

Copper-62 an Alternative Isotope for Intravascular Brachytherapy

Clinical trials have shown that intravascular brachytherapy is effective in reducing restenosis. Beta source is preferred because of shielding issue and liquid or gas filled balloon seems to give the best dose distribution. Major concerns with liquid filled balloon are organ dose and contamination. The purpose of this study is to evaluate the possible use of Copper-62, a PET agent with a half-life of 9.7 minutes as an alternative agent for liquid filled balloon brachytherapy.

As model, a 3mm x 30mm cylinder filled with liquid Rhenium-188 and Copper-62 is used. Monte Carlo (MCNP4B) codes is used to generate the dose rate distribution for the two isotopes in water. With a specific activity of 100 mCi/ml of Cu-62 can delivers a dose of 24 Gy to a point 0.5 mm from the surface of a 3mm x 30mm balloon in 5.25 minutes. Surface dose is 38.4 Gy and decreases to 17 Gy at 1 mm depth.

Compare to Re-188, Cu-62 results in similar treatment time. Moreover, surface dose is lower by about 12.5% and dose to 1 mm depth is higher by about 15%. The two 0.511 MeV photons give off by Cu-62 constitute only 0.2% of the dose. Since the amount of activity needed for treatment is similar to that used for PET scan, the total dose that will be deposited in case of a balloon rupture is safe. With its short half-life, decontamination time would be less than 3.5 hours.