rate was normal but slight decrease of hepatic uptake and slightly enlarged spleen and increased uptake of the spleen were observed. The sensitization over 100 days induced more enhanced liver injury such as marked fibrosis and lobular disorganization. In these rats disappearance rate was reduced (0.40−0.60 min^{-1}). The decreased hepatic uptake (80～84%) and slightly increased splenic uptake as well as slightly enlarged spleen were observed.

As indicated above, two groups of rats with liver injury gave different results in both splenic and hepatic uptake of radioactive colloid. However, decrease of the hepatic uptake was observed in rats with enhanced liver injury in both of the two groups. Therefore the above experiments seems to indicates that the decrease of radioactivity over the liver results in th relative increase of radioactivity over the spleen and cause spleen visualization more easily.

An Analysis of Hemodynamics of the Liver by Intrasplenic Injection of ^{198}Au Colloids Determination of Distribution Function of Transit Times and Intrahepatic Shunt

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The surface counting curve recorded over the liver after sudden injection of ^{198}Au colloids into the spleen, was analized to elucidate the hemodynamics of the liver. The curve usually shows rapid rise and fall, and a plateau, followed by gradual rise by recirculalation. The plateau indicates the removed amount of ^{198}Au colloids after passing through the liver as a borus, and in the initial phase of rapid rise and fall, we can suppose the accumulating process of colloids as well as colloids in the blood stream. Therefore the curve was considered to have the following three factors, removal rate per unit of time (ζ: sec^{-1}), distribution function of transit times h (τ), and imput function of colloids into the liver system from the spleen.

In our report the fraction of colloids removed in the liver after the one pasage was expressed as removal ratio or extraction ratio E to distinguish from the above removal rate constant ζ (sec^{-1}). We reported that the removal ratio E is related to the removal rate and the distribution function of transit times h (τ) by the equation $E=1-\int_0^{\infty} h(\tau)e^{-\zeta\tau}d\tau$

As the removal of colloids in the liver should be considered to be in proportion with the amount of colloids in the blood in the liver, the removal rate constant ζ (sec^{-1}) is determined by the construction of accumulating process under the surface counting curve. The imput function of colloids may be estimated by the disappearance curve over the spleen, but this estimation is not exact.

The further analysis was made by application of Laplace transform to the relation between the imput function, the distribution function of transit times and observed surface counting curve over the liver and we demonstrated that the distribution function of transit times, the mean transit time and the extracction ratio by digital computer using the above approximately estimated imput function as initial guess.

The results in normal and in a case of liver cirrohsis were reported. In a normal case, the mean transit time was 11.55 sec and the distribution of transit times was resembled to Poisson distribution having a peak between 10 and 10.25 sec., and the extraction ratio was

0.515. In a case of liver cirrhosis, transit times widely distributed from beneath 2.5 sec. up to 50 sec., but the mean transit time was 7.38 sec. The extraction ratio was 0.219. This value indicated that about 50 per cent of intrahepatic shunt should be evaluated.

Studies on the Liver Circulation in Hepatic Diseases with Radio-isotopes 5. Liver Circulation During Excercise

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In the past four meetings of this Society we reported the results of our studies on changes in the liver circulation brought about by altering postures and during exercise, and we placed special emphasis on such changes in liver diseases, including liver cirrhosis where we already find disturbance in the hepatic circulation.

This time we will present our findings obtained with aid of radiohepatograms using radio-isotopes on the subjects in the supine posture and during or after exercise. For exercise we used an ergometer and for recording the radiohepatograms we employed a portable scintillation detector devised by us. The subjects were made to ride on the ergometer at speed of 60 revolutions per minute, which was equivalent of 15 km/hr of the surface speed. Methods: We injected 10 μ Ci ^{198}Au-colloid to each subject early in the morning with empty stomach in the supine posture, took the record of radiohepatogram. Subsequently, the subject was made to take a preliminary exercise on the ergometer for 5 minutes, then 10 μ Ci ^{198}Au-colloid were injected and again exercised for 10 minutes. Following this the subject was kept at the supine position for 20—30 minutes, again asked to take exercise on the ergometer, and took the radiohepatogram to ascertain the plateau. The blood pressure and the pulses were measured before and during the exercise. As a result it was confirmed that the changes in these measurements were insignificant.

The subjects of our study were composed of 10 normal controls, 7 cases definitely diagnosed as of chronic hepatitis, and 7 cases of liver cirrhosis to the total of 24 individuals. On taking the liver accumulation coefficient (KL), it was found to be 0.200 ± 0.041 and 0.190 ± 0.038 in the control group; 0.176 ± 0.043 and 0.177 ± 0.036 in the chronic hepatitis group; and 0.150 ± 0.023 and 0.136 ± 0.028 in the liver cirrhosis group at supine position and during exercise respectively, revealing a slightly decreasing tendency according to the severity of diseases. As for the alteration ratio, it was $-4.52 \pm 12.83\%$ in the control group; $+2.23 \pm 16.49\%$ in the chronic hepatitis group; and $-10.0 \pm 5.37\%$ in the liver cirrhosis group, indicating also no marked difference among them. Contrary to our expectation, we did not observe any appreciable decrease in KL of the liver cirrhosis group after the exercise as compared with normal controls. This, we assume to be due to the following factors: 1) The number of subjects was too small to yield reliable results; 2) the weight of detector itself and the exercise with the detector attached to subjects of severe liver cirrhosis; and 3) we asked the cooperation in this work only outpatients who were of mild case of liver cirrhosis having undergone sufficient recompensation. These factors seem to have made it very difficult to estimate accurately the disturbance of hepatic circulation in the cases like severe liver cirrhosis.