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# Ultrasonography in Early Stage of Rheumatoid Arthritis and Psoriatic Arthritis: Review Article

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## ABSTRACT

**Background:** Musculoskeletal ultrasound (MSUS), which is also known as the rheumatologist's third eye, stethoscope, or extended finger, is now widely regarded by rheumatologists as an extension of their clinical examination and a crucial tool in their diagnostic collection.

**Objective:** Assessment of ultrasonography in the early stage of rheumatoid arthritis and psoriatic arthritis.

**Methods:** Ultrasonography, Early stage, Rheumatoid arthritis and Psoriatic arthritis were all looked for in PubMed, Google scholar, and Science direct. References from relevant literature were also evaluated by the authors, but only the most recent or complete study from November 2001 to November 2021 was included. Due to the lack of sources for translation, documents in languages other than English have been ruled out. Papers that did not fall under the purview of major scientific investigations, such as unpublished manuscripts, oral presentations, conference abstracts, and dissertations, were omitted.

**Conclusion:** As there is no ionizing radiation or claustrophobia risk, US is a reasonably affordable and patient-friendly imaging technique. Due to MSUS's great sensitivity in identifying inflammatory and structural lesions, this imaging technique may definitively identify the pathology behind symptoms including pain, stiffness, and restricted range of motion.

**Keywords:** Ultrasonography, Early Stage, Rheumatoid Arthritis, Psoriatic Arthritis.

## INTRODUCTION

The area of musculoskeletal ultrasound (MSUS) has expanded rapidly since Dussik initially wrote on the use of ultrasound (US) to scan articular and periarticular tissues in 1958 and the first in-depth US imaging of a human joint in 1972 **(1).**

This growth has been fueled by rheumatologists' increased interest in and use of the technology, as well as technological advancements that have resulted in the development of high resolution transducers that can image superficial structure **(2).** Musculoskeletal ultrasound (MSUS), which is also known as the rheumatologist's third eye, stethoscope, or extended finger, is now widely regarded by rheumatologists as an extension of their clinical examination and a crucial tool in their diagnostic collection **(1).**

Early seronegative rheumatoid arthritis diagnosis can be difficult, potentially leading to incorrect treatments and diagnostic blunders. This is probably caused by the lack of precise indicators for seronegative RA as well as the more challenging early-stage RA categorization **(3).**

Disease-modifying anti rheumatic drug (DMARD) treatment and diagnosis of patients with seronegative RA were delayed, according 2010 categorization criteria. Additionally, seronegative RA patients had a lower remission rate, indicating that they may be more likely to miss the window of opportunity for intervention **(4).**

Despite often being thought of as having a less inflammatory and damaging version of RA**,** according to 2010 (American College of Rheumatology) ACR/EULAR (European League Against Rheumatism) criteria, individuals who are seronegative need to exhibit more clinical symptoms before being diagnosed with RA**,** compared to those who are seropositive, and may thus need delayed diagnosis **(5).** Early diagnosis is essential for seronegative individuals as well since early therapy benefits all patients **(6).**

Early polyarticular psoriatic arthritis is frequently the predominant differential diagnosis for seronegative early RA types. Its diagnosis may be challenging when dealing with modest or unusual cutaneous or nail symptoms **(7).**

### MSUS Advantages:

Due to the lack of ionizing radiation or claustrophobia concerns, US is a very affordable and patient-friendly imaging technique **(8).**

MSUS is more accurate than conventional radiography for identifying joint structural deterioration. This imaging approach can successfully identify the pathology underlying symptoms such as pain, stiffness, and limited range of motion because to MSUS's superior sensitivity in identifying structural and inflammatory lesions. MSUS can be used to identify the disease, monitor the illness' development, and evaluate the efficacy of treatment. It may also be used to evaluate the degree of structural damage and anatomical inflammation in early arthritis. It may be used to spot early erosions, enthesitis, and subclinical synovitis. It can also help articular and periarticular procedures work better **(9).** Additionally, US is simple to repeat and may be used to evaluate many joints at once (unlike MRI). Additionally, dynamic tests may be carried out while the joints and tendons are moving **(10).**

### RA and psoriatic arthritis (PsA) US findings:

Studies appear to support the hypothesis that significant extra-synovial involvement might help identify



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PsA from RA in terms of differential diagnosis. Oedema and the peritendinous PD signal are symptoms of soft tissue inflammation that are unique to PsA and not seen in RA patients [11].

Wrist, metacarpophalangeal (MCP), and PIP joints are most often effected by synovitis and erosions in RA. It was discovered that as compared to PsA, synovitis is more frequently found in RA (91.1% of the joints versus 59.6% for PsA) [12].

Patients with RA tend to experience tenosynovitis more frequently in the wrist, whereas those with PsA are more likely to experience finger flexor problems, with dactylitis being a defining feature of PsA [13].

Patients with both disorders showed erosive synovitis and tenosynovitis, according to the first research employing MSUS to differentiate between RA and PsA, but only PsA patients had extrasynovial pathology [14].

