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Complementary and Integrative Medicine for Neurological Conditions: A Review

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Synopsis

Although many neurological conditions are common, cures are rare and conventional treatments are often limited. Many patients therefore turn to complementary and alternative medicine (CAM). The use of selected, evidence based CAM therapies for the prevention and treatment of migraine, carpal tunnel syndrome, and dementia are presented. Evidence is growing for a number of modalities including nutrition, exercise, mind-body medicine, supplements, and acupuncture.

Keywords

Integrative medicine; complementary medicine; alternative medicine; migraine; carpal tunnel syndrome; headache; dementia

INTRODUCTION

Although many neurological conditions are common, cures are rare and conventional treatments are often limited. Many patients turn to complementary and alternative medicine (CAM) to find relief. CAM is defined as a group of diverse medical and health care systems, practices, and products that are not presently considered conventional medicine.¹ While over half of adults with common neurological conditions use CAM, most have not discussed this use with their health care provider,^{2,3} highlighting the need to make CAM use a routine part of the history and an important subject to understand as a provider. Patients are searching for additional treatments, and having an informed provider discuss and advise on CAM can clarify what modalities may have the most benefit. Devising an effective treatment plan for these conditions should include a discussion of CAM options. An integrative approach is

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especially important in improving self-efficacy and empowering the patient to make healthy changes that could provide significant benefit. Adherence to all treatments improves when patients feel they are actively involved in determining their plan of care. Treatments that fall within the CAM category change over time, as treatments that once were considered “alternative” can gain enough evidence to become accepted as mainstream. Lifestyle factors, mind-body practices, acupuncture, supplements, and therapeutic touch are modalities currently considered CAM and their use for migraine, carpal tunnel syndrome, and dementia are discussed in this paper (see Table 1).

MIGRAINE

Migraine is a recurrent disorder that manifests as severe, unilateral, pulsating headaches that worsen with activity, last 4–72 hours, and are associated with photophobia, phonophobia, nausea, and/or vomiting. Migraine is a clinical diagnosis made by history and exam, although red flags may warrant additional testing to rule out secondary headache disorders. This common and disabling condition affects 36 million Americans and costs \$13 billion/year due to lost workdays, diminished productivity, and increased health care utilization.⁴ Although the genetic predisposition to migraine gives rise to the condition for many individuals, effective preventive and treatment strategies can significantly diminish the frequency and disability. Pharmaceutical options have many limitations, such as patient preference, side effects, limited efficacy, co-morbidities, pregnancy and breastfeeding. These limitations may explain why up to 82% of migraineurs seek CAM options.⁵ Lifestyle factors may trigger or influence the presence of individual migraine attacks, so non-pharmaceutical approaches become a key component to effective migraine prevention and management.

Non-pharmacological treatment options

Lifestyle—Unhealthy and irregular lifestyle factors may lower the headache threshold or even trigger individual migraine attacks. Targeting and treating lifestyle factors seems quite simple, but when done effectively can have profound positive effects on migraine frequency. Consistent meals/hydration and appropriate sleep hygiene can provide the stability needed to decrease the likelihood of migraines. Lifestyle factors important in migraine prevention include:

- Regularly scheduled meals; avoiding missing or delaying meal-time
- Routine hydration with non-caffeinated beverages throughout the day
- Consistent sleep schedule every night of the week, including weekends

Certain foods, diets, and exercise may trigger or improve migraines for some individuals.^{6,7} Obesity increases the risk of migraine converting from episodic to chronic. In addition, migraine and obesity are highly co-morbid. Therefore healthy diet and exercise interventions may be especially beneficial for migraineurs. Historically, long lists of foods to avoid are provided to migraine patients (e.g., foods with tyramine, aspartame, monosodium glutamate, chocolate, certain alcohols, etc.). However, the role of dietary triggers in migraine is complex, as only some migraineurs may have food sensitivities, and even then ingestion of a precipitant does not always trigger an attack. Only a few small studies with elimination diets

have been conducted and evidence is promising but limited by methodological concerns. Further, broad lists of foods to avoid may be too restrictive, create undue anxiety, and limit otherwise healthy options. Carefully completed headache diaries may help patients self-identify certain triggers that can then be avoided (using the list of potential trigger foods as a guide in this process). Universal recommendations for elimination of all possible migraine food triggers in all migraine patients is not recommended, but a well-balanced diet with avoidance of fasting and skipping meals is recommended. Current research is ongoing that may help identify optimum diet and exercise programs for migraineurs.⁸

