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MUSCULOSKELETAL IMAGING

ORIGINAL ARTICLE

How may complementary magnetic resonance imaging findings facilitate the diagnosis of inflammatory hand arthritis involving the distal interphalangeal joint? A prospective cohort study

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PURPOSE

In this study, we aimed to characterize the role of magnetic resonance imaging (MRI) in making a specific diagnosis of inflammatory hand arthritis (IHA), particularly in early stages or ambiguous cases.

METHODS

Patients aged ≥18 years with suspicious IHA in at least one joint were enrolled in this single-center prospective study. Three Tesla MRI (3T-MRI) with a fine-tuned protocol was utilized, whereby differential diagnoses were made by radiologists according to the predominant involvement of synovium or synovioentheseal complex (SEC) and/or specific degenerative findings. Physical examination, laboratory findings, treatment response, and already-established classification criteria were used to reach the final diagnostic groups: psoriatic arthritis (PsA), rheumatoid arthritis (RA), erosive osteoarthritis or calcium pyrophosphate dihydrate deposition disease (EOA/CPPD), and arthritis with distal interphalangeal joint (DIPJ) involvement (ADIPI) not otherwise classified into any group. Statistical analyses mainly included pairwise comparisons of MRI findings across diagnostic groups.

RESULTS

Of 80 patients enrolled, 57 [42 women; mean age, 54 years (range, 28–79 years)] constituted the final group with eventual clinical diagnoses of 11 PsA, 14 RA, 11 EOA/CPPD, and 21 ADIPI. MRI revealed no difference between the PsA and ADIPI groups, except for nailbed enthesitis ($P = 0.048$, effect size: 0.416). A comparison between PsA and RA revealed that enthesitis, excluding pulley enthesitis, was more frequently observed in PsA ($P = 0.033$, effect size: 0.497). Periarticular soft tissue edema was also more common in PsA than RA ($P = 0.042$, effect size: 0.461). When the ADIPI and PsA groups were combined, enthesitis and periarticular soft tissue edema were more common than in other groups ($P < 0.001$).

CONCLUSION

SEC inflammation and periarticular edema on MRI strongly predict PsA, especially in patients with DIPJ arthritis who do not meet rheumatological classification criteria.

CLINICAL SIGNIFICANCE

3T-MRI with a fine-tuned protocol enables a more accurate differential diagnosis of hand inflammatory arthritis, potentially guiding earlier and more targeted interventions.

KEYWORDS

Arthritis, psoriatic, arthritis, rheumatoid, magnetic resonance imaging, enthesitis, hand

The findings of the study were partially presented at the annual European Congress of Radiology 2025 (ECR 2025) in Vienna, Austria.

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Inflammatory hand arthritis (IHA) is a diagnostic challenge, particularly in the early stages, where clinical and radiographic findings may be non-specific. Although rheumatoid arthritis (RA) and psoriatic arthritis (PsA) share overlapping features, their distinct treatment approaches necessitate accurate differentiation.[1] However, limitations in diagnostic criteria lead to diagnostic uncertainty, resulting in delays that can worsen outcomes.[2]

Despite advances in imaging, the literature remains limited in identifying reliable imaging biomarkers to distinguish inflammatory arthritis subtypes at early presentation.[3] Traditional approaches rely on radiographic assessment of joint distribution, specific deformities, and bony changes, such as periostitis or erosions, which typically become apparent only in later stages.[4,5] However, in earlier phases, the predominant site of inflammation, whether at the synovium or the enthesis, becomes critical for accurate diagnosis. Imaging microanatomical regions, such as the synovioentheseal complex (SEC), offers a potential alternative, particularly in diagnostically ambiguous cases.[1,6]

Notably, in 10%–15% of PsA cases, musculoskeletal symptoms may precede overt skin manifestations—a form referred to as "PsA *sine psoriase*".[7] Among the distinctive patterns of involvement observed in these patients, distal interphalangeal joint (DIPJ) arthritis stands out as a key feature.[8,9] To date, few studies have been conducted on the role of imaging in arthritis cases involving the DIPJ without skin psoriasis or not satisfying the classification criteria, including the Classification Criteria for Psoriatic Arthritis (CASPAR). In our study, we identify a final diagnostic subgroup of patients who exhibited clinical features suggestive of PsA with DIPJ involvement (ADIPI) but did not meet CASPAR. These patients were categorized as having arthritis with ADIPI, a term we use to describe cases that may represent "PsA *sine psoriase*" or remain unclassifiable despite clinical evidence of inflammatory DIPJ arthritis.

Main points

- Differentiating inflammatory arthritides in early stages or with atypical presentations remains challenging, especially in cases that do not fulfill the classification criteria.
- Synovioentheseal complex involvement and periarticular edema can be used as a diagnostic imaging marker for psoriatic arthritis in ambiguous cases.
- Three Tesla magnetic resonance imaging with a fine-tuned protocol enables a more accurate differential diagnosis of inflammatory arthritis of the hand, potentially guiding earlier and more targeted interventions.

This study aims to assess the diagnostic utility of a tailored 3 Tesla magnetic resonance imaging (3T-MRI) protocol for IHA, with particular emphasis on SEC inflammation and related features. We hypothesized that 3T-MRI can reliably differentiate PsA from RA, erosive osteoarthritis (EOA), and crystal arthropathies, even in diagnostically challenging scenarios, by highlighting distinct inflammatory patterns. To test this, we conducted a prospective study using a fine-tuned MRI protocol on a cohort of 57 patients with untreated IHA.

Methods

This study was approved by the Hacettepe University Clinical Studies Ethics Committee (registration number: KA-21113, approval date: December 29, 2021) and conducted per the Declaration of Helsinki and Good Clinical Practice guidelines. Written and verbal informed consent were obtained from all participants.

Study design and patient enrollment

This study was conducted at Hacettepe University Hospitals between September 1, 2021, and June 1, 2024. Patients presenting to the rheumatology outpatient clinic with untreated IHA were considered for recruitment. Although the aim was to include a broad spectrum of inflammatory arthritis cases, practical limitations and study-specific objectives resulted in a partial representation of certain disease subtypes.

