FOREWORD

Special Focus Issue: Prostate Cancer Imaging

Prostate cancer imaging: a special focus issue from *Future Oncology*

“As we progress to more and more accurate imaging modalities for prostate cancer, we are able to visualize and localize disease that was previously missed.”

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This issue of *Future Oncology* is devoted to prostate cancer imaging. Over the last 10 years, multiparametric MRI (mpMRI) and molecular imaging with PET have increasingly been used to better detect, stage and follow-up prostate cancer. In this special issue, these new ideas for MRI and PET imaging of localized and recurrent prostate cancer are presented. In addition to these, utilization of imaging in clinical decision making in urology and radiation oncology is also discussed.

Borofsky *et al.* discuss technical aspects of mpMRI, which recently became the workhorse of localized prostate cancer management for lesion detection and staging. Several important points on mpMRI such as hardware selection (magnet strength, coil systems), patient preparation, pulse sequence optimization are covered in that review article. They propose that the future is bright for mpMRI as the urology community continues to embrace this evolving technology. Advancements in hardware and software will provide better imaging in less time. As protocol standardization and postprocessing techniques mature, mpMRI will continue to fortify its role as a critical component in prostate cancer management [1].

Mendhiratta *et al.* review the impact of mpMRI on diagnostic and therapeutic

paradigms in contemporary prostate cancer management. They discuss impact of MRI on biopsy performance through guided biopsy approaches, disease staging, stratification, treatment planning for focal therapy and follow-up. They state that “MRI provides the advantage of prebiopsy cancer localization and characterization, thereby allowing improved prebiopsy risk stratification and tumor sampling. For men with low risk disease, MRI and MRI-targeted biopsy facilitate more accurate candidate selection through improved disease characterization. In addition, MRI helps identify men on active surveillance requiring intervention for suspected occult high-grade disease” [2].

Watson *et al.* explain the integration of mpMRI and fusion-guided prostate biopsy with novel biomarkers and predictive nomograms in contemporary clinical practice. They compare novel biomarkers such as prostate cancer antigen 3 (PCA3), 4-Kallikrein (4K) and prostate health index with mpMRI for prediction of clinically significant prostate cancer (PCa). They also comment on existing nomograms for prediction of locally aggressive disease and biochemical recurrence and compare these with MRI. They conclude that mpMRI is now being integrated into the urologist’s clinical practice. As

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mpMRI continues to evolve, and is integrated with prognostic nomograms and novel biomarkers, its impact on the diagnosis, staging and management of PCa will only continue to increase [3].

Active surveillance is a commonly applied strategy for indolent prostate cancer patients and MRI has been increasingly used in major academic centers for this indication. Gupta *et al.* discuss the potential role for prostate mpMRI and targeted biopsy techniques incorporating MRI in the selection of candidates for active surveillance, monitoring patients on active surveillance and as triggers for definitive treatment in their review article. They touch base with the current selection criteria for active surveillance and limited standardization of inclusion criteria through systematic transrectal ultrasound (TRUS)-guided biopsy approach for active surveillance pathway. They provide valuable information on distinguishing high-risk disease from low-risk disease by using MRI and guided biopsies. Finally, they comment on use of MRI in follow-up of active surveillance patients and potential triggers for intervention in those patients. They state that long-term outcomes of active surveillance cohorts will inform us of the added value of MRI in initial risk stratification and follow-up. These data will also allow us to formulate follow-up strategies and the optimal frequency/intensity of mpMRI monitoring [4].

Pathmanathan *et al.* studied the role and challenges of mpMRI and PET in delineating a tumor boost to be delivered by external beam radiotherapy. They focus on identification of the intraprostatic lesions (IPL) by MRI and/or PET and importance of this image-guided intraprostatic boost on dose escalation, patterns of recurrence, improved therapeutic ration, multifocality and dose painting. They explain feasibility of MRI defined boost delivery theoretically, and clinically and potentials of the use of novel tracer PET imaging for the same challenge. They state that dose-escalation to an MRI or PET-CT defined IPL is theoretically feasible, but further studies are needed to confirm the optimal imaging techniques which will faithfully represent the IPL in the radiotherapy planning process [5].

McCammack *et al.* discuss the contemporary imaging paradigm for the evaluation of local prostate cancer recurrence. They explain in detail the role of MRI in patients with biochemical recurrence after surgery, radiation and focal therapy. They also comment on role

of imaging in salvage therapy following biochemical failure. They propose that the decision between these various imaging possibilities and subsequent treatment options will require close interaction in a multidisciplinary format depending on resource availability and skill set to ensure most optimal patient management on an individual case basis [6].

Mertan *et al.* evaluates the role of PET imaging in both recurrent and metastatic prostate cancer. Targeted PET imaging is an emerging topic for prostate cancer with several alternative tracers actively in use. The article covers almost all of them and their use in the setting of recurrent and metastatic prostate cancer. Recent novel approaches such as targeted prostate-specific membrane antigen (PSMA) imaging and bombesin analog agents are also covered in this extensive review article. They conclude that the ideal imaging agent for prostate cancer would detect only clinically significant disease at first diagnosis, at recurrence and at the first signs of metastasis. It would have few false positives and be convenient to use. It would be capable of detecting recurrent disease at prostate-specific antigen (PSA) values <0.5 ng/ml. They propose that being armed with such an agent, the treatment of prostate cancer could be very different. Focal therapies for primary disease and recurrent disease could be developed. Even focal therapies for early metastatic disease could be developed. However, none of the available agents can fulfill that role currently and further research is needed [7].

There are certain current hot topics of prostate cancer imaging. For MRI, a popular topic is PIRADSv2, which is a new standardization system for image acquisition and interpretation of prostate MRI prepared by joint effort of American College of Radiology and European Society of Urogenital Radiology in early 2015. A worldwide expert on this topic and one of the PIRADS committee members, Dr Clare Tempany provided her commentary on PIRADS and explained the opportunities for mpMRI with PI-RADSv2 to make a difference. She noted that PIRADSv2 is a living document and will evolve and change over the years to come [8]. It is the new standard for prostate MRI and it is here to stay. For PET imaging, PSMA targeting agents is a recent hot topic and Dr Thomas Hope and his colleagues from UCSF provided their commentary on PSMA imaging agents. They summarized the importance of this topic as “As

“Imaging using prostate-specific membrane antigen-targeted PET is currently the most accurate imaging option available, but we likely are not seeing the entire distribution of metastatic disease in these patients.”

we progress to more and more accurate imaging modalities for prostate cancer, we are able to visualize and localize disease that was previously missed. Imaging using PSMA-targeted PET is currently the most accurate imaging option available, but we likely are not seeing the entire distribution of metastatic disease in these patients” [9].

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