

From Simulation to Surgery and Back Again: Dialogues in Translational Research

Biomechanical models are frequently used to simulate surgical procedures in order to gain insight into clinical outcomes. For example, computer simulations have been applied to investigate the consequences of muscle re-attachment and tendon transfer procedures in the upper limb. In my lab, we have performed numerous simulation studies to gain understanding of how orthopaedic surgical reconstructions of the upper limb influence hand and arm function. This research has been received enthusiastically by clinicians; most perceptibly because many of our results resonate with anecdotal clinical experience. In addition, our simulations have generated hypothesis-driven experimental studies, including a multi-center clinical trial, aimed at providing data that both add to evidence-based medical practice and improve the accuracy of the biomechanical models that we build. In this context, I will highlight simulation and experimental findings describing the outcomes of tendon transfer surgeries performed following cervical spinal cord injury. This work illustrates the potential impact biomechanical modeling can have on clinical practice as well as our overall understanding of the role of the mechanics of the musculoskeletal system in human movement