

► More than a headache

The little-understood migraine afflicts 28 million Americans, mostly women.

BY JULIE L. McDOWELL

The first signs of an attack occur when Shelley Thomson's eyes lose focus—what she calls “wavy vision”. Then comes the cramping nausea. Slowly, the pain takes hold, spreading from the back to the front of the head, stopping just short of her left temple.

“It feels like my head is in a one-sided vise grip,” says Thomson. “One side is padded so I can't feel the pain, but the other side of my head feels like it's being cranked tighter and tighter.” Her life halts for two or three days as she sits perfectly still in her darkened bedroom, waiting for the pain and nausea to pass.

Thomson, a patent examiner with the U.S. Patent and Trademark Office in Arlington, VA, is one of 28 million Americans who suffer from migraines, according to the National Headache Foundation. Far more extreme than “bad headaches”, migraines affect about 6% of men and 18% of women, most of whom are between 25 and 55 years of age. Thomson is the only one in her family to have migraines, but the condition is often hereditary—a child has a 50% chance of inheriting the propensity to get migraines if one parent suffers and a 75% chance if both parents suffer.

Migraines defined

The National Institute of Neurological Disorders and Strokes (NINDS, Bethesda, MD) classifies migraines as vascular headaches, which refers to an abnormal function of the brain's blood vessels or vascular system. Migraines are most prevalent in women during the adult reproductive years, hitting their peak around the age of 40, after which the disorder begins to fade.

“Migraines are typically an episodic disorder,” says Fred Freitag, associate director of the Diamond Headache Clinic in Chicago. “On average, a migraine patient in the United States will suffer one attack per month. About 4% of the migraine population develops a chronic form of the disorder where they suffer some form of the attack every day.”



According to Freitag, migraines can be provoked when there is a fall in estrogen levels as women move between ovulation and menstruation cycles. Decreased estrogen prompts an increase in production of prostaglandins, a group of fatty acids involved with regulating blood pressure and body temperature, which can cause cranial blood vessels to dilate and become inflamed. In addition, low estrogen levels can lead to a decrease in production of endorphins, the body's natural pain relievers. “There's an increased sensitization of the pain perception mechanisms by the brain, which is

probably related to the change in endorphin levels,” says Freitag.

Researchers are not clear about the exact causes of migraines, according to the NINDS, but most experts believe that the disorder involves changes in blood flow to the brain. Specifically, migraine patients appear to have blood vessels that overreact to certain triggers. The body's nervous system responds to a trigger by generating spasms in certain nerve-abundant arteries located at the base of the brain. These spasms cause several of these arteries (especially the scalp and neck arteries) that supply blood to the brain to close or constrict, thus reducing the flow of blood to the brain. Simultaneously, the blood-clotting platelets in these arteries release serotonin, which further constricts the arteries.

As a result of this reduction in blood flow, the brain is not getting its usual supply of oxygen, which might prompt neurological symptoms, such as distorted vision and slurred speech. This causes certain arteries in the brain to widen, in an attempt to increase the oxygen flow. As the artery dilation spreads to the neck and scalp, prostaglandin production increases, along with production of other chemicals that cause inflammation and pain sensitivity. These chemicals circulate, and the dilation of the scalp arteries stimulates nociceptors, sensory receptors that respond to pain. At this point, the migraine attack is well under way.

Triggers

Migraine triggers are highly individualized, says Freitag, and for about 40% of migraine patients, diet is the trigger. Foods such as chocolate, nuts (including peanut butter), beans, pickles, aspartame, and fermented products such as soy sauce and breads with a high content of yeast are all known to trigger migraines in some people. Caffeinated beverages such as soda and coffee can also provoke migraines, along

with foods containing monosodium glutamate. Migraine patients are also advised to avoid all foods containing tyramine, a chemical found in some cheeses, red wine, and pickled fish. Changes in weather and barometric pressure can also incite a migraine, and daily routines are important for many patients. "Any change in their daily schedule, such as staying up later than usual or skipping meals, might provoke a migraine," explains Freitag.

