Diabetic Retinopathy

Main Number ........................................ 215-928-3000
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                                                1-877-289-4557
Emergency Service ................................. 215-503-8080

Retina Service .................................... 215-928-3300

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Diabetic retinopathy is a complication of diabetes mellitus. Diabetes mellitus is a condition in which the blood sugar level is elevated because the body is unable to use and store sugar. This high sugar content damages blood vessels in the body over time and can affect a variety of body organs such as the eyes, heart, and kidneys. Diabetes affects the eyes by causing deterioration of blood vessels in the retina. Breakdown of retinal blood vessels may result in fluid leaking into the center of the retina (macular edema) or abnormal blood vessels that grow on the surface of the retina (neovascularization) which can bleed and scar. This can lead to loss of central and possibly peripheral vision.

Causes and Associations

The longer someone has diabetes mellitus, the more likely they will develop diabetic retinopathy. After 25 years, nearly all people with diabetes mellitus will show some signs of diabetic retinopathy. The severity of diabetic retinopathy is also related to blood glucose (sugar) control. Keeping blood glucose levels down to as normal as possible reduces the degree and rate of progression of diabetic retinopathy and other diabetic complications in the body. The hemoglobin A1C level reflects how well blood sugar control has been achieved over the past several months. The goal in managing diabetes is to keep the hemoglobin A1C level less than 7.

Symptoms

Symptoms of diabetic retinopathy include gradual, progressive blurring of vision, sudden, severe vision loss, floaters or fluctuating vision. It is important to recognize that people with diabetic retinopathy may not necessarily have visual changes even in more advanced stages. It is important and mandatory that people with diabetes mellitus have their eyes examined at least annually.
A comprehensive ophthalmic examination is important in the assessment of diabetic retinopathy and includes vision testing, drops to dilate pupils, and a complete examination of the front and back of the eye.

**What the Doctor Sees**

There are two major types of diabetic retinopathy: non-proliferative retinopathy (Figure 2) and proliferative retinopathy (Figure 3). Non-proliferative diabetic retinopathy is the earlier stage and is characterized by visible damage to small retinal blood vessels. These blood vessels may develop balloon-like swelling called microaneurysms. Microaneurysms and other areas of abnormal retinal blood vessels may leak fluid, causing the retina to swell or bleed. This may lead to vision loss. Leakage in the center of the retina (macula), known as macular edema, is the most common mechanism of vision loss in people with diabetic retinopathy. Non-proliferative diabetic retinopathy is the most common form of diabetic retinopathy, accounting for approximately 80% of all cases.

Some people progress to the more advanced proliferative diabetic retinopathy stage. Proliferative diabetic retinopathy is characterized by such severe, small retinal vessel damage and reduced oxygenization of the retina that the retina reacts by growing abnormal blood vessels (neovascularization). These abnormal blood vessels are fragile and can bleed and pull on the retina as they grow. Bleeding into the vitreous cavity of the eye (vitreous hemorrhage) can result in sudden and sometimes severe loss of vision.

This type of hemorrhage is painless and, early on, may be seen as cobweb-like floaters in one’s vision. New floaters and any sudden vision change in a person with diabetic retinopathy should be evaluated promptly by an ophthalmologist.

Proliferative diabetic retinopathy can also lead to traction retinal detachments. The retinal neovascularization can grow to be large and then contract, pull, and lift the retina. Retinal detachment can lead to loss of vision if it involves the macula.

![Figure 2](image1)

**Figure 2**
Nonproliferative Diabetic Retinopathy with macular edema (arrow).

![Figure 3](image2)

**Figure 3**
Proliferative Diabetic Retinopathy (Dark arrow shows leakage of new vessels on the optic nerve. Light arrow shows hemorrhage in front of the retina).
Diabetic Retinopathy

Testing

People with diabetic retinopathy may have several types of tests to evaluate their condition.

Fundus Photography
People may undergo photographs of their retinas to document the stage and findings of diabetic retinopathy. There are no risks associated with this simple test.

Fluorescein Angiography
Fluorescein angiography (Figure 4) may be used to determine the extent of diabetic retinopathy or to detect areas of leakage or bleeding that may lead to vision loss. The test is performed by injecting sodium fluorescein dye into a peripheral vein with a small needle. This dye then goes through the body and eyes, as well as the retina, to show blood flow and various features of retinopathy such as leakage. It is considered a routine and safe test, but people should expect some temporary, mild yellowish tinting of skin and orange colored urine. Most people have no difficulty with this test, although a low percentage of people will experience some transient, mild nausea after the injection. Very rarely, allergic or even more severe reactions can occur.

Optical Coherence Tomography (OCT)
OCT imaging is a fast, non-invasive test that uses low energy laser to scan the macula and determine whether there is swelling or distortion of the macula in the setting of diabetic retinopathy. The test is also useful to assess the response to diabetic macular edema treatment.

