Mechanisms of action by which PRFE may exert a neuromodulatory effect and decrease pain include alteration of inflammatory responses (2), increase in early Fox immunoreactivity in lamina I and II of the dorsal horn (5), a selective effect on the afferent side of primary sensory neurons (3), and alteration of excitatory postsynaptic transmission (4).

The greater and lesser occipital nerves derive from the C2 nerve root [6]. The relationship between occipital nerves and migraine is often poorly understood. However, there is a growing understanding that excitation or inflammation of the greater occipital nerves can produce referred pain in diverse cranial structures, not only within the C2 distribution, but also within other nerves as well, particularly the ophthalmic division of the trigeminal nerve [7]. Occipital neuralgia is also associated with migraine, either as a potential trigger or a face complication [6]. It has been found that of 385 patients diagnosed with migraine headaches, 144-148 had headaches caused by irritation of the greater occipital nerve which could be arrested by injecting the trigeminal greater occipital nerve with local anesthetic (6).

The mechanism by which irritation of the occipital nerves can be associated with the trigemino-neuralgic syndrome is unknown. The trigemino-neuralgic complex are the major efferent nervous system, that supplies efferent input from the mesencephalic and cortical structures; they are the neural substrates of head pain” [10]. Stimulation of trigemino-neuralgic intracranial structures, such as superior ophthalmic veins, dural routes and large cerebral vessels evoke painful sensations and implies that afferent input from dural structures is the likely neural substrate in both head pain and migraine [9]. Noxious input from the dura mater is transmitted by small diameter A and C fiber afferents in the trigemino-dorsal horn of the trigeminal complex [10]. Opercular and subcortical structures, such as vessels and the dura mater of the posterior fossa, deep paranasal neck muscles, upper cervical zygapophyes (facet) joints, and ligaments have no effect on the trigeminal nociception [10]. Patients have been found to experience relief from nociceptive input which is mediated by small diameter afferents fibers which cross myelinated afferent nerves in the trigemino-dorsal horn of the trigemino-neuralgic complex [7, 10]. Thus, there is a direct coupling between meningeal afferents and cervical afferents in the spinal dorsal horn [11].

Hence, the application of PRFE to the occipital region and upper cervical spine may play a role in decreasing migraine frequency and severity, as well as influencing migraine’s associated symptoms, both through a direct neuro-modulatory effect on nociceptive afferents in peripheral nerves and the trigeminal-neuralgic complexes of the upper cervical spinal cord and brainstem, and by decreasing potential pain and inflammation into structures in the occipital, subcortical and upper cervical regions which may be producing nociceptive input. The Provant system for delivering PRFE at home as a non-invasive, non-pharmacologic modality is a novel approach for delivering patient controlled analgesia in the treatment of chronic occipital neuralgia with associated migraine. The results of this case series warrant further investigation into this modality as a useful, subjective treatment for an often disabling condition.

REFERENCES