

## “The Eye of the Needle” with Peter Campochiaro, M.D.

### Transcript of Cerebrum Podcast



**Guest: Peter Campochiaro**, M.D., is the Eccles Professor of Ophthalmology and Neuroscience at the [Wilmer Eye Institute](#), Johns Hopkins University School of Medicine. He is a clinician-scientist whose [laboratory](#) research studies ocular neovascularization and excessive vascular leakage, which occurs in age-related macular degeneration, diabetic retinopathy, and retinal vein occlusion. The clinical trial group under Campochiaro provided the first demonstration of the benefits of suppression of VEGF in diabetic macular edema and retinal vein occlusion. He has developed strategies for sustained suppression of VEGF that are currently being tested in clinical trials. Campochiaro trained at the University of Notre Dame, Johns Hopkins School of Medicine, and the University of Virginia.

**Host: Bill Glovin** serves as editor of Cerebrum and as executive editor of the Dana Foundation. He was formerly senior editor of *Rutgers Magazine*, managing editor of *New Jersey Success*, editor of *New Jersey Business* magazine, and a staff writer at *The Record* newspaper in Hackensack, NJ. Glovin has won 20 writing awards from the Society of Professional Journalists of New Jersey and the Council for Advancement and Support of Education. He has a B.A. in Journalism from George Washington University.

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[Intro] Bill Glovin: You might be wondering why a podcast about the brain is addressing the issue of vision and more specifically, macular degeneration? Well the easy answer is that vision won't work without the optic nerve, which is a cable like grouping of nerve fibers that connect and transmits visual information from the eye to the brain. Hi, I'm Cerebrum editor, Bill Glovin, and welcome to the Cerebrum Podcast, where we explore matters of brain science with leaders in the neuroscience field. Our podcast is sponsored by the Dana Foundation in New York City, and you can find all our content at [dana.org](#). Today, we welcome in Dr. Peter Campochiaro, Professor of Ophthalmology and neuroscience at the Wilmer Eye Institute at The Johns Hopkins University School of Medicine.

[Snippet] Peter Campochiaro: *Macular degeneration, Bill, is a major public health problem because it is the most common cause of visual loss in people over the age of 60. And as that elderly portion of the population increases, the prevalence of macular degeneration is really exploding.*

- Bill Glovin: Peter, who is the author of our recent *Cerebrum* magazine feature on macular degeneration, “Eye of the Needle,” is a clinician scientist whose laboratory provided the first demonstration of the benefits of suppression of something called VEGF, a protein that stimulates new blood vessels in people with diabetes. His lab work is currently being tested in clinical trials.
- Welcome to our podcast, Peter. Let's start by referencing your wonderful article, which you tell to the experience of treating a patient. Explain to listeners what macular degeneration is and what causes it.
- Peter Campochiaro: Sure, Bill. Macular degeneration is a very prevalent problem. It's the most common cause of moderate and severe vision loss in people over the age of 60. It's a condition in which the retina begins to degenerate and there's critical cells in the retina, the photoreceptors which capture light and begin the process of transforming them to an image that goes to the brain. Those cells degenerate over time. It's a very slow degeneration and it causes gradual reduction in vision with blank spots in the center portion that gradually enlarge over time. And then about 20 percent of patients who are undergoing slow degeneration have this increased production of the factor that you mentioned, vascular endothelial growth factor, or VEGF, and that causes stimulation of abnormal blood vessels to grow under the retina. And they leak fluid into the retina, and that causes a very rapid reduction in vision. So basically, macular degeneration is just slow degenerative process that can be complicated by these abnormal blood vessels, which cause a very rapid reduction in vision.
- Bill Glovin: What are the signs that you may be suffering from it?
- Peter Campochiaro: Well, because it's a rather slow degeneration, oftentimes in the beginning, patients don't know they have this problem. And they may first find out when they go to the ophthalmologist just to get their glasses changed and he looks in the eye and he sees these deposits that occur under the retina, called drusen. And he may then inform them that they have the earliest signs of macular degeneration. But the first thing that patients see is they often see small blank spots in the center portion of their vision. And then if they develop the wet form of the disease, they have the sudden onset of distortion where straight lines look crooked, and their vision just gets rapidly decreased.
- Bill Glovin: So how long is it before the first symptoms and serious problems?
- Peter Campochiaro: It's a variable amount of time. Many patients go to an ophthalmologist, find out they have the earliest signs of macular degeneration and then go years and years without really noticing very much in the way of a problem. And then they

may just begin to notice these little bit of blank spots but then also, may suddenly experience the distortion and decreased vision that heralds the onset of the wet form of the disease.

Bill Glovin: Can macular degeneration be helped through a stronger eyeglass prescription or LASIK?

Peter Campochiaro: No. So, you can think of the eye like a camera. The retina is analogous to the film in the camera, and glasses can help to focus images on the retina better. But they can't change what's going on in the retina. So, if the film in the camera is bad, you can't get a good image regardless of how well you focus things on the film.