Mind/Body Practices—Stress is the number one reported trigger for migraines.⁹ Treatments that target stress may be particularly beneficial in decreasing migraine frequency and in building additional coping behaviors. These behavioral interventions have Grade A evidence for migraine prevention.¹⁰

- Cognitive behavioral therapy, including stress management and coping skills
- Biofeedback (electromyographic and thermal with relaxation)
- Relaxation training

Evidence is beginning to emerge for treatment of migraine with mind/body practices.¹¹ For example, yoga¹² and mindfulness meditation¹³ may be beneficial for migraines. An improvement in cardiac autonomic balance (e.g., enhancement of vagal tone and drop in sympathetic drive) may be involved in the mechanism underlying these changes. Additional cognitive and affective mechanisms may be playing a role in the modulation of pain by these mind/body practices.¹⁴ Despite American Headache Society recommendations against opioids for treatment of migraines, many patients may turn to opioids,¹⁵ and mind/body practices may be a non-narcotic option to achieve pain relief.¹⁶

Massage, Chiropractic, and Acupuncture—While tension-type headaches have historically been considered a condition of “muscular tension,” many migraineurs also have concurrent neck pain with their migraines and find symptom relief with massage or chiropractic manipulation. Methodological shortcomings limit the interpretation of studies evaluating these treatment options,¹⁷ and more rigorous studies may suggest no additional benefit beyond placebo.^{18,19} Chiropractic manipulation has been associated with rare life-threatening events such as cervical artery dissection, although there is debate as to whether the association is causal.²⁰ Financial concerns often limit the widespread use of massage. Given the limited evidence, massage is not a treatment typically recommended for use in migraine. For those patients who can afford it and find symptomatic relief, it may be helpful. Future research could also further investigate the potential indirect effects of massage on migraine through its relaxation properties and resulting improvements in anxiety and/or stress. The lack of well-conducted research for chiropractic treatment along with the potential risks of cervical manipulation limit its recommendation for use for migraine.

Evidence suggests that acupuncture may be a helpful treatment for adults with migraines, even if the effect is similar to sham acupuncture.²¹ Acupuncture also results in significantly fewer side effects compared to traditional pharmacological treatments for migraine (6% with 24 sessions of acupuncture vs. 66% with daily topiramate).²² Given the potential benefits

with minimal side effects, acupuncture may have a potential role in the treatment of migraine. Unfortunately, many patients find acupuncture cost-prohibitive, especially since it is not covered by most United States insurance companies. Group-based acupuncture sessions may be an affordable option if available.

Supplements—Herbs, vitamins, and minerals may help prevent headaches. Although considered “natural,” side effects can occur. Supplement quality and drug-supplement interactions also need to be considered. Table 2 lists the supplements with American Academy of Neurology (AAN) level A–C evidence (A-strongest; C-least strong) for use in the prevention of episodic migraine.²³ MIG-99 (an extract of the herb feverfew [*Tanacetum parthenium*]), magnesium, and riboflavin (vitamin B2) have level B evidence for migraine prevention, and Coenzyme Q10 has level C evidence. Although *Petasites hybridus* (butterbur) was categorized as level A, recent concerns over hepatotoxicity have limited recommendations for its use so it is not included in the table.

Oral magnesium has historically been used for migraine during pregnancy. However, the FDA recently re-classified magnesium sulfate injections as pregnancy category D from A based on potential teratogenic effects on fetal bone growth. Since magnesium is typically administered orally for migraine prevention, the safety of oral magnesium for migraine during pregnancy is currently under debate.²⁴ Given magnesium’s current classification as Category D, and the lack of research on the impact of daily oral magnesium on the fetus, precaution is advised for use in pregnancy.

