Positive Bone Images in Patients with Normal or Equivocal MRI Studies: Two Case Reports

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During nuclear medicine bone imaging, the accumulation of technetium-labeled radiopharmaceuticals in the bone is primarily related to blood supply. Bone imaging is very sensitive, and high resolution images representing physiologic function of the bone tissue can be obtained. Magnetic resonance imaging (MRI) can provide excellent images of soft-tissue contrast. Tissue anatomy, pathology, metabolism, and flow are easily visualized. With the increased use of computed tomography and MRI to visualize abnormalities of the extremities, bone imaging may no longer be of primary consideration in patient workups. The following case studies of an ankle and wrist are presented, utilizing bone images of these extremities correlated with MRI. Our preliminary evaluation suggests that bone imaging can be very sensitive to abnormalities, even when plain radiographs and MRI are normal.

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Case 1

A 64-yr-old female with a history of left foot pain was referred for a bone scan. A three-phase bone scan with 24.1 mCi of technetium-99m methylene diphosphonate (^{99m}Tc-MDP) was performed. Prior to injection, a general all purpose collimator was placed anteriorly over both ankles. A flow of 3-sec intervals for 1 min was obtained to determine regional blood flow. The flow was followed by anterior and lateral immediate images for 300,000 counts. At 2.5 hr, the patient returned for static images. Anterior, lateral, and plantar static images were obtained using an information density technique of 1,000 over the area of greatest activity of the noneffected limb.

Correlation with MRI. T1 weighted sagittal, coronal, images and T2 coronal and axial images were obtained through the left ankle. The feet of the patient were placed inside a head surface coil and immobilized with foam padding. The right foot was included in the field of view for comparison purposes.

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Case 2

A 42-yr-old female with a history of pain and swelling to the right wrist, hand, and arm was referred for a three-phase bone scan. The palmar surfaces of the patient's hands, including the wrists, were placed directly on the upturned collimator face of the detector head. An intravenous bolus injection of 23 mCi of ^{99m}Tc-MDP was injected in the left antecubital space utilizing a butterfly and three-way stopcock. Immediate dynamic images of the hands and wrists were obtained at 3-sec intervals for 1 min. Following the flow, immediate static images at 200,000 counts were obtained to record blood-pool activity. Anterior, and palmar static images were obtained using an information density technique of 1,000 over the area of greatest activity of the noneffected wrist.

Correlation with MRI. Utilizing a padded 5-in surface coil, T1 and T2 weighted coronal and axial images were obtained of the right wrist. The patient was placed in a prone position with the arm extended to place the wrist on the extremity coil.

DISCUSSION

Case 1, as demonstrated by MRI (Fig. 1), shows no evidence of occult fracture, osteocondritis dissecans, osteomyelitis, or joint effusion. There was also no evidence of ligament or tendinous abnormalities. The bone scans of the same area on the immediate image and the three-hour delay image (Fig. 2) clearly demonstrate abnormal activity. The increased activity is localized in the talo-navicular joint. A contusion of this area could account for the increase in uptake; however, there is no evidence of fracture or injury on plain radiographs.

Case 2 demonstrates diffuse increased activity in the right hand and wrist on the blood pool and the delayed images (Fig. 3). This appearance could be consistent with reflex sympathetic dystrophy. Also, increased activity in the third joint of the left hand is indicative of degenerative arthritis. The MRI correlation of this same area demonstrates extensive soft-tissue swelling over the dorsum of the hand, but no focal mass or ganglion is identified (Fig. 3B). There is no evidence of osteonecrosis or bone marrow abnormality.

FIG. 1. (A) Transaxial, (B) sagittal, and (C) coronal T1 weighted MRI images of ankle. (Courtesy of A. Lesselroth, MD, Mountain Diagnostics, Las Vegas, NV.)

