

Dose outside the irradiated volume in radiotherapy

Data are presented that enable an estimation of the dose to organs outside the irradiated volume in radiotherapy, often called the peripheral dose (PD). This can be of interest when young or pregnant patients have to be treated with radiation and an evaluation is required of the benefits and risks. Using a large water phantom, the PD was measured as a function of field size, distance, depth, and patient thickness from cobalt-60 gamma radiation to 25 MV x-rays, for perpendicularly as well as tangentially incident beams. PDs were also determined by recalculating and averaging published data for different treatment machines. The spread of these averaged data of about 30% is adequate for risk assessment. Physicists in The Netherlands provided data on leakage and collimator scatter for their treatment machines showing that the variation for different types of machines from different manufacturers is small. Therefore, two sets of data are sufficient for PD estimates, one for cobalt-60 gamma radiation and one for 4-25 MV x-rays. The accuracy of the model was checked under clinical conditions by measuring the dose at the location of the perineum in patients treated for various tumor types. The dose at large distances from brachytherapy sources including Co-60, Cs-137, and Ir-192 was also measured.