

▶ Imaging in Oncological Brain Diseases (PET/CT)

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Molecular imaging techniques are used to generate maps of functional and biochemical activity in target tissues *in vivo*. Currently, PET is one of the most successful techniques in the diagnostic work-up of brain tumours, its importance deriving from its ability to address various metabolic features of gliomas, relevant for diagnosis, classification, characterisation, preoperative evaluation, radiotherapy planning and post-therapeutic monitoring.

PET/CT is defined as an integrated or multimodality technique that employs a combination of a PET and a CT system with a single, conjoined patient handling system. It allows sequential acquisition of corresponding PET and CT portions of the examination with the patient in the same position for both PET and CT and enables co-registration of both data sets. It has grown in importance, especially thanks to the increasingly widespread availability of radiopharmaceuticals. PET/CT not only contributes to differential diagnosis, but also offers the possibility of tailoring imaging to different clinical indications. The two main metabolic features extensively studied so far are glucose metabolism by means of ^{18}F -FDG and the amino acid transport (incorporation) using amino acid radiopharmaceuticals such as ^{11}C -methionine (^{11}C -MET), ^{18}F -fluoroethyltyrosine (^{18}F -FET), ^{18}F -labelled 3'-deoxy-3'-fluorothymidine (^{18}F -FLT) and ^{18}F -dihydroxyphenylalanine (^{18}F -DOPA; fluorodopa). In the spirit of continuity with EANM and international guidelines on the topic, we shall cover the major clinical applications of these techniques, together with acquisition methods and patient preparation; some notes are also provided on quantitative imaging and radiotherapy planning. Brain imaging is a competitive diagnostic environment, in which many tools are technically evolving to offer the best solutions available for patient care. Nuclear Medicine accepts the challenge and this talk, based on Tech Guide chapter, is designed to identify clinical scenarios in oncology in which positron emission tomography (PET) and computed tomography (CT) may modify patient management and in which a combined PET/CT study would offer great diagnostic value.