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論　文　内　容　の　要　旨
Synopsis of Thesis

氏　　名 Ｎａｍｅ	Rouaa Beshr
論文題名 Title	Preliminary feasibility study on differential diagnosis between radiation-induced cerebral necrosis and recurrent brain tumor by means of [^{18}F]fluoro-borono-phenylalanine PET/CT (F-18標識フルオロボロノフェニルアラニンとエックス線コンピュータ断層・陽電子断層一体型装置による放射線壊死と再発脳腫瘍の鑑別診断に関する基礎的研究)

論文内容の要旨

〔目　的(Purpose)〕

A previous study reported that a differential diagnosis between glioblastoma progression and radiation necrosis by 4-borono-2-[18F]-fluoro-phenylalanine ([^{18}F]FBPA) PET can be made based on lesion-to-normal ratio of [18F]FBPA accumulation. Two-dimensional data acquisition mode PET alone system, with in-plane resolution of 7.9 mm and axial resolution of 13.9 mm, was used. In the current study, we aimed to confirm the differential diagnostic capability of [^{18}F]FBPA PET/ CT with higher PET spatial resolution by three-dimensional visual inspection and by measuring mean standardized uptake value (SUVmean), maximum SUV (SUVmax), metabolic tumor volume (MTV), and total lesion (TL) [^{18}F]FBPA uptake.

〔方法 (Methods)〕

Twelve patients of glioma (9), malignant meningioma (1), hemangiopericytoma (1), and metastatic brain tumor (1) were enrolled. All had preceding radiotherapy. High-resolution three-dimensional data acquisition mode PET/CT with in-plane resolution of 4.07 mm and axial resolution of 5.41 mm was employed for imaging. Images were three-dimensionally analyzed using the PMOD software. SUVmean and SUVmax of lesion and normal brain were measured. Lesion MTV and TL [^{18}F]FBPA uptake were calculated. The diagnostic accuracy of [^{18}F]FBPA PET/CT in detecting recurrence (n=6) or necrosis (n=6) was verified by clinical follow-up.

〔成績(Results)〕

All parameters showed significantly higher values for tumor recurrence than for necrosis. SUVmean in recurrence was 2.95±0.84 vs 1.18±0.24 in necrosis (P=0.014); SUVmax in recurrence was 4.63±1.23 vs 1.93±0.44 in necrosis (P=0.014); MTV in recurrence was 44.92±28.93 mL vs 10.66±8.46 mL in necrosis (P=0.032); and mean TL [^{18}F]FBPA uptake in recurrence was 121.01±50.48 g vs 12.36±9.70 g in necrosis (P=0.0029).

〔総　括(Conclusion)〕

In this preliminary feasibility study, we confirmed the possibility of differentiating tumor recurrence from radiation necrosis in patients with irradiated brain tumors by [18F]FBPA PET/CT using indices of SUVmean, SUVmax, MTV, and TL [^{18}F]FBPA uptake.

論文審査の結果の要旨及び担当者

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論文審査の結果の要旨

放射線治療後の脳腫瘍の再発と壊死を鑑別するための核医学画像診断法の開発を試みた。ヒト悪性腫瘍に発現しているlarge amino acid transporter 1(LAT1)に親和性の高い放射性医薬品F-18 fluoro-phenylalanine (F-18 FBPA)を静脈投与し、Positron Emission Tomography (PET) で頭部を撮像し、F-18 FBPAの集積を定量的に測定した。臨床的に脳腫瘍の再発と診断された群では、放射線壊死と診断された群と比較して病変へのF-18 FBPAの集積が有意に亢進しており、鑑別診断が可能であることが示唆された。放射線治療後の脳腫瘍の再発と壊死を鑑別は、治療方針の決定に極めて重要であるが、既存の画像診断法では精度に限界があった。本研究は脳腫瘍の再発と壊死の鑑別診断法として、新規性および臨床的価値が高く、学位に値するものと認める。