150 Multicenter Analysis of Impact of High Biologically Effective Dose (BED) on Biochemical Failure (Phoenix Definition) and Survival Outcomes in Patients With Gleason Score 7–10 Prostate Cancer Treated by Permanent Prostate Brachytherapy

N. N. Stone[1], L. Potters[2], B. J. Davis[3], J. Ciezki[4], M. Zelefsky[5], M. Roach[6], P. A. Fearn[5], M. Kattan[4], R. G. Stock[1]

[1]Mount Sinai School of Medicine, New York, NY, [2]New York Prostate Institute, Oceanside, NY, [3]Mayo Clinic, Rochester, MN, [4]Cleveland Clinic, Cleveland, OH, [5]Memorial Sloan-Kettering Cancer Center, New York, NY, [6]University of California at San Francisco, San Francisco, CA

Purpose/Objective(s): The biochemical control rates and overall survival for Gleason score 7–10 prostate cancer patients (pts) undergoing permanent prostate brachytherapy (PPB) is investigated as a function of biologically effective dose (BED).

Materials/Methods: Six centers provided data on 5889 PPB patients of which 1078 had Gleason score (GS) 7 (n = 845) or GS 8-10 (n = 233) and post-implant dosimetry results. Mean PSA was 11.3 ng/ml (range 0–300). Median censored follow-up was 46 months (range 5–130). I-125 was used in 219 (20.3%) and Pd-103 in 859. Short-term hormone therapy (HT, median duration 3.9 months) was used in 666 (61.8%) and supplemental external beam irradiation (EBRT) in 620 (57.5%). The BED was calculated from the post-implant D90 and EBRT dose using an alpha/beta ratio of 2. Pts were stratified into 3 BED groups: (1) <200 Gy (n = 645), (2) 200–220 Gy (n = 199), and (3) >220 Gy (n = 234). Freedom from biochemical failure (bFFF) was determined using the Phoenix definition, PSA nadir plus 2 ng/ml. Survival functions were calculated by the Kaplan Meier method with factors compared by log rank. The effect of multiple variables was tested by Cox regression.

Results: The median BED was 192 Gy (158–215; 25–75%ile). The 5-year bFFF for the entire cohort was 80%. bFFF for GS 7 and 8–10 by BED dose groups were 82.3%, 82.5% and 89.5% ($p = 0.094$), and 51.6%, 85.5% and 86% ($p < 0.0001$), respectively. For GS 8-10, bFFF improved from 68.7% to 92.5% when pts were analyzed by 2 dose groups, BED ≤ 220 Gy vs. >220 Gy (OR 4.2, 95% CI 1.8–10, $p < 0.001$). bFFF for patients with a pretreatment PSA >20 (n = 119) by BED groups are shown in the table. For the entire cohort, Cox regression revealed GS, PSA, HT, EBRT and BED dose as significant ($p < 0.001$). The mean BED for the monotherapy pts was 155 Gy (25–75%ile 140–165) compared to 214 Gy (25–75%ile 195–232) for the EBRT/PBB pts ($p < 0.001$). 36.4% of the EBRT/PBB pts had a BED > 220 Gy vs. 2% of the monotherapy pts. Overall survival at 5 and 10 years for the 3 BED dose groups were 96.8%, 99.3%, 100% and 38.8%, 66.2%, 88.9%, respectively ($p = 0.05$).

Conclusions: These data suggest that PPB combined with supplemental EBRT and short term HT yields excellent bFFF and survival results when delivered BED doses are greater than 220 Gy. These doses can be achieved by a combination of 45 Gy EBRT with 120 Gy of Pd-103 or 130 Gy of I-125.

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