

Notes on nuclear bone scans for inflammatory arthritis diseases like Rheumatoid Arthritis

These are some notes that I collected before I wrote this post. This is not a research paper on bone scans for RA. There is only one purpose for these notes: To demonstrate that nuclear bone scans have been used to measure inflammation due to inflammatory arthritis diseases.

Questions about the scan

- 1. Do scans work for RA?** They appear to be successful in tightly controlled circumstances of the studies I've read. The jury may still be out. Some patients I know have had great success; several studies sound promising, but others warn of unreliability.
- 2. Was my scan performed properly?** My [full body scan was completed](#) in less than 25 minutes. I read that the camera should take 45 to 60 minutes to pass over the body. The patients I've talked with who had successful scans said they took that long. For the single body part, 10 to 30 minutes is required for an accurate scan; my feet and hands were each scanned for only 5 minutes. Many articles say 4 hours is the optimal time between injection and scan. Two hours is the minimum time. My scan was run at 2.5 hours post injection.
- 3. Was my scan read adequately?** I'm not sure. That was my question. It still is. "[Normal radiotracer uptake in the bones appears as a uniform gray in the image;](#)" that does not describe my scans.

List of some resources on bone scans for inflammatory arthritis

[Imaging modalities of the painful wrist: the role of bone scintigraphy](#), Oxford Journal of Rheumatology - "Bone scanning is a valuable diagnostic tool because of its sensitive and non-invasive nature. It is used increasingly in the assessment of the painful wrist as it is successful in the early detection of infectious, **inflammatory**, traumatic and ischaemic problems of the wrist components. It is often used when patients present with wrist pain despite treatment or when the physical examination and/or radiograph is inconclusive or unremarkable... Bone scans are extremely sensitive for evaluating skeletal pathology but they can be non-specific in some instances... Well-established scintigraphic patterns include those for stress fractures, osteonecrosis, reflex sympathetic dystrophy, non-union, **arthritis** and Charcot."

[Evaluation of technetium-99m-ciprofloxacin \(Infecton\) for detecting sites of inflammation in arthritis](#), Oxford Journal of Rheumatology - "Conclusion. The Infection scan is not specific for infection but may be a reliable procedure for identifying the **presence and distribution of the inflammation within joints**. It has the potential for monitoring the response of inflamed joints to treatment."

[Bone scan](#), DiagnoseMe.com - "The bone scan known as scintigraphy detects areas of increased or decreased bone metabolism and can indicate hidden bone fractures, bone infections, arthritis, cancer, or the cause of unexplained bone pain... After the appropriate amount of time, the patient

rests on a padded table while the gamma camera, housed in an arm-like device, passes over the body and records patterns of tracer absorption in the bones. It is important to lie very still. A scan of an individual bone can take from 10 to 30 minutes and an entire skeletal scan can run from 45 minutes to an hour... Evidence of abnormal metabolism shows up either as darker "hot spots" with greater tracer uptake or as lighter, "cold spots" with little or no tracer uptake. Hot spots represent increased bone metabolism while cold spots indicate decreased bone metabolism. With arthritis, the tracers show up on the bone surfaces of the joints."

[Scintigraphic evaluation of disease activity in rheumatoid arthritis: a comparison of technetium-99m human non-specific immunoglobulins, leucocytes and albumin nanocolloids](#), PubMed.gov. – "Technetium-99m-labelled, non-specific, polyclonal, human immunoglobulin G (99mTc-hIG) has been used to quantify synovial inflammation in rheumatoid arthritis... Twenty patients affected by rheumatoid arthritis and suffering from clinically active synovitis were studied ... seems to show that 99mTc-hIG is more useful than 99mTc-NC in the initial phases of the disease."

[Nuclear medicine's role in infection and inflammation](#), PubMed.gov. – "Nuclear medicine imaging techniques can help in patient evaluation where infectious and non-infectious inflammatory disorders are suspected... Nuclear medicine has to add specificity to its already high sensitivity if it is to distinguish both categories of inflammatory disorder."

[Psoriatic Arthritis](#), University of Washington, UWMC Roosevelt Clinic, Musculoskeletal Radiology – "Scintigraphy: bone scans may show abnormality prior to radiographs; asymmetric ≠ RA... Radionuclide bone scan in a patient with psoriatic arthritis and a swollen 5th finger. This delayed image shows markedly increased uptake in the 5th finger."

