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

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Abstract: We report the case of a 74-year-old man with seropositive rheumatoid arthritis (RA) and radiographic osteoarthritis (OA) who underwent dual-phase high-resolution $^{99m}$Tc-MDP SPECT/CT. Early radiotracer enhancement was noted in 2 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, joint-centered pattern for the OA joint.

Key Words: blood pool, bone scan, osteoarthritis, rheumatoid arthritis, SPECT/CT, synovitis

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REFERENCES

FIGURE 1. A 74-year-old man with seropositive rheumatoid arthritis (RA) (Disease Activity Score in 28 Joints of 3.61) presented prior to starting therapy. The patient underwent dual-phase SPECT/CT bone scan, conducted 15 minutes (early soft-tissue phase) and 220 minutes (delayed osseous phase), respectively, after a single, 925-MBq intravenous injection of 99mTc-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 joint (arrow, A and B). That pattern is consistent with hyperemia and synovitis. Hyperemia at the fifth proximal interphalangeal 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 joint, CT images showed joint space narrowing with increased sclerosis and 2 osteophytes of less than 2 mm each, 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 metacarpophalangeal and fifth proximal interphalangeal joints demonstrated focal increased tracer activity, more on the proximal aspect of the joints (arrow, D and E), whereas the first carpometacarpal joint showed a rather symmetrically increased joint-centered radiotracer uptake pattern (arrowhead, F). This case illustrates the potential of 99mTc-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 99mTc-MDP activity in soft tissues is suggestive of hypervascularity and inflammatory synovitis, a hallmark of RA, and less commonly of OA. The tracer distribution on delayed images, which displays considerably different patterns, is suggestive of osteoblastic activity, which could be seen with both RA and OA. In the absence of erosive changes, bone remodeling in RA could be attributed to osteitis from the overlying inflamed synovium (outside-in hypothesis).