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PET-guided stereotactic irradiation of prostate cancer lymph node metastases

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TO THE EDITOR: We read with interest the study by Rauscher et al reporting data about the short-axis diameter of prostate cancer lymph nodes detected by prostate-specific membrane antigen (PSMA) positron emission tomography (PET) (1). They suggest that this imaging modality may be helpful to guide salvage surgery (1). Such a paradigm is already being applied in radiation oncology, where non-invasive PET-guided salvage stereotactic body radiotherapy (SBRT) has entered routine clinical practice (2). Individual lymph nodes detected by choline or PSMA PET/computed tomography (CT) can be irradiated in selected patients with oligo-metastatic prostate cancer. This avoids many of the risks associated with surgery as well as the intra-operative challenge of locating a specific node. In keeping with Rauscher et al, our clinical impression was that the nodal metastases being detected with these scans were frequently under the 8-10mm threshold in short-axis diameter used to identify nodes with a higher risk of being pathological on conventional imaging (3). We therefore reviewed the plans of 46 PET positive prostate cancer nodal metastases treated with SBRT, 37 detected by choline and 9 by PSMA PET/CT. The median short axis on CT, of choline detected nodes was 0.9cm (0.5–2.4), and for PSMA 0.7cm (0.7–1.4), with 10/37 (27%) and 24/37 (65%) choline detected nodes and 5/9 (56%) and 7/9 (78%) PSMA detected nodes having a short axis <8mm and <10mm respectively. These results corroborate those of Rauscher et al and indicate that nodal metastases identified by prostate cancer specific PET imaging would frequently have been considered normal/low-risk by size criteria alone[1]. The median volume of choline and PSMA detected nodes was 1.3cm^3 (0.4–12.6) and 0.6cm^3 (0.4–1.7) respectively.

The authors mention the possibility of incorrectly allocating nodal fields in PET and surgical lymphadenectomy. Accurate targeting is also relevant in radiation oncology, especially when treating individual nodes as opposed to nodal regions. For example, if there are neighbouring PET negative nodes, it may not always be possible to differentiate the nodal metastasis on size or morphological criteria. Therefore, co-registration of the diagnostic PET/CT with the radiotherapy planning CT scan may be used to help identify the target node during treatment planning. In such situations it is important to verify the registration between the PET and the low-dose CT, to ensure that the region with enhanced uptake on PET corresponds to the correct node on the CT, and avoid possible misalignment of the PET and planning CT. A further challenge with small nodes can be good

visualization on the imaging system (e.g. cone-beam CT scan, CBCT), that is used to correctly position the node prior to irradiation. In our experience, if pre-set CBCT scan options are not optimal, certain parameters (on the TrueBeam™ platform, Varian Medical Systems) may be adjusted by the user, improving image quality and facilitating accurate targeting.

Advances in diagnostic imaging are helping to drive new treatment options for patients and are enabling the detection of small metastases, with further reductions in the size threshold being likely (4). This is expected to present additional challenges to clinicians and to manufacturers of image-guided radiation therapy platforms that need to be able to accurately treat ever smaller targets in the body.

DISCLOSURE

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