

# The Burnham Review

## Corneal Dysfunction and Keratoconus

Consider Manual Therapy and Complementary and Alternative Medicine for Optimal Vision

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**Kimberly Burnham, PhD Editor**

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**Corneal Skin & Connective Tissue** tissue regeneration relying on the existence of stem cells located in the limbal epithelium (the junction zone between the corneal and conjunctival epithelia).

Corneal tissue is made up of the dense fibrous connective tissue and corneal epithelium (skin).

So something like corneal epithelial

Total loss or hypofunction of the stem cells can occur as a result of certain conditions that cause damage or alteration of the corneal surface (termed limbal deficiency).

Normal healing of corneal epithelial defects is prevented and a unique pathological state ensues manifested by poor epithelialization (persistent defects or recurrent erosions), chronic stromal inflammation (keratitis mixed with scarring), corneal vascularization, and conjunctival epithelial ingrowth.<sup>2</sup> (Aetna Insurance Co. 2007).

### Dysfunctions of the Cornea

Where there are skin dysfunction, there are liver and toxicity issues so it is not surprising that the cornea is often damaged by mechanical injury, infections and toxic insults.

Common causes of corneal

### The Cornea and Manual Therapy

There is no recent literature to indicate that manual therapy and massage directly affects dysfunctions of the cornea, but there is evidence to indicate that manual therapy can address the underlying issues that caused the corneal problem in the first place and that recovery of corneal function can be attained with manual therapy and complementary medicine approaches.

The cornea is made up of skin and connective tissue and where there are problems of the skin and connective tissue there are issues with the immune system. There is considerable evidence that Complementary and Alternative Medicine (CAM) approaches can support the immune system.

There is also evidence that nutritional supplementation (flavanoids and green tea) can improve the blood vessels relationship with the corneal and membrane integrity.

Addressing the thyroid dysfunction can also be a way to improve corneal function.

peeling could be thought of as flaky skin.

Scattered within the corneal connective tissue, the substantia propria are the flattened fibroblasts which produce the collagen and ground substance.

The cornea is clear because of the arrangement of the connective tissue and epithelia tissue.

The nonkeratinized stratified squamous corneal epithelium (skin) consists of several (5 to 6) layers of cells. These cells are cuboidal through most of the thickness of the epithelium but become squamous (thin and flat) at the surface.

The water content of the ground substance is carefully regulated, to maintain uniform spacing among collagen fibers.<sup>1</sup> (King, 2007).

Like any other skin, "the corneal epithelium is well known for its rapid self-renewal process, with ultimate

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dysfunction include: Chemical / thermal injuries of the ocular surface; Stevens-Johnson syndrome (reaction to medications); Multiple surgeries or cryotherapies to the limbal region; Contact lens-induced keratopathy or toxic effects from lens-cleaning solutions.; Limbal (cornea) deficiency (hypofunction or total loss of stem cells); Aniridia (hereditary); Keratitis associated with multiple endocrine deficiency (hereditary); Eurotrophic keratopathy (neuronal or ischemic); Chronic limbitis (corneal inflammation); Peripheral corneal ulcerative keratitis; Pterygium and pseudopterygium; Superficial corneal dystrophy (including granular, lattice, and Reis-Bückler's dystrophy); Epithelial membrane dystrophy; Irregular corneal surfaces due to Salzmann's nodular degeneration or keratoconus nodules; Corneal scars and opacities (including post-traumatic, post-infectious, post-surgical, and secondary to pathology); Recurrent corneal erosions; Fuch's dystrophy; Vitamin A deficiency with xerophthalmic scars of cornea; Tuberculosis of eye; Syphilitic interstitial keratitis; Herpes zoster keratoconjunctivitis; Herpes simplex disciform keratitis; Measles keratoconjunctivitis; Gonococcal keratitis and Mechanical complication due to corneal graft<sup>3</sup> (Aetna Insurance (2007).

### **Cornea and The Immune System**

In a recent study, researchers collected data on the immune function of the corneal layer of the eye. The results "suggest that the cornea is capable of actively participating in the immune response to foreign antigens and autoantigens, rather than being a passive bystander. Additionally, one important aspect of immune privilege is likely the ocular

'imposition' of the immature phenotype on its resident bone marrow-derived cells."<sup>4</sup>(Hamrah, 2007).

### **Hands On Care fo the Immune System**

There are a number of hands-on therapies, recommended by leading expertise in the field of complementary medicine, that support the immune system including massage therapy <sup>5</sup>(Shor-Posner, 2006); <sup>6</sup>(Field, 2005) and <sup>7</sup>(Hernandez-Reif, 2004); Integrative Manual Therapy <sup>8</sup>(Burnham, 2007) and <sup>9</sup>(Giammtteo, 2005); Qigong <sup>10</sup>(Lee, 2003) and <sup>11</sup>(Lee, 2005); Reflexology <sup>12</sup>(Lee, 2006); Osteopathic Manual Therapy<sup>13</sup> (Noll, 2004), and acupuncture. <sup>14</sup> (Karst, 2003).

