

What You Should Know About Diabetic Retinopathy Before You Show Any Signs of It

By David J. Browning, MD, PhD

Most patients with diabetes mellitus know that over time, the disease can cause damage to the eyes, kidneys, and nerves and vessels of the feet and legs. They have been repeatedly educated that certain factors make these complications develop earlier in the course of diabetes. In this brochure, we will review these facts for the eye complications. It helps to have an idea of the normal eye in order to understand how things go wrong in diabetes. Figure 1 shows the inside of the normal eye. The retina is the thin neural lining of the back of the eye. Light is turned into nerve signals in the retina, and the signals travel to the brain via the optic nerve. The retina has a rich network of nourishing blood vessels, which are the primary targets of disease in diabetes.

Figure 1. Normal Retina



Diabetic Retinopathy

When blood sugar is elevated over a long enough period of time, changes occur in the retina, the neural lining of the back of the eye. The capillaries can become dilated, develop outpouchings called microaneurysms, and begin to leak fluids into the surrounding tissue. This swelling of the retina, called macular

edema, causes blurred vision.

Later, abnormal sprouts of new vessels grow from the normal blood vessels of the retina and optic nerve, the nerve that connects the retina to the brain. These abnormal blood vessels are fragile and easily break, causing blood to pool in the vitreous gel that fills the eye. Vitreous hemorrhage causes floaters if it is mild and blocks vision if it is severe.

Eventually, the normal small vessels of the eye can be occluded such that circulation to the retina is impaired. Called capillary nonperfusion, this can cause poor vision just as macular edema and hemorrhaging can. Thus, diabetes can impair vision at least three ways:

by edema, bleeding, and decreased circulation to tissue. Figures 2, 3, and 4 show examples of these problems.

Figure 2. Macular Edema



Figure 3. Vitreous Hemorrhage

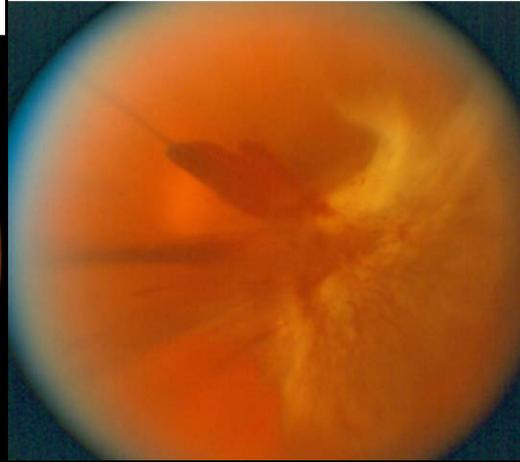
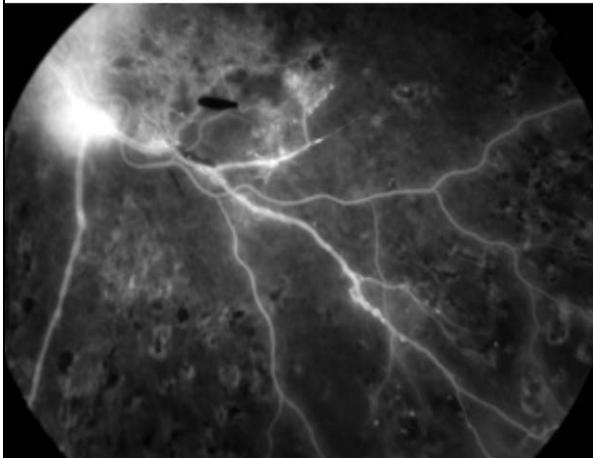


Figure 4. Capillary Nonperfusion



What Factors Govern Development of Retinopathy?

The most important factor is the level of blood sugar over time. The higher the blood sugar and the longer it is elevated, the more damage that occurs in the retina. The best way for a patient to monitor this factor is to learn about a blood test called the hemoglobin A1c done by the doctor who supervises the patient's diabetic care. This test gives an average value over a 3-month period unlike the spot blood glucose test done by patients at home. The advantage of the A1c is that it gives an idea of overall control, including those times such as at night, when blood sugar is not often tested. Generally an A1c less than 7.0 means that a patient is

under good control. Higher A1c's raise concern that retinopathy will progress faster.

Next in importance is blood pressure. The desirable range of blood pressures seem to be getting lower as we learn more, but certainly a systolic (top number) blood pressure less than 140 is desirable. For the diastolic (lower number) blood pressure, less than 90 is desirable. Your doctor may recommend even stricter targets. Higher blood pressures over a period of years can make diabetic retinopathy progress faster.

Lastly, serum cholesterol has an influence on diabetic retinopathy. Higher cholesterol values are associated with more fatty deposits in the retina. Your primary care doctor will advise you how best to improve your levels, but in general diet and medications are used to manage serum cholesterol.

Final Comments

Patients with diabetes need yearly dilated eye examinations to detect developing or advancing retinopathy, which may be asymptomatic during long periods of time before they finally impair sight. Treatments such as laser photocoagulation, injections of drugs into the vitreous, and surgery are available for patients who develop retinopathy, but our goal is to prevent retinopathy in the first place. With disciplined efforts to monitor blood sugar, blood pressure, and serum cholesterol as close to normal as possible, the risk of retinopathy and its progression can be reduced.

After reading this brochure, if you have any questions, please contact If you are interested in pursuing more information on your own, we have developed a website dedicated to educating people using the Contact button on the left side of the home page of this website (www.retinareference.com). An additional resource we recommend is Pubmed at www.pubmed.com.