

# LIVING WITH GLAUCOMA

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From the Meeting of

April 26, 2014

THE CORNEA AND GLAUCOMA

Presented by

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## LOOKING OUT WHILE LOOKING IN THE CORNEA

Ordinarily, we don't think much about our corneas except when the wind blows a particle in our eye and we try desperately to dislodge it. Nor do we regard the cornea as a key player in the glaucoma syndrome. To enlighten us on both issues, the Group was pleased to welcome Pritti Batta, MD, Assistant Professor of Ophthalmology at New York Eye and Ear Infirmary on April 26, 2014.

**This newsletter is published by The Glaucoma Support and Education Group  
in participation with The Glaucoma Foundation**

As those of us who have attended many lectures we now know that the eye possesses many parts, some of which exist as layers. The cornea's clear dome-shaped structure on the surface of the eye is one of these layers, the outermost layer of the eye. Another outer layer is the white part of the eye, known as the sclera. The sclera is covered by the conjunctiva, a thin membrane, which is connected to the cornea but has its own structure. Both the sclera and the cornea possess collagen as do other parts of the body. Without collagen the body would be lacking in valuable structure. The iris, the colored part of the eye, lies beneath the cornea.

The cornea serves multiple purpose, foremost allowing for clear vision. Serving as a barrier against bacteria, dirt, dust and the like, it also prevents injury to the internal structures of the eye. If perchance something gets into your eye, the cornea blocks it from penetrating to the interior of the eye.

Should the cornea become damaged, an essential barrier is compromised, leaving the eye vulnerable to infection, injury and loss of vision.

A healthy cornea is defined as clear, transparent, and free of blood vessels. The cornea needs to be clear and transparent in order to allow for clean, unobstructed vision. The presence of any opacity, including blood vessels, would block vision. The cornea receives its nutrition from our tears, rather than from blood vessels. By blinking, our tear film spreads the nutritive fluid across the cornea.

A healthy cornea also contains many nerve endings, more than any other part of the body. Should your cornea become scratched, pain and misery follow. If something gets into your eye, it's very bothersome, but nature is telling you there is a problem that must be attended to. Otherwise, you may lose vision. This abundance of nerve endings signifies a sign of how important our eyes are—an evolutionary gift. You cannot see without a cornea. There needs to be something in the front of the eye to provide clarity and focusing power.

While there are a number of layers in the cornea, three important ones frame the construction of the cornea. These

are the epithelium; the stroma; and the endothelium. Each of these plays a unique role in the cornea.

The epithelium is the very smooth top-most layer of cells. It prevents injury from foreign matter entering into the eye, and prevents infection. You might call it the barrier layer. Its smooth surface allows unimpeded blinking and comfort. Should this layer become damaged, risk for infection and injury to the eye is increased. Should you get a corneal abrasion (abrasion, in layman's terms, a scratch on the cornea), it's the epithelium that is affected. A corneal abrasion means a portion of the epithelium has been scratched off. This is painful, and puts you at increased risk for infection.

Common conditions that may affect your cornea epithelium include dry eye and allergy. Seasonally, your eye may feel uncomfortable especially when pollen is in the environment, causing the eye to itch and tear up. Or you may experience dry eye, a feeling that something is in your eye. This is because in these conditions, your cornea surface is no longer smooth, an important factor for both vision and comfort. Dr. Batta compared this condition to trying to look through raindrops. It's because of minute scratches on your cornea.

People with dry eye are not only uncomfortable but they also don't see very clearly.

The stroma, the second layer in the middle of the cornea, takes up 95% of the real estate in the front of the eye. This layer provides strength to the cornea primarily due to a strong substance called collagen. It is uniquely packed with many collagen cells on top of each other, a veritable lasagna of cells providing strength to the cornea. Nature designed these layers in such a way that although dense they still allow clear visual acuity. Dr. Batta calls it a miracle of evolution.

