Prognostic Value of MRI-Assessed Central Gland Volume for Biochemical Recurrence after Prostate Cancer Radiotherapy

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Introduction: Increasing central gland volume has been associated with less aggressive prostate cancer, theorized to be secondary to biomechanical stress from benign prostatic hyperplasia (BPH). The aim of this study was to evaluate pretreatment prostate magnetic resonance imaging (MRI) metrics and clinical characteristics in predicting biochemical recurrence (BCR) after definitive radiotherapy (RT) for prostate cancer.

Methods: In this retrospective single institution study, we identified men in our database with prostate cancer who underwent MRI within 6 months prior to completing definitive RT from May 2011 to February 2023. Total prostate volume, central gland volume, and peripheral zone volume were measured by a radiologist using manual segmentation. The primary objective was to determine the association of central gland volume with biochemical recurrence, defined by Phoenix criteria. A multivariable Cox proportional hazards regression model was constructed and adjusted for clinical factors.

Results: A total of 373 men (median age 68 years) were included, with a median follow-up of 28 months. 13 (3.5%) were low risk, 97 (26%) favorable intermediate ris, 201 (53.9%) unfavorable intermediate risk, and 62 (16.6%) high risk. 54 (14.5%) patients received conventionally fractionated RT, 105 (28.2%), moderately hypofractionated RT, 121 (32.4%), high-dose rate brachytherapy, and 93 (24.9%) stereotactic body RT. The 3 and 5 year rates of BCR were 7.8% and 18.3%, respectively. Taking into account NCCN risk group and RT type, higher central gland volume was associated with decreased risk of BCR (HR: 0.73, 95% CI: 0.55-0.98, p=0.03). No significant association was seen with peripheral zone volume, PI-RADS score, or RT type.

Conclusions: Increased central gland volume on pretreatment prostate MRI is independently associated with a lower risk of biochemical recurrence after definitive radiation for prostate cancer. BPH appears to confer favorable outcomes in RT patients and represents a novel, easily quantifiable metric in risk-stratification.