Imagery<sup>15</sup> (Richardson, 1997) and Laughter<sup>16</sup>(Berk, 2001) are cheap and easy ways to help improve our immune system and bring a sense of well being.

So, if you want to live well and see well, eat healthy, exercise and take care of your immune system.

### **Effects of Treatment**

Visual problems are very common in today's society and take many forms. A good number of these go undiagnosed or untreated, but are amenable to osteopathic treatment, including functional eye problems and visual strain.<sup>17</sup> (Dolgin, 2003).

In speaking about an osteopathic approach to vision prescriptions, Dolgin says, "remember, the proper prescription will produce the least effect on the body's normal motion and will add no new strain patterns with light coming through the eyes. As the body is one continuous unit, this balanced prescription will not only reduce the physical strain on the head, but also on the neck, shoulders,

back and in fact, the whole body. Reducing the stress load on the body increases the level of health and thus, the ability of the body to help itself. Along with osteopathic treatment, this will help resolve chronic strains in the body, which contribute to health problems.<sup>18</sup> (Dolgin, 2003).

### **Hands On Solutions for Visual Dysfunctions**

Integrative Manual Therapy (IMT) clients, literally seeing improvements, include both adults and children with visual labels such as detached retina, lazy eye, visual headaches, migraines with visual auras, cataracts, glaucoma, corneal ulcers, keratoconus, astigmatisms and dyslexia. IMT is also effective for clients with conditions involving an eye component, such as spinal cord injuries, multiple sclerosis, high blood pressure, seizures, tinnitus, Cerebral palsy & Down's syndrome.<sup>19</sup>

### **Keratoconus**

From the editor on Integrative Manual Therapy: "My own experience is one of considerable healing of my eyes and whole visual system. I have keratoconus, a genetic disorder where the cornea becomes weaker than it should be. I also had nystagmus, where the eyes would get twitchy, especially when I was tired. My knowledge of what can be done with visual and eye related problems is both professional and personally. I started wearing glasses when I was about 10 years old. About five years ago in my 40's I stopped wearing them one day and pursued IMT treatment to help with my vision, nystagmus, and keratoconus (corneal weakness). All have improved. For a while the nystagmus was only slightly visible when I was very tired and look to the extreme right side. Now it is completely gone. The

keratoconus has stopped degenerating and is reversing. I have virtually no dysfunctional light sensitivity, which is usually a big problem with keratoconus. My astigmatism is improving, as is my vision. I have had one migraine headache in the last 5 years, previous to that I had 3-6 severe migraines a year. About 6 months after I stopped wearing glasses, a friend said to me "it is starting to look like you can see." My vision and eyes were so bad it used to look like I couldn't see. The change in the last five years has been so significant for me."

### **Medical Treatment Keratoconus**

By way of comparison, investigators in a medical study "found that the mean improvement in uncorrected visual acuity in persons with keratoconus who received Intrastromal corneal ring segments (INTACS) was four lines of uncorrected visual acuity and two lines of best corrected visual acuity. The investigators also reported decreases in irregular astigmatism."<sup>20</sup> (Boxer Wachler, 2003)

In a prospective study involving 10 patients with keratoconus, Colin, et al. (2000)<sup>21</sup> reported a 70 percent improvement in uncorrected visual acuity and a 50 percent improvement in best corrected visual acuity. INTACS was approved by the U.S. Food and Drug Administration (FDA) for use in keratoconus under a Humanitarian Device Exemption (HDE), as the FDA has determined that INTACS are a medical device intended to treat a condition that affects fewer than 4000 individuals per year in the United States<sup>22</sup> (FDA, 2004).

### **NFP for Vision**

A self-care piece you can do at home is the Neurofascial Process

with one hand on the eyes and the other on the Low Back/Ureters for a total of several hours and then several hours of NFP from the eyes to all process centers. There is detailed information about this easy to do, yet time consuming self-care approach in the book *Body Wisdom*.<sup>23</sup> (Weiselfish-Giammatteo, 2002)

### **Biophysiology and Nutritional Wellness**

There is nutritional supplements to improve vision the general ones are essential fatty acids and vitamin B complex, for specifics speak to a trained nutritional therapist, who can evaluate what would be best for you as an individual.

### **Vitamin A and The Cornea**

Night blindness is one of the first signs of vitamin A deficiency. In ancient Egypt, it was known that night blindness could be cured by eating liver, which was later found to be a rich source of the vitamin<sup>24</sup> (Gerster 1997).

Night blindness is the flip side of light sensitivity, which is typical in people with corneal problems.

