

Diagnosis of Intrahepatic Shunt by Radio-Isotope

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A mixed solution of D-galactose-1-¹⁴C, T-1824 dye, and serum of the patient was injected into the superior vena cava, and blood was continuously sampled from the brachial artery for 5 to 15 seconds and from the hepatic vein for 25 to 35 seconds and for 35 to 45 seconds after the injection.

Per cent intrahepatic shunt was calculated as follows:

Per cent intrahepatic shut = $(C_h / C_a) / (D_h / D_a) \times 100$ where C_h and C_a are the radioactivity of the hepatic venous and brachial arterial blood, D_h and D_a are T-1824 dye concentrations of the hepatic venous and brachial arterial blood.

Per cent intrahepatic shunt calculated in 7 controls with normal liver was 4-20%, averaging 12%. In 5 patients with acute viral hepatitis, it was 0~22%, averaging 10%. Four of the latter patients were in the icteric stage. Thus, determination of the intrahepatic shunted blood flow by the D-galactose-1-¹⁴C method seems to be little influenced by acute hepatic injury. This finding is in contrast to that with the chemical galactose method, by which considerable intrahepatic shunted blood flow was calculated in some patients with acute icteric viral hepatitis. This superiority of the D-galactose-1-¹⁴C method over the chemical galactose method may be ascribed to the low galactose concentration used in the D-galactose-1-¹⁴C method.

Per cent intrahepatic shunt of 26 patients with hepatic cirrhosis averaged 45%. Per cent intrahepatic shunt of 28 patients with chronic hepatitis was 11~50%, averaging 27%. Differences from both the control and the

patients with hepatic cirrhosis were statistically significant. Slight increase in per cent intrahepatic shunt was also observed in some patients with alcoholic fibrosis, biliary fibrosis, congestive hepatic cirrhosis and presinusoidal portal hypertension. All these patients had hepatic fibrosis. Per cent intrahepatic shunt of patients with fatty liver without fibrosis was within the normal range. There was a statistically significant correlation between the per cent intrahepatic shunt and the percentage amount of interstitial tissue measured in hepatic biopsy specimens. Therefore, the per cent intrahepatic shunt seems to be a useful method of diagnosis of hepatic cirrhosis and hepatic fibrosis.

Although increased per cent intrahepatic shunt was shown in patients with primary and metastatic hepatic tumors, it is considered, from animal experiments, not to be due to real increase of the intrahepatic shunted blood flow but to be due to abnormal metabolism of galactose in tumor tissue.

Animal experiments confirmed the above clinical studies. After various kinds of hepatic injuries were produced in rats, per cent intrahepatic shunt was determined in these rats by means of D-galactose-1-¹⁴C and heat-denatured radioiodinated serum albumin which was phagocytized by the reticuloendothelial system. Per cent intrahepatic shunt increased slightly in hepatic fibrosis, increased markedly in hepatic cirrhosis, but did not increase in fatty liver. Rats with 3'-methyl-DAB carcinoma showed increase of per cent intrahepatic shunt only when D-galactose-1-¹⁴C was injected into the hepatic artery.