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EDITORIAL

A fresh breeze sweeps through nuclear medicine 2018

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There are, at times, hidden benefits from a period of absence. Having absconded from the annual EANMMI Congresses for a couple of years, it was insightful and indeed delightful to return to the annual meeting and experiencing new enthusiasm, optimism and commitment in the field. The presence of so many young investigators augurs that the best is yet to come. The topics briefly addressed below were actively discussed at the Congress.

Times are changing, and with it, the realization that an increasing and aging population imposes new challenges and requires novel solutions. The spectrum of cognitive decline is of significant concern, both to the individuals and families affected, and indeed the healthcare providers, who are also concerned with resource implications and funding. Similarly, despite major progress achieved, cancer and coronary artery disease remain major contributors to morbidity and mortality. In all the above, nuclear medicine is providing ample and new opportunities and discoveries.

Whilst the purpose here is not to provide a comprehensive literature review, it is pleasing to note that nuclear medicine biomarkers, their use and effectiveness in the differential diagnosis of the dementias, are now extensively discussed in the medical literature at large [1], not only in specialised imaging journals. A biologically based definition of Alzheimer disease recently announced in the USA, includes the nuclear medicine tracers for tau, amyloid and neurodegeneration [2].

To meet the challenge posed by the dementias, two aspects are fundamental: reliable recognition and diagnosis, and novel treatment approaches. It is known that even in established centres, between 20 and 30% of patients are incorrectly diagnosed. We have now learned, and with relevant contributions from nuclear medicine that major pathological changes occur many years before symptoms render a clear cut diagnosis; a significant development has arisen from the novel tracers for tau and amyloid imaging, supported by the information gained from metabolic imaging with FDG. Significant progress has been achieved with reliable methodologies for image quantification—nuclear medicine is ready to offer to the clinical community early and reliable diagnosis of the presence of these pathologies. Whilst many of clinical therapeutic trials have met with disappointment, most recent data, some via the use of antibody-mediated treatments, point to renewed optimism. Nuclear medicine will make its contribution by establishing the success of these and helping to identify the best candidates for therapy.

There is a continuing debate relating to the causality of amyloid deposition in the development of dementia of the Alzheimer type and similar controversies have been mentioned with respect to tau deposition. It has been argued that inflammation is a more relevant precipitator of the onset of abnormal misfolding of the relevant proteins, and indeed it may be so. And indeed we may have soon good bioimaging markers to also asses this process, the C-11 labelled P2X7 receptor ligand was described at the conference for investigation of active microglia. Nevertheless, whilst the discussion is extremely important in further elucidating the causes of disease, and indeed guiding better therapeutic approaches and choices, it is also true that we now have already the means to better triage early disease, and better classify patients at greater or lesser or no risk.

In oncology, nuclear medicine is making strong progress, in early diagnosis, accurate staging and re-staging, and in treatment follow up. For many hospital institutions worldwide, PETCT imaging has become a routine investigation [3], and appreciated by all stakeholders (patients, physicians and surgeons) whilst even the providers and funders of health service can no longer deny this progress to the populations under their care. Not so long ago, there were so many dissenting and pessimistic viewpoints…. Whilst in the last 10 years, sentinel lymph node detection and imaging have profoundly changed the management of patients presenting with early breast carcinoma, PETCT and indeed PETMR are making constant progress in the management

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of patients suffering from a variety of cancer pathologies. F-18 labelled Dopa and fluorocholine were discussed in the investigation of medullary thyroid carcinoma, Ga-68 NODAGA exending in the difficult detection of insulinomas. A breakthrough has been achieved with the development of radionuclide labelled probes which can be targeted not only for diagnosis but indeed treatment. Patients presenting with carcinoma of the prostate are the most recent beneficiaries. Remarkable progress has been achieved, both with the use of GMP approved Ga-68 generators and their labelled products, as well as a variety of novel F-18 labelled imaging agents. Prostate specific membrane antigen (PSMA) labelled probes are the most recent and outstanding examples. Rapid acceptance by the clinical and operating communities point to the success of these newer methodologies. It is important to underline the success of nuclear medicine procedures and how they have become sources of reference in major medical publications [3]. Our Nuclear Medicine Community must relearn (if need be) or maintain an UpToDate vision as what transpires in the wider non imaging journals—some will be surprised.

Theranostics could be defined as a methodology that seeks to identify a biological target that can be used to deliver both diagnostic information and treatment. One could argue that nuclear medicine initiated this field with the use of radionuclides of iodine in the early 1950s.

Now we have rather clever approaches, which make use of a variety of well-characterized biological targets. G-protein coupled receptors have huge biological significance, and the somatostatin receptor targeted therapy has now gained clinical acceptance. There are widely available Ga-68 labels of DOTATATE and DOTANOC in the diagnostic setting, followed by Lu177-labelled DOTATATE in the treatment setting. There has been significant clinical progress, impacting on patient management. Further developments in this area continues with the interesting progress surrounding the newer receptor antagonists.

PSMA is highly expressed in prostate epithelium and hence has become available as a diagnostic target with several radionuclide labels (Ga-68, F-18) as well as Y-90 and Lu-177 for treatment purposes. Major interest has developed, clinical oncologists, surgeons, urologists and imaging experts relating important advances in the field. A large proportion of date can now be seen and is published. Google shows 1.4 million reports in 0.35 s for theranostics…

The huge success of multimodality imaging, mainly with PETCT and yet to a much lesser extend with PETMR, has been clearly dominant, and the driver of developments in our field in the last decade. It is with some regret that SPET and SPETCT have lagged, for understandable and known reasons. Yet it must be recalled that gamma cameras continue to be much more widely available and hence accessible. In this sense, it behoves us all, and editors as well, to attempt to restore enthusiasm in this area of nuclear medicine. We would all (patients and health care providers) benefit. New hope is given inter alia with the development of solid state SPET and SPETCT CZT devices, the quantitative measurement of coronary blood flow, the assessment of infection with labelled WBCs, SPET studies in dosimetry measurements, Tc-99m labelled Pertuzumab for HER2 positive cancer, Tc-99m EDDA HYNIC—exending four for insulinoma detection, I-123 labelled ioflupane for the investigation of Parkinson's disease, Tc-99m PSMA in nodal detection, I-123 mIBG SPET in the evaluation of neuroblastoma and naturally, Tc-99m bone scintigraphy assessing a variety of conditions.

A proposal: there is a need to convey a major conference, with industrial support of the major stake holders, to discuss specifically the future and value of SPET and SPETCT in the wider setting of the world practice.

Before ending this small missive, a word of warning. Life is changing even more rapidly that we might wish. Two disruptive events have blossomed, and some of us, have not yet fully noticed. One is the rapidly expanding role of machine learning (or artificial intelligence) in healthcare provision. This will soon impact on our models of delivery. The other is the development of wearable devices (i.e. the FDA approved Apple watch software to deliver 24 h recording of ECGs, the wrist impedance measuring devices for epilepsy monitoring, and so on). Be prepared to interact with all above in protocols that will benefit our imaging expertise.

Compliance with ethical standards

Conflict of interest The author declares no conflicts of interest; this paper does not contain results of studies performed by the author.

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