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Lymph Node Visualization in the Elbow Region

TO THE EDITOR: We read with great interest the article by Ongseng et al. (*1*) on ipsilateral axillary lymph node visualization due to extravasation of ^{99m}Tc-MDP. There was, however, no description of lymph node uptake in the elbow region in their results listing 48 of 2435 (2%) of axillary lymph node visualization. We encountered a patient who had extravasation of a bone imaging agent in the wrist region resulting in visualization of lymph nodes in the ipsilateral elbow region on bone scintigraphy.

In a 73-yr-old man with a 40+ yr history of smoking referred for bone scintigraphy because of lung cancer in the right upper lobe with mediastinal lymphadenopathy and right pleural effusion, a total-body anterior bone image (Fig. 1) acquired 3 hr after intravenous administration of 22 mCi ^{99m}Tc-HMDP showed increased uptake in the patient's right shoulder. We also observed an area of activity in the right wrist, which was the known injection site with infiltration.

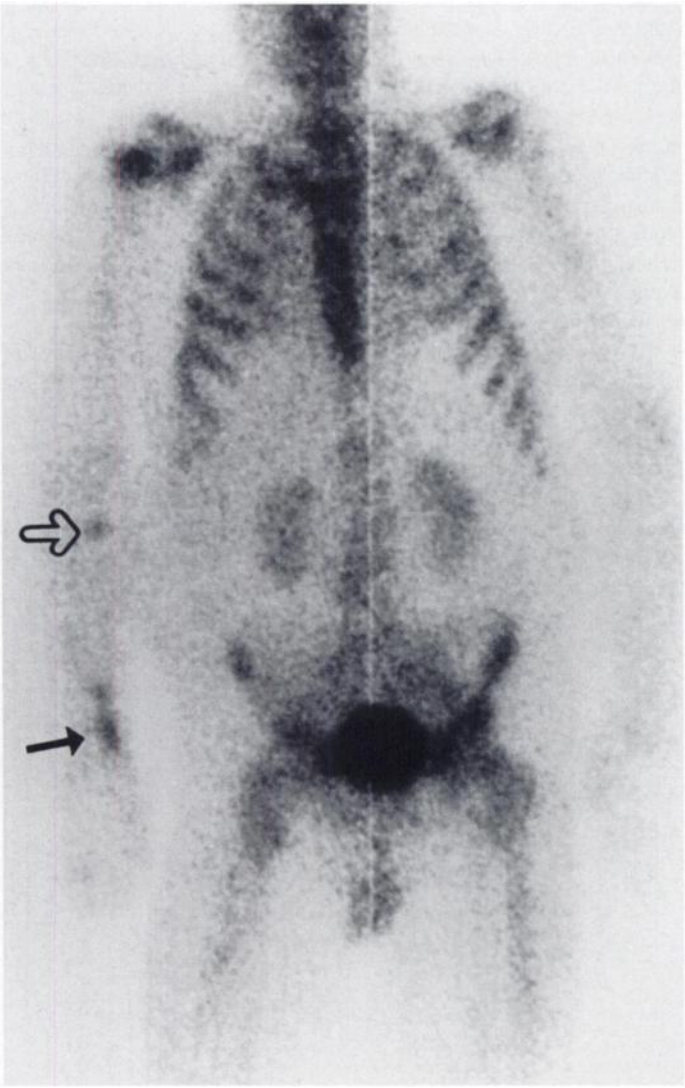

FIGURE 1. Total-body anterior bone image shows increased uptake in the right shoulder, suggestive of increased uptake in the left acetabulum and linearly increased radioactivity near the right wrist (arrow). Note the focal area of increased uptake near the elbow, possibly in the right proximal radius (open arrow).

