**Muscle Evoked Potentials after Spinal Cord Stimulation Can Monitor Motor Tract.**

Muneharu Ando¹ MD, PhD and Tetsuya Tamaki² MD, PhD

¹ Department of Orthopedic Surgery, Wakayama Rosai Hospital, Wakayama Japan
² AITOKU Medical and Welfare Center, Wakayama Japan

**Introduction**

Some researchers insist that muscle responses to direct electrical stimulation of the spinal cord are not specific for being transferred via the cortico-spinal tract but can also be elicited by stimulation of the dorsal column alone. The elicited responses in the muscles after stimulation of the dorsal columns can be neurophysiologically explained by antidromic activation of the primary afferent fibers in the dorsal column that originated from spinal ganglion cells, which have collaterals to the alpha motor neurons¹. However, other study revealed that nerve evoked potentials in tibial nerve after electrical spinal cord stimulation came from combined sensory and motor spinal pathway².  

**Objective**

The aim of this study is to clarify that muscle evoked potential after electrical stimulation to the spinal cord can monitor motor tract of the spinal cord.

**Methods**

Five consecutive patients (4 women and 1 men), with an average age of 63.4years(range, 40-74 years), were studied during the surgery of cervical spine and thoracic spine.  

We recorded muscle evoked potential from upper and lower extremities.

Three types of stimulation methods were performed (1. transcranial electrical stimulation to the brain, 2.electrical stimulation to the spinal cord, 3. collision: simultaneous stimulation to the brain and spinal cord)

1. transcranial electrical stimulation to the brain  
    Cork screw type electrodes were inserted symmetrically into the outer table of the skull 5 cm lateral and 2 cm anterior to Cz (International 10-20 system). We used a 5 train stimulation of 2ms ISI with 0.5 ms duration and 150-200 mA intensity.  

2. electrical stimulation to the spinal cord  
    To stimulate the spinal cord, a catheter electrode was inserted into the epidural space caudal to the level of the lesion. Electrical stimulation was delivered as a 5 train stimulation of 2ms ISI with 0.2 ms duration and 10-40 mA intensity.

**Anesthesia**

Propofol and remifentanil were used as anesthetic agents. Muscle relaxants are only used during intubation.

**Results**

In all patients at simultaneous stimulation to the brain and spinal cord, the wave form of muscle evoked potentials from abductor hallucis muscle(AH) was same of that by spinal cord stimulation.

**Case**

70 yrs female, cervical spondylotic myelopathy

**Discussion**

By collision method (simultaneous stimulation of Stim 1 and Stim 2), the wave form of the muscle evoked potential from AH muscle similar to that by not stim 1 but stim 2. It means that the volleys of cortico-spinal tract after brain stimulation was collided by the antidromic volley after the stimulation to the spinal cord. In other words, electrical spinal cord stimulation can elicit the volleys travelling through the motor tracts.  

Until now multiple studies concerning with nerve evoked potentials or muscle evoked potentials in lower extremities by spinal cord stimulation have been reported. Most of the reports³-⁸, concluded that these potentials were mediated by antidromically activated afferent fibers in the dorsal column and not reflect motor function. However Péréon et al ² reported that nerve evoked potentials in tibial nerve elicited by thoracic spinal cord stimulation contained both sensory and motor originated potentials. Furthermore other 2 reports⁹,¹⁰ concluded that the evoked muscle potentials after train spinal stimulation remained after complete section of dorsal column with animal study.  

This clinical study revealed that muscle evoked potentials in lower extremities after spinal cord stimulation can monitor motor tract.

**References**