Vitamin A deficiency contributes to blindness by making the cornea very dry and damaging the retina and cornea<sup>25</sup> (Sommer 1982).

### **Cornea and Blood Vessels**

The cornea itself doesn't have blood vessels. It would not be clear if it did. When blood vessels start to form (neovascularization [new vasculature]) it can cause a number of visual problems related to the cornea. A reading of the literature on neovascularization could be interpreted to mean that corneal neovascularization is a type of corneal cancer or pre-cancerous.

"The wide distribution of the

flavonoids in the plant kingdom together with the presented results suggests that flavonoids may contribute to the preventive effect of a plant-based diet on neovascular disease of the eye."<sup>26</sup> (Joussen, 2000).

"In an attempt to identify phytochemicals contributing to the well-documented preventive effect of plant-based diets on cancer incidence and mortality, we have previously shown that certain flavonoids inhibit in vitro angiogenesis. Here, we show that the flavonoid luteolin inhibited tumor growth and angiogenesis."<sup>27</sup> Baglio, 2004).

"Epidemiological studies have indicated that regular consumption of red wine and green tea is associated with a reduced risk of coronary heart disease and tumor progression. The development of tumors and of atherosclerosis lesions to advanced plaques, which are prone to rupture, is accelerated by the formation of new blood vessels. These new blood vessels provide oxygen and nutrients to neighboring cells. Therefore, recent studies have examined whether red wine polyphenolic compounds (RWPCs) and green tea polyphenols (GTPs) have antiangiogenic properties.

Moreover, intake of resveratrol or green tea has been shown to reduce corneal neovascularization induced by proangiogenic factors such as VEGF and fibroblast growth factor in mice."<sup>28</sup> (Oak, 2005).

Another case refers to a man with decreased vision, photophobia [light sensitivity], severe dry eyes and progressive corneal vascularization caused by graft-versus-host disease (GVHD) after a bone marrow transplant.<sup>29</sup> (Mohammadpour, 2007).

## **Withania, Medicinal Plant**

“The medicinal plant *Withania somnifera* is widely researched for its anti-inflammatory, cardioactive and central nervous system effects.<sup>30</sup> (Mohan,2004).

## **Copper Metabolism Dysfunctions**

“Wilson disease, an autosomal recessive disorder due to mutations of the ATP7B gene, is characterized by copper accumulation and toxicity in the liver and subsequently in other organs, mainly the brain and cornea.”<sup>31</sup> (Leggio, 2007)

## **Blood Sugars & Corneal Stiffening**

In this study researchers determined, how changes in corneal elasticity/stiffness might influence intraocular pressure (IOP) readings in diabetic patients. They concluded, “Glucose-mediated corneal stiffening due to collagen cross-linking might be responsible for IOP overestimation in diabetic patients. Corneal stiffening might explain why diabetic eyes tend to have higher IOP readings in large population-based studies and why those with ocular hypertension have a reduced risk for glaucoma progression.”<sup>32</sup> (Krueger,2007).

## **Corneal Biomechanics and Age**

“There was a considerable increase in stiffness associated with both age and load rate. Equations were derived to describe the nonlinear stress-strain relationship of corneal tissue for any age between 50 and 95 years. The cornea demonstrates considerable stiffening with age with the behavior closely fitting an exponential power function typical of collagenous tissue. The increase in stiffness could be related to the additional age-related nonenzymatic cross-linking affecting the stromal collagen fibrils.”<sup>33</sup> (Elsheikh, 2007)

## **Glaucoma, Corneal Mechanical Stress and Membrane Integrity**

“Glaucoma is the second leading cause of blindness worldwide. It has many risk factors such as age, race, sex, intraocular pressure, optic nerve changes, corneal thickness, refractive error, systemic diseases, family history and trauma.

Central corneal thickness plays an important role in risk stratification among patients in whom glaucoma was of concern. Scleral thickness and central corneal thickness have a moderately positive correlation. Stress [mechanical stress] is responsible for glaucoma and causes deformations of the retinal layers and the consequent high levels of neural tissue strain. Stress and scleral thickness have inverse relation together and since scleral thickness is related to central corneal thickness positively, stress is related to central corneal thickness inversely.

Risk of progression of glaucoma damage has an inverse relation with the central corneal thickness. Based on formula of stress, when central corneal thickness decreases, the amount of stress increases inversely. This leads to more interruption of retinal layers and consequent higher levels of neural tissue strain that increases the risk of suffering glaucoma.”<sup>34</sup> (Mehdizadeh, 2007).

## **Cornea Connected To The Thyroid and The Heart**

“Thyroid hormone can affect the development of the cell membranes of apposed cells in epithelium as well as the endothelium of the embryonic chick cornea.”<sup>35</sup>(Masterson, 1977).

