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Migraine relief

Nonpainful stimulation for acute attacks

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WHAT WAS THIS STUDY ABOUT? In their article "Nonpainful remote electrical stimulation alleviates episodic migraine pain," Dr. Yarnitsky et al.[1] investigated the use of nonpainful electrical stimulation of the skin of the arm in reducing migraine attacks. Therapeutic electrical stimulation has been widely used for pain treatment. It is believed to be effective when applying the stimulation next to the painful location. For example, the Food and Drug Administration has approved the first device for migraine prevention using electrical stimulation to the area above the eyes. A number of other neurostimulators are under investigation for migraine.[2] The idea is to activate parts of the brain with connections to the spine. Triggering pain systems that are remote from the site of migraine pain can relieve pain. In this case, the authors used nonpainful stimulation as a trigger for relief. The idea was to create a conditioned response. This means that giving electrical stimulation at low intensity to a different part of the body will send signals to the brain that then stop or reduce the migraine attack. The authors thought it would be easier to apply electrical stimulation to the lower arm than the head (figure).

Figure **Migraineur wearing nonpainful stimulating device (Nerivio Migra, Theranica Ltd., Netanya, Israel) on her arm**

The device consists of 2 rubber electrodes mounted on an armband with a power source controlled by a custom application on the patient's smartphone.

WHO WERE THE PARTICIPANTS? The study included 86 patients with a history of migraine with and without aura. Migraine was diagnosed using standard criteria.[3] Patients had 2–8 attacks per month and had not taken any migraine preventive agents for at least 2 months. Not all migraine patients could participate in the study. Those with other pain problems, other serious medical diseases, and potentially conflicting treatments were excluded.

To make the study scientifically valid, the patients were divided into 2 groups. One group received stimulation therapy on the arm. The other group had pretend or sham stimulation. After a period of time, the treatment groups were reversed. The investigators used various measures to decide which treatment produced the best pain response. The study participants were asked to activate the device for 20 minutes on either arm regardless of the side of the migraine pain. They were also asked to use the device for up to 20 attacks. Pain responses were recorded with a smartphone at 10, 20, and 120 minutes after the start of stimulation.

WHAT WERE THE RESULTS? The researchers looked at several measures. They studied how many people responded to stimulation overall. They judged how many had their pain reduced by at least 50% within 2 hours at least half of the time. They also asked people to rate their pain level on a scale of 1–10 after the treatment. They studied 71 patients and many of them had more than one migraine attack that could be studied. Nearly 2/3 of patients had their pain reduced by at least 50%. Only about a quarter of those getting sham stimulation improved by 50%. Early use of the treatment (within 20 minutes of the attack) yielded better pain reduction. Early stimulation proved to be nearly twice as effective as later stimulation.

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WHY IS THIS STUDY IMPORTANT? The study suggests that nonpainful remote skin stimulation of the upper arm can reduce migraine pain, especially when used early during an attack. The findings appear to support the researchers' theory of pain mechanisms. The study is important because it supports the use of a nonpharmacologic, safe, easy to use tool to treat migraine attacks.

WHAT IS NOT YET KNOWN? The patients in the study had migraines between 2 and 8 times per month. It is not known if nonpainful remote skin stimulation is effective for patients with more frequent migraine, chronic migraine, or medication overuse headache. We do not know if this treatment would be as effective for people with more severe migraine who are taking preventive medications. It would be useful to know if nonpainful stimulation is effective for migraine prevention, but this is still unknown. Finally, it is unknown whether the benefits differ among different social and economic groups, or in patients with other pain symptoms in addition to migraine.

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About migraine

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WHAT IS MIGRAINE? Migraine is a common and chronic brain disorder with intermittent symptoms. These include moderate to severe headaches, gastrointestinal symptoms, and sensory disturbances such as sensitivity to light, sound, smell, and movement. Migraine has several phases. Some patients may experience auras that may include flashing lights, zigzag or wavy lines, spots, sensory changes such as tingling or numbness, weakness of one side of the body, or impairments in language function.

The premonitory phase is the pain-free phase right before the migraine attack. It is a period associated with brain changes and changes in pain perception. Symptoms of the premonitory phase include fatigue, frequent yawning, neck stiffness, changes in appetite or mood, and sensitivity to sensory stimulation. Patients who are able to identify the premonitory phase may have an advantage in being able to treat the attacks more quickly.

