
Differentiation of Infected from Noninfected Rapidly Progressive Neuropathic Osteoarthropathy

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Differentiation of infected from noninfected rapidly progressive neuropathic osteoarthropathy can be difficult in a combined bone/ ^{111}In -leukocyte study. We present two cases: one infected and one not infected. By examining the distribution of the ^{111}In leukocyte activity and the change in the lesion-to-background ratios from the 4-hr to the 24-hr image, it may be possible to determine if the rapidly progressive neuropathic osteoarthropathy is infected.

Key Words: indium-111-leukocytes; Charcot joints; osteomyelitis

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Seabold et al. evaluated 14 patients with rapidly progressive neuropathic osteoarthropathy (Charcot joints) with a combined bone and ^{111}In -leukocyte study and MRI (1). They concluded that rapidly progressive neuropathic osteoarthropathy may be indistinguishable from osteomyelitis on both the combined bone/ ^{111}In -leukocyte study and MRI (1). The following cases provide clues on how this differentiation can be made in clinical practice.

CASE REPORTS

Patient 1

During a 7-mo period, the radiograph of this 34-yr-old diabetic man went from near normal to almost complete destruction of the metacarpal bones. This was interpreted as rapidly progressive neuropathic osteoarthropathy, but infection was possible. A combined bone/ ^{111}In -leukocyte study was performed by drawing 43 ml blood into a syringe containing heparin and hetastarch. Following sedimentation, the cells were washed and labeled in saline using ^{111}In -oxine. Imaging was performed on a gamma camera that simultaneously captured and separated the 140-keV $^{99\text{m}}\text{Tc}$ peak and the 247-keV ^{111}In peak. The ^{111}In -leukocyte image was acquired for 50 kcts or 15 min at 4 and 24 hr postinjection of the ^{111}In -leukocytes. A 10% window at the 140-keV $^{99\text{m}}\text{Tc}$ peak and a 20% window at the 247-keV ^{111}In peak were used for the 4- and

24-hr images. The bone images and ^{111}In -leukocyte images were photographed on separate sheets of film so that they could be overlaid and compared.

The bone images (not shown) visualized increased activity in the metacarpal region corresponding to the activity seen on the ^{111}In -leukocyte study. The 4- and 24-hr ^{111}In -leukocyte images are presented as Figure 1. The study was interpreted as consistent with neuropathic osteoarthropathy without osteomyelitis. At discharge, the patient's foot pain was felt secondary to fracture without evidence of osteomyelitis. He was discharged without antibiotic therapy. During the next 15 mo, he was admitted to the hospital five times for poorly controlled diabetes. There was no further evaluation for possible osteomyelitis.

Patient 2

During a 6-mo period, the radiographs of this 67-yr-old diabetic woman went from moderate degenerative changes to almost complete destruction of the metacarpal bones. She had cellulitis and foot ulcers that did not respond to antibiotic therapy. Thus, the possibility of osteomyelitis was considered. A combined bone/ ^{111}In -leukocyte study was performed. The bone images (not shown) visualized increased activity in the metacarpal region corresponding to the activity seen on the ^{111}In -leukocyte study. The 4- and 24-hr ^{111}In -leukocyte images are presented in Figure 2. This study was interpreted as consistent with osteomyelitis as well as neuropathic changes. Amputation below the knee was performed. Surgical pathology confirmed the presence of osteomyelitis.

DISCUSSION

Superficially, these cases appear similar, but subtle differences led to the correct diagnoses. In Figure 1, there is diffuse ^{111}In -leukocyte activity. In addition, the activity in the region of the neuropathic osteoarthropathy compared to the activity in the blood pool (background) decreases from the 4-hr to 24-hr study. The ^{111}In -leukocytes seem to migrate to the neuropathic osteoarthropathy early, then wash away with time. This has been a consistent finding in the six or more cases of uninfected rapidly progressive neuropathic osteoarthropathy evaluated at our institution. [In the vast majority of cases, the osteoarthropathy is not rapidly progressive and there is no increased uptake of ^{111}In -leukocytes (2)]. The diffuse faint accumulation seen in Figure 1 is similar to that seen in the cases of noninfected rapidly progressive neuropathic osteoarthropathy reported by Seabold et al. (1).

