Brain metastases recurrence diagnosis

It is difficult to differentiate local brain metastases recurrence from radiation induced-changes in case of suspicious contrast enhancement. New advanced MRI techniques (perfusion and spectrometry) and Amino Acid Positron Emission tomography allow to be more accurate and could avoid a stereotactic biopsy for histological assessment, the only reliable but invasive method.

PET

Whereas positron emission tomography (PET) with the widely used 18F-2-deoxy-2-fluoro-D-glucose (18F-FDG) has low diagnostic accuracy after SRS, the use of radiolabelled amino acids or amino acid analogues such as L-methyl-11C-methionine (11C-MET) and O-(2-18F-Fluoroethyl)-L-Tyrosine (18F-FET) reaches sensitivity and specificity values in the range of 78 and 100 % rendering especially 18F-FET a highly reliable tracer in glioma imaging.

In patients with MRI-suspected tumor recurrence after focused high dose radiotherapy, 18F-FET PET has a high sensitivity and specificity for the differentiation of vital tumor tissue and radiation-induced lesions [1)].

Tran et al. performed a feasibility study to prospectively evaluate 11C methionine positron emission tomography and11C PBR28 positron emission tomography in 5 patients with 7 previously SRS-treated brain metastases demonstrating regrowth to differentiate tumor regrowth (TR) from radiation necrosis (RN).

Sequential imaging with dual tracers was well-tolerated. [11C]methionine was accurate for detecting pathologically confirmed TR in 7/7 lesions, whereas [11C]PBR28 was only accurate in 3/7 lesions. Tumor PBR-TSPO expression was elevated in both melanoma and lung cancer cells, contributing to lack of specificity of [11C]PBR28-PET.

Sequential use of PET tracers is safe and effective. [11C]Methionine was a reliable TR marker, but [11C]PBR28 was not a reliable marker of RN. Studies are needed to determine the causes of post-radiation inflammation and identify specific markers of RN to improve diagnostic imaging [2)].

MRI

The multimodal MRI has greatly contributed to refine the differential diagnosis between tumour recurrence and radionecrosis, which remains difficult. The FDG PET is helpful, in favour of the diagnosis of local tumour recurrence when a hypermetabolic lesion is found. Others tracers (such as carbon 11 or a fluoride isotope) deserve interest but are not available in all centres. Stereotactic biopsy should be discussed if any doubt remains [3)].

An increase in FLAIR signal of the fluid within the resection cavity might be a highly specific and early

sign of local tumor recurrence/tumor progression also for brain metastases. [4].

References

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