

Is a simplified version of PsAMRIS (sPsAMRIS) a potential tool for therapy monitoring in established psoriatic arthritis?

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Research article

Keywords: psoriatic arthritis, PsAMRIS, magnetic resonance imaging

Posted Date: September 24th, 2019

DOI: <https://doi.org/10.21203/rs.2.14892/v1>

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Abstract

Background: To evaluate whether a simplified version of the psoriatic arthritis magnetic resonance imaging score (PsAMRIS), sPsAMRIS, is a potential tool for therapy monitoring in psoriatic arthritis (PsA). **Methods:** Seventeen patients with PsA, according to CASPAR classification criteria, with inadequate methotrexate response received anti-TNF treatment and were assessed by 3T MRI of the clinically dominant hand at baseline and after 6 months. Scoring was according to PsAMRIS. Items were reduced based on standard response mean (SRM), resulting in a simplified PsAMRIS (sPsAMRIS), which was compared to PsAMRIS by calculation of the total SRM and relative efficiency (RE) after bootstrapping. **Results:** The PsAMRIS subscore of MCP3, 4, and PIP4 resulted in the highest SRM (-0.07 each) and were, therefore, included in sPsAMRIS. sPsAMRIS had a higher SRM compared to PsAMRIS (-0.13 vs. -0.02) and a higher RE (29.46). PsAMRIS and sPsAMRIS were highly correlated at baseline ($r=0.75$, $p<0.01$) and follow-up ($r=0.64$, $p=0.01$). The evaluation time was reduced from 471 to 142 seconds at baseline and from 478 to 133 seconds at follow-up ($p<0.001$). **Conclusions:** sPsAMRIS is a potential tool for therapy monitoring in psoriatic arthritis and is a time-saving variation of OMERACT PsAMRIS.

Background

Psoriatic arthritis (PsA) is a chronic inflammatory disorder that results in progressive joint destruction if left untreated [1,2]. With a global prevalence of 0.05–0.25%, PsA constitutes one of the most common inflammatory joint diseases next to rheumatoid arthritis (RA) and gout [3,4]. PsA consists of a large range of manifestations, such as dactylitis, enthesitis, synovitis, and bone erosions [5]. Similar to RA, early diagnosis and targeted treatment of PsA are crucial for a better clinical outcome, e.g., clinical remission or low disease activity [6, 7]. Current treatment strategies suggest escalation of therapy in cases of no response [8], hence, early detection of treatment failure is paramount. Consequently, reliable tools for therapy monitoring are required.

Even though it is not part of the Classification Criteria for Psoriatic Arthritis (CASPAR) [9], magnetic resonance imaging (MRI) becomes increasingly important as a tool for early detection and monitoring of PsA-related joint-involvement [7,10]. MRI is a reliable tool for detecting early PsA-related pathologies, such as soft tissue swelling, enthesitis, bone marrow edema, and bone erosion [11,12]. In 2003, the Outcome Measures in RA Clinical Trials (OMERACT) working group presented a reliable tool, the RA MRI Score (RAMRIS), for changes related to RA, which has been used for outcome measurement ever since [13]. Subsequently, in 2007 the OMERACT Psoriatic Arthritis Magnetic Resonance Imaging Scoring System (PsAMRIS) was introduced [14]. PsAMRIS is a semi-quantitative scoring system that includes typical changes in peripheral PsA, such as enthesitis, synovitis, tenosynovitis, periarticular inflammation, bone edema, bone erosion, and bone proliferation in 24 joints, resulting in a sum score [15]. PsAMRIS is an increasingly accepted tool for reliable and objective outcome measurement in controlled clinical trials investigating PsA [16]. A drawback to PsAMRIS is the considerable time needed for scoring. We recently demonstrated that a simplified version of the RAMRIS, termed RAMRIS-5, provides comparable sensitivity in the detection of arthritic changes while being more time efficient in RA [17].

The aim of this study was to evaluate whether a simplified version of PsAMRIS, dubbed sPsAMRIS, is a potential tool for therapy monitoring of psoriatic arthritis.

