Preface

Radiobiological models towards a personalized radiation oncology

The goal of radiation therapy (RT) is to deliver the therapeutic dose to the target tumor minimizing the risks of normal tissue complications. Nowadays, technological advances in radiation delivery and the introduction of particle therapy have strongly limited the amount of dose distributed to normal tissues and enhanced the tumor killing capacity.

However, tumor heterogeneity has a great impact on the RT success and needs research efforts to achieve the administration of personalized treatments. Indeed, today RT planning is based on physical metrics such as radiation dose and tumor volume. In fact, these parameters are measurable, and thus the treatment plan is directly verifiable. Nonetheless, treatment plans should also evaluate biological parameters, including mutations, omic biomarkers, % of cancer stem cells, % of hypoxia, and these parameters are essential for patient stratification and radiation dose prescription.

This special issue will give the readers an insight on worldwide research on this topic, which use *in vitro* and *in vivo* models towards a personalized radiation oncology. Different fields of interest are explored, describing the role of cancer stem cells, hypoxia, angiogenesis, immune system activation, DNA repair system, etc. in driving the biological effects induced by different types of treatment modalities and beams. Different experimental approaches are used, which cover the necessity of investigating basic medical physic and biological mechanisms, towards translational applications on preclinical and human models.

The necessity to introduce biomarkers of normal tissues and tumor radiosensitivity into treatment planning is also discussed, which could lead to prescribe an increased total dose to the tumor in patients with relatively radioresistant normal tissues and to move candidate patients having high risk of developing severe normal-tissue reaction to either different RT regimens (alternative fractionation schedules, treatment planning, or modalities) or alternative treatments (surgery, chemotherapy, target therapy, ablative treatments, etc.).

Then, this Special Issue, titled "*Radiobiological models towards a personalized radiation oncology*" will give the reader a snapshot of the state of the art in cell and molecular radiation oncology research.

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