Comparison Between Radiocardiograms Obtained with Simultaneous Injection of $^{99m}$Tc- and $^{131}$I-Labelled Human Serum Albumin

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$^{99m}$Tc-labelled human serum albumin ($^{99m}$Tc-HSA) has been increasingly applied for nuclear angiography. The quantitative analysis of the angiography may require $^{99m}$Tc-HSA to be stayed in blood pool during measurement.

In order to estimate the in vivo stability of $^{99m}$Tc-HSA radiocardiograms were obtained by simultaneous injection of $^{131}$I and $^{99m}$Tc-HSA with a single scintillation probe and dual pulse height analyzer. $^{99m}$Tc-derived blood volumes had 7.5% on the average higher values than $^{131}$I-derived ones. The ratio of cardiac output (CO) to blood volume (BV) were found to be lower in $^{99m}$Tc study than in $^{131}$I one. As a result there was no significant difference in cardiac output between $^{99m}$Tc- and $^{131}$I-HSA. However, external counting values for $^{99m}$Tc-HSA showed a significantly faster decline, as compared with that for $^{131}$I-HSA. Comparison in the pattern of radio-cardiogram showed that the ratio of left to right peak count was significantly lower in $^{99m}$Tc-radio-cardiogram than in $^{131}$I-one, indicating more tissue absorption of the radioactivity of $^{99m}$Tc.

It was concluded that a significant difference in BV and the pattern of radiocardiogram, and no difference in CO were noted between $^{99m}$Tc and $^{131}$I-HSA.

ECG Gated High Resolution Analysis of Left Ventricular Pool Images


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The gated cardiography was performed in 38 cases (9: normal, 4: hyperthyroidism, 11: myocardial infarction, 4: myocardial infarction with congestive heart failure, 10: other cardiac diseases) using R wave trigger of ECG.

1) Contraction pattern. The contours of gated sequential left ventricular images were traced every 80 msec. during systolic & diastolic phases. Normal 4 cases had uniform contraction patterns. The contraction patterns of all myocardial infarctions were non-uniform, showing asynergy corresponding to the infarcted areas. When associated with congestive heart failure (CHF), the enlarged left ventricles were observed. In hyperthyroidism the distance between the contour lines was wider, due to hyperkinesia of left ventricle. The contractile function of myocardosis showed decrease without non-uniform movement.

2) Ejection fraction of left ventricle. The relative volume curve was obtained by the counting method of ROI placed over left ventricle. The background was calculated by multiplying total channel numbers of ROI by average counts per channel obtained from the region deduced by subtraction of the left ventricular area of diastole & systole. The ejection fraction of normal cases was 55 to 88%. Hyperthyroidism was normal in the ejection fraction. The myocardial infarction indicated 47% in the mean ejection fraction. When associated with CHF the ejection fraction decreased to 21% in the cases with myocardial infarction. One of two cases with angina pectoris showed normal value, while the other showed 45%. Two cases with myocardosis showed decreased ejection fraction which were 45 & 53%.

3) Relative volume velocity. The relative volume velocity was obtained by the diffrenciation of the relative volume curve. The maximum values of the
systolic & diastolic relative volume velocities were compared in the cardiac diseases. The value of the maximum systolic volume velocity (MSVV) ranged 2.74 to 4.72/sec. with a mean value of 3.76/sec. and the value of the maximum diastolic volume velocity (MDVV) ranged 2.22 to 5.18/sec. with a mean value of 3.64/sec. in normal cases. In hyperthyroidism the values of MSVV were 4.46 & 4.6/sec., showing the upper limits of normal values, while the values of MDVV were 5.55 & 5.5/sec., resulting in an increase. In myocardial infarction with & without CHF, the values of MSVV ranged 1.22 to 2.69/sec. with a mean value of 2.11/sec. showing decreased values, while the values of MDVV ranged 0.73 to 2.72/sec. with a mean value of 1.87/sec., sowing decreased values.

Three groups, normal, myocardial infarction & hyperthyroidism, could be separated better by this parameter than ejection fraction.

Gated Myocardial Perfusion Scintigraphy

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High temporal resolution EKG gated analysis was performed for the study of left ventricular function. Four mCi of Thallium-201 Chloride was injected intravenously to visualize myocardium. Using 32 KW computer system and LIST mode data acquisition, sequential events during 10 to 50 msec. intervals are continuously recorded for 1500 to 2000 cardiac cycles. Besides 20 to 100 high temporal resolution sequential images of myocardial mass during a cardiac cycle, cyclic changes of muscle volume was obtained.

Thirty two cases including 6 normal control were examined. Gated myocardial perfusion image produced the sequential high temporal change of myocardial muscle volume during each cardiac cycle. By removing the cardiac motion, detection of the ischemic lesion became more clarified. Cyclic change of muscle volume was found to occur in the different grade when compared apex, free wall and septal wall. Asynchronous change of muscle contraction was clearly noted in such cases as OMI and PMD.

Out of 32 Thallium-201 cardiac scan, right ventricle is hardly seen in 18 cases (56%), however 10 cases showed right ventricular accumulation and the rest of 4 cases showed remarkable accumulation indicating considerable thickening of the right ventricle. This 4 cases are consisted by 2 cases of COPP, 1 case of PMD, and OMI.

Out of 16 cases of old myocardial infarction (OMI), 11 cases showed defect in TI scan indicating the presence of transmural infarction. EKG finding in these 16 cases correspond well in 10 cases. The rest of 6 cases showed discrepancy either due to false positive or false negative reading of EKG and recovery of ischemic region by collateral circulation without accompanying EKG change. Such analysis of left heart function when combined with gated pool scintigraphy have shown considerable promise in the daily diagnostic aid and investigational use.

Clinical Experience of Myocardial Imaging Using $^{201}$TI

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Scintigraphy of the myocardium using $^{201}$TI was performed in 12 patients with myocardial infarction, in 6 patients with angina pectoris, and in 3 patients with primary myocardopathy.

Images were obtained with a gammacamera (GCA-102) using the high resolution 20000 parallel