Methods

Patients

Twenty-one patients with PsA (mean age of 47 ± 6 years, minimum/maximum 26/72 years, male/female 11/10), fulfilling the CASPAR criteria, with a mean disease duration 4 ± 3.6 years and suffering from peripheral joint involvement of at least two metacarpophalangeal (MCP) joints and dactylitis of at least one finger were prospectively recruited for the "Analysis of the DActylic Melange" (ADAM) research initiative. All patients had failed methotrexate (MTX) monotherapy and were escalated to Etanercept (Enbrel® 50 mg s.c.) fortnightly after a baseline MRI scan. Seventeen patients (mean age of 53.7 ± 11.6 years, minimum/maximum 26/72 years, male/female 9/8) were included. Follow-up was available in 13 patients (mean age of 57 ± 9.01 years, minimum/maximum 42/73, male/female 7/6) at 6.2 ± 0.85 months (minimum/maximum, 5/8 months) after treatment escalation. The study was approved by the local ethics committee. Written and informed consent was obtained from all patients before the initiation of the study. The Disease Activity Score 28 (DAS 28) was 2.42 ± 0.72 (minimum 1.8/maximum 4.3, median 2.2) at baseline and 2.06 ± 0.27 (minimum 1.6/maximum 2.5, median 2.1). C-reactive protein (CRP) levels were 0.87 ± 1.35 mg/dL (minimum 0.1/maximum 5.8, median 0.3) at baseline and 0.43 ± 0.27 mg/dL (minimum 0.1/maximum 1.1, median 0.4) at follow-up.

MRI

Baseline (T0) and follow-up (T1) MR imaging of the clinically dominant hand were performed using a 3T MRI scanner (Magnetom Skyra, Siemens Healthineers) and a dedicated 16-channel hand coil (3T Tim Coil, Siemens Healthineers). The imaging protocol follows the recommendations of the OMERACT working group and includes pre- and post-contrast (gadolinium-based, intravenous-injection of 0.4 mL/kg bodyweight) T1-weighted and non-contrast fat-saturated T2-weighted/ short tau inversion recovery (STIR) images in two different orthogonal planes.

In detail, the following sequences were used:

Coronal T1 turbo spin echo (TSE) (TR/TE in ms, 862/27, flip angle in °, 150, slice thickness in mm, 2.5, field of view in mm, 140), coronal STIR (TR/TE in ms, 5560/31, flip angle in °, 120, slice thickness in mm, 2.5, field of view in mm, 140), sagittal proton density (PD) TSE fat-saturated (TR/TE in ms 3150/47, flip angle 150°, slice thickness 2.5 mm, field of view 150 mm), transversal T2 TSE fat-saturated (TR/TE in ms: 5693.8/89, flip angle 180°, slice thickness 3.0 mm, field of view: 160 mm), transversal T1 SE fat-saturated after iv contrast (TR/TE in ms, 807/16, flip angle in °, 90, slice thickness in mm, 3.0, field of view in mm, PsA:130), and coronal T1 TSE after iv contrast (TR/TE in ms, 862/27, flip angle in °, 150, slice thickness in mm, 2.5, field of view in mm, PsA; 140).

Image analysis

MR images were read and analyzed in consensus by two radiologists and one rheumatologist trained in PsAMRIS-Scoring, according to the OMERACT PsAMRIS guidelines [15,16]. In the case of different scores, the analysts decided scorings by common agreement. Images were evaluated for synovitis (score 0–3), flexor tenosynovitis (score 0–3), periarticular inflammation (score 0 or 1), bone edema (score 0–3), bone erosion (score 0–10), and bone proliferation (score 0 or 1) for the MCP (metacarpophalangeal), PIP (proximal interphalangeal), and DIP (distal interphalangeal) joint region of fingers 2–5, according to the OMERACT PsAMRIS guidelines [15]. In all joints, the proximal and distal or the dorsal and palmar portions, respectively, were analyzed separately for the presence of bone edema and erosions or periarticular inflammation. For comparison of time effort, one highly trained radiologist (CS) timed the scoring of PsAMRIS and sPsAMRIS.

Development of a simplified psoriatic arthritis MRI score, sPsAMRIS

For the development of a simplified scoring system, sPsAMRIS, we applied a single-site weighted summation approach. Priority was assigned to the joints with the highest standardized response mean (SRM) for the change of overall PsAMRIS at baseline and at follow up (Table 3)

All statistical analyses were performed using the R project for statistical computing (version 3.5.1 “feather spray”, the R foundation). For descriptive analysis mean, standard deviation, minimum, and maximum were presented. The sensitivity for change and their responsiveness was calculated by SRM for PsAMRIS and sPsAMRIS, as follows: $SRM = \frac{\Delta \text{score}}{SD}$. Relative efficiency (RE) was calculated for sPsAMRIS compared to PsAMRIS as a reference, as follows: $RE = \frac{SRM_{sPsAMRIS}}{SRM_{PsAMRIS}}^2$. Confidence bounds for the RE were estimated by the bootstrap method (based on B=5000 bootstraps with replacement) and application of the percentile method. A $RE > 1$ indicates that sPsAMRIS is more efficient than PsAMRIS in detecting change. For correlation analyses, Pearson’s product-moment correlation with Pearson’s correlation coefficient, r , was used. A p-value of < 0.05 was considered to be significant. Inter- and intra-rater reliability was calculated by two-way mixed intraclass correlation coefficients [single-measure ICC (sICC) for intra-rater and average-measure ICC (aICC) for inter-rater reliability].

