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REVIEW ARTICLE

Musculoskeletal involvement of the wrists and hands in Systemic Lupus Erythematosus: A narrative review

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ABSTRACT

Joint involvement is a common manifestation of systemic lupus erythematosus (SLE) and represents a major concern in rheumatology due to its impact on pain, function, and quality of life. Clinical presentations are heterogeneous, ranging from mild arthralgia to deforming arthropathy and, in a minority of cases, erosive disease. This work is based on a narrative review of clinical studies and imaging data addressing wrist and hand joint damage in SLE. Musculoskeletal manifestations in this context include deforming, erosive, symptomatic, and subclinical forms, the latter being increasingly identified through musculoskeletal ultrasound (MSUS) and magnetic resonance imaging (MRI). Current evidence indicates that synovitis and tenosynovitis are frequently detected by imaging, often in the absence of clinical symptoms. MSUS has demonstrated a high prevalence of subclinical inflammation, whereas MRI remains the most sensitive modality for detecting bone marrow edema and subtle structural damage. Although bone erosions are less common than in rheumatoid arthritis, they are increasingly recognized, particularly in patients with overlapping features (rhupus syndrome). Jaccoud's arthropathy, characterized by reducible deformities without erosions, remains a distinctive feature of lupus-related joint involvement. Wrist and hand involvement in SLE is therefore more complex than previously assumed. Advanced imaging has reshaped our understanding by revealing both subclinical and structural abnormalities. Further research is needed to standardize imaging assessment and optimize management strategies.

Keywords: Systemic lupus erythematosus, wrists, hands, arthritis, ultrasound, MRI.

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1. INTRODUCTION

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease characterized by multisystem involvement and the production of autoantibodies directed against nuclear components. (1). Over the past two decades, advances in diagnostic tools and therapeutic strategies have significantly reduced mortality. Nevertheless, musculoskeletal manifestations remain highly prevalent and contribute substantially to morbidity and impaired quality of life (2). Historically, joint involvement in SLE has been considered non-destructive and of lesser importance compared with visceral manifestations. However, growing evidence has challenged this view, particularly with the increasing use of advanced imaging modalities such as musculoskeletal ultrasound (MSUS) and magnetic resonance imaging (MRI), which have revealed a broader and more complex spectrum of joint pathology (3).

2. METHODS

This article is a narrative review based on a non-systematic analysis of literature. Relevant studies were identified through databases including PubMed and Google Scholar using keywords such as “systemic lupus erythematosus”, “arthritis”, “ultrasound”, “MRI”, “synovitis”, and “tenosynovitis”. Studies were selected based on their relevance to wrist and hand involvement in SLE, with particular emphasis on clinical presentation and imaging findings. Priority was given to recent publications and studies providing significant insights into lupus-related musculoskeletal involvement. This work is based on a narrative review of clinical studies and imaging evaluations concerning SLE-related wrist and hand joint damage.

3. CLINICAL AND OSTEOARTICULAR INVOLVEMENT

Joints of the Wrist and Hand in SLE

Wrist and hand joints are primarily synovial joints that facilitate complex, precise movements essential for daily activities. These joints are frequently affected in SLE, leading to symptoms such as pain, stiffness, swelling, and, in some cases, deformities (4).

The most commonly involved joint in SLE is the radiocarpal joint, a synovial wrist joint, which often manifests with pain and reduced range of motion due to synovitis (10). The metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints are also frequently affected, and lupus arthritis can clinically resemble rheumatoid arthritis (RA), presenting with symmetrical joint involvement and morning stiffness (4).

Distal interphalangeal (DIP) joints are less frequently involved, which helps distinguish SLE from other inflammatory arthropathies, such as psoriatic arthritis (5).

Tendon involvement is also common in hand and wrist disease associated with SLE, often manifesting as tenosynovitis affecting both flexor and extensor tendons. Inflammation of the tendon sheaths, particularly flexor tenosynovitis, contributes to pain, swelling, and functional impairment (6). Chronic tendon inflammation may lead to ligamentous laxity, deformities, and, in rare cases, spontaneous tendon rupture (7).

In contrast to RA, tendon damage in SLE is more often related to inflammation and ligamentous laxity rather than erosive joint destruction (4,8).

Osteoarticular Involvement in SLE

Osteoarticular manifestations are among the most common features of SLE, occurring in 95% of patients (9). Joint involvement occurs in approximately half of the patients at diagnosis and in up to 90% over the course of the disease (10).

These manifestations vary widely, ranging from arthralgia to arthritis, with or without deformities. Although the erosive nature of lupus arthritis remains a subject of debate, different profiles can be observed within the same patient. Joint symptoms may be temporary or may develop chronically through flare-ups and remissions.

