CNS 2018 ANNUAL MEETING
HOUSTON, TEXAS
OCTOBER 6–10, 2018

Frequency Optimization of Spinal Cord Stimulation for Volitional Movement

David P Darrow MD MPH; David Y. Balser; Andrew Lamperski PhD; Uzma Samadani MD; Ann Margaret Parr MD, PhD, FRCS(C); Theoden Netoff PhD

Introduction

Spinal Cord Stimulation (SCS) has been reported to restore volitional movement in patients with motor-complete chronic spinal cord injury. The E-STAND trial was designed to independently test the restoration of movement and autonomic function while optimizing stimulation parameters of SCS systems through remote data collection.

Methods

An android application was created to facilitate remote data collection from wireless accelerometers used during volitional movement by patients in the E-STAND trial. Bayesian and probit optimization was used to assign monthly stimulator settings for efficient parameter space testing and identification of the optimal therapy settings.

Results

Two patients evaluated 40 settings each and response surfaces were created. Individual differences were found in intermediate range frequencies while both patients had converging optimized settings at two distinct peaks. Frequency preference for volitional movement was found around 30 Hz and 200 Hz with a trade off between volitional movement and side effects at lower frequencies.

Conclusions

Optimal frequencies for the restoration of volitional movement in paraplegic patients by SCS include previously reported low frequency ranges and previously undescribed high frequency settings around 200 Hz. Higher frequency stimulation was associated with reduced side effects. Our novel platform allows for automatic optimization using a low cost solution.

Learning Objectives

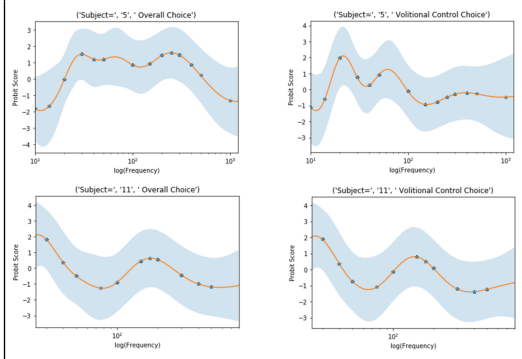
1. Volitional movement is restored in paralyzed patients by SCS.

2. Remote data collection using a low cost sensor (accelerometer) allows optimization of neuromodulation

3. A novel frequency range of around 200 Hz may facilitate improve volitional movement while decreasing side effects.

[Default Poster]

Frequency Preferences for Volitional Movement and Overall



The frequency preferences for volitional movement and overall are shown for two patients with motor-complete paraplegia.