

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

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Objective:

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 National Comprehensive Cancer Network (NCCN) low, intermediate (IR), and high risk (HR) 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, along with PI-RADS score. The primary objective was to determine the association of central gland volume with biochemical recurrence, defined by Phoenix criteria. Multivariable Cox proportional hazards regression model was constructed and adjusted for NCCN risk group, RT type, and MRI metrics.

Results:

A total of 373 men (median age 68 years, interquartile range [IQR] 62-73 years) were included, with a median follow-up of 28 months (IQR 16-43 months). 13 (3.5%) were low risk, 97 (26%) favorable intermediate risk (FIR), 201 (53.9%) unfavorable intermediate risk (UIR), 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 (per 5 cc) was associated with decreased risk of BCR (hazard ratio [HR]: 0.73, 95% confidence interval [CI]: 0.55-0.98, p=0.03). No significant association was seen with peripheral zone volume, PI-RADS score, or RT type. Relative to FIR, HR demonstrated increased risk of BCR (HR: 4.42, 95% CI: 1.04-18.8, p=0.04), while no association was seen with UIR.

Conclusion:

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 represent a novel, easily quantifiable metric in risk-stratification.