Bill Glovin: Are there preventative measures one can take, either through diet, vitamins or exercise?

Peter Campochiaro: There have been epidemiologic studies that have demonstrated that people who eat a lot of green leafy vegetables have a slower incidence of macular degeneration. And therefore, we always recommend that patients eat a lot of green leafy vegetables. I think all physicians do that because they're just helpful in general for your health. Also, it has been demonstrated that people who have the intermediate form, the early stages where you just have the deposits in the retina, that if they take antioxidant vitamins and zinc, a formulation called AREDS 2, by PreserVision, that the risk of progressing to the more severe forms of the disease is decreased by 25 percent over five years. So, in the very earliest stages, we recommend that patients eat a lot of green leafy vegetables and also take this formulation of antioxidant vitamins.

Bill Glovin: Are there any drugs that you prescribe for this?

Peter Campochiaro: Well, there are no treatments currently for the dry form of the disease. The wet form, there is some treatment, and that has really changed the landscape in terms of wet AMD because previously, when patients got wet AMD, they were guaranteed to go on to have legal blindness in that eye. But through a lot of laboratory research, it was demonstrated that VEGF, vascular endothelial growth factor, plays a major role in the development of the abnormal blood vessels and their leakiness. And now, proteins, antibodies that bind VEGF have been developed, and we are able to inject them into the eye and that can reduce the leakiness from the vessels and prevent them growing.

Bill Glovin: Can you maybe describe in a little bit more detail, the difference between wet and dry AMD, which is the acronym for macular degeneration?

- Peter Campochiaro: Dry AMD is the degenerative process. It's the very slow degeneration of the photoreceptors and the RPE cells, which are the cells that occur under the photo receptors. It results in slow deterioration of vision over many, many years. And a certain percentage, about 20 percent, of patients who are undergoing this slow degeneration experience a sudden change. And that sudden change occurs because the cells in their eye begin producing this substance, vascular endothelial growth factor, which causes abnormal blood vessels to grow under the retina. They leak fluid into the retina and that fluid causes rapid deterioration to vision. Now fortunately, that deterioration is reversible. If we can stop the leakage from those blood vessels from occurring, the fluid can be pumped out of the retina and the vision can improve. And we now have some medications that are capable of doing that.
- Bill Glovin: Before we get into how you would treat this, is there a link between AMD and diabetes or any other medical conditions?
- Peter Campochiaro: Diabetes is another medical condition that causes problems in the eye, but it causes different type problems and it's not really related to AMD. So AMD and diabetes are not related with respect to what occurs in the retina. There are some conditions, such as very high blood lipids, which can make patients more prone to develop AMD. But in general, AMD is a condition that is separate from other medical conditions that affect other areas of the body.
- Bill Glovin: How about genetics? Do they play a part?
- Peter Campochiaro: Yes. AMD is fundamentally a genetic disease. There are multiple genes who can have defects in them that contribute to the development of AMD. And many of those genes are genes that code for proteins that participate in the body's defense system, particularly the complement system, which is the first line of defense. And what's been demonstrated is that defects in genes that participate in this complement system can make patients much more likely to develop AMD.
- Bill Glovin: Let's talk about treatment, which you do discuss in the article. And for people who are interested in this topic, you can find Peter's article at [dana.org](http://dana.org). What is the treatment for this condition?
- Peter Campochiaro: So, as I mentioned, there is currently no treatment for the dry form of the disease. But patients who develop the wet form, there are antibodies and other proteins that bind to VEGF that we can inject into the eye and neutralize the VEGF, which causes the abnormal blood vessels to stop leaking. And therefore, the fluid that's collected in the retina can resolve. And that can result in

improvement in vision. Now these proteins that we inject, they'd last in the eye for about a month. So, after they've exited the eye, it's necessary to inject them again.

Peter Campochiaro: So, it means that we have to do repeated injections. Sometimes, the period between injections can be lengthened out. But in general, most patients with the wet form of macular degeneration require injections of these medications every four to six or eight weeks for the remainder of their life.

Bill Glovin: Is it painful?

Peter Campochiaro: Well, we can numb up the eye fairly well so that most of the pain is eliminated, but there is maybe a brief period of discomfort. And certainly, there is some irritation afterwards because we have to use medication that kills all the bacteria and other germs around the eye. And that is a little bit irritating to the eyes. So, patients who have these injections maybe feel just a very small amount of discomfort at the time of the injection, but then have irritation for several hours or even a day after the injection.

Bill Glovin: Is there a protective element when somebody leaves your office for the hours it takes for the injection to work, or can they just walk out of your office seeing regularly?

Peter Campochiaro: So, the injections really don't disturb the vision very much, maybe from dilating the pupil and a little bit of drying in the cornea, the vision may be down a little bit. But many patients have the injection and then go right to work or go home and do their normal activities. But as I mentioned, there is a little bit of irritation. So, some patients like to go home and have some quiet time where they just lay down and close their eyes and let them recover a bit. But by the next day, almost all patients are back to all of their normal activities.

