

malignancies comprised the first patient cohort. One hypothetical operational efficiency to be gained with prospective peer review is the opportunity to identify clinically-meaningful changes upstream such that replanning is not required should the same suggested change be retroactively identified after the patient starts treatment. There were daily 30-minute peer review sessions four times per week with a required quorum of two radiation oncologists and one medical physicist. Attendees reviewed each plan, including feedback indicating “must change,” defined as prompting a mandatory hold in treatment planning until the change was made. Contours were reviewed prior to planning and plans prior to treatment start. Data including the number of patient cases, time per case, and error detection rates were recorded. The TNR was calculated as: $((\text{time per case}) \times (\text{individuals required for peer review})) / (\text{must change rate})$. This framework was then extended to explore and predict how different case throughput and error detection rates impact the TNR. To assess the potential for operational time savings, the estimated time saved for every replan avoided was four hours.

Results: During the first 25-weeks of prospective thoracic peer review, the mean number of cases per week was 18.4, the time per case was 0.1 hours, three individuals were mandatory attendees for peer review, and the must change rate was 8.4%. Based on these clinical values, the TNR was 3.6 hours. If the time required to review each case decreases to 0.05 hours but the error rate remains the same, then the TNR decreases to 1.8 hours. If the error rate decreases to 5% and each case requires 0.05 hours to review, the TNR is 3.0 hours.

Conclusion: Disease-specific peer review identified an 8.4% mandatory change rate. The number of people-hours required to identify one plan requiring mandatory change was 3.6 hours. Compared to an estimated four hours to replan a case, prospective peer review was operationally time saving. This proposed concept of “time needed to review” can be used to model potential time savings in other disease sites and clinical settings.

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Rectal-Avoidance PTV Margins in Prostate Radiation: A Large Volume Single-Institution Retrospective Series

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Purpose/Objective(s): Continued advancements in prostate radiotherapy techniques have allowed for planning target volume (PTV) margin reductions, leading to improvements in radiation-related gastrointestinal (GI) side effects. Standard PTV expansions assume that the setup error is a normal distribution around a mean. This study evaluated the oncologic and toxicity outcomes of patients treated with prostate radiotherapy with the assumption that the PTV error is one-sided and removing the PTV overlap with an empty rectum. By reducing the PTV expansion overlapping with the rectum, we aimed to reduce GI toxicity, while maintaining oncologic efficacy.

Materials/Methods: Data was collected from 365 consecutive patients treated with intensity-modulated radiotherapy (IMRT) for intermediate or high-risk prostate cancer. Patients were treated with 70 Gy in 28 fractions or 78 Gy in 39 fractions. All patients were simulated after at least one enema and re-simulated if bowel emptying was not achieved. The PTV was a 7 mm circumferential expansion from the prostate, except for 4 mm posteriorly, and all overlap with the rectum was removed from the PTV, effectively resulting in no posterior margin where the prostate and rectum touched. Biochemical recurrence-free survival (BCRFS), distant metastasis-free survival (DMFS), prostate-cancer specific survival (PCSS), and overall survival (OS), were calculated using Kaplan-Meier analysis. Acute and late toxicities were graded using CTCAE v5.0.

Results: Median follow-up was 121.5 months. Most patients had unfavorable intermediate-risk or high/very-high risk disease (84.4%), and were treated with moderate hypofractionated RT (98.6%). The 10-year BCRFS, DMFS, PCSS, and OS rates were 82.8%, 92.3%, 97.5%, and 70.7%, respectively. Local recurrence as defined by biopsy or PSMA PET positivity (in the setting of rising PSA) at 10 years was 2.7%. 6 of the 11 patients with local failures occurred in the posterior of the prostate. Acute Grade 2 GI toxicity was observed in 2.2% of patients, and late Grade 2 GI toxicity was 0.5%, with no Grade 3+ GI toxicity observed. Acute Grade 2 genitourinary (GU) toxicity occurred in 32.6% of patients, while late Grade 2 GU toxicity was 8.2%, and late Grade 3 GU toxicity was 1.1%. Comparisons with modern trials revealed that our cohort had significantly lower rates of acute and late GI toxicity, suggesting that reducing the overlap of the PTV with an empty rectum minimizes toxicity without compromising oncologic control.

