Editorial

Brain Imaging with Positron Emission Tomography: Novel Radiopharmaceuticals

Since its introduction in the current clinical practice, Positron Emission Tomography (PET) provided a sensitive tool for the evaluation of several biochemical processes and for the imaging of pathological substances in-vivo. Several radiolabelled compounds for PET use were developed for the evaluation of central nervous system in the last decade. These compounds allow the evaluation of tumour metabolism, the pathological accumulation of several substances responsible for various neurodegenerative diseases and inflammation. In nuclear medicine, the creation of a radiotracer that is able to satisfy these purposes is challenging. In particular, a radiotracer for clinical use is characterized by a rapid pharmacodynamics with a significant affinity for the target thus resulting in a good signal to noise ratio. As for radiolabelled compounds designed for the evaluation of metabolic processes, a good target to background is desirable especially in brain tumours. The radiolabelled compound must ensure the detection of relapse by detecting a pathological metabolic process that is different from those of the surrounding normal brain tissue. Lastly, all these compounds should cross the blood brain barrier rapidly and, finally, levels of radiation exposure for patients should be limited.

In this issue, the authors will address the pharmacological aspects and the in vivo applications of the radiotracers used for PET imaging of brain in various diseases, thus providing an in depth review of the properties and applications of these novel radiolabelled compounds.

We are pleased to introduce the present Special Thematic Issue “Brain Imaging with Positron Emission Tomography: novel radiopharmaceuticals” that reviews different aspects concerning the usefulness of Positron Emission Tomography in the field of neurological sciences and cutting-edge frontiers of neuroscience. The aim of the present volume is to give an up-to-dated state of the art of those clinical and research boundaries within which this kind of methodology achieved interesting advances.

In the field of clinical neuro-oncology, On hand interesting works by Treglia et al. highlighted the implementation of $^{18}$F-FET PET in differentiating brain tumours from non-neoplastic lesions as well as low-grade from high-grade gliomas, on the other hand the revised work of Quartuccio and Asselin evaluated the availability of PET radiotracers availability in measuring the high-grade gliomas related adverse hypoxia. These themes appear of relevance, considering the fundamental consequences related to treatment planning in terms of clinical efficacy, patients’ quality of life and targeting treatments.

However, the present volume - overcoming these aspects also by an in depth study of PET imaging diagnostic procedures showing the involvement of Central Nervous System in systemic autoimmune diseases (Ursini et al.), focused on recent important advantages related to PET procedures in neurodegenerative disorders. In particular, Bauckneht et al. and Cistaro et al. respectively deepened the feasibility of PET procedures in evaluating Lewy bodies and Amyloid-related neurodegenerative disorders, thus representing new frontiers in diagnosis, treatment and prognosis of such health and social burden.

In conclusion, this Special Issue is really trustworthy to be read considering that PET imaging may be actually considered as the present and the future in clinical research.

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