Visual Field Loss in Glaucoma

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And then on the right side is someone with glaucoma and what their visual field looks like. So you can see there's a blind spot here as well, but extending from that blind spot, there are patchy areas of dark areas where the patient is not able to see.

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This is a very classic pattern. We call this a superior arcuate defect, stemming from the blind spot and extending over. So the patient basically is missing this area, mainly by their nose and their peripheral vision.

Welcome to the IQ Podcast. I'm Dr. Rani Banik here to help you boost your IQ with powerful insights that connect your eyes, your brain and your whole body wellness.

Hi there and welcome to the IQ Podcast where you can gain insights into your eye health, your brain health and your overall wellness to help you raise your IQ.

I'm your host, Dr.

Podcast Intro and Glaucoma Awareness Series

Rani Banik, America's integrative neuro-ophthalmologist, and this month, during January, during Glaucoma Awareness Month, I'm doing a multi-part series on glaucoma so you can better understand the disease and really be empowered with the tools you need to prevent vision loss from glaucoma.

This week we are up to part two and I'll be sharing some of the testing that we do for glaucoma and what it means because it's very, very important that whether you're being screened for glaucoma or you're being monitored for it, you understand what your eye doctor is doing and why and what are the implications of these tests.

So let's get started on this week's episode of the IQ Podcast. Did you know that most adults spend over 10 hours a day on devices? In our screen-dominated world, meet your eye's new ally, Fortify.

Fortify is designed to defend your macula against blue light with a potent blend of lutein, zeaxanthin, mesozeaxanthin, and astaxanthin. Fortify also helps to support your optic nerve, retina, and cornea with Mackey and bilberry extracts, dincobaloba, and a powerful form of vitamin E called tocotrienol.

From teens to adults, Fortify empowers you for healthier screen time. I'm Dr. Rani. Don't let screams dim your view. See the world without limits with Fortify.

Science in every capsule. Act now. Visit my website to learn more about Fortify's powerful ingredients and to purchase. Let Fortify be your partner against blue light.

Fortify. Empowering your vision. All right, let's get into glaucoma testing.

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So if you remember from last week's episode on the IQ podcast, I was talking about glaucoma being a disease that

damages the optic nerve where there is peripheral vision loss and the eye pressure may or may not be elevated.

So when we think about glaucoma testing, we're looking at all of those factors. What does the optic nerve look like? Is there damage to the optic nerve?

What does the visual field look like? And what is the eye pressure? I've listed here some of the main tests that we do for our glaucoma patients. We do these tests both for screening as well as monitoring of the disease if a patient is being monitored or treated.

So let's go through each of them in detail so you can better understand what's being done during an eye exam. So number one is eye pressure, also called intraocular pressure or IOP.

Let's talk a little bit about eye pressure. So the eye pressure is literally the pressure inside of your eyeball. Now if you take your two fingers and very close your eyelid and very gently press on your eyeball, you'll feel that there's a little bit of give to the eyeball.

And the reason why there's some give there is because the eye is filled with fluid and the eye is also slightly elastic. It's got some collagen. So we can kind of press on it and get a sense, okay, is it a little soft or is it rock?

That used to be the only way we had to check eye pressure. Since over the years and decades and centuries, we've come across with some pretty sophisticated tools to actually check the eye pressure and monitor it very, very carefully.

So the gold standard for monitoring eye pressure is this device that's shown right here in the picture. This is called a Goldman appellation tonometer, or Goldman for short.

and it uses a calibration device that is mounted to the microscope that your doctor is using to examine your eyes. That microscope is called the slit lamp microscope.

So this little device, it has a blue light that we use and we also put a dye inside the eye to help stain the surface of the eye. So that in conjunction with the device, the blue light and the dye helps us to check eye pressure.

Now, this device comes up very close to the eye and then actually touches the surface of the eye in order to measure the pressure. Now, don't worry, you won't feel this because with the drop that's put in, the drop that has a dye in it, it actually also numbs the eye.

