Radiopharmaceuticals: Cancer Therapy

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Week 7

March 4th, 2022

AIM

The aim of this is paper is to make aware the reader about the technologies that exists that make the treatment of certain diseases such as cancer to be more efficient by the use of different approaches. In this particular case, we'll look into the dealings in regards to the radioactive substances and the science behind them that is being applied to treat diseases such as cancer. Radiopharmaceuticals, or medicinal radio compounds, are a group of pharmaceutical drugs containing radioactive isotopes. Radiopharmaceuticals can be used as diagnostic and therapeutic agents. Radiopharmaceuticals emit radiation themselves, which is different from contrast media which absorb or alter external electromagnetism or ultrasound. Radiopharmacology is the branch of pharmacology that specializes in these agents. The main group of these compounds are the radiotracers used to diagnose dysfunction in body tissues. While not all medical isotopes are radioactive, radiopharmaceuticals are the oldest and still most common such drugs. Radiation therapy was first used to treat cancer more than 100 years ago. About half of all cancer patients still receive it at some point during their treatment. And until recently, most radiation therapy was given much as it was 100 years ago, by delivering beams of radiation from outside the body to kill tumors inside the body.

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Response and toxicity prediction is essential for the rational implementation of cancer therapy. The biological effects of radionuclide therapy are mediated by a well- defined physical quantity, the absorbed dose (D), which is defined as the energy absorbed per unit mass of tissue. The long and well- established cancer treatment experience in radiotherapy has provided ample evidence that absorbed dose may be used to predict biological response. In chemotherapy, targeted biologic therapy and immunotherapy, there is no dosimetry analogue. Dosimetry as implemented in RPT may be thought of as the ability to perform the equivalent of a pharmacodynamic study in treated patients in real time. Dosimetry analysis may be performed as part of patient treatment to calculate tumour versus normal organ absorbed dose and therefore the likelihood of treatment success. The ability to rapidly assay genetic and epigenetic characteristics of tumour samples comes closest to providing the kind of information that RPT dosimetry provides regarding the potential efficacy and toxicity of a therapeutic agent in an individual patient.

Current imaging techniques do not possess the resolution required to resolve activity distributions at the microscopic scale. However, by pairing whole- organ macroscale measurements that can be performed in humans with microscale information that can be obtained from preclinical studies, it is possible to extract microscale information from macroscale measurements. A contour may be drawn on an image obtained with a patient imaging modality such as PET/CT or SPECT/CT that encompasses the entire organ (for example, kidney) or macroscopic subcompartments within the organ (for example, renal cortex). These macroscale contours may be used to obtain time- versus-activity curves (TACs) for the entire organ or macroscale subcompartments within the organ.