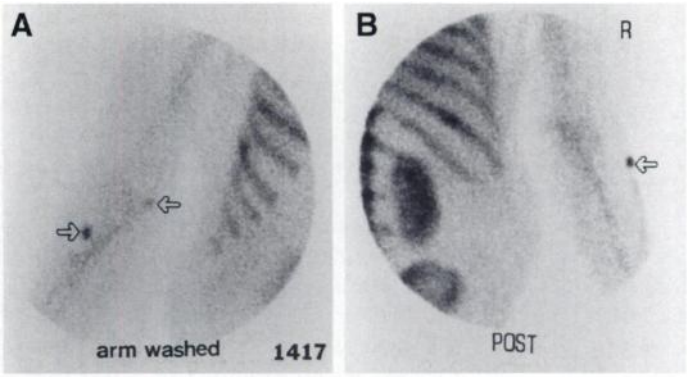

FIGURE 2. (A) Anterior image of the right elbow with slight rotation shows two discrete areas of uptake (open arrows) being separated from the joint or bone structure; the medial area is located in the superficial area of the soft tissue. (B) Posterior image of the right elbow shows focal uptake (open arrow) in the forearm in the superficial soft tissue and a suggestive lesion is seen in the right 10th rib posteriorly.

The abnormal area of activity near the elbow was thought to be urine contamination. Therefore, the patient's forearm and elbow regions were washed; two additional images were then obtained (Fig. 2).

Incidental axillary lymph node visualization after radiotracer subcutaneous infiltration of ^{99m}Tc-MDP into the antecubital region has been well documented (*2–6*). Our patient had extravasation of radiopharmaceutical around the dorsal part of the wrist leading to superficial lymphatic drainage to the lymph node near the elbow. The lymph node visualization might be misinterpreted as a lesion in the radius or as urinary contamination. After the patient's forearm and elbow were washed, two additional images depicted two discrete superficial foci in the elbow region, which were separated from the overlying bony structure, the elbow joint or were located in the superficial area of subcutaneous tissue. These foci were concluded to result from lymphatic drainage from the subcutaneous infiltration near the wrist.

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Effective Communication on Radiation Risk: Who Is at Fault?

TO THE EDITOR: This communication addresses the Editorial "Scatter: Invasion from Mars" in the October 1995 JNM. I find it remarkably inconsistent with your previous professional writings. The use of generalizations and an attack on the issues of ignorance toward realistic radiation

safety only encourage misunderstanding and distrust of those professionals responsible for the safe use of radiation and radioactive materials.

Educated and responsible physicians are not afraid of radiation or its invisible boogieman, nor are they casual or uncaring about the real associated risk. If physicians, radiation safety officers and other professionals behave incorrectly towards the real radiation risk, then it is your fault and my fault for not educating them.

I have never (in 30 yr) met a physician that was any more knowledgeable about the realistic dangers of medical radiation uses than a member of the general public, unless that physician had specific radiation training. Again, this is not their fault, and their fear is consistent with what they do not know. Again, this is OUR fault as supposedly the knowledgeable experts. Indeed, we have actually profited upon this fear.

I emphasize "OUR" fault because your editorial tries to place blame on the regulatory agencies. Agencies such as the NRC, OSHA, EPA and the FDA are not the cause of difficulty involved in radiation uses in the medical field. It is not the regulation that causes difficulty, but ignorance that is the boogieman. You and I are the cause of its existence. Shame on us.

If the NRC deletes its control over medical use of radioactive material, you will surely have some of these uneducated physicians regulating your activities through the advisory body of "experts." You do not actually think that the SNM and ACNP will always pick the controlling body, do you? I think not. In the last 22 yr of working with radioactive materials, I have *never* experienced the NRC hindering the responsible medical use of byproduct materials.

If control is left up to the states, more restrictions will surely result. Most states cannot even agree on who is a physician much less an authorized user. What makes you think they can be realistic and consistent in their regulations? Do not forget, each state will need the funds to operate this new section. For current agreement states, the expense will certainly not be less. Decentralization usually (almost always) costs more. We will pay dearly to spite the NRC.

Be careful SNM and ACNP, you may get your wish!

Michael H. Courey
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REPLY: About the only thing that makes me feel good about your letter is that you read my column "Scatter," entitled, "Invasion from Mars," and felt moved enough to write to me about it. I am disappointed that I apparently communicated so ineffectively that you think that our thoughts are not compatible.

I am gravely concerned about the lack of understanding of radiation effects among the public, regulators and physicians, including many radiologists, possibly nuclear medicine physicians and, certainly, radiation safety officers and health physicists. Several years ago, one of my mentors, Dr. Roslyn Yalow, in an editorial published in *Health Physics*, castigated the health physics community for its failure to educate and, in fact, for taking advantage of radiation phobia. Of course, as a presumably knowledgeable nuclear medicine physician activist and editor, I blame myself (in part) for this problem.

