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Research Paper

Detection of Asymptomatic Enthesopathy by Ultrasonography in Psoriatic Patient

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ABSTRACT:

BACKGROUND:

The psoriatic arthritis considered a commonest related systemic symptom of psoriasis and asymmetric oligoarthritis of the smaller joints of the feet and hands being the major presentation.

OBJECTIVE:

To study value of musculoskeletal (MSK) ultrasonography of small enthesis of the hands in detection of asymptomatic enthesopathies in patient with psoriasis.

PATIENTS AND METHODS:

This is a cross-sectional analytic study included 35patients of either gender (16 Male, 19 Female) with confirmed diagnosis of psoriasis. The high-resolution MSK ultrasound assessment was performed and three entheses of hand: Extensor digitorum communis (EDC), Flexor digitorum superficialis (FDS), and Extensor pollicis brevis (EPB) were scanned in longitudinal and axial planes

RESULTS:

MSK ultrasonography of hand entheses shows enthesitis in 68.5% of psoriatic patients and 43.8% of total entheses sites.

The most frequently involved enthesis site was proximal insertion of Extensor digitorum communis tendon (EDC) followed by proximal insertion of Flexor digitorum superficialis (FDS) and Extensor pollicis brevis (EPB) tendons. The ultrasound element of hypoechogenicity was the most frequently noticed followed by enthesophytes, calcification, entheseal thickening, least likely seen parameter was bony erosion. No power Doppler vascularity was seen in all examined enthesis sites.

CONCLUSION:

Ultrasound examination of functional entheses at hand level is a useful tool in detection of subclinical abnormalities of psoriatic arthropathy. Ultrasound images can clearly document elementary component of enthesopathy in form of hypoechogenicity, calcification, tendon thickening enthesophyte, and bony entheseal erosions.

KEYWORDS: enthesopathy, ultrasonography, psoriatic.

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INTRODUCTION:

The enthesis is defined as a location in which tendon, ligament, or joint capsule inserts into the bone in order to facilitate movement of the joint ⁽¹⁾. Enthesopathy represent pathologies involving the tendon, joint capsule and ligament insertions ⁽²⁾. Enthesopathy is the main feature of spondyloarthopathies. Several studies by Niepel et al. starting in 1966 were contributing to the initial clinical evaluation of enthesopathy, including assessment of anatomic involvement, clinical signs and symptoms, radiological evaluation and histopathological assessment ⁽³⁾.

Patients with psoriatic arthritis can have involvement of juxta-articular tendons (tendonitis) and the sites where they insert into bone (enthesitis) as well as swelling of the fingers (dactylitis). Enthesitis and dactylitis have been reported in ~20% and 15–30%, respectively, of patients with possible or definite psoriatic arthropathy. In psoriatic patients, nail involvement consider a strong predictor of concomitant psoriatic arthritis ⁽⁴⁾. The diagnosis of patients with psoriatic arthritis (PsA) can be delayed because the majority of patients presented other symptoms and not that of arthritis.⁽¹⁶⁾ Delayed diagnosis of PsA is

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associated with deterioration in physical function, with increased incidence of diabetes mellitus, cardiovascular disease, and metabolic conditions which are aggravated or precipitated by the persistent of inflammation in untreated PsA⁽⁵⁾. Early diagnosis of PsA is important, as disease progression often results in loss of function and irreversible joint destruction.⁽⁶⁾

Ultrasonography examination has been considered as a reliable test used for the diagnosis of enthesitis and considered superior to clinical assessment, conventional x-ray, and magnetic resonance imaging (MRI), especially in the early stages of disease ⁽⁷⁾. Also Ultrasound (US) demonstrated high sensitivity, reliability and low costs in early assessment of enthesopathy ⁽⁸⁾. It is fast, easy to use, can examine the patient at bedside, and the preferred modality among most radiologists ⁽⁹⁾. In addition US can demonstrate tendons in different positions (static and dynamic), can do examination of many joints in different angles ^(8, 10). Also US can be used to monitor response of patient to treatment ⁽¹¹⁾. US can demonstrate the enthesis abnormalities which include thickening of the tendon, loss of normal tendon pattern (hypoechogenicity with fibrillar pattern), erosions of bone, focal calcifications, and enthesophytes, these findings can be seen in psoriatic patients with skin manifestations and no clinical evidence of psoriatic arthritis^(7, 12, 13).

