PO011 / #645
OBSERVING NOCICEPTIVE FUNCTION IN PERSISTENT SPINAL PAIN SYNDROME TYPE 2 PATIENTS DURING SPINAL CORD STIMULATION

E-POSTER VIEWING

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Introduction: Observing spinal cord stimulation (SCS) effects on nociceptive function will contribute to future personalized treatment of chronic pain in persistent spinal pain syndrome type 2 (PSPS-T2). We are developing a measurement technique that measures nociceptive detection thresholds (NDTs) combined with evoked potentials (EPs) in response to intra-epidermal stimulation[1,2]. We investigated the feasibility of using the NDT-EP method in patients with PSPS-T2 during SCS treatment and subsequently explored the NDT-EP outcomes using a test-retest.

Materials / Methods: Thirteen PSPS-2 patients (8 male, age: 52.0±5.9) who were effectively treated by SCS (≥50% pain reduction) underwent two measurements (with 1-hour time interval) using the NDT-EP method when the stimulator was on. During each measurement, three stimulus types (single-pulse, double pulse with 10 ms inter-pulse interval (IPI), and 40 ms IPI) were applied with a total of 450 trials.

Results: Preliminary results showed that the average psychophysical NDTs and slopes, detection rate, response time, and the number of false positives were not significantly different between both measurements. The detection probability and the EP amplitude at 445 ms post-stimulus were significantly associated with all stimulus types. However, the detection rate was significantly decreased for the amplitude of a second pulse after 10 ms during the second measurement, which indicates a different task performance. Moreover, the effect of the second pulse (with 10 ms IPI) on evoked brain activity was significantly decreased in the second measurement.

Discussion: NDT-EP outcomes were not changed between test-retest measurements for most stimulus types, implying that it might be promising for in-depth exploration of SCS effects on nociceptive function in PSPS-T2.

Conclusions: The NDT-EP method seems to be feasible to apply to PSPS-T2 patients during SCS. Future research on task performance per stimulus type is recommended in an enlarged PSPS-T2 patient group treated by SCS.

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Learning Objectives: The objective of this study is (1) to study whether the EP can be induced during SCS in patients with PSPS-T2, (2) to investigate the feasibility of using the NDT-EP method during SCS in patients with PSPS-T2 and (3) to determine the reliability of clinical NDT-EP outcomes during SCS using test-retest measurements.

Keywords: Persistent spinal pain syndrome type 2, Nociception, Failed back surgery syndrome, Spinal cord stimulation

PO012 / #893
OPTIMIZED INDUCTIVE RECHARGE OF AN IMPLANTED PULSE GENERATOR USING AN AUTOMATIC OPTICAL POSITIONING SYSTEM

E-POSTER VIEWING

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Introduction: A patient with an inductively rechargeable neurostimulation implant must periodically recharge it. Inductive charging requires, among other things, very good alignment of the primary and the secondary coils. Moreover, misalignment severely reduces the transmitted power while a larger part of the emitted power is dissipated in heat. This results in longer charging times for the patient and shorter autonomy of the charger device. In order to minimize this issue, we developed an optical positioning system to evaluate and automatically correct any misalignment that can occur during the entire charging session.

Materials / Methods: This novel positioning system relies on optical communication between the Implantable Pulse Generator (IPG) and its external charger device (ECD). The IPG contains an optical source emitting toward the ECD which includes at least four photoreceptors in the corresponding wavelength range. The signals received by each of the photoreceptors are processed by triangulation to determine the direction and degree of misalignment. A preliminary manual positioning performed by the patient is thus complemented by a finer positioning by a micro-motorized system which ensures optimal alignment during the complete charging procedure. *In-vivo* tests have been conducted in sheep implanted at a depth between 5 mm and 15 mm and recharged weekly.

Results: The positioning system produces an alignment of the primary coil with the secondary coil with a precision of +/- 1 mm. This allows the charger to maintain its position in the optimal charging area during the entire recharging process. The resulting efficiency yields a higher energy transmission while limiting the implant and the charger temperature rise within safety limits thus allowing continuous charging. Our *in-vivo* studies demonstrate complete charging sessions in sheep of less than 10 minutes. Histopathology of explanted tissues in contact with the IPG or the charger revealed no mark of heat damage or other pathology.

Discussion: This novel system produces an optimized transfer efficiency between the energy emitted by the primary coil and the energy received by the secondary coil. Combined with a high charging rate battery, it drastically reduces the charging time without compromise for patient safety.

Conclusions: Patients using this technology with a rechargeable implant should thus benefit from a significantly decreased charging time. This decrease in charging time would remove one of the major drawbacks of the rechargeable implants while enhancing the experience of the implanted patients.

Learning Objectives: (1) Optimisation inductive recharge (2) Automatic optical positioning system.

Keywords: Neurostimulation, Charger, automatic optical positioning system