DETECTION AND QUANTITATION OF LEFT-TO-RIGHT SHUNTS BY HOMOMORPHIC FILTERING. T.NAGASAWA, M.KAKAMURA, T.Takahashi, S.SUGIWARA, Y.SUZUKI, School of Medicine, Tokai University Isehara.

A method for detection and quantitation of left-to-right shunts is presented and applied to the data from 39 patients with left-to-right shunts and from seven normal patients. Pulmonary time-activity curve from radionuclide angiocardiography is decomposed into the primary circulation curve (CP) and the first recirculation curve (Cr) by homomorphic filtering. First left-to-right shunts are detected by using the following: Mean transit time ratio of the two decomposed curves; Difference between the time at maximum of CP and the appearance time of Cr; The ratio of the maximum value of CP to the value at crossing point of the two decomposed curves. Second, pulmonary-to-systemic flow ratios (CP/CS) are calculated from the two areas of the decomposed curves and compared with those from cardiac catheterization. Linear regression analysis gave the following value: r=0.92, regression line slope=1.18, and intercept=-0.31. It is considered that homomorphic filtering method is useful for detection and quantitation of left-to-right shunts. However, it is a subject of further study how to select the characteristic of a filter used.


The clinical usefulness of subtraction-processed image of radioisotopic angiography was evaluated in comparison with conventional radioisotopic angiogram. Radioisotopic angiography performed with usual procedure obtained sequential 120 to 240 frames of image at 0.2 to 1.0 second intervals. Subtrahend and minuend images, the latter of which showed a radioisotopic distribution peripheral in flow phase after injection to the one of the former, were prepared by addition processing by means of referring to time-activity curves of several regions of interest. Then, subtraction-processed image was obtained by subtracting subtrahend from minuend image after the subtrahend image was processed with a factor calculated from counts in the same region of interest in both images for the purpose of reducing artifact image arising from excessive subtraction. Consequently, images obtained demonstrated optional region of blood flow area with narrow distribution of radioisotope and very low back-ground around the region. And, the image could showed accurate finding for diagnosis of heart disease or malignant tumor in all of 20 patients studied more clearly than conventional radioisotopic angiogram.

IN RADIONUCLEIDE ANGIOGRAPHY CALCULATING ELLIPTIC REGION OF INTEREST USING A COMPUTER SYSTEM. S.Ishio, K.Yamada, S.Endo, J.Hatazawa, T.Matsuzawa, Y.Sasaki, T.Kodama, S.Endo, N.Kamamoto, N.Sakuma. The Research Inst. for Tuberculosis & Cancer, Tohoku University School of Medicine and Sasaki Hospital, Sendai and Fukushima.

Left ventricular ejection fractions were determined from radionuclide angiography by means of a computer program. In this program a left ventricular region of interest was defined as the ellipse, which approximately calculated from an isocount contour by method of least squares, for exclusion of uncertainty on the lateral edge and on the valve plane edge. The ejection fractions obtained by computer-linked radionuclide method were comparable to those obtained by generally used radionuclide method in the 12 patients with an r=0.92.


Clinical evaluation of subtraction-processed image of radioisotopic angiography was performed in four patients with coronary artery disease. The computer program used for subtraction was operated in Hitachi 4 Channel RIA Counting System (HMA-4A) and it was designed for increasing accuracy of SPECT, as compared with conventional subtraction. In order to improve the accuracy of detection process, a new algorithm for subtraction process was developed and was applied to the system. The results were compared with the conventional method and the new algorithm shows more accurate results in the detection of perfusion defects.