

VI. Heart, Lung and Blood Flow

Measurement of Blood Volume Distribution in Patients with Cardiac Disease —Analog Computer Aided RCG Diagnosis—

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Determination of the amount of blood volume and its distribution in the circulating system in patients with cardiac disease has been reported by many investigators, but none has been observed simultaneously.

We have reported a method of analog computer analysis of radiocardiogram which enables to quantitate mean transit time of right heart, lung, left heart, body and shunt rate based on mathematical model of dynamic transportation system of radioisotope. By using a simultaneously measured circulating blood volume, we can calculate cardiac output, right and left heart volume, pulmonary blood volume and blood volume of body.

Method: 40 μ c of RISA is injected intravenously and radiocardiogram is taken by the scintillation detector attached with a 20 cm long collimator which enables to register radioactivity from right and left heart insensitively and which is placed on the precordium to cover all heart and exclude lung or great vessels. Furthermore, input curve is

recorded by the detector placed on the subclavian vein of the injection side. The radiocardiogram so obtained is analysed by the analog computer and blood volume of heart, lung and body is calculated.

Results and Conclusion: In 27 normal subjects, the mean fraction of blood volume of heart, lung and body is $11.6 \pm 1.3\%$ (Mean \pm SD), $11.9 \pm 2.3\%$, $76.5 \pm 4.0\%$, respectively and is limited in a narrow range. In 50 patients with intracardiac shunt, central blood volume, (a sum of heart and pulmonary blood volume), is increased in proportion to shunt rate. In 23 patients with mitral valvular disease, central blood volume, especially heart volume is increased in proportion to severity of the disease and in two severest cases central blood volume is over 50% of circulating blood volume. Increased blood volume in mitral valvular disease is suggested to be mainly due to increased central blood volume, not due to increased blood volume of body.