Despite their frequency, joint manifestations in SLE are often underestimated. Several studies have highlighted their functional impact. Johnson et al. reported in a study of 109 patients with lupus that 25% had deformities, 16% had undergone hand surgery, 73% experienced hand-related discomfort, and 42% reported difficulties with daily activities. The mean HAQ index was 0.88 (range, 0–2.75), with a median value of 1 (range, 0–14). Hand dysfunction involves joints, tendons, and muscles, with reduced grip strength and pain being the most commonly reported symptoms. The most affected activities included household chores, childcare, professional tasks, and studying, whereas personal care was less affected (11).

Joint involvement is a key feature of the classification criteria for lupus. It is one of the 17 criteria of the Systemic Lupus International Collaborating Clinics (SLICC) criteria (12). The 2019 ACR-EULAR classification includes joint involvement as one of the ten criteria (13). However, these criteria are primarily used for research and not for strict diagnostic purposes.

Arthralgia and Arthritis in SLE

Arthralgia and arthritis in SLE are typically intermittent, brief, asymmetric, and migratory. The wrists, knees, and small hand joints, including the MCP and PIP joints, are the most commonly affected joints.

Arthralgia

Arthralgia accounts for approximately a quarter of joint symptoms in SLE and is often inflammatory. Morning stiffness is common but usually resolves quickly; however, it may be missed by the physician. These symptoms frequently do not respond well to non-steroidal anti-inflammatory drugs.

Advances in imaging, particularly ultrasonography, have enabled the detection of subclinical synovitis in lupus patients with arthralgia, resulting in changes in diagnosis, treatment, and disease management (14)

Arthritis

Lupus arthritis is typically migratory and transient, often resolving quickly (9). It may present as bilateral symmetrical polyarthritis, predominantly affecting the small distal joints of the hands. The onset of arthritis can precede other systemic manifestations of lupus. Chronic arthritis in lupus can occur in one of three forms, as classified by Van Vugt (15). **Non-deforming, non-destructive polyarthritis** is the most common musculoskeletal manifestation in SLE, reported in approximately **80–85 % of patients** with arthritis on conventional imaging. **Non-destructive deforming polyarthritis,** classically referred to as **Jaccoud's arthropathy**, occurs in a smaller portion of patients, with a reported frequency of approximately **5 %** (16).

Erosive polyarthritis, which features overlapping RA (often termed rhupus), is rare in SLE, with a prevalence of around 5 % of patients (17). Reported prevalence rates vary considerably across studies, likely due to differences in patient populations, disease duration, diagnostic criteria, and imaging techniques used. Synovial fluid analysis in lupus arthritis usually reveals a mildly inflammatory profile, with variable protein levels and low cellularity (2,000–4,000 cells/mm^3), mostly mononuclear cells. Antinuclear and anti-DNA antibodies can be detected. Synovial biopsy results are non-specific.

Jaccoud's Arthropathy

Jaccoud's arthropathy (JA) is a deforming, non-erosive arthropathy associated with connective tissue diseases, including SLE, systemic sclerosis, and dermatomyositis. It occurs in approximately 5% of patients with lupus and is associated with disease duration and joint inflammation, particularly affecting the wrists and MCP and PIP joints. Elevated levels of C-reactive protein (CRP) (18,19), anti-DNA antibodies, anti-citrullinated protein antibodies (ACPA) (19), rheumatoid factor (RF), and antiphospholipid antibodies (aPL) have been associated with JA (20).

JA has been associated with valvular heart disease and Libman-Sacks endocarditis, both of which are linked to antiphospholipid syndrome (APS) (21). Some studies suggest that small-vessel thrombosis in APS may cause ischemia and periarticular fibrosis, while hypermobility may be associated with secondary hyperparathyroidism resulting from renal failure (15). JA deformities affecting the hands include: ulnar deviation of the MCP joints, boutonnière and swan-neck deformities, Z-shaped thumb deformities (16,22). These deformities arise from capsuloligamentous laxity and tendon abnormalities rather than from synovial destruction, which distinguishes JA from RA (16). Radiographs typically show reducible deformities without erosions or chondrolysis. MRI studies reveal capsular swelling, joint effusions, tenosynovitis, and minimal erosions, particularly at sites of mechanical stress, such as the ulnar styloid (23,24).

Histopathologic findings include fibrin deposits, microvascular alterations, and minimal cartilage erosion, with no inflammatory pannus formation, distinguishing JA from RA (25). JA significantly affects hand function. Studies comparing lupus patients with and without deformities have shown disability, particularly in wrist movement and pinch grip (11). Surgical treatment for JA has been attempted with varying success, and further research into its pathophysiology may improve outcomes (26).

