AbstractID: 1549 Title: Preliminary Investigation of Secondary Neutron Dose for High Energy IMRT

A common practice of conventional radiotherapy has been to treat deep-seated targets with higher energies, ≥ 10 MV. High-energy x-rays deliver larger doses at greater depths and enhance skin sparing. However, photons with energies greater than 7 MeV can generate neutrons through interactions with accelerator structures and the treatment room, as well as within the patient. Extensive studies have been performed to determine the energy spectra and the effect of unwanted dose to the patient for conventional radiation therapy. This unwanted neutron dose is relatively low and considered acceptable by most clinicians. Another radiation treatment delivery technique, Intensity Modulated Radiation Therapy (IMRT), now used in many radiotherapy centers around the world can achieve very steep dose gradients, delivering high dose the treatment volume while maintaining remarkably low doses to normal tissues. IMRT delivers dose in small segments or beamlets by attenuating large portions of the primary photon beam, thereby requiring many segments to deliver dose to a large treatment area. This inherent inefficiency leads to substantially longer treatment times, and consequently, increased secondary neutron production. For IMRT, the secondary neutron dose has been presumed to be only a function of the increase in beam-on time. This preliminary study evaluates secondary neutron dose from conventional and IMRT prostate treatments with 18 MV. Neutron spectra were determined using a Bonner Sphere TLD measurement system. Results show a higher secondary neutron dose equivalent from the IMRT treatment versus the conventional treatment. These increases are slightly greater than the ratio of the monitor units.