2014 R-01 Overview

Spinal reflexes take important part in our movement. After spinal cord injury (SCI), reflexes often change. For many years, researchers and doctors have assumed that abnormally acting spinal reflexes lead to movement problems, without clear scientific evidence. For example, in people who suffer spasticity, a common problem after SCI, walking is disturbed, presumably because spinal stretch reflexes (e.g., knee jerk reflex) and some other reflexes are not working well. Yet, which reflex is causing a problem in what way has not been well understood. Such understanding is very important in developing and applying effective therapies for improving gait recovery after SCI. Thus, in this project, we will study the activity of spinal stretch reflexes (which are exaggerated in spastic individuals by definition) during walking, to understand how these reflexes contribute to spastic gait problems in people with chronic incomplete SCI.

Specifically, we will examine how spinal stretch reflexes in the calf muscles function during walking in people with chronic incomplete SCI who suffer spasticity. Because the H-reflex (electrical analogue of spinal stretch reflex) is often abnormal and clonus (shakiness) is commonly seen in people with SCI, we anticipate to find abnormal stretch reflex activity during walking. Finding that certain components of stretch reflexes are hyperactive (or hypoactive) in certain phases of gait cycle where the muscle activity is abnormal and preventing appropriate joint motion will help us develop and apply effective therapies for improving gait. Understanding which reflex components are not working well in what ways may also help us combine existing therapies towards maximizing movement recovery. Successful completion of this project will result in better understanding of spastic gait problems, which then will lead to more appropriate and effective therapy application, and thereby improving the quality of life, in people after SCI.