A Phantom Study of the Liver Scintigraphy and an Evaluation of Space Occupying Lesions in Clinical Cases

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A liver phantom was made according to the measured values of the livers of normal men in their forties (Jap. J. Path. 39, 1950). Spherical Mix-DP targets sized 1.0, 2.0, 3.0, 4.0 and 5.0 cm in diameter were respectively placed on the anterior and posterior surfaces of each lobe of the phantom filled with 1 mCi of $^{99m}$Tc pertechnetate solution. The detection capability of the targets was investigated with a gamma-camera. It was revealed that a 3 cm diameter target on the posterior surface of the right lobe and a 2 cm diameter target on the posterior surface of the left lobe could be detected in the prone position.

The scintiphotos in the prone position served to discover defects near to the posterior surface of the right lobe better than those from the right lateral direction.

The 57 cases with space occupying lesions (SOL) are as follows: 15 primary hepatomas, 31 metastatic hepatomas, 2 fibrosarcomas of the liver, 6 benign tumors and 3 liver abscesses.

The patients with SOL were devided into 4 groups according to the location of SOL: right lobe, left lobe, both lobes and multiple lesions. Defects in both lobes and multiple defects were mostly due to metastatic hepatoma, namely 26 of 31 patients (83.9%). There were 7 false positive cases in 58 patients (12.7%) and 6 false negatives in 98 patients (6.1%).

Diagnostic Value of the AFP and Positive Scanning with $^{67}$Ga Citrate in Primary Liver Cancers

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a) The diagnostic value of serum AFP (alpha-fetoprotein)

We had recently experienced an interesting case who was diagnosed as hepatoma at early stage by radioimmunoassay of serum AFP. In this case, the increase of serum AFP value was
in proportion to the increase of the volume of tumor. By this fact, we estimated presumable diameters of nodules of hepatoma corresponded with serum AFP value of 2000, 1000, 400 and 200 ng per milliliter in five cases of nodulate hepatomas with high concentration of serum AFP. Presumable mean diameters of tumors were 2.5, 2.0, 1.5 and 1.2 cm respectively. It seems that hepatoma is detected below 2 cm of diameter in some case.

b) The clinical significance of the scanning with $^{67}$Ga citrate.

Scintiphotography with $^{67}$Ga citrate was performed in 14 cases of primary liver cancer and positive scanning case were 11 cases (78%).

Clinical differences between positive and not positive scanning case.

1. ICG retention rate is increased and clearance rate of $^{198}$Au colloid in blood is decreased in not positive cases as compared to positive cases. It is suspected that effective hepatic blood flow has relation to positive scanning of hepatoma.

2. 9 of 11 positive scanning cases and 1 of 3 not positive cases are high concentration of serum AFP. However, 2 of 4 cases of hepatoma with low concentration of serum AFP also showed positive scanning.

3. There are no efficient histological differences between positive and not positive scanning cases in our study.

Dynamic Studies on the Portal Hemodynamics by Scintiphotosplenoportography

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A new technique, scintiphotosplenoportography (SSP), was developed, which permits a clear visualization of portal venous system by injecting $^{99m}$TcO$_4^-$ into the spleen. Thirty three patients with various disorders were studied. The scintillation camera employed was a Picker Dynacamera system and all information was stored on videotape for large playback. The images of the SSP in the portal circulation were divided into 4 groups. Group I: No abnormality of portal circulation. Group II: Tortuous splenic vein present. Group III: portal systemic channels with liver image present. Group IV: Portal systemic channels present, but no liver image. All patients with liver cirrhosis were placed into Group II, III or IV. It suggests that patients of Group II, III and IV show a portal hypertension in some extent.

We, also, using the data processor, estimated the time taken for $^{99m}$TcO$_4^-$ to travel a known distance between the two areas of interest over the splenic and/or portal veins and thus calculated the velocity of the portal flow in terms of cm/sec. The velocity of the portal flow was $9.78 \pm 2.45$ cm/sec in patients without liver disease, $7.80 \pm 1.66$ cm/sec in patients with chronic hepatitis and $4.39 \pm 1.40$ cm/sec in patients with liver cirrhosis. Consequently the velocity of the portal