Due to their distinct symptoms, central slip enthesitis at the PIP joints and extensor digitorum tendon, paratenonitis can help identify early PsA from RA [12].

At the MCP joint's extensor tendon The MCP joint's synovial capsule, peritendinous tissue, and sesamoid fibrocartilage are all components of the functional enthesis, which is made up of the extensor digitorum tendon [15].

Central extensor tendon insertion at proximal interphalangeal (PIP) joint: Most often, it has been observed that central slip enthesitis occurs in PsA patients in conjunction with joint synovitis [16]. The synovial-entheseal complex (SEC) inflammation in PsA is further supported by this association [7].

Distal interphalangeal (DIP) joint extensor tendon insertion: It is well known that the fascia that supports the nail root is an outgrowth of the enthesis of the extensor tendon. This discovery demonstrates the strong connection between PsA involvement of the bones and nails. Physical examination has shown that extensor tendon enthesitis is a common cause of nail disease, even in those who do not have arthritis. By finding enthesitis of the extensor tendon insertion on the DIP joint, a typical sign of PsA, US assisted in the differentiation between RA and PsA [17].

**Finger flexor compartment entheseal involvement:**

System of flexor pulleys compared to RA patients, those with PsA exhibit a significantly greater load of pathologic anomalies in the functional mini-entheses of the hand's flexor tendons. According to studies, PsA patients' finger pulleys are much thicker than those of RA patients and healthy people. These findings demonstrate how pulleys are implicated in PsA-related tenosynovitis and dactylitis and emphasize the "Deep Koebner" phenomena in dactylitis and areas of significant physical stress. The digital pulleys might loosen as a result of the inflammation brought on by flexor tenosynovitis. Damage to the pulley system diminishes patients' functional capacity and is a reflection of illness activity. It is not yet clear if the inflammation is what caused these changes to the digital pulleys or if they might result in tenosynovitis [18].

**Erosions:**

The outcome measures in rheumatology (OMERACT) definition of bone erosion describes it as a surface discontinuity that may be seen in two perpendicular planes inside an articulation. In easily accessible joints, including the MCP and PIP joints in the hands, a US inspection of bone erosions can be done. Due to US's inability to observe the entire bone's perimeter, this imaging technique is less reliable when used on other joints (such as the carpal joints) [19].

Numerous studies found that RA has a greater frequency of erosions than PsA. It was reported that the quantity and extent of erosions in the metatarsophalangeal (MTP), MCP, and wrists can help distinguish PsA from RA. In comparison with individuals with PsA, those with RA have more erosions that are bigger in size. Large erosions at certain joints, such as the distal ulna, second and fifth MCPs, and fifth MTP, are highly specific and predictive of RA. Different findings were reported by **Lin *et al.*** [20] showing that erosions were more common in PsA than RA [20].

**Patients with psoriatic arthritis and those with rheumatoid arthritis were compared using ultrasound nail imaging:**

Given that it enables accurate, real-time viewing of nail architecture, US offers more benefits than other technologies now in use [21].

A trilaminar band with two hyper-echoic layers and a hypo-echoic layer separates the nail's regular sonographic appearance. Under the nail plate, the nail bed is visible as a hypoechoic band, and the distal phalanx is visible as a hyperechoic line. The nail matrix is shown as an isoechoic zone in the proximal section of the nail bed, underneath the proximal nail fold [21].

Both the nail plate and the nail bed are abnormal US findings in psoriatic onychopathy. While, the ventral plate may experience slight loss of the hyperechoic definition in the early stages, both plates thickening and fusing (with the removal of the intermediate anechoic layer) are more common in the later stages [22].

In one research, the first and second toe nails were the most severely impacted, with all groups (patients with cutaneous psoriasis, PsA, rheumatoid arthritis, and controls) exhibiting aberrant nail echography [23].

The primary observation in the nails of both PsA and cutaneous psoriasis patients was abnormalities of the ventral plate. Individuals with PsA and psoriasis who did not have clinically apparent onychopathy also showed this echographic trait. Although it is difficult to see during a clinical examination, this characteristic may be a sign of subclinical psoriasis, according to **Wortsman *et al.*** [24]. In one investigation, it was discovered that none of the plates (type IV) had lost definition, but that there has been a reduction in the interpolate space, which has thickened both the dorsal and ventral plates [25].

Patients with PsA and cutaneous psoriasis were shown to have an increase in this distance of more than 2

mm when compared to those with rheumatoid arthritis (CI, 2-2.6 mm)[25, 26].

Patients with PsA and cutaneous psoriasis had a common trait: abnormalities of the ventral plate in their nails. These anomalies were also seen in PsA and psoriasis patients without clinically obvious onychopathy [27].

## CONCLUSION

As there is no ionizing radiation or claustrophobia risk, US is a reasonably affordable and patient-friendly imaging technique. Due to MSUS's great sensitivity in identifying inflammatory and structural lesions, this imaging technique may definitively identify the pathology behind symptoms including pain, stiffness, and restricted range of motion.

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