A few studies suggest pyridoxine (vitamin B6), melatonin, omega-3 fish oil, vitamin D3, and supplement combinations (e.g., folic acid/B6/B12) may have potential benefits for migraine, but evidence is preliminary and recommendations cannot be made at this time. As with daily prophylactic medications, supplements need to be used at the goal dose for 2–3 months before determining effectiveness.

New devices and treatment options—There are several new FDA-approved devices for treatment of migraine (e.g., transcranial magnetic stimulation and transcutaneous electrical nerve stimulation) and more under investigation. Although these are an option for those seeking non-drug treatment options, they will not be discussed here. However, research is promising^{26,27} and further clinical use will help determine their role in clinical care.

CARPAL TUNNEL SYNDROME

Carpal tunnel syndrome (CTS) is an entrapment of the median nerve at the wrist that causes painful paresthesias, numbness, and occasional weakness of selected hand muscles. It is the most common nerve entrapment syndrome, affecting 10 million individuals in the United States alone. Four percent of the general population, 10% of the working population and over 30% of pregnant women have CTS.²⁸ Risk factors for CTS include repetitive hand use, obesity, pregnancy (progressively worse in later terms), diabetes, thyroid dysfunction and other medical conditions.²⁸ The debilitating symptoms can lead to significant disability at work and in daily activities. CTS is diagnosed by history, physical examination,

electrodiagnostic studies including nerve conduction studies and electromyography, and neuromuscular ultrasound.²⁹

The conventional treatment for CTS has historically been divided into surgical (i.e., transection of the transverse carpal ligament) and nonsurgical options, such as splinting, oral anti-inflammatories, and steroid injections. The recurrence rate, potential complications of surgical intervention, need for less invasive treatment during pregnancy, and patient preference make integrative therapies important options to consider when developing treatment plans for CTS. Up to one third of patients already request alternative therapies for CTS.³⁰ Further, these therapies can be used in an integrative approach in conjunction with traditional approaches.

Nonpharmacological treatment options

A variety of studies assess integrative therapies for CTS.³⁰ Those with limited investigative research include yoga, acupuncture, hand physical therapy, and magnet therapy. Although research evidence is limited, these options may be reasonable non-invasive considerations to try prior to surgical referral in select patients requesting a trial of less invasive therapy. It is reasonable to move on to another therapy if there is no improvement in symptoms after a 4–8 week trial.

Mind-body practices—Yoga has been explored as a treatment for CTS. In a well-designed *JAMA* study, eight weeks of yoga was compared to standard of care wrist splint use.³¹ Those in the yoga-based intervention experienced increased grip strength and decreased pain when compared to the wrist splint, although no physiological changes were seen on nerve conduction studies. Patients need to be counseled on the importance of gentle yoga, typically found in a restorative or hatha style yoga class. Patients should avoid any poses that cause discomfort in the wrist area and should inform their instructors of their condition.

Acupuncture—The 1997 NIH Consensus statement concluded that acupuncture may be useful adjunct therapy or as an acceptable alternative treatment for CTS.³² A more recent systematic review from 2016 also confirms these findings.³³ Acupuncture treatment has been shown to be as effective as oral steroids for CTS over a four week period and this effect appears to be sustained over a 1 year follow-up period.^{34,35} When compared to wrist splinting, patients treated with acupuncture report fewer symptoms and improved physiological measures with improved nerve conduction velocities.³⁶

Manual treatments—Hand therapy is a well-established, although underutilized, modality typically performed by physical or occupational therapists.³⁷ It is included here as a reminder of an effective, less invasive integrative therapy that can be used alone or as an adjunct. A hand therapy treatment session may include ultrasound, exercises to stretch the nerve referred to as “nerve gliding,” myofascial release (an osteopathic manipulation technique), and/or iontophoresis. Nerve gliding was found to reduce pain and increase active range of motion of wrist extension and flexion.³⁷ Ultrasound is a brief, well-tolerated technique that exposes injured tissue to varying frequencies of sound waves either

continuously or in a pulsed manner. When compared to superficial and continuous exposure, deep pulsed ultrasound is more effective in reducing pain, paresthesia and sensory loss, and in improving median nerve conduction and strength.³⁸ This is the ultrasound modality used in most hand therapy clinics for CTS treatment.