The back layer, the endothelium, is very thin. It possesses tiny little cells lined up like little soldiers sitting on the inside of the cornea. Their unique function is to remove water from the cornea. Our bodies contain water and need water. That's why we have to drink so much water, but the need is limited. The cornea must have a precise amount of water, and any excess water needs to be removed in order to be able to see clearly and to avoid a cloudy cornea. If the water is not removed adequately, a condition called corneal edema ensues and that is a problem that sometimes needs to be fixed surgically. Corneal edema may result from a number of

causes, one of which is Fuch's Dystrophy, a common genetic disease.

Your eye drops do not affect the amount of water in your cornea. When you use drops for dry eye, these drops remain on the surface of the eye. Very little of the substance penetrates into the eye. Unfortunately, the glaucoma drops are also drying and contain preservatives that are rough on the eye. Virtually all drops packed in bottles contain preservatives, and over time they adversely affect the cornea. Of course there are preservative-free drops that require refrigeration and come in tiny vials with a limited amount of medicine. Dr. Batta stated that rather than just using one drop as recommended it's okay to use two or three drops from the same vial.

Other factors that contribute to corneal dryness are heat (for example a hot shower), cold weather and wind, but these conditions are transient. If the condition persists, the underlying cause needs to be checked out.

How does the cornea affect the glaucoma condition?

There are many studies showing a relationship between the central corneal thickness and the risk of developing

glaucoma. It's very well established. It is a linear relationship, the thinner the cornea, the greater the risk for glaucoma. A thicker cornea lowers the risk of glaucoma. Your doctor measures the thickness of the cornea by using a special test called pachymetry.

To understand why corneal thickness impacts glaucoma, we have to understand how eye pressure is measured. First numbing drops are instilled in your eye. Then your doctor applies the tonometer to gently touch your cornea. The doctor makes a correction for a thinner cornea as compensation for corneal thickness. The thickness is measured in microns. The normal range is in the 500 micron range, the thinner range is in the 400's. Therefore, if your cornea is thin, your doctor needs to add points to your pressure. Let's say your pressure is 12 but your corneal thickness is really low, only in the 4 hundreds, the doctor may need to add up to 7 points to correct for it. An actual pressure of 16 becomes 23. This is an example of a severe case of a super thin cornea. Unfortunately with glaucoma patients, thin corneas need this kind of correction.

Conversely, if you have a nice thick cornea, it's possible to actually subtract points from your pressure. The number of

points to add or subtract from your pressure is based on published data, but this is not an exact science. Basically, the number of points added or subtracted are based on the judgment of your glaucoma specialist.

The second point about corneal thickness, not well understood, is that even with correction of pressure a person with a thinner cornea is still at higher risk, for even though treatment is geared to correct the pressure and the pressure is lowered to a healthier range, there is still a higher risk of developing glaucoma than somebody with a thicker cornea. Obviously, the reason is that there is still something different about an eye with a thinner cornea. It's possible that these eyes with thinner corneas are anatomically different, in a way that allows glaucoma to develop. Whether a person with a thin cornea will develop glaucoma does not always bear out. Only a small percentage of those with thin corneas do. Statistical data does not exist on this issue. Nevertheless, a thin cornea is definitely a risk factor.

Moving to a new topic, what many of you are concerned about are the effects of glaucoma treatment on the cornea. Most of you are on some glaucoma eye drops. Many of the treatments for glaucoma unfortunately can have a negative

impact on the health of the cornea. This applies primarily to medical treatment and to a lesser degree to surgical treatment for glaucoma. Glaucoma medications have multiple side effects. The first one is dry eye syndrome. This is far and away the biggest negative impact that glaucoma eye drops have on the cornea. It seems like a trivial thing but it's really not. Those of you who have dry eye syndrome no doubt suffer extensive irritation in the eye, a constant feeling of discomfort that makes you want to close your eyes. It's the preservatives in your glaucoma eye drops that are implicated in this syndrome. Eye drops in a bottle generally contain preservatives that make the medication shelf-safe. In the long run, these preservatives are not good for the cornea.

