

Preliminary Evaluation of Maximum Intensity Projection SPECT Imaging for Whole Body Tc-99m Hydroxymethylene Diphosphonate Bone Scanning

Authors : Yasuyuki Takahashi, Hirotaka Shimada, Kyoko Saito

Abstract : Bone scintigraphy is widely used as a screening tool for bone metastases. However, the 180 to 240 minutes (min) waiting time after the intravenous (i.v.) injection of the tracer is both long and tiresome. To solve this shortcoming, a bone scan with a shorter waiting time is needed. In this study, we applied the Maximum Intensity Projection (MIP) and triple energy window (TEW) scatter correction to a whole body bone SPECT (Merged SPECT) and investigated shortening the waiting time. **Methods:** In a preliminary phantom study, hot gels of 99mTc-HMDP were inserted into sets of rods with diameters ranging from 4 to 19 mm. Each rod set covered a sector of a cylindrical phantom. The activity concentration of all rods was 2.5 times that of the background in the cylindrical body of the phantom. In the human study, SPECT images were obtained from chest to abdomen at 30 to 180 min after 99mTc- hydroxymethylene diphosphonate (HMDP) injection of healthy volunteers. For both studies, MIP images were reconstructed. Planar whole body images of the patients were also obtained. These were acquired at 200 min. The image quality of the SPECT and the planar images was compared. Additionally, 36 patients with breast cancer were scanned in the same way. The detectability of uptake regions (metastases) was compared visually. **Results:** In the phantom study, a 4 mm size hot gel was difficult to depict on the conventional SPECT, but MIP images could recognize it clearly. For both the healthy volunteers and the clinical patients, the accumulation of 99mTc-HMDP in the SPECT was good as early as 90 min. All findings of both image sets were in agreement. **Conclusion:** In phantoms, images from MIP with TEW scatter correction could detect all rods down to those with a diameter of 4 mm. In patients, MIP reconstruction with TEW scatter correction could improve the detectability of hot lesions. In addition, the time between injection and imaging could be shortened from that conventionally used for whole body scans.

Keywords : merged SPECT, MIP, TEW scatter correction, 99mTc-HMDP

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