Myositis Ossificans Demonstrated by Positive Gallium-67 and Technetium-99m-HMDP Bone Imaging But Negative Technetium-99m-MIBI Imaging

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Gallium-67-citrate and ^{99m}Tc-diphosphate bone imaging agents are localized in myositis ossificans, a tumor-like benign soft-tissue mass that makes it impossible to differentiate between malignant tumor and the infection/inflammatory process. We present such a myositis ossificans patient whose bone and ^{67}Ga-citrate imagings showed increased uptake in the left thigh and two foci of the right gluteal region leading to inconclusive results. Technetium-99m-MIBI imaging showed the absence of substantial uptake in these regions. A CT scan confirmed myositis ossificans. The lack of ^{99m}Tc-MIBI uptake in myositis ossificans means that ^{99m}Tc-MIBI imaging may be useful in the differential diagnosis.

Key Words: myositis ossificans; technetium-99m-diphosphonate bone imaging; technetium-99m-MIBI imaging; gallium-67-citrate imaging

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CASE REPORT

A 75-y-old man with hip pain was referred for bone scintigraphy to rule out the possibility of aseptic hip necrosis. Technetium-99m-HMDP 2-h bone images show two small focal areas of increased uptake near the posterior ileum and a rectangular area of increased uptake in the anterior thigh (Fig. 1). The second ^{99m}Tc-HMDP bone images were performed 3 wk later because of bilateral hip pain. The blood-pool image of both hips showed increased radioactivity in the left upper thigh; 2-h bone images showed two small foci of increased uptake near the posterior ileum and a rectangular area of intense uptake in the left upper thigh (Fig. 2). A concurrent bone radiograph of the left femur was negative. One week later, a 24-h ^{67}Ga-citrate posterior image showed two focal areas of increased uptake posterior to the left posterior ileum while an anterior image showed a large rectangular area of increased uptake in the left upper thigh (Fig. 3). These findings correspond to those of the bone scans as shown on the second bone images (Fig. 2). Immediately after the ^{67}Ga anterior thigh image and before the patient or camera was moved, a ^{67}Ga scatter into a ^{99m}Tc window image was obtained for the same time frame as for the ^{67}Ga image. Then the patient was injected with ^{99m}Tc-MIBI. A 20-min ^{99m}Tc-MIBI image was obtained for the same frame time as for the ^{67}Ga. The patient was not moved between the two imaging sessions. The ^{99m}Tc-MIBI image was corrected for ^{67}Ga scatter (Fig. 4A). Both ^{67}Ga and scatter-corrected ^{99m}Tc-MIBI images had the bladder/bowel area masked, through the computer, and were normalized based on the maximum pixel count of a ^{67}Ga lesion ROI (Fig. 4B). The ^{67}Ga image was subtracted from the scatter-corrected ^{99m}Tc-MIBI image, resulting in the lower left image in Figure 4B. This image demonstrates that the majority of the slight increase in tracer activity seen in the ^{99m}Tc-MIBI image is noncongruent with that of the ^{67}Ga uptake. Therefore, it is most likely due to blood pooling rather than to ^{99m}Tc-MIBI uptake into the lesion. Contrast CT performed 8 d after ^{67}Ga-citrate and ^{99m}Tc-MIBI images shows a well-defined mass of irregular calcifications in the anterior to the femur and separated in the femur itself, consistent with myositis ossificans (Fig. 5A). Retrospectively, a CT of the abdomen, performed 1 wk after the first bone scan, showed a satellite calcification in the left gluteal muscle, consistent with myositis ossificans (Fig. 5B).