And by the way, that dye is kind of like a fluorescent yellow, so your eyes may look a little bit fluorescent yellow for a few minutes until your body absorbs that dye.

But basically, it is a water-soluble dye that's very, very safe. And so the eye pressure gets checked this way. And again, this is the gold standard, though there are other methods to check the eye pressure.

Goldman testing is really what's used for all types of clinical trials. So it is really the most reliable way to check eye pressure. There are other ways as well.

For example, there are handheld devices, either the eye care machine, which is shown here, or the tonal pen, which I'll show you in a moment.

Overview of Glaucoma Testing

This handheld device is used, first it's positioned over the patient's eye and it touches the forehead right here. And then you can see in this close up right here, there's this little whitish ball that, and it basically very gently touches the surface of the eye.

Patient doesn't feel it, it does not require coming of the eye. But it's a very quick kind of a touch with a pressure

reading. And it does it multiple times, maybe five or six times, and then averages that reading.

So this is another way to check eye pressure. It's very useful in people who may be at the bedside or even in children or post-op patients. It's a common way to check eye pressure.

Very reliable, but not as reliable as the Goldman tonometer.

Measuring Eye Pressure

The other handheld device that we usually use is the tonal pen. This, again, is very lightweight. It can be used at the bedside or in ambulatory settings or in a wheelchair, for example.

This does require numbing of the surface of the eye. It does not require dye, just numbing of the surface of the eye. This tonal pen actually touches the very surface of the eye and measures a pressure also.

Multiple readings are averaged. Now again, this is prone to error. Depending on where the surface of the eye is touched, it should be touched right in the center rather than off to the side.

So if it's not measuring exactly at the center, the measurement can be off. But these are the three common devices or ways to check eye pressure. I will say that there is another method that some people may be familiar with called the air puff method or the air puff tonometer in which a small puff of air is used to measure the pressure.

Unfortunately, it's fallen out of favor. It's not very precise. I would highly recommend that if you had that done, please, please, please request that the pressure be rechecked either using the Goldman, the iCare or their tonal pen.

Also, a lot of people probably have, you know, a little bit of a slightly traumatized kind of experience at the eye doctor when they don't expect that air puff to come and it can be very jarring to have a puff of air suddenly blown into your eye.

So people usually don't like to have that done. of eye pressure, you may be wondering, okay, what is normal eye pressure and when is it elevated and when is there a risk for glaucoma?

Well, the average eye pressure, this I say with a little caveat in that the studies that were done to get this range of eye pressure of 10 to 21 were all done in men, Caucasian men.

Usually, I believe the ages were about 55 and above. So it was this very specific demographic which was used to determine what the normal range of eye pressure is.

So again, 10 to 21 is the standard. However, that does not include women. It doesn't include people who are younger. It doesn't include different races.

For example, people who are black or Hispanic or Asian were not included in that cohort to establish the normative database. So with that in mind, people can have different eye pressures and it can still be within normal range.

For example, people can have pressures that are less than 10. I have many patients whose pressures are six, seven, eight, nine, and it's normal for them.

It doesn't mean that there's anything abnormal or pathologic going on. It's just that they tend to have a lower eye pressure than the normal range of 10 to 21. Then on the other end of the spectrum, there are patients who have pressures that are higher.

I have plenty of patients whose pressures are 22, 24, 25, 28, and that's normal for them. So having an elevated eye pressure, usually into the mid 20s, is not a problem unless that's associated with other measures of glaucoma, which we'll talk about in a moment.

So the eye pressure is one piece of the puzzle. Now, that being said, if someone does have eye pressures that are a little bit higher than normal, let's say 25, and they have no other signs of glaucoma, we do call that ocular hypertension.

So it is something that is a risk factor for glaucoma, but not necessarily. It doesn't mean that glaucoma is definitely in that person's future, but it's something that needs to be monitored.

