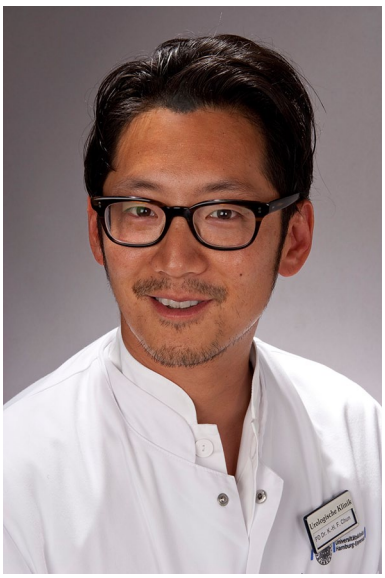
World J Urol (2014) 32:843–845
DOI 10.1007/s00345-014-1354-x

EDITORIAL

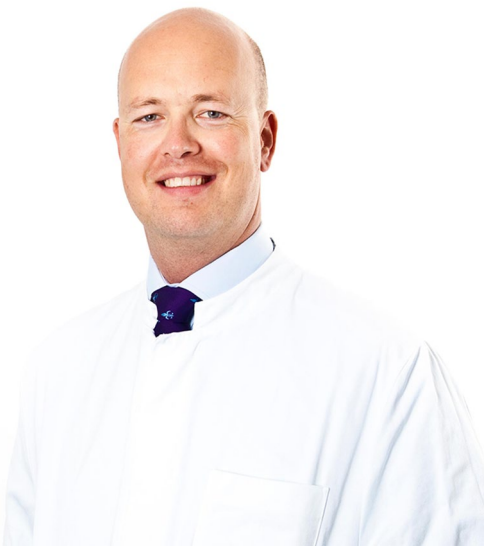
Prostate imaging—the future is now: current concepts and future potentials

Felix K.-H. Chun · Thomas R. W. Herrmann

Published online: 4 July 2014



Felix K.-H. Chun



Thomas R. W. Herrmann

Due to its high prevalence, prostate cancer represents worldwide the leading and consequently the most debated oncologic entity within the field of Urology. Traditionally, back in the days ruling in prostate cancer represented more or less the major goal of early detection or screening activities. Conversely, today based on the growing prospectively derived evidence, multiple relevant aspects prior to an individual prostatic biopsy recommendation need to be considered. The main drivers within this ongoing debate are mainly dominated by the keywords: potential "overdiagnosis" and consequential "overtreatment." In fact, this ongoing debate includes not only a clinical but a health-economical/health-political level, respectively [1–3]. It is of note that urologic key opinion leaders suggest within a NCCN symposium a new terminology for indolent and precancerous disorders stating that "… prostate cancer is probably the tumor with the greatest risk for overdiagnosis and overtreatment …" as recently published in Lancet Oncology [4]. As a consequence, to improve prostate biopsy indication, technique

F. K.-H. Chun (✉)
Department of Urology, University Hospital Hamburg-Eppendorf, University of Hamburg, Hamburg, Germany
e-mail: chun@uke.de

T. R. W. Herrmann
Department of Urology and Urologic-Oncology, Hannover Medical School, University of Hannover, Hannover, Germany

and treatment strategies, multiple novel diagnostic as well as therapeutic concepts are being developed and promoted. With these notions in mind, the aim of the current WJU issue was to give clinicians an update on these much debated aspects in prostate biopsy by inviting state-of-the-art reviews as well as selecting adequate original articles related to prostate biopsy.

Of the invited reviews, pre-operative risk stratification, up-to-today standard randomized biopsy schemes as well as evaluation of different novel imaging technologies are being critically discussed. Firstly, Hansen and colleagues discuss which and how established/novel prostate cancer biomarkers and risk factors prior to prostate biopsy should be used. We believe that this topic is timely and important since the panel of potential biomarkers is constantly changing. The authors made an effort in organizing this wealth of markers and selecting and emphasizing which of those risk factors are promising and indeed how they can be used in clinical practice.