DISCUSSION

Myositis ossificans, a benign, self-limiting ossifying soft-tissue mass, has been described by various names including heterotopic ossification, pseudo-malignant osseous tumor of soft tissue, extra-osseous localized non-neoplastic bone and cartilage formation, myositis ossificans circumscripta, and pseudo-malignant myositis ossificans (*1–6*). Etiological factors may be associated with post-trauma, postoperative coma, paralysis, hemophilia, and severe burns and tetanus (*7,8*). Up to 60% of patients have no history of prior injury (*9*). It occurs within skeletal muscle or soft tissue and favored locations are the extremities. Our patient had no apparent history of injury, and his lesions are located in the left thigh and right gluteal

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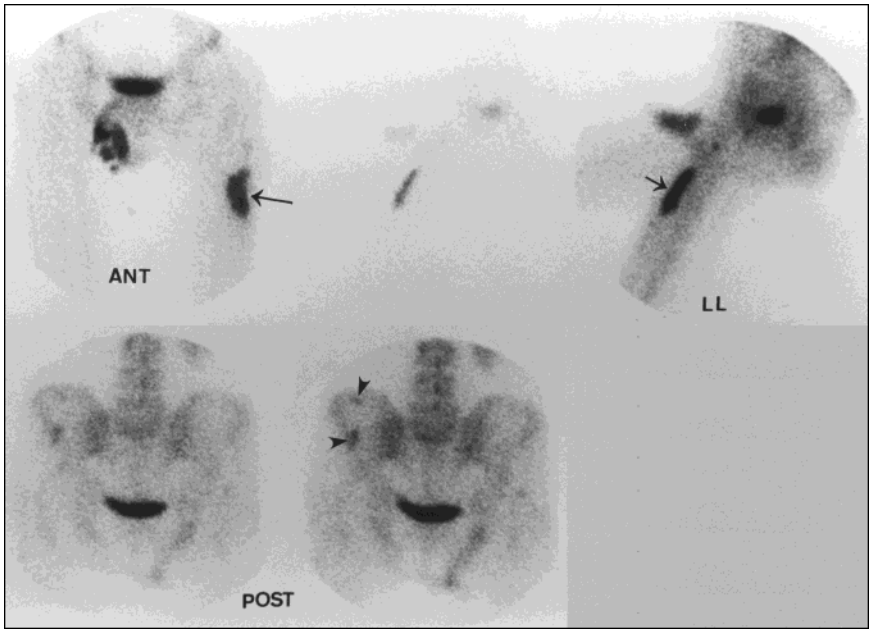

FIGURE 1. Technetium-99m-HMDP 2-h bone images show two small focal areas of increased uptake (arrowheads) near the posterior ileum on posterior pelvic views, and a rectangular area of increased uptake (arrow) in the left upper thigh seen on anterior and left lateral views.

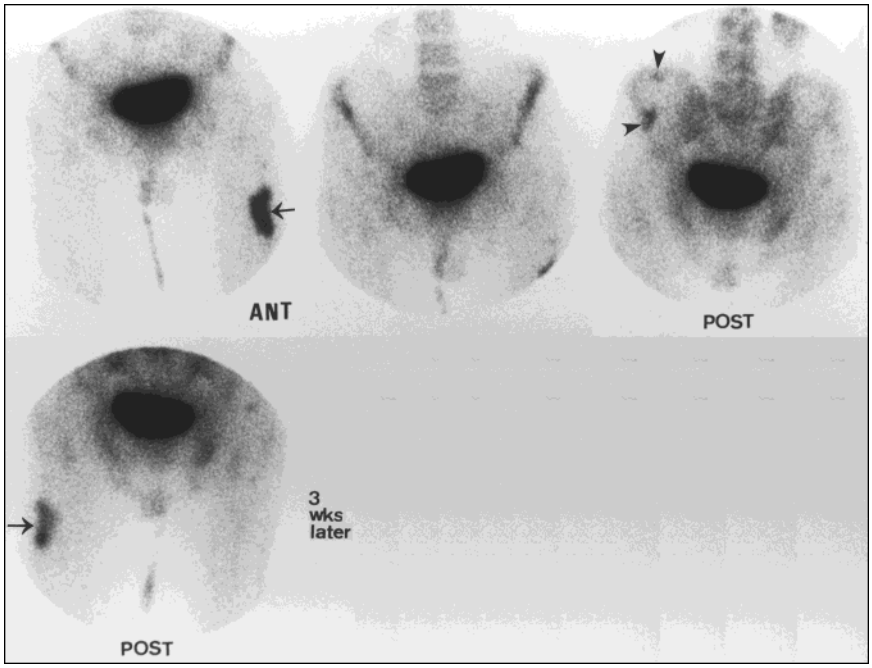

FIGURE 2. The second ^{99m}Tc-HMDP bone images show two small foci of increased uptake (arrowheads) near the posterior ileum and a rectangular area (arrow) of intense uptake in the left upper thigh. There are no interval changes from the findings of Figure 1.

