Differentiation of Infected from Noninfected Rapidly Progressive Neuropathic Osteoarthropathy

TO THE EDITOR: In his article in the August 1995 issue, Schauwecker (*1*) appears to have neglected one of the pitfalls of dual-isotope imaging: namely, spurious counts in the higher energy window arising from "pile up" of events associated with the lower energy isotope. This effect would account for the findings in Patient 1 in his study.

Two technetium photons sufficiently close together in time can interact with the camera crystal and be summated such that their combined energies fall within the indium energy window. This can be two unscattered photons, two scattered photons or one of each. The administered activity of technetium and the bone images of Patient 1 are not presented in Schauwecker's article, but in a patient with neuropathic osteoarthropathy, a high technetium count rate would be anticipated. Under such circumstances, the summation of technetium photons can occur with sufficient frequency to produce an "indium" image that contains significantly more spurious than true counts. Occasionally, this effect can produce interesting artifacts (*2*).

It is highly likely that the 4-hr indium image in Patient 1 resulted from this mechanism with very little, if any, specific white cell uptake. Of course, this effect would be expected to fade on the 24-hr image due to the physical decay of technetium.

To avoid such artifacts, I would suggest that a separate-day protocol is preferable to combined imaging. This would also allow the use of technetium-labeled leukocytes, if desired.

REFERENCES

1. Schauwecker, DS. Differentiation of infected from non-infected rapidly progressive neuropathic osteoarthropathy. *J Nucl Med* 1995;36:1427–1428.
2. Miles, KA, Barber, RW. A man with three knees? False hot spot with dual-isotope imaging. *BJR* 1990;63:789–800.

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REPLY: Dr. Miles is correct in stating that ^{99m}Tc 140-keV counts can "pile up" in the ^{111}In 174-keV window. This was originally described by Fernandez-Ulloa et al. (*1*). Previously, I illustrated how pile up could cause a problem in clinical practice when using simultaneous bone ^{111}In-leukocyte studies (*2*). Based on phantom studies, this problem could be eliminated using *our* older equipment if one closed the 174-keV window for the early and delayed images (*2*). The studies reported in this article were performed on newer equipment, in which it was possible to close the lower window for the early images and leave it open 10% for the delayed images without interference.

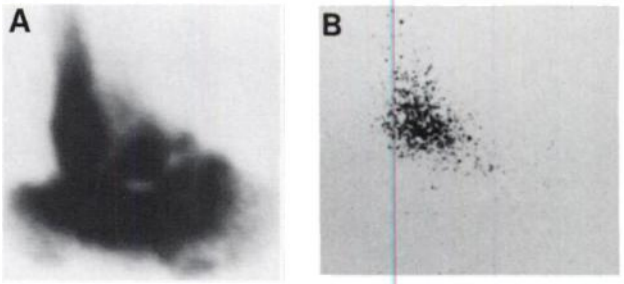

FIGURE 1. Technetium-99m-MDP bone image obtained simultaneously with the ^{111}In-leukocyte image presented as Figure 1B in the original case report (*3*).

If Dr. Miles' hypothesis for our findings is correct, then the distribution of the ^{99m}Tc activity and the distribution of the ^{111}In-WBC pile up image should be nearly identical. Figure 1A was the right lateral ^{99m}Tc-MDP image obtained simultaneously with Figure 1B from the case report and is reproduced here (*3*). A comparison of Figure 1A with Figure 1B shows that the activity distribution is different. Therefore, I feel that Figure 1B must represent the distribution of ^{111}In-leukocytes and not pile up.

In conclusion, I agree with Dr. Miles that poor technique can cause artifacts and a two-day protocol would be preferable to artifacts. Proper technique optimized for the equipment one is using, however, can minimize or eliminate these artifacts. The anatomic information provided by the bone scan in the peripheral skeleton or the bone marrow scan in the axial skeleton can be combined with the inflammation data provided by the ^{111}In-leukocyte study. The simultaneous bone ^{111}In-leukocyte or bone marrow ^{111}In-leukocyte studies localize the infection far more accurately than is possible if the anatomic landmarks are removed.

REFERENCES

1. Fernandez-Ulloa M, Hughes JA, Krugh KB, Chin D. Bone imaging in infections: artifacts from spectral overlaps between ^{99m}Tc tracer and ^{111}In-leukocytes. *J Nucl Med* 1983;24:589–592.
2. Schauwecker DS. Osteomyelitis diagnosis with ^{111}In-labeled leukocytes. *Radiology* 1989;171:141–146.
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