Poster Presentations - May 27 - May 30
Spine - Pain

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EFFECTS OF 10 KHZ HIGH FREQUENCY STIMULATION ON SPATIO-SEPCTRAL NEURAL PATTERNS IN CHRONIC PAIN

I. Telkes PhD[1], N. Raviv MD[2], M. Gillogly BA/BS-RN[2], S. Paniccioli CNIM[3], R. Grey CNIM[3], M. Briotte CNIM[3], K. McCarthy CNIM[3], J. Pilitsis MD-PhD[2]

[1]*Albany Medical College, Department of Neuroscience and Experimental Therapeutics, Albany, USA*
[2]*Albany Medical Center, Neurosurgery, Albany, USA*
[3]*Albany Medical Center, Nuvasive Clinical Services, Albany, USA*

Introduction: The success of spinal cord stimulation (SCS) for refractory chronic pain conditions is well documented[1]. Yet, treatment remains suboptimal for significant subsets of patients with little to no control over their pain[1]. Even though increased benefit has been shown with novel waveforms such as 10 kHz high frequency stimulation (HFS), only one study has examined the SCS and EEG to date[2], and the effect of SCS on neural patterns in chronic pain is still unclear. Therefore, we explored the spatio-spectral dynamics of SCS at the cortical level in chronic pain.

Materials/Methods: We recorded 16-channel resting state EEG from 3 chronic pain patients (68±7.5yo), who were diagnosed with Failed Back Surgery Syndrome, during stimulation OFF (baseline) and stimulation ON at 10kHz. Following preprocessing of EEG signals, power spectral density estimates were computed, and the spectral features were extracted from motor (MI) and somatosensory cortex (SI). The primary and secondary outcome measures were collected before and 4±2.6mo after SCS surgery. Finally, the trends between the objective measures and the multidimensional pain scales were evaluated.

Results: The spectral power distribution of baseline EEG and HFS showed clear peaks at theta (4-7Hz) and alpha (8-12Hz) bands. When the alpha-to-theta peak power ratio between OFF and ON states were investigated, two subjects (P2, P3) showed increased power ratio (≥2dB) indicating faster rhythms in MI and SI under pain relief while one subject (P1) showed less amount of positive change in SI. Total power in beta band (13-21Hz) was lower in P2-3 under HFS while P1 did not present visible changes. Assessment of pain scores indicated negative linear trends with relative alpha and beta power while positive linear trends with power ratio in SI.

Discussion: These preliminary results provide initial evidence for alterations in brain electric activity in response to 10 kHz HFS in the short term. As previously indicated in chronic pain subjects compared to healthy controls[3], our findings also showed decrease power in theta and beta bands and faster alpha rhythms in MI-SI regions in response to HFS (pain relief).

Conclusions: Our preliminary results might show an underlying pathophysiology and its responses to 10 kHz HFS in chronic pain patients.

Objectives

1) Investigate EEG dynamics under 10 kHz HFS in chronic pain conditions

2) Characterize spatio-spectral features as objective measures in pain

3) Evaluate interactions between objective and subjective pain measures

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Spine - Pain

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HIGH FREQUENCY SPINAL CORD STIMULATION EFFECTIVE TREATMENT FOR DRUG-INDUCED PERIPHERAL POLYNEUROPATHY

H. Pinckard-Dover MD[1], M. Stephens MD[1], E. Petersen MD[1]

[1]*University of Arkansas for Medical Sciences, Neurosurgery, Little Rock, USA*

Introduction: The treatment of refractory chronic pain with epidural spinal cord stimulation has become one of the hallmarks of neuromodulation. The types of pain etiologies treated using spinal cord stimulation have grown immensely. The use of spinal cord stimulation for peripheral neuropathy is well cited in the literature. [1,4,5,6] Many drugs can cause particularly painful mono and polyneuropathies, particularly, chemotherapeutic agents such as platinum agents, vinca alkaloids, and taxanes. [9] Less commonly, long term therapy with antibiotics such as linezolid can cause painful peripheral neuropathies.[2,3,7,8]

Materials/Methods: We present a case of a 72 year old male treated with long-term Linezolid for a lower extremity mycobacterium chelonae who developed subsequent polyneuropathy of the lower extremities.

Results: A 72 year old male presented with a 2 years of painful, bilateral lower extremity neuropathies. Three years prior, the patient was treated with an 8 month course of Linezolid for leg ulcers caused by mycobacterium chelonae. The linezolid therapy was terminated due to interval development of peripheral polyneuropathy. His neuropathy was described as bilateral, lower extremity painful parasthesias that radiated to his feet. EMG/NCS demonstrated bilateral sensorimotor polyneuropathy of the lower extremities. He was trialed on both, gabapentin and pregabalin, which did not offer any relief. On physical examination, the patient had multiple scars on his lower extremities and hypesthesia of his distal lower extremities in a non-dermatomal distribution. The rest of the physical examination was unremarkable.

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