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Treating cancer with neutrons –Options for Boron Neutron Capture Therapy

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Despite all advances in cancer treatment, there are still clinical situations in which a locoregional tumor is fatal. More efficient local therapies are mandatory. Boron Neutron Capture Therapy (BNCT) has the potential of such a modality to overcome radiation resistance in certain tumors or to re-irradiate local recurrences after high-dose radiotherapy.

BNCT is based on the $^{10}\text{B}(n,\alpha)^7\text{Li}$ reaction producing 2 particles with high biological effectiveness in killing cells and short range in tissue (approx. the diameter of one cell). If such reactions can be selectively triggered in tumor cells, a “cell-surgery” results: single tumor cells invading normal tissues are destroyed without damaging surrounding healthy structures.

BNCT was proposed as early as 1936, but so far, no large-scale clinical trials were possible to prove the usefulness of the method for cancer therapy. This was mainly because BNCT required research reactors, mostly located far from a hospital and not always available for patient care.

Recently this situation is changing with the advent of accelerator-based neutron sources. First projects have started at hospitals in Japan and similar projects are underway in other countries.

In this presentation, BNCT development from an academic research project to a market-ready therapy is presented. The current BNCT projects worldwide and the efforts in Europe and Germany to develop and establish this modality will be shown.

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