LETTERS TO THE EDITOR

Tl-201 Single-Photon Emission Computed Tomography (SPECT)

Two conflicting papers comparing the 180° and 360° data collection for Tl-201 SPECT were recently reported (*1*,*2*) with a related Teaching Editorial by Dr. Hoffman (*3*). As a user of this technique for almost three years, I would like to offer the following observations, based on 1000 patients studies.

We use a filtered back-projection algorithm without attenuation correction for reconstruction and have observed that 180° data collection provides much better qualitative results than the 360° method. We now use the first procedure exclusively. The most obvious beneficial effect of the 180° was a decrease of the background activity in the reconstructed sections. Consequently there were fewer counts per section, but that resulted from the decrease from the background rather than a change in the absolute myocardial activity, which was only slightly affected. The reason for the decreased background is probably because in the right posterior projection most of the data collected are background counts, including scattered photons. As was emphasized by Dr. Hoffman (*3*), only 3 to 7% of the photons coming from the myocardium will reach the camera from this direction. As a consequence, there is an obvious improvement of the contrast between normal and hypoperfused myocardium, which was clearly shown by Tamaki et al. using 180° collection (*2*). Coleman et al. (*1*) found no difference in the contrast between the heart and the background when comparing the two methods of data collection; however, their 360° study was corrected for attenuation whereas the 180° one was not. Conversely, it is likely that the basal portion of the myocardium would benefit from a rotation of more than 180°, since the base is the most deeply situated cardiac wall. Hence the introduction of new algorithms allowing data collection with angular values between 180° and 360° should now be considered.

Dr. Hoffman (*3*) remarks that "the obvious area in which SPECT might excel is in quantitative measurements of tracer concentrations of new radiopharmaceuticals which, we hope, will have properties that will allow measurement of physiological rather than anatomical parameters." I believe that SPECT has demonstrated a superiority over planar imaging in the qualitative detection of Tl-201 defects (*4*,*5*) and that this role is established. The improved detection is of real clinical importance because the examination becomes more sensitive. In addition, the interpretation becomes much more objective. These advantages have led us to dispense with the planar imaging procedure in all the routine Tl-201 examinations in the Department of Nuclear Medicine. It is obvious that if reliable *quantitative* measurements can be achieved with SPECT, a major new field would be opened to nuclear medicine. In such an event, it is likely that 360° data collection would be more suitable. The quantitative data that can be obtained with 180° rotation may also have physiological significance, however, and further analysis may provide additional insights that are distinct from the anatomical interpretations. For example, it should be possible to compare the mean absolute myocardial uptake in a given patient with the values observed in a normal population. Or one could follow locally the temporal evolution of the uptake after stress exercise. Tl-201 SPECT appears to offer not only promise for the future but also real advantages now.

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Reply

We have read with interest the comments of Dr. Maublant. We do not think the two papers comparing the 180° and 360° data collection for Tl-201 SPECT are in conflict. As the tables clearly show, the image contrast for Tl-201 in both phantoms and patients is similar with 180° collection without attenuation correction and with 360° collection with attenuation correction (*1*). Our study (*1*) and the study by Tamaki et al. (*2*), did not compare images in the same manner. Since the image contrast in our phantom studies and patient studies was similar for 180° without attenuation correction and for 360° with attenuation correction, we would have predicted similar image contrasts by the two techniques in patients with prior myocardial infarction. Since Tamaki et al. tabulated their data in a defect-to-normal ratio, these results cannot be compared with our image contrast results. Ours were obtained with a dual-detector SPECT system using a specific procedure for data acquisition and reconstruction. One criterion for our evaluation was the determination of the variability of the myocardial image contrast, C_{image} (defined as the count density within an ROI placed over the image of the myocardium minus the background count density, all divided by the background count density), for situations where the absolute myocardial uptake ratio, C_{obj} (defined as the difference between the radionuclide concentration within the myocardium and the background concentration, all divided by the background concentration), was known to be constant. For the phantom study, where C_{obj} is constant, our data