Results

Simplified score: sPsAMRIS

Change of overall PsAMRIS and each PsAMRIS item between baseline and follow-up assessed by SRM is summarized in Table 1. Regarding overall PsAMRIS, MCP3, MCP4, and PIP 4 show the highest SRM (0.07, –0.07 and –0.07) and are hence combined as a new, simplified score: sPsAMRIS (s. Figure 1).

PsAMRIS and sPsAMRIS over the course of therapy

The PsAMRIS and sPsAMRIS results regarding the overall scores and each subscore at baseline under MTX therapy and at follow-up, after escalation to etanercept, are summarized in Table 2. Synovitis, flexor tenosynovitis, and periarticular inflammation are frequently found using both PsAMRIS and sPsAMRIS (examples in figure 2). Bone edema and bone erosions, on the other hand, are less frequently seen, whereas bone proliferations are rarely detected.

At follow-up, overall PsAMRIS and sPsAMRIS, as well as subscores for synovitis, bone proliferations, periarticular inflammation, and bone erosions, were increased. Flexor tenosynovitis and bone edema, on the other hand, were improved at follow-up.

PsAMRIS and sPsAMRIS sensitivity to change/responsiveness assessed by the standardized response mean (SRM)

The sensitivity to change of PsAMRIS and sPsAMRIS was assessed by SRM [18] and is summarized in Table 3. Common thresholds for SRM are the following: large, ≥ 0.8 ; moderate, 0.5–0.8; small, 0.2–0.5; trivial, ≤ 0.2 . Overall there is trivial sensitivity to change measured by PsAMRIS and sPsAMRIS, whereas the latter shows a slightly higher sensitivity. Only periarticular inflammation and bone erosion measured by PsAMRIS and synovitis measured by sPsAMRIS showed a higher, but still low, sensitivity.

Relative efficiency and reliability

The relative efficiency for sPsAMRIS compared to the known PsAMRIS is 29.46 (confidence bounds 2.5/97.5%: 0.00/59.88). Intra- and inter-rater reliability was high (aiCC=0.95, siCC= 0.92).

Correlation of PsAMRIS and sPsAMRIS

Correlation of PsAMRIS and sPsAMRIS is shown in Table 4. There was a strong correlation between PsAMRIS and sPsAMRIS regarding the overall values at baseline and at follow-up after escalation etanercept therapy (baseline, $r=0.75$, $p<0.01$; follow-up, 0.64, $p<0.05$). Also, there was a strong correlation regarding most subscores.

PsAMRIS and sPsAMRIS: Time comparative analysis

The evaluation time was variable and changed with the number of lesions detected. The time comparative analysis is depicted in figure 3. At baseline, it ranged from 375 to 578 seconds (470.7 ± 82.88 , median 424) with PsAMRIS and from 95 to 168 seconds (142 ± 21.85 , median 151) with sPsAMRIS. At follow-up, the PsAMRIS assessment took 300 to 607 seconds (467.3 ± 95.48 , median 452.5) and sPsAMRIS took 106 to 174 seconds (138.1 ± 21.63 , median 136.5). When comparing PsAMRIS and sPsAMRIS at baseline and at follow-up, the evaluation of sPsAMRIS was significantly shorter compared to PsAMRIS ($p<0.001$).

Discussion

PsA is one of the most common chronic inflammatory joint disorders [3,19,20]. Typically, PsA clinically presents with painful and swollen joints and decreased functionality, ultimately resulting in destruction of joints [21]. Enthesitis, bone erosions, edema, and proliferations, as well as dactylitis, are typical findings underlying these clinical features [8,22,23].

Similar to RA, early diagnosis and targeted treatment of PsA is crucial [4]. Conventional synthetic (cs) DMARD therapy and - in case of non-responsiveness - early escalation e.g. to biological (b) DMARDs have become

increasingly important [8]. Moreover, treat-to-target (T2T) was introduced in PsA, according to well established T2T strategies in RA, and was shown to be superior to conventional strategies [24]. That is why the application of MRI for early detection and reliable monitoring of joint inflammation and disease activity is constantly evolving [25,26].

