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Pelvic Chemoradiation with HDR Brachytherapy Boost for Synchronous Prostate and Rectal Cancers

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Abstract
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Aren S. Saini [1], Ritesh Kumar [2], Isabella Bustillos [3], Aditya Garg [3], John S. Peterson [4], Lorraine Portelance [4], Morgan Tharp [4], Kosj Yamoah [4], G Daniel Grass [4], Jessica M. Frakes [4], Sarah E. Hoffe [4], Bruce Libby [4], Dylan Hunt [4], Amarjit S. Saini [4], Daniel Fernandez [4], Ronald Ennis [2], Anupam Rishi [4]

1. Department of Radiation Oncology, University of Miami Miller School of Medicine, Miami, FL, USA 2. Department of Radiation Oncology, Rutgers Cancer Institute of New Jersey, New Brunswick, NJ, USA 3. Department of Radiation Oncology, University of South Florida Morsani College of Medicine, Tampa, FL, USA 4. Department of Radiation Oncology, Moffitt Cancer Center, Tampa, FL, USA

Corresponding author: Aren S. Saini, axs2285@miami.edu

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Abstract

Purpose: Synchronous prostate and rectal cancers are rare and present competing priorities for local therapy. Prostate external beam radiation therapy (EBRT) can elevate rectal dose and compromise anastomotic healing after rectal chemoradiation therapy (CRT). High-dose-rate brachytherapy (HDR BT) provides conformal intraprostatic dose escalation while minimizing rectal exposure, making it an attractive strategy in this setting. The aim of this study is to report outcomes of pelvic CRT combined with HDR BT boost for synchronous prostate and rectal/anal cancers and propose a practical treatment algorithm.

Methodology: We retrospectively reviewed a multi-institutional cohort between 2011 and 2023 to identify six men (ages 60–78) with synchronous prostate and lower rectal/anal cancers treated with curative intent. All patients received guideline-concordant pelvic CRT. Prostate HDR BT boosts were delivered to the prostate ± proximal seminal vesicles with planning objectives of prostate V100 ⩾95%, prostate D90 ⩾100% Rx, rectum V75% ⩽1cc%, and urethra D10 ⩽115%. Surgery or non-operative management of the rectal/anal primary was performed per standard protocols. Acute and late toxicities were graded per CTCAE v5.0. Outcomes included rectal pathologic response, biochemical control as measured by prostate-specific antigen (PSA), locoregional recurrence, distant metastasis, and overall survival.

Results: All patients completed CRT, HDR BT, and surgery or non-operative management without unplanned interruptions. CRT was 45–50.4 Gy in 25–28 fractions with concurrent 5-fluorouracil or capecitabine, followed by HDR BT (14.5–15 Gy in a single fraction in 5 patients; 23 Gy in 2 fractions in 1 patient). At a median follow-up of 40 months (range, 30–110 months) after HDR BT, no locoregional recurrences were observed. Two rectal cancers achieved a pathologic complete response, and four additional patients remained recurrence-free. All prostate cancers remain biochemically controlled by PSA. Two patients developed distant metastases from the rectal primary three years after treatment; both demonstrated radiographic responses to systemic therapy. HDR-BT achieved excellent prostate coverage (V100 94.6–97.7%, D90 103–107%) and rectal sparing (rectum D2cc 40–72% of prescription, V75 ⩽1.4 cc). Only a single late grade 3 event (proctitis/urethral stricture) occurred in one patient who had received fractionated high-dose HDR BT. In contrast, all patients treated with a single 14.5–15 Gy HDR BT boost experienced no grade ⩾3 GU/GI toxicities, and acute CRT-related side effects (primarily diarrhea and urinary frequency) were limited to grade 1–2 and resolved.

Conclusions: Long-course CRT followed by HDR BT boost is feasible and effective for men with synchronous rectal or anal and intermediate- to high-risk prostate cancers. This approach maintains rectal oncologic outcomes, delivers definitive prostate dosing, and avoids the rectal toxicity associated with EBRT boosts. These findings support HDR BT boost as a preferred strategy and justify further prospective evaluation.