INFORMATION FOR HEALTH CARE PROFESSIONALS

Surgical Treatment of Headache

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"Neurostimulation" and other surgical techniques have been used to treat certain types of headache that are refractory to medications and other therapies. These techniques include occipital nerve stimulation, vagal nerve stimulation (VNS), deep brain stimulation (DBS), and "surgical deactivation" procedures. The literature consists largely of case reports and small series. The lack of controlled studies, the possibility of placebo response and spontaneous improvement in these conditions need to be kept in mind when evaluating these reports.

Occipital Nerve Stimulation

Electrodes are inserted percutaneously to deliver electrical stimulation of one or both occipital nerves. Conditions that have been treated include posttraumatic headache, chronic migraine, chronic cluster, hemicrania continua, and new daily persistent headache. When effective, pain may be replaced by paresthesiae. The mechanism of action is unknown. Response to prior occipital nerve blockade is not predictive of a response to occipital nerve stimulation. Prior to placement of permanent leads a trial using temporary electrodes may be undertaken. All patients in Schwedt's retrospective series of 15 patients improved to varying degrees. Complications include infection, and migration or breakage of leads. The need for surgical revision seems significant.

Vagal Nerve Stimulation (VNS)

VNS has also been utilized in medically-refractory headache. It was chosen in part because both epilepsy and depression are comorbid with migraine, and VNS has been shown to be effective for both conditions. It also produces analgesia in animal models. Some patients treated with VNS for epilepsy note an improvement in their headache frequency and/or severity. VNS was used in small series for refractory migraine and refractory chronic cluster headache. Half of Mauskop's series of medically-refractory patients had improvement of varying degrees. Complications are related to placement of the device and include nausea, infection, transient voice change and equipment failure.

Deep Brain Stimulation (DBS)

DBS was studied for chronic refractory cluster headache patients and, in a more limited fashion, for refractory SUNCT (Short-lasting UNilateral headache with Conjunctival injection and Tearing).

The Milan Group (Bussone/Leone) has the most experience. Functional and anatomic imaging of these two headache types shows abnormalities in or near the posterior hypothalamic gray matter. The electrode placement has been targeted for this region but there is some debate about what exact anatomic structure(s) the stimulation is affecting. Most patients have a dramatic response although there has been at least one death (intracerebral hemorrhage related to electrode insertion). Other complications include infection, eye movement abnormalities/diplopia, vertigo and bradycardia. The total number of patients so treated remains small and there are internal controls only. In this severely refractory and desperate population one would not expect a significant placebo response. Clearly DBS is a more invasive and potentially dangerous treatment option than occipital nerve stimulation or VNS.

Surgical Deactivation

Surgical deactivation is based on the de-afferentation of "trigger sites". The trigger sites are identified based on the location of headache onset and may include frontal, temporal or occipital locations, corresponding to the muscles innervated by supraorbital and supratrochlear nerves, the zygomaticotemporal branch of the trigeminal nerve, the greater occipital nerve, or the nasal mucosa. Trigger sites are determined based upon the response to onabotulinumtoxinA injections into the regions of the nerves. The nerves are surgically decompressed but not destroyed. There are numerous case series reported, and one placebo-controlled surgical trial using sham surgery (Guyuron). While there are methodological faults in the study, with some patients having very infrequent migraines, at least 50% migraine reduction was achieved in 15 of 26 patients in the sham group, vs. 41 of 49 of those who received the actual procedure. 28 of the 49 patients having the true procedure reported complete elimination of migraine at 12 months compared to one patient in the sham group. The morbidity and complication rate was low and no hardware is required. This procedure may be of value for patients with intractable, chronic migraine but requires further study in that patient population.

Summary

A significant minority of headache sufferers do not benefit from adequate trials of multiple acute and prophylactic drugs. Surgical treatments offer such patients the possibility of improvement. These procedures are presently quite expensive, often not covered by insurance companies and the data regarding them is limited, but suggests strongly the need for further research with controlled trials.