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Tytuł pracy: Y-90 SOL - GEL MICROSPHERES FOR RADIOEMBOLIZATION THERAPY AND DOSIMETRY METHOD FOR DETERMINATION OF ADMINISTERED DOSE

Temat:

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Abstrakt:

Introduction

Radioembolization with radioactive microspheres has gained clinical acceptance as a therapeutic option for patients with liver malignancies. The presented work consist of two subjects, a first - a new technology for the production of radiopharmaceutical, ⁹⁰Y microspheres in the form of spherical yttrium oxide particles obtained by sol-gel method and the second-one - elaboration of a dosimetry method that allows the verification of the therapeutic doses evaluation in SIRT (Selective Internal Radiation Therapy) therapy.

Description of the Work

The authors present and discuss the results of investigations performed in the development of new production technology of yttrium microspheres and determination of their physico-chemical properties. The final product has the structure of spherical yttrium oxide grains with a diameter 25-100 μm, is stable and free from contaminants. Irradiation of 20 mg samples of grains with diameter of 20-50 μm in the thermal neutron flux of $1.7 \times 10^{14} \text{ cm}^{-2} \text{ s}^{-1}$ at the core of MARIA research nuclear reactor allowed to obtain microspheres labelled with the ⁹⁰Y isotope on the way of the nuclear reaction $^{89}\text{Y}(n, \gamma)^{90}\text{Y}$. Specific activity of irradiated microspheres has been determined by application of absolute triple to double coincidence ratio method (TDCR) and has been evaluated at 190 MBq/mg Y. [1]

Presented method consists in analysing the patient's PET-CT images after administering a radiopharmaceutical in the form of Y-90 microspheres. The subject of the presentation is the analysis of the distribution of activity and dose absorbed in a dedicated water phantom with vials containing ⁹⁰YCl₃ solution with volumes and activities similar to the therapeutic ones. For the purposes of the work, a water phantom was designed and constructed, in which small-volume vials were placed to test the scanner's response to Y-90 activities. Dedicated software was developed for the analysis of image data. The development of the tool is consulted with the clinical community so that it can ultimately be used not only for scientific purposes, but also clinically.

Conclusion

⁹⁰Y microspheres prepared by the proposed technique can be regarded as a promising medical material for radioembolization of liver malignancies. The dosimetry method allows for verification of therapeutic dose administered onto liver.

Reference

W. Łada, E. Iller, D. Wawszczak, M. Konior, T. Dziel. ⁹⁰Y microspheres prepared by

sol-gel method, promising medical material for radioembolization of liver malignancies. Mat. Sci. Eng. C[30] Vol. 67 (2016), 629–635. DOI: 10.1016/j.msec.2016.05.050

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