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Neutron Therapy in the 21st Century

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The question of whether or not neutron therapy works has been answered. It is a qualified yes, as is the case with all of radiation therapy. But, neutron therapy has not kept pace with the rest of radiation therapy in terms of beam delivery techniques. Modern photon and proton based external beam radiotherapy routinely implements image-guidance, beam intensity-modulation and 3-dimensional treatment planning. The current iteration of fast neutron radiotherapy does not. Addressing these deficiencies, however, is not a matter of technology or understanding, but resources.

The future of neutron therapy lies in better understanding the interaction processes of radiation with living tissue. A combination of radiobiology and computer simulations is required in order to optimize the use of neutron therapy. The questions that need to be answered are: Can we connect the macroscopic with the microscopic? What is the optimum energy? What is the optimum energy spectrum? Can we map the sensitivity of the various tissues of the human body and use that knowledge to our advantage? And once we gain a better understanding of the above radiobiological issues will we be able to capitalize on this understanding by precisely and accurately delivering fast neutrons in a manner comparable to what is now possible with photons and protons?

This presentation will review the accomplishments to date. It will then lay out the questions that need to be answered for neutron therapy to truly be a 21st Century therapy.

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