CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP180031

Project Title:
Imaging of biochemical alterations in human breast malignancy using CEST-MRI

Award Mechanism:
Individual Investigator

Principal Investigator:
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Entity:
The University of Texas Southwestern Medical Center

Lay Summary:

Due to progress in detection and treatment of breast cancer, its mortality rate has steadily declined. Widespread adoption of mammography and routine screening has been credited for this decline, as it has a vital role in detection and evaluation of breast cancer. But the breast cancer management has recently come under scrutiny, due to concerns about increased number of unnecessary biopsies and unjustifiably aggressive treatments.

Magnetic resonance imaging (MRI) is widely utilized for radiological surveillance due to its superb sensitivity. However, MRI suffers from lower specificity and cannot provide information on biochemical level, thus failing to fully characterize breast lesions.

We are developing a novel molecular MRI method: Chemical Exchange Saturation Transfer (CEST) and tailor it for the breast malignancy assessment. CEST is sensitive to the events occurring on the molecular level. Cancer cells undergo specific biochemical and genetic transformations before morphological changes are detectable. By merging advances in biochemistry with state-of-the art imaging, we aim to create a non-invasive and non-ionizing imaging tool capable of detecting alterations in cancer biology at the biochemical and genetic level, prompting a paradigm shift from morphology to biochemisty-based imaging. CEST will allow better differentiation of malignant tumors from benign lesions and further differentiation of aggressive tumors, thus improving MRI specificity. For treatment planning, CEST-MRI may non-invasively predict tumor therapy response, thus improving patient outcomes.

MRI is low risk imaging modality (no iodizing irradiation). CEST-MRI uses FDA approved equipment. Our research is conducted using a whole-body 3T MRI, which is widely available clinically. Since no injections are required and only software modifications are needed, the results of our research could have immediate impact on the diagnosis and management of thousands of breast cancer patients.