Thomson estimates that about 80% of her migraines begin with some visual stimulant, such as a flashing or strobe light. "If I'm driving at night, sometimes the lights from the other cars will trigger a migraine episode," she says. Certain scents also lead to migraines. She used to work as a stylist in a hair and nail salon, where she recalls getting migraines after exposure to chemical-laden smells from nail adhesives and treatment solutions. Thomson avoids all scented lotions, soaps, and detergents, and she doesn't wear perfumes. "I try to stay away from environments that have these

odors," she says. "In fact, I share an office with someone who doesn't wear perfume."

The difference

Migraines are distinct from other headaches, such as tension headaches, because the pain is accompanied by two major groups of symptoms. The first group is gastrointestinal, which means many patients feel nausea, vomit, and get diarrhea during an attack.

The second group is neurological and involves an increased sensitization of the senses. Examples of these symptoms include light sensitivity and a vulnerability to loud sounds or strong smells. Thomson's visual disturbances are the first sign that a migraine is about to hit. "The first thing to go is my vision. I notice that I have a real hard time focusing," she says. "Then my head will gradually start hurting. Sometimes the pain is not so bad if I'm perfectly still, but if I move at all it feels like a jackhammer pounding on my head."

Freitag emphasizes that any neurologi-

cal symptoms can be part of a migraine attack. "Some people even have strokelike symptoms where they have trouble speaking during a migraine attack," he adds.

Migraines are classified as either aura or nonaura, depending on which symptoms precede an attack. "An aura is a distinct set of neurological symptoms that precedes the headache pain," explains Freitag. "It's most commonly visual, such as bright flashes of light and image distortions." Most migraine sufferers do not get auras, but for those who do, these symptoms usually last about 15 or 20 minutes. After a brief calming, the symptoms fade away, and the headache takes hold and begins to escalate. Auras are believed to occur when the nervous system is initially responding to a trigger through arterial spasms at the base of the brain.

Relief from pain

Thomson, who does not get auras with her migraines, estimates she gets an attack about every two months. For the past year, she has been taking the tablet form of

Imitrex (sumatriptan succinate), a pain reliever, within the first 20 minutes of the onset of her visual symptoms. Once the attack takes hold, she shuts herself away in her bedroom. Her bedroom has thick curtains to keep light out, and her husband knows to keep their dog outside to minimize noise. Even when she takes Imitrex to diminish the pain and nausea, Shelley is still confined to her bed for two or three days with what she calls a “migraine hangover”. Basically, her body is exhausted from the pain. “My whole body just feels like it has been dragged through a ringer,” she says. “When I’m having a migraine, all of my muscles tense up. When the pain is gone, my body feels like it’s worn out.”

Currently, Imitrex is available as a tablet, nasal spray, and self-injector, but Freitag points out that the injector is the most rapid and effective form of the medication. Imitrex, like all sumatriptan medications, counteracts the dilation and inflammation of the blood vessels. This helps to alleviate the pressure on the pain-sensitive nociceptors.

Patients who suffer from three or more migraines a month often turn to preventative drug therapy. Examples of these medications include the anticonvulsant drug Depakote (divalproex) and propranolol hydrochloride, which stops blood vessel dilation. Antidepressants called monoamine oxidase inhibitors have also been shown to prevent migraines.

Social costs

Since migraines put her out of commission for at least three days every two months, Thomson’s professional and personal life suffer because of her migraines. She just began attending law school part-time and is worried about migraines interfering with her rigid and stressful academic schedule. “It’s very disruptive to my life,” Thomson explains. “The pain and hangover are just unbearable, and it’s just unexpected.”

In fact, this disruption can translate into millions of dollars of annual losses in the workplace. A recent study conducted by the University of Michigan (Ann Arbor) found

that indirect and direct costs associated with migraines totaled more than \$20 million a year for Bank One, a financial services corporation based in Chicago (*J. Occup. Environ. Med.* **2002**, *44*, 523–529). Costs were calculated based on direct expenses from medical claims and indirect expenses associated with decreased productivity or absenteeism.

“Because of the severity of the headache and the associated symptoms, migraines are the leading cause of disability related to pain in the United States,” says Freitag.

For more information

National Headache Foundation; www.headaches.org.

NINDS Headache Information Page; www.ninds.nih.gov/health_and_medical/disorders/headache.htm.

Diamond Headache Clinic; www.diamondheadache.com.

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