Radiopharmaceuticals: Cancer Therapy

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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.

Week 11

RPT has proven to be an effective cancer treatment when other standard therapeutic approaches have failed. However, despite more than 40 years of clinical investigation, RPT has not become a part of the cancer treatment armamentarium in the same way as other therapies292. 'Targeted' cancer therapies are associated with clinical trial failure rates of 97% (ref.1), partly because the agents targeted a pathway that was not involved in promoting the cancer phenotype2. By contrast, RPT has been unsuccessful owing to a failure to adopt and rigorously evaluate this treatment modality, which may be explained in part by the multidisciplinary nature of the treatment.

Additional challenges facing the development and application of RPT include public perception and fear of radioactivity as well as the perceived complexity of the treatment. Until very recently, the >40 years of experience with these agents was largely ignored or presented as a burdensome multidisciplinary endeavour in the medical literature. A 2007 review of the management of painful bone metastases293 highlights this, implying that the efficacy, low toxicity, minimal side effects and non- addictiveness of RPT for bone pain palliation is trumped by the complexity and need for a multidisciplinary

implementation. The lack of a medical constituency for RPT suggests the need for a new specialty or subspecialty to provide the multidisciplinary training needed to safely and effectively administer RPT agents to patients and subsequently manage them. Such a specialty or subspecialty would require training in nuclear medicine, radiation oncology and also general oncology. As delivery of radiation is involved, the participation of medical physicists familiar with both imaging and radionuclide dosimetry is important. Finally, as a radiation delivery modality, one may envision widespread adoption of treatment planning that combines RPT with external- beam radiotherapy; the former to target disseminated cancer and the latter to target bulky disease that is less effectively treated by RPT. Such a combination strategy would\ expand patient eligibility for both RPT and external- beam radiotherapy.