In 2009, the OMERACT working group established the PsAMRIS [15] for detecting and grading PsA-related findings. The PsAMRIS is increasingly used for structured, semi-quantitative evaluation of peripheral joint changes related to PsA [18,27,28]. Even though PsAMRIS is a sensitive and validated tool [16,29,30] for detecting early PsA-related changes, it is very time consuming and, thus, of limited use in clinical practice. However, up until now, there has been no alternative to the OMERACT PsAMRIS for semi-quantitative evaluation of joint changes. That is why some authors developed and applied their own, abbreviated version of PsAMRIS for their studies. Feletar et al. only scored osteitis, tenosynovitis, and synovitis, without demonstrating correlation with regular PsAMRIS [31]. We previously demonstrated that an abbreviated version of the OMERACT Rheumatoid Arthritis Magnetic Resonance Imaging Score (RAMRIS), RAMRIS-5, is a time- and resource-saving alternative [17]. Similar to our approach for the RAMRIS-5, we reduced the current PsAMRIS to a simplified, abbreviated version, termed sPsAMRIS, that scores 36 instead of 144 items in 3 instead of 12 joints. We found a strong correlation between sPsAMRIS and PsAMRIS at baseline and at follow-up after six months of etanercept therapy. Further, sPsAMRIS indicated a very high relative efficiency compared to PsAMRIS and compared to other reported RE [32] and, thus, can be considered to be efficient for detecting change. Additionally, sPsAMRIS exhibited a significant reduction of scoring time compared to regular PsAMRIS. Hence, sPsAMRIS, potentially, is a time- and resource-saving alternative for semi-quantitative scoring of PsA-related joint changes of hands. As PsAMRIS is of limited clinical use to its time-consuming elicitation, sPsAMRIS is better applicable in a clinical setting.

Following Ostergaard et al. and Glinatsi et al., who stated potential difficulties in scoring especially DIP- and to a lesser extent PIP-joints due to a lack of spatial resolution, there is additional weight for an abbreviation with focus especially on the MCP-region [15,16]. Using an MRI with an even higher field, 3 T against 1.5 T, and a dedicated 16-channel hand coil, spatial resolution is considerably improved, making analysis of the PIP region more accurate. With sPsAMRIS containing only MCP 3, 4, and PIP 4, the initial concerns with the known PsAMRIS mentioned above should be resolved or significantly improved with sPsAMRIS.

Our study has limitations. Since PsA is a disease with several ways of clinical and radiological presentation, this study focused more on a well-defined and homogeneous than on a large patient collective. However, due to our small patient collective, further investigations with larger cohorts are required to confirm our results and the eligibility of sPsAMRIS. Further, as mentioned above, sPsAMRIS is a data-driven, weighted approach that is derived from a certain patient collective and, hence, could lack applicability for other collectives. Since PsA is a very heterogeneous and complex disease, a "one fits all" scoring system that is both sensitive and timesaving seems more difficult to established, e.g., compared to RA. However, the concept of simplifying regular PsAMRIS could still be beneficial to make it more accessible for daily practice and therapy monitoring. Another potential limitation is using SRM as a statistical means for assessing responsiveness. However, SRM is among the most widely used statistical means [18,32] and, therefore, it is considered to be a reasonable calculation to estimate responsiveness. In our data-driven approach, we chose items based on the

absolute amount of the SRM, disregarding the direction of the association. This takes into account that improvement and deterioration of different dimensions (e.g., synovitis, osteitis, tenosynovitis) may coexist in any given patient and/or joint.

Conclusion

The simplified MRI scoring system for PsA-related changes in hands, sPsAMRIS, showed a strong correlation with the known PsAMRIS and, hence, is a potential tool for therapy monitoring in PsA. It can be considered a time-saving simplification to regular PsAMRIS.

