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Authors

Xu, Melody
Diao, Dongmei
Lazar, Ann
et al.

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Title: High-dose rate brachytherapy boost for T3 prostate cancer patients: a single institution experience

Authors: Melody J. Xu, MD[1]; Dongmei Diao, MD[1,2]; Ann Lazar, PhD[1]; Katsuto Shinohara, MD[3]; Albert J. Chang, MD[4]; Adam Cunha, PhD[1]; I-Chow Hsu, MD[1]

[1] Department of Radiation Oncology, University of California San Francisco, San Francisco, CA
[2] Department of Surgical Oncology, First Affiliated Hospital of Xi'an Jiaotong University, Xi'an, China
[3] Department of Urology, University of California San Francisco, San Francisco, CA
[4] Department of Radiation Oncology, University of California Los Angeles, Los Angeles, CA

Abstract (3000 char)

Background: Treating prostate cancer with extraprostatic extension (stage T3a) or seminal vesicle invasion (stage T3b) using brachytherapy boost after external beam radiotherapy (EBRT) enables dose escalation and is technically challenging. Treatment outcomes associated with high-dose rate (HDR) brachytherapy boost for T3 disease have not been well described.

Objectives: Assess disease control rates among patients treated with HDR brachytherapy boost for T3 disease.

Methods: Retrospective chart review was performed to identify patients with T3 prostate cancer treated with combination EBRT and HDR brachytherapy boost between July 1997 and September 2014. Biochemical recurrence (BCR), defined as prostate specific antigen (PSA) nadir + 2 ng/mL, locoregional recurrence (LRR), distant metastases (DM), and prostate-cancer specific mortality (PCSM) were estimated using cumulative incidence and subdistribution hazard ratio (SHR) competing risk analysis. Overall survival (OS) was estimated using Kaplan Meier product limit estimator, with Cox proportional hazards modeling used to analyze associations between pre-treatment characteristics and survival outcomes.

Results: Of 185 patients, 139 (75.1%) had T3a and 46 (24.9%) had T3b disease. Gleason 8-10 disease was present in 87 (47.3%) patients and the median PSA was 9.3 (interquartile range [IQR] from 25th to 75th percentile, 5.8-19.4). Nearly all patients received whole pelvis EBRT (178, 96.2%) and androgen deprivation therapy (95.7%, median duration 11 months).

The median follow-up time was 89 months (IQR 49-122). The 8-year BCR rate was 29%; 26.1% for T3a and 38.3% for T3b (SHR 1.5, 95% CI 0.9-2.7, p = 0.15). The 8-year LRR rate was 7.9%, 5.2% for T3a and 16.8% for T3b (SHR

2.3 95% CI 0.9-6.1, p = 0.09). The 8-year DM rate was 11.9%, 9.2% for T3a and 21.3% for T3b (SHR 3.0, 95% CI 1.5-6.2, p = 0.003). The 8-year PCSM rate was 3.6%, 1.9% for T3a and 9.1% for T3b (SHR 6.1, 95% CI 1.6-23.7, p = 0.008). The 8-year OS rate was 90.1%, 91.5% for T3a and 85.7% for T3b disease (Cox HR 2.1, 95% CI 0.9-4.7, p = 0.07). Grade 3 or higher gastrointestinal and genitourinary (GU) toxicities were rare; only one patient had a grade 3 chronic GU toxicity (0.6%).

Conclusions: HDR brachytherapy boost for T3 prostate cancer was well tolerated. Patients with T3b disease had higher rates of LRR and statistically significantly higher rates of DM and PCSM. This suggests HDR brachytherapy boost is safe and efficacious for T3 disease, but combination chemohormonal agents may be necessary to address the high metastatic risk in patients with locally advanced prostate cancer, particularly for T3b disease.