AIM OF THE STUDY:

In order to demonstrate the value of ultrasonography in detection of asymptomatic enthesopathies of hand small enthesis in patient with psoriasis.

PATIENTS AND METHODS:

This is a cross-sectional analytic study which was conducted at Al-Imamain Al-Kadhemain Medical City from June 2021 to February 2022. Thirty-five patients of either gender (16 Male, 19 Female) were studied and chosen from those attending the Department of dermatology with diagnosis of psoriasis according to clinical history and examination. Their ages range between (20-50 years) with a duration of psoriasis symptom in range of (1-20 year).

Inclusion Criteria: adult patients with clinically established diagnosis of psoriasis. **Exclusion criteria:** patients with previous history of hand surgery or trauma or local injection in the examined areas, patients with other rheumatological diseases, patient with other dermatological diseases, malignancies, gout, infections, psoriatic patient with obvious arthritis and enthesitis or dactylitis and patient on treatment for psoriatic arthritis.

Ethical consideration: The study was approved by local scientific committee of the Arab board of Medical Specializations. An oral consent from all participants was obtained.

General Examination: a detailed clinical history including age, gender, occupation, family history, drug history and clinical data of psoriasis that include: type of psoriasis, duration of psoriasis and nail involvement also were collected.

MSK ultrasound Examination protocol: high resolution MSK ultrasound examination was done using General Electric (GE) system (voluson E6, GE healthcare, USA); using 6 to 18 MHz linear transducer with 10 MHz Doppler frequency. All the patients were examined by US applying the protocol adopted by Balint et al. (74). Examination was done in longitudinal and axial planes for the following three entheses: Flexor digitorum superficialis tendon insertions into the proximal phalanx of 4th digit. The tendon insertion of the extensor pollicis brevis at base of thumb proximal phalanx, Extensor digitorum communis tendon insertion into the extensor expansion of index finger.

Image analysis and interpretation: grayscale image was applied to detect any morphological or structural abnormality, then power Doppler technique was applied for detection of any abnormal blood flow, according to the criteria adopted by the Outcome Measures in Rheumatology (OMERACT) Ultrasound Task Force ⁽¹⁴⁾.

Criteria for abnormal enthesis according to definition **OMERACT** 2014 include: Hypoechogenicity: lack of the homogenous fibrillar pattern, Increased thickness at the site of tendon insertion, Enthesophyte, Calcification, Doppler signal and erosion at the site of enthesis less than 2mm near bony cortex (should be at enthesis not artifact or nutrient artery with or without cortical irregularity, erosion or enthesophyte). So the diagnosis of enthesitis was considered when there at least one of the above mentioned US findings.

Statistical Analysis: all statistical analyses were performed using SPSS statistical software, version 25. The data were tabulated in the form of quantitative variables as mean \pm standard deviation and analyzed with independent student t test. Categorical variables were represented in the form of number and percentages and were

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analyzed with chi square test. Data correlations between age and disease duration with other conduction parameters was done using the 2 tailed Pearson's correlation analysis. A p value of less than 0.05 was considered significant.

RESULTS:

Present study included 35 patients with clinical diagnosis of psoriasis. The patient's mean age was 36.74 ± 9.52 SD years (20-50 years), 19 patients (54.28%) were females while 16 patients (45.72%) were males with female: male ratio of 1.18:1. The mean duration of psoriasis symptom was $7.8\pm$ 4.78 years (1-20 year), with mean Body mass index was 31.05 ± 5.06 kg/m2 (18.5-39.9).

