Analysis of Liver Scintigram and Dynamic Study in Patients with Malignant Lymphoma and Leukemia

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It is very difficult to diagnose the diffuse hepatic infiltration of malignant lymphoma by the liver scintigram alone, except for cases showing marked hepatomegaly or focal defects.

As the comprehensive RI liver examination using $^{99m}$Tc-phytate, we have quantitatively analyzed the size of the liver, spleen/liver count ratio and hepatic accumulation index (K-value) using a minicomputer, associated with the routine (naked eye) evaluation of RI angiogram and static liver scintigram. The purpose of the present study is to evaluate the usefulness of those parameters for the diagnosis of hepatic involvement of malignant lymphoma and leukemia.

Thirty two patients with malignant lymphoma (Reticulum cell sarcoma; 26 patients, Hodgkin's disease; 6 patients) and 6 patients with leukemia were studied.

On the liver scintigram, they were divided into three groups, 1) normal group without evidence of enlargement of liver and spleen, uneven distribution of radioactivity or focal defects, 2) evident group with marked enlargement of liver and spleen or focal defects and 3) equivocal group.

Mean K-value in these groups were 0.261 in normal group, 0.432 in evident group and 0.334 in equivocal group. K-values of the patients with hepatic involvement proven by biopsy or autopsy were higher than the $m \pm S.D.$ of the normal control cases ($0.255 \pm 0.048$). Seven out of 8 cases in which follow up studies were performed after chemotherapy revealed a decrease of K-value associated with a reduction of hepatosplenomegaly.

S/L ratio demonstrated no significant differences between cases with and without hepatic involvement, even though the splenomegaly was noted.

On the basis of these results we concluded that increased hepatic accumulation index (K-value) may indicate diffuse hepatic infiltration of malignant lymphoma and leukemia. The cause for the increased K-value remains to be studied.

A Study of the Diagnostically Usefulness of Serial Scintigraphy with $^{131}$I-BSP in Choledocal Cyst

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The serial scintigraphy with $^{131}$I-BSP (Bromsulphalein) is useful method for diagnosis of hepatobiliary diseases, especially the retention images give valuable informations. We reported 5 cases of choledochal cyst or dilatation of the common bile duct diagnosed by this method. The chief complaints of these patients were jaundice, abdominal pain and abdominal mass.

The serial scintigraphy was performed and compared with cholangiography.

After IV injection of $^{131}$I-BSP (5–8 $\mu$Ci/kg), scan was usually performed at the time of 15 minutes, 60 minutes, 2–3 hours, 5–6 hours and 24 hours.

Case 1) 3.6/12 years old male. Congenital intrahepatic ductal cyst.

In the 15 minutes image, the vertical focal defect was seen in the middle portion of the liver,
and at 2 hours later, there is a concentration of activity filling the area of the defect. In 6 hours image the activity of the liver decreased, but retention was seen in the central portion yet.

Case 2) 23 years old, female. choledochal cyst (dilatation of the bile duct and intrahepatic stones).

Serial scintigraphy showed a dilated bile ducts image around the porta hepatis in the early phase, and even in 5 hours later it stayed.

Case 3) 26 years old female. choledochal cyst

Serial scan showed the liver to be compressed by a large abdominal mass. In 15 minutes, later scan $^{131}$I-BSP accumulated in the mass and stayed for 24 hours. No activity was seen in the intestine.

Case 4) 35 years old female. choledochal cyst

3 hours after injection the high activity was seen in the porta hepatis in the size of $5 \times 8$ cm, 5 hours later its activity transferred from liver to intestinal partially.

Case 5) 41 years old, female. choledochal cyst. In the 120 minutes image, two hot area was seen in the area of the lower portion of the right lobe, 3 hours later one activity was disappeared. At laparatomy a choledochal cyst and dilated gallbladder was disclosed.

The common bile duct and gallbladder were not visualized with cholangiography and drip infusion cholangiography in these 5 cases and revealed with PTC or direct infusion during operation. Follow up study has being done with functional images with $^{131}$I-BSP.

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$^{131}$I-BSP Hepatobiliary Function Test with Deconvoluted Analysis

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Dynamic data from $^{131}$I-BSP hepatobiliary function test were deconvoluted by an on-line computer system to obtain the transfer function which should represent the hepatic response function when the dose of $^{131}$I-BSP were injected as a single bolus into hepatic artery. This transfer function was utilized to have information on excretory function of the liver for $^{131}$I-BSP in terms of the transit time excluding the effect of hepatic blood flow. Following intravenous injection of 300 $\mu$Ci of $^{131}$I-BSP, sequential data were recorded by an on-line computer system (DAP-5000N) at 30 second intervals in $64 \times 64$ matrix form for a period of 40 min.

Regional hepatogram for each element of the matrix was deconvoluted using time-activity curve over cardiac region as input function. For each of the regional transfer function, two parameters of mean transit time (MTT) and initial height (IH) were estimated. The latter was assumed to be an index of regional hepatic blood flow. Estimated values were displayed on CRT such that the brightness was proportional to the estimated values, followingly recorded by poloroid camera as functional images. MTT for the whole liver region was also estimated and automatically printed out. In addition, the effective hepatic blood flow (EHBF) was determined from the time-activity curve over cardiac region using Cohen's method. In normal subjects functional images for both parameters of MTT and IH showed diffuse distribution.

Estimated EHBf was 600–800 ml/min and MTT for the whole liver was 12–15 min. In some obstructive diseases MTT images showed focally delayed MTT as hot area in hilar region of the liver, that was not evident in original serial scintiphotos. In diffuse parenchymal diseases such as liver cirrhosis or hepatitis, both MTT and IH images showed irregular distribution.

MTT for the whole liver was prolonged to 30–50 min. and EHBf was decreased to 200–500 ml/min. In 24 patients studied, there was a good inverse relationship between EHBf and MTT ($\tau = -0.787$, $p<0.001$).