Hepatic Function Test with ^{131}I (Monoiodide) BSP

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^{131}I labeled monoiodide BSP was prepared. Its structure was confirmed by nuclear magnetic resonance determinations and by elementary analysis. For comparison, ^{131}I-diiodinated BSP, ^{131}I-rose bengal, ^{35}S-BSP and BSP were used. ^{131}I monoiodide BSP showed slower blood clearance than ^{35}S-BSP and BSP. However, the monoiodide was cleared and excreted from the blood through the liver into the bile more rapidly than ^{131}I-diiodinated BSP and ^{131}I-RB except in the case with Dubin Johnson syndrome. BSP was found useful in sequential scanning for the differential diagnosis of medical, surgical and constitutional hyperbilirubinemia and in simplified retention testing. The latter is performed by injecting 0.5 mg of ^{131}I-BSP in volume of 0.5 ml equivalent to 50–100 μCi intravenously. Thirty minutes later 2–3 ml of blood was drawn from antecubital vein of other side for the determination of 30 min retention of ^{131}I-BSP.

Hundred fifty three cases were studied. Normal control value is $2.46 \pm 0.66\%$ with upper range of 4%. Cases with hepatitis, liver cirrhosis, obstructive jaundice and malignancy showed reasonal increased retention of the dye. The correlation with conventional BSP 45 minutes retention test is good ($\gamma = 0.782$).

The advantages of this dye are 1. BSP is a dye well evaluated in the last several decades, 2. because of its radioactive label the retention test is easily performed with tracer dose loading, even in cases with jaundice.

Statistics at the Central Clinical Pathology Lab. indicated the marked decrease in the number of the conventional BSP test because of its side effects.

^{131}I-BSP retention test is expected to replace the conventional BSP retention test.

A Simpler Method by Using ^{131}I-BSP in Liver Function Test Metabolism of ^{131}I-BSP

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Purpose:

To find a simpler method of liver function test, we tried to check the decreasing rate and resting rate of ^{131}I-BSP in the blood by using the external counting method and by sampling counting method with well type scintillation counter.

Method:

1 μCi/Kg of ^{131}I-BSP was injected i.v. and the decreasing curve (Y) was recorded by

the external counting method for 15–20 minutes. During that time blood was drawn out at 5, 10, and 15 minute intervals after injection and that blood sample was counted on the well-type scintillation counter.

The figures were plotted on a semilogarithm graph taking Y on spindle as c.p.m. and time (min.) on transverse. These were analyzed in 2 components as a sudden drop (B) at the beginning and a gradual decrease (A) after 5–10 minute period. Then, we elongated the former slope (B) and the value $t = 0$ and named it (B_0) and elongated the latter slope (A) and named it (A_0). Using this graph, the following index was concluded: The half time of slope $A = T\frac{1}{2}$, decreasing index of the blood $K = 0.693/T\frac{1}{2}$; resting rate $R\% = S/A_0 \times 100$ or $S/A_0 + B_0 \times 100$.

We used three methods in calculating this index:

1. From curve Y we calculated A_0, B_0, $T\frac{1}{2}$. Sn was calculated by taking the relative equivalent count at X time and naming it R%.
2. Count was taken from each blood samples.
3. A combined method of (1) and (2) above.

Result:

Taking the mean value of ten normal persons, using Method 1, the $T\frac{1}{2}$ was 1.08 ± 0.11 min. of curve (B) and 10.2 ± 1.8 min. of curve (A), $K = 0.069 \pm 0.012$, $R = S15/A \times 100 = 33.7 \pm 7.6\%$, $S15/A + B \times 100 = 24.6 \pm 5.4\%$.

Using Method 2, $T\frac{1}{2}$ was 5.7 ± 1.2 min. (curve B), $K = 0.126 \pm 0.021$, $S15/A \times 100 = 18.0 \pm 6.0\%$.

In cases of patients suffering from liver dysfunction, $T\frac{1}{2}$ was extended; K decreased and R% increased.

Conclusion:

Comparing the three methods used, we found in Method 1, the curve had to be written explicitly. In Method 2, blood samples had to be drawn out three times and moreover skill is required to do this. In Method 3, curve A which was obtained by Method 1 made it possible to eliminate the procedure of drawing out blood. Assuming that from curve Y, Slope B signifies the diffusion of ^{131}I-BSP in the body and Slope A signifies the liver uptake of ^{131}I-BSP, it was better to use A_0 at 0 time density rather than $A_0 + B_0$.

For comparison purpose, we utilized ICG and found the results to be similar to that method where ^{131}I-BSP was used.

Metabolism of ^{131}I-BSP

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^{131}I-BSP was used in combination with BSP in rats as well as in humans. It was found that ^{131}I-BSP given i.v. to rats was excreted in bile quickly and almost totally. Alumina column chromatography of bile disclosed ^{131}I-BSP was conjugated as was BSP, but to a much smaller extent. Pretreatment of rats increased the conjugation significantly. It was also found that at least three conjugate forms appeared with BSP and there were corresponding forms of ^{131}I-BSP, and that the speed of elution was slightly faster in the latter.

When used with BSP in constitutional hyperbilirubinemia, it was found that the late rise of BSP in plasma in Dubin-Johnson Syndrome consisted mostly of conjugated