The correlation of clinical, treatment, and dosimetric parameters with the development of a PSA spike following permanent prostate brachytherapy was studied.

The population consisted of 218 hormone naïve patients free of biochemical failure or incipient failure who underwent permanent prostate brachytherapy with or without supplemental XRT. The median patient follow-up was 46.2 months. A PSA spike was defined as a rise ≥ 0.2 ng/mL followed by a durable decline. Dosimetric parameters included the minimum dose received by 90% of the prostate gland (D_{90}), the percent of the prostate volume receiving 100%, 150%, and 200% of the prescribed dose (V_{100}, V_{150}, and V_{200}), and urethral doses.

Fifty-two patients (23.9%) developed a PSA spike at a median of 16.3 months. The median PSA prior to the spike was 0.50 ng/mL, and the median PSA at the time of spike was 0.90 ng/mL. Statistically significant findings were that patients experiencing a spike were 3.4 years younger than non-spike patients and were more likely to be implanted with $^{125}$I than $^{103}$Pd. In addition, the first postimplant PSA was higher in spike than in non-spike patients. In Cox multivariate regression analysis, patient age, clinical stage, first postimplant PSA, and V_{150} were predictive of a PSA spike. A postimplant dosimetric threshold for D_{90} of < 115% prescribed dose or a V_{150} of < 55% of the prostate volume was strongly predictive of a spike. By 66 months, the mean and median serum PSA for spike and non-spike patients were all ≤ 0.1 ng/mL.