Erosive Arthropathy

Erosive arthropathy remains a debated condition. Some researchers consider it an overlap syndrome with rheumatoid arthritis (27,28), while others believe it is a distinct condition within lupus-related joint damage (29). Rhupus is observed in 5% to 15% of cases, with variation attributable to differences in selection criteria across studies. It is defined by the presence of symmetrical, deforming polyarthritis affecting small and medium joints (MCP, PIP, wrists, and knees) with radiographic erosions (27,28), frequently associated with rheumatoid factor (RF) and anti-citrullinated protein antibodies (ACPA) (28,29). Advanced imaging reveals that the most affected areas include the radiocarpal and midcarpal joints of the wrists and the MCP and PIP joints of the 2nd and 3rd rays (30), which often show joint effusion, synovial hypertrophy, bone erosions, and possible tendon involvement (17).

Tendon involvement

Tenosynovitis : Tenosynovitis is an inflammatory condition affecting the synovial sheath surrounding tendons, which occurs in less than 10% of patients with SLE (30). It predominantly affects the extensor tendons of the wrist and hand, leading to swelling and pain. Involvement of the flexor tendons can result in carpal tunnel syndrome.

Tendon Ruptures

Although rare, tendon ruptures are a serious and potentially disabling complication in SLE. They are more common in male patients and may be bilateral in up to half of cases (31). Clinically, tendon ruptures present with sudden pain, localized tenderness at the tendon insertion, and impaired extension of the affected limb. The patellar, quadriceps, and Achilles tendons are more frequently involved than the wrists and hands (31). Pathogenesis is linked to chronic corticosteroid therapy, prolonged disease duration, coexisting musculoskeletal conditions, fluoroquinolone use, secondary hyperparathyroidism, and trauma (31). These ruptures frequently occur in association with Jaccoud's arthropathy (32).

Diagnostic imaging with ultrasound and MRI is essential for confirming tendon rupture. Histopathological examination typically reveals hemorrhage, chronic degenerative changes, and mononuclear cell infiltration without evidence of vasculitis (30).

4. IMAGING (RADIOGRAPHY, MSUS, MRI)

Joint imaging techniques are crucial for diagnosing and monitoring patients with SLE to assess inflammation and bone damage. Imaging methods include standard X-ray radiography, MSUS, and MRI, which is reserved for specific cases or research purposes. Table 1 compares these techniques.

Role of Standard Radiography of the Wrists and Hands. Radiography provides a two-dimensional view of the wrist and hand structure with lower radiation exposure than CT. The standard view is a frontal posteroanterior view of both hands. Typical findings include joint space narrowing, deformities, and late erosions. Although widely available, radiography has limited sensitivity for early disease.

MSUS of the Wrists and Hands

Practical Applications in SLE

In patients with SLE, MSUS is a sensitive tool for detecting inflammatory and structural abnormalities, including synovitis, synovial hypertrophy, tenosynovitis, and bone erosions in the wrists and hands.

The OMERACT definitions, first introduced in 2005 (33) and updated in 2017–2019 (34,35), standardize the interpretation of ultrasound lesions in inflammatory arthritis.

Synovitis is defined as synovial hypertrophy with or without joint effusion and may be associated with a Doppler signal. According to the OMERACT–EULAR composite scoring system, synovitis can be graded semi-quantitatively from grade 0 (absence of synovial hypertrophy and Doppler signal) to grade 3 (severe synovial hypertrophy with marked Doppler activity), with intermediate grades reflecting increasing severity of structural and vascular changes. Tenosynovitis is defined as hypoechoic or anechoic thickened tissue, with or without fluid, within the tendon sheath, visible in two perpendicular planes, and possibly associated with a Doppler signal. It is also graded semi-quantitatively from grade 0 (normal) to grade 3 (marked sheath distension with significant Doppler activity).

In addition to inflammatory changes, ultrasound can detect tendon pathology such as tendinosis, partial tears, or rupture, allowing differentiation between inflammatory and mechanical damage. Bone erosions are defined as intra-articular discontinuities of the bone surface visible in two perpendicular planes.

The 2017 EULAR standardized procedures (36) and the 2021 EULAR reporting recommendations (37) provide systematic frameworks for joint assessment and reporting using grayscale (GS) and Doppler modalities, improving reproducibility and reliability. Given its high sensitivity for detecting subclinical inflammation, MSUS plays an important role in evaluating disease activity in SLE, distinguishing lupus arthritis from other inflammatory arthropathies, and guiding therapeutic decisions.

