EFFECT OF PRIOR RADIATION ON SURVIVAL IN BLADDER CANCER: A POPULATION ANALYSIS

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Background

- Exposure to ionizing radiation is a risk factor for the development of bladder cancer.[1]
- Retrospective analyses suggest that patients with bladder cancer with a history of radiation for prostate cancer develop bladder tumors of higher stage and higher grade.[2]
- However, few data exist on survival outcomes for patients who develop bladder cancer following radiation exposure.

Objectives

- To assess overall and disease specific survival in patients who develop bladder cancer following radiation therapy for a separate malignancy
- To evaluate stage-specific survival outcomes for bladder cancer patients previously treated with radiation

Methods

- Surveillance, Epidemiology, and End Results (SEER) database queried to identify patients diagnosed with bladder cancer as second malignancy
- Patients having undergone radiation prior to developing bladder cancer selected for comparative analysis
- A total of 25,836 patients were identified, of which 15,034 had available survival data for analysis (identified in SEER 9 series)
- Kaplan-Meier analysis and Cox non-proportional hazards regression models were used to assess the association between previous radiation and bladder cancer survival
- A sub-analysis was performed to assess stage-specific survival (n=5,041)

Results

- Five-year all cause survival: HR 1.04 (CI 0.99-1.08)
- Five-year bladder cancer specific survival: HR 1.12 (CI 1.03-1.23)
- For NMIBC, prior radiation associated with elevated all-cause and bladder cancer-specific mortality at five years (Table 1)
- For MIBC, there was a trend towards increased five-year bladder cancer-specific mortality

Conclusions

- A history of previous radiation appears to confer a five-year survival disadvantage for patients with bladder cancer
- Urologists caring for bladder cancer patients with a history of radiation should be aware of the increased risk and the potential for different behavior of these tumors

Overall Survival

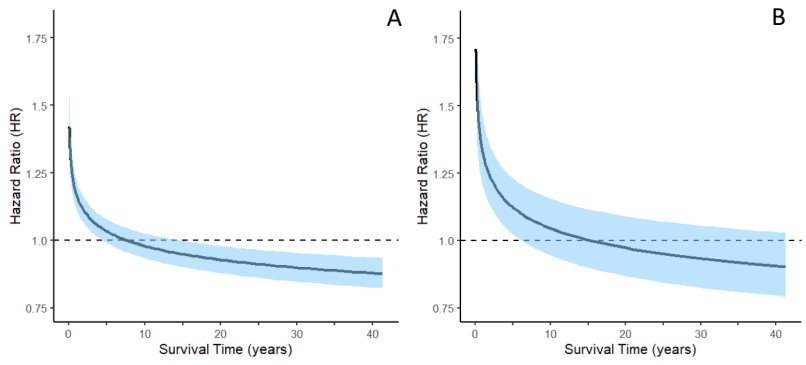

Figure 1. Estimated hazard ratios across the full survival period, 0-41.3 years, for all-cause (A) and bladder cancer specific (B) mortality. Hazard ratio curves were smoothed by estimating associations at 120 equidistant survival points. Shaded regions represent 95% confidence intervals, and the horizontal band at HR=1.0 represents the null association (n = 15,034).

Stage-specific Survival

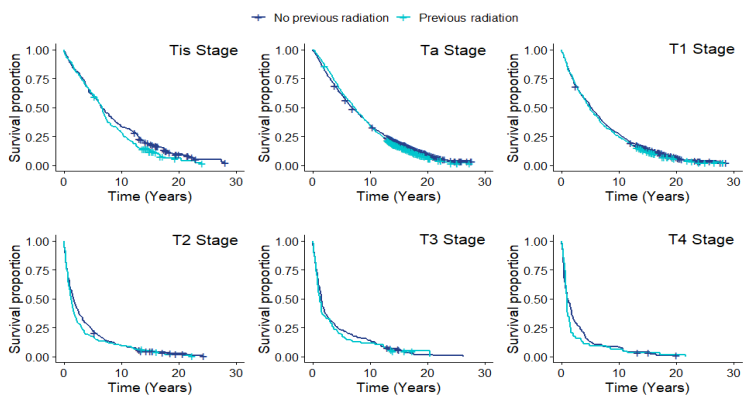

Figure 2. Kaplan-Meier survival curves for bladder cancer patients with and without history of previous radiation, by T stage at diagnosis. Includes cases reported to a SEER 9 registry from 1988-2003 (N=5,041).

Table 1. Hazard ratios (HRs) and 95% confidence intervals (CIs) estimated at five-year survival timepoint by stage. HRs and 95% CIs estimated by Cox regression using log survival time interaction terms to model non-proportional hazards.

T stage	Previous radiation	Total N	Deaths N	5-year survival HR (95% CI)
All cause mortality				
All stages	No	3,175	2,885	ref
	Yes	1,866	1,716	1.17 (1.09, 1.24)
Tis	No	228	203	ref
	Yes	174	158	1.53 (1.21, 1.92)
Ta	No	1,477	1,295	ref
	Yes	975	875	1.51 (1.35, 1.68)
T1	No	780	718	ref
	Yes	407	380	1.09 (0.95, 1.24)
T2	No	355	343	ref
	Yes	153	150	0.99 (0.80, 1.21)
T3	No	202	196	ref
	Yes	94	90	0.82 (0.61, 1.10)
T4	No	133	130	ref
	Yes	63	63	1.16 (0.79, 1.71)
Bladder cancer specific mortality				
All stages	No	3,175	544	ref
	Yes	1,866	371	1.23 (1.07, 1.41)
Tis	No	228	34	ref
	Yes	174	41	2.16 (1.34, 3.47)
Ta	No	1,477	228	ref
	Yes	975	166	1.35 (1.06, 1.73)
T1	No	1,477	228	ref
	Yes	407	84	1.26 (0.95, 1.67)
T2	No	355	74	ref
	Yes	153	41	1.19 (0.77, 1.84)
T3	No	202	31	ref
	Yes	94	14	1.00 (0.50, 2.01)
T4	No	133	42	ref
	Yes	63	25	1.44 (0.80, 2.61)

References:

1. Murray L, Henry A, Hoskin P, Siebert FA, Venselaar J. Second primary cancers after radiation for prostate cancer: A systematic review of the clinical data and impact of treatment technique. *Radiother Oncol*. 2014;110(2):213-228. doi:10.1016/j.radonc.2013.12.012
2. Yee DS, Shariat SF, Lowrance WT, et al. Impact of Previous Radiotherapy for Prostate Cancer on Clinical Outcomes of Patients With Bladder Cancer. *J Urol*. 2010;183(5):1751-1756. doi:10.1016/j.juro.2010.01.014