THE ROLE OF NUTRITION IN GLAUCOMA CARE

Can supplements enhance disease management?

BY TOM CHWE, OD, DIPL ABO

Glaucoma is a significant global health issue and the leading cause of irreversible blindness worldwide.[1] Although current treatments focus on reducing IOP, deterioration of retinal ganglion cells (RGCs) and loss of visual function can still occur despite effective IOP management.[2]

Research has revealed other mechanisms contributing to the progression of glaucoma, such as oxidative stress, vascular dysregulation, and neuroinflammation.[3-5] This highlights the need for approaches beyond IOP reduction, focusing instead on neuroprotective approaches to directly preserve RGCs and optic nerves, targeting the underlying causes of cell and nerve damage.[6]

Many patients, driven by the fear of losing their sight, are seeking ways to complement traditional glaucoma treatments. Nutritional support may provide additional benefits, and it should be noted that eating a variety of healthy whole foods and following the MIND[7] diet may be sufficient for many individuals with or at risk of having glaucoma.[8] Effective nutritional counseling starts with building a solid foundation of healthy eating habits.

FOOD AND GLAUCOMA

The Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet was designed to promote brain health and reduce the risk of cognitive decline (see *9 Foods to Eat and 5 Foods to Limit on the MIND Diet*).[7,8] It combines elements of the Mediterranean diet and the Dietary Approaches to Stop Hypertension (DASH) diet, focusing on foods believed to support cognitive function.[9] The Rotterdam Study reveals that greater adherence to the MIND diet is associated with a lower risk of developing open-angle glaucoma.[8] This association is independent of IOP, highlighting the MIND diet's powerful antiinflammatory and neuroprotective benefits. Key components, such as green leafy vegetables and berries are particularly beneficial due to their high concentrations of antioxidants and flavonoids, which have been shown to protect retinal ganglion cells.[10]

While there is promising evidence regarding the role of diet in glaucoma development and management, more rigorous clinical studies are needed to establish definitive guidelines. Future research should focus on long-term dietary interventions and their direct impact on glaucoma progression.

NUTRACEUTICALS AND GLAUCOMA

Nutraceuticals have been gaining attention for their antioxidant, antiinflammatory, and neuroprotective benefits.[11] Counseling about dietary supplements with patients should include a recommendation to also consult with their primary care physician to ensure safety should they have any potential interactions or contraindications.

Preclinical studies on nutritional supplements and glaucoma have shown promising results in both in vitro and animal models.[12,13] Although some human studies have been conducted, better quality randomized clinical trials are needed to confirm the efficacy of nutritional supplements and determine their role in glaucoma care. Eye care

providers should follow evidence-based guidelines for managing glaucoma, and patients should view supplements as supportive therapy, rather than as a replacement for traditional care.

Below are some of the leading supplements that may provide neuroprotective benefits for patients with glaucoma, or those at risk of developing the disease. *Note: This is not an exhaustive list of promising supplements, as many are currently being studied*. Based on a review of the literature, the list below highlights supplements that I believe will continue to receive increasing attention.

9 FOODS TO EAT AND 5 TO LIMIT ON THE MIND DIET

EAT:	LIMIT:
1. Green leafy vegetables*	1. Butter and margarine
2. All other vegetables	2. Cheese
3. Berries*	3. Red meat
4. Nuts	4. Fried and fast food
5. Olive Oil	5. Pastries and sweets
6. Whole grains	
7. Fish	
8. Beans	
9. Poultry	

*The MIND diet categorizes green leafy vegetables and berries separately, both of which may offer neuroprotective effects. This separation could clarify the stronger association between the MIND diet and the incidence of open-angle glaucoma compared to other diets.

Vitamin B_3

Vitamin B_3 occurs naturally in two forms: niacin (nicotinic acid) and niacinamide (nicotinamide). Niacin is typically used to manage cholesterol levels and reduce cardiovascular risk, whereas nicotinamide is essential for producing nicotinamide adenosine dinucleotide to issues such as mitochondrial dysfunction and oxidative stress, which can contribute to glaucoma.[14] Nicotinamide also helps restore NAD, protecting RGCs by improving mitochondrial health and reducing cell stress. Niacin triggers the release of prostaglandins, often leading to a niacin flush, characterized by redness, warmth, and itchiness. Nicotinamide does not cause flushing, as it does not affect prostaglandin release. Supplementing with niacin can cause certain dangerous side effects, such as liver damage, hypotension, and peptic ulcers, while niacinamide is usually safer, with fewer potential side effects.

Studies in animals and humans show that nicotinamide can improve retinal function and protect against glaucoma-related damage. Clinical trials have demonstrated enhanced visual function, measured using electroretinogram and visual field, in patients taking nicotinamide alone or with other compounds, such as pyruvate.[15-17] Nicotinamide is widely available in 500-mg capsules, and human studies have used a dosage between 1.5 g and 3 g daily. Ongoing research is exploring its long-term benefits, with results expected by 2026.[18]

Citicoline

Citicoline (also known as CDP-choline or cytidine diphosphate-choline) is a naturally occurring compound that has gained attention for its potential neuroprotective effects in glaucoma.[19] It serves as a building block for phospholipids, which are essential components of neuronal cell membranes, and supports the production of key neurotransmitters such as dopamine and acetylcholine. By stabilizing nerve cells and reducing oxidative stress, citicoline helps preserve optic nerve and RGC health.

