Radioisotope Scanning in Bone Tumor

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For early detection of bone tumor, it is ideal to perform positive scanning by administration of radioisotope (RI) which is specifically taken up into it as radioiodine in some cases of the metastatic thyroid cancers, but rather exceptional even in it.

99mTc or 131I-MAA may be concentrated in the bone tumor because of high vascularity in the region of the tumor, but only scarce cases positive scanning by this method could reveal tumor earlier than X-ray films or arteriograms. Strontium is metabolized similarly as calcium and rapidly localizes in bone by incorporation into new bone tissue, but positive scanning by radioactive strontium is not always specific for bone tumor. To evaluate this method in early detection of bone neoplasms, the author investigated in 75 patients with malignancy.

After intravenous injection of 20 μCi of 85Sr Cl₂, profile scanning is performed. Additional administration of 100 μCi in patients with positive profile scanning is followed by area scanning. In 10 patients, scanning revealed abnormalities earlier or more extensively than those visualized by roentgenography. In such a case, scintigraphy is valuable for planning the irradiation field. Negative scans were obtained in 5 patients with marked abnormalities of bones on roentgenograms. In a case with malignant hemoangioendothelioma of sacrum, negative scan was obtained on admission, but following radiation therapy enhanced new bone formation and positive scan according to repaired sacrum on the roentgenograms was obtained. In general, 85Sr bone scanning is useful in early detection of bone tumor in the skull, vertebra and pelvis. As accumulation of strontium is not specific for the invasion of the bone tumor, positive scan may be obtained in other pathologic conditions with possibility of new bone formation. Especially in pediatric age group, because of normal high uptake epiphyseal bone formation may simulate positive scan, one should carefully evaluate scanograms of children with bone tumor. High exposure dose and lengthy of the procedure are shortages of 85Sr bone scanning, but scinticamera instead of conventional moving scanner and using short lived isotope may overcome these shortages.

Scintiscanning of Bone Tumor

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Needless to say that the scanning procedure is very characteristic and helpful to make a definite diagnosis of bone tumor.

A total of 119 85Sr bone scintiscans in 110 patients of bone diseases including bone tumors was performed.

Administrating dosage of 85Sr was 1 μCi/kg body weight and the scanning was done in 24 to 48 hours after giving the dosage.

Both the profile scans and the area scans were performed in each patient and compared the symmetrical parts of the both extremities.

1) Malignant tumor sometimes does not show any positive scintiscan, even the severe case having remarkable bone destruction, so that it would be dangerous to made a definite diagnosis by scintiscanning alone.

2) It might be impossible to make a differential diagnosis of osteoblastic bone tumor and osteomyelitis by the scintiscan, for which X-ray would be more helpful sometimes.
3) The scintiscan can be of significant value in evaluation of patients with suspected or early stage of bone tumors, even if the patients had negative skeletal roentgenograms. The profile scanning especially, would be very useful as a screening procedure to find out bone lesions with $^{85}$Sr.

**Diagnosis of Hormones Responsible for Breast Cancer, and Hormonal Activity in Serum**

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A simplified method for determination of hormones responsible for breast cancer was studied using tumor slices in vitro. $^{32}$P-uptake into nucleic acid of tumor slices was activated by addition of dependent hormones, and was suppressed by sensitive hormones. Spontaneous and cortisol. Responsible hormones for breast cancer were varied individually. This method is manifestation of hormonal influence for tumor itself. From these results, the postoperative desirable treatment for breast cancer were suggested.

Etrogens, androgens activity in serum were determined by use of castrated rat uterus and prostates. Cortisol activity were also determined by castrated-adrenalectomized rat liver. The RNA-polymerase activity or protein synthesis of these organs were activated by the existence of steroid hormones. Determination of hormonal activity in serum is difficult by other method, and needed a good deal of serum, so the present method is useful by 2 ml serum test. But enzymatical activity except hormones, protein effects and usual stock of castrated animals are remaining problems for this method.

**Clinical Application of Radioactive Isotopes in the Diagnosis of Breast Cancer**

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The application of $^{33}$P in the diagnosis of breast cancer:

To differentiate between the malignant and the benign tumors, 79 breast tumor patients were given radioactive phosphate solution intravenously at the dose of 6 to 8 $\mu$Ci per kg body weight. The $^{32}$P incorporations by the tumor or the contralateral normal breast were assessed by means of a Geiger-Müller counter placed over the skin surface. Both malignant and benign tumors were divided into three groups from the percent increase in the $^{32}$P incorporation by the tumor over the control. Thirty-two malignant tumors comprised 23 tumors of the group A (>30%), 3 of group B (20–30%), and 6 of group C (<20%), while 47 benign tumors did 4 of group A, 6 of group B and 37 of group C. Six malignant tumors of the group C were consisted of the 2 small (<1 cm in diameter), the 3 deeply located and the one scirrhous tumors. Two of the 4 benign tumors of the group A showed huge fibroadenoma and other 2 did premenstrual mastopathia. The minimum diameter of cancer detected by this method was 1.2 cm. The results would lead to the conclusion that it is not so worthy to apply this method to the diagnosis of early breast cancer.