Conclusion: Reducing the PTV expansion posteriorly by ensuring a patient has an empty rectum at simulation resulted in expected oncologic outcomes with a near absence of GI toxicities. This technique offers a viable, non-invasive alternative to rectal spacers, simplifying treatment and reducing cost. Prospective studies are warranted to validate these findings and further explore their long-term impact on patient outcomes and quality of life.

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Prostate-Specific Membrane Antigen (PSMA) Imaging Practice Patterns and Association with Androgen Deprivation Therapy Usage: Results from a Prospective Statewide Radiation Therapy Quality Consortium

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Purpose/Objective(s): In December 2020, the FDA approved PSMA positron emission tomography (PET) imaging for men with prostate cancer. Compared to computed tomography and bone scan, PSMA-PET offers superior diagnostic accuracy; however, its utilization and influence on planned androgen deprivation therapy (ADT) with curative-intent radiotherapy remain unknown. Given this rapidly evolving landscape, we leveraged a prospective statewide consortium to analyze current PSMA-PET trends and their association with ADT use in contemporary practice.

Materials/Methods: Patients enrolled in the statewide consortium with non-metastatic, Gleason grade group 3-5 prostate cancer were included; those with M1 disease were excluded. Clinical and treatment variables were collected prospectively using standardized forms, including diagnostic imaging, radiotherapy details, and ADT intent, type, and duration. The primary outcome was PSMA-PET staging utilization. Secondary analyses assessed associations between PSMA-PET staging and guideline-concordant ADT (18-36 months, “GC ADT”) in the high-risk/N1 cohort using multivariable analysis (MVA) adjusted for treatment facility, T-stage, Gleason grade group, and PSA.

Results: Between 04/01/2021 and 11/30/2024, 1,023 patients from 26 centers met inclusion criteria. Overall, 352 patients (34%) underwent PSMA-PET staging, including 238 of 511 (47%) with high-risk disease. Utilization increased annually (0% in 2021 to 59% in 2024 among all patients, and 0% to 74% in the high-risk cohort; both p-trend <0.01). Rates of guideline-concordant ADT in the high-risk/N1 cohort were similar between those staged

with PSMA-PET (164/228, 72%) and those without (176/268, 66%; $p=0.13$). On MVA, PSMA-PET use was not significantly associated with guideline-concordant ADT (OR 1.2 [0.7-2.1], $p=0.45$). Among PSMA-staged high-risk patients, 50 of 232 (22%) had pelvic lymph node-positive disease, with higher GC ADT utilization in PSMA node-positive cases versus node-negative (85% vs. 68%, $p=0.02$). In MVA, pelvic lymph node positivity remained a significant predictor of GC ADT use (OR 2.4 [1.1-5.4], $p=0.04$).

Conclusion: PSMA-PET utilization has increased dramatically within a statewide consortium, with three-fourths of high-risk patients undergoing molecular imaging in 2024. Guideline-concordant ADT rates were similar regardless of staging imaging modality. However, within the PSMA-staged cohort, pelvic lymph node positivity was associated with a two-fold increase in GC ADT use. Ongoing trials, such as NRG GU009 (NCT04513717), which incorporate PSMA-based staging, may better define the optimal ADT duration as molecular imaging becomes more integrated into clinical practice.

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Postoperative Hypofractionated Radiotherapy for Prostate Cancer: Late Toxicity and Clinical Outcomes

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Purpose/Objective(s): Postoperative radiotherapy (RT) is recommended for patients with PSA recurrence as salvage RT and patients with high-risk pathologic features as adjuvant RT. Due to the low α/β ratio of prostate cancer (PC), hypofractionated RT (HFRT) has the potential to realize the dose escalation without increasing treatment duration and toxicity. However, current data on postoperative HFRT have been limited, with the majority of studies constrained by short-term follow-up periods. Late genitourinary (GU) toxicities are the primary safety concern, and few investigations have systematically characterized the incidence and related factors of these late GU toxicities. The aim of this study is to evaluate the clinical outcome, late toxicity of a large retrospective cohort with a relatively long follow-up period, and we also identify the factors affecting late GU toxicities.