Magnet Therapy—Patients with CTS may seek treatment with magnetic wristbands and often inquire to their physicians about this treatment. The proposed mechanism of action involves increased local vascularity, vascular tone, alterations in the sodium potassium pump and decreases in histamine and carrageenan.^{39,40} Several small studies have shown improvements in electrodiagnostic testing and pain scales with the use of magnetized wristbands.^{41–43} However, the research is preliminary, has methodological concerns, and only provides limited clinical information for treatment recommendations. Although magnet therapy cannot be recommended as treatment at this time for CTS, further research is important to better understand efficacy, dose, and duration.

DEMENTIA

Dementia refers to a loss of cognitive function, resulting in decreased understanding, perception, or awareness of one's thoughts and ideas. Some risk factors for dementia include age, atherosclerosis, genetics, head trauma, and various infections of the brain and body such as syphilis or HIV. Dementia may occur gradually or quickly and can be caused by brain changes associated with disease or trauma. An estimated two million Americans suffer from severe dementia; one to five million experience mild to moderate dementia.⁴⁴ Some causes of dementia are preventable; however, many causes of dementia, like Alzheimer's disease, have no cure. Standard of care pharmaceutical treatments attempt to, at best, slow symptom progression. Integrative therapeutics may offer complementary options to patients interested in such modalities. Due to increased popularity, research and evidence for the benefit of some of these treatments are growing, especially for "memory loss."² With the limited options for treatment or cure and the devastation of dementia sequelae, many are desperate to find additional options. Patients with cognitive impairment may be additionally susceptible to poor judgment given their condition, so appropriate counseling about treatment and recommendations becomes critically important.⁴⁵

Non-pharmacological Treatment Options

Diet and Lifestyle—Nutrition, exercise, sleep and stress all play a part in the pathophysiology of memory loss. Studies have examined prevention and treatment of age-related cognitive decline, mild cognitive impairment, and people with dementia. Often the recommendations for prevention and treatment overlap.

Nutrition: One relevant and preventable risk factor is nutritional deficiencies.⁴⁶ Deficiencies of certain nutrients, especially the B vitamins, may lead to dementia. Homocysteine levels in the body are increased with deficiencies of folic acid, vitamin B1 (thiamine), and vitamin B12 (cyanocobalamin). An elevated homocysteine level is thought to be a risk factor for developing dementia and heart disease. Iron deficiency may lead to anemia, which can lead to brain cell death and eventually dementia.⁴⁷ These vitamin deficiencies may be driven by

the challenges many elderly patients have in eating high quality, fresh fruits, vegetables, whole grains, and good quality protein sources. The International Conference on Nutrition and the Brain recently developed recommendations on diet and lifestyle recommendations for the prevention of Alzheimer's disease.⁴⁸ Briefly, they recommend, reducing saturated fats and trans fats intake; increasing vegetables, legumes, fruits and whole grains; vitamin E from foods rather than supplements (15 mg/day); a reliable source of B12 (2.4 mg/day); choosing multi-vitamins without iron and copper unless anemia is a concern, and minimizing aluminum exposure.

Exercise: Evidence from well-designed meta-analyses consistently support that physical activity and exercise, especially aerobic exercise such as walking, jogging, and bicycling, improve cognitive outcomes in older adults and individuals with dementia.⁴⁹ Interestingly, physical activity that requires memory for muscle movement such as tai chi and dance also improve cognitive outcomes.⁴⁹ Exercise may impact dementia by increasing hippocampus size.⁵⁰ A current exercise recommendation for the prevention of Alzheimer's disease is forty minutes of aerobic exercise three times per week at an intensity equivalent to brisk walking.⁴⁸

