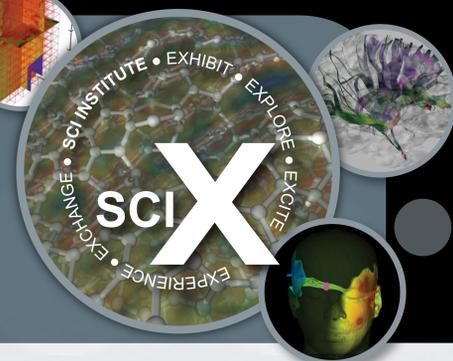


# Effect of Focal Chondral Defects in the Hip: A Framework for Understanding Degradation and Developing Treatment Strategies

Jocelyn N. Todd<sup>1</sup>, Travis G. Maak<sup>2</sup>, Jeffrey A. Weiss<sup>1</sup>

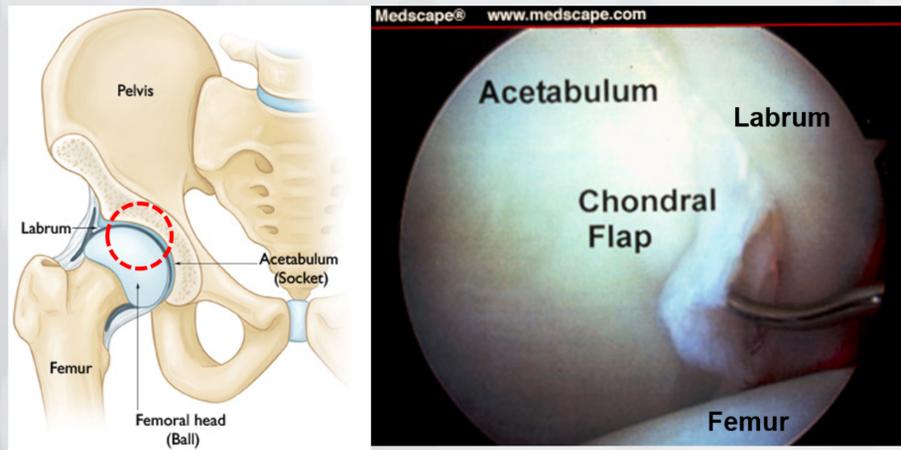
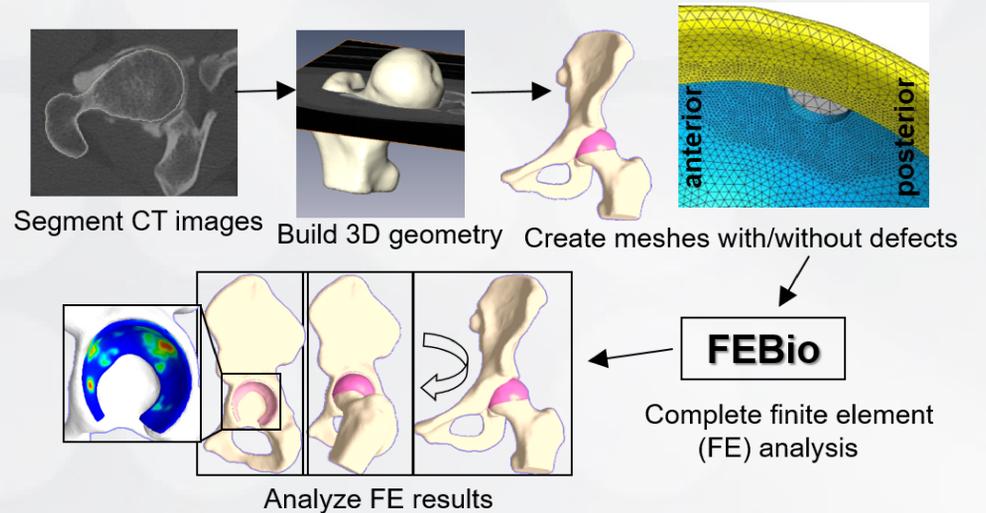
<sup>1</sup> Department of Bioengineering  
<sup>2</sup> Department of Orthopaedics



Articular cartilage is a specialized layer of dense connective tissue that covers the ends of bones in articulating joints, such as the hip and knee. Localized damage to the articular cartilage, known as a focal chondral defect, occurs due to sudden mechanical overload.

