Alternative and Complementary Approaches to Treating Common Ocular Disorders

Part 1—Cataracts and Glaucoma

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It has been said that the eye is the "window" to a person's soul. For the physician, the eye is a window to a person's body. The eye provides a direct view of blood vessels and nerves and can reflect the state of a person's overall health. The eye can also be affected by conditions within the body. This two-part article examines four common eye disorders—cataracts, glaucoma, diabetic retinopathy, and macular degeneration—and discusses alternative and complementary medicine (ACM) approaches to treating these disorders. The etiologies and clinical presentation for each disorder are described and then popular ACM interventions are outlined. Part 1 covers cataracts and glaucoma. Part 2 will cover diabetic retinopathy and macular degeneration.

Cataracts: Description and Etiology

Cataracts, the clouding and opacification of the crystalline lenses of the eyes,[1] are the leading cause of decreased vision and blindness in the United States. The disorder affects almost 4 million people.[2] Cataract surgery is the most prevalent procedure performed on patients over 65, with an estimated 1.3 million operations a year at an annual cost of approximately $3 billion.[1] With such a heavy burden on U.S. health care dollars, there is a great deal of interest in defining and describing the causes for lens dysfunction.

The etiologies of cataracts are predominately developmental (congenital and disease-related), degenerative (senile, traumatic, drug-related [iatrogenic] and exposure to causative substances), and inflammatory.[1]

Because cataracts can be acquired, ophthalmologists and research scientists believe that many people, if they live long enough, will develop clinical symptoms of cataracts.[2] The disorder occurs more frequently in patients that smoke, have uncontrolled diabetes that can lead to glycosylation and lens damage, or are exposed to excessive unfiltered sunlight. All of these factors create oxidative-related damage. Early research has shown that oxidative injury to the eye lens appears to be a major causative factor in the development of degenerative cataracts in human and animal study models.[3,4]

Signs and symptoms of cataracts include blurring vision; a gradual, painless loss of vision; subjective myopia; "halo vision" during night driving; altered color perception; cloudiness of the lens; an absent or abnormal red reflex and a "dark defect"; which are determined via opthalmoscopic examination.[5]

Prevention of Cataracts: The Best Intervention

When addressing cataracts, the role of primary care physicians must be focused on prevention. This can be clinically accomplished with minor dietary and lifestyle modifications. Reducing the oxidative burden on the ocular structures can have lasting effects on the function of the lens and its ability to interact with the neurologic aspects of vision.

Prevention includes the use of proper eye protection to filter the harmful effects of ultraviolet-B light.[6] Consumption of a diet replete with antioxidant-rich fruits and vegetables is also important. In fact, The Nurses' Health Study revealed that regular consumption of spinach and kale was moderately protective against cataracts in women and the Health Professionals Follow-Up Study revealed that spinach and broccoli decreased the risk of cataract development in men.[7,8] Annual eye examinations are also vital for patients who are in high-risk categories for developing ocular disease.

Patients with low blood levels of antioxidants and who eat few antioxidant-rich fruits and vegetables are excellent candidates for nutraceutical supplementation (e.g., lutein; beta-carotene; vitamins A, C, and E; selenium; the reduced form of glutathione; lipoic acid; etc.) to boost these patients' free-radical scavenging capabilities.[9–11]

The major antioxidants in the lens of the eye are vitamin C[9] and glutathione, a tripeptide molecule composed of the amino acids cysteine, glutamic acid, and glycine. In its reduced form, glutathione is the body's most potent antioxidant.[10] Vitamin C is needed as a cofactor to activate vitamin E,[8] which, in turn, amplifies the effects of glutathione.

Vitamin E has been shown to decrease the development of age-related cataracts in human and animal study models.[12,13]

Some studies reveal that eating more foods rich in vitamin A and beta-carotene, or the judicious use of vitamin A lowers the risk of cataract development.

Quick Reference to Common Signs and Symptoms of Cataracts or Glaucoma

	BV	VL	HV	EP	M	S	RR
Cataracts	X	X	X				X
Glaucoma	X	X	X	X	X		

BV = blurred vision; VL = vision loss; HV = halo vision; EP = eye pain; M = mydriasis; S = scotoma; RR = absent red reflex.