Sleep: About 25% of adults are not satisfied with their sleep; 10–15% have insomnia symptoms with negative daytime consequences and 6–10% meet diagnostic criteria for insomnia. A clear association exists between sleep impairment and cognitive impairment or Alzheimer's disease.⁵¹ Approximately 7–8 hours of sleep is recommended for most individuals. Evaluating and treating any underlying sleep disorders, such as obstructive sleep apnea, is also very important.⁴⁸

Stress: Psychological stress and reactivity to stress affects brain health. Chronic psychological stress contributes to cognitive decline, hippocampal injury, and neurodegenerative diseases either directly or through stress mediators.⁵² Stress clearly has an influence on cognitive function. Any intervention that could support a reduction in stress or stress reactivity would support the prevention of stress impairing cognition. Mind-body medicine is the therapy of choice for stress reduction in patients because of its great evidence for improving stress markers.

Mind-Body Medicine—Meditation, one of the most common mind-body medicine therapies, has moderate support for effectiveness for improving cognition in non-impaired adults and older adults.⁴⁹ Evidence for meditation's mechanism of action on cognition has been evaluated directly through various pathways in meditators versus controls. For example, brain structure changes have been observed in meditators in areas associated with self-regulation, self-control, focused problem-solving, adaptive behavioral responses under changing conditions, visuo-spatial imagery, episodic memory retrieval and self-processing operations.⁵³ A systematic review of 12 studies found evidence that meditation for older adults is feasible, and may offset age-related cognitive decline.⁵⁴ Indirect mechanisms may also be at play, as meditation may target other mediating factors that impact cognition such as sleep. A systematic review found positive evidence to suggest benefit of mind-body therapies for sleep especially in the elderly.⁵⁵ Research is limited on meditation's impact in

those with mild cognitive impairment (MCI) or dementia, but one small study showed that in adults with MCI, meditation positively impacted the regions of the brain most related to dementia.⁵⁶ Tai chi, a form of moving meditation, also has evidence for enhancing cognitive function, especially executive functioning, in older adults.⁵⁷

Cognitive training/stimulation has evidence from well-designed meta-analyses that consistently supports improved cognitive outcomes in people with dementia. The affected outcomes include improved memory and mental ability; making less errors when learning; verbal and visual learning; improved executive functioning, language, and attention; improved functioning in activities of daily living; and lower depression. Remarkably, the effects of cognitive training appear to last as long as five years after therapy.⁴⁹

Supplements—*Ginkgo biloba* and *Bacopa monnieri* have good evidence of benefit for dementia. In a rigorous meta-analysis, 240 mg/day of *Ginkgo biloba* extract was found to be effective and safe in the treatment of dementia.⁵⁸ *Bacopa monnieri*, otherwise known as water hyssop, also has evidence from a meta-analysis demonstrating improved cognition, especially speed of attention.⁵⁹ Omega-3 fatty acid therapy has positive but conflicting results on dosage and benefit so more rigorous research is recommended.⁶⁰ Other natural products such as phosphatidylserine, huperzine-A, coenzyme Q10, and caprylic acid are often used but still need further research to evaluate efficacy for dementia and related symptoms.

Other—Therapies such as Reiki, Therapeutic Touch, and Healing Touch have moderate evidence to decrease agitation and salivary cortisol and improve cognitive function and mood in adults with dementia.⁴⁹ Therapeutic touch reduced physical non-aggressive behaviors in one study with Alzheimer's patients.⁶¹ Multiple randomized controlled trials consistently demonstrate the benefit of music therapy for dementia. Taught individually or in a group setting, music therapy aims to improve quality of life and is based on music's influence on nonmusical brain and behavior functions.⁴⁹

SUMMARY AND FUTURE CONSIDERATIONS

Complementary treatments with the best evidence for migraine include lifestyle factors, mind/body therapies, acupuncture and supplements (MIG-99/feverfew, magnesium, riboflavin, and CoQ10). Complementary therapies with the best evidence for CTS include yoga, acupuncture, and hand therapy. The complementary treatments with the best evidence for dementia include nutrition, exercise, cognitive training, meditation, *Ginkgo biloba*, and *Bacopa monnieri*. Table 1 summarizes which treatments to consider for each condition.

