Determination of Ineffective Output in the Tetralogy of Fallot

H. Saito, J. Lin and K. Hattani

Department of Radiology, and Surgery, University School of Medicine, Nagoya

The distribution of 131I-MAA after iv injection to the tetralogy of Fallot was determined using Ring Type Total Body Section Counter with 4π moving bed geometry.

In 33 cases of 5 to 27 years old patients, ineffective output was 27 to 74% due to right to left shunt. Blood supply to the head was 8 to 40% and the average was 21%. In case of a retarded child, 10% of MAA, entered the body circulation, was distributed in the head. In case a patient was crying seriously when MAA was injected, 30% of extrapulmonary activity was found in the head. The distribution of MAA was relatively low in the liver, where the main blood supplier is portal artery. In contrast to the liver, a large portion was trapped by the kidneys.

The length of lung scintigram in normal cases and the length of base of activity curve over the pulmonal section were proportional. Therefore the amount of trapping of MAA in the lung in Fallot was determined excluding the contribution of activity from extrapulmonary section. Blood flow through the bronchial artery was thought insignificantly small, since blank parts were observed in many lung scintigram of severe cases.

The determination of ineffective output in the tetralogy of Fallot was done quantitative and served for the diagnosis and determination of indication for operation.

Clinical Estimation of the Right Heart Function by Analysis of 13I-MAA Build up Curve

S. Sato, K. Noya, T. Kunieda, T. Date, T. Sekimoto, T. Ohashi, O. Suzuki and K. Hosono

Department of Internal Medicine, School of Medicine, Keio University, Tokyo

It is important to estimate the washout process of an indicator form the right ventricle to study the right heart function. This, however, encountered technical difficulty to obtain accurately right ventricular dilution curve, because the curve recorded from external counting at right heart region includes dilution components of both right auricle and right ventricle, even through the rapid single injection might be actually carried out. Using an indicator of RISA, dilution curve is deformed by overlapping of subsequent left heart curve, and using MAA it is also affected by accumulation of indicator in lung field. 131I-MAA build up curve might be considered to reflect a dilution process of the right ventricle and to imply an integral of right ventricular washout curve. According to this principle MAA build up curve develops as follows: A detector with 2 inch NaI crystal and tapered collimator was placed on the right upper lung posteriorly, and time concentration curve was recorded following rapid injection of 131I-MAA into a medial vein. Upon assuming the downslope of the dilution curve from the right ventricle by an exponential equation of \( Io \cdot e^{-\lambda t} \) an integral of the exponential is given in the equation of \( \frac{C}{\lambda} - \frac{Io}{\lambda} \cdot e^{-\lambda t} \) (C: integral constant).

Since this latter equation can be replaced by the equation of \( \frac{Io}{\lambda} \cdot e^{-\lambda t} \), theoretically \( \lambda \) value

Presented by Medical*Online
of the dilution curve can be calculated from this build up curve. In order to clarify this theoretical manipulation, an experiment was performed with anesthetized dog. The right ventricle and lung field were simultaneously scanned following the rapid injection of $^{131}$I-MAA through a catheter inserted into the right ventricle. Each data calculated from the right ventricle dilution curve was plotted in the semilogarithmic graph. The two lines has obtained showed parallel and straight, and straight, and each $\lambda$ value was approximately equal. It was evidenced that the $^{131}$I-MAA curve reflects the right ventricular dilution curve and it is emphasized that this dilution process at the right ventricle can easily estimated upon analyzing the $^{131}$I-MAA build up curve. The presently described method is useful as one of indicators of the right heart function in its clinical application.

According to this principle, 5 normal subjects, 12 patients with cardiac diseases, of which the majority consisted of mitral valvular diseases, and 4 patients with various pulmonary diseases were studied. $\lambda$ values ranged from 0.45 to 0.52 in the normal subjects, on the contrary the $\lambda$ values in the majority of the cardiac diseases were relatively lower in comparision with normal subjects, ranging from 0.15 to 0.42, and in the pulmonary diseases the values were widely ranged. The effent of inhalation of oxygen of low concentration (12% $O_2$ for about 10 minutes) were studied in two normal subjects and five cardiopulmonary diseases. All of these subjects showed lower values in $\lambda$. These data were considered to indicate an increase in the residual volume of the right ventricle.

Pre and Postoperative Hemodynamics in Cyanotic Congenital Heart Diseases on External Counter Technique

S. Kawata, K. Nishikawa and T. Inoue

Department of Surgery, School of Medicine, Keio University, Tokyo

Pre- and postoperative hemodynamic status of cyanotic congenital heart diseases, especially of tetralogy of Fallot, was examined repeatedly with the use of external counter technique of radioisotope. The data drawn out by this method was compared with those of cardiac catheterization, angiocardiogram and dye dilution curve.

The cases on which radical operation and pre- and postoperative examinations of the above methods were performed are as follows; Tetralogy of Fallot 21, Pulmonary stenosis with R-L shunt 1, Two-chambered right ventricle with R-L shunt 1.

The postoperative change of R-L or L-R shunt was followed up at decided intervals by the simultaneous recording with scintillation counter pointed to the carotid artery and lung field. While, the majority of the cases revealed a prolonged down slope immediately after surgery, suggesting a remainder of L-R shunt, the lung curve became rapid gradually, suggesting disappearance of the shunt. It is noteworthy, on the other hand, that the completely normal curves immediately after surgery in 3 of the cases resulted their death by the 1st postoperative day.

It is apparent that the down slope of radio-cardiopulmogram is reflected by blood flow of coronary and bronchial arteries besides intracardiac shunt. Postoperatively, remaining shunt or leak from the attached patch should also be put into consideration.

The postoperative normalization of the down slope pattern cannot be due to remaining intracardiac shunt nor coronary circulation when compared with the cardiac catheterization data. This may be better explained by the following, i.e., the well developed collateral route through the bronchial arteries,