathy documented by ultra-sonography in patients with psoriasis and PsA. The application of MRI to the spine or sacroiliac joints in psoriatic arthritis is especially helpful since MRI identifies lesions in the sacroiliac joints and the spine much earlier than can be detected on radiographs.

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