So ocular hypertension is what we call it. Now, moving on to other metrics of glaucoma, this is very important, is the visual field test. This is in a standard way to measure one's peripheral vision.

It gives us very precise numbers and metrics to go on based off of, again, a normative database. So the machines are built with a normative database in which tens of thousands, perhaps hundreds of thousands of people were tested.

And so we know based off of a person's age and their sex, what their visual field should look like, meaning their peripheral vision should be. And this is the standard test that's used.

This is called a Humphrey visual field test. There are other machines on the market as well, like Octopus, et cetera. But Humphrey is the standard machine.

Basically, the patient has one eye that's patched because we only test one eye at a time. So we patch one eye. The patient sits with their face inside the machine, and the inside of the machine is like a white bowl, and they're shown various light stimuli.

Little circles of light, different intensities, different sizes, and the patient is asked when they see the light to press a button. That helps to map out what the patient can see within their peripheral vision.

And usually the test maps about anywhere from 48 to 60 degrees from fixation. So fixation is right in the middle. So we do 24 degrees on each side to 24, 24. That would be 48 degrees of the visual field.

If we go out a little bit further, we do 30 and 30, which means 60 degrees of someone's visual field is what the test will measure.

Visual Field Testing and Glaucoma Defects

Now, there are newer ways to test the visual field. Actually, this is something that I use in my office. I've transitioned from using the big machine, which is again, typically the Humphrey machine, to a portable headset, similar to a virtual reality headset where the patient wears the headset over their glasses and both eyes are tested and there's no need to patch one eye or the other.

Both eyes are tested using a virtual reality simulator. I find this very effective. And it's very similar to the data I get from the traditional testing.

It's a lot easier for the patient to do. And it's also great for people who can't necessarily put their head into the machine. Let's say they're in a wheelchair or they have some neck issues.

They can't necessarily lean forward. It's very patient friendly. And the test usually takes about two to three minutes per eye. So it's very quick versus the Humphrey.

Yes, it can take two to three minutes per eye, but sometimes it takes four, six, eight minutes or longer per eye, which can be very, very tiring. So I think a lot of practices may be transitioning over into a portable headset, but we'll see what happens with that.

But I found it very, very useful for my patients who actually like it a lot more than the traditional way of testing. So what is a patient with glaucoma?

What does their visual field look like? Or what are we worried about on their visual field? So I'm going to first talk about what we see on the left, which is a visual field printout of someone with normal vision.

So we all have a normal blind spot, which is about here. So this, by the way, this is the left eye. So this is what a patient would look like on their visual field in their left eye.

So there's a blind spot, a small blind spot on the left side, which everyone has a small blind spot and the rest of the field looks pretty clean and open.

And then on the right side is someone with glaucoma and what their visual field looks like. So you can see there's a blind spot here as well, but extending from that blind spot, there are patchy areas of dark areas where the patient is not able to see.

And these are areas that we call scotomas or visual field defects. And so you can see up above, there's kind of like an arc, a vision that's missing in this patient.

And this is a very classic pattern for glaucoma. We call this a superior arcuate defect, stemming from the blind spot and extending over. So the patient basically is missing this area, mainly by their nose in their peripheral vision.

And also, if you look closely, there is some loss down below as well. They're missing a little bit of their peripheral vision by their nose in the inferior part of their visual field.

So this patient has loss both up above and below in their visual field. Very, very classic for glaucoma. Now I had shown you this picture also in part one of my podcast series.

If you caught it last week, you may remember this picture, but if you didn't, please go back and take a listen. This is what this image here is showing you progression of visual field loss over decades in a patient with glaucoma.

So in A, in picture A, this is a normal field, really nothing to worry about. In B, this is taken about five years later, so we're starting to see some loss here up above, some dark areas and loss here as well.

This is image C taken a few years after B, and you can see that the visual field is starting to close in. There's loss both above as well as below. Again, this is very, very classic for glaucoma.

comatose field loss, and then finally in D, this is a very advanced case, basically end stage glaucoma, where there's only a small central island remaining through which the patient can see.

