

IV. Bone

The Whole Body Metabolism of ^{85}Sr and ^{47}Ca in Osteoporotic Patients

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The conventional techniques for the study of calcium metabolism, such as the calcium balance study or the estimation of bone formation rate with ^{45}Ca , in the patients with bone diseases are limited by the difficulty of long-term measurements or the systematic error caused by the failure of complete collection of excreta. Recently, the whole body counting of gamma-emitting isotopes, such as ^{85}Sr and ^{47}Ca , and the compartment theory have enabled the long-term kinetic study of bone diseases, but little work has been done to study the osteoporosis by this technique.

In present study, the calcium metabolism in osteoporotic patients was investigated by the whole body counting method, using a clinical profile scanner. The patients studied were 15 post-menopausal women aged 60 to 83 years old and 2 girls with bow leg. The diagnosis and classification of grade of osteoporosis in the former senile group were done from the X-ray film of bone.

Nine and 6 patients with osteoporosis in several grade were taken a single intra-venous administration of ^{85}Sr and ^{47}Ca , respectively. Some of them were orally administered the isotopes later.

The double tracer method by both isotopes

was also tested with a few patients. The analysis by a 2-compartment model was carried out from the data of intra-venously administered ^{85}Sr .

The results of the analysis were as follows:

1) The whole body counting, following the administration of $10\mu\text{Ci}$ of ^{85}Sr , revealed the accuracy within the error of 3% for 100 days long. So that, the metabolism of ^{85}Sr in non-exchanging (or fixed bone) phase could be estimated.

2) Corresponding with the grade of osteoporosis, the excretion rate and the ratio of pool size of exchangeable space to fixed bone space were increased, and the resorption rate was decreased.

Although the metabolism of ^{47}Ca in fixed bone phase was not clear because of short half life of the isotope, it had been suggested by Cohn et al. that the data from ^{85}Sr in this phase could be normalized to ^{47}Ca metabolism. The double tracer technique was useful from this point of view.

The relationship of osteoporosis to the absorption rate of the calcium measured by the whole body counting following oral administration is in progress.