

Vascular access for hemodialysis is often achieved with an arterial-venous graft (AVG). Restenosis within the graft however occurs in 80% of the patients within a year, resulting in major problems in patient management. Brachytherapy is being explored for prevention of stenosis within these grafts. A beta-emitter is used consisting of 24 attached $\text{Sr}^{90}/\text{Y}^{90}$ 2.5 mm long seeds jacketed in a CO_2 filled balloon. The diameter of the inflated balloon is selected to fill the lumen of the vessel. A dose calculation algorithm was developed to provide treatment planning (TP) capability for dialysis implants. A dose kernel was evaluated for a Sr^{90} -seed using Monte-Carlo simulations. The kernel was separated into two components: (1) a geometrical factor which depends on the seed geometry and the distance of the seed to a point in tissue and (2) an absorption factor that depends on the path length of the beta particles in the tissue. Fluoroscopic images are used to identify the position of sources and the wall of the balloon. The dose calculation was performed on a 100 micron grid surrounding the implant taking into account the path length of the beta particles through the gas filled balloon and tissue. The dose-distribution is displayed superimposed on the fluoroscopic image of the AVG. Dose-area histograms were also generated. These developments provide treatment planning capabilities for dialysis implants using radiographic localization of the sources. The brachytherapy dosimetry tools developed could be used to correlate clinical outcome with dose delivery.