

AbstractID: 1417 Title: Dosimetry Comparison between HDR and Permanent Implant Prostate Brachytherapy

Current prostate brachytherapy is performed with permanent implantation of I-125 and Pd-103 seeds, as well with fractionated high dose rate treatments with Ir-192. In both methods, hollow needles are inserted into the prostate with template guidance. During HDR treatments, the high activity Ir-192 seed is programmed to different dwell positions along the needles, for planned dwell times. This creates an equivalent non-uniform radioactive Ir-192 seed placement distribution. Thus besides the advantages in accuracy and reproducibility associated with HDR, one has the additional ability to tailor the radioactivity strength at each point to best create a desired homogeneous dose distribution. Recently, the minimum total required radioactivity in permanent prostate brachytherapy was theoretically calculated by assuming the radioactivity to be in continuous form (Med. Phys. 28, 2001.) The variable dwell times in HDR offer a good practical model for this study. In this work, for both permanent implants and HDR treatments, the seed placement / dwell times are optimized to achieve a prescribed target dose, and then the total seed activities / dwell times are computed along with the dose distribution indices. We find, as expected, HDR gives a more homogeneous dose distribution as indicated by a more uniform dose volume histogram, and with lower radioactivity usage as measured by total activity multiplied by time. In conclusion, HDR has a large advantage in dosimetry for prostate brachytherapy, and gives a good model for theoretical study.