Interest in MSUS in SLE

Over the past two decades, MSUS has become a key tool in rheumatology due to its high sensitivity, accessibility, lack of ionizing radiation, and suitability for bedside use (33,38). In SLE, it has proven valuable for evaluating synovial and tendon inflammation and identifying early bone erosions (39,40).

As previously described, joint involvement is a frequent manifestation of SLE. MSUS has demonstrated effectiveness in detecting subclinical synovitis and tenosynovitis of the wrists and hands, underscoring the limitations of clinical examination alone. Several studies consistently report a high prevalence of subclinical synovitis detected by MSUS, often exceeding 50%, even in asymptomatic patients (42–45). A key study by Yoon et al. found subclinical synovitis in 58.3% of 48 asymptomatic lupus patients, with synovitis scores correlating positively with ESR and anti-dsDNA levels; within six months, 22.9% of patients developed joint symptoms, highlighting the predictive value of ultrasound (44). Similarly, Ruano et al. demonstrated that MSUS can detect preclinical joint

involvement regardless of standard clinical and biological parameters, making ultrasound scores potential biomarkers for disease activity monitoring (45).

The identification of subclinical synovitis has prompted consideration of modifying disease activity indices. Salliot et al. (46) found that 85% of asymptomatic SLE patients showed ultrasound abnormalities, and the ultrasound SLEDAI score was 4 points higher than the clinical SLEDAI in 51% of patients, indicating that MSUS could improve disease activity assessment. The prospective USEFUL study (47) further demonstrated that SLE patients with a positive baseline ultrasound had significantly better clinical responses to intramuscular methylprednisolone, and that the BILAG and SLEDAI definitions could be refined to incorporate specific US findings.

Gabba et al. assessed 108 SLE patients and found that those with rhupus (n=8) had a higher rate of joint damage (87%) and bone erosion (87%) than those with Jaccoud arthropathy (50% and 17%, respectively) and those without deformities (37% and 21%, respectively) (41). Ogura et al. demonstrated that, compared with RA, SLE arthropathy is characterized by a predominance of tenosynovitis and periextensor tendon inflammation developing independently of joint synovitis (48).

Bone Erosion Assessment

Bone erosion assessment by ultrasound, well established in RA (49,50), has been increasingly studied in SLE. Although lupus-related erosions occur less frequently than in RA, they remain clinically significant. Reported prevalence varies across studies: 4% (15.2% of patients) in Salliot et al. (46), 5.9% in Piga et al. (8), and 31.4% in Mosca et al., with the most commonly affected sites being the 2nd and 5th MCP joints and the radiocarpal and ulnar regions of the wrist (51). A landmark study by Piga et al. (8) using CT as the gold standard demonstrated ultrasound sensitivity of 36% and specificity of 98% for erosion detection, with the highest sensitivity at the dorsal and lateral aspects of the 2nd and 5th MCP joints.

Recent Advances: Enthesitis and Emerging Techniques

Entheseal involvement is a rapidly evolving area. A 2025–2026 scoping review by Qi et al. (53) systematically reviewed 24 studies and found that inflammatory enthesitis, identified using power Doppler and bone erosion criteria, was present in SLE patients, most commonly at the patellar and quadriceps entheses. The authors concluded that enthesitis may represent a new musculoskeletal domain in SLE and called for its routine integration into ultrasound evaluation protocols.

Beyond standard imaging, shear wave elastography (SWE) combined with Power Doppler ultrasound has shown promise for assessing synovial stiffness in SLE. Marsico et al. (54) demonstrated that SLE patients had significantly higher joint stiffness values than controls and that subclinical synovitis was detectable in asymptomatic patients. Positive Doppler findings correlated with higher SLICC-SDI scores, suggesting that SWE is a promising complement to conventional MSUS for quantitative characterization of synovial tissue properties.

MRI in Assessing Wrist and Hand Joint Involvement in SLE

Prevalence of Subclinical and Clinical Joint Abnormalities

MRI has emerged as the most sensitive imaging modality for detecting both clinical and subclinical musculoskeletal involvement in SLE, including inflammatory changes in joints, tendons, and periarticular soft tissues (43). Although less commonly used due to cost and accessibility, it remains the gold standard for detecting bone marrow edema, subtle erosions, and inflammatory changes across the full spectrum of arthropathy subtypes (14).

The largest contrast-enhanced MRI study to date, by Corzo Garcia et al. (55), involved 107 SLE patients and 24 healthy controls. Any lesion was present in 74.7% of SLE patients, compared with 41.67% of healthy subjects ($p = 0.002$). Synovitis was detected in 64.52%, 51.61%, and 45% of the symptomatic, arthralgia, and asymptomatic groups, respectively, compared to 20.83% of healthy subjects ($p = 0.013$). Bone marrow edema and tenosynovitis were also significantly more frequent in SLE patients. Notably, peritendonitis was detected in 6% of SLE patients, an alteration never previously assessed by MRI in SLE.

