Positron Emission Tomography in Pituitary Tumors: A Report of Three Cases

IV. 5. Positron Emission Tomography in Pituitary Tumors: A Report of Three Cases

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Introduction

It was reported that positron emission tomography (PET) is useful to detect microadenoma or recurrence of pituitary adenoma[1,2,3]. But the number of reports about application of PET for pituitary adenoma is little. We tried PET study in pituitary adenoma and got an interesting result. This paper reports the usefulness of PET study in pituitary tumors.

Method

PT931 (CTI inc., USA) or PT711 (CTI inc.,USA, and Tohoku University) were used for this study. 18F-Fluoro-deoxyglucose (^{18}F-FDG) and ^{11}C-Methionine (^{11}C-Met) were supplied from Tohoku University cyclotron and radio-isotope center. PET images were obtained after an administration of ^{18}F-FDG or ^{11}C-Met for static scan images. In addition, dynamic scans (5 min.x 6scans) was performed for one case (case 1) before his static scan. An amount of radio-isotope was 3-4 mCi for a patient. Transmission scan and interpolation were performed to minimize partial volume effects from surrounding structures.

Result

Case 1: A 64-year-old men was incidentally diagnosed as pituitary tumors (Fig. 1). He has only headache and no symptoms due to pituitary tumor. The postoperative histlogical diagnosis was chromophbe pituitary adenoma.^{18}F-FDG PET images showed pituitary adenoma as high uptake area of ^{18}F-FDG (Fig.2). Moreover the dynamic scans disclosed that it took more than 25 minutes to discriminate tumor from cavernous siuns (Fig. 3). This period is necessary to decrease intravascular radioisotope concentration enough. Taking account of this result of dynamic study, ^{18}F-FDG PET image must be obtained after more than 25 minutes from an injection of a radioisotope, if it is performed merely to detect a pituitary tumor.

Case 2: A 27-year-old women was diagnosed as prolactinoma (Fig. 4). A ^{18}F-FDG PET study showed tumor as high uptake area too (Fig.5).

Case 3: A 18 year-old women was diagnosed as pituitary adenoma and operated in our hospital (Fig. 6). But after her operation, she diagnosed as Rathke's cyst histlogically. A ^{18}F-FDG PET study was negative study (Fig. 7). But the ^{11}C-Met PET image on the same level as ^{18}F-FDG PET image showed pituitary region as high uptake area (Fig. 8). We could not decide that this area was tumor or not, because even a pituitary gland shows high uptake compared to brain tissues. But it was certain that ^{18}F-FDG image contained pituitary region. And Rathke's cyst seems to be large enough to be detected taking account of MRI image and results of other PET studies. For this reasone, we concluded that Rathke's cyst was revealed liw uptake area by ^{18}F-FDG PET study. It was not from partial volume effects.

Discussion

A PET is very useful to evaluate a function and/or metabolism of tissues though the resolving power is inferior to MRI and CT scan. Generally neoplasms have high energy metabolism, so that they are high uptake area compared to normal tissues except brain. It is difficult to decide presence of neoplasms in a brain according to ^{18}F-FDG uptake, because a brain, especially cerebral cortex, has very high glucose metabolism. Pituitary gland is small organ but fortunately it was relatively low glucose metabolism compared to a brain and surrounded with arachnoid cistern and cavernous sinus. Activity of radioisotope is decreasing gradually. In this study, the time necessary to discriminate pituitary adenoma from cavernous sinus was about 25 minutes. And finally pituitary adenoma was showed high uptake area of ^{18}F-FDG, as well as previous reports[1.2.3.4]. Moreover PET images could differentiate Rathke's cyst from pituitary adenoma. Rathke's cyst is thought non neoplastic lesion. For this reason, an glucose uptake of Rathke's cyst might be lower than pituitary adenoma. There are many lesions around pituitary gland. A PET study seems to be helpful to differentiate those lesions. Moreover serial PET studies may be possible to evaluate the efficacy of drugs, such as Bromocriptin and Corticosteroid hormones, based on changing the uptake of radioisotopes[5,6].