List Of Abbreviations

ACR: American College of Rheumatology

ADAM: Analysis of the DActylic Melange

aICC: average measure ICC

bDMARD: biological DMARD

CASPAR: classification criteria for psoriatic arthritis

CRP: C-reactive protein

csDMARD: conventional synthetic DMARD

DAS: Disease activity score

DIP: Distal interphalangeal

DMARD: disease modifying drug

EULAR: European League Against Rheumatism

ICC: intraclass correlation coefficient

MCP: Metacarpophalangeal

MRI: Magnetic resonance imaging

Ms: milliseconds

MTX: methotrexate

OMERACT: Outcome measures in rheumatoid arthritis clinical trials

PD: proton density

PIP: Proximal interphalangeal

PsA: Psoriatic arthritis

PsAMRIS: Psoriatic arthritis magnetic resonance imaging score

RA: rheumatoid arthritis

RAMRIS: rheumatoid arthritis magnetic resonance imaging score

RE: relative efficiency

SE: spin echo

sICC: single measure ICC

sPsAMRIS: simplified PsAMRIS

SRM: standardized response mean

STIR: short tau inverse recovery

T: Tesla

T2T: treat to target

TE: echo time

TR: relaxation time

ts: targeted synthetic DMARD

TSE: turbo spin echo

Declarations

Ethics approval

The study was approved by the ethic committee of the medical faculty of the Heinrich-Heine University Duesseldorf (4962R). Written and informed consent was obtained from all patients before the initiation of the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

The project was funded by the “Pfizer GIP Inflammation Germany Research Initiative 2014” to PS and SV and by a grant from the German “Bundesministerium für Bildung und Forschung”(BMBF), ArthroMark (01EC1009). DBA was supported by an internal research grant of the local research committee of the medical faculty. None of the funding bodies participated in the design of the study, the collection, the analysis, the interpretation of data or in the writing of the manuscript.

Authors' contributions

DBA: Acquisition, analysis, and interpretation of data. Draft and design of the work.

CS: Conception and design of the study. Interpretation and analysis of data. Draft and design of the work. Revision of the work.

PS: Design and conception of the study. Analysis and interpretation of data. Draft and design of the work. Revision of the work.

MF: Interpretation and analysis of data. Draft and design of the work. Revision of the work

RB: Analysis and interpretation of data. Draft and design of the work. Revision of the work.

SV: Design and conception of the study. Draft and design of the work. Revision of the work.

CG: Analysis and interpretation of data. Draft and design of the work. Revision of the work.

MS: Design and conception of the study. Draft and design of the work. Revision of the work.

BO: Design and conception of the study. Draft and design of the work. Revision of the work.

All authors have read and approved the manuscript.

Acknowledgements

Mrs. Erika Rädisch technically performed all MRI scans.

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Tables

Change between baseline (T0) and follow-up (T1) assessed by SRM												
PsAMRIS item	MCP				PIP				DIP			
	2	3	4	5	2	3	4	5	2	3	4	5
Overall	-0.01	0.07	-0.07	-0.03	-0.01	0.0	-0.07	0.00	0.0	-0.01	0.0	-0.03
Synovitis	-0.02	0.05	-0.07	-0.04	0.02	-0.03	-0.11	-0.03	-0.05	-0.05	-0.04	-0.04
Flexor tenosynovitis	0.05	0.09	0.00	0.01	0.01	0.04	-0.05	-0.08	0.04	0.1	0.04	-0.02
Bone Proliferation	-0.01	NaN	-0.01	NaN	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.03	NaN
Periarticular inflammation	-0.03	0.01	-0.01	0.00	-0.06	-0.05	-0.13	0.00	-0.03	0.01	-0.01	-0.06
Bone edema	-0.02	0.05	-0.07	-0.04	0.02	-0.03	-0.11	-0.03	-0.05	-0.05	-0.04	-0.04
Bone erosion	-0.04	0.00	-0.04	-0.05	-0.02	-0.01	0.03	0.03	0.00	-0.04	0.01	0.00

Table 1. Change between T0 and T1 for different PsAMRIS items and overall PsAMRIS assessed by standardized response mean (SRM) (SRM=(mean score T0 - mean score T1)/(SD mean score T0 - mean score T1)). PsAMRIS, Psoriatic Arthritis Magnetic Resonance Imaging Score; DIP, distal interphalangeal joint; PIP, proximal interphalangeal joint; MCP, metacarpophalangeal joint; NaN, not calculated.

