

dual-probe system, if it is used to examine large regions of the brain. Such an unusual use of a PET scanner would reduce the radiation dose to the patient in the same way that our HEADS system does. Some studies of brain chemistry do not require a high degree of spatial resolution and therefore a simple, low cost, portable system can be used.

Drs. Strother and Allard's noise and sensitivity analysis is not applicable to our uses of HEADS. In the studies we reported, the tracer activity is not concentrated within a small volume at the center of the field-of-view. Moreover, it is incorrect to assume that most of the *recorded* events of the simple coincidence system arise from annihilations occurring within a small central volume.

We believe that the use of positron-emitting radiotracers to study neurotransmission, amino acid transport, and glucose metabolism should not be assumed *a priori* to require a PET scanner, even though some studies do require a high degree of spatial resolution.

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Image Distortion in 180° SPECT Studies

TO THE EDITOR: The article, "Clinical Evaluation of 360° and 180° Data Sampling Techniques for Transaxial SPECT Thallium-201 Myocardial Perfusion Imaging" by Go et al. (1) reviewed the problem of using 360° or 180° sampling in SPECT. In 1982 there was also such discussion in the Journal (2-4) which pointed out that 180° sampling advantages include a much shorter acquisition time and, in some cases, better detectability of lesions. The disadvantage of 180° sampling in SPECT is that attenuation correction for such studies has not yet been developed and evaluated. One hundred eighty degree sampling has also been applied in liver and spleen studies (5) in addition to thallium-201 (²⁰¹Tl) SPECT studies of the heart. We have applied such sampling in liver spleen studies, and in lungs perfusion SPECT studies too; we were surprised by image distortion in such situations. This initiated a study of 360° vs. 180° slices in SPECT in which the main object of investigation has been image distortion. We have performed a simulation study of tomographic LSF for 360°, 0°-180°, and 180°-360° sampling to explain the image distortion in limited angle sampling (6). Also, our own software, based on filtered backprojection algorithm, enables us to select the start, as well as the last angle. This provides all 64 views which are mostly used in our routine SPECT studies, or only limited number of successive views simulating limited angle sampling with desired first and last angle. Our comparison, which has been performed on the same patient or phantom data only, as well as the study of tomographic LSF, indicates that in some SPECT limited angle studies (including 180° ²⁰¹Tl SPECT studies of the heart) geometrical distortion can be significant. This geometrical distortion is mainly due to variable spatial resolution, with distance from the camera. It may be shown that for the point source in a circular attenuation region, geometrically averaged projection value depends

only on the length of an intersection between corresponding ray and circular attenuation region and is independent of the position of the point source in this ray, i.e., it is independent of the "depth" of the point source. Thus, in 360° SPECT studies it is possible to obtain, by means of opposite views averaging, slices without geometrical distortion, which is not the case in 180° SPECT studies. Therefore, if SPECT study is used for lesion sizing or determination of an actual volume, we conclude that 360° slices should be used, although in some situations limited angle scans have better image contrast (7).

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REPLY: We want to thank Dr. Karin Knešarek, whose comparative studies between the 180° and 360° data acquisition modes in patients, phantom data, as well as tomographic line spread function confirmed our finding that the 180° acquisition mode for SPECT image reconstruction shows significant geometric image distortion but not with the 360° data acquisition mode (1). This finding has also been recently confirmed by Clausen et al., comparing the two data acquisition modes using line sources in air (2).

References

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