Preoperative and Postoperative Studies on the Lung Perfusion in Cardiac Diseases

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Quantitative Interpretation of the lung perfusion is useful to evaluate the effect of the surgery in patients with congenital and acquired heart diseases. Left-to-right ratio and upper-to-lower ratio were calculated on the posterior perfusion images using a minicomputer. Five normal cases and 98 cases with cardiac diseases before surgery and 57 cases after surgery were studied. Postoperative perfusion images of the patients were obtained just before leaving hospital.

In preoperative studies, 8 of 18 cases with MS showed higher upper-to-lower ratio. The ratio returned to norml range after surgery in 5 of cases with higher ratio. A decrease in upper-to-lower ratio was observed in 8 of 21 cases with VSD and 11 of 20 cases with ASD before surgery. The ratio did not return to normal range within 1 month after surgery. All of 5 cases with PDA showed lower upper-to-lower ratio before surgery which did not return to normal range within 3 weeks after surgery. Left-to-right ratio decreased in many cases with cardiac diseases but the ratio did not return to normal range after surgery.

A Study on the Estimation of "Pulmonary Blood Volume", with Special Reference to the Significance of Peak to Peak Time in RCG.

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Pulmonary blood volume has been measured by analog simulation of radioangiocardiogram and so on. The significance of peak to peak time (PPT) in RCG for the estimation of "pulmonary blood volume" ("PBV") was reinvestigated with use of RI angiocardiography. RI angiocradiography was performed in 22 patients with various cardiac diseases and 5 patients without cardiac diseases both in the left anterior oblique position and anteroposterior position. Radioisotope counts rate curves in the regions of interest such as RV, PA, LA, LV and whole area over the heart occupying mostly LV and RV, were recorded. The mean transit times (MTT) were measured in each dilution

curves and ΔMTT between each compartment stated above, that is, ΔMTT_{RV-LA}, ΔMTT_{RV-LA}, ΔMTT_{PA-LA}, ΔMTT_{PA-LV}, was calculated. As the result, PPT was found to be close to MTT_{PA-LV} and it was nearly equal in both before mentioned positions as to PPT. Consequently, "PBV" calculated from the pulmonary trunk to the mitral valve, can be expressed from RCG with the following simple formula.

"RBV"$\fallingdotseq PPT_{RCG} \times$ CO (Cardiac Output), since mean value of PTV (volume of pulmonary trunk) was approximately equal to 1/2LVV (half of left ventricular volume). "PBV" was obtained by RCG with this formula in 8 patients without cardiac diseases, 8 patients with mitral stenosis, 10 patients with ischemic heart disease and 7 patients with hypertension. "PBV" tended to be higher in patients with cardiac diseases, particularly with mitral stenosis, than in patients without cardiac diseases.

Cardiac Output Estimation Using Cardiac RI Angiography

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The cardiac output calculation by RISA can be obtained by multiplying the blood volume (ml.) by the ratio of 60 (cm. per min. for paper speed) times height in equilibrium to the area (cm^2.) under curve in the radiocardiogram.

This ratio is theoretically equal to the ratio of 120 (frame per min.) times equilibrium count number to the total count number of the area under curve in the ROI map.

According to this view, the new ratios were obtained from the radiocardiograms of right atrium, right ventricle, left atrium, and left ventricle in the figures of RI angiography.

The ratios drop in proportion to cardiac output reduction, but those are larger about 40% than the RISA ratio.