MedicalXpress

Researchers assess severity of prostate cancers using magnetic resonance imaging

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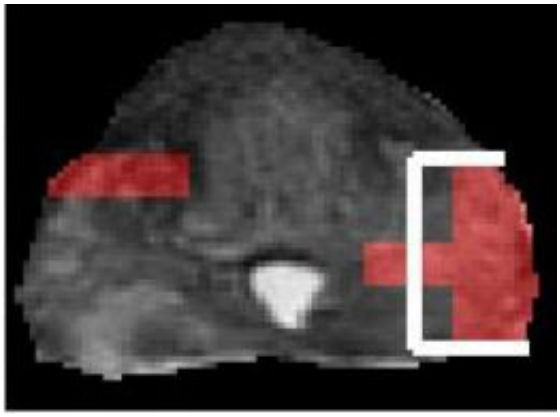


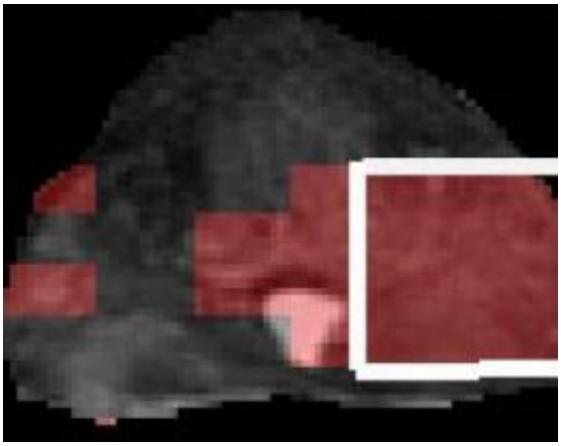
This is an MRI image of prostate gland, with red regions indicating high-grade prostate cancer based on Rutgers image analysis techniques. The area inside the white outline was confirmed as high-grade cancer by analyzing surgically removed gland. Credit: Rutgers, UCSF

Rutgers researchers are developing methods that can accurately assess the severity of prostate cancer by analyzing magnetic resonance images and spectra of a patient's prostate gland. This may help physicians decide more confidently which patients need aggressive treatment and which are better served by "watchful waiting," and could even postpone or eliminate invasive biopsies in patients with low-grade tumors.

In a presentation next month at the world's premier medical image analysis conference, Rutgers biomedical engineers will report that they

achieved over 90% accuracy in distinguishing low-grade from high-grade prostate cancers by running computer analyses of the images and spectra made on 19 patients in an early research study.

"The breakthrough we've had in the last few months is that we see image signatures that distinguish aggressive cancers from less aggressive ones," said Anant Madabhushi, associate professor of biomedical engineering at Rutgers and a member of The Cancer Institute of New Jersey (CINJ).



This is an MRI image of prostate gland, with red regions indicating presence of prostate cancer based on Rutgers image analysis techniques. The area inside the white outline was confirmed as cancerous by analyzing surgically removed gland. Credit: Rutgers, UCSF

These studies build on earlier research at Rutgers and elsewhere to identify prostate cancer using powerful, high-resolution magnetic resonance imaging (MRI) technology.

"Now we're getting beyond merely identifying whether a person has cancer or not," he said. "This could lead to better patient management and cost savings."

Biomedical engineering graduate student Pallavi Tiwari will present research results and describe image analysis techniques at the Medical Image Computing and Computer Assisted Intervention (MICCAI) Conference in Bejing, China, on Sept. 22.

Tiwari and Madabhushi worked with John Kurhanewicz, professor of radiology and biomedical imaging at the University of California, San Francisco, to obtain prostate gland images from 19 patients who later had radical prostatectomies. They examined both traditional magnetic resonance (MR) images, which provide two-dimensional pictures of the gland's cellular structure, and MR spectroscopy, which maps concentrations of certain chemicals to locations in the prostate gland. Changes in concentrations of these chemical metabolites - choline, creatine and citrate - indicate the presence of cancer.

The researchers compared the MR images and spectra to digital images of the actual excised glands, which pathologists identified as having high-grade (aggressive) or low-grade (indolent) tumors using the established Gleason Grading System. They used pattern recognition techniques to recognize characteristics of areas in the MR images and spectra that corresponded to the cancerous tissue in the excised samples. This involved using computerized tools to align the MR views with digitized images of tissue slices, and to match the different resolutions of the images and spectra.

The objective is to "teach" the computer system to accurately and consistently recognize image patterns that correspond to various grades of cancerous tissue without having the tissue samples available to manually verify.

Madabhushi notes that the techniques will have to be evaluated on more people before they can be considered for clinical use. However, he is encouraged by the early results.

Each year, there are more than 27,000 deaths from prostate cancer in the United States and 190,000 new cases diagnosed. Most clinical diagnoses today are based on PSA levels in blood, physical examinations and needle biopsies. While one in six men might expect to get prostate cancer in their lifetimes, only one in 34 will die of it. Recent studies, including one at CINJ, suggest that men with low-risk cancers are receiving aggressive treatment. Improved diagnostic methods such as the Rutgers work could help patients with low-risk cancers and their physicians feel more confident with watchful waiting.

Provided by Rutgers University