Certainly, it is of utmost importance to know the current recommended randomized biopsy gold standard to situate oneself in relation to the novel imaging technique. In order to do so, the group of Scattoni et al. did an excellent job in summarizing this current status-of-care in different biopsy scenarios as well as in relation to the number and to the direction of randomized biopsy cores. Thus, after reading this review, the clinician will know: why, when, how many and where to take randomized biopsy cores.

Next, despite exciting developments of novel diagnostic tools, two reviews of Pummer and colleagues as well as Walz et al. address the existing body of literature of elastography, contrast enhanced ultrasound, histoscanning, computer-based analysis of the transrectal ultrasound signal (C-TRUS) and multiparametric MRI. One of the several strengths of these meticulous reviews resides in the fact that they clearly demonstrate that in the near-future visualization of prostate cancer lesions is—by far—not far fetched. However, the authors emphasize that currently no recommendation for their routine use can be made. Moreover, there seems to be a clear need of standardization of study designs and study protocols when comparing randomized versus targeted novel imaging-based biopsy protocols in order to achieve an optimal level of prospective evidence, which is key within this exciting field.

Nevertheless, it is important to mention that the future of prostate imaging obviously has already begun. This applies specifically to the MRI technology and may also in part explain its current momentum. For example, the Standards of Reporting for MRI-targeted Biopsy Studies (START) consortium explicitly addressed this debate. The START authors concluded that implementation of their suggested checklist will improve the quality of reporting in MRI-targeted biopsy studies as well as their comparison [5]. Moreover, the European Society of Urogenital Radiology (ESUR) has published a guideline for multiparametric MRI recommending a structured reporting scheme called Prostate Imaging Reporting and Data System (PI-RADS) generating a score which reflects a patient's individual risk profile [6].

Beyond these efforts, other MRI-based technologies such as MRI/TRUS fusion-guided prostate biopsy and even therapeutic concepts such as active surveillance or focal therapy are clearly on the rise. As a prerequisite, these concepts demand high-quality multiparametric MRI pictures. For example, in the detection setting, Rastinehad et al. [7] and Sonn et al. [8] have recently demonstrated improved detection using the fusion technology in detecting clinically significant prostate cancer over standard-randomized biopsies. This finding is of note since prediction of significant disease by clinical variables seems to be insufficient [9] and novel markers still await large-scale validation [10].

As a result, based on these imaging developments, multiple novel areas in urology are being/will be created. For example, novel risk stratification tools will be available, profound MRI knowledge on the urologists' side will be key as well as adoption of novel therapeutic concepts such as active surveillance where imaging may truly reflect surveillance/trigger reflex biopsy or focal therapy in select men where only the "index lesion" is being (re-) treated in order to preserve quality of life and tumor control will be matters of future debates [11–14].

In contradistinction to these truly exciting concepts, the downsides of novel technologies also need a mention. Certainly, multiparametric 3 Tesla MRI does not represent a "one size fits all"—solution in all men with prostate cancer suspicion and is clearly not equally available around the globe. Additionally, efforts to shorten the MRI procedure time beyond 30 min, management of biopsy artifacts, as well as other confounders such as concomitant BPH/infections need to be addressed. Moreover, the personal and logistic efforts are increasing and so do the associated healthcare costs [13, 15, 16].

Taken together, the prostate biopsy scenario is currently becoming distinctively complex. It has clearly moved far beyond any prostate cancer detection, or avoiding biopsy-related complications such as infections or patients' anxiety. Importantly, the future of prostate imaging especially of multiparametric MRI-based technology has already begun. Therefore, as a urologic society, it should be within our own interest to be actively participating within this process and not leaving this field to interventional radiologists/oncologists.

