

(2) Problems of extrapolation.

(1) The curve recorded by a large detector (3 inch in diameter and with 20 cm-long cylindrical collimator), which is placed over the entire region of cardiac shadow, is helpful for quantitative and qualitative diagnosis of cardiac patients. But cardiac output computed from this curve (Curve-A) by our analog simulation method was 35% larger than that measured by direct Fick method (computed CO/Fick CO = 1.35 ± 0.22 (mean \pm SD), N = 22). This is because the observed pool has some later components that come into the region after the period of primary circulation, and the final dilution level is falsely high. The liver, spleen, large veins, skin or muscle must have greatly contributed to it. When radiocardiogram was recorded by a 2 inch crystal with 9 cm-long collimator, which was placed closer to the chest wall over the second intercostal space at the left sternal margin, cardiac output was only 6% larger than that by Fick method (Curve-B). This shows that the first

point (identical mixing pool) is satisfied better in Curve-B than in Curve-A.

(2) Calculation of cardiac output by MacIntyre's method (M-method) rests on the accurate extrapolation of multichamber dilution curves. But in case of decreased output it is impossible to eliminate recirculation wave from the prolonged left heart slope, and the area of the primary circulation is overestimated. However, our analog simulation analysis is based on the mathematical model, in which recirculation is taken into consideration, and there is less possibility to make such an error (S-method). Therefore, with the prolongation of half time clearance of left heart ($T-1/2$), the ratio of cardiac output by S-method to M-method increased: RO by S-method/CO by M-method = 1.05 ($T-1/2 < 6$ sec.), 1.23 ($6 \text{ sec.} < T-1/2 < 15 \text{ sec.}$), and 1.64 ($15 \text{ sec.} < T-1/2$).

Reference:

Kuwahara, M. et al.: IJBE 1: 13, 1972.

Analysis of Dilution Curve by Scintillation Camera with Computer processing Data of Congenital Heart Diseases

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With aid of scintillation camera with computer processing of data, we are conducting the analysis of dilution curve of congenital heart diseases, and here we report some of our experiences.

The camera was directed obliquely toward the left anterior aspect of the thorax. $^{99m}\text{TcO}_4^-$, 10 mCi/1-3 ml was injected into the ante-cubital vein, and immediately with time lapse camera as well as with polaroid film by hands, consecutive pictures are taken. Simultaneously, by the

scintillation camera time lapse records are taken on video tape recorder. After play back, we obtain dilution curves of regions of interest such as the right heart, left heart, pulmonary outflow, lung and aorta.

While this method affords only an auxiliary diagnosis, it is not only safe but can be repeatedly performed so that as a non-operative examination method, it is an extremely useful method for determining the clinical course and success or failure for-surgical operation.