Tumor Detection Using 18F-Fluorodeoxyuridine in Animal Studies

III. 14 Tumor Detection Using ^{18}F-Fluorodeoxyuridine in Animal Studies

Abe Y., Yamada K., Fukuda H., Endo S., Yoshioka S., Yamaguchi T., Matsuzawa T., Ishiwata K.*, Takahashi T.* and Ido T.*
Department of Radiology and Nuclear Medicine, Research Institute for Tuberculosis and Cancer, Tohoku University
Cyclotron and Radioisotope Center, Tohoku University

We studied the tissue distribution and the tumor uptakes of the three fluorinated purimidines such as ^{18}F-5-fluorouracil(5FU), ^{18}F-f-fluorouridine(FUR), and ^{18}F-5-fluorodeoxyuridine(FdUR). We concluded that the FdUR was the proper radiopharmaceutical for tumor detection.[1,2)]

The purpose of this study was to make comparison among the uptakes of FdUR in the various tumor cell lines. Imaging of the rabbit tumor through positron emission tomography were also carried out.

Materials and Methods

The synthesis of the FdUR was previously reported.[3)]

Tumor cell lines were as follows; 1) MM48, mammary cell carcinoma (C_3H/He mice), 2) FM3A, mammary cell carcinoma (C_3H/He mice), 3) AH109A, ascitic hepatoma (Donryu rats). These cell lines were transmitted by our laboratory. All these cell lines were innoculated either mice or rats subcutaneously. Seven or ten days after innoculation the experiments were performed. The tumor-bearing rodents were killed by cervical dislocation at 10, 30, 60 and 120 minutes after intravenously receiving FdUR. The tumor removed, blotted, weighed, and radioactivity counted in an NaI well counter. Data were expressed as % Dose/G. The ratio of the each tumor cell line were calculated as follows;

$$\text{Ratio} = \frac{\%\ \text{DOSE/G at each time}}{\%\ \text{DOSE/G at 10 min}}$$

A 3×2×2 cm rabbit tumor VX2 was subcutaneously innoculated into the dorsal site of a rabbit's thorax. The rabbit was placed left side down. A transmission scan was done with ^{68}Ge/^{68}Ga ring source. Immediately after 4.47 mCi FdUR was injected intravenously, emission scans were performed. Each scan lasted five minutes.

Results and Discussion

Figure 1 indicates the ratios of three tumor cell lines. The ratios obtained with FM3A and AH109A are completely identical. But the ratio obtained with MM48 are increased with time. The exact reason is obscured. However, considering the origins of MM48 and FM3A was the same mammary cell caricinoma of C_3H/He mice, this results suggests the possibilities of detecting not only the tumor localization but the qualities of the tumors using FdUR methods.

Figure 2 illustrated the positron emission tomogram of a VX-2-bearing rabbit after being injected with FdUR. This image was obtained from 15 to 20 minutes after administration. Tumor tissue could be observed and clearly distinguished from surrounding tissue.

References

1) Abe Y. et al., CYRIC Annual Report 1981 p. 202.
2) Abe Y. et al. Eur. J. Nucl. Med. (in press).
3) Takahashi T. et al., CYRIC Annual Report 1981 p. 155.

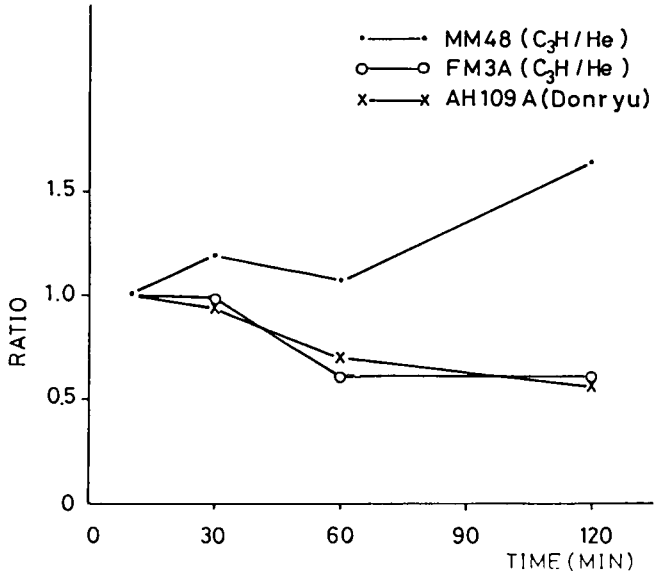

Fig. 1. Tumor uptakes of ^{18}F-FdUR in three cell lines

$$\text{Ratio} = \frac{\text{\% Dose/G (at each time)}}{\text{\% Dose/G (at 10 min)}}$$

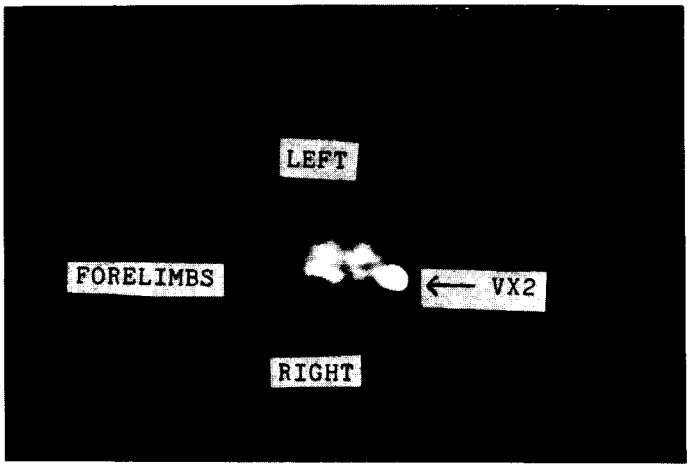

Fig. 2. Positron emission tomogram of VX2-bearing rabbits