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Characterization of nanodosimeter for real time measurements in radiotherapy and medical physics

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Purpose: The available implantable dosimeters in radiotherapy, i.e. semiconductor, MOSFET, radio luminescence of gallium nitride, etc, are imperfect and need a correction factors. In this study, we probed by simulation the size limit for a new generation of dosimeters at micro/nano scale for real time measurements in routine radiotherapy.

Materials & Methods: Monte-Carlo simulations were carried out to study the influence of nanodosimeter size on the accuracy in dose measurements using a water volume irradiated with ⁶⁰Co photons. The mean specific energy ($\langle zt \rangle$), characterizing the actual deposited dose, was calculated for various dose values and various radii of cylindrical targets placed within the irradiated volume. Then, the probability that a measurement yields a value outside the intervals [$\langle zt \rangle - \gamma \langle zt \rangle$; $\langle zt \rangle + \gamma \langle zt \rangle$] with γ equal to 3%, 5% and 10% was calculated.

Results & Discussion: The distributions for the smallest target show a very high dispersion of specific energy values, while those for the largest target tend to become gaussian and narrower, with increasing dose. An excessively small radius renders the measurements chaotic and not statistically-reproducible, even for a dose as high as 10 Gy. On the other hand, a target radius of 10 μm may allow for a better reproducibility of the measurements in a wider range of doses.

Conclusion: The ability of the nano dosimeter to yield measurements dependent on its size and on the deposited dose. Nano dosimeter should be large enough to produce a statistically-reproducible measurement in the intended range around the irradiation dose value.

Biography

Abdulhamid Chaikh, has completed his PhD at Grenoble-Alpes University, France. He was qualified for Assistant Professor position in French University. He is working as scientist for Medical Physics & Radiation Oncology and teaching in master degree at the medical school of Grenoble-Alpes University. He has published more than 15 papers in international journals and participated to over 15 national and international conferences. He is carrying out peer reviewed articles and serving as an Editorial Board Member of the *Journal of Case Reports in Oncology and Therapy*. He is a member of American Association of Physicists in Medicine.

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