Status of Research Progress: Study is now closed to enrollment. A total of 27 patients completed the study.

Findings/Conclusions:
Post-operative tDCS treatment was associated with a 22% reduction in total PCA hydromorphone usage in our sample. The effect of tDCS (real versus sham) on the slope of the cumulative PCA hydromorphone curve was statistically significant (F(238,2879)=5.06, p<.001). These preliminary findings indicate that tDCS may have the potential to decrease post-operative hydromorphone usage among lumbar spinal fusion patients. Future investigations involving other surgical populations and varying parameters of tDCS are also warranted to provide more definitive conclusions regarding the efficacy and safety of the post-operative use of tDCS.

Presentations/Publications:
Keith C. Carver, D.M.D., M.S., Jeffrey J. Borckardt, Ph.D., John Glaser, M.D., Sarah Fredrich, John Hohenberger, Mark S. George, M.D., Scott Reeves, M.D.
Transcranial Direct Current Stimulation (tDCS) in the Management of Acute Post-Spine Surgery Pain: A Prospective Randomized Controlled Trial
American Society of Anesthesiologists Annual Meeting 2012.

Other Funding:
No other funding has been secured to date related to this project.

Abstract:
Systemic opioid or other analgesic use along with regional blocks is currently the most popular method to control post-operative pain. However, many patients continue to report considerable post-operative pain despite these interventions and side effects associated with systemic opioid administration may lead to negative outcomes. Brain stimulation techniques including transcranial direct current stimulation (tDCS) have shown promise in decreasing post-operative hydromorphone usage after ERCP and total knee arthroplasty. No published study has examined the effect of tDCS following spine surgery. The purpose of this randomized, double-blind, sham-controlled clinical study is to assess the effectiveness of tDCS on subjective pain-ratings, PCA opioid usage, and post-operative complications among patients receiving lumbar spinal fusion surgery. Twenty-seven (27) patients undergoing lumbar spinal fusion surgery completed this study. The mean age of the sample was 59.4 years (SD=2.1), and 15% were African American (85% Caucasian). Immediately after surgery, participants were randomly assigned to receive four 20-minute sessions of either real or sham tDCS (2mA, anode placed over the superior motor cortex (corresponding to the low-back/trunk area) and cathode over the right dorsolateral prefrontal cortex). Patient-controlled analgesia (PCA; hydromorphone) pump usage was tracked throughout each participant's post-operative hospital stay. At the time of discharge, participants who received real tDCS used an average of 12.82mg (SD=10.27) of hydromorphone and subjects receiving sham tDCS used an average of 16.35mg (SD=12.73) suggesting that tDCS was associated with a 22% reduction in PCA usage. The effect of tDCS (real versus sham) on the slope of the cumulative PCA hydromorphone curve was significant (F(238,2879)=5.06, p<.001). These preliminary findings indicate that tDCS may have the potential to decrease post-operative hydromorphone usage among lumbar spinal fusion patients. Future investigations involving other surgical populations and varying parameters of tDCS are also warranted to provide more definitive conclusions regarding the efficacy and safety of the post-operative use of tDCS.