

O. Bone and Joints

Preclinical and Clinical Studies with ^{99m}Tc Methylene Diphosphonate

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Methylene diphosphonate (MDP) labeled with ^{99m}Tc was investigated by animal experiments and clinical studies. ^{99m}Tc -MDP was compared with ^{99m}Tc diphosphonate and ^{99m}Tc pyrophosphate in tissue radioassay 1 hr after injection to the rats.

Skeletal concentration, skeletal/blood and skeletal/muscle of ^{99m}Tc MDP were greater than those of ^{99m}Tc diphosphonate and ^{99m}Tc pyrophosphate. Urinary excretion of ^{99m}Tc MDP for 1 hr was similar to that of ^{99m}Tc diphosphonate but faster

than that of ^{99m}Tc pyrophosphate. In human volunteers the blood clearance of ^{99m}Tc MDP was faster than that of ^{99m}Tc diphosphonate.

Although satisfactory bone scintigrams were obtained 3 hr. after injection, bone images 2 hr after injection were good enough to be diagnosed. ^{99m}Tc MDP proved satisfactory and safe for clinical bone imaging studies and better than ^{99m}Tc diphosphonate and ^{99m}Tc pyrophosphate.

Clinical Evaluation of Bone Seeker Agent Using ^{99m}Tc -MDP (Methylene Diphosphonate)

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The various bone diseases were performed the radioisotopic evaluation using ^{99m}Tc -MDP (methylene diphosphonate).

The images was obtained remarkable results within 2 hours after the injection for clinical interpretation setting whole body scanner and γ -camera.

The $T_{1/2}$ from blood and urine were about 30 and 150 minutes after the injection, respectively. The quality were noted 75% with the excellent and

efficient images in 42 cases. But one case with iliac metastasis from thyroidal cancer, adenocarcinoma in pathologically, was notified as false negative result. In addition according to be worse the kidney function, the image was often noted as high back ground activity.

However, its images had very advantageous result for clinical evaluation in various bone diseases. We can suggest that ^{99m}Tc -MDP is much better available radioisotopic agent.

Clinical Investigation of Bone Scintigraphy with ^{99m}Tc M.C.P.

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Two hundred and four patients were investigated by whole body scintigraphy with ^{99m}Tc -MDP, developed by Sabramanian, for the detection of malignant bone tumors. In twelve of 14 patients

with primary malignant bone tumor, scintigrams showed abnormalities, however, 18 out of 21 benign bone tumors showed abnormalities also. This results indicates that bone tumors are con-

siderably manifested abnormalities by scintigraphy.

A hundred and sixty-nine patients were performed the scintigraphy with ^{99m}Tc -MDP for the detection of bone metastasis, and 52 of them showed abnormalities. In twenty-three of 118 patients of breast cancer, the scintigrams showed abnormalities and definite metastases were confirmed in 13 patients. Patient with prostatic carcinoma and lung cancer also showed abnormal-

ities in high ratio.

We have already experienced bone scintigraphies of more 1,000 patients using ^{99m}Tc EHDP, and noticed that, in comparison with ^{99m}Tc EHDP, ^{99m}Tc MDP is more suitable agent of scintigraphy for the skeletal survey of patients with malignant tumors, because of its rapid blood clearance and urinary excretion.

Evaluation of the Clinical Utility of ^{99m}Tc -MDP Bone Scan Compared with PYP and EHDP

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The purpose of the present study is to evaluate clinically bone images obtained by using currently available three bone scanning agents of ^{99m}Tc -MDP (methylene diphosphonate), EHDP (ethane hydroxy diphosphonate) and PYP (pyrophosphate). The image itself is remarkably improved by Micro Dot Imager whole body γ scanner compared with 3 inch whole body scanner.

The results were as follows: 1) The quality of the images were defined into three categories. By using ^{99m}Tc -MDP 59% of good, 28% of fair and 14% of poor images were obtained. By using ^{99m}Tc -PYP 14% of good, 50% of fair and 36% of poor images were obtained. By using ^{99m}Tc -EHDP no good case, 57% of fair and 43% of poor

images were obtained. 2) The half time of blood clearance of ^{99m}Tc -MDP, EHDP and PYP were 16 ± 4 , 17 ± 7 and 35 ± 3 minutes respectively. 3) The 24 hours urinary excretion rate of ^{99m}Tc -PYP, MDP and EHDP were 40 ± 19 , 47 ± 19 and $60 \pm 16\%$ of injected doses respectively. 4) A case of prostate cancer was scanned by using three bone scanning agents. The quality of the image of ^{99m}Tc -MDP, PYP and EHDP were good, fair and poor respectively. 5) Generally speaking the aged cases showed frequently unsatisfied bone scans than the cases of adult.

In conclusion, the bone scan using ^{99m}Tc -MDP could provide us with better quality image than those using ^{99m}Tc -PYP or EHDP.

Scintigraphy with ^{99m}Tc -Methylene Diphosphonate

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The use of ^{99m}Tc -Methylene diphosphonate (MDP) for bone scanning has become increasingly common. This is the report of our experience using this agent. The accumulation rate of this agent in each bone increased markedly until 2 hours after administration, and reached a plateau at 2-3 hours

except for the spine which showed a minimal increase then.

The count rate of each ROI in the bone showed a plateau at 2-3 hour, but that of kidney or background was decreasing. This suggests the adequate timing for the bone scanning to be at