Positron Emission Tomography – A Vital Component of Molecular Imaging

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Contemporary medical imaging is progressing towards quantification of tissue function in addition to merely providing anatomical information, as illustrated by the rising use of such modalities as functional magnetic resonance imaging (fMRI), magnetic resonance spectroscopy (MRS) and positron emission tomography (PET). As far back as 1951, positron-emitting radiotracers have been used for localisation of brain tumours at the Massachusetts General Hospital (MGH). Ter-Pogossian was among the pioneers to have used ^{15}O-oxygen to study metabolism in murine tumours. Since that time, PET has come of age. This was fundamentally due to both the rapid development of PET radiochemistry in which many biologically significant molecules could be labelled with PET isotopes and progress in PET physics and technology which contributed to better scanners and image processing, providing higher resolution and sensitivity. The last 2 decades saw the entry of PET from the research arena into clinical practice, aided by the ready availability of commercially-produced cyclotrons and PET/PET-CT scanners and the compelling evidence from numerous research and clinical publications on the utility of PET in oncology, cardiology and neurology.

After several years of gestation, PET imaging eventually arrived in Singapore in mid-2003. This is a significant development in tandem with the economic growth of the Asia-Pacific region and, in particular, the strive towards medical excellence in this part of the world. In this issue of the *Annals*, we have sought to assemble a collection of reviews of PET, contributed by internationally-renowned scientists and physicians in PET imaging. Townsend[1] provides a clear discussion of the physics, having been a key member of the team of scientists that first developed a highly successful combined PET-CT scanner. Schlyer's article[2] on radiochemistry provides an excellent overview of the complex world of radiochemistry and its almost unlimited potential. From his years of experience in Hong Kong, Ho[3] provides a valuable regional perspective to the clinical applications of PET. Ho Shon and Maisey's[4] detailed review on the issues of PET in lung cancer brings a wealth of information to the clinician closely engaged with day-to-day issues in management of lung cancer. Although the development of clinical PET was largely driven by oncologic applications, it continues to play a significant role in cardiology. These cardiac applications are succinctly reviewed by Chua and Keng.[5]

Finally, recognising the need to optimise the use of this relatively expensive medical technology, a set of guidelines[6] for patient referral for PET was drawn up by a panel comprising nuclear physicians, diagnostic radiologists, medical and radiation oncologists, cardiologists and neurologists. This set of guidelines has been included here.

Although this technology has been available for several decades, it is still rapidly evolving and we believe that its full potential has yet to be realised.

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