Natural Therapies for Reducing Intraocular Eye Pressure: Rationale and Two Case Reports

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Abstract

Elevated intraocular eye pressure is the principal diagnostic risk factor for glaucoma. People with diabetes have an increased risk of glaucoma, suggesting that this eye disease is influenced by elevated glucose and insulin levels. Adopting a low-glycemic hunter-gatherer Paleolithic diet, as well as taking insulin-sensitizing dietary supplements, can reduce weight and improve glucose tolerance. It is reasonable to assume that such dietary changes may also lower intraocular eye pressure.

Introduction

Aging is characterized by increases in cell damage, reductions in biological performance, and a greater risk of degenerative disease. Many researchers have described how the risk of degenerative diseases can be accelerated by the modern calorie- and carbohydrate-dense Western diet. Such a diet leads to a higher risk of insulin resistance, Syndrome X, diabetes, heart disease, cancer and other "diseases of civilization." It stands to reason that a nutrient-dense diet, as well as dietary supplements (to further increase nutrient density), may decelerate these age-related changes.

Very modest increases in glucose–far below what would be diagnosed as diabetic–significantly increase the risk of diabetes and coronary artery disease.[1,2] Between 1990 and 1998, the incidence of adult-onset diabetes increased by 33 percent in the United States and by 70 percent among Americans ages 30-39.[3] Eleven million Americans have been diagnosed with adult-onset (type 2) diabetes, and this number is predicted to increase to 29 million by the year 2050.[4] Furthermore, an estimated 47 to 70 million Americans currently suffer from Syndrome X, a prediabetic clustering of insulin resistance, abdominal obesity, hypertension, and elevated blood lipids that increase the risk of coronary artery disease.[5,6]

Elevated Glucose and Eye Disease

Chronically elevated glucose levels, that is, diabetes, increase the risk of serious eye diseases, including glaucoma, cataract, and age-related macular degeneration. Much of the damage to eye tissues likely results from elevated blood glucose, which can auto-oxidize and generate tissue-damaging free radicals.[7] Increases in glucose, as well as age-related decreases in glucose tolerance, may also increase the risk of eye diseases. Indeed, chronically elevated levels of insulin, characteristic of the modern Western diet, are associated with an increased risk of developing juvenile-onset myopia.[8]

In particular, glaucoma affects an estimated 3 million Americans and is the second leading cause of blindness (after macular degeneration). Elevations in intraocular eye pressure (IOP) are the principal risk factor for glaucoma, which is characterized by a narrowing of the visual field and of damage to the optic nerve. In open-angle glaucoma, which accounts for 90 percent of cases, fluid in the eye (aqueous humor) cannot drain efficiently because of obstructed drainage channels. As a consequence, IOP increases and injures the optic nerve.

Conventional medical therapies for glaucoma include pharmaceuticals (such as beta-blockers), laser therapy, and surgery. However, adult-onset diabetes and prediabetic insulin resistance are nutritional diseases and may be best prevented or reversed through dietary means. Similarly, the risk of glaucoma may be reduced through diet.

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Dietary and Supplement Strategies

Since 1983, medical interest in the Paleolithic diet has grown, based on the idea that humans are best suited genetically to a traditional pre-agricultural hunter-gatherer diet consisting of lean meats, fish, and vegetables. Such a diet excludes grains (a major source of carbohydrate calories in the modern diet), dairy products, and legumes, which were incorporated into the diet approximately 10,000 years ago, too short a period of time for genetic adaptation.[9]

Although clinical trials have not compared the effects of a Paleolithic diet to a conventional one, small trials have tested popular high-protein diets. High-protein diets have similarities to the protein-rich Paleolithic diet in that they exclude or limit grains and dairy products. Unfortunately, high-protein diets do not provide as many vegetables as a protein-rich Paleolithic diet. Regardless, such diets can promote weight loss and normalization of glucose levels, presumably reducing the risk of diabetes and coronary artery disease.[10,11,12]

In addition to modifying the diet, it is possible to use insulin-sensitizing and glucose-lowering nutritional supplements as substrates for myriad biochemical reactions. One such supplement, the antioxidant alpha-lipoic acid, is sold over-the-counter in the United States and as a prescription drug for the treatment of diabetic polyneuropathy in Germany. Clinical trials and animal studies have found that it sensitizes insulin, enhances glucose uptake apart from its effect on insulin, and reduces glucose levels.[13,14] Alpha-lipoic acid is now emerging as a supplement that may help prevent diabetes and diabetic complications.[15] One study found that it can lead to improvements in glaucoma.[16] Other glucose-tolerance-enhancing supplements include chromium, zinc, magnesium, and manganese.