PsAMRIS item	Baseline				Follow-up			
	PsAMRIS/sPsAMRIS				PsAMRIS/sPsAMRIS			
	Mean	SD	Range	Median	Mean	SD	Range	Median
Overall	65.41/16.29±17.42/4.43		37-93/9-25	64.0	67.50/17.14±14.44/3.11		49-98/14-25	68.0/16.5
Synovitis	22.12/6.35 ±5.67/1.46		13-33/5-9	22.0/6.0	24.0/6.93 ±4.67/1.27		17-32/5-9	23.5/7.0
Flexor tenosynovitis	10.47/2.94 ±4.99/0.9		3-22/2-5	10.0/3.0	9.57/2.79 ±3.11/0.7		5-16/2-4	10.0/3.0
Bone Proliferation	1.06/0.18 ±1.39/0.53		0-4/0-2	1.0/0.0	1.13/0.2 ±1.46/0.56		0-4/0-2	1.0/0.0
Periarticular inflammation	17.71/4.53 ±3.1/1.42		10-22/1-6	18.0/5.0	18.86/4.93 ±3.7/0.83		9-23/4-6	19.5/5.0
Bone edema	6.59/0.47 ±5.47/1.18		1-20/0-4	5.0/0.0	5.64/0.43 ±6.01/0.94		0-23/0-3	4.0/0.0
Bone erosion	7.47/1.82 ±5.46/1.59		1-20/0-5	6.0/1.0	8.21/1.86 ±5.56/1.29		1-19/0-5	7.0/1.5

Table 2. PsAMRIS and sPsAMRIS at baseline and at follow-up regarding the overall scores and each subscore. sPsAMRIS, simplified Psoriatic Arthritis Magnetic Resonance Imaging Score; SD, standard deviation.

Standardized Response Mean		
PsAMRIS item	PsAMRIS	sPsAMRIS
Overall	-0.02	-0.13
Synovitis	-0.11	-0.21
Flexor tenosynovitis	0.15	0.08
Bone Proliferation	NaN	NaN
Periarticular inflammation	-0.31	-0.16
Bone edema	0.2	-0.13
Bone erosion	-0.29	0.12

Table 3. Sensitivity to change of PsAMRIS and sPsAMRIS between baseline and follow-up assessed by SRM. Scale of SRM values: large, ≥ 0.8 ; moderate, 0.5–0.8; small, 0.2–0.5; trivial, ≤ 0.2 .

PsAMRIS item	Baseline		Follow-up	
	Correlation	95% confidence interval	Correlation	95 % confidence interval
Overall	0.75**	0.42; 0.90	0.64*	0.17; 0.87
Synovitis	0.84**	0.61; 0.94	0.74**	0.34; 0.91
Flexor tenosynovitis	0.72**	0.36; 0.89	0.59*	0.09; 0.85
Bone Proliferation	0.66**	0.27; 0.87	0.66**	0.23; 0.88
Periarticular inflammation	0.79**	0.50; 0.92	0.35	-0.22; 0.74
Bone edema	0.31	-0.2; 0.69	0.85**	0.58; 0.95
Bone erosion	0.8**	0.51; 0.92	0.74**	0.35; 0.91

Table 4. Correlation of PsAMRIS and sPsAMRIS regarding overall value and each item at baseline and at follow-up. Strength of association: small, 0.1-0.3; medium, 0.3-0.5; large, 0.5-1. *p<0.05. **p<0.01.

Figures

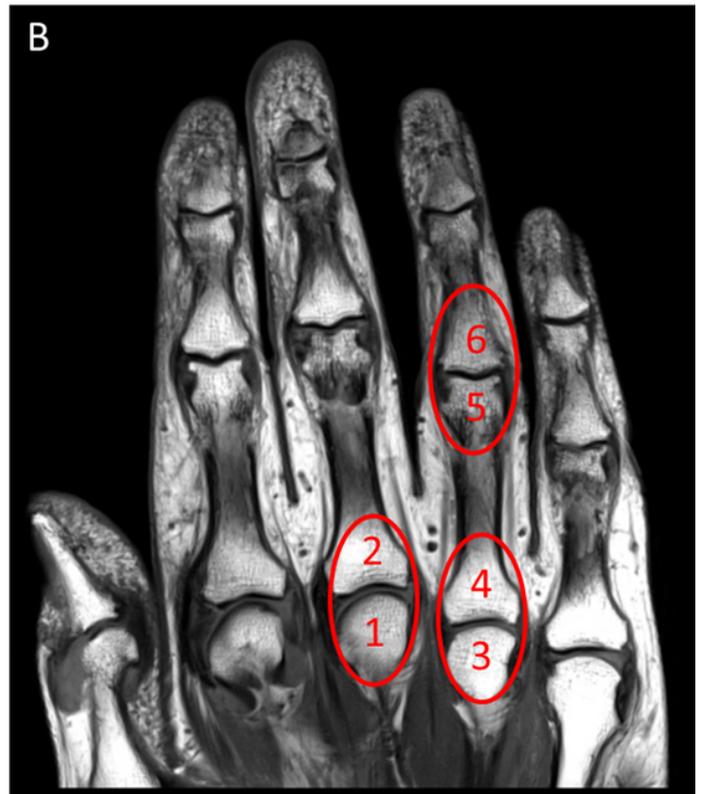


Figure 1

Coronal T1-weighted MRI. A) PsAMRIS. B) sPsAMRIS. Circles indicate scored joints. Numbers indicate joint sites evaluated in certain subscores. In A, 24 joint sites and/or 12 joints got evaluated. In B, this number is reduced to 3 joints and/or 6 joint sites.

