Experimental Studies on Radioactive Strontium-85

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Strontium-85 is one of the radioactive isotope which recently has been used frequently, for diagnosis of malignant tumor in the bone. The author investigated the accumulation of 85Sr in various organs of animals depending on difference of their age. Following administration of 85Sr to rats, they were killed and dissected at regular intervals. And the uptake of 85Sr to rats, they were killed and dissected at regular intervals, and the uptake of 85Sr in various organs, such as the femur, lung, liver, kidney, spleen, muscle and the blood, was measured.

Next, we investigated the influence of 60Co irradiation on accumulation of 85Sr in the femur.

The tele cobalt ranging from 2,000 to 8,000 R was irradiated to the left femur of adult rabbits. The picture of scintiscan of the irradiated femur was compared to that of the non-irradiated femur. The results are as follows.

At intervals of time, the accumulation of 85Sr in the femur of the youngest rats showed the highest value and that of the oldest showed the lowest, and the accumulation of 85Sr in the femur of the middle aged rats was found between these values them, but the degree of concentration of 85Sr in the bone, was much higher as compared with that in other organs.

It was noted that the degree of concentration of 85Sr in the bone proved to be found slightly in the scintigram after 4,000R irradiation to left femur.

Evaluation of 85Sr External Counting for the Diagnosis of Spinal Diseases

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Since 1966, we have been studying the clinical application of the 85Sr external counting in the diagnosis of various diseases of the spine, especially of tuberculous spondylitis.

In this report, the measurements were made in twenty-seven patients with tuberculous spondylitis.

The patients were given 0.5μCi of 85Sr per kilogram of bodyweight intravenously. The external counting was done twice for two weeks by a scintillation detector with a 1.5 inch × 1.0 inch NaI crystal. Twelve points along the mid-line of the spine were chosen as measuring points.

The results of measurements are as follows. Typical cases of active tuberculous spondylitis showed high uptake of 85Sr on the vertebral foci at the first measurement and further increase of its activity at the second measurement. However, there were other patients in the active stage in whom uptake of 85Sr was high, but had a tendency of decrease at the second measurement. As a focus was healing, the local uptake of 85Sr decreased progressively, and fell within the normal range in the healing stage.

From these facts, four stages were classified by isotope measurements.

Assending stage (active): 85Sr activity increases progressively.

Descending stage.

First stage (convalescent): 85Sr activity decreases progressively and its value is higher than 1.7.

Second stage (quiescent): 85Sr activity decreases progressively and its value between 1.7 and 1.3.

Invariable stage, healing: Value is lower than 1.3.

There was good correlation between the
activity of the infection and the uptake of $^{85}$Sr. It can be concluded that $^{85}$Sr external counting is a useful method in the evaluation of the activity and prognosis of tuberculous spondylitis.

A Experience of Bone Scan with $^{85}$Sr

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We reported a experience of bone scan with $^{85}$Sr.

Bone scan was performed in 33 patients with 47 bone lesions, which consisted of 13 patients with 24 lesions of bone metastases, 9 patients with 11 lesions of bone metastases suspected, 9 patients of primary bone tumor and 2 patients of systemic bone disease.

In our study of 47 bone lesions, both X-ray and the scan in 23 lesions were positive for tumor metastases.

In 5 lesions the scan was positive and the roentgenogram was negative. We presented three representative cases to show the effectiveness of this method.

The first case was a 42 year old female with reticulum cell sarcoma, who had progressive and severe pain in the lumbar region. The roentgenogram was normal. A strontium-85 scan of the same area, revealed an abnormal and marked isotope accumulation in the area of pain in the left ilium and sacroiliac joint.

In this case, bone scan was effective in the early diagnosis of bone metastasis.

The second case was a 56 year old male with high back pain and a history of gastroectomy for cancer of the stomach. Roentgenogram of the 7th cervical vertibral body demonstrated slightly osteolytic change.

The scan revealed marked deposition of $^{85}$Sr in the same area. And in this scan, metastases of the scapular region which was missed in the roentgenogram was also detected.

Bone scan could easily detect the bone metastases which were apt to pass by a oversight in roentgenogram.

As the last case we showed 59 year old male with cancer of the right maxilla. The orbital wall involved. It was difficult to demonstrate the bone invasion by routine X-ray technique. Bone scan revealed marked isotope accumulation in the area.

Bone scan was useful in such a case that interpretation of the roentgenogram was difficult.

41 bone lesions with abnormality in roentgenogram were divided into 4 groups according to roentgenographic characteristics.

Bone lesions with osteoplastic change was all positive in bone scans and 6 of 13 osteolytic changes were positive. Almost all of bone abnormalities with pure osteolytic change in X-ray and negative scan were primary bone tumor with cyst. Because bone metastases usually consist of the both osteolytic and osteoplastic changes, bone scans effective for early diagnosis of bone metastasis.