GAMMA CAMERA COLLIMATION

In our paper "Gamma camera collimator considerations for imaging ^{123}I" we discussed the fact that although the predominant gamma-ray energy is 159 keV, there are much higher energies present, which although of low abundance, can lead to image degradation because of septum penetration (*1*). The problem is accentuated in presently commercially available ^{123}I because of the high-energy gammas from other isotopic impurities present, such as ^{130}I. Iodine-123 obtained from Medi-Physics, Inc. could be satisfactorily imaged with the pinhole collimator and to a lesser degree with a collimator (4,000 hole) having septa 0.030 in. thick, but serious septal penetration was found with technetium collimators. The pinhole collimator limits imaging to small organs such as the thyroid.

We obtained a sample of "pure" ^{123}I from Brookhaven National Laboratory (BLIP), supplied to us by H. L. Atkins, E. Lebowitz, and P. Richards. The ^{123}I is produced by a (p,5n) reaction on ^{127}I, and the only other isotopic impurity present is said to be ^{125}I at less than 0.1%. The collimator septum penetration measured with the BLIP ^{123}I is a factor of 3 lower than obtained with Medi-Physics ^{123}I, as we had expected. Thus, the septum penetration on a low-energy technetium collimator with 0.010-in. septa has been reduced to the level of about 3%. Although this is still higher than given by a ^{99m}Tc source, it would allow the use of technetium parallel-hole collimators for imaging ^{123}I with satisfactory results. Therefore, the imaging of large organs with the resolution and efficiency of a thin septa collimator designed for technetium would be possible using "pure" ^{123}I. Although the full width half maximum resolution will be comparable to that obtained with ^{99m}Tc, the system MTF using ^{123}I will be slightly degraded because of the higher septal penetration.

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ANATOMIC LANDMARKS ON SCINTIPHOTOS

Anatomic landmarks on scintigrams are not only desirable but are often essential for scan interpretations. It is difficult to put such landmarks on images obtained from a scintillation camera (scintiphotos). A flexible tube source, although found suitable for cisternograms (*1*), was found to produce a dense image, masking part of the liver in liver scintiphotos. An electronic marking device as described by Walton and Sharpe (*2*) needs an involved electronic coordinate transfer system. A lead strip to produce an impression on the scintigrams works only with low-energy radionuclides with gamma rays and often blurs the data in the regions of interest. We have devised a method of putting landmarks on the scintiphotos with the help of a digital computer system (Med II, Nuclear Data) linked with a scintillation camera (Picker Dyna Camera).

The Med II system has its own builtin software and communication with the computer is made through a conversational language called two-letter

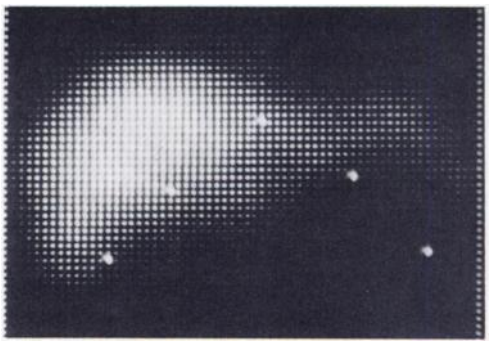

FIG. 1. Normal liver image obtained on computer scope with costal margin marking made with hot sources.

mneumonics (TLM). The procedure for putting landmarks is simple and involves only four steps:

1. Take a static picture and store it on the disk.
2. Without moving the patient, place the hot marker buttons (point sources of a suitable radionuclide) on the desired landmarks on the body and take a 2-sec exposure.
3. Print out the coordinates of the center of these buttons with the help of the coordinate markers available with the system.
4. Display the static image and insert maximum value (4K) in each of the button coordinates obtained in Step 3. Step 4 brings the maximum brightness to the marking points. Figure 1 shows a liver scintiphoto with the costal margin shown by this method.

For point sources 1 mCi of ^{57}Co may be used. The long half-life of ^{57}Co avoids frequent replacement of these hot buttons. Two-second acquisition on these markers provides sufficient counts (2K/button) and at the same time gives negligible radiation exposure to the patient. Other radioactive sources such as ^{170}Tm and ^{241}Am emitting low-energy gamma rays may be equally acceptable.

Steps 3 and 4 use the builtin software in our system and take about 60 sec of the technician's time. It is not difficult for those who do not have these software facilities on their digital systems to write the programs used in Steps 3 and 4. If the static image (Step 1) and marker image (Step 2) are stored on the disk, the actual marking (Steps 3 and 4) can even be done after the patient has left.

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DELAYED BONE SCANNING

The case report "Enhanced detection of a skeletal lesion with delayed ^{99m}Tc-polyphosphate bone scanning" (*1*), considered altered uptake associated with an idiosyncratic response or prior drug therapy as a plausible explanation for the authors' success at 10 hr compared with earlier attempts to delineate a rib lesion.

An alternate explanation is suggested by the following observations: a patient with left anterolateral chest pain and known metastatic bone disease (femur, pelvis, and cervical spine) due to bronchogenic carcinoma had a rectilinear polyphosphate bone scan that was considered inconclusive for a left rib lesion (Fig. 1). Gamma camera views taken immediately after the scan and at 3–4 hr following administration of the radiopharmaceutical clearly brought out a solitary left rib lesion as the patient

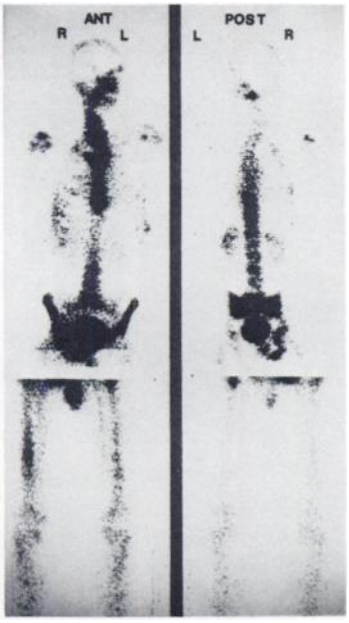

FIG. 1. Technetium-99m-polyphosphate, 15 mCi; i.v. scan at 2–3 hr postdose. Metastases from bronchogenic carcinoma, femur, pelvis, cervical spine. Activity left rib, lower chest, was considered inconclusive to explain complaint of left chest pain.

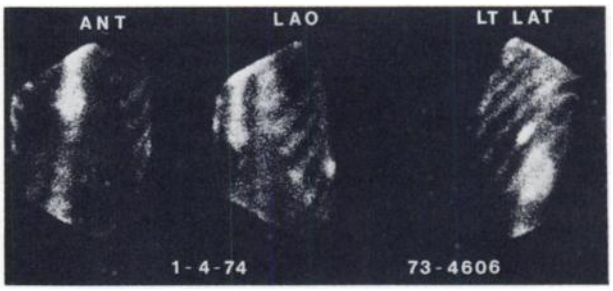

FIG. 2. While anterior view shows left rib lesion, rotation through LAO to lateral view provides convincing demonstration of solitary rib involvement. Camera views taken about 3½ hr after injection.