S-2 On Diagnosis of Diffuse liver Disease
Diagnostic Value of Liver Scintigraphy for Chronic Diffuse Liver Disorders, with Special Reference to Correlation with Histological Finding
Itsuma Kamoi
Department of Radiology, Kyushu University School of Medicine

Diagnostic value of liver scintigraphy for diffuse liver disorders, especially for chronic liver diseases, is assessed by correlating histological findings with scintigraphic findings.
Liver scintigrams of 229 cases with biopsy performed at III Department of Internal Medicine were reviewed for analysis.
Liver scintigraphy was done using 200-300μCi of 198Au-colloid or 1.5mCi of 99mTc-phytate with rectilinear scanner (SCC-150S with Crystal 5½x2, or SCC-230SA with Crystal 3½x2 inches, Shimazu). Focusing collimator with 37 holes was used for 198Au, and that with 55 holes for 99mTc. Scintigraphic findings were evaluated by scores defined according to the grade of abnormality as follow:
1. Figure of the liver.
2. Visualization of the spleen.
3. Visualization of the bone marrow.
Scores of these abnormal findings were multiplied, and were given as Scinti-Scores.

On the other hand, biopsied materials were evaluated by scores same as scintigrams and Histological-Scores were calculated.

Result
Histological-Scores showed that liver cirrhosis has the highest scores, chronic hepatitis, active form, next, inactive form, the third.
Scinti-Scores showed the same orders.
Next, distribution of each case by histological and scintigraphic scoring showed close relationship between scintigraphic and histological abnormalities.

Summary
Close relationship between Histological-Scores and Scinti-Scores was noted in this study.
The differential diagnosis of inactive, active form of chronic hepatitis and liver cirrhosis is possible with this relatively objective and easy scorig method.

S-3 On Diagnosis of Biliary Tract Disease
99mTc-labeled Cholescintigraphic Agents: Fundamental Studies and Clinical Evaluation
Rikushi Morita, Akira Yokoyama and Teruo Odori
School of Medicine and School of Pharmacy, Kyoto University, Kyoto

Fundamental and clinical studies were performed on the 99mTc-lavede cholescintigraphic agents (99mTc-panicillamin, 99mTc-HIDA and 99mTc-pyridoxylidene glutamate).
Penicillamin (Pen) was was labeled with 99mTc by our simple resin-Sn++ method; after mixing penicillamin, 99mTcO4 and Sn++ adsorbed resin in a syringe for 2 min, the mixture was passed through a millipore filter and the filtrate was ready to use.
Tissue distribution studies after 1mCi of 99mTc-Pen i.v. in mice showed a rapid increase in radioactivity in the gallbladder bile reaching the ratio of the gallbladder to liver of 200:1 at 45 min. Other organs did not show significant radioactivity.
Cholescintigram of normal subjects showed high concentration of radioactivity in the gallbladder at 2-3 hrs after i.v. of 4 mCi of 99mTc-Pen.
HIDA was synthesized from IDA and chloro(dimethoxacetanilide and labeled with 99mTc by SnCl2.
Sequential scintigrams of rabbits after 1 mCi of $^{99m}$Tc-HIDA i.v. showed radioactivity in the liver, kidney and in the intestine within the first 5 min and the gallbladder was visualized at 20 min and during the course of the study its image became clearer as the radioactivity in the liver diminished. The cumulative urinary excretion of $^{99m}$Tc-HIDA was approximately 14% of the injected dose at first hr. These data proves that the $^{99m}$Tc-HIDA is an excellent cholescintigraphic agent with high concentration in the gallbladder within a short period of time. More toxicity study, however, must be carried out before human use since the carcinogenicity of NTA (nitrito-triacetic acid), a hydrolytic product of HIDA, is known.

Pyridoxilideneglutamate (PG) was labeled with $^{99m}$Tc by our simple resin-Sn++ method; PG, $^{99m}$TcO$_4$ and resin-Sn++ were mixed and shooked in a vial for 2 min and heated in boiled water for 3 min. $^{99m}$Tc-PG was ready to use after millipore filtration.

Sequential scintigrams of rabbits after 1 mCi of $^{99m}$Tc-PG i.v., showed early visualization of the liver, kidney and intestine. The gallbladder was visualized at 20 min and during the course of the study its image became clearer as the radioactivity in the liver faded.

The $^{99m}$Tc-PG exhibited rapid blood clearance in normal subjects, showing tow exponential components; a fast component with the half life of 5 min and a slow component with the half life of 50 min, corresponding to the liver uptake rate and the urinary excretion rate of $^{99m}$Tc-PG individually.

The ratio of each intercepts to Y axis at time 0 (A$_1$ fast component/A$_2$ slow component) was greater than 1.0 normally, and the ratio was smaller than 1.0 in parenchymal liver diseases and, in fact, the amount of urinary excretion of $^{99m}$Tc-PG increased in liver diseases.

The gallbladder and common bile duct were normally seen within first 15-20 min after injection of $^{99m}$Tc-PG, and early entrance of tracer into the intestine was also clear.

In diffuse liver diseases, the gallbladder might or might not be visualized. In either cases, however, the distended bile ducts were not observed which were characteristic of extrahepatic biliary obstruction.

Cholescintigram with $^{99m}$Tc-PG in cholelithiasis was of characteristic. The image of the gallbladder was poor, however, the appearance of $^{99m}$Tc-PG in the common bile duct and intestine was rapid and abundant as far as cholecystitis was not associated.

On the cholescintigram with $^{99m}$Tc-PG in complete extrahepatic biliary obstruction, no concentration of $^{99m}$Tc-PG in the biliary tree or intestinal tract was exhibited and, in times, a defect was seen in the region of the gallbladder.

In incomplete extrahepatic obstruction, an area of increased radioactivity was seen in the region of porta hepatitis presumably due to the extended bile ducts. In addition, no clear cut gallbladder was visualized and intestinal excretion was scanty. There were some cases, however, which did not show a positive image of the distended bile ducts. In these cases, differentiation was difficult from jaundiced cases with hepatocellular diseases only on the basis of the cholescintigram.

In conclusion, 1): these $^{99m}$Tc-labeled cholescintigraphic agents are suitable for use in human with wide margin of safety except for $^{99m}$Tc-HIDA, 2): these seem to be useful for the investigation of biliary tract disorders, 3): and especially $^{99m}$Tc-PG appears to offer an useful method to differentiate moderate jaundiced patients. However, these compounds are not suitable for kinetic liver function study, since more than 20% renal excretion can occur in patients with severe parenchymal liver diseases. In this point, we are now underway to develop $^{99m}$Tc-cholescintigraphic agents which are not excreted through the kidney.