

19

Usefulness of ^{11}C -Methionine PET in Evaluation of Brain Lesions with Hypo- or Isometabolism on ^{18}F -FDG PET

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Objectives: Because some brain tumors show iso- or hypometabolism on ^{18}F -FDG PET, there have been problems in detection of primary or recurrent tumor and in differentiation from benign lesion with ^{18}F -FDG PET. We investigated the usefulness of ^{11}C -methionine PET in characterizing brain lesions in these conditions. **Methods:** In 34 patients with brain lesions (27 for initial diagnosis, 7 for detecting recurrence) who showed hypo- or isometabolism compared to normal brain tissue on ^{18}F -FDG PET, we performed ^{11}C -methionine PET. Five minutes after injection of 550 MBq ^{11}C -methionine, attenuation corrected brain images were obtained with a dedicated PET scanner. Brain lesions were 18 gliomas, 4 metastatic brain tumors, 2 meningiomas, 1 mixed germ cell tumor and 3 benign tumors and 6 non-tumorous lesions (3 neurocysticercosis, 2 tumor necrosis, 1 granuloma). To find the correlation between methionine uptake and proliferation activity, Ki 67 proliferation Index in 8 patients or Proliferation index (PI = G2+M+S/total cycle) using DNA flow cytometry in 10 patients were obtained. **Results:** Of 25 tumorous lesions without definitive hypermetabolism on ^{18}F -FDG PET, all except two glioma (92%) showed moderate to high uptake in entire or thick peripheral tumor uptake in ^{11}C -methionine PET. The uptake ratio of tumor to normal brain in ^{18}F -FDG and ^{11}C -methionine PET were 0.96 ± 0.32 and 2.43 ± 1.26 , respectively. Nine benign lesions with hypo- or isometabolism on ^{18}F -FDG PET were also no significantly increased ^{11}C -methionine uptake. ^{11}C -methionine uptake and proliferation activity were correlated with Ki 67 index or PI ($r=0.6$). Two glioma shown no increased ^{11}C -methionine uptake had low proliferative activity (Ki 67 < 1%). **Conclusion:** ^{11}C -methionine PET could detect brain tumors and differentiate brain lesions with high sensitivity and good contrast, which showed iso- or hypometabolism on ^{18}F -FDG PET. In evaluation of these patients, ^{11}C -methionine PET could give the additional information concomitantly used with ^{18}F -FDG PET.