(3). The size of myocardial infarction from thallium scintigraphy

The size of infarction from thallium scintigraphy was determined by computer processings of schematic drawings in digitalized image. This calculated scitigraphic size (%)(ratio of infarction/myocardium) showed good agreement with that estimated from the serial measurements of serum enzyme(ΣCPK) and precordial ST mapping(ΣST) for anterior infarction. correlation coefficients were 0.86 and 0.82 respectively. However, the estimated defect size was thought to be difficult for inferior infarction from the collimation and position. The calculated scintigraphic size was compatible with non-contracted segment(NCS) in LVG. Ejection fraction estimated from LVG were correlated with scintigraphic sizes(r=-0.78). These data showed that thallium scintigraphy reflected the infarct size simply and easily. And estimation of necrotic masses is useful for the follow up of the infarct patients.

(4). Extents of ischemia from thallium stress myocardial scintigraphy

Myocardial imagings were performed at rest and exercise in 23 patients of angina pectoris. In comparison with coronary angiography, 16 patients with 75% narrowing of coronary artery showed the new defect in stress myocardial imagings, while remaining 7 cases showed no defect after exercise. There were 4 patients with less than 75% narrowing of one coronary artery, 3 patients with complete obstructed LAD supplied with good collaterals. Our results showed high sensitivity(84%) and specificity(97%) of the stress images to evaluate the coronary lesion in the patient with suspected coronary diseases and this is superior to the excecise ECG which permits the substsntially large number of positive patients. And regional uptake ratios (exercise/rest) also reflected the myocardial blood flow.

In conclusion, in comparison with angiographic findings, myocardial perfusion imaging revealed the viability of myocardium, which is functioning and detected the extent of necrotic mass and the exercise induced ischemia noninvasively.

Evaluation of Thallium-20I stress myocardial perfusion imaging in detection of coronary artery diseases,and the clinical application of20I-Tl total -body imaging.

Takeshi Kobayashi

Hokkaido University,School of Medicine,Division of Cardiovascular Medicine,SAPPORO.

I). Thallium-20I myocardial perfusion imaging was performed in 30 patients with effort angina investigated by selective coronary angiography. The images collected in anterior,left anterior oblique views (30°,45°,and 60°),left lateral views, at rest and during exercise were analysed in seven segments : apical,anterior,anteroseptal,antero - lateral,posterolateral,posteroinferior,and postero-septal.

A technique for quantifying segmental regional myocardial Tl-20I activity was developed in our laboratory. The segmental perfusion ratio (SPR) was calculated from the computer processed data.

In normal subjects,the value for SPR was I.0I+0.I0 (n=67). The transient perfusion defects on stress scintigrams were revealed in patients with coronary artery diseases. The SPR of hypoperfused segments was 0.76+0.I (n=I7).

The segmental perfusion ratio was independent of the dose administered,the contrast setting of the recording instrument,and the observer threshold for diagnosing the lesion.

Using selected segments,we were able to identify the presence of coronary lesion revealing a 75% or greater area of stenosis,with 79% sensitivity,and 95% specificity.

Correlation of segmental hypoperfusion with angiographically proven significant coronary stenosis was good for the left anterior descending arteries (92% sensitivity,88% specificity,fig.I),and the right coronary arteries (with 90% sensitivity,I00% specificity,fig.2), but not as good for the left circum flex arteries (55% sensitivity,95% specificity,fig. 3). By this objective means with additional visual inspection of the scintigrams,the site and the severity of the coronary arterial lesions could be evaluated non-invasively.

II). By Thallium-20I total-body imaging,noninvasive visualization of the regional distribution of cardiac cardiac output was studied in 6 healthy volunteers. In addition, the changes of the total body distribution of Tl-20I at rest and during exercise were evaluated.

3 mci.of Tl-20I was injected intravenously,both in the sustaining supine position strictly at rest, and during upright exercise by bicycle ergometer.

At least IO minutes after injection, the human distribution of the radio activity concentration was studied using SHIMAZU SCC-IO50.

The data then were processed by the computer,and the percent activity per organ was determined : the heart 5%,liver I3%,kidney I4%,abdomen 23%,arms 5%, legs I5%,lung I3%,and thyroid 2%,respectively.

There was relatively little difference in the above distribution among individuals studied,as far as the person has been strictly at rest and sustaining supine position.

In contrast,during exercise by bicycle ergometer, the whole-body imaging showed a significant difference in the organ distribution,i.e.,3-fold accumulation of activity was observed in the leg (I5%→4I%),and a decrease of activity in abdomen (23%→I4%),kidney (I4%→7%),liver (I3%→7%), respectively.

It is expected that after further experience and validation,the total-body imaging could be usefull in detecting the distribution of cardiac output in a variety of clinical situations.

figure I.

LAD disease on CAG		Hypoperfusion on Stress Scintigram +	−
+	13	12	1
−	17	2	15

Sensitivity : 12 13 **92%** false negative : 1 16 **6%**
Specificity : 15 17 **88%** false positive : 2 14 **14%**

figure 2.

RCA disease on CAG		Hypoperfusion on Stress Scintigram +	−
+	10	9	1
−	20	0	20

Sensitivity : 9 10 **90%** false negative : 1 21 **5%**
Specificity : 20 20 **100%** false positive : 0 9 **0%**

figure 3.

LCx disease on CAG		Hypoperfusion on Stress Scintigram +	−
+	11	6	5
−	19	1	18

Sensitivity : 6 11 **55%** false negative : 5 23 **22%**
Specificity : 18 19 **95%** false positive : 1 7 **14%**

EVALUATION OF LEFT VENTRICULAR FUNCTION BY RADIONUCLIDE ANGIOCARDIOGRAPHY. A COMPARATIVE STUDY WITH ECHOCARDIOGRAPHY

Keiji Ueda
Division of Cardiology,Tokyo Metropolitan Geriatric Hospital, Tokyo

The radionuclide(RI) imaging technique of the left ventricle(LV),as a measure to characterize the functional state of LV in a variety of heart diseases, was evaluated. The RI angiocardiography,involving the procedures of "the equilibrium method(ECG-gated cardiac blood-pool imaging) and "the first pass method", was compared with echocardiography in the analysis of parameters relating to various aspects of LV function; ie,contractile state of the myocardium, pump performance and asynergy of the contraction.

In the determination of ejection fraction of LV in 10 cases with valvular heart diseases,comparison with echocardiography showed an excellent correlation with a correlation coefficient,r=0.875, while the correlation was poor in 14 cases with recent or old myocardial infarction(r=0.427). Thus it would appear that RI angiocardiography,in which counting rate is analysed, is more accurate in cases with ventricular dilatation and/or wall motion abnormalities.

Since ejection fraction is influenced not only by contractile state of LV,but also by loading status of LV(i.e.;preload or afterload), a more sensitive index to reflect the contractile state will be required. In this respect, a beat-to-beat analysis will give an additional information. Echocardiography is more suitable, at the present time,for the analysis of beat-to-beat changes of ejection fraction or change of circumferential shortening velocity of LV, when wide range of R-R intervals is present or contractile state is potentiated by interventions ;ie. postextrasystolic potentiation.

It can be expected that improvements of technique in RI angiocardiography,including better detecting technique with a higher counting rate and less statistical error, will allow the beat-to-beat analysis and more comprehensive evaluation of LV function.