

Diabetic Retinopathy

1. Definition

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 properly. 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.

2. 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. Patients should discuss the appropriate target A1C with doctor that helps them manage their diabetes. Maintaining blood pressure and blood lipid (cholesterol) levels in normal ranges can also have a favorable impact on the course of diabetic retinopathy.

3. 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.

4. Examination

A complete ophthalmic examination is important in the assessment of diabetic retinopathy and this 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 and proliferative retinopathy. **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 cause 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 oxygenation to 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. Symptoms of 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.

Testing

People with diabetic retinopathy may have several types of tests in evaluating their condition.

Fundus Photography:

People may have 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 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 (usually in the arm) 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. Fluorescein is not a radiologic contrast dye and does not affect the kidneys.

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 seen 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. Certain types of retinal detachment may need relatively urgent surgery.

5. Prognosis

People who maintain healthy, active lifestyles and who optimize their blood sugar and blood pressure 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 near 7 or less.

6. Treatment

Injections:

Medicines injected into the eye such as anti-VEGF drugs (eg. Lucentis, Eylea, and Avastin) and steroids (Triamcinolone or Triescence, Ozurdex and Iluvien) are commonly used to treat diabetic macular edema and sometimes also the proliferative manifestations of the condition such as when there is vitreous hemorrhaging. Both anti-VEGF and steroid medications have been proven in large-scale studies to be highly effective in reducing macular edema and improving vision. Repeat injections may be necessary for long-term control of the problems.

The injections are performed in the office using topical anesthetic drops. They are very well tolerated and complications are rare. There is a very small risk of infection with any eye injection. 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 retinal specialist.

Laser:

Laser photocoagulation is a 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) that can cause bleeding. Laser photocoagulation has been proven in large clinical trials to reduce the risk of 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 for some of the laser procedures. People will experience brief, bright flashes of lights. Some people may experience discomfort during or after the laser, especially with the longer (panretinal) treatments, 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 to occur. 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 detected early. Lastly, laser treatments may not work in everyone and other treatments may be needed.

Vitrectomy:

People with diabetic retinopathy may require vitrectomy surgery in an operating room setting. A vitrectomy is performed when there is bleeding or pulling on the retina (traction) that causes loss of vision in people with advanced diabetic retinopathy. In this surgery, small instruments are inserted into the eye under microscopic visualization, and both the vitreous hemorrhage and any scar tissue are removed. 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 place if there are retinal holes or detachment. The visual prognosis for people who require vitrectomy surgery depends upon the underlying health of the retina.