Comparison of Preoperative and Real-Time Intraoperative Planning in 125I Permanent Prostate Brachytherapy: Long-Term Clinical Biochemical Outcome

Introduction and Objectives: To evaluate the long-term clinical outcome through biochemical no evidence of disease (bNED) rates among men with low to intermediate risk prostate cancer treated with two different ^{125}I brachytherapy implant techniques: preoperative planning (PP) and real-time intraoperative planning (IoP).
Methods and Materials: From June 1998 to July 2011, 1176 men underwent transperineal ultrasound-guided prostate brachytherapy using either PP (132) or IoP (1044) for clinical T1c-T2b adenocarcinoma of the prostate Gleason less than 8 and PSA less than 20 ng/ml. Men with Gleason 7 disease were treated by combination therapy of brachytherapy, external beam radiation therapy and 6-month androgen deprivation therapy (ADT). Median age was 67 years and the median follow-up was 83 months for the PP group and 47 for the IoP one. Biochemical failure was determined according to the Phoenix definition.
Results: The 5- and 10-year actuarial biochemical control rate was 95% and 85% respectively. The 10-year actuarial biochemical control was 59% for patients treated by PP technique and 95% for those treated with the IoP technique ($P < 0.001$). Comparing the 10-year bNED rates for the brachytherapy-monotherapy group, given to lower risk patients yielded 60% for the PP group and 94% for the IoP group ($P < 0.001$). Multivariate Cox regression analyses identified, implant technique or D90, ADT and PSA as independent prognostic factors for biochemical failure.
Conclusion: Following our previous published results addressing the limited and disappointing outcomes of PP method when compared to IoP based on CT dosimetry and PSA kinetics, we now confirm the long-term clinical, PSA based bNED rates clear cut superiority of IoP implant methodology. In our practice the dynamic real time calculations result in an ideal dose distribution within the target volume and translate to excellent clinical outcome.