Otherwise, there are defects all the way around. In this end stage, unfortunately, when a patient gets to this stage, the peripheral vision loss is irreversible.

There's really not much we can do to bring it back. Even in C, there's really not much, really, the visual field does not reverse whatever damage has been done.

But the goal is not to let patients get to these stages. Ideally, we want to catch them early when they're in stage A or B to prevent them from getting to stages C or D.

And you can imagine in D, if you're walking around with a visual field that's only just a few degrees intact, maybe five or 10 degrees or so, it's very easy to bump into things, to not see things, to trip, to fall.

So there is a safety concern here as well, especially with navigation, especially outside of the home in unfamiliar environments. Again, we do not want to let our patients get to the advanced stages of field loss.

This is another unfortunate example of someone with bilateral damage from glaucoma. In the right eye, which is shown here on the right, the patient is completely a black visual field.

So they've lost complete vision in that eye. It's wiped out. It's a black field. And on the right, they have pretty advanced loss as well, which is kind of closing in on them.

And so unfortunately, this patient is at a very advanced stage of glaucoma field loss. Let's talk a little bit about the optic nerve and cupping and I want you to understand this very well because this is a measure that's tracked over time with every doctor's visit.

You'll get your cup to disc ratio measured and it's important for you to know what your cup to disc ratio is. Remember back to my last episode, part one, I talked about the optic nerve and I talked about that it's a circle and the center part is the cup.

That's where the blood vessels enter the eye through the cup. A normal cup to disc is 0.4 or smaller. And this here is showing you a cup to disc ratio of about 0.3, which is normal.

By the way, as a reminder, we have 1.2 million nerve axons going through that small optic nerve. Now, the picture on the right is someone with glaucoma.

And you can see that they've lost healthy nerve tissue.

Optic Nerve Cupping and OCT Imaging

And where they've lost tissue, instead of it being the normal reddish-orange color, it looks yellowish-white because that's atrophy of the optic nerve or damage of the optic nerve.

And we call this cupping. It's a ratio. The cup-to-disc ratio is a ratio of the ratio of the area of cupping to the overall area of the optic nerve itself.

The cup to disc ratio is the cup to the entire nerve and here it's about 0.8 or 80% of the optic nerve. And this is very, very suspicious for glaucoma because glaucoma looks like, this is the classic appearance of glaucoma, is this type of optic nerve cupping.

Now, this is an image which I got off of the internet. Sorry, I don't have credit. I don't exactly remember which website I got it from. And I also don't know the patient's details.

But I chose this to show you the progression of cupping over time. Just to orient you here, OD is right eye, which is on the top. OS is left eye on the bottom.

And you can see in 1999 when the patient was 20 years old, this is what their cupping looked like. So this is why it's very important to get photos of the optic nerve, which should be done periodically at least once a year during your visit with the eye doctor.

But basically here the cup is a little bit bigger than normal. I would say this is probably 0.55, 0.6 in the right eye, and maybe like 0.45, 0.5 in the left eye.

A little suspicious for glaucoma. And then you can see about eight years later, there is worsening of the cup and you start to see these kind of dots here.

These are called laminar dots, which is highly suspicious for glaucoma because it means that healthy nerve tissue has been lost in those areas. So again, when we see laminar dots, it's almost pathognomonic for glaucoma damage.

You can see the cup is growing in size in both eyes, a little bit more on the right eye than the left eye. Here, just five years later in 2011, significant worsening of cupping.

Now we're up to maybe a 0.7 cup, almost a 0.8 cup in the right eye, and maybe like a 0.65 cup in the left eye. Here,

at age 34 in 2012, this is also very important.

This here, you see there's a little redness right here. This is actually a hemorrhage. This is blood. And we call this a splinter hemorrhage off of the optic nerve.

and this is again highly highly highly suspicious for glaucoma when we see these types of optic disc hemorrhages and you can see the cup is again pretty big maybe a little bit worse than it was you know the year prior and here definitely in the left eye it's increased significantly and by the age of 40 20 years later there's pretty significant cupping that's progressing even more in both eyes.