Reference

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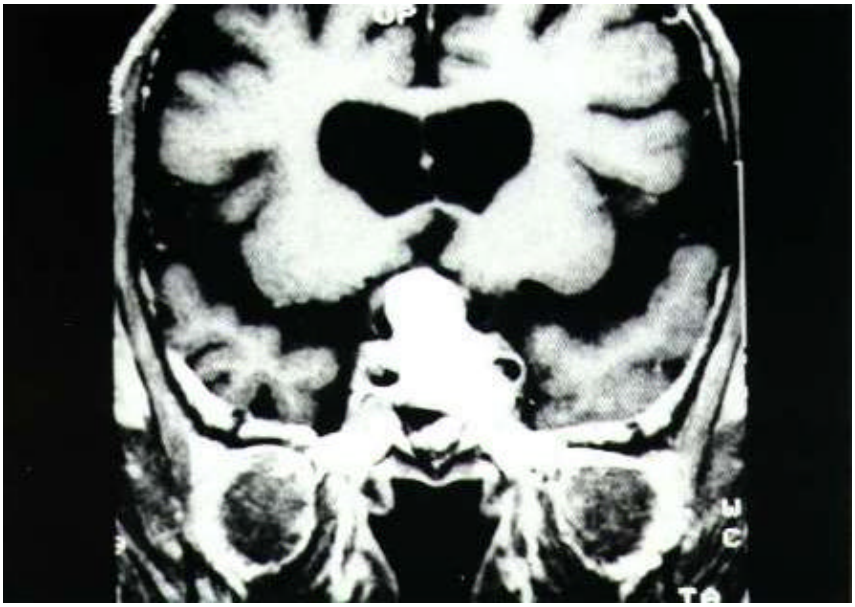

Fig. 1. MRI image (coronal view) of case 1.

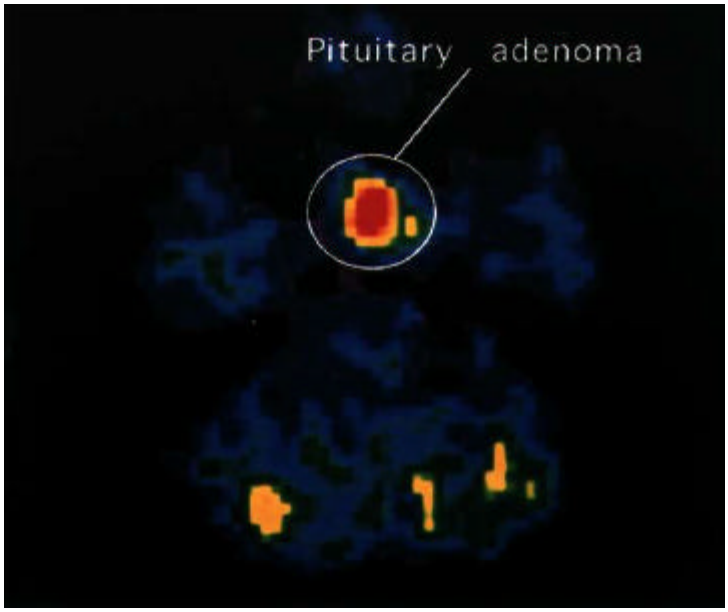

Fig. 2. ^{18}F-FDG PET image of case 1. (arrow: pituitary adenoma)

