ABSTRACT

Clinical trials employing γ– or β–emitters to prevent coronary artery restenosis are currently being carried out. A catheter-based β-emitter system, which consists of 12 encapsulated ^{90}Sr/Y seeds and 2 gold markers, is modeled in cylindrical vessel geometry using the Monte Carlo code, MCNP4B. Dose distributions are calculated around the source train that is surrounded by a stainless steel stent placed at 1.92 mm from the source centerline. For a total source activity of 70 mCi, the dose delivered in the radioactive seed region varies from 40 to 0.23 cGy/sec as the radial distance increases from 0.64 to 6.4 mm. The corresponding values in the gold marker region vary from 37 to 0.16 cGy/sec. In the plane 2 mm below the edge of the source train, the radial variation ranges from 26 to 0.1 cGy/sec. In particular, the dose rates at the radial distance of 2 mm are: 9.3 cGy/sec in the seed region, 8.2 cGy/sec in the gold marker region, and 4.8 cGy/sec in the plane 2 mm below the edge of the source train. The dose enhancement due to the primary and the secondary electrons scattered by the stent is shown to be about 9.3% near the stent. For radial distances beyond the stent (2.0–6.4 mm), the dose is slightly reduced by 4%–12%, compared to the case without the stent.