Evaluation of ^{18}F-FDG Accumulation in Chemically Induced Subcutaneous Inflammation Tissues in Rat by using Autoradiography

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Abstract

^{18}F-FDG（2-deoxy-2-[^{18}F] fluoro-D-glucose：FDG）, one of the positron-labeled radiopharmaceuticals, has been widely used for the tumor diagnosis of positron emission tomography. FDG is known to accumulate not only in the malignant tumors but also in the inflammatory tissues. Therefore differential diagnosis for the tumors against inflammation is required. In this study, inflammations were experimentally induced by the subcutaneous inoculation of turpentine oil (10μl) in the back of rats (Jcl Wistar, male, 7wks old, n=10), and accumulation of FDG in the different stage (2-18 days after inoculation) of inflammation was investigated by using autoradiography (ARG). FDG (0.5mCi/body) was injected from tail vein of the rats and after 90 min of injection, rats were sacrificed under deep anesthesia and inflammatory tissues are removed. Then the tissues were frozen with carbon dioxide snow-containing isopentane and served for frozen sections. The sections and F-18 calibration filter papers were then contacted with IP plate and ARG images were obtained to calculate standard uptake value (SUV). The area of high SUV (high accumulation of FDG) was well stained by hematoxylin that surrounds the area of turpentine, which corresponded to the area of neutrophil layer. In this study, the inflammatory cell layer was defined as the sum of the layers of neutrophils and macrophages, and the thickness (mm) of each layer was measured. The SUV rose up maximum 4 days after inoculation, and declined to the similar level at 10-18 days after the inoculation. The inflammatory cell layer was also the thickest 4 days after inoculation, when neutrophils were dominant. Macrophages became dominant 10-18 after inoculation. There was good correlation between SUV and the thickness of inflammatory cell layer (r^2=0.76). However, better correlation (r^2=0.91) was observed between SUV and the thickness of neutrophils layer. These results indicated that high SUV in inflammatory tissues may reflect the activities of neutrophils. Therefore as neutrophils disappear, the SUV goes down and macrophages become dominant.