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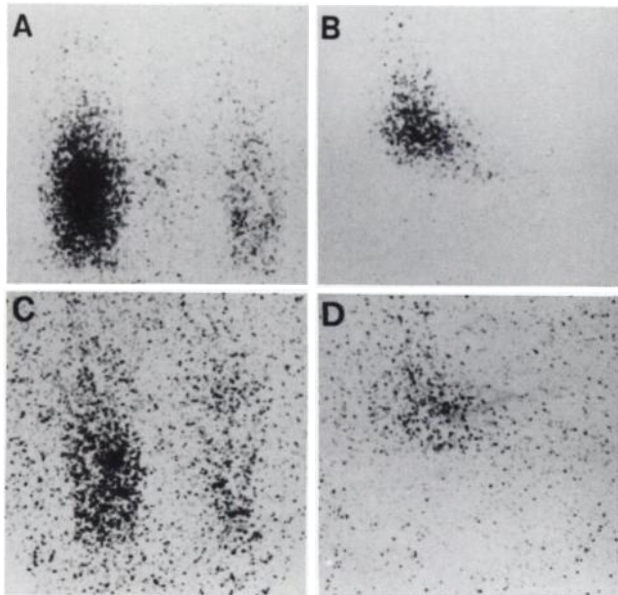


FIGURE 1. A 34-yr-old diabetic man with foot pain and radiographic destruction of the metacarpal bones during a 7-mo period. A and C are the 4- and 24-hr plantar ^{111}In -leukocyte images, respectively. B and D are the 4- and 24-hr right lateral ^{111}In -leukocyte images, respectively. Comparison of the 24-hr and 4-hr images reveal an interval decrease in the diffuse activity in comparison to the blood pool. This was rapidly progressive neuropathic osteoarthropathy.

In Figure 2, the accumulation of ^{111}In -leukocytes is not faint and diffuse, but rather, there are several focal accumulations of ^{111}In -leukocytes. In Seabold's case of infected neuropathic joint, there is a focal intense area of ^{111}In -leukocyte activity distinctly different from the $^{99\text{m}}\text{Tc}$ -MDP activity (1). More importantly, when the 4- and 24-hr images are compared, there is continued increase in ^{111}In -leukocyte activity in the midfoot region compared to the blood pool of the foot. Indium-111-leukocytes will continue to migrate into the area of infection over time, causing an increase in the lesion-to-blood pool ratio.

CONCLUSION

While the experience related in this report is limited, there are two clues: the distribution of the activity and the change in lesion-to-background ratios from the 4-hr to 24-hr images, which may help determine when infection is superimposed in rapidly progressive neuropathic osteoarthropathy.

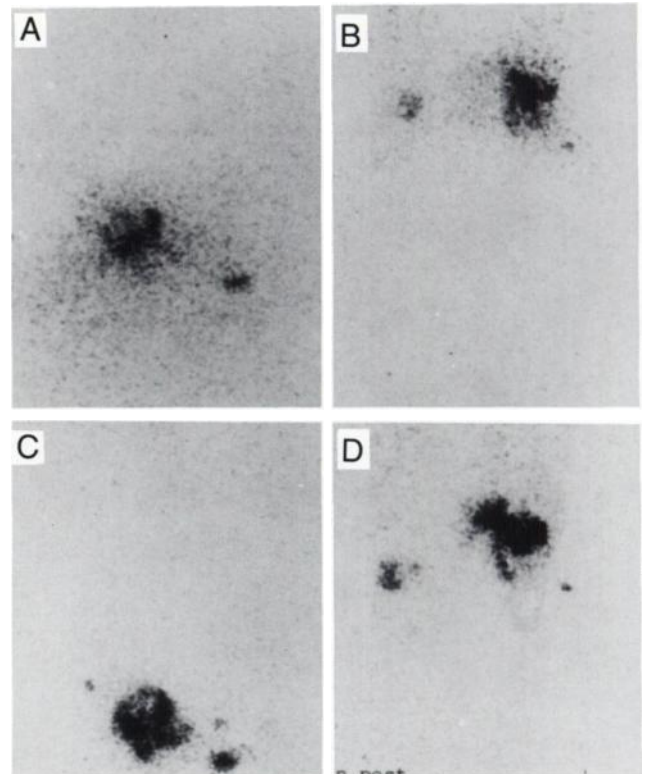


FIGURE 2. A 67-yr-old diabetic woman with radiographic destruction of the metacarpal bones during a 6-mo period. A and C are the 4- and 24-hr plantar ^{111}In -leukocyte images, respectively. B and D are the 4- and 24-hr posterior left foot and lateral right foot ^{111}In -leukocyte images, respectively. Comparison of C to A and D to B reveal an interval increase in the areas of focal activity compared to the blood pool. At amputation, the neuropathic joints were infected. Incidental notice is made of cellulitis of the left heel.

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