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CLINICAL ASPECTS OF SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY (SPECT).

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SPECT has been widely used in the routine nuclear medicine study. This method has advantages compared to planar method, since it has high sensitivity of lesion detectability and multiple tomographic images. On the other hand, SPECT has lack of image qualities since it has technical problems such as absorption correction, filtering method etc. Therefore, in this symposium, the role of SPECT in clinical application was reviewed in comparison with planar method and other modality.

1) The role of SPECT for physiological and metabolic diagnosis

SPECT can offer tomographic image such as transverse, coronal, sagittal and oblique views, however, other modalities such as MRI or CT have higher resolutional image qualities. For example, in myocardial infarction, the infarcted area was shown as wall thinning by MRI or CT, however, the myocardial viability was clearly demonstrated by stress thallium SPECT. Therefore, SPECT should be directed to the physiological and biochemical diagnosis of the tissue and organ. It should be considered SPECT has limitation for the evaluation of anatomical diagnosis.

2) Clinical usefulness of SPECT

The sensitivity and specificity of SPECT were 89 and 93%, where those of planar were 75 and 95% respectively. SPECT had high

detectability compared to planar method. And SPECT is superior in the detection of diagonal lesion, LCX and RCA lesion. ROC analysis and quantitative circumferential profile analysis also demonstrated that SPECT had superior to planar method.

However, the false positive SPECT image should be considered in the case with low statistics. In addition, Bullseye image, which is a comprehensive method that quantifies the three-dimensional distribution of thallium from stress and redistribution is useful for the detection of myocardial ischemia.

3) Future direction of SPECT

To overcome clinical problems of SPECT, the following three issues should be determined.

- (1) The improvement of sensitivity, spatial resolution of SPECT; slant-hole, cut-off, fan-beam collimator or triangle, multiple (ring) detector must be developed.
- (2) The improvement of image display of SPECT; comprehensive three dimensional or comparative display with CT or MRI must be developed.
- (3) The improvement of radiopharmaceuticals for SPECT; Tc-99m-myocardial agents, I-123-fatty acid, I-123-amphetamine must be developed.

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CURRENT AND FUTURE ASPECT POSITRON EMISSION TOMOGRAPHIC STUDY.

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PET study, now, focuses on the investigation of human brain and achieves successful results. PET study which is based on the in vivo dynamic study will change the nuclear medicine into the new aspect.

In future, PET study will have two ways: the one is research for strictly defined quantitation of the metabolism of human organ, such as brain, heart, liver, and so on. The other was stress on clinical usefulness such as cancer diagnosis, assessment of efficacy of cancer therapy, and so on. We show some example concerning the latter.

- 1) Liver and pancreatic cancers are positively imaged using F-18-2-fluoro-2-deoxy-D-glucose (F-18-FDG) with PET. F-18-FDG is an excellent tumor imaging agent. There are various tumor uptake of F-18-FDG in liver and pancreatic cancers, which we consider the degree of differentiation.
- 2) In lung cancer, tumor uptake of F-18-FDG and C-11-methionine is closely related to the histological diagnosis.
- 3) It will be possible to assess the efficacy of cancer therapy using F-18-FDG. PET study of patients whose status after therapy is complete remission showed negative tumor uptake of F-18-FDG during therapy. On the contrary, PET study of a patient whose status after therapy is partial remission showed the positive tumor uptake of F-18-FDG even after therapy.

Thus, PET study is very useful for clinical oncologist to assess the efficacy of cancer therapy as well as cancer diagnosis.

The future problem of PET study is development of new positron labeled radiopharmaceuticals and the methods of quantitation. It is desirable to quantitate the metabolisms with simple methods. PET study will continue to approach biochemistry and biophysiology of diseased or healthy human beings.