Two Cases

The following two cases are noteworthy in that they demonstrate that dietary modification and/or alpha-lipoic acid supplementation can significantly lower intraocular eye pressure.

Case #1. Male subject, age 45, was "in denial" of glucose intolerance and early signs of Syndrome X. He was 5' 7.5" in height and weighed 170 pounds and had been wearing eye glasses for approximately 25 years. In May 1996, an eye examination noted IOP of 21 mm Hg in his right eye (R) and 22 mm Hg in his left eye (L). Around this time (date uncertain), the subject began taking 50 mg of alpha-lipoic acid daily. One year later, in May 1997, his IOP was 19 mg Hg (R and L). In September 1997, a physical examination and laboratory tests noted a fasting glucose of 111 mg/dl (almost prediabetic). Blood and hair analyses indicated low levels of most minerals, including chromium, magnesium, zinc, and manganese, which have roles in glucose tolerance.

The subject increased his dosage of alpha-lipoic acid to 380 mg daily. He also switched to a more bio-available form of magnesium (citrate), and began taking 1,000 mcg of chromium daily. He had been taking, and continued to take, other supplements, including vitamin E (400 IU) and vitamin C (12,000 mg) daily. Another eye examination in December 1998, noted IOPs of 19 mg Hg (R) and 18 mm Hg (L).

In the spring of 1999, the subject stopped eating pasta and slowing began adopting a Paleolithic-style diet, consisting primarily of chicken and turkey, fish, and large amounts of nonstarchy vegetables and fruit. He continued to avoid pasta, pizza, and nearly all grain products and legumes. After three months, he had lost 20 pounds and 4 inches from his waist. A blood test in April 1999 indicated a greatly improved fasting glucose of 87 mg/dl, and another blood test in November 1999 indicated normal fasting glucose levels of 85 mg/dl. An eye examination in September 2000 found intraocular eye pressure of 16 mg Hg in both of the subject's eyes.

Case #2. Male physician, age 84, in ex-

cellent health other than minor age-related osteoarthritis and a sore back (that improved with walking). He was energetic enough to work full days, travel, and lecture. In early 2001, an optometric examination found his intraocular eye pressure to be 26. The subject was referred to an ophthalmologist, who noted IOPs of 23 (R) and 22 (L). His field of vision was normal, but the ophthalmologist placed the subject on a pre-glaucoma watch with a follow-up appointment at six months. The subject had been taking numerous vitamin supplements, including niacin for 45 years. He began taking 200 mg of alpha-lipoic acid after each meal (600 mg total daily). On follow-up his IOP was 20.5 in both eyes. The decrease in intraocular eye pressure was noted about four months after starting alpha-lipoic acid supplementation, the only change in supplementation during this time. In March 2002, his IOP was 20 in both eyes.

Conclusion

In addition to glucose and insulin levels, C-reactive protein levels may be a clinical marker of excessive intake of refined and high-glycemic carbohydrates. Elevations in C-reactive protein, both a marker and promoter of systemic inflammation, are strongly associated with diets rich in high-glycemic foods, such as potatoes, breakfast cereals, white bread, muffins, and white rice, which are frequently consumed in the Western diet and are inconsistent with a Paleolithic diet.[17] This finding is significant because elevated CRP levels are common in obesity,[18] insulin resistance[19] and diabetes,[20] and elevated CRP is a powerful predictor of heart attack risk.[21]

A dietary analysis has found that it would be relatively easy to adopt a modern version of the Paleolithic hunter-gatherer diet. Such a nutrient-dense diet is remarkably simple: it consists of lean meat, fish, nonstarchy vegetables, and nuts, while excluding grains, dairy products, and such high-glycemic vegetables as potatoes.[22] Eating for maximum nutrient density and further increasing nutrient density and cellular efficiency with dietary supplements would seem to be a rational initial approach to normalizing IOP and reducing the risk of glaucoma.

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