Another term for dry eye related to medication is medication-related toxicity. Literally, the drops are toxic to the cornea. A fancier word is medicamentosa. As a cornea specialist Dr. Batta often treats patients with severe glaucoma. There are a number of different eye drops for glaucoma that cause dryness on the surface of the eye. Dry eye syndrome affects the corneal epithelium. During your eye exam, your eye doctor can use a dye called fluorescein to see areas where the cornea is not smooth, where bumps or

scratches are present on the cornea. Any area that stain with the dye indicates an abnormality in the corneal surface.

Initially, dry eye is treated with artificial tears. Dr. Batta recommends artificial tears whenever you're on glaucoma medications. They should be preservative free and can be purchased over the counter. And Dr. Batta assured the group that it's possible to use a vial two or three time rather than one time as recommended by the manufacturer. Then it's possible to use the same vial throughout the day.

Use gels or ointments at night. Refresh PM makes a very good quality lubricating gel. Systane makes a gel. Genteal makes a good gel. There are other good quality creams available. No need for a prescription for any of the above.

Dry eye maintenance also consists of warm compresses. Dip a clean towel in hot water, wring it out and rest it on your eyes. Massage your eye lids at the eyelash root after the hot compress is removed to loosen any crust formation. Tear glands sit right behind the eyelashes and if they get clogged, the quality of tears is compromised. This is a good routine to do at least once a week, more if the condition is severe.

There are some preservative-free glaucoma medicines, and some pretty new. They can be expensive, and some insurance plans may cover them. If you are really suffering from dry eye and are on multiple glaucoma medicines, talk to your doctor about considering a preservative-free form. Timoptic and Cosopt (a combination eye drop of Timolol and Trusopt) are available preservative-free and come in tiny single-use vials. That's one option. Another drug, Zioptan, is in the same class of medicines as the prostaglandins—Xalatan, Lumigan, and Travatan. Zioptan has only been approved in the last couple years but it's preservative-free. If you feel that your eyes are very dry from your glaucoma medicine, it's worth discussing this with your ophthalmologist.

Another important consideration to discuss with your doctor is the possibility of a laser procedure that will reduce the need for glaucoma drops.

There are other side effects to glaucoma medications besides dry eye. One is an allergic reaction, which can cause either allergic dermatitis or allergic conjunctivitis. Allergic dermatitis occurs due to contact between the eye drop and your skin. The skin around your eye becomes red and probably itchy.

Allergic conjunctivitis is actually a bit more common. Conjunctivitis is a disease of the conjunctiva, the thin surface of the eye. Conjunctivitis basically looks like pink eye where the eye looks pink. You get itching, redness, discharge, swelling. Alphagan is by far, the most common cause of allergic conjunctivitis. Alphagan used to be made at a higher percent concentration, which was much more likely to cause allergy. Alphagan-P, either .15 percent or .1 percent, is a newer option which is much less likely to cause an allergic reaction than the original that is manufactured at 2 percent.

General rules about treating allergy in the eye consists of cold compresses, artificial tears, and antihistamine eye drops which are available over the counter or by prescription. That will help soothe your allergy symptoms. However, if an allergic reaction occurs to a glaucoma medication, the glaucoma medication may need to be stopped and another one may need to be chosen to reduce eye pressure. This would need to be discussed with your eye doctor.

The prostaglandins can cause darkening of the skin around your eye and also darken the eye color with people who have light colored irises. A side effect that women love is

lengthening of the eyelashes; the compound in the medication has now been isolated and sold as a cosmetic.

In rare cases, chronic use of glaucoma eye drops can cause so much damage to the surface of the eye, that scar tissue develops. This type of scarring is rare, but it is not reversible. The only way to get rid of a scar is through surgery.

Here are some responses to questions asked by the audience:

Lasik does and doesn't increase your risk for glaucoma. The Lasik procedure itself doesn't raise the risk of glaucoma. However, Lasik does make it harder to check the eye pressure, because the pressure measurements may read artificially lower than they actually are. This may mask potential glaucoma.

Does myopia (nearsightedness) lead to glaucoma? Dr. Batta cited a landmark study conducted some 20 years ago that suggested that a near-sighted eye, longer than the average eye, stretches the retina creating areas of weakness. Because the myopic eye is longer, it affects the wall of the eye, the sclera, which becomes thinner. The wall of the optic nerve is attached into the sclera. Possibly a relationship exists

between a thin or weak sclera and glaucoma. But although the above stated study did establish a relationship, Dr. Batta felt that more study is needed.