[Bone Scan](#), Lakeview Imaging – "Bone scan is a two part test involving an intravenous radioactive injection (Technetium99m HDP) followed by images of the blood flow and blood pool to the area of interest. The HDP takes 2-3 hours to be absorbed by the bones, so a delay is required in order to visualise the bone structures... Injection: 15 minutes (including initial images) Scan: (2-3 hours later) 45 minutes... Clinical Indications: Arthritides - Degenerative Joint Disease, Rheumatoid Arthritis, Pseudoarthritis."

[FDG uptake in sternoclavicular joint synovitis](#), Journal of Radiology Case Reports – "The degree of FDG uptake in this case is unusual and has not been previously noted by the author. Despite the lack of osseous changes on the CT and the relatively mild degree of the uptake on the bone scan, the FDG uptake and the synovial enhancement seen on the CT suggests a substantial degree of synovitis."

[The Diagnosis and Treatment of Early Psoriatic Arthritis: Early Joint Manifestations in Psoriasis](#), Medscape – "Over the past 30 years, investigators have turned to a variety of imaging modalities to study the joints and periarticular structures in psoriasis patients without musculoskeletal complaints or signs of inflammation. Bone scintigraphy, for instance, reveals the extent of joint inflammation at various sites and, despite its low specificity and poor resolution, may be more sensitive than clinical examination or radiography in the detection of early joint involvement in psoriasis (Figure 1a)... Bone scans were positive in 35 of the psoriasis patients but only 4 of the

controls ($P < 0.001$). The results of this study further support the concept that bone scintigraphy could be useful for detecting subclinical joint disease in patients with psoriasis... Nuclear bone scan showing increased uptake of technetium in the small joints of the hands and carpus, which suggests the presence of articular inflammation, in a patient with psoriasis referred to a rheumatology clinic for back pain”

[Oxford Journal of Rheumatology](#), 1993 – “These results show that ^{99m}Tc -IgG scintigraphy, when compared to ^{99m}Tc -HDP scintigraphy, is a more specific method of detecting synovitis and, also, shows differentiation between different degrees of arthritis activity in RA.”

[Oxford Journal of Rheumatology](#), 2009 – “Conclusion. ^{99m}Tc -anti-CD3 scintigraphy is a useful method in the differential diagnosis of rheumatic diseases.”

[PubMed.gov NIH](#), 1988 – “Of the joints which were to become eroded, 46/47 were scintigraphically active at all the check ups... New erosions were especially prone to appear in joints with persisting and high scintigraphic activity. On the contrary, inactive joints by repeated scanning never eroded. Scintigraphic and clinical activity and radiographic erosiveness correlated significantly with each other. The sensitivity and specificity of visual scintigraphic assessment and the relative pixel activity method proved to be superior to the region of interest methods and clinical evaluation for prediction of erosiveness.”

[Annals of Rheumatic Diseases](#) – “Conclusions: Radiolabelled human anti-TNF mAb allows visualisation of synovitis in patients with RA. Joint accumulation of this agent is partly due to specific TNF targeting and is highly predictive for inflammation.”

Book [Imaging of Arthritis by Barbara N. Warren Weissman](#): “Scintigraphy may detect inflammation or bone turnover at sites of active erosion. Several approaches for evaluating RA have been tested with bone, joint, metabolic, and inflammation-seeking radiopharmaceutical agents. Scintigraphic techniques rely on specific images in probes to target disease activity. Common radio labeled probes include biphosphonates to detect bone turnover and leukocytes to detect inflammation. Molecular probes that may have utility for RA include albumin nanocolloid, immunoglobulins (specific and non specific), and F-fluoro-deoxy-glucose (F-18-FDG).”

[Oxford Journal of Rheumatology](#), 2007 – “Despite these limitations, does a positive BS still have value in predicting joint damage in inflammatory arthritis? A careful study in early rheumatoid arthritis found that erosions were predated by persistent scintigraphic activity in affected joints [5]. Of note, however, almost all finger joints that eroded were active on clinical examination. The sensitivity of clinical examination was inferior to scintigraphy in the foot joints, but as analysis was by joint rather than by patient and as the scintigraphic score was derived from multiple BS, the implications for routine clinical practice are not clear.”

[Informa Healthcare](#) – “The degree of radiologic cartilage destruction correlated significantly with the isotopic uptake. In the early stages of rheumatoid arthritis, the isotopic uptake was found to be heterogeneous within the joint in one half of the cases.”