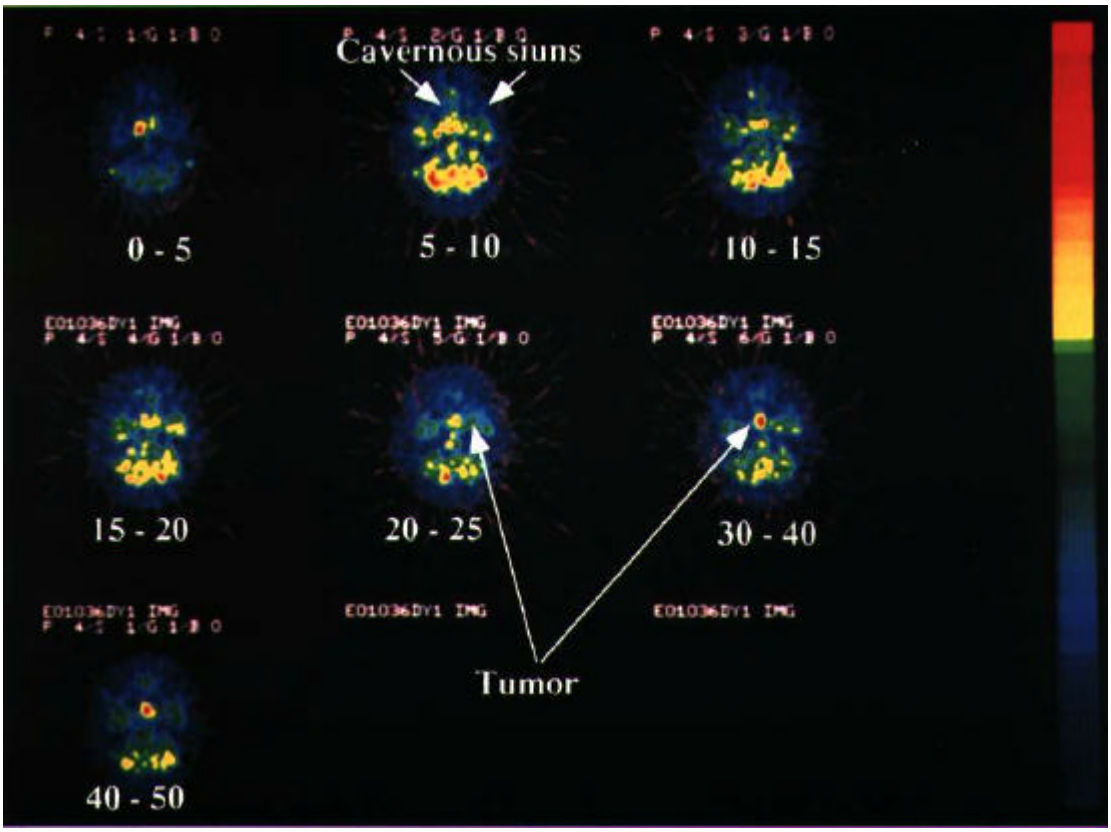

Fig. 3. ^{18}F-FDG PET dynamic images of case 1. (arrow: pituitary adenoma, arrow heads: cavernous sinus)

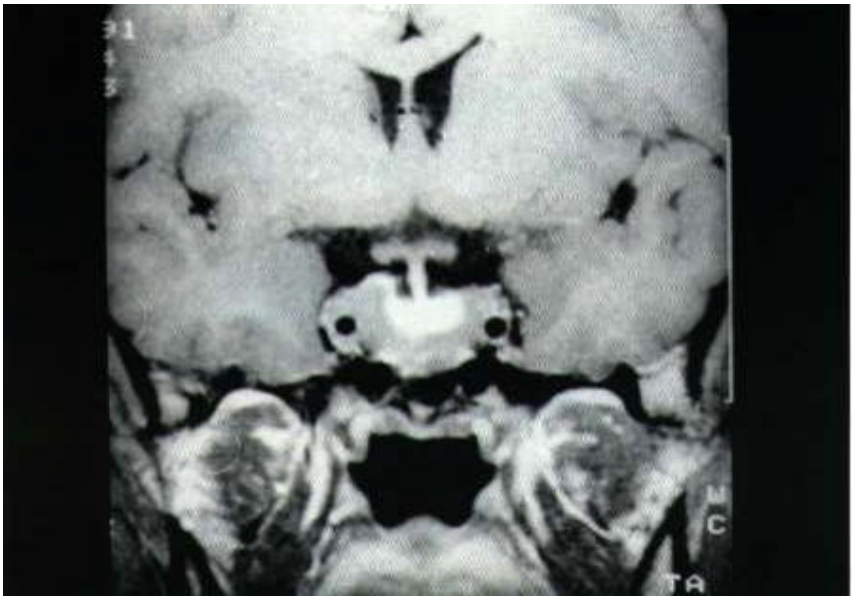

Fig. 4. MRI image (coronal view) of case 2.