The Vitamin E and Cataract Prevention Study (VECAT), a 4-year, prospective, randomized, controlled trial of vitamin E versus placebo for the prevention of cataract development in healthy volunteers, tested subjects ages 55–80.[14] The researchers found a statistically significant relationship between prior use of vitamin E and a lowered incidence of cataract in 1111 participants (unpublished data). A statistically significant relationship was found between past vitamin E supplementation and the development of cortical cataracts.[15]

During aging, the levels of vitamin C in the eye lens decreases[11]; however, taking vitamin C prevents this decrease [16] and is linked to a lower risk of developing cataracts.[17,18] In the Nurses' Health Study, vitamin C supplementation for a period of 10 years or longer resulted in a 77-percent lower incidence of early lens opacities and an 83-percent lower incidence of moderate lens opacities. However, the same study demonstrated no significant protection from vitamin C supplementation of less than 10 years' duration.[13]

Some studies reveal that eating more foods rich in vitamin A and beta-carotene, or the judicious use of vitamin A lowers the risk of cataract development.[7,19] It is still not clear what the exact role of carotenoids is in protecting the lens from opacification and oxidative damage. Studies have shown that people who eat a lot of spinach, which is high in lutein, a nutrient similar to beta-carotene, appear to be at a low risk for developing cataracts.[19]

Additional protection has been achieved with vitamin B_2 (riboflavin) and vitamin B_3 (niacin), which are needed to protect against glutathione degradation. Vitamin B_2 deficiency has been linked to cataracts in a number of studies.[20,21] Older patients who take riboflavin and niacin daily may be partially protected against cataract development.[21]

Quercitin, a molecule belonging to the water-soluble bioflavonoids, has been shown to potentiate the vitamin C activity[22] as well as blocking enzymatic activity (aldose reductase) in the sorbitol pathway.[22] This influence on the polyol pathway could prove to be very significant in managing cataract-related dysfunction in patients with diabetes who have with altered sorbitol metabolism.

Treatments for Cataracts

Botanical agents that may be helpful for treating and managing cataracts include *Vaccinium myrtillus* (bilberry), a close relative of blueberry, which is high in bioflavonoid complex anthocyanosides.[23] Anthocyanosides have been shown to protect both the lens and the retina from oxidative damage. Bilberry also helps patients to adapt to bright light but research on effects on night vision have produced mixed results. *Pulsatilla pratensis* (pulsatilla) has historically been used internally for the treatment of senile cataracts[24]; however, careful attention must be used when prescribing this toxic herb. *Cineraria maritima* (silver ragwort) has been used in the form of eye drops for treating patients who are in the early stages of senile cataracts; but, note that use of this herb is contraindicated for patients with glaucoma.[24]

Glaucoma: Description and Etiology

Glaucoma is the second leading cause of blindness in the United States. The term glaucoma describes a group of eye conditions involving increased pressure within the intraocular mechanism. Glaucoma is characterized by a neuropathy of the optic nerve, usually the result of the increased pressure within the eyeball. Closed angle glaucoma occurs when the chamber angle is narrowed or completely closed because of forward displacement

Homeopathy may be effective for acute pain relief in patients with glaucoma.

of the final roll and root of the iris. The closure obstructs the flow of aqueous humor and results in increased pressure. Open-angle glaucoma results from increased resistance to the outward flow of aqueous humor.

The changes in normal pressure accommodation can ultimately lead to blindness and account for more than 150,000 cases per year. In many circumstances, the cause is unknown. In some cases, however, glaucoma is caused by an underlying pathologic condition that must be arrested. Therefore, it is important for people with glaucoma to be diagnosed by, and to remain under the care of, an ophthalmologist.

Regular eye examinations are especially important for patients with high-risk profiles. These include patients with familial histories of the disorder, African American patients (who have a 4–6 times higher incidence of glaucoma), patients with long-term metabolic disorders (e.g., diabetes mellitus, thyroid-hormone dysregulation), patients who take high-dose oral corticosteroids for prolonged periods of time, patients with food sensitivities or allergies,[25] or patients who are more than 40 years' old.[1]

With regard to clinical signs and symptoms, it is important to note that acute-angle closure glaucoma is painful while chronic open-angle glaucoma (COAG) is