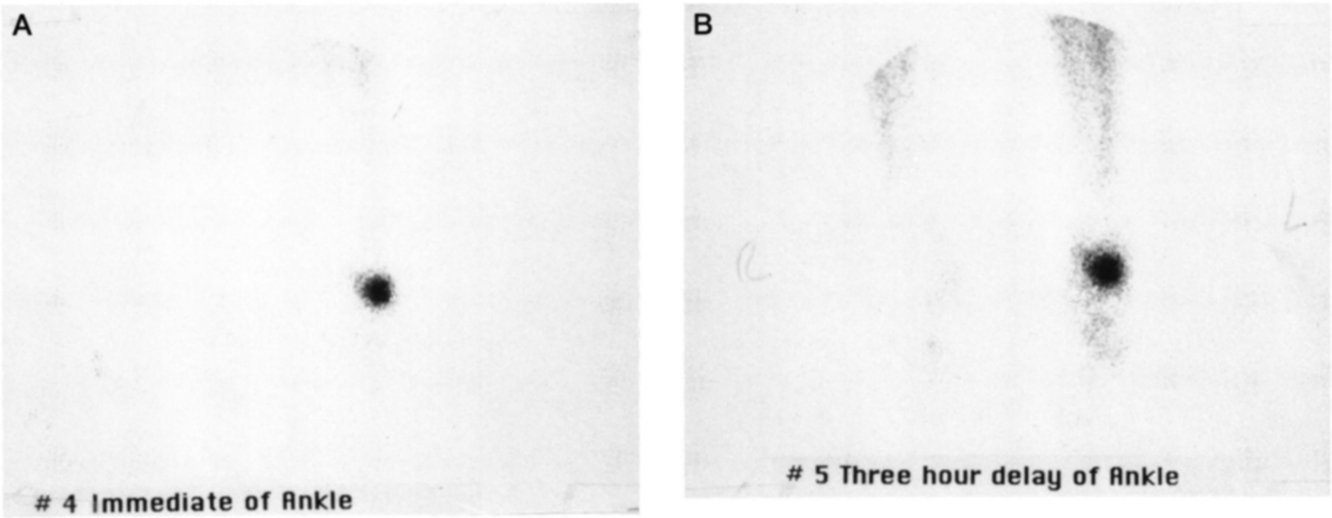

FIG. 2. (A) Immediate and (B) 3-hr delayed bone scan of ankle, which demonstrates significantly increased activity. (Courtesy of A. Lesselroth, MD, Mountain Diagnostics, Las Vegas, NV.)

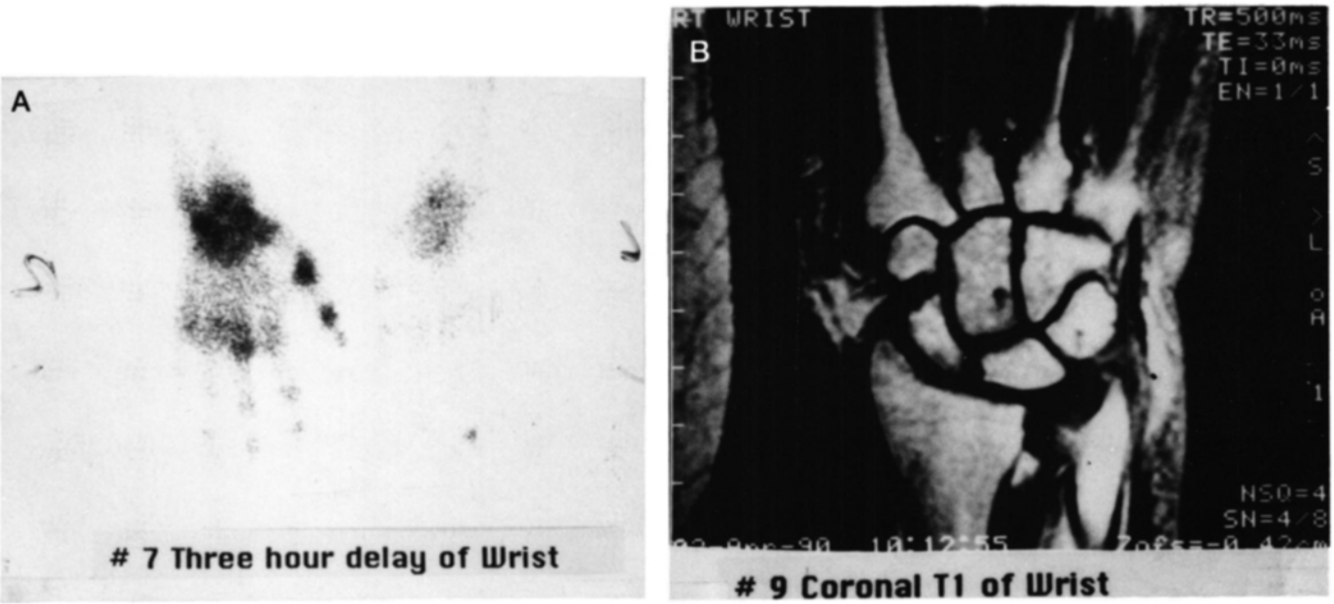

FIG. 3. (A) Three-hour delayed bone scan of hand and wrist demonstrating increased activity corresponding to (B) area of soft-tissue swelling on MRI image. (Courtesy of A. Lesselroth, MD, Mountain Diagnostics, Las Vegas, NV.)

CONCLUSION

The fact that the bone scans detected abnormalities in the osseous tissue, where the correlating MRI scans did not, clearly demonstrates the advantages and sensitivity of nuclear medicine bone scan images. Since MRI scans are excellent in demonstrating contrast changes of tissue, their ability to rule out various pathological conditions makes them a useful supplement to abnormal bone scans to aid in patient diagnosis (*1–4*).

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