

Dry Eye as a Trigger for Headaches

Aggressive treatment of dry eye can greatly reduce or eliminate the frequency and/or severity of headaches.

BY JACQUELINE W. MULLER, MD

Several years ago, I hypothesized that by treating keratitis sicca aggressively and improving the quality of the ocular surface, I could decrease patients' eye strain and thereby potentially decrease the frequency and/or the severity of associated headaches.

Dry eye decreases visual acuity and causes ocular discomfort and asthenopia, which in susceptible individuals, can lead to headaches. The prevalence of dry eye has increased in recent years, especially in people between the ages of 16 and 75 years. This is due to the increased use of computers, contact lens wear, air travel, an increase in the use of medications that contribute to or exacerbate dry eye, and poor air quality. Some medical conditions are also associated with dry eye (ie, environmental allergies, diabetes, rheumatologic diseases, thyroid disease, collagen vascular diseases, etc.).

TAKING THE HISTORY

Many patients report that their eyes feel dry. Others complain of symptoms such as eye strain or fatigue; ocular discomfort or irritation; burning; redness; the feeling of sand or an eyelash in their eye(s); intermittent blurry vision; a gritty feeling; itching; soreness; and/or light sensitivity. Fortunately, during the past decade, physicians and scientists have made tremendous progress in the diagnosis and treatment of keratitis sicca.

It is imperative that ophthalmologists evaluating a patient make every effort to elicit any symptoms that a person may be experiencing regarding dry eye. It is also important to take the patient's history regarding any associated medical conditions, medications with potential ocular side effects, computer use (ie, specifically how many hours each day), information regarding contact lens wear, and environmental allergies.

THE CLINICAL EXAMINATION

Upon clinical examination, the eye care practitioner should look for signs of keratitis sicca using conjunctival stain (ideally, lissamine green) and corneal stain (using

fluorescein). The physician should identify a decreased tear meniscus, assess the quality of the tear film, and determine the tear film breakup time, with or without Schirmer testing. Dry eye can lead to varying degrees of superficial punctate keratopathy, which leaves the epithelium overlying the cornea irregular. When this irregularity is moderate or moderate to severe, and especially when it is overlying the visual axis, it can decrease a patient's vision both qualitatively and quantitatively.

The Thought Process

It is not uncommon for patients to exhibit superficial punctate keratopathy involving the visual axis after hours of intense visual tasks such as reading, driving a car, or working on a computer. Because working on computers is visually demanding, it is common that individuals with minor vision-related problems who would not normally have symptoms, find themselves symptomatic in this setting. Computer-related dry eye is thought to be multifactorial. Ergonomic factors such as glare from overhead lighting, the computer screen's orientation with respect to the user, and the quality of the image on the computer display, in combination with a decreased blink rate and increased evaporation rate of the tear film, lead to symptoms. These symptoms include eye fatigue; dry, burning, or irritated eyes; blurred vision; and light sensitivity, which can then lead to symptomatic eye strain.

I hypothesized that, cumulatively, hours of eye strain and struggling to see clearly could trigger headaches in susceptible individuals. I wanted to treat keratitis sicca aggressively, thereby improving the integrity of the ocular surface and decreasing symptomatic eye strain, to secondarily decrease the frequency and/or severity of headaches.

The Treatment

To test this hypothesis, I began aggressively treating all of my patients who had both headaches and keratitis sicca, more than 200 patients total. I explained my

hypothesis and asked if they were committed to aggressively treating their dry eye in an effort to decrease or eliminate their headaches; all patients were anxious to get started. Because these patients were going to be given a rigorous medical regimen, it was critical that they were committed.

I educated the patients regarding their condition and counseled them to control as many exacerbating environmental factors as possible. I also discussed decreasing any medications that might exacerbate their dry eye. Because I prescribed numerous medications, I recommended that they create a spreadsheet to ensure their compliance. I then saw the patients for a follow-up visit in 1 month and re-evaluated their signs and symptoms.

Most often, the aggressive treatment regimen included Restasis b.i.d. (cyclosporine 0.05%; Allergan, Inc.), omega-3 fatty acids, Lotemax q.i.d. (loteprednol etabonate ophthalmic suspension; Bausch + Lomb), a combination antibiotic-steroid ophthalmic ointment at bedtime, five to six 8-oz glasses of water a day, preservative-free artificial tears every 1 to 1.5 hours while awake, sunglass wear outside, a desktop and bedside humidifier, and lid hygiene b.i.d. If any patients had significant blepharitis, oral doxycycline and Azasite (azithromycin; Inspire Pharmaceuticals, Inc.), massaged

into the base of their lashes, were also added to their medical regimen.

THE RESULTS

I found these patients to be highly motivated, as some of them were taking systemic pain medications to alleviate their headaches. After 1 month, more than 90% of the patients were significantly better on biomicroscopic examination, and most importantly, reported either significant amelioration or elimination of their headaches.

It has been my experience that once patients have positive results, they are extremely motivated to work with their ophthalmologist to maintain that benefit. The next step in my practice was determining the minimum dry eye treatment regimen that would keep each patient symptom free.

Eye care practitioners should make a point of inquiring about headaches in patients with dry eye to see if that patient might benefit from an aggressive dry eye treatment regimen. ■

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RESEARCHERS REVEAL HOW LIGHT WORSENS MIGRAINE HEADACHES

By Malaika David, Associate Editor

Scientists from Harvard Medical School's Beth Israel Deaconess Medical Center (BIDMC) in Boston have discovered how migraines are exacerbated by light, according to findings published in *Nature Neuroscience*.¹

The investigators studied two groups of blind patients who suffer from migraines. The patients in the first group were completely blind as a result of eye diseases such as retinal cancer and glaucoma; they could not see images or sense light. The patients in the second group were legally blind as a result of retinal degenerative diseases such as retinitis pigmentosa; they could not see images but could sense light.²

"The patients in the first group did not experience any worsening of their headaches from light exposure, [however,] the patients in the second group clearly described intensified pain when they were exposed to light, in particular blue or gray wavelengths," said Rami Burstein, PhD, lead investigator of the study, in a news release. "This suggested to us that the mechanism of photophobia must involve the optic nerve, because in totally blind individuals, the optic nerve does not carry light signals to the brain." Dr. Burstein is a Harvard Medical School professor of anesthesia and critical care medicine at BIDMC. He

added that retinal cells containing melanopsin photoreceptors played a part in the process because they are the only functioning light receptors in legally blind individuals.

Following this discovery, investigators performed experiments in an animal model after it experienced a migraine. The researchers injected dye into the model's eye and traced the path of the melanopsin retinal cells through the optic nerve to the brain. Here, they discovered a group of neurons that were electrically activated during the migraine.²

"When small electrodes were inserted into these 'migraine neurons,' we discovered that light was triggering a flow of electrical signals that was converging on these very cells," said Dr. Burstein. "This increased their activity within seconds."

He further stated that even after the light was removed, the neurons remained activated, which explains why patients said their headaches worsen seconds after light exposure and do not improve for up to 30 minutes.

"Clinically, this research sets the stage for identifying ways to block the pathway so that migraine patients can endure light without pain," concluded Dr. Burstein.

1. Noseda R, Kainz V, Jakubowski M, et al. A neural mechanism for exacerbation of headache by light. *Nat Neurosci*. 2010;13(2):239-245.

2. Prescott B. Light worsens migraine headaches: extreme light sensitivity in blind patients helps researchers track ailment [press release]. Boston, MA: Science and Engineering at Harvard University; January 11, 2010.