Novel Use of an Implantable Peripheral Nerve Stimulator for the Management of Upper Extremity Post-Stroke Pain, a Case Study

Neil Mandalaywala, MD; Margarita Cantir, MD; Young IL Seo, MD; Frank Schirrapo, BS; Salvador Portugal, DO; Charles Kim, MD

Introduction
Shoulder pain post stroke is commonly seen as a local pain due to regional nerve irritation from mechanical stress and decreased structural support. Peripheral nerve stimulation has been thought to achieve pain control through gate control theory. Traditional electrical stimulation is limited by tissue resistance. The Bioness StimRouter has shown promise for the treatment of regional neuropathic via direct neuromodulation bypassing tissue resistance

Case Report
We selected two patients with challenging post stroke shoulder pain for StimRouter placement to aid in pain management and functional rehabilitation.

Patient one is a 52 year old male with history of stroke in 2012 and residual right upper extremity paresis along with refractory right shoulder pain with radiation down the arm. Patient two is a 57 year old female with prior stroke in 2012 and residual right upper extremity paresis along with refractory right shoulder pain with radiation down the arm. Both patients reported improvement on NRS scores with a decrease from 10 to 3 in patient one and 9 to 2 in patient two. Both patients were also noted to report decreased need for opioid medication.

Both patients underwent StimRouter placement in our ambulatory surgical center under fluoroscopy. A guidewire with testing stimulator was advanced to the surgical neck of the humerus. Repeated stimulation of the axillary nerve was performed at the lowest current necessary for muscle twitch and decreased pain sensation. Following test stimulation, device leads were tunneled through the guidewire and anchored in the subcutaneous tissue with closure of the skin. The electrode patch was subsequently placed over the receiver and programmed to deliver stimulation to decrease pain symptoms.

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Discussion
It is well recognized that the recovery and long-term health of stroke survivors can be adversely affected by chronic pain. Chronic post-stroke pain ranges from 32-42% of total stroke patient and occurs up to 84% in patients with hemiparesis. Standard of care treatment includes physical therapy, pharmacological intervention, and injections or surgical procedures. Medications used range from steroids, NSAIDs, bisphosphonates, calcein, beta-blockers, calcium channel blockers, alpha-adenergic blockers, topical capsaicin to antidepressants, anticonvulsants, and opioids. The later three have common side-effects of sedation and dizziness which can limit their use and tolerance. More aggressive interventions including local and intra-articular injections, ganglion blocks, and sympathectomy have also been used however may require re-interventions or are very invasive.

There are limited published works exploring the effectiveness of implanted neurological stimulators especially with the goal of pain relief after CVA. The significant improvement in pain if both of patients in this case study warrants additional investigation of the utility of this novel intervention.

Conclusion
By continuing to explore targeted neuromodulation techniques, this application may serve useful in the management of various pain conditions via direct peripheral nerve neuromodulation.

References