PET applications in neurooncology have received new effectiveness by the advent of positron-emission labelled amino acids, so that it has been coined the term “Amino acid PET” to differentiate this imaging tool from FDG-PET. Radiolabeled amino acids are a very interesting class of PET tracers with great diagnostic potential in neuro-oncology because of their low uptake in normal brain and, conversely, high uptake in most brain tumors including low-grade gliomas.

The use of L-[methyl-11C]Methionine (MET) is restricted to PET centers with an in-house cyclotron and radiochemistry facility, because of the short half-life (20 min) of 11C. The promising results of MET have stimulated the development of 18F-labelled aminoacid tracers, particularly O-(2-18F-fluoeoethyl1)-L-tyrosine (FET), that has the same properties of MET and, thanks to the longer half-life of 18F (about 110 min), allows a distribution strategy from a production tracer site to user satellite PET centers. Considering a more widespread use of Amino acid PET, together with the recent development of integrated PET-MRI imaging systems, and the oncoming clinical validation of other interesting PET tracers, i.e. FMISO or 18F-FAZA for hypoxia imaging and FLT for tumor proliferation imaging, it can be reasonably expected that metabolic imaging with PET is close to becoming a key diagnostic modality in the management of brain tumors, as has already been for Total Body FDG-PET/CT in extra-brain oncology [1].

Modern multiparametric MRI techniques such as diffusion weighted imaging (DWI) with apparent diffusion coefficient (ADC) mapping, dynamic susceptibility weighted contrast enhanced perfusion imaging, and MR spectroscopy (MRS) allow a much deeper and still noninvasive insight into interpretation of brain lesions, resulting in greater specificity of diagnostic imaging, especially in combination with PET with radiolabeled aminoacid [2] [3] [4]. [5]. [6].

1)
Crippa F, Alessi A, Serafini GL. PET with radiolabeled aminoacid. Q J Nucl Med Mol Imaging. 2012 Apr;56(2):151-62. Review. PubMed PMID: 22617237.
2)
Kao H.-W., Chiang S.-W., Chung H.-W., Tsai F. Y., Chen C.-Y. Advanced MR imaging of gliomas: an update. BioMed Research International. 2013;2013:14. doi: 10.1155/2013/970586.970586
3)
Bulik M., Jancalek R., Vanicek J., Skoch A., Mechl M. Potential of MR spectroscopy for assessment of glioma grading. Clinical Neurology and Neurosurgery. 2013;115(2):146–153. doi: 10.1016/j.clineuro.2012.11.002
4)
Roy B., Gupta R. K., Maudsley A. A., et al. Utility of multiparametric 3-T MRI for glioma characterization. Neuroradiology. 2013;55(5):603–613. doi: 10.1007/s00234-013-1145-x
5)
Ahmed R., Oborski M. J., Hwang M., Lieberman F. S., Mountz J. M. Malignant gliomas: current perspectives in diagnosis, treatment, and early response assessment using advanced quantitative imaging methods. Cancer Management and Research. 2014;6(1):149–170. doi: 10.2147/cmar.s54726
6)
Ion-Margineanu A., van Cauter S., Sima D. M., et al. Tumour relapse prediction using multiparametric MR data recorded during follow-up of GBM patients. BioMed Research International. In press