A cataract is not a corneal issue. It is a clouding of the lens in the eye. At birth we're bestowed with a clear lens, efficiently providing clarity of vision until about the sixth decade of life when age-related changes in the lens may cause it to become cloudy. All of us, if we live long enough, will develop some cataract, a fact of life comparable to gray hair, wrinkles and whatever else that age bestows on us. With cataract surgery the clouded lens is removed and a plastic lens inserted providing clarity and focus. Cataract surgery is so advanced that for the most part a healthy cornea is unaffected. But for those patients with unhealthy corneas, the cataract operation requires care and deep understanding of the condition. These patients are at slightly higher risk of developing consistent corneal edema after cataract surgery and they sometimes need further work on their cornea in order to see clearly. But by and large that's the exception, not the rule. The vast majority of people will do fine with cataract surgery because the operation has become very advanced. Occasionally, the operation can become complex, especially

with a dense cataract. But the cornea usually does not take a hit with cataract surgery.

All contact lenses reduce the ability of the cornea to receive the nutrition from tears. As you blink, tears wash over your cornea providing nutrition. Wearing a contact lens daily deprives the cornea to some extent of necessary nutrition.

A sty is also very uncomfortable, but a sty is on the eyelid. It's separate from the cornea.

We seldom think of pigment in terms of health. We know that our skin, hair and eyes reflect certain amounts of pigment. But there is one class of people who suffer lack of pigment—the Albinos. Because they do not possess pigment in their eyes, their optic nerve and retina are deprived of this valuable substance. In most cases an Albino will be legally blind.

It is possible to have glaucoma in only one eye but this is rare. What can happen with early glaucoma diagnosis is that glaucoma is detected in one eye and some time later it is found in the second eye.

There is no standard eye pressure. Treatment depends upon the amount of glaucoma damage that has occurred.

Pressures in the 30's are usually treated even if no nerve damage has been detected. A small group of people (Normal Tension Glaucoma) suffer nerve damage even though their pressures are controlled. Usually, the doctor recommends further lowering of the eye pressure in these cases.

Remember, pressure is the only thing we have control over with glaucoma. We cannot control the anatomical issues with your eye. Perhaps there's something unusual about the structure of your eye that's predisposing you to glaucoma. At present there's no way that ophthalmologists can change a predisposing condition.

We want to thank Dr. Batta for her most informative lecture and her concern for the care and comfort of her patients. Dr. Batta can be reached either through calling the New York Eye and Ear Infirmary or in her Mineola office at:

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\*Addenda:

**Additional Information on preservatives in eye drop medications: (SOC is less toxic than BAK)**

Alphagan	0.005	BAK	
Alphagan P	0.005	SOC	
Azopt	0.01	BAK	
Betagan		0.005	BAK
Betimol		0.01	BAK
Betoptic S	0.01	BAK	
Cosopt	0.0075	BAK	
Lumigan	0.05	BAK	
Rescula	0.015	BAK	
Timoptic	0.01	BAK	
Timoptic XE	0.012	BDD*	
Trusopt	0.0075	BAK	
Xalatan	0.02	BAK	

Over the Counter

Gen Teal		Sodium Perborate	
Hypo Tears	0.01	BAK	

Refresh Tears 0.0005 SOC

Tears Naturelles 0.001 polyquaternium-1\*\*

\*BDD benzododecimum bromide—a product similar to BAK

\*\*studies indicate polyquaternium-1 moderate to extensive superficial eye surface erosion

\*source: Glaucoma: Patient to Patient, Book by Edith Marks

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**Please note: The contents of this newsletter are for informational purposes only. The content is not intended to be a substitute for professional medical advice, diagnosis, or treatment. Always seek the advice of your physician or other qualified health provider with any questions you may have regarding a medical condition.**

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**This newsletter is published by the Glaucoma Support and  
Education Group in partnership with  
The Glaucoma Foundation**