

The role of whole-lesion apparent diffusion coefficient analysis for predicting outcomes of prostate cancer patients on active surveillance

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Abstract

Purpose: To explore the role of whole-lesion apparent diffusion coefficient (ADC) analysis for predicting outcomes in prostate cancer patients on active surveillance.

Methods: This study included 72 prostate cancer patients who underwent MRI-ultrasound fusion-targeted biopsy at the initiation of active surveillance, had a visible MRI lesion in the region of tumor on biopsy, and underwent 3T baseline and follow-up MRI examinations separated by at least one year. Thirty of the patients also underwent an additional MRI-ultrasound fusion-targeted biopsy after the follow-up MRI. Whole-lesion ADC metrics and lesion volumes were computed from 3D whole-lesion volumes-of-interest placed on lesions on the baseline and follow-up ADC maps. The percent change in lesion volume on the ADC map between the serial examinations was computed. Statistical analysis included unpaired t tests, ROC analysis, and Fisher's exact test.

Results: Baseline mean ADC, $ADC_{0-10\text{th-percentile}}$, $ADC_{10-25\text{th-percentile}}$, and $ADC_{25-50\text{th-percentile}}$ were all significantly lower in lesions exhibiting $\geq 50\%$ growth on the ADC map compared with remaining lesions (all $P \leq 0.007$), with strongest difference between lesions with and without $\geq 50\%$ growth observed for $ADC_{0-10\text{th-percentile}}$ (585 ± 308 vs. 911 ± 336 ; $P = 0.001$). $ADC_{0-10\text{th-percentile}}$ achieved highest performance for predicting $\geq 50\%$ growth (AUC = 0.754). Mean percent change in tumor volume on the ADC map was $62.3\% \pm 26.9\%$ in patients with GS $\geq 3 + 4$ on follow-up biopsy compared with $3.6\% \pm 64.6\%$ in remaining patients ($P = 0.050$).

Conclusion: Our preliminary results suggest a role for 3D whole-lesion ADC analysis in prostate cancer active surveillance.

