Microbeam radiation therapy

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Both the efficacy and side effects of radiation therapy depend not only on the exposure dose but also on the volume of tissue exposed to that radiation. As a general rule, the smaller the volume, the greater the tolerance. As such, microbeam radiation therapy, which relies on the high power and pinpoint accuracy of synchrotron X-rays has for the last two decades or so been the focus of pre-clinical studies on various laboratory mammals. The planar microbeams are generated by a multi-slit collimator in the synchrotron, which cuts the emerging X-rays into horizontal beam slices tens of micrometres thick. Typically, target tissues are exposed to multiple quasi-parallel slices separated by a few hundred micrometres.

Now, Sigen Wang of the FROS Radiation Oncology Cyberknife Center, at Manhattan Radiation Oncology, in New York City and Xin Qian of the Department of Radiation Oncology, at New York Presbyterian Hospital, part of Columbia University, also in NYC, USA have reviewed this promising medical technology in the *International Journal of Computational Biology and Drug Design*. They point out that the state of the art preclinical studies suggest that radiation doses as high as several hundred Greys are surprisingly well tolerated by healthy tissues. Moreover, these same microbeams cause preferential damage to malignant tumour tissues.

The benefits to treating tumours that are close to sensitive organs in diseases such as ocular melanoma, pituitary adenoma, and tumours of the spinal cord, could be substantial. In addition, the same technology might also be extended to the treatment of other diseased tissues such as

those brain tissues invoked in epilepsy and movement disorders, such as Parkinson's disease. "The potential of microbeams for central nervous system (CNS) research is very large," the team says. "Our review shows that microbeams can selectively ablate slices of neurons, oligodendrocytes, and astrocytes in the CNS because of the differential dose sensitivity of different cell types, without causing tissue necrosis."

More information: "Microbeam radiation therapy: a review." *Int. J. Computational Biology and Drug Design*, Vol. 8, No. 2, pp.127-138. DOI: 10.1504/IJCBDD.2015.071125

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