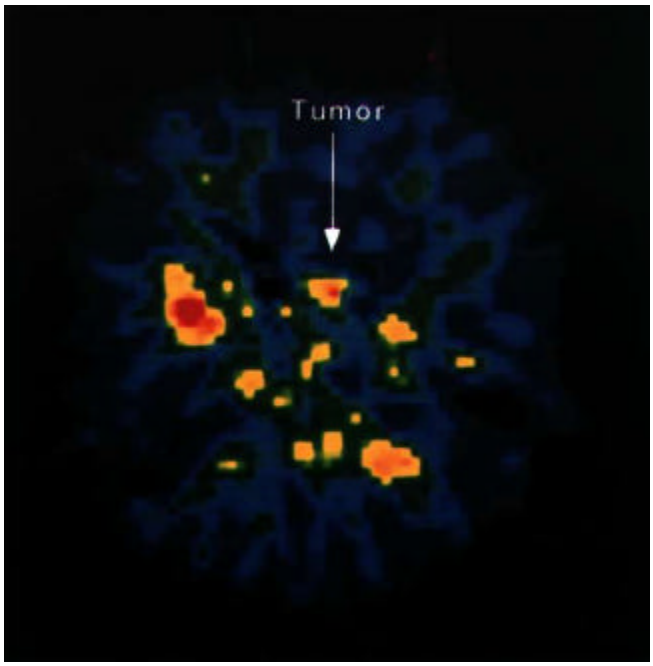

Fig. 5. ^{18}F-FDG PET image of case 2. (arrow: pituitary adenoma)

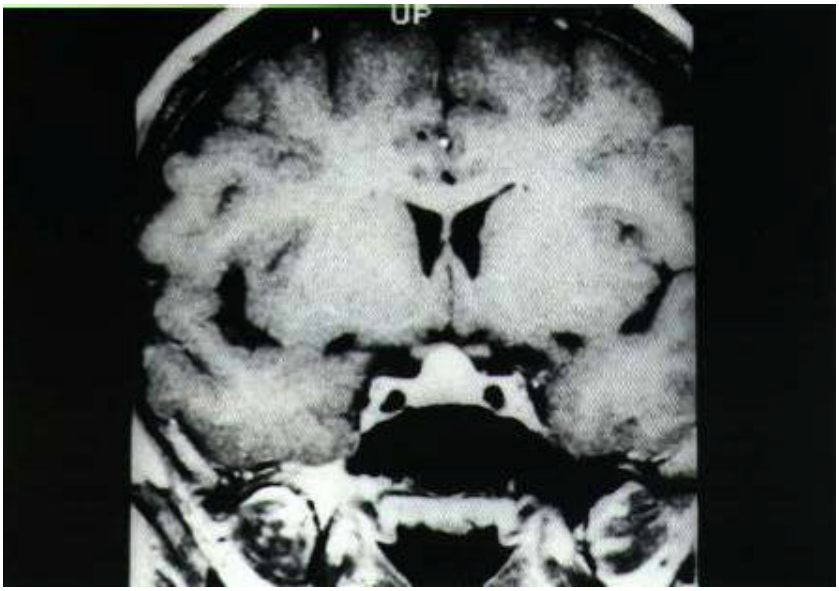

Fig. 6. MRI image (coronal view) of case 3.