Bill Glovin: What are the prospects for new treatments? You did talk about drugs a little bit before, but anything on the horizon that might alleviate the need for these injections?

Peter Campochiaro: There's a lot of work being done, try to identify treatments that provides sustained suppression of VEGF. And so there is an implantable refillable reservoir, which can be placed in the eye and the medication that blocks VEGF is put into the reservoir and it slowly releases in the eye over many months. And patients who have that don't need injections anymore, but they get a refill of the reservoir every six months. There's other agents that are being incorporated into polymers that then form nanoparticles that can be injected in the eye. And

they release slowly and suppress the abnormal blood vessels over many months as well. And that's currently in clinical trials. And the hope is that they can be injected about every six months and keep the blood vessels in check. And then there's gene therapy. Instead of injecting the proteins into the eye, that involves injecting, using a viral vector to inject the gene that makes the protein. It's then incorporated into cells in the eye, and then slowly produces the protein that's needed to treat the disease.

Bill Glovin: Are any of these things something that your own lab is working on?

Peter Campochiaro: Yes, we're working on all of these different approaches. So, there's a lot of work in this area because this is such a prevalent disease process that affects so many patients. And our current treatments, although quite good, are still not satisfactory. It's just not very efficient to have patients come in every four to six weeks to have to give these injections.

Bill Glovin: Has there been any link between AMD or any vision issues and Covid?

Peter Campochiaro: No, there's no real link. Of course, Covid has been a problem because patients who need to come in and depend upon these injections, when we're in the middle of a pandemic, it makes it much more challenging to get into the clinic and get your injections. So it's been a journey for many of the patients with macular degeneration during this pandemic.

Bill Glovin: Have you been able to get the kind of funding that you need to do this research, and how is the funding climate in general for macular degeneration?

Peter Campochiaro: Of course, for every line of research, biomedical research, more funding is always welcomed and needed. There is the National Institutes of Health, and particularly the National Eye Institute, has made macular degeneration a priority. And there is a lot of federal funding for research related to macular degeneration. In addition, there are foundations that focus on macular degeneration. So there are many avenues to obtain funding. But nonetheless, the research is extremely expensive, and more funding is always necessary.

Bill Glovin: Why is the research so expensive?

Peter Campochiaro: Well, it requires generation of genetically modified mice for the models for this disease process. And all of their reagents are quite expensive. And of course, for laboratory personnel. There's many personnel that are needed for all the different experiments and that's quite expensive.

- Bill Glovin: What do you recommend to people in terms of getting or seeing a doctor such as yourself on a regular, semi-regular basis? How often should someone be getting their vision checked, especially someone who, let's say, is over 50?
- Peter Campochiaro: For someone over 50 who does not have any known retinal problem, we recommend examinations once a year. And during that examination, the physician will look at the retina, evaluate it, make sure that there's no problems, as well as take the pressure in the eye, which is also important and check the vision. Once macular degeneration is identified, we then often recommend visits every six months. It's important that if you have macular degeneration, that you also monitor your vision yourself, so that if you do experience a change in condition, that you're quickly aware of it and that you go in to see your physician right away, because early treatment is very important with regard to the ultimate outcome.
- Bill Glovin: Your article states that there's 200 million people worldwide with this condition and that by 2040, let's say, it's expected to increase by another hundred million. So it seems like the problem is getting worse because people are living longer and the population is expanding. What do you see as the future of the field in let's say 10 years and the prospects for this disease?
- Peter Campochiaro: Macular degeneration, Bill, is a major public health problem because it is the most common cause of visual loss in people over the age of 60. And as you point out, our population is aging. We have the baby boomers who are increasing the elderly portion of our population. And as that elderly portion of the population increases, the prevalence of macular degeneration is really exploding. So it's a major, major public health problem. And right now, the drugs that we inject it into the eye have become one of the most expensive ticket items on the Medicare budget. There's so much macular degeneration that these treatments, for this particular eye disease, have become some of the biggest financial drains on our healthcare budget.
- Bill Glovin: If you don't have private insurance, I would assume it's a big problem to pay for the kind of treatment that you would need.
- Peter Campochiaro: It is a big problem. And of course, patients who have this disease are over the age of 60 or 65. So most will have Medicare. But even with Medicare, there is a copay, and these drugs are very expensive. So the copay is a problem. Most patients have some additional insurance to help with the copay. But particularly if you don't have insurance or any assistance with your healthcare costs, this is really a major problem.

Bill Glovin:

Oh boy. I think that's a great place to end, although a sad place actually. Again, I'd like to thank Peter Campochiaro, author of our *Cerebrum* magazine article, "The Eye of the Needle." Again, you can find the article on Dana.org. I'm your host, Bill Glovin, And thanks for listening and please stay healthy out there.