III. Bone

The Role of ^{85}Strontium Photoscanning in the Detection of Abnormalities of the Skull and the Facial Bones

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Radiographic anatomy of the base of skull and the facial bones is often hard to be analysed because of their complicated structure and superimposition. Multiple radiographic projections including tomogram are required to assess the extent of the lesions.

The purpose of this study is to evaluate the value of ^{85}strontium photoscanning in cases of malignant tumor of the skull and the facial bones. Forty ^{85}strontium photoscans were compared with the radiographs (including tomogram) of corresponding cases.

Methods:

Scanning was performed 72 hours after intravenous injection of 70 μCi of ^{85}strontium chloride.

A shimadzu PHO/Dot scanner, of which NaI crystal was 5 inches in diameter, was used with 37 hole collimator and a pulse height analyser. Scanning speeds ranged from 60 to 70 cm per minute.

Results:

1. Good correlation between photoscans and radiographs were obtained. Abnormal radiographic findings (osteolytic and mixed in type) were seen in thirty-one of forty cases. Of these 31 cases 25 cases had positive photoscans.

2. The skull was divided into three parts; vault of the skull, base of the skull and the facial bones. Osteolytic lesions of the vault of the skull were lesily detected radiographically, but not scintigraphicaly. On the other hand, osteolytic lesions of the base of the skull and the facial bones were hard to be detected on the plain radiographs, but easy on photoscans.

3. ^{85}Strontium photoscans were useful to assess the extent of the bony infiltration of malignant neoplasms. This is quite true with malignant neoplasms of the nasopharynx.

A Basic Study on Bone Scanning. Difference on Scan Time

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For bone scanning, ^{85}Sr, ^{87m}Sr, and ^{18}F have been used. Although ^{85}Sr and ^{87m}Sr had scan time of 1–3 days and 1–3 hours, respectively, the scintigram was similarly interpreted. The authors studied the mode of uptake of Sr due to such a different scan time using the site of fracture in mouse with ^{89}Sr autoradiography and microradiography.

Results:

1) Sr uptake reached the maximum at the time of fusion of the fracture, according to the 3 hour value after fracture or the ^{87m}Sr

scan time. At 24 hours, or the ^{85}Sr scan time, the maximal value appeared later.

2) In the autoradiogram findings, the distribution of Sr was not markedly different at both 3 and 24 hours 3–4 weeks after fracture, or at the stage of predominant bony callus.

3) However, at the stage of 1–2 weeks after fracture with mixed presence of cartilaginous callus and bony callus, Sr uptake was high in the cartilaginous callus 3 hours later (the scan time for ^{87m}Sr). On the contrary, at 24 hours on the scan time for ^{85}Sr, the Sr uptake was high in the bony callus.

These findings would suggest the possibility of detection of initial lesion by ^{87m}Sr scintigram as compared with ^{85}Sr scanning.

For the interpretation of these two kinds of bone scanogram, the data described above should be kept in mind.

Scanning with ^{87m}Sr, ^{85}Sr in the Diagnosis of Bone Fracture

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Ever since Bauer and Wendeberg reported on the application of external counting in the diagnosis of bone tumor and bone fracture in 1957 and Fleming on the use of ^{85}Sr photoscan in the diagnosis of metastatic cancer in 1961, not a few reporter have been made in this field. This time, we injected ^{87m}Sr 2 mCi intravenously to 79 bone fracture patients and observed chronologically the healing process of fracture. We conducted profil scan and area scan immediately after operation, at 4 weeks, 8 weeks, 12 weeks and 24 weeks after operation, and as late as 2 years and 2 months with the longest case, and compared the findings with those of the normal extremities. The following are the results we obtained.

(1) Observation of the healing process of fratcure by scanning revealed no uptake of Sr immediately after fracture or during the physiological inflammation period. However, the Sr uptake started to rise from around the time when the new bone began to appear or when osseous sclerosis became evident and continued to increase at 8 weeks, 12 weeks and 24 weeks after operation.

(2) Strong uptake of Sr could be noted in the fractured area even with elderly patients, proving that active recovery process is taking place with them too.

(3) With those cases with a long recovery process after fracture, with those cases with poor osseous accretion, or with those cases clearly presenting a false joint, no increase in Sr uptake could be noted, and even defects could be observed. This proves that this is a very helpful method of examination in the diagnosis of pseudoarthrosis.