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Stereotactic Radiotherapy for Prostate Cancer with Bilateral Hip Replacements

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Abstract
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Abstract

Objectives:

The primary objectives of the study were to evaluate toxicity, biochemical control, and dosimetry in patients treated with short-term stereotactic radiotherapy CyberKnife for localized prostate cancer with bilateral replacements.

Methods:

Between August 2010 and 2020, 1830 patients with low/intermediate risk prostate cancer were treated. Based on the retrospective evaluation, bilateral hip replacements were found in 13 patients (0.71%), including 6 and 7 patients in the low- and intermediate-risk groups, respectively. Short neoadjuvant androgen deprivation therapy was used in 4 patients. Median age was 72 years (range 61-76), median PSA (prostate-specific antigen) level was 6.4 ng/ml (range 3.4-12.8), and median CTV (clinical target volume) was 63 ml (range 36-99). A prescribed total dose of 36.25 Gy at 7.25 Gy per fraction was administered for a CTV with a 0.3 cm margin (0.5 cm laterally for the intermediate-risk group). Sequential optimization was used to calculate the dose, and compared to cases with a unilateral hip replacement, it was not possible to completely avoid metallic areas while maintaining the quality of the treatment plans. A 6 MV linear accelerator delivered the dose every other day for a total of 5 fractions over 10 days; online image guidance was based on four 3mm fiducials implanted before treatment. Acute and late toxicity was assessed according to CTCAE ver. 5.

Results:

The median duration of radiotherapy was 9 days (range 811). The incidence of grade 2 acute genitourinary toxicity was 15% and grade 1 was 46%. The incidence of grade 2 acute gastrointestinal toxicity was 0% and grade 1 was 53%. The incidence of grade 1 late toxicity was 0.5% for the urogenital tract and 1.1% for the rectum. Two deaths (23 and 78 months after radiation) were observed during a median follow-up of 63 months (range 22-111). The median nadir PSA level was 0.23 ng/ml (range 0.01-0.73) and no biochemical relapse was detected according to the Phoenix definition. Median compliance index, coverage, D20ml rectal and D15ml bladder wall were 1.13 (range 1.07-1.34), 97% (range 95-98), 19.5 Gy (range 12.5-24.4) and 10.8 Gy (range 6.9-16.7), respectively. The median dose for bilateral hip replacements was 2.6 Gy (range 1.5-3.9).

Conclusion(s):

Stereotactic radiotherapy with online fiducial guidance is feasible. Although complete avoidance of the beam from hip replacements causes unacceptable dosimetric parameters, a significant reduction of dose to this region allows for rich conventional dose-volume criteria. There is no indication of inferior biochemical control or toxicity in a specific group of patients.