References

1. Hugosson J, Carlsson S (2014) Overdetection in screening for prostate cancer. Curr Opin Urol 24(3):256–263
2. Loeb S, Bjurlin MA, Nicholson J, Tammela TL, Penson DF, Carter HB, Carroll P, Etzioni R (2014) Overdiagnosis and overtreatment of prostate cancer. Eur Urol 65(6):1046–1055
3. Vickers AJ, Sjoberg DD, Ulmert D, Vertosick E, Roobol MJ, Thompson I, Heijnsdijk EA, De Koning H, Atoria-Swartz C, Scardino PT et al (2014) Empirical estimates of prostate cancer overdiagnosis by age and prostate-specific antigen. BMC Med 12:26
4. Esserman LJ, Thompson IM, Reid B, Nelson P, Ransohoff DF, Welch HG, Hwang S, Berry DA, Kinzler KW, Black WC et al (2014) Addressing overdiagnosis and overtreatment in cancer: a prescription for change. Lancet Oncol 15(6):e234–e242
5. Moore CM, Kasivisvanathan V, Eggener S, Emberton M, Futterer JJ, Gill IS, Grubb Iii RL, Hadaschik B, Klotz L, Margolis DJ et al (2013) Standards of reporting for MRI-targeted biopsy studies (START) of the prostate: recommendations from an International Working Group. Eur Urol 64(4):544–552
6. Barentsz JO, Richenberg J, Clements R, Choyke P, Verma S, Villeirs G, Rouviere O, Logager V, Futterer JJ (2012) European society of urogenital R: ESUR prostate MR guidelines 2012. Eur Radiol 22(4):746–757
7. Rastinehad AR, Turkbey B, Salami SS, Yaskiv O, George AK, Fakhoury M, Beecher K, Vira MA, Kavoussi LR, Siegel DN, Villani R, Ben-Levi E (2013) Improving detection of clinically significant prostate cancer: magnetic resonance imaging/transrectal ultrasound fusion guided prostate biopsy. J Urol. doi:10.1016/j.juro.2013.12.007
8. Sonn GA, Chang E, Natarajan S, Margolis DJ, Macairan M, Lieu P, Huang J, Dorey FJ, Reiter RE, Marks LS (2014) Value of targeted prostate biopsy using magnetic resonance-ultrasound fusion in men with prior negative biopsy and elevated prostate-specific antigen. Eur Urol 65(4):809–815
9. Chun FK, Haese A, Ahyai SA, Walz J, Suardi N, Capitanio U, Graefen M, Erbersdobler A, Huland H, Karakiewicz PI (2008) Critical assessment of tools to predict clinically insignificant prostate cancer at radical prostatectomy in contemporary men. Cancer 113(4):701–709
10. Klein EA, Cooperberg MR, Magi-Galluzzi C, Simko JP, Falzarano SM, Maddala T, Chan JM, Li J, Cowan JE, Tsiatis AC, Cherbavaz DB, Pelham RJ, Tenggara-Hunter I, Baehner FL, Knezevic D, Febbo PG, Shak S, Kattan MW, Lee M, Carroll PR (2014) A 17-gene assay to predict prostate cancer aggressiveness in the context of gleason grade heterogeneity, tumor multifocality, and biopsy undersampling. Eur Urol. doi:10.1016/j.eururo.2014.05.004
11. Ahmed HU, Arya M, Freeman A, Emberton M (2012) Do low-grade and low-volume prostate cancers bear the hallmarks of malignancy? Lancet Oncol 13(11):e509–e517
12. Ahmed HU, Hindley RG, Dickinson L, Freeman A, Kirkham AP, Sahu M, Scott R, Allen C, Van der Meulen J, Emberton M (2012) Focal therapy for localised unifocal and multifocal prostate cancer: a prospective development study. Lancet Oncol 13(6):622–632
13. Moore CM, Petrides N, Emberton M (2014) Can MRI replace serial biopsies in men on active surveillance for prostate cancer? Curr Opin Urol 24(3):280–287
14. Salami SS, Vira MA, Turkbey B, Fakhoury M, Yaskiv O, Villani R, Ben-Levi E, Rastinehad AR (2014) Multiparametric magnetic resonance imaging outperforms the Prostate Cancer Prevention Trial risk calculator in predicting clinically significant prostate cancer. Cancer. doi:10.1002/cncr.28790
15. Moore CM, Robertson NL, Arsanious N, Middleton T, Villers A, Klotz L, Taneja SS, Emberton M (2013) Image-guided prostate biopsy using magnetic resonance imaging-derived targets: a systematic review. Eur Urol 63(1):125–140
16. Robertson NL, Hu Y, Ahmed HU, Freeman A, Barratt D, Emberton M (2014) Prostate cancer risk inflation as a consequence of image-targeted biopsy of the prostate: a computer simulation study. Eur Urol 65(3):628–634