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### Authors

Abdelhafez, Yasser G  
Hagge, Rosalie J  
Badawi, Ramsey D  
[et al.](#)

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## Early and Delayed $^{99m}\text{Tc}$ -MDP SPECT/CT Findings in Rheumatoid Arthritis and Osteoarthritis

Yasser Abdelhafez, MD<sup>\*†</sup>, Rosalie Hagge, MD<sup>\*</sup>, Ramsey D. Badawi, Ph.D<sup>\*</sup>, Siba P. Raychaudhuri, MD<sup>‡</sup>, and Abhijit J. Chaudhari, Ph.D.<sup>\*</sup>

<sup>\*</sup>Department of Radiology, University of California Davis, California, USA

<sup>†</sup>Nuclear Medicine Unit, South Egypt Cancer Institute, Assiut University, Assiut, Egypt

<sup>‡</sup>Department of Rheumatology, University of California Davis, California, USA

### Abstract

We report on a 74-year-old man with seropositive rheumatoid arthritis (RA) and radiographic osteoarthritis (OA) who underwent dual-phase high-resolution  $^{99m}\text{Tc}$ -MDP SPECT/CT. Early radiotracer enhancement was noted in two RA joints of the right hand, both presenting with a ring-like uptake pattern around the joint, consistent with synovitis. Insignificant early enhancement was noted at the first carpometacarpal joint, despite presentation of CT features of OA. The delayed-phase enhancement patterns were distinct, showing asymmetry in RA joints, but a symmetric, centered pattern for the OA joint.

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A 74-year-old man with seropositive rheumatoid arthritis (RA) (Disease Activity Score 28 [DAS-28] of 3.61) presented prior to starting therapy. The patient underwent dual-phase SPECT/CT bone scan, conducted 15 min (early soft tissue phase) and 220 min (delayed osseous phase) respectively, after a single, 925 MBq, intravenous injection of  $^{99m}\text{Tc}$ -methylene diphosphonate ( $^{99m}\text{Tc}$ -MDP) radiotracer.

Images of the right hand are presented. The soft-tissue phase images (A–C) showed markedly increased ring-like radiotracer distribution around the first metacarpophalangeal (MP) joint (arrow, A & B). That pattern is consistent with hyperemia and synovitis. Hyperemia at the fifth proximal interphalangeal (PIP) joint was also noted (A, not shown in cross sections). Corresponding CT images showed joint space narrowing with no evidence of bone erosion. On blinded examination, the patient was found to have swelling and tenderness at both these joints, consistent with RA. For the first carpometacarpal (CMC) joint, CT images showed joint space narrowing with increased sclerosis and two < 2 mm osteophytes, consistent with Eaton stage II osteoarthritis (OA). Insignificant elevation in radiotracer uptake was, however, noted for this joint in the soft-tissue phase (arrowhead, C).

In the osseous phase images (D–F), both first MP and fifth PIP joints demonstrated focal increased tracer activity, more on the proximal aspect of the joints (arrow, D & E), while the

first CMC joint showed a rather symmetrically-increased joint-centered radiotracer uptake pattern (arrowhead, F).

This case illustrates the potential of  $^{99m}\text{Tc}$ -MDP high-resolution SPECT/CT imaging for assessing inflammatory activity and bone turnover in RA and OA via a single radiotracer injection. The early enhancement of  $^{99m}\text{Tc}$ -MDP activity in soft tissues is suggestive of hypervascularity and inflammatory synovitis, a hallmark of RA, and less commonly of OA<sup>1, 2</sup>. The tracer distribution on delayed images, which displays considerably different patterns is suggestive of osteoblastic activity<sup>3</sup> which could be seen with both RA and OA<sup>4-6</sup>. In the absence of erosive changes, bone remodeling in RA could be attributed to osteitis from the overlying inflamed synovium (outside-in hypothesis)<sup>7, 8</sup>.

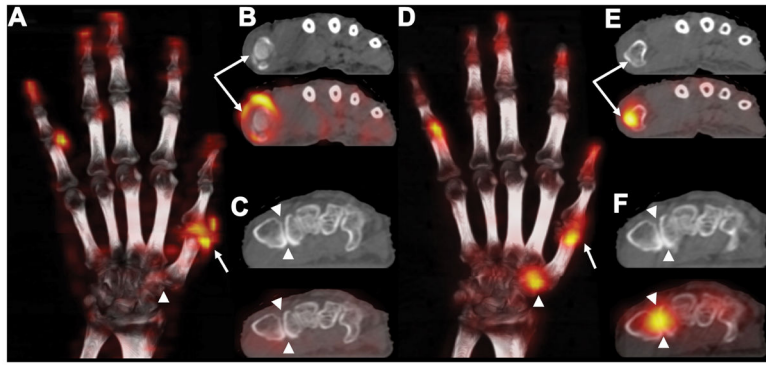
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**Figure 1.**