The inclusion criteria were adults ≥18 years of age with clinical, laboratory, or ultrasonographic findings suggestive of inflammatory arthritis in at least one hand joint. Patients with absolute contraindications for MRI, such as the presence of metallic implants or devices incompatible with MRI or severe claustrophobia, were excluded. Similarly, patients with a known allergy to gadolinium-based contrast agents or impaired renal function contraindicating gadolinium use (e.g., estimated glomerular filtration rate <30 mL/min/1.73 m^2) were also excluded. Given the study's focus on diagnostic utility in differential diagnosis, patients diagnosed with other diseases outside the study's scope (e.g., infectious arthritis) and those without evidence of inflammation on MRI were excluded to maintain the study's reliability and focus (Figure 1).

Notably, although the cohort was consecutive in terms of cases with ADIPI, the inclusion of other disease types, such as RA and PsA, was influenced by the study's specific objectives and the availability of MRI requisitions. This situation highlights how patients with ADIPI constituted the majority of MRI referrals in this study, despite the higher prevalence of RA and PsA in general clinical practice.

Imaging (hand radiography and magnetic resonance imaging) protocol and procedure

Hand radiographs were obtained in an anterior–posterior projection. MRI of the symptomatic hand was performed after the patient was positioned supine with their arms by their sides. T1-weighted axial and coronal spin echo (SE) images were obtained to evaluate the hand anatomy and joint structures. T2-weighted fat-saturated (FS) SE and coronal short-tau inversion recovery sequences were acquired to show edematous areas and fluid in the joint space. Proton density-weighted coronal FS SE sequences were obtained to evaluate the ligaments, especially the collateral ligaments. Axial and coronal FS T1-weighted SE images were obtained 5–10 minutes after intravenous contrast media injection to show periarticular soft tissue inflammation and osteitis. A three-dimensional (3D) zero echo time sequence was included in the protocol to create computed tomography-like images, confirming erosions and evaluating osteophytes or new bone formation more clearly. The post-contrast 3D fast spoiled gradient recalled echo sequence, which provides higher contrast resolution, was also used. The total duration of the examination was 50 minutes (Table 1). A gadolinium-based contrast agent (Gadovist® 0.1 mmol/kg, Bayer Pharmaceuticals) was used in all patients.

Evaluation strategy for index test and reference standard

Two radiologists (Y.Y., a 5th-year radiology resident, and A.E.Y., a radiology consultant with 6 years of dedicated musculoskeletal radiology experience) performed the MRI assessment and reached a consensus using the hospital's picture archiving and communication system. Radiologists were aware of the symptomatic hand and that the patient was being evaluated for inflammatory arthritis; however, they were blinded to the final

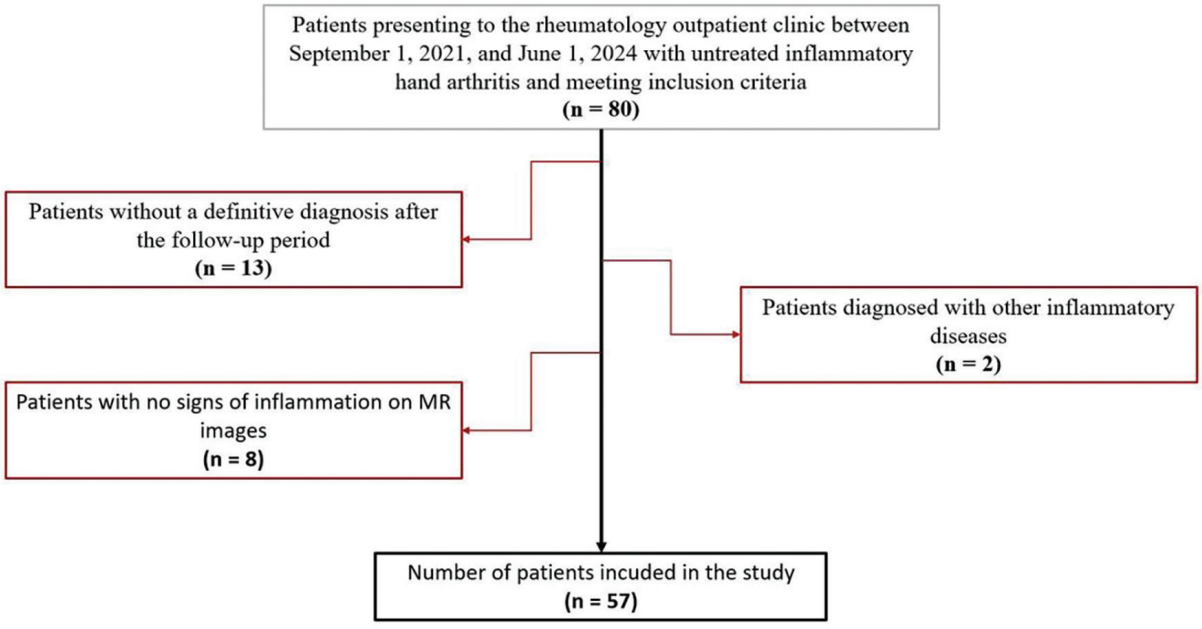

Figure 1. Flowchart of the study. MR; magnetic resonance.

clinical diagnosis and were not provided with laboratory results, treatment history, or rheumatological classification. Radiographs were labeled as normal or abnormal in the presence of any findings, including joint space narrowing, osteophytes, new bone formation, and erosions. The MRI findings were categorized in a dichotomous fashion as "present" or "absent" for enthesitis [both classical (collateral ligament enthesitis and nailbed enthesitis) and functional (extensor peritendinitis, pulley enthesitis)], synovitis, tenosynovitis, osteitis, erosion, periarticular soft tissue edema, osteophyte, periarticular bone proliferation, and joint space narrowing. The distribution of synovitis was classified into nine groups based on joint involvement, and some other findings were further categorized into subgroups (Table 2).

Based on the MRI findings, patients with predominant inflammation of the SEC were assigned a presumptive diagnosis of PsA (Figure 2), and patients with predominant synovial inflammation were assigned a presumptive diagnosis of RA (Figure 3). Additionally, patients presenting with inflammatory arthritis characterized by prominent degenerative joint findings without evidence of SEC involvement were given a presumptive diagnosis of EOA or calcium pyrophosphate dihydrate deposition disease (EOA/CPPD) (Figure 4).