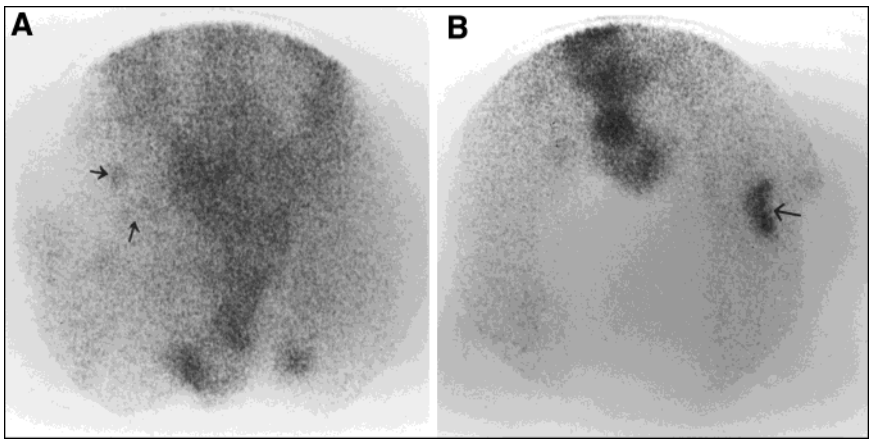

FIGURE 3. (A) Gallium-67-citrate posterior pelvic image shows two focal areas (arrows) of increased uptake posterior to the left posterior ileum. (B) Gallium-67-citrate anterior thigh image shows a large rectangular area (arrow) of increased uptake in the left thigh.