Ultrasonography data: MSK ultrasonography examination of hand show 1 or more of the followings abnormalities (thickening of the enthesis, hypoechogenicity, enthesophytes, bony erosions, calcification, and abnormal blood flow in power Doppler (PD)) in at least 1 entheses in 24 (68.5%) patients while 11 (31.43%) patients showed no abnormality.

A total of 105 enthesis sites (3 sites in 35 patients) were examined by ultrasound, 46/105 (43.8%) show abnormal findings. Of the affected enthuses shown in Table 1, proximal insertion of Extensor communis digitorum (EDC) tendon into the extensor expansion (MCP) of index finger was the most commonly affected 19 (41.3%) with at least 1 abnormal US finding, followed by proximal insertion of Flexor digitorum superficialis (FDS) tendon into the proximal phalanx (MCP) of 4th digit 16 (34.7%) and insertion of tendon of extensor pollicis brevis (EPB) at base of the thumb proximal phalanx 11(23.9%)..

Enthesis site (n)	Number of abnormal enthesis (%)
EDC (35)	19 (41.3%)
FDS (35)	16 (34.7%)
EPB (35)	11 (23.9%)
Total (105)	46 (43.8%)

Table 1: Anatomical distribution of abnormal enthesis sites.

Table (2) demonstrate that among Ultrasound finding of enthesitis on 3 enthesis sites (EDC, FDS and EPB tendons insertions) of 35 psoriatic patients the elements of hypoechogenicity was the most frequently involved followed by enthesophytes,

calcification and entheseal thickening, the least likely involved parameter was bony erosion and no power Doppler abnormality was seen in all examined enthesis sites.

at the nanu entheses in patients with psoriasis.					
Ultrasound finding	EDC	FDS	EPB		
	No. = 35	No. = 35	No. = 35		
Hypoechogenicity	16 (44.4%)	13(36.1%)	7(19.4%)		
Enthesophytes	12(33.3%)	9(25%)	5(13.8%)		
Calcification	10(27.7%)	8(22.2%)	4(11.1%)		
Thickening	7(19.4%)	4(11.1%)	3(8.3%)		
Bony erosion	2(5.5%)	1(2.7%)	0(0)		
Power Doppler	0(0)	0(0)	0(0)		

 Table 2: Demonstrate the frequency and distribution of abnormal US findings at the hand entheses in patients with psoriasis.

There is significant correlation between the number of abnormal enthesis and patient's age (r = 0.332, p < 0.045) and duration of the disease

(r = 0.866, p < 0.032), but BMI shows no correlation, these findings were shown in table 3.

Table 3: Pearson's correlation of number of abnormal enthesis site with age,BMI and duration of the disease in psoriatic patients.

Variable	Age (Year)		BMI		Disease duration	
	r	P value	r	P value	r	P value
No. of abnormal Enthesis site	0.332	0.045	0.052	0.766	0.866	0.032
Significant P-Value < 0.05						

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Figure A: 40 year old female with psoriasis, longitudinal US scan of the MCP joint, show normal enthesis of (EPB) tendon insertion with normal synovial joint (blue border). Figure B: 35-year-old male with psoriasis, longitudinal US scan of the MCP joint showing inflammation of the peritendon, hypoechogenicity (yellow star) of the tendon of extensor digitorum (EDC) in addition to the presence of enthesophyte (red square).



Figure A: 22-year-old female with psoriasis, longitudinal US scan of MCP joint showing inflammation of the peritendon, hypoechogenicity (red circle) involving the tendon of flexor digitorum (FDS) in addition to the presence of enthesophyte (red dote) and articular synovitis (blue border). Figure B: 24-year-old female with psoriasis, longitudinal US scan of MCP joint, there is inflammation of the peritendon, hypoechogenicity (red circle) of the tendon of extensor polices brevis (EPB) with presence of articular synovitis (blue border).

