A DYNAMIC APPROACH TO THE DIAGNOSIS OF LIVER DISEASES BY USING HEPATOSCINTIANGIOGRAPHY AND HISTO-PROCESSING TECHNIQUE

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Ever since the introduction of nuclear imaging examination of the liver diseases into clinical use, the lack of specificity of abnormal findings, both localized and diffused, of various diseases remains one of the major drawbacks. In and effort to overcome this obstacle hepatoscintiangiography (HSA) has been utilized to hemodynamically evaluate cold-area lesions of the liver and histo-processing tests (HPT) to quantitatively analize radionuclide-distribution pattern in the reticuloendothelial system of the liver, spleen, and spinal bone marrow.

Our approach to this problem was dualistic. Thus, the diseases which manifested scintigraphically more or less discrete cold area or areas were subjected to HSA study with the primary interest focussed on a blood flow analysis and those which manifested diffused pattern change of the liver and spleen to HPT. Diseases belonging to the first category consisted of hepato-cellular carcinoma, metastatic cancer, and abscesses and those belonging to the second category were hepatitis, liver cirrhosis, hepatocellular carcinoma, and metastatic cancer.

HSA was carried out after an intravenous bolus injection of 10 mCi of Tc-99m-phytate into the antecubital vein by obtaining sequential anterior scintiphoto images of 1-second exposure for 16 seconds following the initial appearance of radioactivities in the proximal part of the abdominal aorta. Observations included(1) a baseline study of normal hepatic and portal blood flow pattern by correlating HSA images with x-ray contrast angiogram, (2) time-sequence phasing of normal HSA, and (3) blood flow pattern analysis of altered HSA findings in hepatocellular carcinoma, metastatic cancer and abscesses of the liver.

The results were : (1) Normal HSA demonstrated 3 distinct phases of arterialization(AP), arterial hepatogram(AHP), and portal venous hepatogram (PVHP). The means of each phase were 5.3, 6.3, and 8.3 seconds after the first appearance of radioactivities in celiac region, respectively. The portal vein could be seen in all but one of 20 normal subjects. Of these the protal vein was well depicted in 9 and recognizably imaged in 10 cases. The portal vein appeared on 4-5 sec. frames in 17 cases or in 90.0%. In 14 cases of positively identified portal vein, the visualization terminated during AHP.

(2) The pattern changes in disease groups were early start of AP in hepatocellular carcinoma and very early start of AP in abscess. AP became prolonged in all disease groups. (3) Distinction between AHP and PVHP was rather sharp in metastasis and abscess but was unsharp in hepatocellular carcinoma. Cold area or areas were positively stained in hepatocellular carcinoma but not in abscess. The cold areas of metastasis were inhomogeneously vascularized in late AP and throughout AHP and became relatively avascular as PVHP began. The cold areas of abscess showed rim enhancement during AH and APH. These HSA patterns were very useful in differential diagnosis of the diseases studied.

HPT was performed following rapid intravenous injection of 5 mCi of Tc-99m-phytate into the antecubital vein. Scintigrams were taken at 2-second interval with the patient in supine position on the examination couch. A region of interest was marked in the heart for reference point and then in the liver, spleen, and spinal bone marrow to obtain target organ histogram for analytical evaluation by a computer program, Radionuclide accumulation ratio(RAR) was calculated by dividing the peak count rates of each target organ by the peak count rate of the heart. For the final assessment of histogram of peak organ count rates the liver-to-spleen ratio(LSR) was introduced.

The results of HPT analysis of 30 normal subjects, 33 hepatitis cases, 13 liver cirrhosis cases, 8 hepatocellular carcinoma cases, and 10 metastatic cancer cases were as shown in Table 1.

Table 2. Histo-analysis of peak organ distribution of Tc-99m-sulfur colloid in normal and liver diseases

Organs / Disease	Liver	Spleen	Spine	Liver/Spleen uptake ratio
Normal (n=30)	98.6±44.3%	6.9±2.9%	3.8±2.6%	14.3
Hepatitis (n=33)	101.6±45.0%	19.0±6.5%	3.5±1.9%	5.3
Cirrhosis (n=13)	48.0±19.3%	31.3±18.6%	4.3±1.7%	1.5
Hepatoma (n=8)	85.5±16.5%	27.5±10.0%	4.0±1.2%	3.1
Metastasis (n=10)	100.6±27.7%	6.3±2.7%	2.8±1.7%	16.0

It was concluded that HPT analysis was very helpful in detecting early hepatitis with subtle scintigraphic manifestations and complementary in reading scintigrams of liver cirrhosis in which LSR was very low. In hepatocellular carcinoma hepatic accumulation was not significant altered but the splenic accumulation increased considerably with resultant low LSR and in metastasis both hepatic and splenic accumulations remained within normal range.