Therapeutics for Eye Conditions

1. *Vitamin C*—At least 500–1000 mg per day often recommended; however, much greater dosages are not uncommon
2. *Vitamin E*—400–800 international units (IU) per day for adults
3. *Vitamin A*—10,000 IU, in divided doses, per day; for males and postmenopausal women, up to 25,000 IU (7500 mcg) of vitamin A per day considered safe; for women who could become pregnant, the safest intake level is being reevaluated; less than 10,000 IU (3000 mcg) per day widely accepted as safe.
4. *Beta-carotene*—Most common beta-carotene supplement intake is probably 25,000 IU (15 mg) per day, although some people take as much as 100,000 IU (60 mg) per day
5. *Lutein*—6 mg (with food to decrease gastric upset) per day for adults
6. *Quercetin*—400 mg, 3–4 times per day,
7. *Coenzyme Q10*—20–150 mg per day, in divided doses
8. *Selenium*—100–200 mcg per day for adults
9. *Rutin*—400–1000 mg per day
10. *α-Lipoic acid*—150 mg per day for glaucoma; 20–50 mg per day recommended for general antioxidant protection,
11. *Magnesium*—250–350 mg per day for adults
12. *Bioflavonoids*—1000 mg of citrus bioflavonoids or 400 mg of quercetin, each 3 times per day
13. *Gingko*—120–160 mg of *Gingko biloba* extract, standardized to contain 6 percent terpene lactones and 24 percent flavone glycosides, 2–3 times per day
14. *Bilberry*—in capsules or tablets standardized to provide 25 percent anthocyanosides, 240–480 mg per day
15. *Coleus*—2-percent forskoliin solutions applied topically
16. *Melatonin*—200 mcg; however, doses from 1 to 3 mg, 2–3 hours before bedtime have shown efficacy

Quick Reference to Therapeutics for Cataracts or Glaucoma

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Cataracts		X	X	X	X	X		X	X					X		
Glaucoma	X	X	X							X	X	X	X	X	X	X

Although the benefits of rutin or other bioflavonoids for people with glaucoma have been recognized, they have not been investigated thoroughly.

not. Thus, the presence or absence of pain is not always a clear indicator of whether a patient has glaucoma or not.[5] Other, indicators include a frequent need to change prescriptions for glasses or contact lenses, impaired adaptation to dark environments, seeing halos around lights, mild headaches, or undefined visual disturbances. In addition, COAG may be totally asymptomatic and may require a work-up with intraocular pressure measurement, slit-lamp examination, visual-fields assessment, and gonioscopy. Fundoscopic examination may reveal an enlarged cup size within the optic disc. If glaucoma is suspected, or if a patient is at a high risk for developing glaucoma, referral to an ophthalmologist for further evaluation is essential to gain a greater understanding of the degree of ocular dysfunction.[26]

Nutritional Treatments for Glaucoma

The conventional approach to managing glaucoma includes a proper referral to an ophthalmologic surgeon for a thorough evaluation. When surgical intervention—an iridotomy—is performed, the majority of patients will be totally cured and have no visual loss.[27] However, when surgery is performed, there are potential risks that must be weighed. Specific adjuvant ACM modality management may include the use of nutrients and herbs to strengthen the vasculature of the eye and provide antioxidant protection. Homeopathy may be effective for acute pain relief. Regular aerobic exercise may also be helpful for treating the condition.[28,29]

Dietary changes that may be influential in preventing the progression and occurrence of glaucoma, as well as hastening recovery from iridotomy include reducing or eliminating exposure to allergens that produce altered vascular permeability and increased intraocular pressure. All known food allergens should be eliminated. In addition, it is important to reduce foods that may dramatically alter blood glucose, such as simple sugars, high glycemic index fruits, and refined foodstuffs. The diet should also provide food that are rich in bioflavonoids and carotenes, such as dark seasonal berries, dark leafy greens, and yellow/orange vegetables. These foods will provide valuable micronutrients for ocular functioning.[30–32]

Vitamin C is perhaps the most extensively researched ACM agent for treating glaucoma. The vitamin has reduced elevated intraocular pressure significantly in numerous studies.[33] These studies used at least several g per day of vitamin C, but the intake varied widely. ACM physicians who prescribe the vitamin for managing COAG vary widely in the amounts they prescribe.[34] Usually, physicians will advise patients to take oral doses of vitamin C equal to "bowel tolerance." Prescriptions ranging from approximately 5 to 20 or more g per day have been shown to be effective for treating increased intraocular pressure. Of course, vitamin C does not cure glaucoma and must be used continually to reduce ocular pressure.[35]

Rutin, a bioflavonoid with collagen-stabilizing effects, was historically used to reduce intraocular pressure in glaucoma.[36] The amount used—20 mg, three times per day—was quite moderate. In one study, 17 of 26 people showed clear improvement.[36] Although the benefits of rutin or other bioflavonoids for people with glaucoma have been recognized, they have not been investigated thoroughly.