Patterns of Bone Erosion and Edema

A comparative low-field MRI study by Tani et al. (56) in SLE patients (n=50), RA patients (n=22), and healthy subjects (n=48) showed that the cumulative erosive burden in SLE was significantly higher than in healthy subjects, though bone marrow edema was substantially less frequent than in RA. This pattern suggests that wrist erosions in lupus may approach RA-level frequency yet reflect a distinct pathophysiological process with less osteitis. These findings are consistent with those of Ball et al. (57), who demonstrated that an MRI-determined erosive phenotype is common in SLE, even in the absence of rheumatoid-specific autoantibodies (only 8.8% ACPA-positive).

Quantitative Assessment and the Need for SLE-Specific Scoring

MRI-based scoring systems adapted from RA, such as RAMRIS, have been used to quantify lupus arthritis features but often underestimate inflammation in SLE, missing joint effusions or tenosynovitis without enhancement or synovial proliferation. New SLE-specific scoring systems are needed to better capture the full spectrum of lupus arthritis, including capsular swelling and edematous tenosynovitis (58).

Clinical Implications for Treatment and Monitoring

MRI's ability to detect subclinical inflammation underscores its potential role in early intervention. Patients with imaging-confirmed synovitis or tenosynovitis might need increased therapy even when physical exams and laboratory results are normal. Conversely, a negative MRI or MSUS could support safely reducing corticosteroids. The presence of bone marrow edema is associated with an increased risk of erosive disease, underscoring its prognostic importance (56).

The 2023 EULAR recommendations acknowledge the role of imaging in guiding treatment escalation in patients with minimal or no clinical joint swelling (59). Standardizing MRI protocols and developing SLE-specific scoring systems remain pressing unmet needs in this field.

Table 1. Imaging modalities in SLE wrist and hand involvement.

Imaging modality	Main findings	Advantages	Limitations
Radiography	Joint space narrowing, deformities, late erosions	Widely available	Low sensitivity for early disease
Ultrasound (MSUS)	Synovitis, tenosynovitis, Doppler signal, erosions	High sensitivity, real-time, no radiation	Operator-dependent
MRI	Bone marrow edema, synovitis, erosions, soft tissue involvement	Highest sensitivity	High cost, limited availability

5. DISCUSSION

This narrative review highlights the complexity and heterogeneity of musculoskeletal involvement in SLE, particularly in the wrists and hands. While traditionally considered a non-erosive arthropathy, recent imaging-based studies challenge this paradigm by demonstrating a higher prevalence of subclinical inflammation and structural damage.

The variability in reported prevalence rates across studies likely reflects differences in patient populations, disease duration, diagnostic criteria, and imaging modalities. In particular, the increasing use of MSUS and MRI has significantly improved the detection of synovitis, tenosynovitis, and bone erosions, even in asymptomatic patients.

Ultrasound has emerged as a practical and sensitive tool for routine clinical assessment, whereas MRI provides a more comprehensive evaluation of deep structures and bone marrow involvement. However, limitations such as cost, accessibility, and lack of standardized scoring systems restrict their widespread use.

Another important issue is the distinction between lupus arthritis, Jaccoud's arthropathy, and rhupus syndrome. These entities likely represent a continuum rather than strictly separate conditions, further complicating classification and management.

This review is limited by its narrative design, which may introduce selection bias. However, these findings have direct implications for clinical practice: early detection of subclinical inflammation may warrant closer monitoring or therapeutic adjustment in selected patients, while also underscoring the need for standardized imaging protocols and the integration of imaging findings into disease activity indices.

6. CONCLUSION

Joint involvement of the wrists and hands in SLE is a frequent and heterogeneous manifestation. Although traditionally considered non-erosive, advances in imaging, particularly MSUS and MRI, have demonstrated that subclinical inflammation and structural damage are more common than previously recognized. These findings underscore the limitations of clinical examination alone and support the increasing role of imaging in the evaluation and monitoring of lupus arthritis. However, important challenges remain, including variability in reported prevalence, lack of standardized imaging protocols, and the absence of disease-specific scoring systems. Future research should focus on harmonizing imaging definitions, integrating imaging findings into disease activity indices, and clarifying the prognostic significance of subclinical abnormalities. From a clinical perspective, earlier and more systematic use of imaging may improve patient management and help prevent long-term joint damage.

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