Complementary and integrative approaches may provide additional benefit in the prevention and/or treatment of migraines, carpal tunnel syndrome, and dementia. These treatments may be used concurrently with conventional therapies. The refractory and persistent nature of these conditions makes many patients seek such additional treatment options. The evidence is growing for many complementary modalities and they warrant consideration for inclusion into treatment plans. However, many complementary treatments may have adverse effects, and even ones considered “safe” involve time, cost, energy, and effort, all valuable resources.

While some research suggests that non-pharmacologic treatments may take longer to see benefit, their effect may be more durable over time, better tolerated, and may confer other benefits to overall wellness, such as improvements in stress, quality of life, pain, anxiety, and depression.⁶²

A small (n=10) pilot integrative program that created personalized recommendations on a combination of CAM interventions such as diet, exercise, stress, brain stimulation, supplements, etc., shows promise for dementia treatment and the need for future expansion and testing.^{63,64} Although multi-modal treatment interventions make it difficult to tease out active ingredients, such treatment approaches demonstrate the possibility of both personalized plans and combination interventions as treatment options.

Questions persist about complementary treatments regarding optimal dose, frequency, duration, efficacy, and mechanisms. Further research with long term data, larger sample sizes, and optimal control groups are needed. In addition, more research is needed on additional integrative therapies for neurological conditions as current therapies still leave many patients with chronic pain and/or impaired function. Future research will hopefully help elucidate which non-pharmacological treatment(s) is most efficacious for which neurological patient. Until then, providers can guide patients on the best treatment options based on evidence, interests, adherence, cost, and access.

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Key Points

- Patients are increasingly turning to complementary and alternative medicine (CAM) for neurological conditions.
- Evidence is growing for CAM therapies, including lifestyle factors, mind-body practices, acupuncture, and supplements, in preventing and treatment migraine, carpal tunnel syndrome, and dementia.
- Clinicians are encouraged to be aware of these modalities and prepared to counsel their patients on their use.

Table 1

Potential nonpharmacological treatment options to consider with the strongest evidence for use for treatment and/or symptomatic relief of migraine, carpal tunnel syndrome, and dementia (see text for additional details of treatment options).

Non-pharmacological Treatment Option	Neurological Condition		
	Migraine	Carpal Tunnel Syndrome	Dementia
Lifestyle (sleep, diet, exercise, stress)	✓		✓
Mind/Body	✓	✓	✓
Acupuncture	✓	✓	
Supplements *	✓		✓
Hand therapy **		✓	
Therapeutic touch, music therapy			✓

* See Table 2 for supplements for Migraine; *Ginkgo biloba* and *Bacopa monnieri* have good evidence of benefit for dementia

** Hand therapy treatment may include ultrasound, exercises to stretch the nerve referred to as “nerve gliding,” myofascial release (an osteopathic manipulation technique), and/or iontophoresis

Table 2

Supplements for Migraine Prevention

Oral Supplement	AAN Grade of Evidence for Migraine Treatment*	Typical Recommended Dose/Frequency for migraine	Potential side effects ²⁵	Comments
MIG-99 (Feverfew extract)	B	6.25 mg tid	Arthralgias, oral ulcers	<ul style="list-style-type: none"> Avoid in pregnancy (can cause uterine contractions)
Magnesium citrate**	B	400–600 mg daily	Soft stools, diarrhea, flushing	<ul style="list-style-type: none"> May be more beneficial for migraine with aura or menstrual migraine GI side effects may be helpful for those with constipation Safety during pregnancy is debated (see text for details)²⁴ Renal failure should prohibit the use of magnesium
Riboflavin (Vitamin B2)	B	400 mg daily	Diarrhea, polyuria, bright yellow urine	
Coenzyme Q10 (CoQ10)	C	100 mg three times/day	Anorexia, dyspepsia, nausea, diarrhea, rash	

* AAN Guidelines (A-strongest evidence; C-least strong evidence)²³

** If problems with diarrhea while on magnesium citrate, magnesium glycinate formulation may be better tolerated