Epilepsy and Trigeminal Nerve Stimulation

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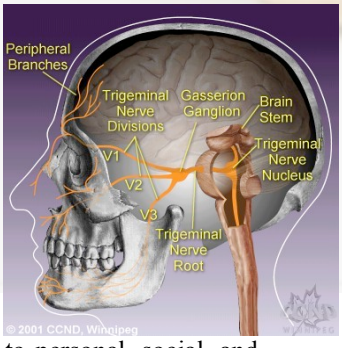
Epilepsy is a neurological disorder resulting from the misfiring of clusters of nerve cells within the brain. This abnormal neuron activity causes seizures characteristic to epilepsy. Persons diagnosed with epilepsy exhibit symptoms including but not limited to strange sensations, changing emotions and behavior, involuntary convulsions and muscle spasms, known as seizures, and/or loss of consciousness (2).

The causes of epilepsy can range from abnormal brain development, unbalanced neurotransmitters signaling in the brain or a complex combination of origins. The potential complexity of an individual's epilepsy explains why there are many methods of treatment; either through anti-epileptic drugs (AEDs), surgical treatments, or nerve stimulation (2).

Considering AEDs are the most common treatment for epilepsy it would lead one to believe it's the most effective method. However, approximately 60 percent of patients being treated with AEDs report having side-effects and 25-40 percent report no decrease in symptoms (1). Neurosurgery, on the other hand, can target the exact locations causing the seizures through surgical diagnostic procedures and, if necessary, a surgeon can remove part of the brain being affected. Unfortunately, the criteria for surgery are specific, the costs are generally astronomical, and the risks are high, sometimes the symptoms are actually more severe (4).



Epilepsy affects over fifty million people worldwide. Many individuals benefit exclusively from AED treatment and/or surgery (6). Unfortunately, forty percent of the 2.5 million Americans with epilepsy have not benefited from AEDs, neurosurgery, or vagus nerve stimulation (VNS) treatment. Their seizures are insufficiently controlled and lead to personal, social, and self-dependant issues (5).

A study conducted by neuroscientists at UCLA tested the effectiveness of trigeminal nerve stimulation (TNS) in treating epileptic seizures (5). Christopher M. DeGiorgio, co-developer of TNS and lead author of the study, aimed for discovering a noninvasive and non-drug alternative treatment. Dr. DeGiorgio and his team of neuroscientists focused on improving neurostimulation by focusing on the trigeminal nerve as opposed to the current VNS treatment(5).

In 1997, the FDA approved VNS treatment in individuals with epileptic seizures. During surgery, the neurostimulator is inserted under the skin of the chest. Electrodes are then wrapped around the vagus nerve and when stimulated seizure activity is reduced (7). The vagus nerve only excites one side of the brain and it also affects the throat and vocal cords. Side effects therefore may include sore throat, difficulty speaking, or shortness of breath (4). Scientists at UCLA recently discovered similar pathways to VNS through the stimulation of the trigeminal nerve (3).

The trigeminal nerve has bilateral branches which connect the face and forehead to both sides of the brain. This nerve has been known for inhibiting seizures and its cutaneous branches are the perfect site for external neurostimulation. The ability to test TNS externally before implantation allows for accurate device programming and makes this method comparably better than VNS treatments (3). Patients participating in a three month clinical trial at UCLA experienced 66 percent reduction in seizure activity. Further research will support TNS becoming the new treatment for epileptic seizures (6).

Works Cited

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