Bone Scanning of Heterotropic Ossifications

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We took bone scanning to eight patients with traumatic spinal cord injury with Tc-99m-labeled phosphate compounds.

On the fresh six cases, we aimed to early detect of heterotropic ossifications and to observe of its progressing. On the old two cases, we did to observe of the progressing after the extraction of heterotropic ossifications.

The results were follows;

1. In the patients with traumatic spinal cord injury, we saw the picture of the localized extraordinary accumulation nn knee and hip which developed heterotropic ossifications.
2. Observing in succession the progressing of the fresh cases for long time, their accumulation showed the patern which increased or decreased. So, we could see clearly the development parts of ossification and transition of spreading.
3. In fresh cases, using X-ray picture jointly, it is possible to early detect.
4. It is that takes effect to judge the activity of ossification in both fresh and old cases. And so, we think it gets important index for the decision of the time to excise ossification.

Bone-Scanning with Tc-99m-Phosphates

——Enphasizing its value in the bone fracture——

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We have performed the bone-scanning with Tc-99m-phosphates on the postoperative bone-diseases and bone fractures. And also we have studied the healing-process after severd half-circle of the bone of the rat with bone autoradigraphy and X-ray. This time we would like to report the results of our clinical experiences as well as well as animal experiments.

Clinical Cases:

Studies have been done on 10 cases of the bone-fracture and 5 cases of the fixation of cervical spine. 10 mCi of Tc-99m-phosphate was injected intravenously and the scanning was performed 3—4 hours after the injection.

In fresh bone-fracture cases (5 days after

the trauma) accumulation radioisotope was very slow initially and it gradually increased for months which showed initial slow phase of phosphate metabolism and gradually accelerated metabolic process of the bone tissue, which could not be visualized by X-ray.

It was found that the bone-scanning was useful, in clinical cases to evaluate the condition of healing process of the bone such as in cases of false joint.

Animal Experiments:

In rats the half-circle of femurs were severed. The bone X-ray and radioautograph were taken chronological from 2 days to 8 weeks after surgery. Early days after surgery there was not remarkable accumulation of radioisotope. However it was gradually increased after the biginning of ossification. The healing process of bone was complated 8 weeks after surgery and there was abnormal accumulation of radioisotope.

We beleive chronological bone-scanning was very useful to evaluate the metabolic state of bone tissue after the bone-fracture and the surgery of bones, which may not be visualized bone X-ray.

Factors Influencing the Uptake of ^{169}Yb, ^{67}Ga and ^{111}In into Bone

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There is no great difference of the tumor uptake rate between ^{169}Yb, ^{67}Ga and ^{111}In. But we reported recenly that ^{169}Yb was rapidly cleared from the blood and most was taken into the bones, and on the other hand, a small amount of ^{111}In was taken up into the bones, and ^{67}Ga showed an intermediate behavior between ^{169}Yb and ^{111}In. And the merked difference in the biological properties between these elements was based on the difference in bone affinity. To explain these facts, we examined the adsorption test of several elements (including ^{67}Ga, ^{169}Yb and ^{111}In) to the hydroxyapatite crystel (as a substitution for the bones) in the protein solution (albumin and transferrin) and 0.01 mole phosphosaline buffer (pH 7.3), to the cation exchange resin in this buffer solution. The results have been sammarized as follows: iron had a strong binding power with transferrin and was not adsorbed into the hydroxyapatite crystal. Among the elements which do not have strong binding power with protein, ^{169}Yb and ^{67}Ga were almost quantitatively adsorbed into the hydroxyapatite crystal, but ^{111}In was not adsorbed as much as ^{169}Yb (or ^{67}Ga). From these results, it is thought that the elements which had a strong binding power with protein were not adsorbed into the hydroxyapatite crystel. The adsorption rate of ^{111}In to the hydroxyapatite crystal in the protein solution and butter solution was smaller than those of ^{67}Ga and ^{169}Yb. Against the cation exchange resin, the same affinity was observed as was seen in the hydroxyapatite crystal. It might be deduced as followings. A reason for the strong affinity of ^{169}Yb to the bone is attributed to the fact that ^{169}Yb stays mostly as cation form in the blood, as only a small amount of ^{111}In stays in cation form in the blood, ^{111}In shows a weak affinity to the bone, and ^{67}Ga shows an intermediate affinity.