

A Biobehavioral Approach to Headache Management

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Effective long-term management of patients with headaches can be challenging because these disorders are complex with heterogeneous triggers, expression, and impact.^{1,2} While the biomedical model has led to important discoveries in the pathophysiological mechanisms of headache, the model has limitations, including the marked varied individual responses to identical treatments.¹ Headache has both sensory (e.g., pain location, intensity, and quality) and affective (e.g., depression, anxiety, distress) components.³ The pain experience involves the interconnectivity of physical vulnerabilities (e.g., genetics), psychological predispositions (e.g., prior learning history), biological changes, psychological issues, and biopsychosocial contexts that influence an individual's evaluation of and response to headache.¹ As a result, effective treatment of headache cannot rely solely on regulating the chemical and electrical signals within the pain pathways associated with headache, but must also address their cognitive, affective, and behavioral components.

Typically, nonpharmacologic treatment for headache has been considered an option when the patient's presentation fell outside the normative patient experience. As headache has begun to be conceptualized as a chronic disease,⁴ treatment also needs to reflect this conceptualization. Hence, a comprehensive, multidisciplinary treatment program to prevent headache is appropriate. The biobehavioral approaches with the strongest efficacy include cognitive behavioral therapy [CBT], relaxation training, biofeedback, and stress management.

BIOLOGICAL BASIS FOR MIGRAINE AND PRIMARY HEADACHE DISORDERS

The pathophysiology of migraine is complex, melding a genetic predisposition⁵ with a cascade of events that have been described over nearly one century. For many years, migraines were thought to be a purely vascular headache, and the aura of migraine was felt to be due to cerebral vasoconstriction resulting in ischemia. In the 1940s, when Leao first described his theory of cortical spreading depression (CSD), an electrical signaling phenomenon involving the cortex of the brains of rabbits, a new postulated mechanism for migraine was born. Since then, fMRI studies in humans have demonstrated that neuronal signaling in CSD is the physiology of migraine aura, though it is unknown whether it is this event or another – originating in deep, subcortical structures such as the brainstem – is the first in the migraine cascade.⁶⁻⁹ The throbbing pain of migraine is triggered by subsequent

activation of the trigeminal vascular system, mediated by a neurogenic inflammatory response, release of nociceptive neuropeptides such as calcitonin gene related peptide (CGRP), neurokinin A, substance P, among others. Nausea and irritability occur through stimulation of the chemoreceptor trigger zone, and autonomic activation results in fluctuating levels of catecholamines.⁵ Central pain processing pathways are subsequently activated in the thalamus, periaqueductal gray (PAG) matter of the midbrain, and the posterior hypothalamus, and a process known as central sensitization contributes to the aversion to stimuli – including sound, light, motion. For some, even light touch can be painful.

The clinical picture of migraine is the result of neurovascular dysregulation, and the many prescription and over-the-counter treatments target nociceptive and inflammatory pathways (such as NSAIDs) or stabilize and constrict cerebral blood vessels (triptans, ergots, and others). Prophylactic agents also operate on central and peripheral pathways, stabilizing blood vessels and autonomic activation (beta blockers and calcium channel blockers), acting on ion channels and neuronal receptors (anticonvulsant medications), or regulating levels of neurotransmitters (SSRIs, TCAs). Each medicine works by interrupting a single link in the cascade; however, no pharmacological treatments operate specifically on central sensitization, or treat the affective component of the pain, both of which may be larger complaints for patients than the pain itself. Non-pharmacologic strategies for headache treatment and prevention are a way to reduce brain-derived autonomic and nociceptive dysregulation, through behavioral “revamping” of these dysfunctional systems. Behavioral treatments in particular are evidence-based, and complementary to medical treatments, providing comprehensive care for a complex condition.

BIOBEHAVIORAL TREATMENTS FOR HEADACHE AND MIGRAINE

Biobehavioral techniques focus on managing the physiological, cognitive, and affective components of stress. These techniques facilitate skill development aimed towards increasing the patient's ability to cope with pain and reduce headache-related distress.¹⁰ A review of biobehavioral treatments consistently show that biofeedback, relaxation, and CBT (including stress management) produce a 30-60% reduction in migraine activity. The US Headache Consortium¹¹ assigned the following treatments “Grade A” evidence (multiple

well-designed randomized clinical trials that yielded a consistent pattern of findings): relaxation training, thermal biofeedback combined with relaxation training, electromyographic biofeedback, and CBT (for prevention of migraine).

Individuals with clinical depression or anxiety, those with moderate-severe headache-related disability, difficulty managing triggers (including stress), having other significant psychological issues (e.g., history of abuse/maltreatment), or preference for biobehavioral approaches are all ideal candidates for biobehavioral intervention.¹¹

Stress and Headache

Stress results from an interaction between the perception of an event as threatening to one's well-being and an individual's physiologic, cognitive, and affective response to the situation. When individuals experience a situation they view as "stressful," the individual's response elicits various physiologic changes including cerebral vasoconstriction and neurogenic inflammation. Stress increases sympathetic arousal and may increase neuronal hyperexcitability.

