

Long-term Outcomes in Patients Treated with Proton Therapy for Localized Prostate Cancer

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Background: The aim of this retrospective study was to analyze the long term outcomes of patients with localized prostate carcinoma who were treated with proton therapy at a single institution.

Materials and methods: Between April 2003 and October 2012, 1375 consecutive patients were treated with definitive proton therapy. Ninety-nine percent of the patients received 74.0 GyE in 37 fractions. Fifty-six percent of the patients received neoadjuvant hormonal therapy, 4% received adjuvant hormonal therapy. Patients were stratified by prognostic risk groups based on National Comprehensive Cancer Network (NCCN) criteria. The numbers of patients (%) were 249 (18.1%), 602 (43.8%), 499 (32.7%) and 75 (5.5%) in the low-, intermediate-, high- and very high-risk groups, respectively. All endpoints were calculated from the radiation completion date. Biochemical failure was defined using the Phoenix consensus definition of the nadir prostate-specific antigen (PSA) concentration plus 2 ng/mL. Overall survival (OS) and biochemical relapse free survival (bRFS) were calculated using the Kaplan-Meier method. Adverse effects were graded according to the Common Terminology Criteria for Adverse Events (CTCAE), version 4.0.

Results: The median follow-up period for the entire cohort was 70 months (range, 4-145 months). For all patients, the 5-/10- year OS and bRFS were 96.0%/82.3% and 89.2%/77.0%, respectively. The 5-/10- year bRFS rates were 98.7%/94.5%, 90.8%/82.6%, 85.6%/63.3% and 65.6%/45.5% for the low-, intermediate-, high- and very high-risk groups, respectively. In the multivariate analysis for the intermediate-risk group, age ($P = 0.003$) and T classification ($P = 0.042$) were predictive factors for biochemical failure. In the multivariate analysis for the high-risk group, age ($P = 0.001$) and Gleason score ($P = 0.007$) were predictive factors for biochemical failure.

The cumulative grade 2 or greater late gastrointestinal (GI) and genitourinary (GU) toxicity rates were 4.1% and 5.4%, respectively. In the univariate analysis, anticoagulant drugs ($P = 0.04$) and diabetes mellitus ($P = 0.05$) were predictive factors for \geq grade 2 late GI and GU toxicities.

Conclusions: To the authors' knowledge, this study represents the largest cohort of patients treated with proton therapy at a single institute for localized prostate cancer, with the longest follow-up to date. Our findings suggest that proton therapy for localized prostate cancer results in excellent bRFS with acceptable late toxicities.

