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Trends in Radiation-Induced Second Malignancy With Increased Utilization of Intensity Modulated Radiation Therapy for Localized Prostate Cancer

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Purpose/Objective(s): The purpose of this study was to investigate whether increased utilization of intensity-modulated radiation therapy (IMRT) starting in 2000 resulted in an increase in second malignancy for prostate cancer (PCa) patients treated with external beam radiation therapy (EBRT).

Materials/Methods: Between 1997 and 2004, 374,355 men with PCa were registered in the Surveillance, Epidemiology, and End Result (SEER) database. In this cohort, 249,722 men with localized PCa (TxN0M0), older than 18, surviving for at least 2 years after treatment, and in active follow-up were selected for analysis. Secondary malignancy was defined as bladder cancer, rectal cancer and sarcoma diagnosed from 2 to 8 years after PCa diagnosis. Cox proportional hazards regression was applied to evaluate the risk of second malignancy.

Results: A total of 249,722 patients met inclusion criteria, out of which 143,160 had no radiation therapy (RT), 74,422 had EBRT and 32,140 could not be determined. A total of 2,896 cases of second malignancy were discovered, consisting of 2,218 bladder cancers, 524 rectal cancers, and 154 sarcomas. Of these patients, 1,332 had no RT, 1,110 had EBRT, and 454 had unknown status. Multivariate Cox proportional hazards regression demonstrated a statistically significant decrease in hazard ratio (AHR = 0.74, P = 0.0029) for second malignancy following EBRT in 2003-2004, after adjusting for race and age (Table 1). Table 1. Multivariate Cox proportional hazards regression of second malignancy in PCa patients. Year variable is in reference to 1997-1998 while race variable is in reference to whites.

Abstract 2558; Table 1.

	coef	HR	se(coef)	z	P	lower 0.95	upper 0.95
Year = 1999-2000	-0.18	0.84	0.11	-1.68	0.092	0.68	1.03
Year = 2001-2002	-0.17	0.85	0.10	-1.70	0.090	0.70	1.03
Year = 2003-2004	-0.30	0.74	0.10	-2.98	0.003	0.61	0.90
Race = African American	-0.30	0.74	0.10	-3.16	0.002	0.61	0.89
Race = Native American	0.28	1.32	0.50	0.55	0.581	0.49	3.52
Race = Asian	-0.27	0.76	0.14	-1.93	0.054	0.58	1.00
Race = Unknown	-14.31	0.00	424.65	-0.03	0.973	0.00	Inf
Age at diagnosis	0.00	1.00	0.00	5.36	0.000	1.00	1.01

Conclusion: Previous studies have cautioned that IMRT may theoretically double the second malignancy rate of 3D conformal RT. Our Cox proportional hazards regression showed that the second malignancy risk of patients treated with EBRT during 2003-2004 demonstrated a statistically significant decrease. Assuming 2001-2004 saw a sharp increase in IMRT use for PCa, our results appear to contradict the theory of increased second malignancy with IMRT. This finding warrants additional study to elucidate the true impact of IMRT on second malignancy as cancer survival continues to increase.

Author Disclosure: C. Wang: Consultant; ViewRay. K. Iwamoto: None. J. Wang: None. D. Low: Research Grant; Varian, Siemens. M.L. Steinberg: Travel Expenses; ViewRay. A.M. Chen: None.

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Clinical Outcomes for Patients With Gleason Score 9-10 Prostate Adenocarcinoma Treated With Radiation Therapy or Radical Prostatectomy: A Comparative Analysis

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Purpose/Objective(s): To compare outcomes of patients with Gleason score (GS) 9-10 prostate adenocarcinoma (CaP) following external beam radiation therapy (EBRT), extremely dose-escalated radiation therapy (as exemplified by EBRT with a brachytherapy boost [EBRT+BT]), and radical prostatectomy (RP).

Materials/Methods: Four hundred eighty-seven patients with biopsy GS 9-10 CaP receiving definitive treatment between 2000 and 2013 were included (230 treated with EBRT, 87 with EBRT+BT, and 170 with RP). The majority of radiation therapy patients received androgen deprivation therapy (ADT) as part of their initial treatment. Kaplan-Meier analysis was performed to estimate 5- and 10-year rates of biochemical recurrence free survival, distant metastasis-free survival (DMFS), cancer-specific survival (CSS), and overall survival (OS). Outcomes between cohorts were compared using multivariate Cox regression adjusted for age, GS, clinical stage, and initial PSA.

Results: The median follow-up of the overall cohort was 4.6 years. Local salvage and systemic salvage were performed more frequently in RP patients (49.0% and 30.1%) when compared with either EBRT patients (0.9% and 19.7%) or EBRT+BT patients (1.2% and 16.1%, P<0.0001). Five- and 10-year DMFS rates were significantly higher with EBRT+BT (94.6% and 89.8%) than with EBRT (78.7% and 66.7%; P = 0.0005) or RP (79.1% and 61.5%; P<0.0001). The 5- and 10-year CSS and OS rates were similar across all three cohorts.

Conclusion: Radiation therapy and RP provide equivalent CSS and OS despite the significantly more frequent use of salvage therapies after RP. Extremely dose-escalated radiation therapy offers improved systemic control when compared with either EBRT or RP. These data suggest that extremely dose-escalated radiation therapy with ADT might be the optimal upfront treatment for patients with biopsy GS 9-10 CaP.

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Semiautomated Prostate Cancer Segmentation on High b-Value Diffusion-Weighted Magnetic Resonance Imaging Predicts Whole Mount Histopathology

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Purpose/Objective(s): To evaluate a commercially available generic semi-automated tumor segmentation program using high b-value diffusion weighted magnetic resonance imaging (MRI) to estimate the total tumor burden in prostate cancer patients with whole mount histopathology as the reference standard.