GOLD NANOPARTICLES: A SENSITIZING AGENT IN RADIATION THERAPY

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Introduction

Despite the huge progress in the technology involved in radiation therapy, the goal of maximizing the radiation dose selectively inside a tumor while sparing the adjacent normal structures still remains a challenge in radiotherapeutic practices. The significant evolution of Nanosciences over the last decades has triggered the invasion of Gold Nanoparticles (AuNPs) in the field of radiation oncology. Our purpose is to highlight the physical and biological mechanisms that are responsible for AuNPs "Dose Enhancement Effect" and report the parameters that affect their radiosensitization properties.

Materials and Methods

Numerous in vivo, in vitro and in silico studies examine the hypothesis that the injection of AuNPs inside a tumor is accompanied by significant dose enhancement and increased tumor cell killing when followed by photon beam irradiation. We have reviewed the existing literature and we have correlated AuNPs efficacy with their properties and certain photon beam characteristics.

Results

The encouraging results from various experimental approaches in different cell lines, animals and simulation models, indicate that AuNPs could be proper radiosensitizers due to their biocompatibility, multifunctionalization and high atomic number. AuNPs size, concentration and photon beam energy are some of the critical aspects that determine the level of the produced dose enhancement.

Discussion and conclusions

Constructing personalized treatment strategies with the use of AuNPs for cancer patients could be a way to achieve the desirable effectiveness, accuracy and precision in radiation therapy delivery. However, the clinical implementation of AuNPs enhanced radiotherapy is still under investigation due to a variety of factors that need deepest research.