Prostate cancer detected with help from optical imaging system

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Hanli Liu, a University of Texas at Arlington bioengineering professor, has landed a three-year, $958,660 grant from the National Institutes of Health to investigate a minimally invasive way to screen for and diagnose prostate cancer by using a multi-channel optical imaging system.

Liu's solution is in developing an instrument called a Transrectal Optical Imaging Probe.

There is no effective imaging tool currently available for prostate cancer detection. Needle biopsy is the current practice for diagnosis of the disease, which aims randomly in the prostate. Transrectal ultrasound has been used as a guiding tool to direct tissue needle biopsy for prostate cancer diagnosis, but it cannot be utilized for detecting prostate cancer due to a lack of sensitivity.

The overall goal is to develop a novel mathematical method in combination with a transrectal optical imaging system for detection and diagnosis of prostate cancer in humans.

Liu said the probe uses diffused optical tomography, which allows data to be collected from the way it shines in many places throughout the tissue.

"One challenge in recording sharp images in the prostate is that the light is so diffused or scattered," Liu said. "The great imaging technology

available for breast cancer is not easily adaptable to prostate cancer images."

Liu credits Dr. Jeffrey Cadeddu, a key UT Southwestern urology surgeon and professor, with supporting her data collection and Dr. Claus Roehrborn, UT Southwestern's chairman of the urology department, with helping her come up with the Transrectal Optical Imaging Probe. The initial step to obtain prostate cancer signatures was in measuring human samples from prostates that were to be discarded from surgery.

"We looked for cancer signatures in 20 prostate specimens," Liu said. "Those signatures showed there were differences in optical signals so we came up with a scientific foundation for what looked like cancer and what looked healthy in the human prostate."

She said another crucial step in creating a sound imaging system to detect prostate cancer was the development of a convergent algorithm another colleague, Jianzhong Su, a UT Arlington math professor, created.

"That algorithm interprets the data that the probe collects," Liu said.

The probe not only gives researchers data from the diffused light readings, but it also gives sound findings to better tell doctors if a patient has the disease. A colleague in computer science engineering, Associate Professor Jean Gao, will assist the project in cancer discrimination based on computer-trained classification methods.

Furthermore, Liu plans to combine light with ultrasound (so-called photoacoustic technique) to improve the image quality. Liu said, "A photoacoustic device will improve spatial resolution from within the body.

"The probe allows you to listen and see what's happening in the body." For this innovative idea, Liu has received a $110,000 grant from the Department of Defense Prostate Cancer Research Program to explore the new development. She will closely work with her new colleague, Baohong Yuan, new professor, in this study.

Her long-term goal is to develop and refine an imaging instrument that keeps doctors from having to make incisions in the prostate to determine if a patient has cancer.

Provided by University of Texas at Arlington