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FEASIBILITY OF TRANSCUTANEOUS ELECTRICAL STIMULATION FOR CONTROLLING PILOCARPINE GENERATED STATUS EPILEPTICUS SEIZURES IN RATS NONINVASIVELY

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Introduction: Epilepsy is the 2nd most prevalent neurological disorder in the US and 1% of the world population is estimated to be affected. Approximately thirty percent of seizures are not controlled with current medications. Implantable systems are not suitable for emergency cases such as status epilepticus. There is a need for an alternative noninvasive treatment for emergency seizures. Our research focuses on the feasibility of transcutaneous electrical stimulation (TES) using concentric ring electrodes for controlling pilocarpine generated status epilepticus in rats.

Methods: Male Sprague-Dawley rats weighing 250-350gms were used in this research in accordance with an IACUC approved protocol. Rats were briefly anesthetized (ketamine), shaved and kept in a rodent restrainer. A mouthpiece fixed to a stereotaxic frame stabilized each rat's head during recordings. Scopolamine (2 mg/kg i.p.) was given 30 min. prior to pilocarpine and after recovery from anesthesia. Various amounts of pilocarpine (290 to 450mg/kg i.p.) were used to study the onset times of status epileptic seizures. Once status epilepticus was achieved TES was applied. Laplacian EEG was recorded using tri-polar concentric electrodes, pre-processed and analyzed.

Results: TES changed the interictal period and spike frequency during seizures that persisted long after stimulation was applied. In some rats the seizures were completely stopped and they returned to normal activities such as eating, drinking, and breeding.

Discussion: The TES was able to control (modulate) status epilepticus seizures. The seizure control was achieved without the strong contractions caused by electroconvulsive therapy (ECT). This may be due to more localized areas of the brain being stimulated with TES compared to ECT.