

PSMA PET/CT–based Patterns of Prostate Fossa Recurrence after Radical Prostatectomy: Clinical Implications for Salvage Radiation Therapy

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Background: Post-operative radiation therapy (RT) to the prostate fossa (PF) is a potentially curative treatment after radical prostatectomy (RP). RT target volumes follow contouring guidelines based on expert consensus and do account for information derived from contemporary imaging, such as PSMA PET. The goal of this study was to analyze the patterns of PF recurrence in patients with biochemical recurrence (BCR) of prostate cancer (PCa) after RP using ⁶⁸Ga-PSMA-11 PET/CT (PSMA PET). Patterns of PSMA PET recurrence were evaluated in relation to the RTOG-based clinical target volumes (CTVs).

Materials and Methods: Patients with BCR post-RP were included in the study if their PSMA PET showed evidence of recurrence in the PF. Two nuclear medicine physicians manually delineated the PF lesions on the CT images of the PSMA PET/CT. Four radiation oncologists, masked to the PSMA PET, contoured the RTOG-based CTVs on the same CT. The coverage of the PSMA PET recurrence by the CTVs was categorized in consensus between a nuclear medicine physician and a radiation oncologist, as follows: fully within, fully outside or partly covered. Further, we evaluated the differences in PSMA recurrence patterns among patients with PF limited disease (miTrN0M0), pelvic nodal (miN1) and extra-pelvic disease (miM1).

Results: 2,415 PSMA PET scans were screened and 230/2,415 (10%) with confirmed PF recurrence on PSMA PET were included in the analysis. 127 patients had recurrence limited to the PF (miTrN0M0), 30 had pelvic nodal involvement (miTrN1M0), 34 had extra-pelvic disease (miTrN0M1), and 39 had both pelvic nodal and extra-pelvic disease (miTrN1M1).

In the miTrN0M0 cohort, the PSMA-positive recurrences were fully covered by the CTV in 68/127 (54%) of the patients, partly covered in 43/127 (34%), and fully outside in 16/127 (13%). Lesion not fully covered by the CTV exceeded contours on the posterior border in 21/127 (72%), postero-lateral in 15/127 (35%), postero-inferior in 2/127 (5%), anterior in 1/127 (2%), antero-inferior in 1/127 (2%), superior in 1/127 (2%) and inferior in 8/127 (19%) of patients.

The PSMA PET recurrences involved or were in close proximity to the rectal and bladder wall in 12/127 (9%) and 4/127 (3%), respectively.

Conclusions: For patients with prostate fossa limited disease, the RTOG contouring guidelines showed suboptimal coverage of the disease in 46% of patients. Our study suggests that PSMA PET can be a valuable tool for SRT planning in the setting of postoperative BCR. These data should be incorporated in the redefinition of PB contouring guidelines.