In intravascular brachytherapy, use of high Z materials, like contrast agents and metallic stents, can introduce significant dose perturbations, especially for low energy photons. To investigate this issue, the radial dose functions across the interface between different materials and tissue were calculated by using Monte Carlo simulation. Various interfaces, including contrast agent to water, stainless steel to water, and bone (simulating a calcified plaque) to water, were investigated for photon energies between 20 keV and 1 MeV. It is found that the dose to water near the interface is enhanced considerably for the photons of energies between 20 keV and 200 keV. The maximum dose enhancement factors for hypaque are 6.4, 9.7, 16.0, 12.0, 7.6, 1.3 for 0.02, 0.04, 0.06, 0.08, 0.1 and 0.2 MeV photons,[1] respectively. The enhancement factor is almost equal to 1 for the photon energy between 0.4 and 1 MeV. For 60 keV photons, the maximum dose enhancement factors are about 16.0, 16.1, 16.4, and 3.4 for hypaque, omnipaque, stainless steel, and bone, respectively. The dose enhancement decreases exponentially with distance from the interface. The affected tissue thickness is also dependent on the photon energy. As expected, the higher the photon energy is, the larger is the affected tissue thickness. The thickness affected is about 10, 20, 40, 60, and 70 microns for 0.02, 0.04, 0.06, 0.08 and 0.1 MeV photons, respectively. This dose enhancement should be considered in evaluation of the efficacy of intravascular brachytherapy.

[1] Dose Perturbations by High Atomic Number Materials in Intravascular Brachytherapy