THE AUTHOR REPLIES

I am pleased that Dr. Galasko has confirmed the main points of my article. His statement regarding optimal scanning time, however, calls for some comment.

In our initial studies with ^{87m}Sr, the mean uptake rate $T_{1/2}$ of the medial femoral condyle in eight patients was 9.9 ± 3.5 min (1 s.d.) (*1*). Bratherton and Maysent give a comparable figure of about 15 min (*2*). If the mean theoretical bone uptake (A), physical decay (B), and effective uptake [A × (1 — B)] are plotted (Fig. 1), it can be seen that a counting plateau exists beginning about 30 min postdose. To assure a uniform counting rate, rectilinear scans with ^{87m}Sr should therefore be started at this time. If the scan is delayed much longer, the bones scanned last will have a lower counting rate than those scanned earlier as a result of radioactive decay, and a possible source of error in interpretation will have been introduced.

These considerations clearly apply to rectilinear scans but not necessarily to those made with a fixed device such as the Anger camera, as Dr. Galasko has shown. Since blood background cannot be suppressed with the camera, a delay of an hour or more before scanning may in fact be desirable. If multiple scans are made, the exposure time for subsequent studies should be corrected for mean physical decay.

Studies by ourselves (*1*) and others (*3*) have shown that up to 5 hr postdose the mean urinary excretion of ^{87m}Sr is only a few percent of the administered dose. Improvement in contrast with time is therefore not the result of augmented excretion but more likely of delayed uptake. In our initial study we found one patient whose uptake $T_{1/2}$ was 17 min. However, a plot of effective counting rate in this situation shows a peak at about 1 hr and a 30-min counting plateau beginning at about 45 min. This is not very different from the counting plateau in the patient with mean uptake rate. Thus delayed scanning is not required with rectilinear instruments from the standpoint of counting rate.

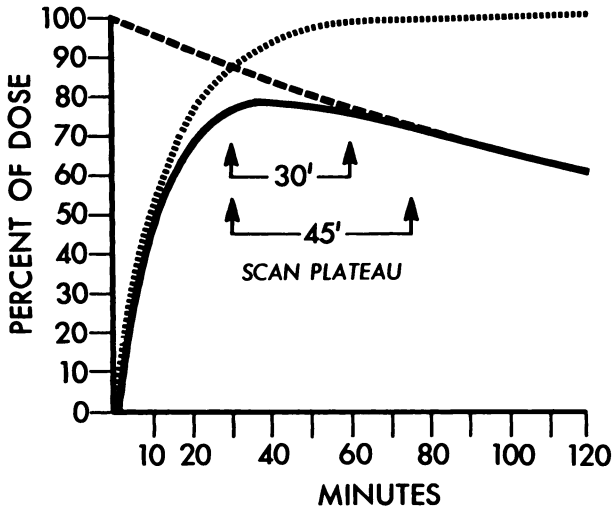

FIG. 1. Percent of maximum bone uptake (. . . .), assuming $T_{1/2}$ 10 min; percent of undecayed ^{87m}Sr atoms remaining (- - -); and their product, effective bone uptake (——) as function of time after injection.

With regard to Dr. Galasko's other point—contrast—it can be shown from the data in the figure that in the average case the bone:nonbone uptake ratio increases from 0.78 (0.44:0.56) at 30 min to 0.98 (0.49:0.51) at 60 min, assuming a final bone uptake of 50% of the administered dose. In the extreme case where the uptake $T_{1/2}$ is 17 min and the scan is begun too soon (i.e., at 30 min), the ratio increases from 0.54 to 0.84 during the same period of time, an unsatisfactory situation. A reasonable compromise would be to begin all rectilinear scans about 40 min after injection; the bone:nonbone ratio in the patient with mean uptake would increase from 0.88 to 0.98, and in the extreme case from 0.67 to 0.89, and the counting rate plateau would not be seriously affected. As Dr. Galasko points out, when the camera is used, a delay of several hours may be optimal in this regard.

In order to improve the contrast ratio and thus shorten the waiting period before the scan can be begun with any instrument, we are currently investigating some biologic methods of increasing the bone: nonbone counting rate ratio.

N. DAVID CHARKES
Temple University School of Medicine
Philadelphia, Penna.

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