After clinical follow-up, patients were categorized into PsA, seropositive RA (SpRA), seronegative RA (SnRA), and EOA/CPPD definite diagnostic groups based on evaluation by the rheumatologist (U.K.) with the aid of diagnostic and classification criteria: the 2010 American College of Rheumatology/European Alliance of Associations for Rheumatology classification criteria for RA and CASPAR for PsA.[10,11] Skin psoriasis was required for patients to be classified as PsA. A separate group, ADIPI, was formed for patients who could not be classified into the aforementioned diagnostic categories but exhibited clinical and examination findings suggestive of PsA *sine psoriase*. Although rheumatologist had access to MRI reports, he independently established final diagnoses by self-blinding to imaging findings and presumptive radiological interpretations during the diagnostic decision-making process. Thirteen patients without a definitive diagnosis during the follow-up period and two patients diagnosed with other inflammatory arthritides were excluded from the analysis.

Statistical analysis

The analyses were conducted using the free and open-source software R (version 4.3.2, https://cran.r-project.org) and the SPSS for Windows Version 23.0 statistical package (Chicago, IL, USA), with the assistance of an academic biostatistician. Descriptive statistics were expressed as medians, means/standard deviations, and percentages. As appropriate, group differences were evaluated using the Student's t-test, Mann–Whitney U test, one-way ANOVA, or Kruskal–Wallis test. Categorical data were compared using the Pearson chi-squared test, the Fisher's exact test, or the Yates-corrected chi-squared test. Diagnostic concordance was measured using weighted kappa coefficients. Logistic regression and receiver operating characteristic analysis were used to assess the predictive model. To identify risk factors for PsA, univariate analysis followed by multiple binary logistic regression was conducted. Variables with a *P* value of <0.20 in univariate analysis were included as candidates in the multivariate model. A forward elimination method based on likelihood ratio statistics was used for variable selection. Clinically relevant potential confounders, such as age, were deliberately included to control for their effects. Model calibration (goodness-of-fit) was assessed using the Hosmer–Lemeshow test, with a *P* value of >0.05 indicating an adequate model fit. Classification accuracy was evaluated using the classification table, and discriminative ability was assessed with the area under the curve (AUC). The pROC package was used for the AUC and its plot for the final model. A *P* value of <5% was considered statistically significant. The sample size was calculated to require 81 participants. The statistical guarantor (H.A.) was responsible for ensuring the transparency and accuracy of all analyses and addressing any related queries.

Results

Study cohort

Hand MRI was performed on 80 patients, and 57 were included after excluding those

Table 1. Magnetic resonance imaging protocol optimized for inflammatory hand arthritis

Parameter/sequence	Ax T1 FSE	Cor T1	Cor STIR	Cor PD	Ax T2 (FS)	Sag T2 (FS)	Ax T1 FSE (FS)	C+ ax T1 FSE (FS)	C+ cor T1	C+ 3D cor FSPGR (FS)	3D cor ZTE
FOV (cm)	12	20	20	20	12	18	12	12	20	20	20
TR (ms)	793	684	3,048	1,950	2,794	4,068	793	793	684	min	2
TE (ms)	min	min	42	42	75	70	min	min	min	min	~0*
ETL	3	4	14	10	20	22	3	3	4	-	-
Flip angle (°)	111	111	120	111	160	111	111	111	111	10	2
Band width (Hz/pixel)	83.33	83.33	83.33	83.33	62.5	62.5	83.33	83.33	83.33	31.25	83.33
Matrix size (Fre × Phase)	512 × 360	640 × 460	440 × 380	640 × 460	352 × 352	640 × 460	512 × 360	512 × 361	640 × 460	400 × 350	320 × 320
NEX	1	1	1.5	1	1	1	1	1	1	1	4
Slice thickness (mm)	3	2	2	2	3	2.5	3	3	2	0.4	0.6
Interslice gap (mm)	1	0.5	0.5	0.5	1	1	1	1	0.5	-	-
Scan duration (min)	3–4	1	2–3	1–2	3–4	1–2	3–4	3–4	1	3	4–5

*TE time is a very small value of approximately 8 µs; Ax, axial; Cor, coronal; Sag, sagittal; FS, fat saturated; FSE, fast spin echo; 3D, three dimensional; FSPGR, fast spoiled gradient echo; TE, time to echo; TR, time to repetition; ZTE, zero time to echo; FOV, field of view; ETL, echo train length; NEX, number of excitations; Hz, hertz; Fre, frequency; C+, contrast enhanced.

who met the exclusion criteria. The final cohort comprised 42 women and 15 men, with a median age of 54 years (range 28–79 years). Among the hands imaged, 37 were right hands, and 20 were left hands. The median duration of symptoms was 12 months (interquartile range: 1–84) (Table 3). An alluvial diagram illustrating the study flow is presented in Figure 5.

Subgroup analysis

The PsA and ADIPI groups demonstrated comparable demographics, including gender distribution, age, and symptom duration. Nailbed enthesitis was more prevalent in patients with ADIPI than in those with PsA ($P = 0.048$, effect size: 0.416). Radiographic abnormalities were also more common in the ADIPI group than in the PsA group ($P = 0.035$, effect size: 0.467). Other MRI findings showed no significant differences between these two groups.

The ADIPI group showed no significant difference in overall enthesitis rates compared with the SnRA group when all four subtypes of enthesitis were considered ($P = 0.170$). However, when pulley enthesitis was excluded from the analysis, the ADIPI group demonstrated significantly higher enthesitis rates than the SnRA group (90.5% vs. 37.5%; $P = 0.008$, effect size: 0.553). Periarticular edema was also more frequent in ADIPI cases than in SnRA ($P = 0.028$, effect size: 0.472).

