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BASIC AND CLINICAL STUDIES OF Tc-99m-HYDROXYMETHYLENE DIPHOSPHONATE FOR SKELETAL IMAGING AGENT.

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The usefulness of Tc-99m-Hydroxymethylene Diphosphonate(HMDP), a new skeletal scintigraphy agent, to detect the bone lesions, was investigated by comparing with Tc-99m-Methylene Diphosphonate(MDP).

No significant difference in blood clearance between HMDP and MDP was observed in 5 healthy volunteers. Any difference was not seen in the urinary excretion studies between these two agents.

In order to estimate the uptake of these agents by bone, the count ratio of normal bone to soft tissue was obtained in 22 cases with HMDP and 23 with MDP by scintimetry. This data suggested that HMDP bone to soft tissue ratio was significantly higher than that of MDP. Although this ratio of HMDP was not significantly higher than that of MDP before first 1 hour after administration, the former became gradually higher than the latter, and difference was significant 2 hour after administration.

Overall, HMDP image was judged to be slightly better than MDP in qualitatively grading by three independent observers.

From these results it is concluded that HMDP is a useful skeletal imaging agent.

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A NEW POSITION FOR PELVIC BONE SCINCIGRAM.

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We apllied a new position for pelvic bone scincigram in order to distinguish the pubic bones from radioactive urine in the bladder. The position is as followed: A patient lies in lithotomy position. Gammacamera is set over against his buttocks. This view gives us an image of looking up his pelvic bottom. Then pubic bones are separated from the shadow of urine on the film. Pubic bones and the shadow of urine which were inseparable on the conventional anterior view were separated top and bottom on the film using our new position. We named this new position as LITHOTOMY-LIKE-POSITION or PELVIC-AXIAL-POSITION. In 47 cases which showed equivocal scans as for pubic bones, 40 cases(85%) were diagnosed correctly by using our new position. This result suggested that our new position was very usefull to examine the pubic bones.

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MEASUREMENT OF 24-HR WHOLE-BODY RETENTION OF Tc-99mMDP WITH A THYROID UPTAKE PROBE AND ITS CLINICAL SIGNIFICANCE.

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A new method for measurement of 24-hr whole-body retention (WBR) of Tc-99mMDP, using a thyroid uptake probe was established and its clinical significance was evaluated in various bone diseases.

1) Reproducibility of 24-hr WBR in 9 patients was very good (r=0.997).

2) 24-hr WBR of normal adult males (n=5) was 30.0 ± 4.9%, which was significantly elevated compared to the result reported by Fogelman (WBR of Tc-99m HEDP: 19.2 ± 1.7%).

3) No significant differences were noted compared to the groups of benign disorders (n=5, WBR: 31.7 ± 3.9%) and malignant tumors without bone metastasis (n=13, WBR: 30.3 ± 3.6%). However whole-body retentions of the groups of chronic renal failure (n=4, WBR: 97.4 ± 2.4%), malignant tumors with bone metastases (n=6, WBR: 45.7 ± 8.8%) and hyperthyroidism (n=4, WBR: 40.7 ± 6.1%) were significantly elevated. WBR of steroid-induced osteoporotic group was significantly decreased (n=5, WBR: 18.3 ± 6.8%).

Based on these results, this thyroid uptake probe method was simple, reproducible and accurate to measure 24-hr WBR of Tc-99m MDP. Quantification of WBR of Tc-99m MDP was of great clinical value to diagnose metabolic bone disease and to follow-up metabolic and metastatic bone diseases.

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EMISSION COMPUTED TOMOGRAFIC IMAGING(ECTI) OF THE BONE.

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In the conventional bone imaging(CBI), it is not always easy to detect and localize the disease especially in the portion composed of multiple complex bones. In this study ECT was evaluated in the imaging of basal skull and facial bones, comparing CBI. The system was GCA-70AS, manufactured by Toshiba Corporation, composed of two opposed large-field-of-view gamma cameras. Four hours after i.v. injection of 15 mCi of Tc-99m MDP, ECT scan was performed by rotating the cameras 180° about the patient's longitudinal axis. The scanning time was 1-3 min.. Transaxial, sagittal and coronal sections were reconetracted by convolution algorithms. As activities concentrated in various complex bones are separated in the ECTI, the pettrous bone, clivus and sella, which could not be visualized in the CBI, were identified in ECTI. The sphenoid and ethomoid sinuses could also be identified separately in ECTI, while these were seen only as the sphenoethomoid complex in the CBI. Further advantage of ECTI was that a little difference of radioactivity could be appreciated because background activity and overwhelming bone activities are separated. We have experienced several patients with sinusitis in whom abnormal concentration and exact location of the disease could be detectedcted only be ECTI.