The headache phase may start gradually or abruptly and typically lasts 4–72 hours. Prolonged periods of migraine lasting >72 hours is known as status migrainosus. The postdrome of a migraine attack is the pain-free period after the attack has resolved. Even after the headache is over, people usually do not feel fully back to normal and may have a sense of feeling hungover or fatigued.

HOW IS MIGRAINE DIAGNOSED? Migraine is diagnosed by the description of the attacks and by examination. There are no widely accepted laboratory tests to diagnose migraine. Brain imaging is often performed if there is concern that something other than migraine might be causing the headaches, but is not required for a diagnosis of migraine. Migraine is diagnosed according to the International Headache Society's International Classification of Headache Disorders III–beta (table).[3] Patients are diagnosed with chronic migraine when headaches are occurring on 15 or more days per month for more than 3 months, and, on at least 8 days per month, there are features of migraine headache. Migraine may sometimes present with other features such as vertigo, abdominal pain, loss of consciousness, weakness or one side, or vision loss with very little headache. In these cases, migraine can be more difficult to diagnose.

WHAT CAUSES MIGRAINE? The exact cause of migraine is not known, but clinical history and genetic studies suggest that migraine runs in families. Theories of migraine as a blood vessel disorder as well as a disorder of brain cells (known as neurons) have both been suggested. However, migraine is best thought of as a neurovascular disorder in which neurons trigger change in blood vessels. Both the environment and genes probably play important roles. Recent genetic advances in migraine have provided evidence for both vascular and neuronal mechanisms.

WHAT TRIGGERS MIGRAINE? Many migraine triggers have been identified. These include weather

Table Diagnostic criteria: migraine without aura

A. At least 5 attacks fulfilling criteria B–D
B. Headache attacks lasting 4–72 hours (untreated or unsuccessfully treated)
C. Headache has at least 2 of the following 4 characteristics:
1. Unilateral location
2. Pulsating quality
3. Moderate or severe pain intensity
4. Aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs)
D. During headache, at least 1 of the following:
1. Nausea or vomiting
2. Photophobia (sensitivity to light) and phonophobia (sensitivity to sound)
E. Not better accounted for by another International Classification of Headache Disorders III diagnosis

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changes, menstruation, skipped meals, lack of sleep or too much sleep, acute stress or stress letdown, intense physical exertion, strong odors, and bright lights or loud sounds. Alcoholic beverages, often including red wine, chocolate, excessive caffeine intake, processed meats, aged cheese, and processed foods containing a lot of artificial additives or MSG are a few common food triggers. In addition to triggers, individuals should identify protective factors that may reduce their risks for migraine attacks.

HOW IS A MIGRAINE ATTACK ABORTED? Acute migraine can be treated with nonpharmacologic and pharmacologic therapies. The pharmacologic treatments include nonspecific agents such as nonsteroidal anti-inflammatory drugs (like ibuprofen or naproxen) or simple analgesics such as acetaminophen. Butalbital containing drugs and opiates should not be considered first line, because if used in excess they can carry higher risks of medication overuse headache.[4] Migraine-specific treatment is used for moderate to severe attacks, usually with a class of medications known as triptans. Triptans can be dosed in several ways, including tablets, oral disintegrating pills, nasal sprays, needleless approaches, and injections. Another acute headache medication, dihydroergotamine, can be delivered by nasal spray or injection. Treatment is most effective when delivered early, when the attack is mild. Ice, menthol, and the transcranial magnetic stimulation device may also help abort attacks.

ARE THERE PREVENTIVE MEASURES? Preventive measures for migraine include lifestyle modifications and nonpharmacologic and pharmacologic interventions. Taking care to get good sleep, reducing stress, exercising, avoiding triggers in the workplace (computer glare, florescent lights), and avoiding common food triggers may be helpful for some. However, therapeutics are sometimes needed if migraines are frequent or severe. Nonpharmacologic approaches include acupuncture, yoga, biofeedback, cognitive-behavioral therapy, and neurostimulation of the supraorbital nerves. Pharmacologic treatments include nutraceuticals (magnesium, feverfew, coenzyme Q10, riboflavin), blood pressure medications, anticonvulsants, antidepressants, and onabotulinum toxin A (Botox) for chronic migraine.[5]

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