The ADIPI and EOA/CPPD patient groups differed according to many variables. The patients with EOA/CPPD [mean age: 63 (60–65) years] were significantly older than patients with ADIPI

Table 2. Magnetic resonance imaging features assessed and their modifiers

Synovitis
Only wrist
Wrist + metacarpophalangeal joints
Wrist + interphalangeal joints
Wrist + metacarpophalangeal + interphalangeal joints
Only metacarpophalangeal joints
Metacarpophalangeal + interphalangeal joints
Only proximal interphalangeal joints
Only distal interphalangeal joints
Proximal interphalangeal joints + distal interphalangeal joints
Enthesitis
Classical (collateral ligament enthesitis and nail-bed enthesitis)
Functional (extensor peritendinitis and pulley enthesitis)
Tenosynovitis
With pulley enthesitis
Without pulley enthesitis
Osteitis
Subchondral
Diaphyseal
Erosions
Marginal
Central
Periarticular soft tissue edema
Osteophytes
Marginal
Hook
Periarticular bone proliferation
Joint space narrowing
Uniform
Non-uniform

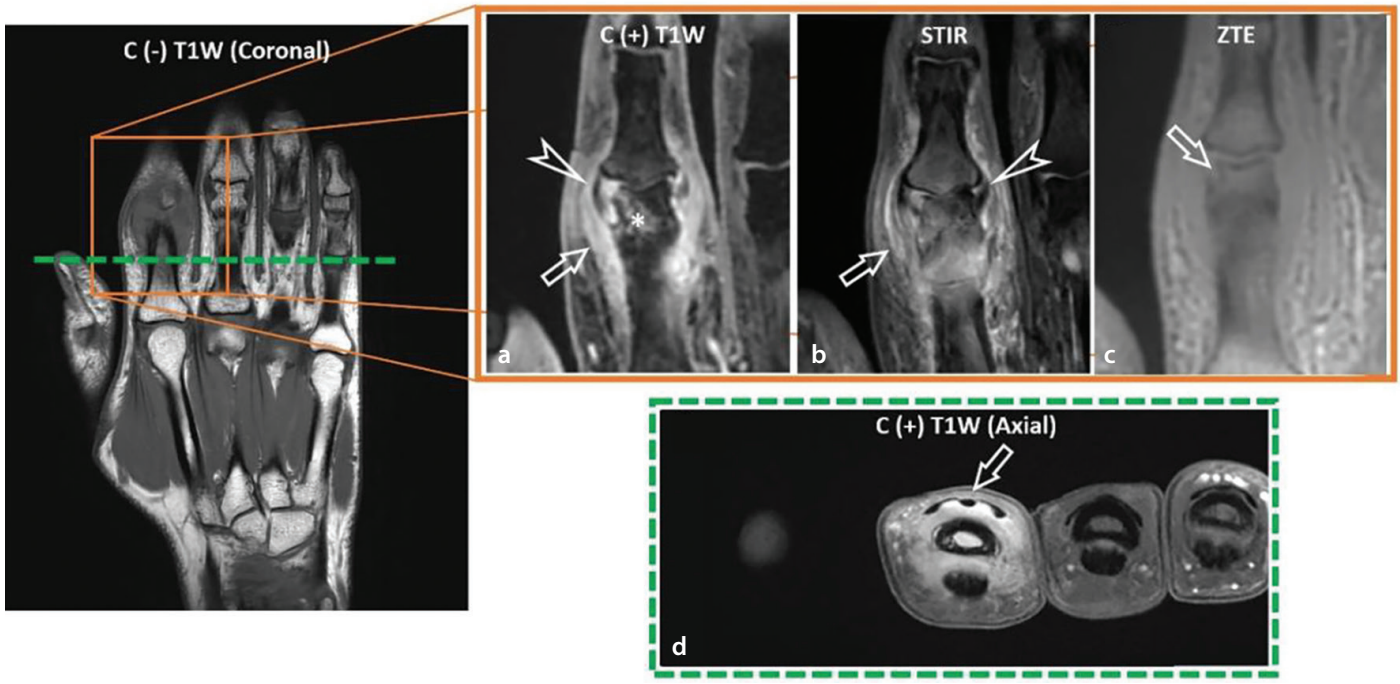

Figure 2. A patient with predominantly synovioentheseal complex inflammation. A 36-year-old male patient with a 4-month history of swelling and pain in the right second finger. Magnetic resonance imaging (MRI) demonstrated widespread periarticular soft tissue inflammation at the level of the second finger proximal interphalangeal joint (**a** and **b**, arrows). Enthesitis of the collateral ligament was observed (**a** and **b**, arrowheads), accompanied by a millimetric erosion at the insertion site of the collateral ligament (**c**, arrow). Additionally, periostitis of the proximal phalanx and extensive osteitis extending to the diaphysis (**a**, asterisk) were noted. Axial images revealed extensor peritendinitis (**d**, arrow). The MRI findings were consistent with inflammatory arthritis, and the final diagnosis was psoriatic arthritis. ZTE, zero time to echo; C+, contrast enhanced; C-, contrast non-enhanced; STIR, short tau inversion recovery.

Table 3. Descriptive data of the study group*

Variables	n (%)
Total number of patients	57 (100)
Gender	
Female	42 (73.6)
Male	15 (26.4)
Age (years)	
Mean ± SD	53.95 ± 12.30
Median [min–max]	54 [28–79]
Magnetic resonance-imaged hand	
Right	37 (64.9)
Left	20 (35.1)
Duration of symptoms (months)	
Mean ± SD	14.12 ± 16.73
Median [min–max]	12 [1–84]
Distribution of final diagnoses	
PsA	11 (19.2)
SpRA	6 (10.5)
SnRA	8 (14.0)
EOA/CPPD	11 (19.2)
ADIPI	21 (36.8)

*Patients excluded from the study are not included in this table; n, number of patients; SD, standard deviation; PsA, psoriatic arthritis; SpRA, seropositive rheumatoid arthritis; SnRA, seronegative rheumatoid arthritis; EOA/CPPD, erosive osteoarthritis/calcium pyrophosphate dihydrate deposition disease; ADIPI: arthritis involving distal interphalangeal joint.

[mean age: 46 (42–55) years] ($P < 0.001$, effect size = 0.678). Regarding the MRI findings, enthesitis was much more common in the ADIPI group (90.4%) than in the EOA/CPPD group (9.0%) ($P < 0.001$, effect size = 0.798). The presence and type of osteophytes differed significantly between the groups. While 14.2% of patients in the ADIPI group had marginal osteophytes, all patients in the EOA/CPPD group had marginal and/or hook osteophytes ($P < 0.001$, effect size: 0.835). Periarticular edema was observed in 76.1% of the ADIPI group but in no cases in the EOA/CPPD group ($P < 0.001$, effect size: 0.724). The erosion patterns of these two groups were also different; although central erosions were more common in the EOA/CPPD group, marginal erosions were more common in the ADIPI group ($P = 0.010$, effect size: 0.573).

