AbstractID: 7751 Title: Dose Distributions on Bifurcated Coronary Vessels Treated with Catheter-based Photon and Beta Emitters in Intravascular Brachytherapy

The dose distributions in the bifurcated vessels in intravascular brachytherapy using a catheter-based delivery system are complicated by the geometry of bifurcation consisting of a main and a branch vessel at different angles. To investigate the dosimetric effects at the bifurcation, calculations were performed on bifurcated vessels of various bifurcation angles from 10 to 90 degree. Radioactive sources of ^{192}Ir and ^{90}Sr/Y were studied. Both were 40 mm long. Calculations were performed for different gap lengths of 0 to 8 mm at the junction of main and branch vessels. Our results indicate that main vessel always receives a higher dose (up to 200%) when the branch vessel is also treated. Hot spots at portions of the main vessel near the junction cannot be totally avoided without severely underdosing the branch vessel. For bifurcation angle greater than 30 degree, a 4 mm source gap can ensure that overdosing of main vessel does not exceed 25% and underdosing of branch vessel does not exceed 12% for ^{192}Ir. However, for ^{90}Sr/Y, 4 mm gap results in overdosage of 40% and underdosage of 60%. ^{90}Sr/Y is more sensitive to the gap length than ^{192}Ir because of a sharper penumbra. For both photon and beta emitters, there is no acceptable solution for bifurcation angles less than 30 degree. Appropriate choice of gap at the junction can only help to reduce either overdosing of main vessel or underdosing of branch vessel, but not both.