B Scan Ultrasonography
This test utilizes standard, non-invasive ultrasound technology and is used in the office to view the retina when the retina cannot be directly visualized by the doctor with standard examination techniques, such as in the setting of a severe vitreous hemorrhage. Typically the doctor will recommend the test to rule out retinal tears and any pulling on or detachment of the retina (Figure 5). Certain types of retinal detachment may need relatively urgent surgery.

Figure 4
Fluorescein Angiography

Figure 5
Fluorescein Angiography
Diabetic Retinopathy

Prognosis

People who maintain healthy, active lifestyles and who optimize their blood sugar control have the best chance of slowing progression of diabetic retinopathy and preserving good vision. It is very important that people with diabetes mellitus undergo at least an annual eye exam, whether or not they have any vision symptoms. It is important to remember that diabetic retinopathy may progress and not cause any symptoms. It is also very important for people to understand that their blood glucose (sugar) control should be as good as possible, with the goal of keeping the hemoglobin A1C level less than 7.

Treatment

Laser

Laser photocoagulation (Figure 6) is a well-established, standard treatment for diabetic retinopathy. A laser delivers a split-second burst of intense light energy to treat leaky retinal blood vessels or promote shrinkage of abnormal blood vessels (neovascularization). Laser photocoagulation has been proven in large clinical trials to significantly reduce the risk of both moderate and severe vision loss in people with diabetic retinopathy.

Laser photocoagulation is performed in the office setting with the patient seated in front of the laser unit. The eye is anesthetized with drops, and a contact lens is placed on the eye to focus the laser-aiming beam. People will experience bright flashes of lights and occasionally a pinching sensation, although many people will have no sensation of the laser at all. Some people may experience discomfort during laser photocoagulation, but generally it is a well tolerated office procedure.

There are two main types of laser treatments in diabetic retinopathy. One is called focal laser and this is the technique used to control diabetic macular edema. It is performed in one session, is generally painless, and can take up to 2 to 3 months to see the desired “drying” effect. The other type of laser treatment is called panretinal (or “scatter”) photocoagulation. These are longer, more extensive treatments that are used to shrink abnormal vessels and reduce the number or severity of vitreous hemorrhages. Panretinal laser treatments may be divided into several sessions and can be associated with some ache in the eye during or after the treatment. The desired effects may take 4 to 6 weeks or more. Both focal and panretinal laser treatments may need to be repeated to control the diabetic retinopathy problems.
In general, laser treatments are intended to stabilize or prevent progression of various diabetic retinopathy complications and may or may not result in noticeable vision improvement. The best results, with the best chances of preserving a good level of vision, are achieved when diabetic retinopathy-related problems are caught early. Lastly, laser treatments may not work in everyone and other treatments (below) may be needed.

**Injections**
Many retina specialists are now using injection therapies into the eye to treat the various complications of diabetic retinopathy such as leakage and abnormal blood vessel growth. Injections of steroids or the anti-cancer drug bevacizumab (Avastin) are now commonly used to treat diabetic macular edema and some of the proliferative manifestations of the condition. Repeat injections may be necessary for long-term control of the problems.

The injections are performed in the office using topical drop anesthesia. They are very well tolerated and complications are rare. These injections are associated with a small risk of infection, and therefore, people are typically treated with topical antibiotic drops. Steroid injections also may be associated with elevating the pressure of the eye or causing progression of cataract. People should discuss risks and benefits of all treatments, including injection therapies, with their eye specialist.

**Vitrectomy**
People with diabetic retinopathy may require vitrectomy surgery in an operating room setting. A vitrectomy is performed when there is bleeding or retinal traction that is causing loss of vision in people with advanced diabetic retinopathy. In this surgical procedure, small instruments are inserted into the eye under microscopic visualization, and both the vitreous hemorrhage and any scar tissue are removed (Figure 7). The vitreous gel typically is replaced with clear fluids at the end of the case. Laser photocoagulation may be performed at the time of surgery, and in some cases, a gas bubble or silicone oil may be placed to hold the retina in position if there are retinal holes or detachment. The prognosis for people who require vitrectomy surgery depends upon the status of the underlying diabetic retina.

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**Figure 7**
Pars plana vitrectomy for vitreous hemorrhage
Frequently Asked Questions

Is it safe for a woman with diabetic retinopathy to become pregnant?
Most diabetic women can have a baby without an increase in retinopathy. In some patients, however, the retinopathy might worsen enough to require treatment. In a few cases, vision might remain decreased. It is recommended that all patients be frequently monitored during pregnancy.

