

# Post-Treatment PSA Kinetics of Three Prostate Cancer Treatment Regimens Involving Brachytherapy

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**Purpose:** Many patients focus attention on their PSA after treatment. This study was conducted to better understand and compare PSA kinetics in a large cohort of patients treated according to 3 prospective approaches: permanent iodine-125 LDR BT as monotherapy (Group 1), EBRT with an HDTBT boost (Group 2), or neoadjuvant and concurrent maximum androgen blockade (MAB) for 4 months with EBRT and an HDRBT boost (Group 3)

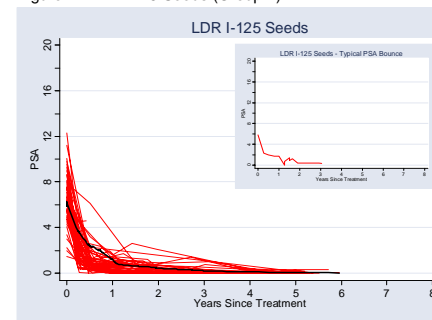
**Materials and Methods:** Groups 1, 2, and 3 were designed for patients with good, intermediate, and poor risk features, respectively. From 1998 to 2003, 719 patients with sufficient data points, including at least 3 years follow-up and at least 4 PSA determinations were included: 152 in Group 1, 227 in Group 2, and 340 in Group 3. For Group 1 patients, the prescribed dose was 145 Gy. For Groups 2 and 3 treatment consisted of EBRT (45 Gy in 25 fractions) and HDRBT (19.5 Gy in 3 fractions). Mean time under observation (36.4, 36.8 and 36.9 months for Groups 1, 2 and 3 respectively) was similar between groups ( $p = 0.964$ ) as was the number of PSA measures per patient (6.1, 6.5 and 6.6 for Groups 1, 2 and 3 respectively,  $p = 0.261$ )

**Results:** Significant differences exist among Groups 1, 2 and 3 for mean pre-treatment PSA (6.1, 6.6 and 9.6;  $p < 0.001$ ), mean Gleason's score (5.3, 5.8 and 6.7;  $p < 0.001$ ) and weighted T stage ( $p < 0.001$ ). The fraction of patients achieving PSA  $\leq 0.2$  was 0.61, 0.68 and 0.81 for the respective treatment groups ( $p < 0.001$ ) during this period of observation. For those achieving a PSA  $\leq 0.2$ , the median time per group was 24.0, 20.9 and 6.0 months ( $p < 0.001$ ). A PSA bounce of  $\geq 0.2$  from nadir occurred in 36%, 41% and 30% of patients. The mean time to bounce was 18.2, 13.8 and 16.0 months ( $p = 0.089$ ) with bounce magnitudes of 0.59, 0.86 and 0.60 ( $p = 0.016$ ). 204 patients had a rapid drop to ablative values (4.6, 10.1 and 51.2 % in Groups 1, 2 and 3 respectively;  $p < 0.001$ ), never manifesting a PSA  $\geq 0.2$  after treatment.

Treatment Group	LDR I-125 Seeds	EBRT + HDR Boost	MAB + EBRT + HDR Boost	<i>p</i>
<i>n</i>	152	227	340	
Follow-up in Months, Mean (s.d.)	36.4 (20.1)	36.8 (18.7)	36.9 (20.0)	0.964 <sup>1</sup>
Pre-treatment PSA, Mean (s.d.)	6.07 (2.54)	6.63 (3.95)	9.62 (4.05)	<0.001 <sup>1</sup>
Gleason Score, Mean (s.d.)	5.34 (0.94)	5.83 (1.02)	6.66 (1.03)	<0.001 <sup>1</sup>
Weighted Staging, Mean (s.d.)	1.41 (0.50)	1.53 (0.56)	1.84 (0.66)	<0.001 <sup>2</sup>
( <i>n</i> T1 = 2aT2 + 3aT3)/N				
Rx Dose, Gy	145	45Gy (25fx+3x6.5Gy)	45Gy (25fx+3x6.5Gy)	
PSA Points/Patient, Mean (s.d.)	6.1 (2.9)	6.5 (2.9)	6.6 (3.0)	0.261 <sup>3</sup>
PSA $\leq 0.2$ , Fraction of Patients	0.61	0.69	0.82	<0.001 <sup>3</sup>
Time(Mo) to PSA $\leq 0.2$				
Median (interquartile range)	24.0 (12.8, 34.1)	20.9 (10.7, 31.3)	6.0 (3.2, 15.2)	<0.001 <sup>4</sup>
<i>n</i>	93	156	277	
PSA Bounce $\leq 0.2$ / # Evaluable, Fraction	42 / 119	79 / 193	81 / 273	0.039 <sup>5</sup>
Time(Mo) to Bounce, Mean (s.d.)	18.2 (10.5)	13.8 (8.6)	16.0 (11.7)	0.089 <sup>5</sup>
Magnitude of Bounce, Mean (s.d.)	0.59 (0.36)	0.86 (0.78)	0.60 (0.48)	0.016 <sup>5</sup>
PSA Never $\geq 0.2$ / # in Group, Fraction	7 / 157	23 / 227	174 / 340	<0.001 <sup>5</sup>
	0.05	0.10	0.51	

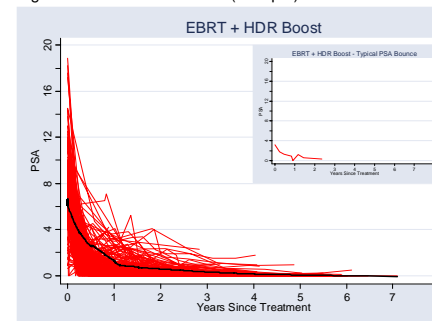
1. Using One-Way ANOVA  
 2. Using One-Way ANOVA (MAB + EBRT + HDR Boost *n*=139)  
 3. Using  $\chi^2$  (chi-squared) test  
 4. Kruskal-Wallis test  
 5. Using One-Way ANOVA (group *n*s: 42, 71, 70)

Figure 1: LDR I-125 Seeds (Group 1) \*



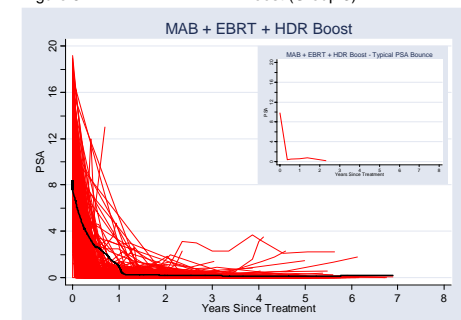
- Sample of representative patients (*n* = 50)
- Inset – Typical PSA bounce pattern

Figure 2: EBRT + HDR Boost (Group 2) \*



- Sample of representative patients (*n* = 50)
- Inset – Typical PSA bounce pattern

Figure 3: MAB + EBRT + HDR Boost (Group 3) \*



- Sample of representative patients (*n* = 50)
- Inset – Typical PSA bounce pattern

**Conclusions:** This study was not designed to analyze treatment efficacy. The 3 groups represent distinct levels of disease risk. The addition of MAB resulted in immediate ablative values ( $\leq 0.2$ ) with no subsequent PSA rise or bounce, in half of patients, and produced the most rapid PSA decline. Seed brachytherapy patients manifested the slowest decline. PSA trends indicate that the fraction achieving ablative values will increase with follow-up time. PSA bounce was common in all treatment groups. The shortest mean time to bounce and the highest bounce magnitude were observed in EBRT plus HDRBT boost patients. For patient counseling, these data provide realistic expectations for PSA kinetics for various prognostic features and treatment approaches.