School of Medicine

Department of Orthopaedics

OrthoRaMS SEMINAR SERIES

Orthopaedic Research and Musculoskeletal Science

Thursday, June 11, 2026 12:00-1:00

Location: *Dickson Conference Room, 3200 Thurston Bldg.*
Zoom Meeting ID: *972 4253 1148,* ***PW:*** *286522*

Orthopaedic Musculoskeletal Science Across Scales: From Cellular Biology to Biomechanics

Departments of Orthopaedics cover an extremely broad spectrum, from basic regenerative biology to biomechanics, surgery, and clinical care. In this talk, I will discuss two areas of my work that address clinical problems across multiple scales, from cellular mechanisms of tissue repair to biomechanical factors that influence surgical outcomes.

In the first part, I will focus on muscle to bone communication during bone repair. Although muscle loss is known to impair bone repair, the molecular signals linking muscle to the bone repair niche remain unclear. Using a mouse femoral bone injury model, we identified CX3CL1 as a muscle associated signal induced near the injury site. We found that endothelial cells in injury adjacent muscle are a major local source of CX3CL1 and promote bone repair through CX3CR1 expressing osteoprogenitors.

In the second part, I will introduce my translational research using finite element method (FEM) based computational biomechanical analysis in spinal instrumentation surgery. In patients with poor bone quality, implant failure remains a major clinical challenge, raising the question of whether improving bone health with osteoporosis treatment can benefit spinal instrumentation surgery. However, conventional animal and cadaveric biomechanical testing is typically destructive and has limited utility in clinical practice. To address this limitation, we developed a longitudinal, patient specific FEM workflow using CT scan. Through industry collaboration, we applied this approach to phase 1 and phase 2 clinical trial data and detected treatment specific biomechanical differences relevant to spinal instrumentation surgery.

Through this talk, I hope to share how different approaches in orthopaedic science, from cellular biology to computational biomechanics, can contribute to improving musculoskeletal care.

Koji Ishikawa, MD, PhD
Research Associate Senior

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BIO

Koji Ishikawa, MD, PhD, is an orthopaedic spine surgeon and bone researcher who currently serves as a Research Associate Senior in Dr. Benjamin Alman's laboratory at Duke University. He completed clinical training in orthopaedic surgery, spine surgery, and bone endocrinology in Japan, with a focus on skeletal fragility in aging patients. His research spans clinical and basic musculoskeletal science, including osteoporosis, spine surgery, bone biology, and musculoskeletal regeneration.