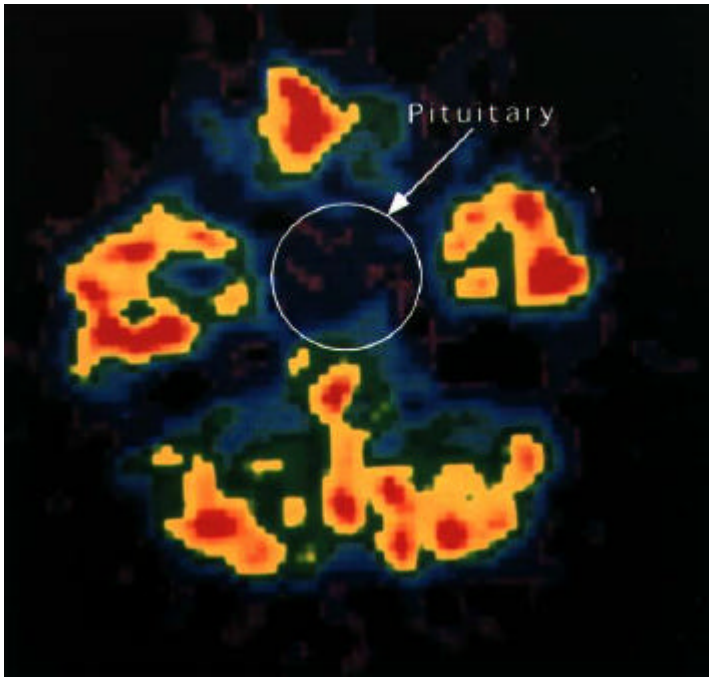

Fig. 7. ^{18}F-FDG PET image of case 3.

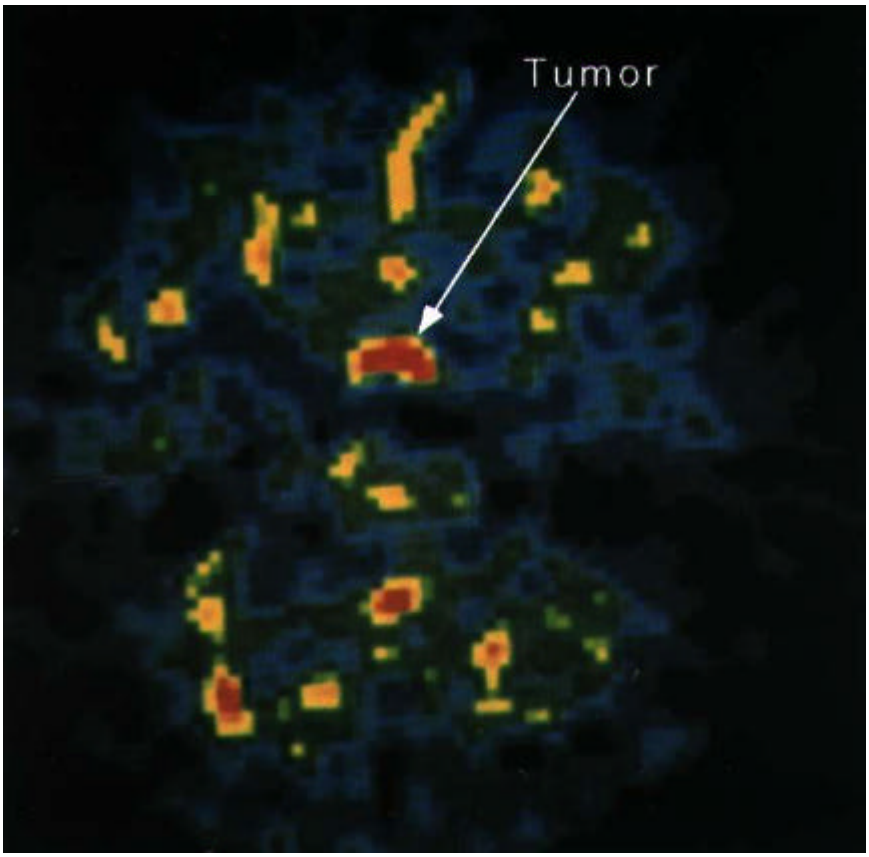

Fig. 8. ^{11}C-Met PET image of case 3. (arrow: pituitary gland and/or tumor)