

Current intravascular brachytherapy (IVBT) protocols often use fixed dosimetry prescriptions. We undertook the current study of 3D treatment planning and dose-volume histogram (DVH) analysis to assess the actual radiation doses delivered when fixed dosimetry methods are employed, to provide a basis for evaluation of the treatment efficacy. The investigators attempted to angiographically document all the steps of the intervention, including the position of the radiation to determine whether the edge of the radiated segment was injured. Following this, IVUS images 1mm apart were imported and reconstructed in a 3D view. The adventitial and intimal layers were then contoured by an experienced cardiologist. Following the clinical trial protocol, the exact number of seeds of the source train is placed within the patient's lumen. From the angiographic analysis data, the seeds are also longitudinally localized in the vessel for the actual treatment scenario, assuming the source was centered on the IVUS. With 15Gy delivered to 2mm from the source center, the dose distribution throughout the IVUS image can be calculated by reconstructing the 3D image. Dose-volume histograms and D90, D50, and D10 values are calculated at the intimal and adventitial layers, as well as for certain slices of interest. DVHs are also calculated for the proximal, central, and distal 5mm of the sclerotic lesion at the adventitial layer to examine the edge effect. These parameters may be correlated to clinical outcomes such as treatment success/failure, and complications (late thrombosis).