

Spring TMS

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Abstract—The Spring TMS is device that delivers a single pulse magnetic field to treat migraines. This device non-invasively depolarizes neurons in the brain reducing migraines with the symptoms. It was created to be a portable migraine treatment alternative for people avoiding the side effects of medication.

I. INTRODUCTION

Migraines are classified as a neurological disease that can cause several debilitating symptoms. They can be caused by emotional stress, sleep pattern changes, fatigue, and other events that put excessive stress on the body. The symptoms can include intense pain on one side of the head, visual agitation, nausea, vomiting, and tingling and numbness in the face or body. Also there is usually extreme sensitivity to a person's senses. These "attacks" can last anywhere from 4 hours to up to 3 days with symptoms varying from person to person. In the U.S. alone 36 million people suffer from migraines and around 1 in 4 households have someone who suffers from them. This disease is also hard to identify in children as the head pain is usually minimal or in-existent while the other symptoms still occur. On the other hand, diagnosis for adults is simpler with more of the common symptoms displayed. The main issue, however, is treating migraines. There are very few non drug related treatments. These usually involve relaxation techniques or following a proper rest and diet regimen and are only preventative. Unfortunately, many other treatments rely on medication. This includes preventative medication taken daily to stop or lessen migraines or medication to relieve symptoms of a current one. As a result, a U.S. based company called eNeura Therapeutics has developed the Spring TMS (Transcranial Magnetic Stimulation), a portable TMS device specifically for treating migraines. This device emits a magnetic pulse which can relieve or stop migraines with a very short treatment. With this portable TMS device people suffering from constant migraines can be treated without constant medication or vast lifestyle changes.

II. METHODS

TMS devices are believed by "Leaders in the field of headache medicine" to depolarize "the hyper-excitability in areas of the brain associated with migraine" (ENeura). It does this by emitting a magnetic pulse which non-invasively travels through the skull and tissue and stops or reduces the migraine and its symptoms. To use this device a SIM card with your prescription must be inserted. Next the power must be turned on to begin treatment and the device must be held against the base of the skull. Once this is done a person must slide the treatment switches in place. The treatment, or magnetic pulse will be delivered in under a minute and all

treatment history will be



automatically recorded. It is to be used as soon as a migraine or its symptoms occur and will function as long as the patient's prescription is filled.

III. RESULTS

Single-pulse TMS devices have been used for over 20 years with minimal to no side effects occurring from use. Repetitive TMS devices have led to temporary muscular contraction which can cause discomfort on the scalp. This, however, is much less common for sTMS. Aside from this, dizziness, nausea, and headaches have occurred but are very uncommon overall. In a clinical trial these symptoms occurred in 0.98% of individuals with 102 participants. The results from the this trial also showed that more people experienced less symptoms 2 hours post treatment and more of them had no pain after that same time frame. Due to the trials and previous uses of TMS devices the Spring TMS is considered to be an extremely safe method for monitoring and treatment of neurological diseases. In addition, it is proven to be as effective as current drug therapies and can eliminate or reduce the need for medication over time.

IV. DISCUSSION

There are several advantages to using the Spring TMS as opposed to drug therapies. There are almost no side effects to this treatment method, it tracks your migraine history, and it is portable. In addition, the magnetic field of the Spring TMS is half the strength of a MRI machine. The procedure also lasts less than a minute compared to the 20 minute constant pulse from an MRI making this device much safer as well. The main disadvantages are that the device relies on battery power and that it isn't FDA approved in the U.S. yet. Overall it is a promising alternative to migraine treatment with no adverse side effects unlike the current medication.

REFERENCES

- [1] Dodick, David W. *Headache: The Journal of Head and Face Pain* 50.7 (n.d.): 1153-163. *Wiley Online Library*. American Headache Society, 10 June 2010. Web. <<http://onlinelibrary.wiley.com/doi/10.1111/j.1526-4610.2010.01697.x/full>>.
- [2] *ENeura - Spring TMS Overview*. Neuralievelve Inc, 2012. Web. <<http://neuralievelve.com/springtms.html>>.
- [3] Merrell, Cynthia. *ClinicalTrials.gov*. Neuralievelve, 7 Jan. 2009. Web. <<http://clinicaltrials.gov/ct2/show/results/NCT00449540?term=Migraine+and+TMS&rank=1&X439876015#othr>>.
- [4] *Migraine Research Foundation*. MRF, n.d. Web. <<http://www.migraineresearchfoundation.org/about-migraine.html>>.
- [5] Paddock, Catharine. *Medical News Today*. MediLexicon International, 24 Sept. 2012. Web. <<http://www.medicalnewstoday.com/articles/250611.php>>.
- [6] Robert, Teri. *Two of the Newest Migraine Treatments*. Remedy Health Media, 17 Oct. 2012. Web. <<http://www.healthcentral.com/migraine/c/123/156595/treatments-winners/>>.