



## 2013 ICTS PILOT AWARD RECIPIENTS

PI: Dr. Bogi Anderson »

PI: Dr. Hak Lee & Dr. Jamie Landman »

PI: Ellis Levin & Young Jik Kwon »

PI: Dr. Roxanne Silver »

PI: Dr. Koyoko Yokomori »

PI: Dr. Hiroshi Yoshioka »

### Study of knee cartilage degeneration by novel orientation/thickness dependent T2 and T1rho mapping approach

#### Details of the Project

Osteoarthritis is one of the most prevalent disorders in today's society, resulting in significant socio-economic costs and morbidity. A host of new and exciting therapeutic modalities are being developed for the treatment of osteoarthritis, which include new chondroprotective and chondroregenerative drugs, osteochondral autografting, and autologous chondrocyte implantation. Therefore, it is important to detect early cartilage degeneration and understand its natural progression for treatment of osteoarthritis. MRI plays an important role in the assessment of internal derangement of joints and has been reported to be an excellent modality to diagnose cartilage lesions. T2 relaxation time and T1rho relaxation time have recently been used in physiologic and quantitative MRI evaluation of articular cartilage, associated with matrix damage, particularly loss of collagen and proteoglycan integrity. However, T2 relaxation time of normal knee cartilage is dependent on orientation to the static magnetic field as well as on different cartilage layers due to relationship between the magic angle effect and collagen orientation. This causes orientation/thickness dependent normal variation of cartilage T2 relaxation time in the knee.

In this project, we hypothesize that we can evaluate early cartilage degeneration of the knee more effectively and accurately using a novel orientation/thickness dependent T2 mapping and T1rho mapping approach. First, we will recruit healthy volunteers without history of knee injury and scan their knees using T2 and T1rho map sequences. Orientation/thickness dependent T2 and T1rho relaxation times will be calculated using custom software. This will allow us to standardize normal T2 and T1rho profiles and evaluate subtle T2 and T1rho abnormality, i.e. early cartilage degeneration, in various locations on the femoral condyle accurately. Next, we will recruit patients with knee osteoarthritis and scan their knees with established T2 and T1rho map sequences. We will perform the same analysis and create orientation/thickness dependent T2 and T1rho mapping from them. Deviation of T2 and/or T1rho relaxation time from normal control T2/T1rho relaxation time will be diagnosed as cartilage lesions. This project will be collaborated with radiologist, orthopedic surgeon, and MR physicist at UCI.

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