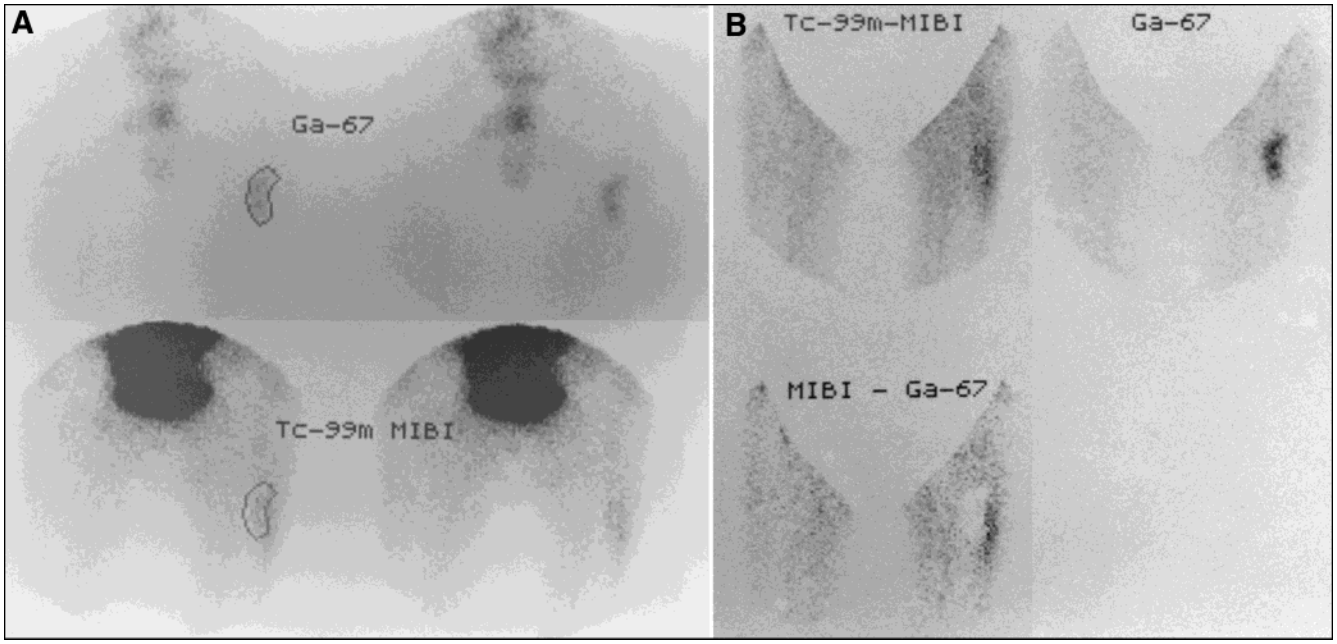

FIGURE 4. (A) Gallium-67 anterior image with and without region of interest around the increased ^{67}Ga uptake in the left thigh (upper two images). Scatter-corrected ^{99m}Tc-MIBI image with and without the same ^{67}Ga region of interest (lower two images). The patient and the camera were not moved between images. (B) The scatter-corrected ^{99m}Tc-MIBI and ^{67}Ga image from Figure 4A had the bladder/bowel area masked by computer and were normalized, based on the maximum pixel in the ^{67}Ga region of interest. The ^{67}Ga image was subtracted from the scatter-corrected ^{99m}Tc-MIBI image resulting in the lower left image.

areas. Plain bone radiography was negative for the calcified (ossified) mass. CT gave irregular diffuse mineralization through the lesion or a rim of mineralization after 4–6 wk (*6*,*10*) . MRI in its early and intermediate phase displays characteristics frequently associated with malignancy (*6*). Because it undergoes calcification and ossification, myositis ossificans localizes the bone imaging agent, as has been well-documented (*1*). The three-phase bone scan may help establish the diagnosis and may be used serially for evaluating disease status (*1*). Increased uptake of ^{67}Ga in the myositis ossificans might be misdiagnosed as infection of a neoplasm (*1*), such as was case with our patient. Uptake of ^{99m}Tc-MIBI in myositis ossificans does not appear to occur, based on this single case.

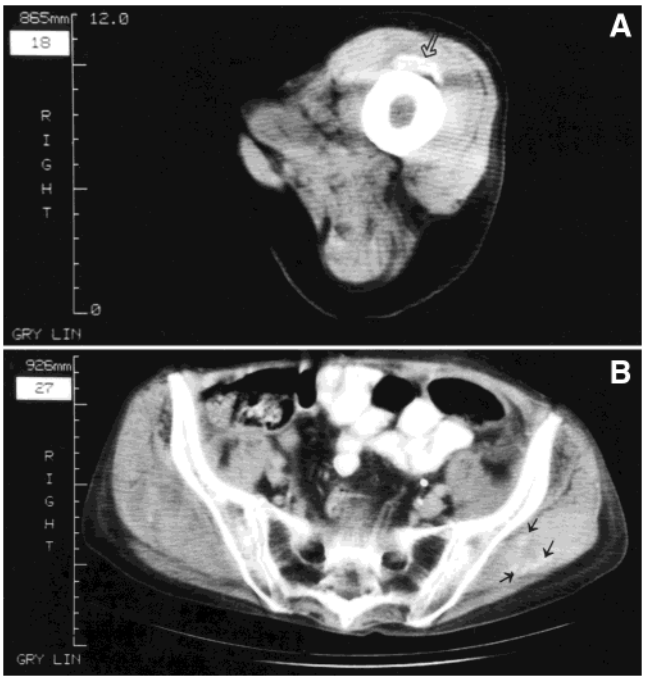

FIGURE 5. (A) Contrast CT shows a well-defined mass of irregular calcifications (open arrows) in the anterior to the femur and separated in the femur itself, consistent with myositis ossificans. (B) A CT scan of the abdomen shows a satellite calcification (arrows) in the left gluteal muscle, consistent with myositis ossificans.

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