Clinical Value and Limit of Radioisotope Scanning

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Subject 8) Bone and bone marrow.

Bone studies are omitted in this report and bone marrow studies are presented from hematologic point of view.

Bone marrow cannot be risualised by X-ray. Some people use radioactive colloid for bone marrowscanning.

However, the most of it is taken up by the liver and wasted. Moreover, radiocolloid distributes in RES and does not always represent hematopoietic tissue, although the distribution of RES and hematopoietic tissue has some similarity. In contrast to radiocolloid, radioiron shows the place of erythropoietic bone marrow. However, area scintigram has shortage, since the distribution of bone marrow cannot be visualised in case poor ^{59}Fe utilization, such as in Hypoplastic anemia, hemochromatosis and etc. Using the Ring Type Total Body and Quantitative Body Section Counter having 4π moving bed geometry, we were able to visualise even in poor ^{59}Fe utilization. ^{59}Fe utilization immediately after iv injection, 6~24 hour distribution (small amount in bone marrow, mostly in storage in poor utilization), and 15~20 day distribution (small amount in RBC, mostly in storage). By the subtraction of ^{59}Fe-RBC distribution curve, obtained from the zerotime curve lowered proportionally to % utilization figure) from storage plus RBC distribution curve of 15~20 days, we obtained storage only curve. This storage curve in subtracted from bone marrow plus storage curve of 6~24 hours and then bone marrow only curve was obtained.

Thus obtained curves of hypoplastic anemias showed d'arrangement of distribution of bone marrow and the curve in hemochromatosis showed normal pattern of bone marrow distribution.

The above described method visualizes not only the bone marrow of hyper-and euplastic and also that of poor utilization. Therefore this procedure expanded the technique of bone marrow beyond the limit of area scintigram developed so far.

Clinical Utility and Limitation of Bone Scintiscans, Especially of Osteomyelitis

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Not a few reports of the studies on the application of ^{85}Sr to the diagnosis of bone disease have been made. There seems, however, to be necessary for further studies with regard to the clinical utility and limitation of bone scintiscanning.

In this paper, serial scans have been obtained from the group of patients included primary and metastic bone tumors, acute and chronic osteomyelitis and miscellaneous bone disorders with clinical evaluation, and an attempt was made to correlate the scanfindings with clinical findings present.

An intravenous ^{85}Sr dose of1 μCi per kg of body weight was administered and scanning was began 24 hour—48 hour after injection. A photoscanning device with a 37 hole lead honey-comb collimater and a 3″ × 3″ sodium iodine crystal was employed for both profile scanning and area scanning.

CONCLUSION

1) Profile bone scanning has proven to be very effective as a mean to find out the presence of lesions and locality as well, when compared with the findings on the corresponding portion in the healthy side of extremities.
2) As for bone tumor, as are seen in many other reports this method was found to be extremely useful for grasping the scope of lesion, even in the early stage of disorders.
3) In the case of osteomyelitis, similar scintigrams were obtained and it seem difficult to differentiate between osteomyelitis and bone neoplasm only from scintigram. If should, however, be noted that findings in scintigram of osteomyelitis cases has been excellently correlated with the clinical findings present.

Bone Marrow Scanning

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Bone marrow scanning using ^{198}Au colloid, ^{99m}Tc colloid or ^{113m}In coloid are began to use widely. However, these colloid can be taken not only by bone marrow reticulum cell but also by reticulo-endothelial cells in the liver and spleen. Then, complete figuers of the total bone marrow in a whole body is hardly obtained because very high activity of these radioisotopes in the liver and spleen may interfere the activity in surrounding bone marrow.

There may be some possibility that the different distribution between reticulo-endothelial cell and hematopoietic cell in a bone marrow are existed. On the hematological point of view, representation of localization and extension of active functioning bone marrow are required. For this purpose, it is more desirable that bone marrow scanning is performed using radioisotopes which is related with the function of hematopoiesis, such as radioactive iron.

Anger et al has shown clear image of bone marrow using ^{52}Fe and positron camera. However, it is inadequate for long term study because ^{52}Fe has an very short half life. Since ^{59}Fe has high energy gamma-ray, it is not suitable for scintiscanning by usually used gamma-camera or scintiscanner. Large dose of ^{59}Fe must be avoided, because it has a moderately long half life. On this circumstances, an scintillation scanner or camera which are suitable and quite efficient for high energy gamma-ray are ernestly desired.

Several cases of bone marrow scinti-photo graphs during ferrokinetics study which is obtained by the author using Anger's whole body scanner are presented and its availability are discussed.