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New technology quantifies effects of prostate tumor laser ablation

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Prostate cancers are either low-grade, low-risk forms that may be monitored but otherwise untreated. Or they're serious enough to require surgery and radiation.

Monitoring can cause patients anxiety. Radical treatment comes with complications.

For those patients with a low-risk form who still want to take action, MRI-guided laser ablation is a growing treatment that occupies the middle ground by killing tumor cells directly while limiting the effects to the immediate location.

But what happens to the prostate after ablation?

Researchers at Case Western Reserve University have developed computational tools to use magnetic resonance images to quantitatively evaluate the effects on the form and structure of the prostate following treatment.

"The risks of surgery and radiation are well known," said Anant Madabhushi, professor of biomedical engineering at Case Western Reserve and director of the Center for Computational Imaging and Personalized Diagnostics. "This image analysis technology may help us understand the risks of ablation."

The detailed analysis of the shape changes may also yield prognostic

information, he said.

The study is published in the online open access journal *PLOS ONE*. Co-authors include Robert Toth, who earned his PhD in Madabhushi's lab and founded Toth Technology, based in New Jersey; and Dan Sperling, MD, founder of the Sperling Prostate Center, with offices in New York and Florida.

In prostate images taken from eight patients, the researchers detected not only a reduction in the size of the gland, but deformations.

To see the changes, the team developed a tool for co-registration—that is, aligning and fusing the before-and-after treatment images. In addition, the tool takes into account whether deformation is caused by such things as a full bladder or other changes in surrounding organs. It subtracts those influences on the prostate, leaving only the changes due to ablation.

Madabhushi's team has patented the co-registration and analytic tools. The researchers believe the technology could be used to monitor any organ undergoing any of a long list of therapies.

The researchers plan to expand their study to at least 40 more patients and track them and the original eight for another 3-5 years to see how changes in the prostate's shape may correlate with patients' long-term outcomes.

"If the patient has a recurrence of active cancer, is the shape change associated?" Madabhushi asked. "If so, would that change allow us to predict the outcome, acting as an early biomarker?"

Prostate-specific antigen tests may not spike and indicate recurrence for a year.

"Quantifying the changes to the prostate may provide us that information earlier," he said, "and earlier is almost always better for patients."

More information: Robert Toth et al. Quantifying Post- Laser Ablation Prostate Therapy Changes on MRI via a Domain-Specific Biomechanical Model: Preliminary Findings, *PLOS ONE* (2016). DOI: 10.1371/journal.pone.0150016