

Assessment of the Radiation Absorbed Dose Produced by Lu-177, Ra-223, AC-225 for Metastatic Prostate Cancer in a Bone Model

Authors : Maryam Tajadod

Abstract : The treatment of cancer is one of the main challenges of nuclear medicine; while cancer begins in an organ, such as the breast or prostate, it spreads to the bone, resulting in metastatic bone. In the treatment of cancer with radiotherapy, the determination of the involved tissues' dose is one of the important steps in the treatment protocol. Comparing absorbed doses for Lu-177 and Ra-223 and Ac-225 in the bone marrow and soft tissue of bone phantom with evaluating energetic emitted particles of these radionuclides is the important aim of this research. By the use of MCNPX computer code, a model for bone phantom was designed and the values of absorbed dose for Ra-223 and Ac-225, which are Alpha emitters & Lu-177, which is a beta emitter, were calculated. As a result of research, in comparing gamma radiation for three radionuclides, Lu-177 released the highest dose in the bone marrow and Ra-223 achieved the lowest level. On the other hand, the result showed that although the figures of absorbed dose for Ra and Ac in the bone marrow are near to each other, Ra spread more energy in cortical bone. Moreover, The alpha component of the Ra-223 and Ac-225 have very little effect on bone marrow and soft tissue than a beta component of the lu-177 and it leaves the highest absorbed dose in the bone where the source is located.

Keywords : bone metastases, lutetium-177, radium-223, actinium-225, absorbed dose

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