Staff Writer
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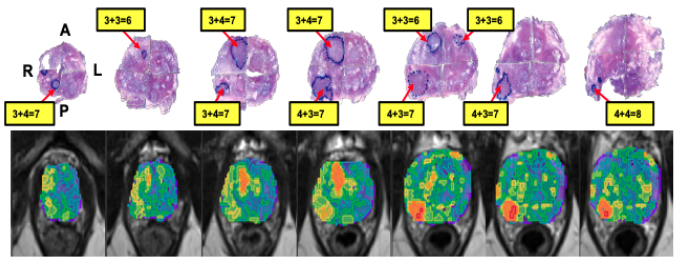
NCI Funds Sylvester Research Aimed at Improving Selection of Patients for Prostate Biopsy

Multidisciplinary research at Sylvester Comprehensive Cancer Center, fueled by a five-year, $2.9 million National Cancer Institute grant, is designed to test the benefit of a novel quantitative MRI imaging algorithm developed at the University of Miami, in combination with blood biomarkers, in selecting patients who should or should not have a prostate biopsy.

Principal investigators Alan Pollack, M.D., Ph.D., professor and chair of radiation oncology and interim deputy director of Sylvester Comprehensive Cancer Center; Radka Stoyanova, Ph.D., professor and director of imaging and biomarkers, radiation oncology; and Sanoj Punnen, M.D., a urologic oncologist at Sylvester and associate professor of urology at the Miller School of Medicine, are collaborating for the single-site study, doing what Dr. Punnen calls “team science.”



Correlation of habitat risk score in MRI images (bottom row) with the radical prostatectomy surgical specimens histological images (top row) in a man with prostate cancer.

Together, they will study undiagnosed men using quantitative multiparametric (mp) MRI to determine if the technology developed by the group, when combined with blood biomarkers, improves the selection of patients who are at a very low risk of having a significant prostate cancer. “Our team has run several clinical trials that provided a framework for the development of software that automates the identification and risk classification of areas in the prostate that should be biopsied,” Dr. Pollack said. Current methods for deciding where to place a needle in the prostate for sampling are much more subjective. “Our approach takes the guesswork out of needle placement for sampling.”

Doctors typically perform biopsies on men thought to be at risk for prostate cancer because of a high prostate-specific antigen (PSA) or other screening test.

Over half of patients sent for prostate biopsies do not have a significant prostate cancer; such biopsies expose patients to unnecessary risks and are associated with substantial cost to the health system. “The problem is the biopsy comes with risk, including infection and other complications,” Dr. Punnen said. “Biopsies often come back negative or with a cancer finding that suggests patients should be monitored with active surveillance and not yet treated. So a lot of patients are subjected to unnecessary basic testing and possibly

unnecessary treatment, if we go straight to the biopsy."

Multiparametric MRI is rapidly becoming the cornerstone for whether to biopsy and where in the prostate to biopsy. The technology is evolving and Sylvester is at the forefront of these advances.

"If the MRI is positive, it suggests the man needs a biopsy. It can also help guide where you put the needle," Dr. Punnen said. "If the MRI is negative, the downside is there's still a 10% to 30% chance there could be a cancer that we just didn't see on the MRI."

The need for better detection and a series of studies and discoveries at Sylvester formed the basis of this latest grant, Dr. Punnen said.

Dr. Stoyanova's group built an image-analysis algorithm that combines the different sequences of mpMRI to map the heterogeneity of the prostate tumors ("habitats"). The algorithm was developed using data from a previous NCI-funded study by Sylvester researchers on men with prostate cancer on active surveillance, as well as other Sylvester-funded protocols. Sylvester researchers then conducted a study on the algorithm's accuracy by looking at 50 radical prostatectomy specimens from patients who had prostate mpMRIs prior to prostatectomy and fusing the images to the reconstructed pathology specimen. Dr. Stoyanova and colleagues compared the MRI, slice by slice, with the actual intact prostate tissue and found that their algorithm did a better job of picking out significant prostate cancers than the standard of care system for scoring prostate MRI.

“We are now testing our scoring system, termed the habitat risk score, along with more sophisticated deep learning methods, for more accurate detection of significant prostate cancer and the decision of whether there is a need for biopsies,” Dr. Stoyanova said.

Dr. Punnen and colleagues have conducted previous major validation studies in urology looking at blood markers, including the 4K score, which is a commercial blood test that is widely used in South Florida.

“Blood markers are tests that clinicians use right before patients go to biopsy to help decide if they need a biopsy or not. We’ve done some work looking at standard-of-care MRI and 4K score, finding two tests are better than one,” Dr. Punnen said. “Now, we’re looking at whether adding this AI aspect will further improve prostate cancer detection.”

In this study, the researchers will look at a collection of blood markers, including the 4K score and others which are more novel and experimental, such as Creatv Microtech’s cancer-associated macrophage-like cell (CAML) biomarker.

The researchers hypothesize that the 30% potential uncertainty with the current standard-of-care MRI at most academic institutions could fall to 16% uncertainty with the artificial intelligence (AI) algorithm. Adding blood markers could bring the level of certainty to more than 90% and uncertainty to less than 10%, according to Dr. Punnen.

“That would make patients much more comfortable with thinking they can safely avoid a biopsy.”

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Sylvester researchers have collaborated to show a continuous pattern of funding for research that crosses multiple aspects of prostate cancer care. The research in this latest grant not only continues that work but also is novel in its use of AI.

“Other groups are looking at various AI modalities in this space, but we’re one of the first to actually incorporate it into a clinical trial to see how well it works,” Dr. Punnen said.