

PET, SPECT and MRI Marriage of Chemical Imaging with Anatomical One

Masahiro Iio, M.D.

Tokyo, Japan

Japan has currently 19 PET centers going into operation. In this paper, our latest results obtained at the University of Tokyo are presented from my talk in March at the final lectureship at the University.

Metabolic study of the heart does not usually require anatomical precision as is frequently required in the study of the brain.

In the PET study of the heart, we have successively introduced the new approach of oxygen loading upon the FDG metabolism of the heart.

Normal heart muscle revealed to show 2-4 times increase in FDG uptake after oxygen load of 4 liter per min. This fact is considered to reflect the increased aerobic metabolism of glucose. Contrary, in the ischemic heart muscle, where usually glycolysis increased during control period, will not cause further increase in the FDG uptake after similar oxygen loading. Increased glycolysis is also observed in such cardiac conditions as aortic regurgitation, mitral stenosis and dilated cardiac myopathy. Improvement of valvular disease frequently lead to the nor-

malized sugar metabolism.

Hypertrophic cardiac myopathy accompanies increased glycolysis which is not influenced by oxygen loading.

PET study of the brain require precise projection of the data upon anatomical information such as obtainable by MRI.

This is successfully conducted at our lab. and PET and SPECT tomograms were precisely superimposed upon 3 dimensional MRI images. This procedure, which is called marriage between chemical and anatomical imaging, made it possible to localize the abnormality of the chemistry of the brain on the brain map.

In addition, abnormal levels of the consciousness can be quantitatively correlated with the metabolic rate of the brain. Effect of chemical poison contusions on the brain and brain death upon consciousness and brain chemistry are presented so that one can draw reliable measure of the level of the mind and consciousness.