

The Scintillation Camera-1600 Channel Analyzer in the Evaluation of Liver and Kidney Function

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The scintillation camera-1600 channel analyzer was used in dynamic studies of liver, gallbladder and kidney function.

Studies on liver and gallbladder function:

One hundred μCi of ^{131}I -rose bengal was injected intravenously in normal subjects and patients with various liver diseases, and the camera was activated with the detector head over the liver. Exposures were made at three-minute intervals for a period of one and a half hours, and the radioactivities in 1600 compartments from the 1600 channel analyzer were printed out at five-minute intervals over the same period.

The maximum hepatic uptake of ^{131}I -rose bengal occurred at 30 min. in normal subjects, 30~75 min. in patients with acute hepatitis, 30~60 min. with a mean of 45 min. in chronic hepatitis, 40~60 min. in liver cirrhosis, and over 90 min. in obstructive jaundice. Gallbladder appearance times were 20~35 min. in normal subjects, 20~30 min. in acute hepatitis, 20~75 min. in chronic hepatitis, and 20~60 min. in liver cirrhosis. The gallbladder was not visualized for one and a half hours in patients with obstructive jaundice. The first discernible intestinal excretion of ^{131}I -rose bengal occurred at 60 min. in normal subjects, and the intestinal excretion of a large amount of ^{131}I -rose bengal was observed in patients with chronic active hepatitis.

The liver uptake rate of ^{131}I -rose bengal was calculated from an analysis of the total radioactivity curve from a scinticamera detector and the blood concentration curve from another scintillation counter placed on the patient's head. The liver uptake rates were 7.0~10.5% per min. in normal subjects, 5.0~8.0% per min. in acute hepatitis, 3.0~8.5% per min. in chronic hepatitis, 2.8~3.5% per min. in liver cirrhosis, and 2.0~5.0% per min. in obstructive jaundice.

From the chronological changes of radioactivities in each compartment from the 1600 channel analyzer, the ^{131}I -rose bengal

uptake rate and excretion rate in each compartment in the liver were calculated. In normal subjects, the ^{131}I -rose bengal uptake rate was almost the same in each compartment. Patients with chronic hepatitis and liver cirrhosis showed different uptake rates in each compartment.

The effect of the oral administration of egg on the radioactivity of ^{131}I -rose bengal was also investigated. In normal subjects, ^{131}I -rose bengal in the gallbladder was excreted into the intestine, and the radioactivity in the gallbladder fell to less than 20% by one hour after ingestion of the egg. In patients with cholelithiasis and cholecystitis, the level of radioactivity in the gallbladder remained high, 50~80%.

The scintillation camera-1600 channel analyzer with ^{131}I -rose bengal thus proved to be very useful in the determination of liver and gallbladder function.

Studies on renal function:

Two hundred μCi of ^{131}I -hippuran and ^{131}I -iothalamate was injected intravenously in normal subjects and patients with various renal diseases, and the camera was activated with the detector head over the kidneys posteriorly. Exposures were made at one-minute intervals for a period of 20 min., and the radioactivities in 1600 compartments from the 1600 channel analyzer were printed out at three-min. intervals over the same period.

The chronological changes in the concentrations of these isotopes in the renal cortex, medulla and pelvis in dehydrated and hydrated normal subjects indicated that water diuresis was accompanied by marked acceleration in the clearance of these isotopes through the renal parenchyma and pelvis. In patients with uremia, the renal uptake of these isotopes was low and the transit time through each compartment in the kidney was prolonged. In patients with renovascular hypertension, actual reduction in the size of the kidney, marked prolongation of renal isotope transit

time were observed, and torsion of the longitudinal axis was considered. The scintillation camera-1600 channel analyzer was thus very useful for obtaining compartmental renograms.

Five second serial scintiphotos following an intravenous injection of 10 mCi of ^{99m}Tc were obtained with the detector head over the kidneys posteriorly. In normal subject, the

15~20 second scintiphoto showed both kidneys with the same concentration of ^{99m}Tc . In a patients with renovascular hypertension, the 15~20 second scintiphoto showed the aorta and left kidney clearly, while the right kidney was barely visible. RI angiography therefore appeared to be a useful screening procedure for renovascular hypertension.