

AbstractID: 6849 Title: Dose Perturbation at Interfaces in Endovascular and High Dose Rate Brachytherapy

Dose perturbations at interfaces are generally ignored in brachytherapy due to localized dose calculations. However, impact of high atomic number (Z) stents, applicators, and encapsulating materials on dose perturbations from Ir-192 sources used for endovascular and high-dose rate brachytherapy is needed which is studied. Measurements were taken at different positions representing the location of interfaces created by stents or devices from the source. Various Z (Al, Ti, Cu, Sn, Ta, Au, Pb) were investigated to study the dose perturbation factor, $DPF(E, t, d, x, Z)$ defined as the ratio of readings with and without interface, where E is energy of the source, t is the thickness, d is the distance of interface from source and x is the distance from interface to the point of measurement. Results show that the DPF is strongly dependent on Z. A dose reduction (<10%) is observed for lower Z (<29) and dose enhancement for Z>29 up to 260% for Pb is clearly visible. DPF is nearly constant between 0.01 mm–0.1 mm thickness and nearly independent with distance where as attenuation is observed for thickness > 0.1 mm of high Z materials. The extent of dose perturbation is visible up to 450 μ m for Ir-192 gamma rays. In conclusion, dose perturbation is intense, significant, and localized for high Z materials and could be used for dose enhancement in high-dose rate brachytherapy by selectively devising applicators. However, special precaution is needed in endovascular therapy where high-Z stent could produce intense dose in normal tissues.