

II. Heart, Circulation, Kidney and Body Fluid

A New Method for a Measurement of Right Ventricular Residual Ratio Using ^{131}I -MAA

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Although the dye dilution method has been employed for the measurement of right ventricular residual ratio, this method has some disadvantages such as a complicated procedure and poor reproducibility due to uneven mixing of dye material in cardiac chamber.

A new technique of precordial counting with ^{131}I -MAA for measurement of right ventricular residual ratio has been devised in our laboratory. Since MAA particulates injected into right ventricle are trapped into the pulmonary capillaries and do not reach to the left heart, MAA dilution curve is not influenced by left heart component. MAA particulates may mix with blood easily, because its specific gravity is almost equal to that of erythrocytes. Moreover, the precordial counting detects intraventricular residue of MAA as a whole. Finally, the procedures are not so complicated as dye dilution method.

About $50\mu\text{Ci}$ of ^{131}I -MAA was flushed with 10ml of saline into the right ventricle through a multi-punched catheter tip which was previously located in the right ventricular apex after the routine right heart catheterization. A couple of 2 inch crystal detectors with tapered collimator (external diameter: 30 mm) were used. One of them was pointed to the center of right ventricular area and the other to the lung field, respectively. A radioisotope dilution curve was recorded by a detector pointed to the right ventricle. However, the dilution curve was sometimes deformed owing to the radioactivity accumulated in the lung,

which could be corrected using the lung built up curve by the other detector. Right ventricular residual ratio calculated by using both heart rate and λ , an exponential constant, obtained from dilution curve, as follows.

$$\frac{V_R}{V_0} = e^{-\lambda \frac{t}{n}}$$

$\frac{V_R}{V_0}$: right ventricular residual ratio

n : heart beat per t seconds

t : time in seconds

Five normal circulatory subjects and 18 cases with cardiopulmonary diseases were studied. The right ventricular residual ratio (RV res. ratio) ranged between 0.51 & 0.66 in normal circulatory subjects and between 0.49 & 0.80 in cardiopulmonary diseases. RV res. ratio showed no correlation with right ventricular enddiastolic pressure and heart rate, a slight positive correlation with pulmonary arterial pressure, and roughly negative correlation with stroke index. The inhalation of 12% oxygen for 6 to 9 minutes was performed in order to study the influence of hypoxia on right ventricular function in 7 cases. During hypoxia test, cardiac index was not changed or slightly increased, heart rate increased in all cases and stroke index was not changed or slightly decreased, while RV res. ratio, right ventricular enddiastolic volume and right ventricular residual volume were always increased.