^{113m}In FOR SCANNING BONE AND KIDNEY

Fred S. Mishkin and Isaac C. Reese

Indiana University Medical Center, Indianapolis, Indiana

The usefulness of scanning for detecting occult lesions of bone can be extended by developing radiopharmaceuticals with a high photon yield and prompt interchange at the crystal surface of bone. Preliminary animal studies suggest that ionic indium, like gallium, may be displaced from its transporting beta globulin in the serum into the bone and also excreted by the kidneys (*1,2*). This is accomplished by prior administration of iron to saturate the beta globulin, transferrin. We have extended our study to human beings.

METHODS

^{113m}In-chloride was prepared using Stern's method (*3*). We eluted a ^{113m}In generator* with 0.05*N* HCl. Ten milliliters of the eluate were placed in a sterile, pyrogen-free vial in a 50° C water bath and 1 ml of 10% gelatin and 60 mg NaCl (0.5 ml of NaCl 120 mg/ml in sterile, pyrogen-free water) were added with stirring. The *p*H was adjusted to 4 with 1*N* NaOH, and the resulting solution was autoclaved at 250° F at 15 psi for 20 min. Calibration was performed with a "Cutie-Pie" ionization chamber.

RESULTS

The first subject was a 22-year-old man with the homozygous form of thalassemia major. He had received multiple blood transfusions to sustain an adequate hemoglobin level. As a result, his unsaturated serum-iron-binding capacity was reduced to 14 μg/100 ml at the time he was seen. He was given 4 mc of $^{113m}InCl_3$ and scanned 2 hr later (Fig. 1). Indium accumulated in the skeletal structures and was excreted by the kidneys so that the bladder was outlined.

The second subject was a 56-year-old man with quadriplegia resulting from pathologic fractures of the 5th and 6th cervical vertebral bodies. He had a destructive lesion of the right sacral wing that was obvious on roentgenographic examination. He had a neurogenic bladder and a Foley catheter in place. He received 0.5 ml of iron Dextran solution (Imferon), containing 25 mg of elemental iron, intramuscularly. His unsaturated iron-binding capacity fell from 225 μg/100 ml at the time of the injection to

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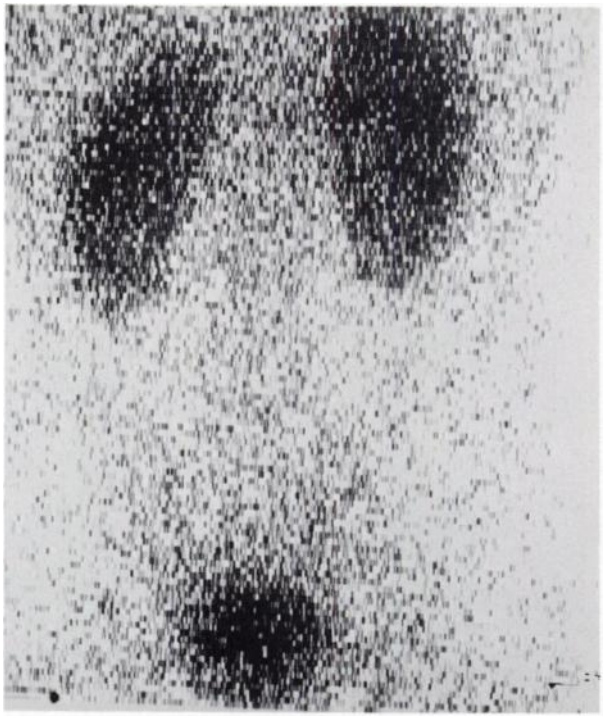

FIG. 1. Posterior scan 2 hr after injection of 4 mc of $^{113m}InCl_3$ in patient with thalassemia shows accumulation of activity in kidneys, bladder and skeleton.

* Obtained from Neisler Laboratories, Tuxedo, N.Y.

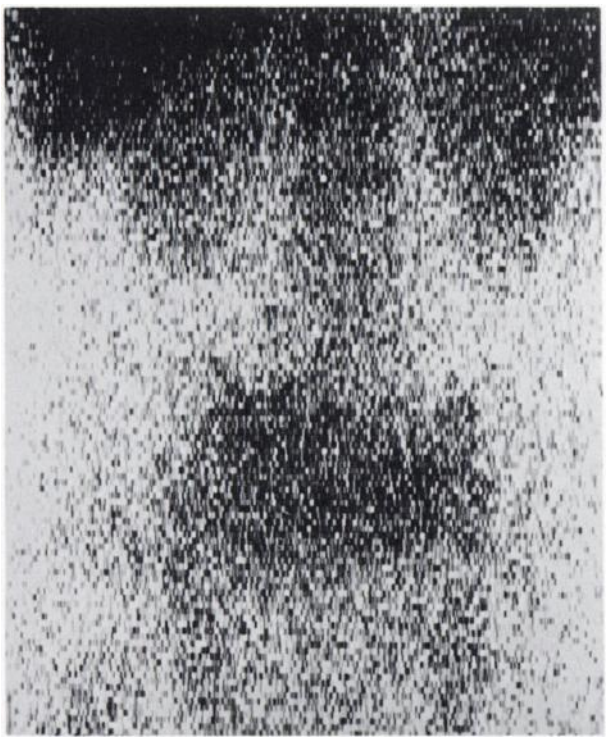

FIG. 2. Posterior scan 2 hr after injection of 4 mc of $^{113m}InCl_3$ in patient who had received 25 mg of iron-Dextran intramuscularly 7 hr previously shows good accumulation of activity in skeletal structures. High accumulation in sacrum is due to destructive lesion easily seen on roentgenographic examination. Bladder was drained by catheter. There is still activity in blood pool as shown by accumulation in liver and spleen.

164 μg/100 ml 7 hr later. At this time he received 4 mc $^{113m}In\ Cl_3$ and his lumbar spine and pelvis were scanned 2 hr later (Fig. 2). The scan shows accumulation of activity in the skeletal structures with increased accumulation in the destructive sacral lesion. There was no accumulation in the bladder because it was continuously drained by catheter; however, a fair amount of activity remained in the blood stream as was shown by activity in the hepatic and splenic areas.

Our results suggest that ^{113m}In in the form of indium chloride can be used to scan the kidneys and bone if the serum transferrin is saturated. This can be accomplished by giving a dose of intramuscular iron-Dextran prior to administration of the indium chloride. Exact time and dose relationships need further study. The high counting rate makes scanning time short, and the short half-life and lack of particulate emission makes the radiation dose to the patient low, less than 200 mR total body dose with 4 mc.

ACKNOWLEDGMENT

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