“Amiodarone is an effective cardiac antiarytmic drug. Long-term, high dose use of the drug is associated with skin discoloration, corneal deposition and alterations in

thyroid hormone levels.<sup>36</sup> (Bahadir, 2000).

Another study said, “Amiodarone, an iodine-rich benzofuran derivative, is a highly effective agent for the prophylaxis and treatment of cardiac arrhythmias, but it is associated with numerous side effects.

Amiodarone toxicity involving several organs simultaneously has rarely been reported heretofore. In this report, we describe a case of a 73-year-old man who developed symptomatic hypothyroidism, pulmonary toxicity, and vortex epitheliopathy of the cornea during 6 months of amiodarone therapy for frequent palpitation and angina after myocardial infarction.”<sup>37</sup>(Chuang, 2000).

The cornea and thyroid are also linked through symptoms in Multiple endocrine neoplasia (MEN) type IIb Characteristic ophthalmic findings include “prominent corneal nerves in a clear stroma and multiple submucosal neuromas of the conjunctiva, eyelids, lips, and tongue. Ophthalmologists have a critical role to play in recognizing these signs, because the early diagnosis of medullary thyroid carcinoma and pheochromocytoma may be life saving.”<sup>38</sup> (Jacobs, 2001).

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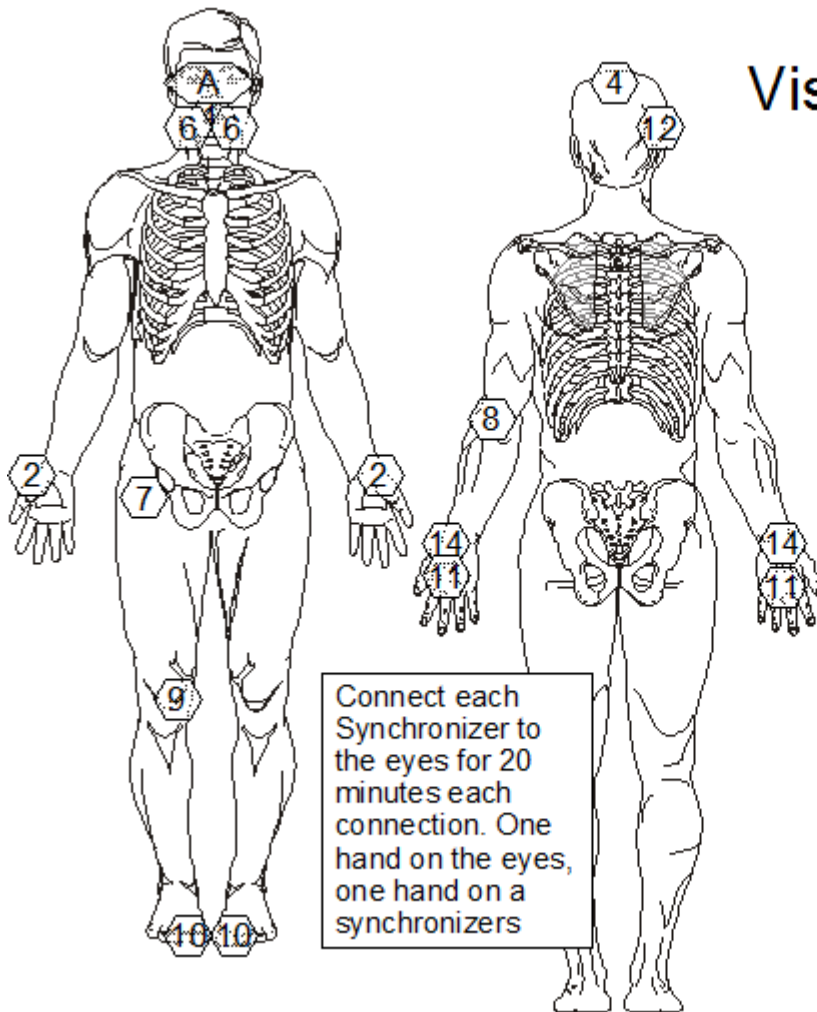
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## Synchronizers for Vision

Your IMT therapist can give you synchronizers / reflex points that can help improve your vision. (Below).



## Vision Synchronizers

- 1. Below nose and right side of nose
- 2. Thumb side of wrist,
- 3. Inner corner of eye
- 4. Top of head (on each side from Sagittal Suture on Coronal Suture)
- 5. Just in front of ear
- 6. On jaw near canine teeth /eye teeth
- 7. Front of Hip (Right anterior femoral head at the greater trochanter)
- 8. Elbow (Left lateral aspect of olecranon process)
- 9. Kneecap (Right patella, medial aspect)
- 10. On top of both big toes at interface of toenail and toe
- 11. Knuckles and fingers
- 12. Ear (Right temporoparietal suture, just above ear)
- 13. Cheek bones
- 14. Wrist and a little above

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