

## IX. Liver and Biliary Tract

### Estimation of Hepatic Blood Flow Rate and Hepatic Volume

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#### 1) Determination of Effective Hepatic Blood Flow Rate (FLEL/V)

For the evaluation of hepatic blood flow using radioactive colloid, disappearance rate has been used, which consists of both hepatic and extrahepatic removal. The general equation for the process is

$$C(t) = C_0 e^{-\frac{F_L E_L + F_S(1-E_S)E_L + F_B E_S + F_B E_B}{V} t}$$

$$= C_0 e^{-\frac{F_L E_L + F_S E_S + F_B E_B}{V} t}$$

, where V(ml) is total blood volume; F and E are blood flow and extraction ratio respectively of the organs indicated in the suffix (L, liver; S, spleen; B, other RES tissues):  $F'_L = F_L - F_S$ ; C(t) and  $C_0$  ( $\mu\text{c/ml}$ ) are concentrations of the isotope at t and 0 time.

However, because the hepatic accumulation and uptake are  $S(t) = F_L E_L C(t) dt$  and

$\frac{S(t)}{I} = \frac{F_L E_L}{F_L E_L + F_S E_S + F_B E_B}$ , we derived the following equation:

$$\frac{F_L E_L + F_S E_S + F_B E_B}{V} \times \frac{F_L E_L}{F_L E_L + F_S E_S + F_B E_B}$$

$$= \frac{F_L E_L}{V}$$

As the injection dose is given as c.p.m. of the isotope in a syringe and the hepatic accumulation by  $\gamma$  camera, the counting efficiency of the liver must be evaluated. The author estimated distribution of the isotope in the body by matrix data obtained with diverging collimator at interval of half a diameter in supine position of 15 patients. As a result the counting efficiency of the liver is shown to be correlated closely to body weight (=0.786) and more closely to body weight to height ratio (=0.876).

#### 2) Estimation of Hepatic Volume

The liver, by its anatomical characteristics, gives the maximal and the minimal area of RI image in right anterior oblique and right posterior oblique projection at an angle of 45. The region of maximal depth in right anterior oblique projection gives the maximal width in right posterior oblique projection. Then we can transform counts to cm a unit of length. The method is influenced by deformity of the liver to the minimum extent and the hepatic volume estimated by this method is thought to be "estimated hepatic volume". In 11 normal controls, the estimated hepatic volume was  $800.8 + 122.5 \text{ cm}^3/\text{m}^2$  of body surface or  $2.3 + 0.41\%$  (v/w) of body weight.