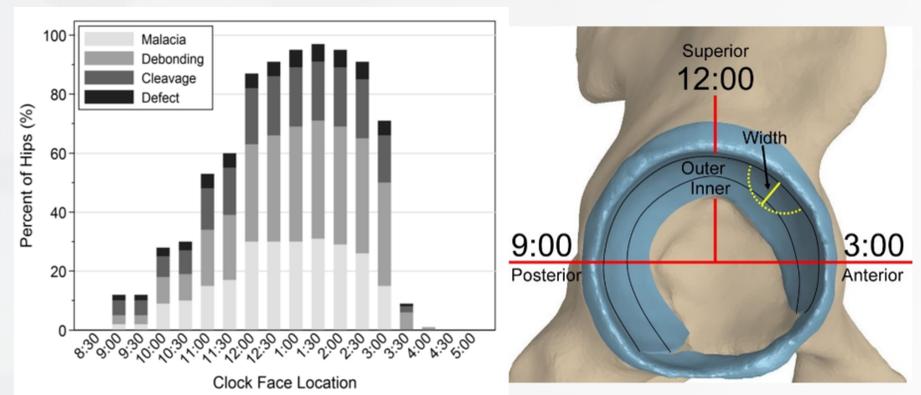
Regardless of the joint, there is increased risk of progression toward osteoarthritis (OA) if this damage is left untreated. This project aims to develop a better understanding of the effects of focal chondral defects in the hip to predict the likelihood of progression and development of OA, and to provide patient-specific treatment recommendations.

To do this, we utilize patient-specific computational modeling, patient data from the clinic, and experimental data collected from testing of cadaveric specimen.

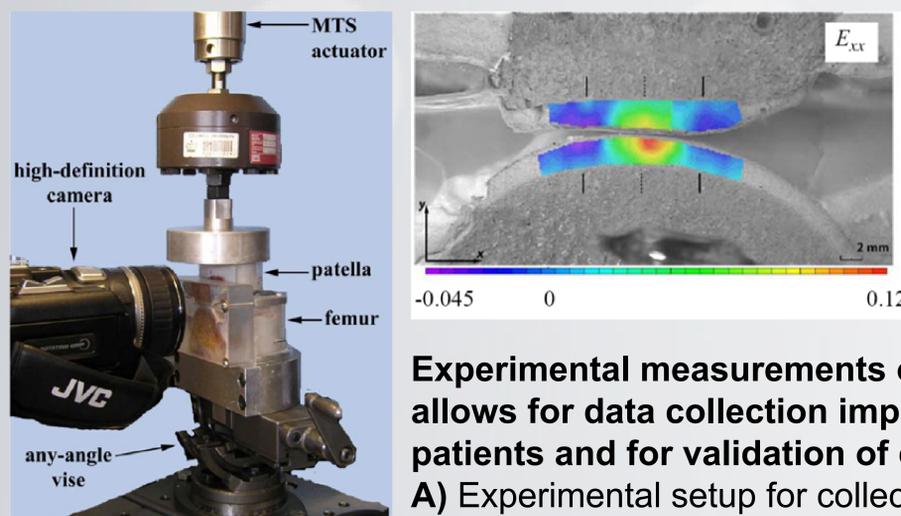


Typical placement of a focal chondral defect in the hip (left) and an example of a focal cartilage defect, seen arthroscopically (right).

Pipeline to create a patient-specific model. Patient-specific modeling allows detailed mechanical analysis of different hip geometries and cartilage damage.



**Patient data adds clinical relevance to the project. A)** Incidence of cartilage damage types at different regions of the hip. **B)** Clock-face convention. Isolated acetabular cartilage damage was identified by the clock-face location and if it located was in the “inner” or “outer” half of the articular surface.



**Experimental measurements on cadaveric specimen allows for data collection impossible to take in patients and for validation of computational results. A)** Experimental setup for collection of transchondral strain measurements in the patellofemoral joint in the knee. **B)** Resulting strain map.