

Are migraine headaches a sign of inflammation? Are they exacerbated by stress? And linked to disease states?

When we have questions about headache generally and migraine headache in particular, we always seek answers from Dr. Charles Matthews, a neurologist and Director of the North Carolina Comprehensive Headache Clinic.

Health&Healing: Our basic question today: Is there a connection between stress, inflammation, and migraine?

DR. MATTHEWS: There are some very interesting connections. There are many types of headache, but only migraine has been demonstrated to be clearly associated with inflammation. Headache classification and diagnosis have been helpfully formalized by the International Headache Society. You can access the medical classification of headaches directly through the IHS website, or through our website at ntheadaches.com.

H&H: What is the connection between migraine and inflammation?

DR. MATTHEWS: Let's go back a bit and talk about Hans Selye, a brilliant physiologist who laid the experimental foundation for thinking about stress and inflammation. Selye described a generalized stress response that occurs whenever anything changes in your body. The series of changes include hormone secretion such as cortisol, adrenalin, and others. Selye realized that "stress is stress." The body doesn't care whether your husband is yelling at you or if you have a stomach virus. According to Selye, stress is all the same in how it affects your body.

Stress hormones are secreted under the control of the brain, which senses these changes and tells the glands to get going. So, under the influence of stress hormones, the blood pressure and heart rate go up, your blood glucose goes up just as if you were a little bit diabetic, and your hands become cold as the arteries clamp down in case there is blood loss. Selye's sequence of physiological events has been called "fight or flight."

H&H: What are the effects of secreting cortisol?

DR. MATTHEWS: Cortisol, like any steroid, is secreted by the body to suppress excess inflammation. With inflammation, we have a Goldilocks situation: it's best to have not too much, and not too little.

For example, if you have poison ivy, your doctor may give you a prednisone dosepack to reduce the inflammation. And your body will do the same thing under stress naturally, so you can make your own prednisone dosepack. A small amount of steroids under stress will be produced naturally by your body, and that can be a good thing.

"Some researchers think that aging is actually a form of stress."

If the stress goes on for a longer time, you begin to run out of cortisol. Your adrenal glands can only do so much and they get tired like the rest of you does. When you run out of cortisol you excrete adrenalin, which is very short term. Adrenalin raises your blood pressure, your heart rate, your blood glucose, and generally makes you act like you are running a race for your life and you need all the fuel you can get, right now.

Steroids in general, such as prednisone as well as those you naturally excrete yourself, cause suppression of the immune system. Steroids also cause tissue catabolism, which means that you start using your body for fuel for this stress response. So in one sense your body carries a store of protein and sugar that can be called on by the stress response.

A little stress can be a good thing. If you have poison ivy or a sinus infection, the inflammatory response produces dilation of blood vessels in the area of the irritation. When the vessels dilate they leak white cells into the affected tissue, and the white cells fight the toxin or the infection.

The classic description of localized inflammation, like poison ivy or sinusitis, was "*calor, dolor, rubor, and tumor*"—Latin for heat, pain, redness, and swelling.

What about when there is a lot of stress? Prolonged stress causes multiple medical problems that appear remarkably identical to those seen with aging. Chronic steroid excretion under stress can cause the same problems as long-term use of prednisone: muscle atrophy, skin atrophy and wrinkles, bone loss (osteoporosis), elevation of blood sugar and changes consistent with diabetes, and exhaustion. Some researchers think that aging is actually a form of stress.

H&H: How does this relate to migraine?

DR. MATTHEWS: There is an interesting animal model of migraine that involves stressing the trigeminal nerve, one of the nerves that supply the head. The researchers place an electrode on the trigeminal nerve and stimulate it continuously, stressing it beyond usual physiological use. The trigeminal nerve supplies the face in areas frequently associated with migraine, and also regulates the blood vessels that supply the coverings on the brain.

What happens next is very interesting. The stimulation of the trigeminal nerve causes blood vessels in the coverings of the brain to dilate, and this allows white blood cells to leak into the surrounding space. If you obtain some spinal fluid and look at it under the microscope, you may see white blood cells,



Stress reduction is the topic as Dr. Matthews discusses headache relief with this patient.

Migraines, Stress and Inflammation

which means that you are seeing a little pus in the spinal fluid, just as if you had an infected wound. So, migraine produces inflammation in the coverings of the brain, just like poison ivy produces a rash on the skin or a sinus infection produces inflammatory changes in the nose. This event is called "sterile inflammation." The sterile part refers to the fact that the meninges are inflamed simply from the continued stimulation of the nerve in migraine, and not because of any infection like we see when someone has Rocky Mountain Spotted Fever or a virus affecting the coverings of the brain.

One would think that actions that reduce stress—avoiding smoking and caffeine, diet, some exercise—would also reduce the inflammatory response and reduce headaches as well. We have certainly seen this in the Headache Clinic.

Once we obtain a remission of frequent headaches, we find that if you can follow anti-inflammatory behavioral changes, your chance of no longer needing medication is about 70 percent. If you don't improve your general health, especially exercise, the chance of being free of headaches without medication drops to about 30 percent. So, your habits and the environment play a very large role in stress and migraine.

H&H: Do you treat migraine with prednisone?

DR. MATTHEWS: Sometimes we have to use steroids for a very brief period of time to induce a remission. It's very

common in medicine to prescribe a steroid dosepack for migraine that persists for many days, and it can be very effective.

At the Headache Clinic, we prefer to administer an anti-inflammatory dose at the exit of nerves along the base of the skull. The procedure is called an occipital nerve block, and it's effective about 70 percent of the time in inducing a remission of headache. A very small amount of steroid can be administered precisely where it can do some good, with very little total body exposure to steroid. It's a very minor procedure that provides a great benefit for many people. **h&h**

The North Carolina Comprehensive Headache Clinic is an outpatient neurology facility providing diagnostic evaluation and treatment for the patient with headache. For information, contact

NORTH CAROLINA COMPREHENSIVE HEADACHE CLINIC

**2501 Atrium Drive, Suite 400
Raleigh, NC 27607**

**Telephone: (919) 781-7423
www.ntheadache.com**

For more information, please visit our website at www.ntheadache.com.

New patients are welcome