DISCUSSION:

The literature on MSK ultrasonography of enthesopathy is mainly based on the large enthesis and not including the assessment of the small enthesis such as the hands. The current study tries to demonstrate involvement of the small enthesis of the hands in psoriatic patient without clinical enthesitis.

The current study included 35 patients with clinical diagnosis of psoriasis (19 Females and 16 females) with female: male ratio of 1.18:1, the age ranged from 20 - 50 years. This demographic distribution identical to that in many previously reported studies ⁽¹⁵⁻¹⁷⁾.

The current study reported abnormal US findings in at least 1 enthesis site in 68.5% of patients with psoriasis in the absence of clinical signs and symptoms. These findings were compatible with the previous results reported by Naredo et al ⁽¹⁰⁾. and Girolomoni et al ⁽¹⁸⁾. In contrast Moshrif et al ⁽¹⁵⁾ found that result of ultrasound examination shows enthesopathy in 36% of Psoriasis Patients and 64% was normal, perhaps this lower incidence of abnormality was attributed to the fact that they examined only lower limbs enthesis and despite

the examination of common large enthesis site, role of small enthesis in diagnosis of psoriatic arthropathy cannot be underestimated.

In the present study, the Extensor digitorum communis tendon enthesis was the most frequently involved enthesis site (41.3%) with a minimum of 1 abnormal US finding, followed by Flexor digitorum superficialis tendon enthesis (34.7%) and Extensor pollicis brevis tendon enthesis (23.9%) these result were similar to that reported by Macia et al ⁽¹⁹⁾, Filippou et al ⁽²⁰⁾, Gutierrez et al ⁽²¹⁾, Macía-Villa et al ⁽²²⁾ Sherif et al ⁽²³⁾.

Regarding flexor tendon enthesis frequency similar results were reported by Tinazzi et al $^{(24)}$. In contrast, Smerilli et al $^{(25)}$ found abnormal finding 15 of 240 fingers (6.3%) of eight PsA patients (26.7%) during US assessment of Finger flexor pulley (A1 pulley) that include. Perhaps this low incidence may be due to small size of A1 pulley that represent small area where the fibrous flexor sheath are reinforced by circular fiber overlies MCP joint $^{(26)}$, that are not easily detectable with US $^{(25)}$, while in present study we examined flexor digitorum superficialis long

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tendon insertion at the base of proximal phalanx that is bigger in size.

This study demonstrate that among Ultrasound finding of enthesitis the elements of hypoechogenicity was the most frequently involved followed by enthesophytes, calcification, entheseal thickening, least likely involved parameter was bony erosion and no power Doppler abnormality was seen in all examined enthesis sites, these results were compatible with previous studies ^(14,20,21,23). In contrast Hussein et al ⁽²⁷⁾ found that thickening of the enthesis was the most prevalent finding during MSK sonography of lower limbs, it possibly attributed to oedema involving the tendons.

Present study shows no power Doppler abnormality in all examined enthesis sites and it is probably due to the assumption of the cut off value of ≤ 2 mm from the bony cortex for diagnosis of abnormal PD, this cut off value was adopted by latest Outcome Measures in Rheumatology OMERACT US Task Force regarding involvement of the large entheses of the lower limb mainly, and may not be applicable to the small hand entheses that evaluated by present study. The hand entheses have been recently recognized as important targets in PsA ^(20, 25, 28), so the small enthesis cannot be ignored and a review definition for diagnosis of abnormal PD in small enthesis is mandetory.

Present study demonstrate that the number of abnormal enthesis significantly correlated with age of patient and disease duration, this result was in agreement with other previously reported studies ^(15, 27).

CONCLUSION:

Ultrasound examination of functional entheses at hand level is a useful tool in detection of subclinical abnormalities of psoriatic arthropathy. Ultrasound images can clearly documented elementary component of enthesopathy inform of hypoechogenicity, calcification, tendon thickening enthesophyte, and bony entheseal erosions.

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