# T1-mapping using phase-sensitive inversion-recovery method

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## Technology description

OHSU developed software that enables the non-invasive, diagnosis of asymptomatic osteoarthritis, monitoring of intervention and preventive measures, and monitoring of allograft transplantations. Osteoarthritis is characterized by cartilage tissue degradation within joints and/or along the ends of joints. Cartilage transmits load between joints. Glycosaminoglycans (GAGs) greatly influence the mechanical properties of cartilage and is widely considered the best biomarker of cartilage health. Delayed gadolinium enhanced MRI of cartilage (dGEMRIC) is a noninvasive imaging technique used to study cartilage GAG content in vivo. In traditional dGEMRIC approaches, relaxation time constants (T1) can be calculated on a per-pixel basis from the MRI image sequences after injection of a gadolinium-based contrast agent to produce three-dimensional color-coded T1 maps reflecting cartilage GAG distribution. Numerous approaches exist for controlling the MRI pulse sequence and for processing the resultant images to calculate these maps, but the calculation of T1 for all these methods has traditionally used only the magnitude of the T1 recovery curve (i.e., the recovery curve has a strictly positive value).

The algorithm developed by OHSU researchers works by restoring the polarity (the sign) of the signal used for T1 recovery curves, effectively doubling the dynamic range of the data. This allows for the calculation of highly accurate T1 maps with greater sensitivity in the estimated relaxation times compared to traditional methods. The algorithm can be applied to any 2D- or 3D- inversion recovery sequences acquired by the dGEMRIC approach, and thus, can be applied to any data sets acquired using the dGEMRIC protocol. In addition, this increased dynamic range allows MRI acquisition times to be reduced without compromising the quality of the data obtained.

The OHSU MRI software provides highly sensitive three-dimensional color-coded T1 maps reflecting cartilage GAG distribution. The software is capable of indicating asymptomatic osteoarthritis and clinically relevant disease monitoring.

### Market Size

Osteoarthritis(OA) is a degenerative disease of the joints that affects 27 million people in the US. It is estimated that one in two people will develop OA in their lifetime, and that OA accounts for as much as $186 billion in aggregate health expenditures in the US per year. Early detection of cartilage damage could enable clinicians to guide patients to engage in preventative measures, including weight loss, altering exercise regimen, and glucosamine supplementation.

## Advantages

Identifies GAG content loss / osteoarthritis in asymptomatic patients
Characterize Small Joint Spaces
Non-invasive
Available in Orthopedists' Offices

## Institution

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