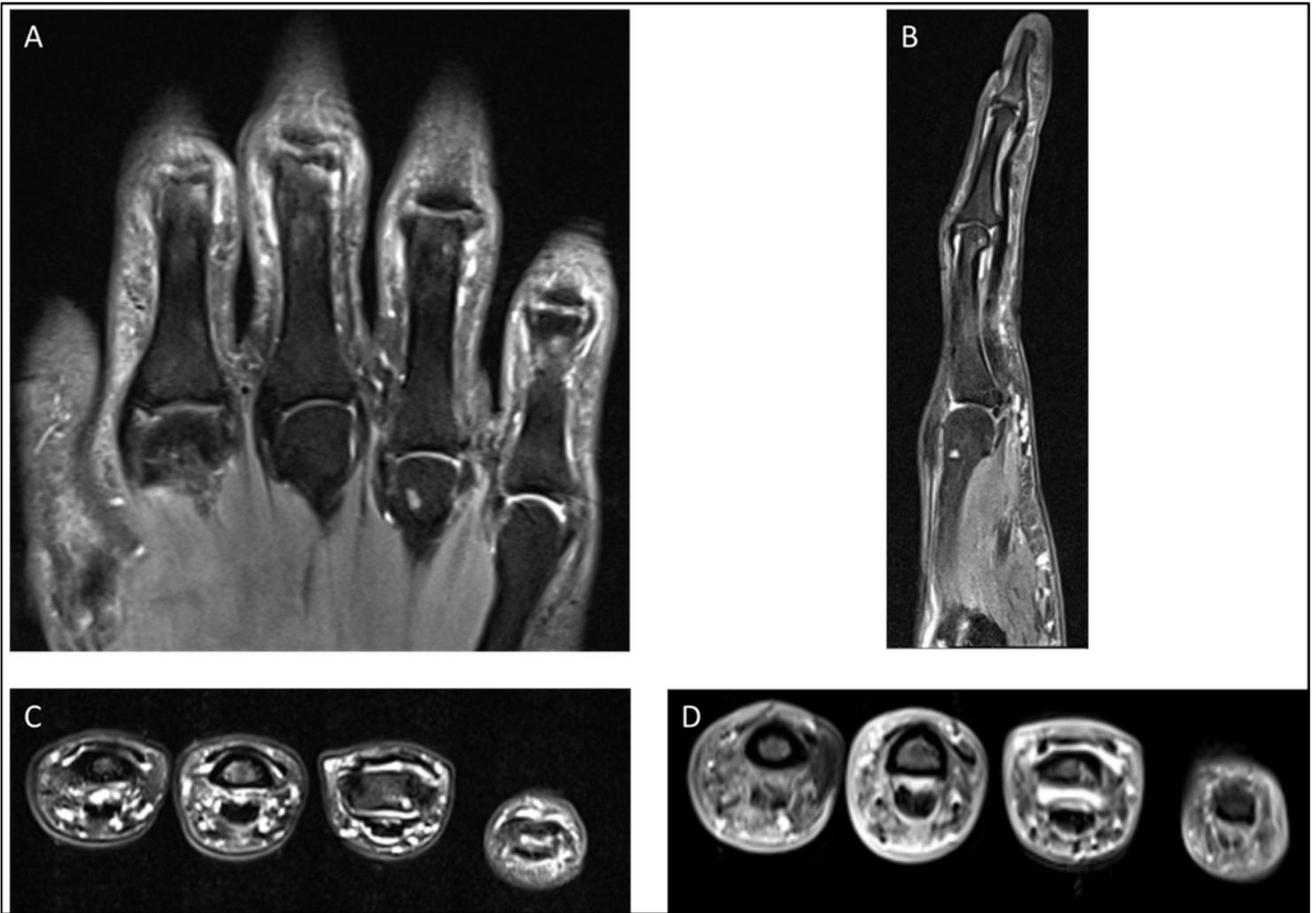


Figure 2

Female patient, 57 years. A) Coronal STIR. B) Sagittal PD fat saturated. C) Transversal T2 fat saturated. D) Transversal T1 fat-saturated + contrast agent. A and B show periarticular inflammation (dactylitis) at PIP 3–5 and bone erosion at the proximal parts of MCP4 and PIP4, as well as synovitis at PIP 3–5 and MCP 4–5. C and D illustrate flexor tenosynovitis, synovitis, and bone erosion at PIP 4 and periarticular inflammation at PIP3–5.