The SpRA and SnRA groups displayed no significant differences regarding either demographic or MRI findings. Although subchondral osteitis was more frequent in the SpRA group than in the SnRA group, the difference was not statistically significant ($P = 0.103$).

The SpRA and SnRA patient groups were combined under the title of RA, since the two groups did not show significant differences in any variable. Compared with RA, patients

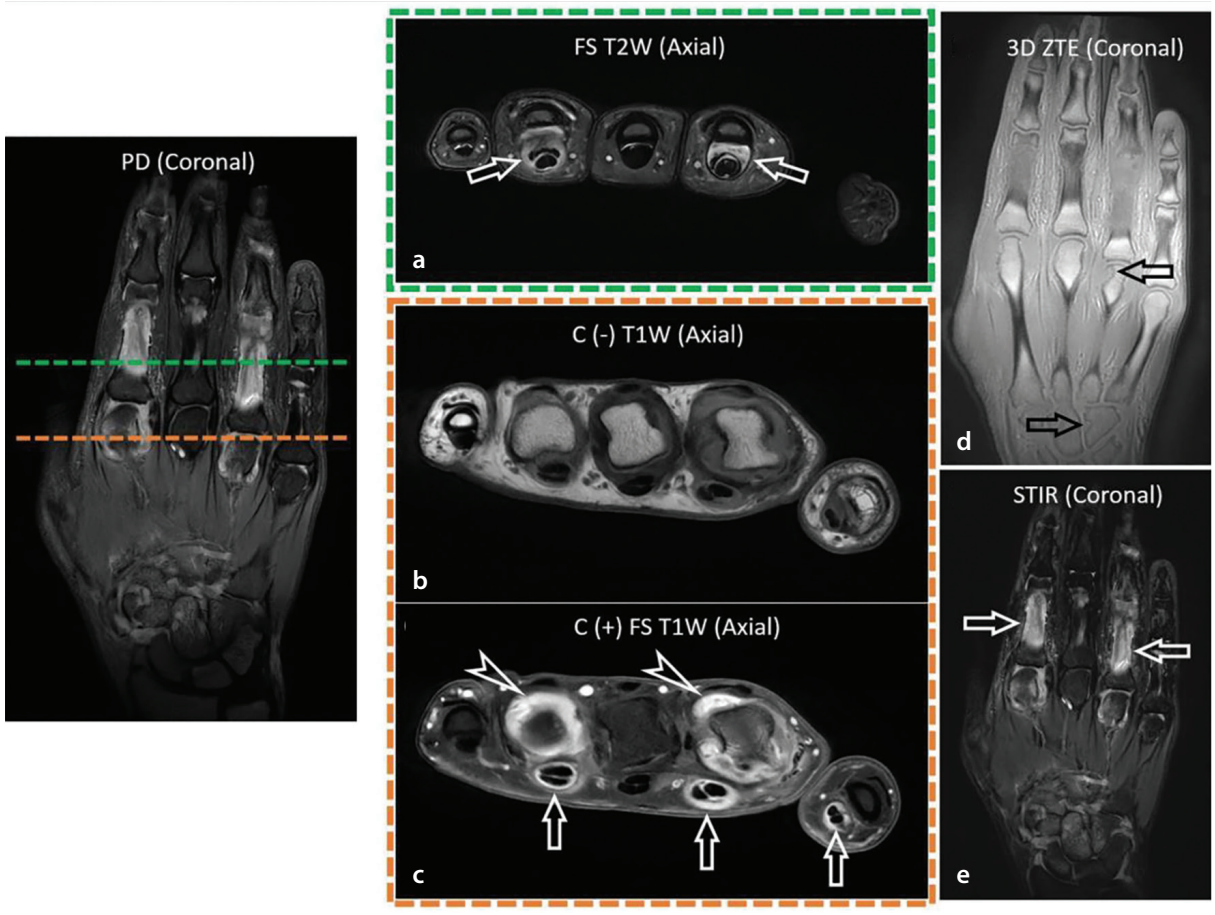

Figure 3. A patient with predominantly synovial inflammation. A 22-year-old female patient had been experiencing diffuse pain and swelling in her hands, more pronounced in the left hand, for the past 6 months. Magnetic resonance imaging (MRI) showed flexor tenosynovitis in the first, second, and fourth fingers (**a**, **c**, and **e**, arrows). There was also prominent synovitis and effusion in the metacarpophalangeal (MCP) joints that are easily seen as enlargement of joint spaces on pre-contrast T1W image **(b)** with intense contrast enhancement on post-contrast images (**c**, arrowheads). Additionally, synovitis was accompanied by erosions in the wrist and MCP heads, most notably on the radial side of the fourth metacarpal [**(d)** arrows]. These MRI findings were consistent with an inflammatory arthritis characterized by intense synovial inflammation, leading to a diagnosis of seropositive rheumatoid arthritis. 3D, three dimensional; ZTE, zero time to echo; C+, contrast enhanced; C-, contrast non-enhanced; FS, fat saturated; T1W, T1-weighted; T2W, T2-weighted; PD, proton density-weighted.

with PsA showed no significant difference in overall enthesitis rates (90.9% vs. 64.3%; P = 0.180). However, when pulley enthesitis was excluded from the analysis, the PsA group demonstrated significantly higher enthesitis rates than the RA group (90.9% vs. 42.9%; P = 0.033, effect size: 0.497). Additionally, the PsA group exhibited higher rates of periarticular edema than the RA group (81.8% vs. 35.7%; P = 0.042, effect size: 0.461). There was no significant difference between the groups in terms of other findings, including the distribution of synovitis.

The ADIPI group was combined with the PsA group before further analysis because there was no significant difference between the PsA and ADIPI groups; on the contrary, nailbed enthesitis, which is well known to be associated with PsA, was more common in the ADIPI group. Enthesitis, apart from pulley enthesitis, was significantly more prevalent in the PsA + ADIPI group than in the RA group (93.7% vs. 42.9%; $P < 0.001$, effect size: 0.515). Periarticular edema was also seen more in the PsA + ADIPI group than in the other groups ($P < 0.008$, effect size: 0.410).