There are five ways that stress can potentially contribute to the expression and maintenance of headache episodes: 1. Predisposer – Stress contributes to headache onset or expression in a person with a preexisting vulnerability; 2. Precipitant – Stress precipitates individual headache episodes; 3. Exacerbator – Stress exacerbates the progression of headache, including transformation from an episodic to chronic condition; 4. Perpetuator – Stress worsens headache-related disability and quality of life; and 5. Consequence – Headache can serve as a stressor.¹² After a stressful period, there may be a letdown phase that can as a result trigger a headache.

Co-morbid Psychiatric Disorders and Headache

Depression and anxiety are more common among patients with headache relative to the general population. Depression and anxiety are especially prevalent among those with chronic migraine, with more than half experiencing depression and nearly one-third experiencing anxiety. Experiencing depression or anxiety is associated with more severe migraines, increased disability, reduced adherence, increased medication use, and lower efficacy for actively managing migraine. In fact, psychological distress may play a greater role in the progression of headache from episodic to chronic than medication overuse.

The prevalence and impact of abuse and maltreatment is beginning to receive greater attention within the headache community. PTSD occurs more commonly in those with migraine (whether episodic or chronic) than in those without migraine. The trauma impairs their ability to cope with various aspects of life, including how to manage headaches. Given a history of trauma, the individual would be well-served by including a psychological evaluation in treatment plan.

Cognitive-Behavioral Therapy (CBT)

CBT, a Grade A treatment for headache prevention,¹³ utilizes

both cognitive and behavioral headache management strategies. Cognitive strategies focus on identifying and challenging maladaptive thoughts, beliefs, and responses to stress.¹⁴ Cognitive strategies for headache management focus on enhancing self-efficacy (i.e., patients' beliefs in their ability to succeed or accomplish a certain task),¹⁴ encouraging patients to adopt an internal locus of control (i.e., a belief that the mechanism for change lies within oneself as opposed to an external locus of control or the belief that only the health-care provider, medication, or medical procedures have the power for change),¹⁵ and eliminating catastrophizing (a hopeless and overwhelming way of thinking), all of which predict poor treatment outcomes.¹⁶

Behavioral strategies include replacing behaviors that may maintain or exacerbate headaches with wellness strategies. Modifiable risk factors for migraine progression include medication overuse, obesity, caffeine overuse, snoring, depression, and stressful life events. Behavioral treatment includes education in wellness activities as a means of enhancing self-management of headaches. For example, patients can benefit from making lifestyle behavior changes designed to help them maintain a healthy weight and achieve a state of physical well-being (i.e., proper nutrition and eating habits, reduced consumption of caffeine, regular physical activity). Interventions that encourage patients to improve sleep hygiene, quit smoking, reduce alcohol intake, and reduce use of sedative medications may also be provided by a psychologist. CBT may also provide the patient with strategies to avoid triggering a headache, improve overall coping, and help the headache sufferer manage co-morbid symptoms of depression and anxiety.

Relaxation Training and Biofeedback

Relaxation techniques possess Grade A evidence for their use.¹⁶ The focus is on helping patients minimize physiological responses to stress and decrease sympathetic arousal. The classic procedure, progressive muscle relaxation training, first published in 1938, involves tensing and relaxing various muscle groups while attending to the resulting contrasting sensations.¹⁷ Other relaxation techniques include visual or guided imagery, cue-controlled relaxation, diaphragmatic breathing, hypnosis, and self-hypnosis.^{16,18}

Biofeedback has also received Grade A evidence for its use.¹⁹⁻²¹ It involves monitoring physiological processes that the patients may not be consciously aware and/or do not believe they voluntarily controls. Digital processes take the patients' physiological information and convert it into a signal that patients receive in either visual or auditory form. Through biofeedback training, patients develop increased awareness of physiological functions associated with headache and stress and learn to control their physiologic states.²²⁻²⁴ Various relaxation skills, such as diaphragmatic breathing or visualization to elicit the "relaxation response"²⁵ are often incorporated into biofeedback training.¹⁹ To achieve the benefits from relaxation and biofeedback, patients may

use any techniques or tools that help them quiet the mind and calm the body (e.g., meditation, prayer, yoga, pleasant music, guided relaxation).²⁶ To achieve maximum benefit of these techniques, patients must be motivated to consistent practice in order to lower their baseline of stress and tension.

Cost-Effectiveness of Behavioral Treatment

Recent research found that the most expensive behavioral treatment method – individual sessions with a psychologist in clinic – cost more than pharmacologic treatment with \$6-a-day drugs in the first months.²⁷ However, at about five months, individual sessions become competitive in cost. After a year, they are less expensive than all methods except treatment with drugs costing 50 cents or less a day. Overall, group therapy and minimal-contact behavioral treatment were cost-competitive with even the least expensive medication treatment in the initial months. At one year, they become the least-expensive headache treatment choice.

SUMMARY

Headaches are more than just a series of changes in neurophysiology and neurochemistry. They also involve individuals experiencing pain and attempting to manage the impact of that pain on their lives. As a result, headache is best conceptualized in a biopsychosocial framework, as involving physiologic, cognitive, affective, and behavioral phenomena. Although pharmacologic treatment alone is considered a basis of involved in migraine management and prevention, many individuals with headache will benefit from multidisciplinary treatment.

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