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Biochemical Response to Linac Radiosurgery for Prostate Cancer: A Single Institution Experience

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Abstract
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Abstract

Objectives:

1- To report the biochemical response in patients with prostate cancer treated with Linac-based stereotactic body radiation therapy (SBRT).
2- To evaluate early and late toxicity in our cohort of patients.
3- To describe the feasibility of using Linac-based SBRT for prostate cancer using Image guided radiation therapy (IGRT) with Cone beam CT (CBCT), without rectal balloon or localization fiducials.

Methods: Between September 2015 and December 2020, 40 patients with prostate cancer were treated at our institution with Linac-based SBRT without using fiducials, spacers, or rectal balloons. Ages ranged from 51 to 92 with a median of 70 years. Thirty-five patients had low and favorable intermediate risk disease and the other five had unfavorable or high-risk disease including oligo-metastases.
Fourteen patients received initial androgen deprivation therapy (ADT) and three patients had previous focal ablative therapies including HIFU and cryoablation. All patients were treated with VMAT using two to four 6 MV FFF arcs. First and confirmatory CBCT was performed prior to every fraction. Total dose ranged from 30 Gy to 40 Gy delivered in 5 fractions. The most frequent dose scheme was 36.25 Gy in 5 fractions of 7.25 Gy. This regimen was used in 34 (85%) of the patients. The seminal vesicles were included in the target volume in 37 (92.5%) patients. Thirty-four (85%) received 25 Gy using 5 Gy/fx with a simultaneous integrated boost (SIB). Three patients were treated only to the prostate gland. Follow-up ranged from 5 to 58 months with a median of 25 months. All prostatic antigen serums (PSAs) were collected from pre-treatment to the most-recent follow-up time for each patient. The patients were divided in 2 groups: Group 1 included 35 patients with low and favorable intermediate risk prostate cancer. Group 2 consisted of 5 patients with unfavorable intermediate and high-risk prostate cancer and/or presence of metastatic disease. The Gastrointestinal (GI) and Genitourinary (GU) toxicities were evaluated according to the RTOG criteria.

Results: There was a favorable response with decrease of the PSA in all patients of Group 1. The response was more than 30% and 15% in 12 and 24 months, respectively, and continued to decrease thereafter or remained stable. Patients that were under short-term androgen deprivation therapy (ADT) showed a sharp decline in the first follow-up PSA. After ADT was discontinued the response was the same as in the other patients in the group. Two patients from Group 2 showed the same response as Group 1 with PSA of 0.1 after 13 and 68 months. One of them was treated with salvage radiosurgery due to previous radiation therapy to the pelvis for colorectal cancer. The other patient received radiosurgery to the prostate and to the adjacent oligometastatic lesion in the ischium. The PSA values for the other three patients went up due to the presence of distant metastases. Two of them were followed with SBRT treatment and are currently biochemical controlled with lower PSA. Fifty percent of the patients developed grade 1 acute GU toxicity and only 20% experienced grade 1 late toxicity, symptoms that were reported in many cases prior to the treatment. No acute or subacute GI toxicity was encountered. The difference between first and second CBCT image, prior to every fraction was analyzed. The shift in patient's position did not differ in more than 2 mm.

Conclusion: The biochemical response over time seems to follow a characteristic trend in patients with low and favorable intermediate risk prostate cancer. We did not find a general behavior for the group of patients with high and unfavorable intermediate risk.
Our initial results suggest that Linac-based SBRT using CBCT can be safe and effective, without the need for rectal balloon or placement or fiducials. No significant toxicity was observed.