Again, look at what the initial images look like and look at the images for 20 years later. You can see the progression of cupping and unfortunately again, this is not my patient.

I do not know the details of the treatment and the progression of field loss, but my guess is by the time this individual was 40, that unfortunately they probably sustained pretty significant field loss compared to when they were 20 when they probably had no field loss at that time.

And I really do hope that this patient is being properly adequately treated over time. Another metric in terms of glaucoma testing, and this is now pretty much standard for glaucoma care, is a scan of the optic nerve to give us some numbers of the thickness of the nerve and the health of the nerve.

And this scan is called an optical coherence tomography, OCT. And think of this as a high resolution light ultrasound. So not sound waves, but light waves.

And it gives us very precise measurements And I'll just share with you the image on the left is a normal individual. Actually, this is the same individual, but earlier in time.

And you can see on these images, this is not a proper photograph, but this is an infrared photo. You can see the patient already has some cupping in both eyes, the right eye and the left eye.

There's already some cupping. But their average RNFL or nerve fiber layer, retinal nerve fiber layer is RNFL, is normal. It's in the green, and normal range is anywhere from 80 to 120 is normal.

The median right there is 100, but 80 to 120 is typically normal. However, this is later, and you can see that, and I don't know, again, this is not my patient, so I don't know exactly how much time has passed, but you can see that now this patient is in the red, meaning that they've lost healthy nerve tissue over time, and this pattern is very classic for glaucoma as well.

So they went from their nerve fiber layer being in the 80s to 90s to down to the 60s. So they've lost a lot of nerve and you can see how red this area is.

So optical coherence tomography or OCT is now an integral part of glaucoma care to monitor small changes in the retinal nerve fiber layer and loss with time that's out of proportion to age.

As we get older, yes, we do lose a little bit on an annual basis, maybe two or three microns, which is the scale of measurement for the OCT. But in glaucoma, it tends to be more significant.

And that's how we can monitor progression. That brings us to the end of part two of Goma, my series on glaucoma, where we talked about testing for glaucoma.

As a recap, glaucoma is a complex disease. It affects the optic nerve, and there are many things we use to monitor glaucoma, many tests we do. Again, to recap, eye pressure, the visual field, cupping with disc photos, and also OCT RNFL.

There are other tests as well that can be done in the office, but to keep things simple, those are the standard tests

that most eye doctors will do for monitoring and screening of glaucoma.

Recap and Closing Remarks

So I hope you found this informative and eye-opening. Hopefully this makes a lot more sense when you go to your eye doctor to understand everything that's been tested.

But again, if you found this episode helpful, please share it with a friend or family member who needs to hear it. Let's say you know of somebody who's at risk for glaucoma or maybe someone who has a family member with glaucoma.

They need to hear this information because this will empower them to better take care of their eyes and better understand what's happening when they go to their eye doctor.

So again, I hope you've enjoyed today's episode. Stay tuned for next week, part three, when I'll be talking about treatments, medical and surgical treatments, which I think you're going to find really interesting.

And then, of course, there's going to be part four when I talk about natural and holistic treatments, including diet, supplements, lifestyle, and mindset.

So there's a lot more to come on my series on glaucoma. But please, if you're enjoying the series, subscribe, because that's the best way to support me and my team in putting this podcast out there to help you and your friends and family with your eyes.

So thanks again for tuning into the iCare Podcast and I look forward to seeing you all next week when we're going to be talking about glaucoma part three treatment strategies.

Take care in the meantime. Thank you for tuning in to the IQ Podcast. I hope you enjoyed today's episode and learned something new to help you boost your IQ.

Leave us a review and share the podcast with your family and friends. Stay connected with me for more eye-opening insights on eye health, nutrition, and lifestyle.

Until next time, keep your vision clear and your IQ sharp.