The distribution of MRI findings by final diagnosis groups is presented in Table 4.

Risk factors for psoriatic arthritis

Logistic regression identified enthesitis as a significant predictor for PsA + ADIPI, with an odds ratio of 24.27 [95% confidence interval (CI): 2.624–63.309] across all groups. This model's AUC was 0.81, with a correct classification rate of 83.7%.

Diagnostic agreement

The weighted kappa coefficient indicated excellent agreement between MRI-based presumptive diagnoses and definite clinical diagnoses (κ = 0.90; 95% CI: 0.812–0.961).

Discussion

Our study demonstrated that MRI-based differential diagnoses showed high concordance with definitive clinical diagnoses. A fine-tuned hand MRI protocol successfully identified subtle yet critical findings that aided differentiation. Prior studies have similarly highlighted MRI's role in early arthritis diagnosis.[12,13] Nevertheless, considering its limitations, imaging should be interpreted in conjunction with clinical and laboratory data.[14,15]

The results from patients with PsA and those with ADIPI were similar except for radiographic findings and nailbed enthesitis. The higher prevalence of radiographic abnormalities in ADIPI may indicate more aggressive disease or rapid progression, which brings early clinical presentation with diagnostic challenges. Montilla et al.[16] similarly reported early radiographic changes in almost half of

Table 4. Distribution of magnetic resonance imaging findings by final diagnosis groups

	PsA	SpRA	SnRA	EOA/CPPD	ADIPI	Total (n [%][b])
Synovitis (n [%][a])	11 [19.3]	6 [10.5]	8 [14.0]	11 [19.3]	21 [36.9]	57 (100)
Enthesitis* (n [%])	10 [25.0]	3 [7.5]	6 [15.0]	1 [2.5]	20 [50.0]	40 (70.2)
Ligamentous enthesitis (n [%])	7 [25.9]	3 [11.1]	3 [11.1]	1 [3.7]	13 [48.2]	27 (47.3)
Extensor peritendinitis (n [%])	5 [31.3]	2 [12.5]	-	1 [6.2]	8 [50.0]	16 (28.0)
Nail-bed enthesitis (n [%])	2 [11.8]	1 [5.9]	-	1 [5.9]	13 [76.4]	17 (29.8)
Pulley enthesitis (n [%])	6 [25.0]	1 [4.2]	5 [20.8]	1 [4.2]	11 [45.8]	24 (42.1)
Tenosynovitis (n [%])	6 [23.1]	2 [7.7]	5 [19.2]	2 [7.7]	11 [42.3]	26 (45.6)
Without functional enthesitis (n [%])	1	1	-	1	-	3
With functional enthesitis (n [%])	5	1	5	1	11	23
Osteitis (n [%])	5 [20.0]	5 [20.0]	2 [8.0]	4 [16.0]	9 [36.0]	25 (43.8)
Subcortical (n [%])	3	5	2	2	4	16
Diaphyseal (n [%])	2	-	-	2	5	9
Erosion (n [%])	4 [12.1]	5 [15.2]	3 [9.0]	9 [27.3]	12 [36.4]	33 (57.8)
Marginal (n [%])	4	4	3	3	11	25
Central (n [%])	-	1	-	6	1	8
New bone formation (n [%])	1 [12.5]	-	1 [12.5]	-	6 [75.0]	8 (14.0)
Periarticular soft tissue edema (n [%])	9 [30.0]	3 [10.0]	2 [6.7]	-	16 [53.3]	30 (52.6)
Osteophyte (n [%])	1 [5.9]	1 [5.9]	1 [5.9]	11 [64.7]	3 [17.6]	17 (29.8)
Marginal (n [%])	1	1	1	8	3	14
Hook (n [%])	-	-	-	3	-	3
Joint space narrowing (n [%])	3 [8.9]	4 [11.8]	2 [5.9]	11 [32.3]	14 [41.1]	34 (59.6)
Uniform (n [%])	2	3	2	4	10	21 (36.8)
Non-uniform (n [%])	1	1	0	7	4	13 (22.8)

*Patients with classical or functional enthesitis in at least one region were considered positive for enthesitis; n, number of observation; [a], percentage within the respective finding; [b], percentage among all included patients; PsA, psoriatic arthritis; SpRA, seropositive rheumatoid arthritis; SnRA, seronegative rheumatoid arthritis; EOA/CPPD, erosive osteoarthritis/calcium pyrophosphate dihydrate deposition disease; ADIPI, arthritis with distal interphalangeal joint involvement.

patients with PsA with ADIPI within 1 year, suggesting rapid early progression.

All patients with PsA met the CASPAR criteria and had skin psoriasis, whereas patients with ADIPI lacked both, except for four borderline cases. Scarpa et al.[9] reported that ADIPI may occur regardless of skin psoriasis, reinforcing the view that current classification criteria may overlook early PsA.[2] Our findings support the utility of MRI, particularly SEC inflammation, in enhancing diagnostic sensitivity alongside CASPAR.

Discussion of magnetic resonance imaging findings

Synovitis prevalence and distribution did not significantly differ between groups, consistent with Narváez et al.,[17] who found synovitis to be non-specific in distinguishing PsA from RA. Although previous studies suggested more severe synovitis in RA,[18,19] we did not grade severity due to concerns over objectivity.

We found that patients in the ADIPI group did not differ from those with PsA, and enthesitis, apart from pulley enthesitis, emerged as distinguishing features that set these two groups apart from other types of arthritis. Moreover, nailbed enthesitis, well-documented in PsA,[20,21] was even more frequent in ADIPI, supporting their clinical similarity.

In a high-resolution MRI study conducted by Tan et al.,[22] it was reported that PsA was differentiated from osteoarthritis (OA) by collateral ligament enthesitis, extensor peritendinitis, and nailbed involvement with predominant SEC inflammation. In our study, the main MRI finding of the ADIPI group was also SEC inflammation. In contrast, the Multimodal Imaging of the Distal Interphalangeal-Joint Synovio–Entheseal Complex in PsA study questioned the specificity of SEC inflammation in DIPJ, noting similar findings in OA.[23] McGonagle et al.[14] also noted that enthesitis may occur in OA, particularly with age-related degeneration.

