Cureus

Open Access
Abstract

Cureus

Microbeam Radiation Therapy Against Cancer – Possible Underlying Biological Mechanisms

Valentin Djonov [1]

1. Institute of Anatomy, University of Bern, Bern, CHE

Corresponding author: Valentin Djonov, djonov@ana.unibe.ch

Categories: Radiation Oncology, Quality Improvement, Medical Physics
Keywords: microbeam radiation therapy, srs, sbrt, radiotherapy

How to cite this abstract
Djonov V (October 24, 2019) Microbeam Radiation Therapy Against Cancer – Possible Underlying Biological Mechanisms. Cureus 11(10): a452

Abstract

Objective(s): The Microbeam radiation therapy (MRT) technique uses synchrotron-generated X-rays to produce a spatially and periodically alternating dose distribution in the tissue. The underlying radiobiology of MRT appears to follow a different paradigm of radiation tissue interactions. In parallel to the excellent tumor control, normal, healthy tissues show a remarkably high resistance even when irradiated with hundreds of Grays in MRT mode.

Methods: The Microbeam radiation therapy (MRT)

Results: Our preliminary data, employing different animal models, indicates that (i) In a range of 400-600 Gy 'peak' dose, MRT could be used as completely novel anti-angiogenic, tumor-vascular disrupting strategy, because it is a unique method to destroy immature tumour-vessels while sparing surrounding mature normal vessels. (ii) MRT in a range of 100-150 Gy causes a partial disintegration of the endothelium which leads to a temporally significant increase in tumor blood vessel permeability. An MRT induced "transpermeability window" has been identified as potent drug delivery system. (iii) Tumor vessels disintegrated by MRT could serve as homing gate for circulating inflammatory and immune cells and thus have the potential to modulate anti-tumor immune responses. (iv) MRT elicited a minor degree of patchy pulmonary fibrosis in normal rat lungs even at 600Gy and one-year post irradiation.

Conclusion(s): The elucidation of the exact underlying biological mechanism could serve in creating novel, more efficient treatment strategies against cancer and angio-proliferative vascular diseases.

Open Access
Abstract
Published 10/24/2019