and pinhole collimators and Graphic 5 scanner were used. The images were obtained at 1, 2, 3, 4, and 6 hours after intravenous injection of 2 to 10 mCi of $^{99m}$Tc-DMSA. In some cases, radioisotope angiograms were obtained after bolus injection of $^{99m}$Tc-DMSA.

In all cases, clear renal images were obtained up to 6 hours after injection. When the pinhole collimator was used and each kidney was enlarged to full crystal size, the detail of renal image was seen with more resolution than using parallel collimator or Graphic scanner.

Because this radiopharmaceutical accumulates in renal cortex and renal medulla demonstrates relatively cold area, therefore, normal variation of this new renal image was different from previous renal images. Normal renal image using $^{99m}$Tc-DMSA and pinhole collimator were classified into three patterns. In patients with chronic pyelonephritis, images demonstrated marked renal cortical atrophy. Renal infarction was also clearly depicted by the combination of $^{99m}$Tc-DMSA and pinhole collimator.

In conclusion, renal imaging by $^{99m}$Tc-DMSA combined with pinhole collimator was found to be the most useful method for renal imaging. Improved image served for the readings of normal renal structure, characteristic findings of the cases with pyelonephritis and space occupying lesions in polycystic kidney, renal infarction and etc.

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**A New Excellent Renal Imaging Agent: $^{99m}$Tc-DMSA**

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Recently $^{99m}$Tc-dimercaptosuccinic acid ($^{99m}$Tc-DMSA) has been developed for renal cortical imaging agent. Results of in vivo study in rats and the clinical evaluation of this new agent proved in kit form are presented.

The distribution of $^{99m}$Tc-DMSA and $^{203}$Hg-chloromerodrin in rats was measured by serial autopsies. The rats were sacrificed at 1, 3, 6 and 24 hours after intravenous injection of these agents and the specific activities in the various organs were measured with a well-type scintillation counter. The concentration of $^{99m}$Tc-DMSA was 20.3% of administered dose at 1 hour, 25.2% at 2 hours, 23.9% at 6 hours and 25.2% at 24 hours. That of $^{203}$Hg-chloromerodrin was 71.1% at 1 hour, 86.2% at 2 hours, 83.7% at 6 hours and 39.9% at 24 hours.

For clinical evaluation of this agent, 152 patients were studied. 44 patients out of them were studied with $^{203}$Hg-chloromerodrin. The $^{99m}$Tc-DMSA renal images were better than those with $^{203}$Hg-chloromerodrin in all of 44 patients.

For a posterior static imaging a dose of up to 2 mCi was used depending upon the age of the patient, and a scintiphotograph was obtained at 1 or 2 hours after intravenous injection. 10 mCi of $^{99m}$Tc-DMSA was injected as a bolus to study the blood flow of the abdomen, and the data were registered in VTR for 5 minutes. Serial posterior
images were obtained every 5 seconds for 10 to 40 seconds. Especially the information concerning the vascularization of the space occupying lesion was useful for differential diagnosis.

We experienced an interesting case with renal stone $^{203}$Hg-chlormerodrin scintiscan failed to demonstrate the affected kidney but $^{99m}$Tc-DMSA scintiscan succeeded in visualizing it. $^{99m}$Tc-DMSA was stable and free $^{99m}$TcO$_4$ was not detected after 6 hours of preparation on thin-layer chromatogram.

The estimated absorbed radiation dose from 1 mCi of $^{99m}$Tc-DMSA was total body 0.014 rad, kidneys 0.582, male gonads 0.010, and female gonads 0.013 respectively.

Any side effects were not observed during our clinical use.

Our conclusion is that $^{99m}$Tc-DMSA might be an excellent and safe renal imaging agent and replace $^{203}$Hg-chlormerodrin in the study of renal corticomedullary morphology.

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Clinical Experiment of $^{99m}$Tc-Dimercaptosuccinate for Renoscan

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A clinical experiment was made on $^{99m}$Tc-dimercaptosuccinate ($^{99m}$Tc-DMS), a new renal cortical scanning agent synthesized by Dainabot Radioisotope Laboratories, Ltd. $^{99m}$Tc-DMS was administered to 70 patients, 45 males and 25 females in age ranging from 5 to 85 years.

After bolus injection of $^{99m}$Tc-DMS (1–10mCi), renal scintiphotos were taken by means of Nuclear Chicago’s Pho Gamma HP scintillation camera and a data-store playback system.

Vascular images of the kidney were produced at 5–10 second intervals commencing when the aorta was first seen after $^{99m}$Tc-DMS injection. Functional images were taken at 3 minutes after intravenous injection and thereafter. Renal images of patients with normal function were taken at 2 hours after injection, and those of patients with abnormal renal function and renal failure were followed for 24 hours.

**Result:** $^{99m}$Tc-DMS RI-angiograms of patients with renal cancer, renal cyst and polycystic kidney showed no clear images. In a functional study, clear renal images of patients with normal function were obtained at 2 hours after injection. Renal images were obtained at 4 hours after intravenous injection in the case of severe acute renal failure (creatinine 11.2 mg/dl and BUN 110 mg/dl) due to obstructive uropathy.

**Conclusion:** In the functional phase, by using $^{99m}$Tc-DMS clear images were obtained for patients with normal renal function. Also in patients with renal failure, renal images were obtained at 4 hours after injection. But in the vascular phase, images with $^{99m}$Tc-DMS are less clear than those with $^{99m}$Tc-DTPA.