In a study on animals, citicoline preserved RGC density and improved visual acuity without affecting IOP, suggesting a neuroprotective effect.[20] Early clinical trials showed that intramuscular and oral citicoline improved visual function—measured using electroretinogram, visual field, and visual evoked potentials—and slowed glaucoma progression.[21,22] Studies also found that citicoline eye drops can improve optic nerve function, although they may cause more side effects than oral forms due to corneal penetrating enhancers such as benzalkonium chloride.[23] Combination therapies using citicoline with other compounds such as docosahexaenoic acid and vitamin E have also shown promise.[24,25]

Ongoing clinical trials are exploring the therapeutic potential of citicoline in glaucoma, including a phase 3 trial evaluating its ability to slow visual field loss and structural damage in patients with glaucoma.[26] Citicoline is commonly available in 250 mg to 500 mg tablets or capsules, and most human trials in glaucoma and neuroprotection have used between 500 mg to 1000 mg daily.

Ginkgo Biloba

The herbal supplement Ginko biloba extract (GBE) has shown potential benefits for managing glaucoma, particularly due to its ability to improve blood flow, reduce oxidative stress, and provide neuroprotection.[27] GBE enhances microcirculation to the optic nerve and retina, which is especially beneficial in normal-tension glaucoma,[28,29] where decreased vascular perfusion may contribute to the disease. Its antioxidant properties help neutralize free radicals, protecting RGCs and optic nerves from damage.

While short-term clinical studies have produced mixed results regarding *improvements* in visual field performance,[30,31] a long-term 4-year study revealed that GBE significantly

slowed the progression of visual field defects.[32] These findings highlight GBE's potential as an additional support to traditional IOP-lowering treatments, but further research is needed to confirm its efficacy.

Typical doses of a standardized extract (eg, EGb761) used in studies range from 120 mg to 240 mg daily, divided into two or three doses. Although GBE is generally safe and well-tolerated, patients should consult their primary care provider before taking it, as it could interact with blood-thinning medications.[33] Doctors may recommend it as a complementary therapy for patients with progressive glaucoma—especially those with normal-tension glaucoma—but regular monitoring is essential.

Resveratrol

Resveratrol, a natural compound found in grapes, berries, and red wine, is gaining attention for its potential neuroprotective effects in glaucoma.[34] It offers powerful antioxidant, anti-inflammatory, and anti-apoptotic benefits, helping protect RGCs, optic nerve, and trabecular meshwork from damage caused by oxidative stress and inflammation.[345] These effects may also support mitochondrial health and enhance cellular resilience, making it a promising complement to traditional glaucoma treatments.

Research in animal and in vitro models suggests resveratrol can reduce oxidative damage and decrease inflammation in the trabecular meshwork, leading to improved aqueous humor outflow.[12,36,37] In addition to its IOP-lowering effect, resveratrol has been shown to prevent RGC death and preserve optic nerve function in glaucoma.[38,39] Although human studies are limited, early findings indicate its potential to complement standard IOP-lowering therapies. Resveratrol supplements are widely available, typically in doses of 50 mg to 500 mg daily. Although the low bioavailability may limit absorption, newer formulations aim to address this issue.

Resveratrol is generally well-tolerated, with rare side effects such as mild gastrointestinal discomfort. However, it may interact with blood thinners or medications affecting blood glucose levels.[40,41] Patients should consult their health care provider before taking resveratrol to ensure it fits safely into their treatment plan. Doctors can recommend resveratrol as an adjunct therapy for glaucoma, encouraging patients to combine supplementation with a balanced diet rich in natural sources such as grapes and berries.

GUT MICROBIOTA

Emerging research suggests gut health, through its influence on inflammation, oxidative stress, and the gut-brain axis, may play a key role in the development and progression of glaucoma.[42] Observational studies have seen a significant change in gut microbiota composition in patients with glaucoma.

For example, butyrate-producing bacteria are less abundant in individuals with glaucoma.[43] These microorganisms ferment dietary fiber and indigestible carbohydrates to produce butyrate, a short-chain fatty acid crucial for maintaining gut health. They are associated with lower IOP and reduced glaucoma severity, suggesting a protective role. There is also a correlation between an increased Firmicutes/Bacteroidetes ratio and RGC loss.[44] Specific strains are being studied for their neuroprotective effects.[45,46] It's important to note that research conducted on one probiotic strain cannot be accurately extrapolated to other strains within the same species.

An imbalanced gut microbiome could worsen optic nerve damage and neurodegeneration, while a healthy microbiome may offer protective benefits. As with other diseases, the gut-eye connection could open new avenues for glaucoma care, including dietary changes, probiotics, and microbiome-targeted therapies.

BUYER BEWARE

The supplement industry is not as strictly regulated as the food and drug industries, leading to variations in purity, potency, and safety. Thus, doctors should guide patients in choosing high-quality supplements. Look for supplements that are third-party tested by organizations such as United States Pharmacopeia, NSF International, or ConsumerLab, as these certifications verify quality and accuracy of labeling. Encouraging patients to choose reputable brands with a history of transparency and adherence to Good Manufacturing Practices is also crucial.

Additionally, doctors should remind patients to check for unnecessary additives or fillers and to avoid products that make exaggerated claims or lack a detailed ingredient list. It is also worth repeating that patients should consult with their primary care provider to ensure the supplement is appropriate for their health needs. This proactive approach will ensure patients receive safe, effective, and reliable nutritional support.

COMPREHENSIVE GLAUCOMA CARE

As glaucoma continues to challenge efforts to prevent blindness, counseling patients about following the MIND diet and integrating nutritional supplements with traditional treatments offers a promising approach. Supplements such as nicotinamide, citicoline, Ginkgo biloba, and resveratrol have shown potential in protecting RGCs and the optic nerve through their antioxidant and neuroprotective properties. Exploring gut health may reveal new therapeutic opportunities. Eye care providers can inspire hope by adopting an integrated approach that combines these strategies with standard IOP-lowering therapies. ■

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