Can We Improve the Reproducibility of Quantitative Multiparametric Prostate MR Imaging Metrics?

Edward Johnston, FRCR, and Shonit Punwani, MRCP, FRCR, PhD

UCL Centre for Medical Imaging, 5th Floor, Wolfson House, 4 Stephenson Way, London NW1 2HE
e-mail: *edward.johnston@nhs.net*

Editor:

We read with interest the article by Dr Dinh and colleagues in the July 2016 issue of *Radiology* (1), whereby quantitative metrics derived from multiparametric prostate magnetic resonance (MR) imaging were combined by using generalized linear models to differentiate tumors with a Gleason score of at least 7 in a multiple imager study. The authors describe extracting metrics that included T2-weighted signal intensity normalized to the obturator internus (OI) muscle and skewness and kurtosis from histograms. We wish to offer two constructive comments regarding this.

To our knowledge, the OI muscle was first selected as a normalization region in a study by Engelhard et al (2), but the reasons for using this structure were not stated and were probably arbitrary. Although subsequent studies involving quantitative T2-weighted signal intensity, including ours (3,4), have followed the same method, OI normalization may not represent optimal technique. Indeed, we have found that normalizing T2-weighted signal intensity to the bladder urine signal intensity may improve image–repeat image reproducibility.

We demonstrated this by retrospectively analyzing 14 patients who underwent repeat multiparametric MR imaging studies with two different machines (3.0-T Achieva [Philips, Best, the Netherlands] and 1.5-T Ingenia [Siemens, Erlangen, Germany) between February 2009 and March 2015, with a maximum of 3 months between imaging examinations (E.J., S.P., unpublished data, 2015). A board-certified radiologist contoured the normal transition zone and peripheral zone on a single section at the mid-gland level for each acquisition, and normalized the T2-weighted signal intensity to largest possible ellipsoidal regions of interest positioned within the bladder and on OI muscle.

We found that reproducibility coefficients (5) decreased from 55% to 37% for the transition zone and from 64% to 34% for the peripheral zone when normalized to the bladder (vs OI muscle), which could be explained by the higher signal-to-noise ratio of this region. In addition, we found that reproducibility coefficients for skewness and kurtosis were very poor (>100%) for both apparent diffusion coefficient maps and T2-weighted images, which could explain why these parameters did not contribute to their best performing models.

Multiple imager, multicenter studies provide the most robust evidence of efficacy of quantitative imaging parameters as tools for clinical decision making (6). However, there is an equally important parallel need for prospective studies to determine and improve the reproducibility of quantitative MR imaging–derived metrics.

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