Identification of the Target Tissue by Comparison of Studies with Widely Different Dose / Depth Functions.

Background. In the pig model isotopes and intracoronary radiation delivery systems have inhibited neointima thickening after stent placement or balloon injury. We compared several studies with widely disparate depth/dose functions to locate the tissue that is most closely correlates with a beneficial effect.

Methods. We retrospectively compared 22 protocols of 9 studies comprising 170 arteries irradiated with Ir^{192}, Sr/Y^{90}, Re^{188}, $Re^{188/186}$ and Re^{186}. Studies with balloon overstretch injury and stent placement were included. Depth dose functions were recalculated from 0 to 2.5mm radial depth from the arterial surface at 0.25 mm intervals. Inhibition of neointimal area was calculated relative to the control groups comprising a total of 93 non-radiated arteries. The recalculated dose at different tissue depths was compared with the inhibition of neointima area.

Results. Inhibition of neointima area was dose related irrespective of tissue location. In the model the best agreement between dose and inhibition was found for a tissue depth at 0.75mm from the lumen surface. At the lumen surface and at deeper tissue depths the agreement was considerably lower. To achieve a 50% inhibition of neointima proliferation a dose of about 12Gy at 0.75 tissue depth is needed regardless of the isotope.

Conclusions. This analysis supports earlier histochemical data indicating that the adventitia is the target tissue for radiation therapy. The data support that the dose prescription point should be at 0.75mm radial to the vessel/lumen interface.