The significance of cardiac functional images using radioisotopes will be reported. Discussion will be limited especially on the washout ratio of myocardial SPECT, 2-dimensional polar coordinate display of gated cardiac pool ECT, and factor analysis of gated pool scintigram; although many methods have been utilized in clinical practice.

Myocardial SPECT images were reconstructed from the data obtained by 180-degree rotation (RAO40-LPO50) of a gamma camera (32 projection s/rotation, 30 seconds /projection). Exercise stress was loaded whenever possible by an ergometer. Three mCi of T1-201 was injected intravenously after the end point was reached, and scintigrams were taken within 10 minutes after the end of exercise and 3 - 4 hours after T1-201 injection. The end point was decided by Michigan criteria. The exercise stress was discontinued 1 minute after the T1-201 injection. ECG gated cardiac pool ECT images were reconstructed from the data obtained by 180-degree rotation (RAO40-LPO50), 32 projection, 60 sec/projection, 10 frames/RR, 50 ms/frame. ECG gated cardiac pool ECT was performed at LAO 30-40 accumulating data for 500 beats with 20 frames/RR and 40 ms/frame. Transverse images were reconstructed by Shepp-Logan filtered back projection method without absorption correction. The equipments used were ELC 7500 gamma camera and Scintipac 2400. Subjects of this study were neurocirculatory asthenia, angina pectoris, myocardial infarction, and other heart diseases.

The two dimensional polar coordinate display (2DPD) TI-201 washout ratio was superior to conventional circumferential analysis for recognition of whole myocardial perfusion status. Redistribution of TI-201 was more easily detected by 2DPD than visual comparison of early and delayed images. ECG gated cardiac pool ECT was useful for the observation of wall motion because of its capability to evaluate left ventricles from multiple directions. The 2DPD of gated cardiac pool ECT seemed to be useful for correlation of ischemic areas with abnormal wall motion. Factor analysis of ECG gated cardiac pool scan will also be discussed.

The kinetics of TI-201, however, have not been clarified yet, and these images do not have same characteristics as the functional images calculated based on the mathematical model.

In addition to these images, positron emission tomography (PET) has introduced a new exciting field in nuclear cardiology. PET can evaluate regional myocardial energy metabolism by measuring the kinetics of the labeled substrates or their analogs, such as C-11 palmitate and F-18 fluorodeoxyglucose. This technique has great advantage in diagnosis of various cardiac diseases. It will be an important tool to connect two major function, which are routinely measured in nuclear cardiology, i.e. myocardial perfusion and ventricular function.

In order to re-evaluate the functional images in nuclear cardiology, their basic problems and the clinical roles were studied focusing on the myocardial kinetics of TI-201 measured by serial dynamic SPECT and relation of the left ventricular function and myocardial metabolism measured by PET.