Neurostimulation for Headache Disorders

By Zac Haughn, Senior Associate Editor

Intractable migraine and other headache syndromes affect roughly 30 million Americans and millions more worldwide. Although there are a myriad of medication regimens available to patients, at least 5 percent of these headache sufferers do not respond in a meaningful way to medications. Continuously failing to beat the biggest opponent in their lives, patients can become distraught with stopgap solutions like quiet, dark rooms and begin searching for anything to end the pain.

Recently, neurostimulation procedures have become more advanced in their treatment of primary neurovascular headaches, namely cluster headache and migraine. However, researchers note one problem is a lack of definition of the term "chronic" according to the International Headache Society criteria for both cluster headache and migraine when needed to select patients for neurostimulation procedures. Meanwhile, there is no conformity about the use of the term "drug-resistant"—again when it is used to select patients for neurostimulation. Some have proposed that only patients suffering from daily neurovascular headaches in the last one to two years, with complete drug-resistance should be proposed for invasive procedures.

To be sure, these procedures are not to be looked at immediately, says Alexander Feoktistov, MD, a staff physician specializing in pain management at the Diamond Headache Clinic in Chicago. “These surgeries are not done for the regular, routine migraine sufferers, we’re talking about patients with intractable headaches, something you can’t control with medication. It’s usually a worse case scenario when they undergo this procedure and even in those cases [we see] 40 percent success rate.” Success, he notes, is when the patient responds by 50 percent improvement or more.

Dr. Feoktistov says there are essentially two main pathways for neurostimulation in headache at this point. The most popular is occipital nerve stimulation (ONS). The second is sphenopalatine ganglion stimulation (SPG) and is the more complicated procedure. The relatively accessible location of the SPG within the pterygopalatine fossa and the development of options for minimally invasive approaches to the SPG make it an appealing target for neuromodulation approaches. The clear advantage of SPG stimulation compared to ablative procedures on the SPG such as radiofrequency destruction and stereotactic radiosurgery is its reversibility and adjustable features.

“Occipital is better researched,” he says. In one study published in the July issue of Cephalalgia, researchers examined 13 chronic cluster headache patients whose headaches lasted for more than two years, were refractory to pharmacological prophylactic treatment with adequate trials, and had at least one daily attack. Patients had chronic ONS delivered through a subcutaneous occipital electrode connected to an implanted generator, in order to induce paraesthesias perceived locally in the lower occipital region. The research team found that after surgery (mean follow-up 14.6 months), the mean attack frequency and intensity decreased by 68 percent and 49 percent, respectively. At their last follow-up, 10 of 13 patients were considered as responders (improvement > 50 percent). Importantly for patients, prophylactic treatment could be stopped or reduced in 8 of 13 cases. There was one case of local infection, leading to hardware removal. In the conclusion of
their study, the authors write: “Our data confirmed the results of the 36 similar cases reported in the literature, suggesting that ONS may act as a prophylactic treatment in chronic CH. Considering their respective risks, ONS should be proposed before deep brain stimulation in severe refractory CCH patients.”

Studies have analyzed the safety and efficacy of suboccipital neurostimulation in drug-resistant chronic headache syndromes such as in chronic migraine, chronic cluster headache and hemicrania continua. These studies suggest “suboccipital neurostimulation can have an effect even decades after onset of headaches, thus representing a possible therapeutic option in patients that do not respond to any medication.” Similarly, to date more than 50 patients with cluster headaches underwent hypothalamic deep-brain stimulation and an average of 50 to 70 percent showed a significant positive reaction.

Subcutaneous occipital neurostimulation at the level of the C1 (occipitocervical junction) has been “championed as a relatively simple, minimally invasive technique for treating many of these intractable headache syndromes. Using unilateral or bilateral electrodes percutaneously placed into the subcutaneous tissues, patients perceive a gentle paresthesia sensation to the back of the head, which blocks the painful areas from disorders, including chronic daily transformed migraines, occipital neuralgia, cervicogenic headaches, and deafferentation neuropathic pain.” Not all patients respond, however, and long-term follow-up consistently reflects a 75 percent to 80 percent success rate with greater than 50 percent pain reduction and diminished use of medications.

Despite exciting advances, the price tag on these procedures still has to be considered. In regards to intractable chronic neuropathic pain, patients saw reduced demand for healthcare resources after they were treated spinal cord stimulation and peripheral nerve stimulation. To provide a cost-benefit analysis, researchers at the Cleveland Clinic gathered data on the utilization of healthcare resources starting one year before surgical implantation by reviewing the Neurostimulation Outcome Questionnaires, returned by 128 patients. The mean per patient total reimbursement of spinal cord stimulation/peripheral nerve stimulation absent pharmacotherapy was $38,187. The authors write: “Patients treated with spinal cord stimulation/peripheral nerve stimulation for pain management achieved reductions in physician office visits, nerve blocks, radiologic imaging, emergency department visits, hospitalizations, and surgical procedures, which translated into a net annual savings of approximately $30,221 and a savings of $93,685 over the 3.1-year implant duration.” This large drop in healthcare utilization after spinal cord stimulation/peripheral nerve stimulation implantation resulted in a net per patient per year cost savings of approximately $17,903.

“The cost effectiveness is a tricky question,” however, says Dr. Feoktistov, “because insurance companies don’t want to pay for the surgery.” He estimated the generator for occipital nerve stimulation was between $12,000 and $16,000 with numbers for the surgery ranging from $30,000 to $50,000. Still, he remains optimistic about the current ongoing studies and pleased with how quickly the technology of neurostimulation has advanced compared even to a few years ago. “The pulse generators were quite large and difficult to tunnel under the skin,” he says. Now he looks forward to Medtronic’s plans to release an MRI compatible spinal cord stimulator later this year. “That will be a huge improvement,” he says. “The studies on occipital nerve stimulation done 10 or 15 years ago, you can’t even compare them. They’re so much more accurate and most importantly, they are much more effective today.”

The 25th Annual Practicing Physician’s Approach to the Difficult Headache Patient will be held February 17 through 20, 2012 in Rancho Mirage, California. For more information, contact the Diamond Headache Clinic.