SIMPLE WAY TO WIDEN THE SPECTROMETER WINDOW IN THE OHIO-NUCLEAR SCANNER FOR ^{67}Ga SCANNING

The Ohio-Nuclear scanner (Model 84) has a maximal spectrometer window width of 100 keV. There is no "gain" dial built in for widening the window.

In ^{67}Ga scanning, Edward and Hayes (*1*) recommended a spectrometer window of 160 keV (from 160 to 320 keV) to include both 184 and 296 keV peaks. The maximal window of 100 keV on the Ohio-Nuclear scanner is not wide enough to include both peaks. In some laboratories there has been modification of the scanner to widen the window for ^{67}Ga scannings. The following is a simple means of expanding the window width.

1. Place a ^{131}I source in the field of view of the upper detector.
2. Set the "centerline" at 364 keV and the window to a 10-keV width.
3. Adjust the high voltage to the maximum counting rate.
4. Adjust the window to 50 keV and record the counting rate.
5. Lower the "centerline" dial to 182 keV and the window width to 25 keV.
6. Reduce the reading of "high voltage" dial until a maximal counting rate is reached, which should be equivalent to the initial counting rate.
7. Reset the readings on "centerline" dial at 120 keV and that on window at 80 keV.
8. Repeat the same adjustments on the lower detector.
9. The spectrometer is now expanded by a factor of 2 and is ready for ^{67}Ga scanning.

It is well known that when the high voltage is reduced the counting rate peak is shifted to the left as shown in Fig. 1. The peak counting rate for a given window increases, but the width is decreased and the total area under the curve is unchanged (*2*).

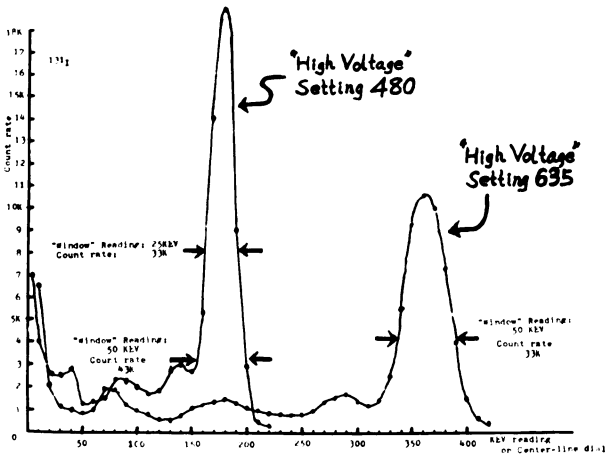

FIG. 1. Iodine-131 gamma-ray energy spectra at different "high voltage" settings on Ohio-Nuclear scanner (Model 84).

If noise appears at the setting with a factor of 2, a reduction of the factor to 1.6 should be tried. It can be done by adjusting the "high voltage" dial to have the ^{131}I peak at a "centerline" reading of 228 keV (364 keV divided by 1.6). Then, a window reading of 100 keV also represents 160 keV.

In the Nuclear-Chicago Pho/Gamma camera, the window setting is a percent of the peak energy level. Therefore, this adjustment does not widen the window.

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REDUCTION IN SCAN TIME WITH MINIFICATION

Recently, two reports have been published (*1,2*) which suggest that reduction of scanning time is permissible provided the scan image is minified. The argument for this maneuver appears to rest on the assumption that by increasing the counts per unit-area-of-scan-image by minification, an increase in the information content of the scan can be obtained; subsequent reduction to the original counts per unit-area-of-image by a reduction in scanning time returns the information content to its original level, i.e., scanning time has been reduced with no loss of information. This analysis neglects the fact that any abnormal area on the scan is also reduced in area by the minification process. In this case, the statistical significance (in the sense of Mallard and Corfield, (*3*)) of any abnormal area remains constant during minification (without scanning time reduction) rather than increasing, and any reduction in

sensitivity caused by reduced scanning time must result in the reduced statistical significance of abnormal areas.

Such reduction in significance may not always be immediately apparent. For example, an abnormality of 20 standard deviations (s.d.) significance would be reduced to one of 10 s.d. by a fourfold reduction in scanning time—still a highly significant abnormality. However, a 5 s.d. abnormality would be reduced to 2.5 s.d. and would almost certainly be missed.

The authors also suggest that visual improvements in general can be obtained by minification. This may be true but it should not be used as an excuse for sacrificing statistical accuracy.

There is no doubt that reducing scanning time is important in improving patient management. If it can be shown that no abnormalities are missed by reducing sensitivity because, for example, abnormalities below a certain size and activity do not present clinically, then reducing scanning time may be permissible. Otherwise, scanning time ought not to be reduced without increases of sensitivity in other directions, e.g., increased administered activity or improvements in collimator design.

I wish to thank Dr. H. Miller, Dept. of Medical Physics, Sheffield, England, and Professor J. R. Mallard, Dept. of Medical Physics, Aberdeen, Scotland, for drawing my attention to this point.

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AUTHORS' REPLY

We entirely agree with Mr. Barber that minification cannot increase the information content of a scan. This claim was not made or implied anywhere in our paper. In fact, we stated that, "the limiting factor must be the information density per unit area scanned," and the title stated that we were proposing "a practical compromise" for bone scanning.

In the daily running of a busy clinical laboratory, as in most routine human endeavors, one must be primarily concerned with what is feasible. This often necessitates compromise with what would be ideally desirable; indeed, the ordinarily recommended information density of 100–200 counts/cm^2 for ^{85}Sr bone scanning is already a compromise. Scanning only localized areas of bone has limited clinical value. Since whole-body bone scanning with ^{85}Sr is not routinely feasible at the above information density, we therefore attempted to see whether: (A) the visual improvements gained by minification (*1*) could in practice reasonably compensate for decreased information with increased scan speed and (B) simple photography was an adequate way to achieve this minification. In our admittedly small series we did not, in fact, miss any of the 28 positive areas by this technique.

When ^{85}Sr still remains the only agent widely available for bone scanning, we believe our study suggests that whole-body bone scanning with miniturization is worthwhile when it might otherwise be quite impractical. The option of rescanning questionable and/or suspicious areas at a higher information density is still available.

Thus, while we completely agree with the theoretical considerations raised by Mr. Barber, we feel the philosophy implied is unnecessarily rigid when the practical alternatives are limited.

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QUALITY CONTROL OF RADIOHPARMACEUTICAL KITS

In the past year there has been a rapid proliferation of commercial kits for the on-site preparation of radiopharmaceuticals, especially those labeled with ^{99m}Tc. Even though this provides a greater variety of radiopharmaceuticals to the nuclear medicine clinician, it has put a new dimension on an old