Computer Processing of Liver Scintigram and Hepatogram, & its Clinical Application on the Biliary Tract Surgery

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On the dynamic study by $^{131}$I-BSP, we have no conclusion even now, where on the liver the interesting area should be instituted.

Liver scitigram and haepatogram with $^{131}$I-BSP were analysed by the computer to be grouped into the 5 types, which is so called IDS (Iso Dose Scintigram) classification.

<table>
<thead>
<tr>
<th>FORM</th>
<th>DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>normal</td>
</tr>
<tr>
<td>Type II</td>
<td>normal</td>
</tr>
<tr>
<td>Type III</td>
<td>transformed (SOL) normal</td>
</tr>
<tr>
<td>Type IV</td>
<td>normal</td>
</tr>
<tr>
<td>Type V</td>
<td>transformed (SOL) no discharge</td>
</tr>
</tbody>
</table>

Using 16φ jumbo scinticamera, type 202 with adapted 1500 holes parallel collimater, we indicated on line these image by 4096 channels.

The histogram of the left view of these three dimensional image were divided, from the maximum point to the minimum point, into the 5 dividing points.

The differences between the each types of the IDS classification were indicated clearly if the each slant curves are compared.

We compared this classification of IDS with the clinical data about 30 cases of the biliary tract surgery performed by our team.

The observation and analysis of $^{131}$I-BSP & $^{99m}$Tc-Phytate liver scintigram were very useful for the pre-operative & post-operative examinations in the hyper-bilirubinemia and tracing the causes of the post-cholecystectomy syndrome.

Evaluation of the Vascular State of Hepatic Tumor with Radioisotope Angiography and Blood Pool Scintigraphies (Early and Delayed)

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Combined radioisotope examinations of hepatic tumor have been performed using $\alpha_1$-fetoprotein radioimmunoassay, radioisotope angiography of the liver and some tumor positive imaging scintigraphies. However, it is frequently impossible with these methods to differentiate metastatic cancers and benign focal lesions.

In the present study, radioisotope angiography of the liver, and both early (5 min. later)—and delayed (4 hours later) blood pool scintigraphies of the liver were done continuously after 10 mCi of $^{99m}$Tc-albumin intravenous injection, in the case of clearcut focal lesions on $^{99m}$Tc-colloid liver scan. Furthermore, the relationships among these findings were examined.

Four out of seven cases with hepatoma and two
out of nine cases with metastatic cancer which showed hypervascular findings on radioisotope angiogram showed clear blood pool activities in the area of focal defects on 99mTc-colloid scan although less than liver.

On the other hand, none of hypovascular tumors on radioisotope angiogram showed blood pool activities. However, four hours later, in most malignant lesions, the lesion to liver activity ratio calculated from data processing system showed a much higher value than the ratio obtained 5 min. later after injection, although two cases with benign focal lesions did not show such sequential change.

From the present study, the sequential evaluation of the vascular state of hepatic tumor using radioisotope angiography, and early-and delayed blood pool scintigraphies was supposed to be extremely useful for the elucidation of the nature of focal hepatic lesions on 99mTc-colloid scan, especially in case of the differentiation between hypovascular malignant- and benign lesions.

Potential Use of Stable Isotope Labeled Benzoic Acid in Evaluation of Liver Function

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We have attempted to devise a test of liver function using non radioactive deuterium labelled benzoic acid. Orally administered benzoic acid is combined with glycine in the liver, and the resulting compound, hippuric acid is excreted in the urine.

We administered deuterium labelled benzoic acid to normal subjects and to patients with a variety of liver diseases. Evaluation of liver function was attempted by measuring the quantity of deuterium labelled hippuric acid (D2-Hippuric acid) excreted in the urine.

Procedure: Approximately 100 mg sodium bicarbonate and 100 mg deuterium labelled benzoic acid (C6D5COOH, 99 atom%) were dissolved in water. The solution was drunk by the subject 1 hr after breakfast, and the urinary bladder was emptied. Urine was collected after administration of the solution at 1, 2, 4, 6, 8 and 10 hrs. Urine volume was measured at each collection.

The D2-Hippuric acid was measured with a Gas chromatography/mass spectrometer.

Amounts of H5-hippric acid and D5-hippric acid were measured simultaneously by method of dilution analysis.

Results: The cumulative excretion of D2-Hippuric acid into the urine is as follows. Most of D5-Benzoic acid taken into body by oral administration is excreted in 1–2 hours in the form of D2-Hippuric acid. After that it is excreted little by little and excretion reaches plateau in 4–6 hours.

The percentage of D5-Hippuric acid excretion in hours after oral administration is as follows: Normal person: more than 55%; Liver trouble patient: less than 55%; (except one example of liver cirrhosis) One example of Hepatitis: 35.1%; Three example of Liver cirrhosis: 36.8%, 50.2% and 94.8%.