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Treatment of Obesity Individuals with Therapeutic Radiopharmaceuticals

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Introduction

Radiopharmaceuticals are drugs that contain small amounts of radioactive material, which can be used in nuclear medicine to diagnose and treat a variety of medical conditions. These drugs are used in a wide range of diagnostic and therapeutic procedures, including cancer imaging and therapy, cardiovascular imaging and bone imaging. Radiopharmaceuticals are also used in research to study the behaviour of biological molecules in living organisms [1].

Description

Radiopharmaceuticals are unique in that they combine the properties of both drugs and radioactive materials. Like drugs, they are designed to target specific biological processes or structures in the body. Unlike drugs, however, they contain radioactive isotopes, which emit radiation that can be detected by specialized imaging equipment. The radioactive isotopes used in radiopharmaceuticals are typically short-lived, with half-lives ranging from minutes to hours. This means that they decay relatively quickly, reducing the risk of long-term exposure to radiation. Additionally, the radiation emitted by these isotopes is typically low-energy, which further reduces the risk of harm to patients.

A well-established class of cancer treatments, radiopharmaceutical therapy (or targeted radionuclide therapy, or TRT) includes a growing number of FDA-approved medications and a promising pipeline of experimental treatments. A mechanistic understanding of these agents' therapeutic potential and potential toxicities relies heavily on radiobiology. However, external beam radiation has always been the primary focus of radiobiology. Dosimeter, dose rate, linear energy transfer, duration of treatment delivery, fractionation, range and target volume all differ significantly between TRT and external beam radiotherapy. Because of these distinctions, it is challenging to extrapolate from the radiobiology of external beam radiation to that of TRT and presents significant difficulties for preclinical and clinical research into TRT. In this article, we look at the state of our knowledge regarding radiopharmaceutical radiobiology and talk about these difficulties.

The Western population has seen a significant rise in the prevalence of obesity. Adipose tissue proportions and physiological processes that could alter drug pharmacokinetics are known to be affected by obesity. However, there are no specific radiopharmaceutical dosing recommendations for this patient group. Due to the high levels of radioactivity, this could also result in drug toxicity and, consequently, suboptimal treatment for obese patients. We aimed to translate the relevant literature on radiopharmaceutical dosing and pharmacokinetic properties into useful guidelines for the administration of radiopharmaceuticals to obese patients in this review. Dosing for radium-223 in obese patients is well known. In addition, dose-escalation studies for samarium-153-ethylenediaminetetramethylene (EDTMP) indicate that obese patients are unlikely to tolerate the maximum tolerated dose at MBq/kg doses. However, there is insufficient evidence to support dose recommendations for lutetium-177-prostate-specific membrane antigen (PSMA), rhenium-168-hydroxyethylidene diphosphonate (HEDP), sodium iodide-131, iodide 131-metaiodobenzylguanidine (MIBG) and lutetium-177-dotatate in obese patients. Fixed doses may be appropriate for these drugs from a pharmacokinetic standpoint. There is a pressing need for additional research into obese patient populations, particularly in light of the worldwide rise in obesity rates.

One of the most common uses of radiopharmaceuticals is in nuclear imaging, which involves injecting a small amount of a radiopharmaceutical into the patient's body. The radiopharmaceutical travels to the targeted tissue or organ, where it emits radiation that can be detected by a specialized camera called a gamma camera. This allows healthcare providers to visualize the structure and function of the targeted tissue or organ. Another common use of radiopharmaceuticals is in radiation therapy for cancer. In this case, a radiopharmaceutical is injected or swallowed by the patient and it accumulates in the cancerous tissue. The radiation emitted by the radiopharmaceutical destroys the cancer cells while sparing healthy tissue. Radiopharmaceuticals are also used in research to study the behaviour of biological molecules in living organisms. Researchers can attach radioactive isotopes to molecules of interest, such as proteins or enzymes and track their movement and interactions in vivo using specialized imaging equipment.

One of the key advantages of radiopharmaceuticals is their ability to target specific biological processes or structures in the body. This allows healthcare providers to diagnose and treat medical conditions with greater precision and accuracy. Additionally, the low-energy radiation emitted by radiopharmaceuticals reduces the risk of harm to patients, making them a relatively safe and effective option for nuclear medicine. However, there are some risks associated with radiopharmaceuticals, particularly in cases where they are used in high doses or for prolonged periods of time. Radiation exposure can increase the risk of cancer and other health problems, so healthcare providers must carefully weigh the risks and benefits of using radiopharmaceuticals in each individual case. In order to minimize the risks associated with radiopharmaceuticals, healthcare providers must follow strict protocols for handling and administering these drugs. They must also carefully monitor patients for any adverse effects and take steps to minimize radiation exposure as much as possible [2-5].

Conclusion

In conclusion, radiopharmaceuticals are a powerful tool for diagnosing and treating medical conditions. They combine the properties of drugs and radioactive materials, allowing healthcare providers to target specific biological processes or structures in the body. While there are some risks associated with radiopharmaceuticals, these can be minimized through careful handling and administration. As technology continues to advance, it is likely that radiopharmaceuticals will play an increasingly important role in the field of nuclear medicine.

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Conflict of Interest

None.

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