over in "severely ill" patients was significantly shorter than the control mean (p<0.001). The free thyroxine fraction bore a significant inverse relation to the biological half-time γ = −0.56, p<0.05). Furthermore, in previous studies, we found that the free thyroxine fractions bore a statistically significant relation to the cellular clearance of thyroxine in thyrotoxicosis, in hypothyroidism and in diabetes mellitus. These results was compatible with the concept that the unbound fraction of thyroxine is a major determinant of hormone turnover.

Studies of Thyroxine Metabolism Using 131I-Thyroxine in Liver Diseases

Y. YUMOTO and T. NAMBA

The First Department of Internal Medicine, Okayama University Medical School, Okayama

Thyroxine metabolism in liver diseases was studied using 131I-thyroxine as a tracer.

Clinical materials: Five cases of hyperthyroidism, 1 case of hypothyroidism, 8 cases of cirrhosis of the liver, 6 cases of chronic hepatitis, 1 case of Budd-Chiari syndrome and 3 healthy controls.

Methods: The methods used in this study followed principally those of Cavalieri (1966). All subjects were given orally 200 mg iodine per day throughout the study. After intravenous injection of the blood containing 131I-thyroxine, 40–60 μCi, blood samples were collected by venipuncture at 5, 10, 20, 30, 40, 50, 60, 90 & 120 minutes & 4, 6 and 24 hours. One ml of the plasma separated from the sample was processed by TCA precipitation & washing and the final precipitation was assayed for radioactivity. External counting over the liver was performed with a 2×2 inch scintillation detector fitted with a single-hole lead collimator. Calibration factor for the detector was determined with a phantom. The calibration factor was 8545 counts/min./μCi. serum T4 iodine concentration was estimated by a modification of the method of Barker.

The time-dependent radioactivity curve for the liver was obtained from the external counts by correcting for the liver was obtained from the external counts by correcting for the activity of the tracer in the plasma. Kinetic analysis was made by assuming the distribution of the tracer between 2 compartments, plasma and liver.

Results: Hepatic T4 distribution volume (H) of 3.16±0.91, rate constant (λ22) of 0.0098±0.0006 min., λ21k of 4100±700 counts/min., and hepatic T4 clearance (CH) of 31±8 mL/min. were obtained in healthy controls. In the cases of cirrhosis of the liver, H was decreased to 0.92±0.64, λ22 was 0.1790±0.0100, λ21·k was decreased to 2000±700, and CH was also decreased to 14±8. In the cases of chronic hepatitis, H was decreased to 0.92±0.34, λ21·k was decreased to 2000±500, λ22 was increased to 0.173±0.0019, and CH was decreased to 16±5. The results on the cases of hyperthyroidism were similar to those of healthy controls; H, 3.09±0.91; λ22, 0.0123±0.0022; λ21·k, 3899±600; and CH, 37±9. The plasma volumes in these cases showed no variation. Eleven to 13% of the administered tracer dose were excreted in the urine during the period of 0 to 24 hours in all cases.

Conclusion: It is evident from those results that hepatic T4 distribution volume and hepatic T4 clearance are decreased in the various hepatic diseases, although the concentration of thyroid hormone in the blood is not influenced as revealed by normal serum T4 iodine concentration. Because of no variation among various diseases of urinary excretion of the tracer in distribution equilibrium, there will be no inhibited secretion of thyroid hormone in the liver diseases. The details of these observations are not evident as yet.