

A Pathway to Radiotherapy Clinical Trials at the ESRF

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The European Synchrotron Radiation Facility has been a pioneer in synchrotron radiation radiotherapy applications. Thanks to several collaborations with different groups, the research since the late nineties, has focused on the use of spatially fractionated X-ray beams, delivered in extremely high doses (several hundreds of Grays) to treat aggressive non-treatable brain tumours. The principle of the Microbeam Radiation Therapy (MRT) as a potential alternative in radiotherapy lies, on one hand, in the destruction of the vascularisation of the tumour and, on the other hand, in the high normal tissue tolerance of such microbeams. It has been proven that normal tissues can repair the damages, unlike those invaded by tumours. Preclinical research studies have demonstrated the ability of MRT to cure a significant number of rodents without side effects. This therapeutic protocol is being improved by combining the X-ray treatment with stimulation of the immune response.

Stereotactic Synchrotron Radiation Therapy (SSRT) is a second, complementary, research programme aiming at treating brain tumours, which has been developed at the ESRF. SSRT is based on loading a high atomic number element, associated either with or without a chemotherapeutic drug, and then irradiating the target with monochromatic X-rays.

In SSRT treated highly aggressive tumour bearing rats, a very significant extension of the life span has been observed in animals previously inoculated with iodinated compounds. An important fraction of animals have been cured when SSRT has been performed with high atomic number elements associated with chemotherapeutic drugs.

Preclinical MRT and SSRT experiments provided results paving the way to clinical trials at the ESRF. An overview of the way the planned clinical programs, with particular attention to the technical and managerial aspects will be presented and discussed.

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