Intraocular pressure follows a very temporal variation, with the lowest pressure commonly occurring in the early morning hours. Research has shown that intraocular pressure also parallels fluctuations in cortisol levels, with high cortisol conferring higher intraocular pressures. Diurnal variations in intraocular pressure are more pronounced in people with glaucoma, leading scientists to believe that a connection exists between intraocular pressure levels and other diurnal variants in the body. Because melatonin levels peak around 2 AM, a time when intraocular pressure is on a downward trend, researchers studied melatonin's effect on intraocular pressure.[26,37,38] Less than 1 mg of melatonin has lowered pressure within the eyes of healthy people,[38] but there is only a limited amount of research on the effects of melatonin on people who have glaucoma.

Coenzyme Q10 has been shown to reduce significantly the deleterious influence of the beta-blocker medication timolol, which is used to lower intraocular pressure.[39] Additional antioxidant activity may be generated by 150 mg of α-lipoic acid, taken daily for 1 month. Studies have revealed improved visual function in people with either stage I or stage II glaucoma.[40]

Epidemiologic and animal studies point to a possible protective effect of omega-3 fatty acids against glaucoma.

Several botanical agents have been shown to be helpful for managing glaucoma.

Both topical administration of prostaglandin E3 and D3 and intramuscular injections of cod liver oil (which is high in omega-3 fatty acids) led to decreased intraocular pressure in animal studies.[39,41] Epidemiologic evidence has revealed a low prevalence of chronic open-angle glaucoma among Inuits on a native diet high in omega-3 fatty acids.[42] The preliminary data from these investigative reports have led researchers to assume that essential fatty acids may be potent tools for managing glaucoma and other ocular diseases. At this point more research is a reasonable next step.[26]

Glaucoma is not solely caused by increased intraocular pressure, being that approximately 20 percent of patients have normal intraocular pressure levels.[27] It is in this subcategory of patients that magnesium has been studied. One study examined whether magnesium might improve vision in people with glaucoma by enhancing blood flow to the eyes (patients with normal intraocular pressure in which optic-nerve damage is caused by vasospasm leading to a decreased blood supply to the optic nerve). In this trial, participants were given 245 mg of magnesium per day. Improvement in vision was noted after 4 weeks but the change did not quite reach statistical significance.[43]

Botanical Agents for Treating Glaucoma

Several botanical agents have been shown to be helpful for managing glaucoma. These include *Vaccinium myrtillus* (limited research),[44] *Crataegus monogyna* (hawthorn berries) especially with concurrent hypertension, and *Ginkgo biloba* (ginkgo)[45,46] especially for compromised circulation (mixed review data). Combine equal parts of ginkgo, hawthorn, bilberry, and elderberry (*Sambucus nigra*) in a tea or tincture to strengthen vascular tissues and improve circulation.

Additional interest has been directed toward *Coleus forskoliin*. The triterpene forskoliin from the plant stimulates the enzyme adenylate cyclase.[47] Adenylate cyclase then stimulates the ciliary epithelium to produce cyclic adenosine monophosphate (cAMP). This cascade then leads toward reducing aqueous humor inflow and decreasing intraocular pressure.[53] A clinical study on the topical use of forskoliin has been promising in healthy human subjects, but use for patients with glaucoma has historically been lacking. What is more, while oral standardized extracts of *Coleus forskoliin* are known to raise cAMP, it is not clear if oral dosages have any effect on cAMP levels in the eye. As such, more research is needed.

Regardless of the medical armamentarium enlisted to treat glaucoma, prevention of this is critical. It is also important to consider altering the biochemical terrain toward regaining homeostasis. There are promising preliminary data that support the use of vitamin C, melatonin, α-lipoic acid, *G. biloba*, *V. myrtillus*, and topical forskoliin. However, many of these studies have been performed on normal, healthy eyes and have yet to withstand the scrutiny of research with patients who have glaucoma—the next vital step in developing therapeutics for treating ocular disease. ⊓

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