Determination of the Urethral Dose in Prostate Brachytherapy when the Urethra is not Visualized in the Post-Implant CT Scan

A urinary catheter is often not utilized when the post-implant CT scan is obtained and the ure thra cannot be visualized to calculate the ure thral dose. This study investigates the feasibility of locating a surrogate urethra at the geometric center of the prostate as a solution to this problem. Twenty I-125 prostate implants which were scanned utilizing a urinary catheter were randomly selected. In each implant, the I-125 seeds were implanted at the periphery of the prostate producing a dose distribution characterized a broad dose minimum in the central region of the prostate containing the urethra. The urethra was outlined from the base to the apex of the prostate using the image of the urinary catheter. In addition, a surrogate urethra was outlined at the geometric center of the prostate. Dose-volume histograms were compiled and the D10, D25, and D50 doses of the actual and surrogate urethras were compared. The difference between surrogate urethra dose and actual urethra dose was 3.3 ± 5.5 % (mean \pm S.D.) at D10, 1.0 ± 6.0 % at D25, and 2.3 ± 7.1 % at D50. These results show that urethra doses from D10 to D50 can determined to within \pm 10% by a surrogate urethra located at the geometric center of the prostate when the I-125 seeds are peripherally loaded and the urethra is not visualized in the post-implant CT scan.