

AbstractID: 6960 Title: Dosimetry of Source Stepping for Intravascular Brachytherapy

Both β and γ sources of fixed length are currently used in the catheter-based Intravascular Brachytherapy (IVBT). Source stepping is usually performed to treat a lesion longer than the effective treatment length of the source used. The major challenge for the stepping procedure is to attain a perfect dosimetric match (uniform dose) at the source junction. This work presents a quantitative and systematic dosimetric analysis for source stepping during an IVBT procedure. The three most commonly used β and γ sources (^{192}Ir by BEST, ^{90}Sr by NOVOSTE and ^{32}P by Guidant) were studied using the EGSnrc Monte Carlo code. A series of source mismatches (gaps or overlaps of 0-5 mm) at the source junction were specified in the calculation. The doses in the case of a mismatch were found to be significantly different from those with a perfect source match. The dose deviation depends on the size of the gap or overlap, radial distance and type of source. The dose deviation increases with gap or overlap, and decreases with radial distance for a given gap/overlap. For example, for a gap/overlap of 2 mm, dose decreases/increases of 30%, 55% and 60% were found at the radial distance of 2 mm from source for ^{192}Ir , ^{90}Sr and ^{32}P , respectively. These dose deviations are reduced approximately by 10% when the radial distance increases from 2 to 3 mm. In conclusion, a considerable caution should be exercised to ensure that sources are properly matched during an IVBT procedure involving source stepping.