

AbstractID: 1109 Title: Integral Dose in External Beam Photon Radiotherapy

Integral dose is the volume integral of the dose deposited in the patient and is equal to the mean dose times the volume. The integral dose is also the area under the curve of a differential dose absolute-volume histogram. It is widely believed that IMRT increases the integral dose to normal tissues as compared to conventional radiotherapy practice. Conventional wisdom also holds that high-energy beams substantially reduce the integral dose. We will show that, for a given configuration of tumor and normal tissue and incident photon beam directions, the integral dose is relatively invariant with the intensity pattern of radiation. Assuming no leakage and electronic equilibrium, Gauss's theorem will be used to show that this is theoretically true for the direction-independent case of a centrally located tumor. The result also does not depend on the number of beam used. A planning system based on convolution/superposition was used to compute the dose distribution for 3-D conformal and IMRT treatments. The integral dose to both critical and unspecified normal tissues for IMRT cases was slightly less than 3-D conformal because the beam boundary margin was being automatically minimized for IMRT. The integral dose for high-energy beams is about the same as for low energy beams, because the reduction due to entrance buildup was nearly offset by the higher exit dose and the need for a larger field boundary margins for high-energy beams.

This work was partially supported by a grant from the NIH (P01 CA088960) and a contract from TomoTherapy Inc.