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THERANOSTICS AND PRECISION MEDICINE SPECIAL FEATURE: EDITORIAL

Theranostics and precision medicine special feature

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Theranostics is an exciting field of diagnostic and therapeutic nuclear medicine. In theranostics, the target biomarker is similar for both imaging and therapy. The imaging of this biomarker demonstrates whether or not the tumour will concentrate sufficient amount of tracer to give an adequate radiation absorbed dose when the imaging is changed to the beta or alpha emitting radionuclide pair. This theranostics principle allows patients who are likely to benefit to be preselected based on their diagnostic scan. In this special feature, we discuss the concept of theranostics and describe the current and emerging evidence for its use in oncology.

In the introductory article, Professor Harvey Turner gives an excellent overview of the theranostic concept and describes how theranostics can be used for personalised medicine. In his second article, he provides insight into the current status and future of theranostics in nuclear oncology. The ultimate goal of theranostic nuclear oncology is to prolong survival and to improve quality of life for cancer patients. There has to be closer collaboration between oncologists, nuclear physicians, radiologists, dosimetric physicists, Pharma, and, above all, with the patients.

Dr Jim Ballinger describes in detail the different radiopharmaceuticals currently in use, the mechanism of action and applications with radiopharmaceuticals ranging from radioiodine to prostate-specific membrane antigen (PSMA). Dr Simon Keek and colleagues discuss the novel field of radiomics, which involves the mining of image features from medical images to provide a method to assess tumour heterogeneity. They outline the current applications of radiomics and how this aids in providing precision medicine.

Although the theranostics concept is relatively new, the theranostic use of radioiodine has been performed since 1946. Dr Partha Choudhury and team describe the well-established value of radioiodine in differentiated thyroid cancer and describe the state-of-the-art practice of radioiodine. The next paper by Dr Archi Agrawal and team describes the use of metaiodobenzylguanidine therapies in adult and child malignancies.

Dr Deborah Pencharz and colleagues discuss the value of somatostatin receptor (SSTR)-based theranostics in neuroendocrine tumours. The authors describe the current evidence of SSTR theranostics and review future prospectives of SSTR targeting. They describe the results of the recent randomised controlled trial: a phase 3 trial of ¹⁷⁷Lu-Dotatate for midgut neuroendocrine tumours.

Two articles on theranostics of prostate cancer are published. In the first of these, Professor Hossein Jadvar and colleagues review the utility of ¹⁸F-NaF in the assessment of response and prediction of outcome in prostate cancer patients with bone metastases treated with ²²³RaCl₂. The second theranostic treatment in prostate cancer targets the PSMA. The PSMA theranostic pair is attracting the most interest globally. Dr Harshad Kulkarni and team provide an excellent review on the theranostic role of PSMA ligands for molecular imaging and targeted molecular radiotherapy, moving towards precision oncology.

In the last review article, Dr Cristina Müller and team discuss the exciting future radionuclides for theranostics: scandium and terbium (which allow positron emission tomography/single photon emission computed tomography imaging and therapy with combined β^- /Auger electrons or alpha therapy). They discuss preclinical investigations and clinical proof-of-concept studies of scandium and terbium radionuclides.

The special feature concludes with an excellent research paper from Dr Emily Vaughan and colleagues on retreatment with peptide receptor radionuclide therapy in patients with progressing neuroendocrine tumours, looking at the efficacy and prognostic factors for response.

Finally, we wish to thank all our distinguished colleagues who have contributed to this special feature on theranostics. We have been delighted to have collaborated with aforementioned groups to provide an excellent overview on these challenging topics.