"Invasion from Mars" was a somewhat lighthearted but nonetheless serious description and criticism of the sad state of insight and understanding throughout the United States. I share your notion that this situation would worsen if the states directly control radiation safety issues. Please notice that I was previously quoted in *Newsline* concerning this matter specifically. I disagree strenuously that fewer problems would exist *without* the NRC. Additionally, I am distressed when knowledgeable health physicists and cancer epidemiologists admit the lack of evidence regarding adverse effects at radiation levels below 10 cGy per annum but say that we have to maintain almost *draconian* control because the United States Congress or the public expects us to do this. The best hope, I believe, is for an informed NRC to mandate national regulations in this regard.

Once again, I wonder what the Martians think about this?

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Don't Forget MERiT

TO THE EDITOR: We read with great interest the article of O'Donoghue et al. (*1*) concerning the relationship between tumor size and predicted curability for radiopharmaceutical therapy with beta-emitting radionuclides: a logical extension of their previous report (*2*). The data presented demonstrate the reduced effectiveness of targeted therapies of small metastatic lesions treated with high-energy beta-emitting radionuclides due to the long path lengths of the energetic particles relative to the size of the tumors. The authors cogently argue for the use of a multiradionuclide therapeutic approach to enhance curability. A low-energy beta-emitting radionuclide (^{199}Au for example) would be utilized to effectively irradiate small lesions, and a radionuclide which emits more penetrating beta particles (such as ^{90}Y) would be used to deposit much greater absorbed radiation doses in larger primary tumors and circumvent nonuniform tracer distribution.

Our group has also recognized the limitations of high-energy beta-emitters for treating small tumors. We have proposed the use of magnetic fields to confine high-energy beta particles to trajectories that promote increased energy deposition in small metastatic lesions (*3*). This technique, which we call magnetically enhanced radionuclide therapy (MERiT), utilizes magnetic fields to curve the paths of energetic beta-particles; confining them, to a certain extent, close to their point of emission. Thus, increasing the amount of energy deposited within the tumor and concurrently reducing radiation exposure from tracer in the tumor to surrounding normal tissues. This approach changes the character of the absorbed energy distribution in the tumor; MERiT can, for small lesions, increase the amount of deposited energy per unit volume of tumor.

To assess the effectiveness of MERiT in extending the size range of curable tumors in the context of the work of O'Donoghue et al. (*1*), the model of cure probability reported in this work was used. The only deviation from the model was the use of a Monte Carlo software package to calculate the absorbed fraction (φ). This simulation allows for the effects of magnetic confinement to be included in the calculation of φ. Results from this analysis for ^{90}Y are shown in Figure 1. The base values as reported by O'Donoghue et al. (*1*) for all model parameters such as tumor cell diameter, clonogenic fraction, packing factor, radiosensitivity, biological half-life and tumor population doubling time were used. In addition,

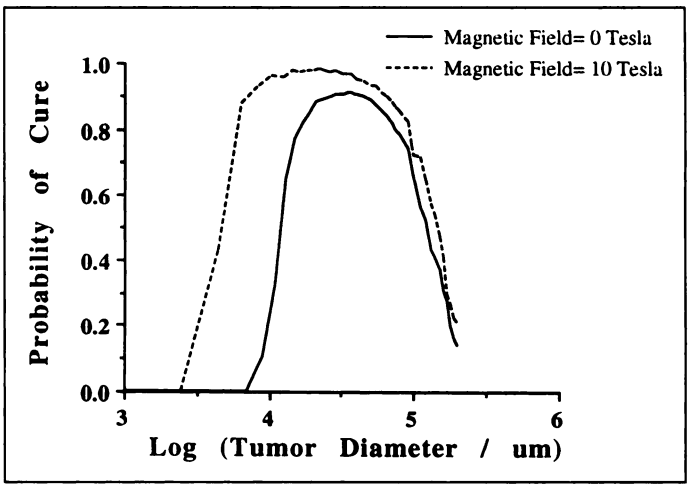

FIGURE 1. Probability of cure plotted versus tumor size. Effects of a 10-Tesla (1 Tesla = 10,000 Gauss) on predicted tumor curability is compared to the standard case when no field is present.