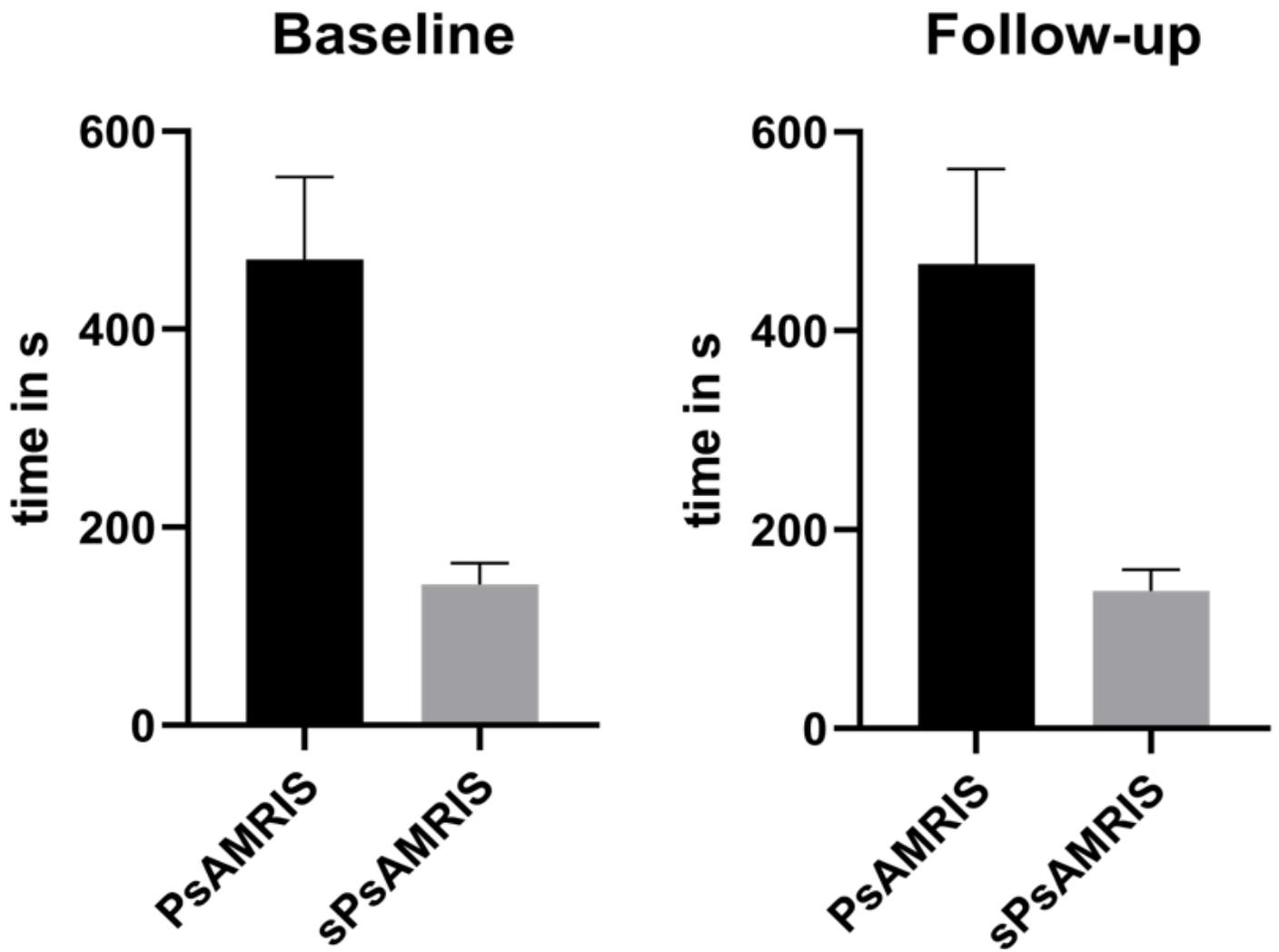


Figure 3

Time comparative analysis between PsAMRIS and sPsAMRIS at baseline (T0) and follow-up (T1). Graphs showed a significant decrease in assessment time at both T0 and T1. $P < 0.001$.