Predictive Parameters and Prediction of Postimplant Prostate D90 Values after Brachytherapy with I-125 Seeds in Patients with Prostate Cancer

Introduction and Objective: The present study was undertaken to identify factors predictive of the dose received by 90% of the prostate volume (D90) after transperineal interstitial prostate brachytherapy with ^{125}I free seeds.
Materials and Methods: We reviewed the records of 180 patients who underwent transperineal interstitial prostate brachytherapy with ^{125}I free seeds for clinical T1/T2 prostate cancer. No patient received supplemental external beam radiotherapy. Eighty-one (45%) of the 180 patients underwent neoadjuvant hormonal therapy (NHT). All 180 patients underwent a preimplant transrectal ultrasound (TRUS) study one month before implantation. One month after seed implantation, postimplant computed tomography and dosimetric analysis were performed. Patient characteristics and treatment status were recorded. Univariate and multivariate analyses were performed to identify factors predictive of D90 after implantation.
Results: The D90 values ranged from 123.3 to 223.6 Gy. The mean ± SE D90 was 171.4 ± 1.5 Gy. Total radioactivity ($p < 0.001$), preimplant prostate volume by TRUS ($p = 0.012$), and number of needles ($p < 0.001$) were significantly and positively correlated with D90 in univariate analysis, but age ($p = 0.538$), serum PSA ($p = 0.370$), and radioactivity per unit volume ($p = 0.080$) were not significant. The D90 was significantly lower in patients with neoadjuvant hormonal therapy (NHT) than in those without ($p = 0.004$) but was not significantly different between patients with Gleason score 7 and those with Gleason score <7. Stepwise multiple regression analysis showed that total radioactivity, preimplant prostate volume by TRUS, and NHT were significant independent predictors. However, a significant negative correlation was found between preimplant prostate volume by TRUS and D90 in the multivariate analysis.
Conclusions: Total radioactivity, preimplant prostate volume by TRUS, and NHT provide significant predictive information on D90 after prostate brachytherapy. The combination of these three factors can be used to predict postimplant prostate D90.