Materials/Methods: We conducted a retrospective analysis of all PC patients who received postoperative HFRT from 2017 to 2020 at our institution. The inclusion criteria were as follows: (1) RP and histologically confirmed PC; (2) the dose of prostatic bed CTV was 62.75 Gy in 25 fractions; (3) no distant metastases before RT. Daily image-guided intensity modulated RT was performed in all patients. Acute and late GU and gastrointestinal (GI) toxicity were graded using CTCAE, v5.0. Endpoints of the analysis were outcome in terms of overall survival (OS), disease specific survival (DSS), biochemical progression free survival (bPFS) and event free survival (EFS). Univariate and multivariate Cox regression analyses were performed to test the association.

Results: A total of 326 patients were included in the analysis. The median age was 66 years (range: 48-84) and median follow-up was 51 months (range: 13-76). At baseline, patients with $\geq pT3a$, positive margin, Gleason score 8-10 and $PSA_{max} \geq 20$ ng/mL took 73.3%, 61.0%, 51.8% and 38.6%, respectively. The 5-year OS, DSS, bPFS and EFS rate were 94.6%, 98.5%, 90.7% and 74.7%, respectively. 6.1% and 2.5% patients reported acute G2 GI and G2 GU toxicity. 1.5%, 28.8% and 9.2% patients reported late G2 GI, G2 GU and G3 GU toxicity. The most frequent late $\geq G2$ GU events were incontinence worsening and hematuria. Univariate analysis identified bladder V60Gy (%) as a predictor of late $\geq G2$ hematuria. For late $\geq G2$ incontinence worsening, univariate analysis revealed three associations: preRT G2-3 incontinence, bladder V60Gy (%), and bladder V50Gy (%). Multivariate analysis confirmed preRT G2-3 incontinence as an independent predictor of late $\geq G2$ incontinence worsening. Patients receiving cystoscopy exhibited a significant higher rate of $\geq G2$ incontinence worsening than did those who did not undergo ($p<0.001$).

Conclusion: The clinical control in this HFRT series appears promising, and longer follow-up may be needed to collect more late toxicity data, especially GU toxicity. Limiting bladder V60 Gy may reduce RT-related hematuria. The benefit and risk should be balanced when performing cystoscopy.

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PREDICTO-Ren – Personalized Radiomics-based Determination of Individual Cancer Treatment Outcome in Patients with Renal Cancer

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Purpose/Objective(s): The use of Stereotactic Ablative Radiotherapy (SABR) for renal cell carcinoma (RCC) is gaining popularity as a curative non-invasive alternative, offering excellent local control with minimal toxicity. Most studies use the RECIST criteria to assess tumor response following SABR. Despite its efficacy, the time for treatment radiological response is long and variable, making patient follow-up and treatment assessment challenging, sometimes generating anxiety among patients and referring Urologists. This study aims to develop a radiomic signature to predict the time to local response after SABR, allowing for personalized patient monitoring.

Materials/Methods: We analyzed data from patients treated with SABR for RCC at a high-volume center between March 2016 and December 2023. Computed tomography (CT) scans from diagnosis and treatment planning were integrated with clinical and digital pathology data to extract radiomic features. Treatment response at one year (TR1y) after SBRT was assessed using diagnostic CT scans, with responders defined as those showing a $>30\%$ reduction in tumor size. Significant features were identified using the Mann-Whitney U and t-tests. Linear Discriminant Analysis (LDA) was employed for model engineering, while Kaplan-Meier and Log-rank tests were used for survival analyses.

Results: We analyzed 47 lesions in 46 patients, with a median follow-up of 29 months (95% CI: 16-39). The overall tumor response at 1 year (TR1y) was 38.9% (95% CI: 27–52.2). The dose-fractionation most commonly used was 40Gy in 5 fractions (33 patients), followed by 26 single-fraction (9 patients). Eighty-four radiomic features were statistically relevant ($p < .05$), with Elongation ($p = .0099$) and Small-Area Low-Gray Level Emphasis ($p = .0068$) being the most significant. The radiomic risk signature stratified patients in high- or low-risk. Based on TR1y, the high-risk patients, or non-responders, had a significantly delayed response, with a median time to response of 19 months (95% CI: 16.5–21.4), compared to 10.4 months (95% CI: 8.4–12.4) of the low-risk group ($p < 0.001$, HR: 0.10; 95% CI: 0.02