Pulley enthesitis did not differ significantly across groups, likely due to confounding factors such as mechanical stress or diabetes.[24] Agten et al.[25] previously stated that flexor tenosynovitis, closely associated with pulley function, was found to be present in almost all healthy subjects at specific degrees, further limiting its diagnostic value. To address this, we conducted a different analysis excluding pulley findings.

Although no significant group differences were found in osteitis, trends were informative. Osteitis was more frequent in SpRA (83.3%) than in SnRA (25.0%), in line with reports linking it to seropositivity.[26] Additionally, diaphyseal osteitis was common in the PsA + ADIPI group but absent in patients with RA, supporting literature that PsA leads to more extensive osteitis.[19,27]

Consistent with the findings of this study, Addimanda et al.[28] and Grainger et al.[29] emphasized central erosions as a key feature of EOA, though marginal erosions are also common. However, the literature comparing erosions in PsA and RA is inconsistent; whereas some studies, including ours, report no difference,[17,19,30] another study found erosions more common in PsA.[31] These contrasting results highlight the heterogeneity in the

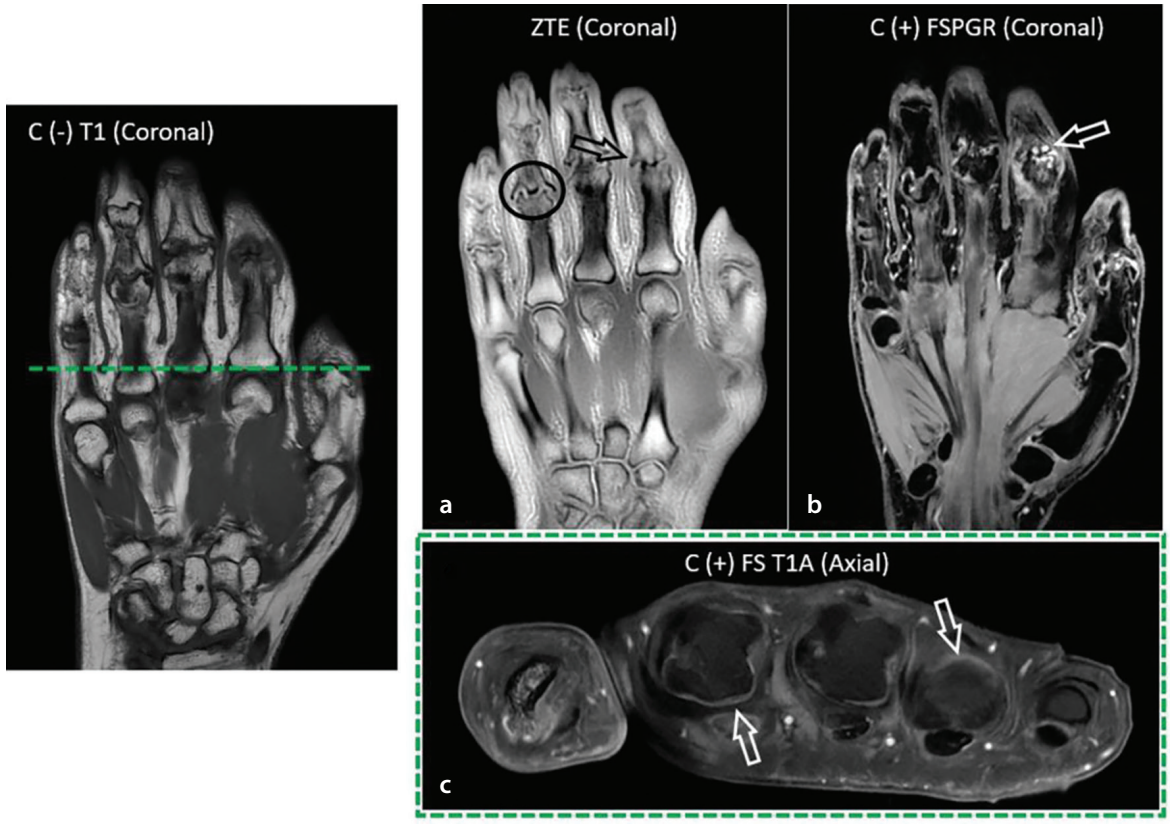

Figure 4. A case of inflammatory arthritis with predominantly degenerative findings. A 62-year-old female patient with a 12-month history of diffuse pain, more pronounced in the left hand. Magnetic resonance imaging (MRI) revealed marked joint space narrowing, prominent osteophytes (**a**, arrow), and subchondral cysts (**b**, arrow), most evident in the proximal interphalangeal joints. Gull-wing appearance (**a**, circle), secondary to central erosions, was also observed. An axial section at the metacarpophalangeal joint level showed mild synovitis (**c**, arrows). Based on these MRI findings, suggesting degenerative coexisting with inflammatory features, the patient was diagnosed with erosive osteoarthritis. ZTE, zero time to echo; C+, contrast enhanced; C-, contrast non-enhanced; FS, fat saturated; FSPGR, fast spoiled gradient recalled echo.

literature regarding the diagnostic utility of erosions in distinguishing PsA from RA.

Periarticular soft tissue edema was observed very frequently in the PsA (81.8%) and ADIPI groups (76.2%), less frequently in the RA group (35.7%), and never in the EOA/CPPD group. This supports previous US studies highlighting periarticular edema as a distinguishing feature of PsA.[18,31] Notably, Abrar et al.[31] incorporated periarticular soft tissue edema into a highly accurate PsA and RA differentiation model.

Strengths, limitations, and future recommendations

The use of a fine-tuned MRI protocol in this study allowed detailed evaluation of joint and periarticular structures, producing findings consistent with prior studies and demonstrating the technique's clinical utility. The prospective design minimized selection bias and provided standardized data.

Although the target sample size was calculated as 81 participants, only 57 patients were ultimately included due to stringent inclusion criteria and unforeseen exclusions. This reduction limited the statistical power of subgroup analyses and constrained the generalizability of our findings. Therefore, although our results indicate the meaningful diagnostic utility of SEC inflammation and periarticular edema in distinguishing PsA and related patterns, these conclusions should be interpreted with caution. Additionally, the single-center design may introduce institutional bias and restrict the validity of our findings. Future multicenter studies with larger, more diverse cohorts are necessary to validate our findings and establish broader clinical applicability. Future studies are also encouraged to explore prognostic imaging markers and treatment-related changes, incorporating standardized classifications and artificial intelligence tools to enhance objectivity.

