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Tumor viability evaluation by positron emission tomography with [^{18}F]FDG in the liver metastasis rat model

Kiichi ISHIWATA,* Han-yu LIU,*,** Kenichi TERAMOTO,** Kazunori KAWAMURA,* Keiichi ODA* and Shigeki ARII**

**Positron Medical Center, Tokyo Metropolitan Institute of Gerontology*
***Department of Hepato-Biliary-Pancreatic Surgery, Tokyo Medical and Dental University*

We prepared a liver metastatic tumor model by injection of rat colon adenocarcinoma cells to Fischer F344 rats through portal vein, and applied positron emission tomography (PET) using 2-deoxy-2-[^{18}F]fluoro-D-glucose ([^{18}F]FDG) ([^{18}F]FDG-PET) to this model. At an early stage of the model, multiple small tumor nodules appeared in the inferior lobes of the livers, and extended later into the superior lobes. To evaluate the tumor growth and tumor viability at the early stage, we proposed a new concept, tumor viability index (TVI), instead of the standardized uptake value (SUV) of the [^{18}F]FDG uptake. The TVI was defined by subtracting the signal based on the normal liver from the total signal in the whole liver including tumor nodules: (whole liver SUV – normal liver SUV) × m*l* of whole liver region of interest (ROI). For the signal of the whole liver, ROIs were placed on six slices covering the whole liver, and the ROI of normal liver region was located in the superior lobe of the liver. The average TVI values increased with tumor growth and significantly correlated with the numbers of tumor nodules. The new concept may be useful for evaluating the tumor viability non-invasively and quantitatively by [^{18}F]FDG-PET.

Key words: Tumor viability index, liver metastasis, PET, [^{18}F]FDG