Novel MRI technique distinguishes healthy prostate tissue from cancer using zinc

22 August 2016

A novel MRI method that detects low levels of zinc ion can help distinguish healthy prostate tissue from cancer, UT Southwestern Medical Center radiologists have determined.

Typical MRIs don't reliably distinguish between zinc levels in healthy, malignant, and benign hyperplastic prostate tissue, so discovery of the technique could eventually prove useful as a biomarker to track the progression of prostate cancer, according to researchers with the Advanced Imaging Research Center, part of UT Southwestern's Harold C. Simmons Comprehensive Cancer Center.

"This research provides the basis for differentiating healthy prostate from prostate cancer by use of a novel Zn(II) ion sensing molecule and MRI," said senior author Dr. A. Dean Sherry, Director of the Advanced Imaging Research Center and Professor of Radiology at UT Southwestern.

The findings appear in the *Proceedings of the National Academy of Sciences*.

"The potential for translating this method to human clinical imaging is very good, and will be useful for diagnostic purposes. The method may prove useful for monitoring therapies used to treat prostate cancer," said Dr. Sherry, who is also Professor of Chemistry at UT Dallas, where he holds the Cecil and Ida Green Distinguished Chair in Systems Biology.

The majority of prostate cancers are classified as adenocarcinomas and originate in epithelial cells. The UTSW researchers initially determined that glucose stimulates release of the zinc ions from inside epithelial cells, which they could then track on MRIs. The prostate cancer tissue secreted lower levels of zinc ions, offering an opportunity to distinguish between malignant and healthy tissue. When they tested the technique on mouse models, they were able to successfully detect small malignant lesions as early as 11 weeks, making the non-invasive imaging procedure a potentially useful method for detecting the disease and its progression.

"Prostate cancer often has no early symptoms, so identifying potential new diagnostic methods that might catch the cancer at an earlier stage or allow us to track how it is progressing is an important opportunity," said co-author Dr. Neil Rofsky, Chairman of Radiology, Director of Translational Research for the Advanced Imaging Research Center, and holder of the Effie and Wofford Cain Distinguished Chair in Diagnostic Imaging.

Prostate cancer is the most common cancer in men in the United States, after skin cancer, and is the second leading cause of death from cancer in men, according to the National Cancer Institute. Prostate cancer occurs more often in African-American men, who are more likely to die from the disease.

Researchers with the Advanced Imaging Research Center are world leaders in developing new MRI tracers, which are non-radioactive, and techniques to reveal the aberrant machinery of cancer, diabetes, obesity, Alzheimer's disease, schizophrenia, depression, and diseases of the heart, lung, and liver. As part of UT Southwestern's Peter O'Donnell Jr. Brain Institute, the scientists are also mapping the brain in unprecedented detail, offering researchers new understanding of the normal brain and abnormal brain as found in subjects with autism and attention deficit hyperactivity disorder (ADHD).

Magnetic resonance imaging (MRI), which uses only harmless magnetic fields and radio waves, is one of the most benign technologies in medicine for studying and diagnosing medical disorders, enabling researchers to view diseases that afflict millions of people, without the need for surgery, X-rays, or radioactive tracers.

More information: Zinc-sensitive MRI contrast agent detects differential release of Zn(II) ions from the healthy vs. malignant mouse prostate, *Proceedings of the National Academy of Sciences*, www.pnas.org/cgi/doi/10.1073/pnas.1609450113

Provided by UT Southwestern Medical Center

APA citation: Novel MRI technique distinguishes healthy prostate tissue from cancer using zinc (2016, August 22) retrieved 1 December 2021 from https://medicalxpress.com/news/2016-08-mri-technique-distinguishes-healthy-prostate.html

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