Can I delay retinopathy by keeping my blood sugar under control?
Several major studies have shown that strict control of blood sugar can markedly delay the onset of retinopathy and slow the progression of early cases. All diabetics should strive for good control of their blood sugar because some patients, even those with more advanced diabetic retinopathy, might delay the progression of the disease if their blood sugar is maintained at a reasonable level. Others, however, will see a progression of the disease even if their blood sugar is normal or near normal.

Patients should know their HbA1c levels, since this is an indicator of control over a three-month period.

Does high blood pressure affect the eyes?
Some studies have shown that patients with high blood pressure are more likely to have retinopathy. However, since high blood pressure alone can damage the eyes, heart, kidneys and brain, patients should keep their blood pressure under control and have it monitored regularly.

Why would a person with no vision problems require laser treatment?
Patients with proliferative retinopathy might have normal vision but are still at high risk for imminent loss of vision due to hemorrhage or retinal detachment. Laser photocoagulation in these patients has been proven to be effective by the Diabetic Retinopathy Study.

Is it true that a person can lose considerable vision shortly after laser treatment?
Each case is different. In patients with advanced disease, laser treatment is not as effective as it is in patients with early retinopathy. In many, the progression of retinopathy is delayed. But in others, the disease progresses despite the laser treatment or, by coincidence, at the same time as the treatment.

Should a person with diabetic retinopathy exercise?
Studies have shown that most patients with proliferative retinopathy have hemorrhages at night while they sleep. There is no convincing evidence that exercise increases the number of hemorrhages. Moreover, exercise is important not only for general well-being, but also for controlling blood sugar levels. Each patient should continue routine exercise unless he or she notices hemorrhages frequently during exercise.

If my doctor tells me that I have diabetic retinopathy, is there anything else that I should be checked for?
Yes. Patients with blurred vision from diabetic eye disease are very likely to have kidney disease and/or high blood pressure. They should be checked regularly by a family practitioner or an internist.
**Diabetic Retinopathy**

**Why can’t I be given a stronger prescription for glasses to compensate for my vision loss?**
If the retina is damaged, stronger glasses cannot return distance vision to normal. They do provide greater magnification, but they also force a patient to hold reading material closer to the face. Most patients who have a moderate degree of vision loss opt for a hand-held magnifier in addition to normal reading glasses, allowing for a more comfortable reading distance.

Some patients might be helped greatly by low vision aids (Figure 8). These are special magnifying devices that enable patients to make the best use of their remaining eyesight by enlarging objects so that they can be seen with parts of the eye other than the macula.

Figure 8
Low Vision Aids

For certain patients, telescopic devices might improve distance vision. These aids are available through your own ophthalmologist or through Low Vision Service at Wills Eye.

**How can I prevent further vision loss from retinopathy?**
There is no evidence that limiting the use of your eyes, avoiding television or bright light, taking vitamins, or using sunglasses or any other devices can prevent the disease or its progression.

I've heard that there is less risk of a heart attack if you take one aspirin daily. But I’m afraid to take aspirin for fear of causing hemorrhages in my eye. What should I do?
As of now, there is no evidence that diabetics who take aspirin are at greater risk of frequent hemorrhages of the eye. The decision to take, or not to take, aspirin should be made with your family practitioner or internist.

I have recently been diagnosed with retinopathy, and my blood sugar level usually measures around 300 to 350. Should I use the insulin pump or use multiple injections of insulin to rapidly bring my blood sugar under control?
You should try to bring your blood sugar level down, but there is some evidence that rapidly bringing it under control might actually accelerate the progression of retinopathy. It is preferable to bring the level down gradually.

Is there any financial assistance available for people who have lost vision?
There may be financial aid for people whose best-corrected vision with glasses is 20/200 or worse, or whose visual field is restricted to 10 degrees or less. They also might be eligible for an additional income tax deduction as well as other financial and rehabilitative benefits to help them cope with vision loss. *(continued on next page)*
Diabetic Retinopathy

People with vision slightly better than 20/200 might be eligible for rehabilitative service. For more information on financial, social and rehabilitative assistance, contact the Pennsylvania Office of Vocational Rehabilitation at 215-557-7112 (toll free 1-888-745-2357) or the Stat of New Jersey Commission for the Blind at 973-648-3333 (toll free 1-877-685-8878).

Notes

About Us

Since our founding in 1832 as the nation’s first hospital specializing exclusively in eye care, Wills Eye Institute has become a world-class leader in ophthalmology. Our motto – Skill with Compassion – is central to every aspect of patient care. Today, we continue to shape the field, thanks to our talented, skilled physicians and staff who are dedicated to improving and preserving sight.

One of our core strengths is the close connection between innovative research and advanced care. Wills physicians pursue research that can be quickly translated into clinical care. Our tradition of excellence has also made Wills a premier training site for all levels of ophthalmic medical education, and a leader in innovative, high tech community outreach efforts.

Wills Eye remains steadfast in our commitment to improving quality of life for our patients and their loved ones.

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