Although the radiologists interpreted the MRI without knowledge of the final clinical diagnosis, and the rheumatologist had access to MRI reports, the latter conducted his diagnostic assessments by self-blinding to imaging findings. Nonetheless, the potential for residual incorporation bias cannot be fully excluded and may still influence the observed high concordance ($\kappa = 0.90$).

The MRI was performed with arms at the side to improve patient comfort and reduce motion artifacts, though this slightly reduced signal strength. Future studies could investigate positions that strike a balance between comfort and optimal signal quality.

Finally, our findings have important implications for clinical practice. In ambiguous cases, MRI findings could support accurate diagnosis and earlier initiation of disease-modifying antirheumatic drugs, potentially preventing irreversible joint damage. Conversely, distinguishing PsA from degenerative mimics, such as EOA/CPPD, can help avoid overtreatment. Integrating specific MRI features into rheumatology workflows, particularly for seronegative or atypical presentations, could enhance diagnostic precision and personalize treatment strategies. Future research should explore prospective validation of imaging-based algorithms and assess their impact on clinical outcomes.

In conclusion, this study provides new insights by systematically evaluating IHA using high-resolution 3T-MRI. Through a prospective design involving early undifferentiated

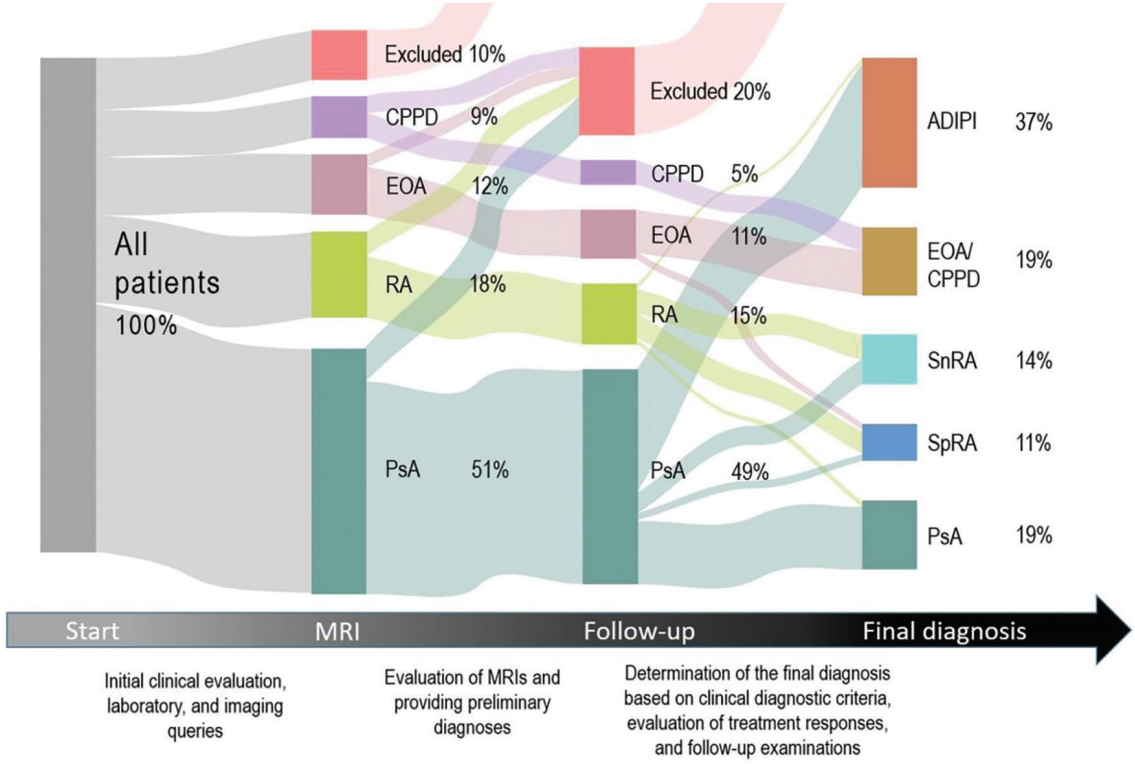

Figure 5. Alluvial diagram illustrating the study flow. **Start:** Eighty patients aged ≥18 years with inflammatory arthritis of the hand in at least one joint based on physical examination, laboratory, and ultrasonography findings and who were not receiving any treatment other than non-steroidal anti-inflammatory drugs for their symptoms were enrolled. Patients who were receiving steroid and disease-modifying agent treatment, who were absolutely contraindicated for magnetic resonance imaging (MRI), or who were allergic to gadolinium contrast agents were excluded. **Magnetic resonance imaging:** Among 80 patients referred to MRI by a rheumatologist, 41 patients were presumptively diagnosed with psoriatic arthritis (PsA), 14 with rheumatoid arthritis (RA), 10 with erosive OA (EOA), and 7 with calcium pyrophosphate dihydrate crystal deposition disease (CPPD). Six patients were excluded because they had no inflammatory findings on MRI, and two patients were excluded because their images were not diagnostic at this stage. **Follow-up:** A further 13 patients were excluded because they did not fall into any of the final diagnostic groups during the follow-up period, and two patients were excluded because they were diagnosed with a different condition (thyroid acropachy and infection). **Final diagnosis:** After clinical follow-up, 57 of 80 patients were included in the final diagnostic groups, with their diagnoses accurately confirmed; 11 of 57 patients were diagnosed with PsA, 6 with SpRA, 8 with SnRA, 11 with EOA/CPPD, and 21 with ADIPI.

arthritis, we demonstrate that imaging markers such as SEC inflammation and periarticular edema-especially when present in combination-may serve as early indicators of PsA. Importantly, the study offers a balanced interpretation by addressing diagnostic overlaps and proposing a potential composite MRI pattern that may support more accurate subtype classification in clinical practice. The strong diagnostic concordance between MRI and clinical assessments underscores the importance of multidisciplinary collaboration between radiologists and rheumatologists in managing these complex conditions.

Footnotes

Conflict of interest disclosure

The authors declared no conflicts of interest.

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