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Prostate-Specific Membrane Antigen Positron Emission Tomography/Computed Tomography-Based Clinical Target Volume Delineation Guideline for Postprostatectomy Salvage Radiation Therapy: The PERYTON Guideline

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Abstract

Purpose: Prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) scan is the standard imaging procedure for biochemical recurrent prostate cancer postprostatectomy because of its high detection rate at low serum prostate-specific antigen levels. However, existing guidelines for clinical target volume (CTV) in prostate bed salvage external beam radiation therapy (sEBRT) are primarily based on experience-based clinical consensus and have been validated using conventional imaging modalities. Therefore, this study aimed to optimize CTV definition in sEBRT by using PSMA PET/CT-detected local recurrences (LRs).

Methods and materials: Patients with suspected LR on PSMA PET/CT postprostatectomy were retrospectively enrolled in 9 Dutch centers. Anonymized scans were centrally reviewed by an expert nuclear medicine physician. Each boundary of the CTV guideline from the Groupe Francophone de Radiothérapie en Urologie (GFRU) was evaluated and adapted to improve the accuracy and coverage of the area at risk of LR (CTV) on PSMA PET/CT. The proposed CTV adaptation was discussed with the radiation oncologists of the participating centers, and final consensus was reached. To assess reproducibility, the participating centers were asked to delineate 3 new cases according to the new PERYTON-CTV, and the submitted contours were evaluated using the Dice similarity coefficient (DSC).

Results: After central review, 93 LRs were identified on 83 PSMA PET/CTs. The proposed CTV definition improved the coverage of PSMA PET/CT-detected LRs from 67% to 96% compared with the GFRU-CTV, while reducing the GFRU-CTV by 25%. The new CTV was highly reproducible, with a mean DSC of 0.82 (range, 0.81-0.83).

Conclusions: This study contributes to the optimization of CTV definition in postprostatectomy sEBRT by using the pattern of LR detected on PSMA PET/CT. The PERYTON-CTV is highly reproducible across the participating centers and ensures coverage of 96% LRs while reducing the GFRU-CTV by 25%.

NB: This guideline is the first based on factual relapse locations as seen on PSMA PET and not on expert consensus, and therefore it is a very valuable guideline in my opinion.