Diabetic Retinopathy

Diabetes mellitus is a growing public health problem worldwide. The rapid increase in diabetes mellitus strongly parallels the increase in obesity around the world. The costs to society from complications of diabetes mellitus are enormous and growing.

Diabetic retinopathy is the leading cause of new cases of legal blindness among working–age Americans. It is caused by cumulative damage to the small blood vessels in the retina (the light sensing tissue in the back of the eye). Although the precise cause of this damage is unknown, it is believed that poorly controlled blood sugar levels are related to its progression.

It is estimated that over eighteen million people in the United States have diabetes mellitus. Worldwide there are approximately 120 million people with diabetes mellitus. Approximately half of these individuals have not yet been diagnosed and are unaware that they have the condition.

Most patients with diabetes have non-insulin-dependent diabetes mellitus (NIDDM) and control their blood sugar with oral medications or diet alone. This form of the disease is sometimes called “adult–onset” or Type II diabetes. The rest have insulin–dependent diabetes mellitus (IDDM), also called “younger or juvenile–onset” or Type I diabetes, and must use insulin injections daily to regulate their blood sugar levels.

Although diabetic retinopathy is frequently seen in both types of diabetes, patients with IDDM are at greater risk for this complication. The risk of diabetic retinopathy increases with time for patients with diabetes. After 5 years, approximately one–quarter of patients with IDDM have retinopathy (damage to blood vessels in the retina). By 15 years, nearly everyone with IDDM has some retinal damage.

Diabetics as a group have 25 times the usual risk of blindness. High blood pressure or pregnancy can significantly accelerate the progression of diabetic retinopathy. These statistics underscore the importance of regular eye examinations for diabetic patients.

If a diabetic patient has regular eye check–ups and is treated when necessary the risk of blindness can be significantly decreased. Additionally, good blood sugar, blood pressure, lipid control and regular exercise significantly decrease the progression of retinopathy and are an important part of diabetic retinopathy management.

Types of Diabetic Retinopathy

Diabetic retinopathy is divided into two main categories:

- Nonproliferative (background) diabetic retinopathy (includes diabetic macular edema)
- Proliferative diabetic retinopathy

Treatment of Diabetic Retinopathy

Systemic Control

The most important tool for treating diabetes and its complications, including diabetic retinopathy, is medical management of the underlying diabetes. Tight control of blood sugar and strict blood pressure control have been clearly proven as critically important in helping to slow the development and progression of diabetic retinopathy. It is important to note that although systemic control is very important, diabetic retinopathy can still progress in some patients.

Laser Treatment Overview

Once certain levels of retinopathy have developed, laser surgery is currently the mainstay of treatment. Lasers have been used in the treatment of diabetic retinopathy for more than 20 years and their benefit has been clearly established by numerous well–designed studies.

Laser surgery is an office–based outpatient procedure in which highly focused green, yellow, red or infrared laser light is aimed through a dilated pupil at the retina. Usually, the laser light is focused by treating through a contact lens placed on the patient's eye. While topical anaesthetic drops are usually all that is required to keep the patient comfortable, occasionally the doctor may wish to give a local anaesthetic with an injection through the eyelids. This type of anesthesia may be used when an extensive amount of laser is required, the patient has difficulty keeping the eye still, or the patient is very sensitive. Most patients tolerate the procedure extremely well with little discomfort afterwards. If there is some postoperative pain, a non-prescription pain medication like acetaminophen (Tylenol) is usually sufficient. Laser surgery is used to treat both diabetic macular edema and proliferative diabetic retinopathy

Laser Treatment for Diabetic Macular Edema

In treating diabetic macular edema, the goal is to help stabilize vision by attempting to stop the damaged blood vessels from leaking fluid into the retina causing it to swell. Usually this form of laser surgery helps stabilize vision rather than improving it (although sometimes it can).

When indicated, laser surgery has been demonstrated to allow patients to maintain their vision longer than those left untreated. Both focal and grid laser surgery are used in the treatment of diabetic macular edema. Focal treatment is possible when there are a small number of discreet areas of leakage which can be targeted directly for treatment. The fluorescein angiogram is often used as a guide for this procedure. When the leakage is diffuse in nature, a grid pattern of laser may be used instead. Laser spots are applied in a grid pattern over the swollen areas of retina.

After laser treatment, the patient may notice small spots in visual field caused by the laser energy. Over time, these spots will often become less noticeable to the patient. It is important to recognize that the effects of laser are not immediate. It is possible that the vision may get a little worse shortly following laser but, in the long run, most of the patients who receive laser for macular edema will have better vision than if they hadn’t received the treatment.

Injection of Intraocular Steroids and Other Medications

Intraocular Steroids

Although injections of intraocular steroids is not a treatment that has been proven in large–scale clinical trials, it has become a standard treatment option for many diabetic patients with macular edema who have not responded to laser treatment. In some patients who have diffuse macular edema, a steroid injection may be the first–choice of treatment rather than focal laser photocoagulation. In this procedure, a small amount of steroid is injected directly into the eye with a tiny needle. The procedure takes about one minute to do, is done in the office, and is essentially painless.

Injections of steroids into the eye have been found to result in very rapid resolution of the macular edema in most patients. Depending on how long the macular edema has been present, steroid injections may result in some improvement in vision in some patients. Once the steroid medication wears off (approximately 2 months) the macular edema may return requiring a repeat injection or some other therapy.

Side–effects of injecting steroids into the eye include cataract formation and elevation of eye pressure. These side effects can usually be managed with relatively simple treatments but more aggressive therapy may be necessary.

Other Off–label Medications

Recently, the intraocular injection of anti–vasogenic drugs, that tell blood vessels to stop growing and leaking, has shown promising results in the control of retinal neovascularization and retinal edema. These treatments have not yet been assessed in prospective clinical trials for diabetic retinopathy but may be used on an off–label, non–approved basis.

One particular medication that has been increasingly utilized for this purpose is Avastin (bevacizumab), a drug that is approved for the intravenous treatment of colon cancer. Intraocular injections of Avastin have shown promising early results, and an excellent safety profile, in the control of retinal swelling and neovascularization due to a variety of retinal conditions including diabetes. Avastin lasts about 6 weeks in the eye after a single injection and the injection may need to be repeated if the disease reactivates.

Laser Treatment for Proliferative Diabetic Retinopathy

The abnormal neovascular vessels (new blood vessels) of proliferative diabetic retinopathy are treated with panretinal (scatter) laser photocoagulation or PRP. This type of laser involves treatment to the peripheral retina which is not receiving adequate blood flow. It is believed that by treating these sick areas of retina the stimulus that drives the neovascular process may be halted. Since this treatment often involves many laser applications (often over 1,000) it may be divided into two or more separate sessions. This type of laser treatment is frequently successful in stopping the growth of the abnormal vessels and in some cases they may shrink. It is important to recognize that panretinal photocoagulation does not improve vision. It is intended to help prevent blinding complications of diabetic retinopathy. It is not without side effects. Some loss of side (peripheral) and color vision is normal following this type of treatment as is a decrease in night vision. Some patients will experience some generalized blurring of vision which is usually transient but may persist indefinitely. Since there are these side effects, panretinal photocoagulation should be performed only for specific indications which have been well established through clinical trials. Despite these side effects, when indicated, panretinal photocoagulation has been clearly shown to reduce the risk of severe visual loss in proliferative diabetic retinopathy.

Vitrectomy Surgery for Proliferative Diabetic Retinopathy

While panretinal photocoagulation is frequently successful in halting the proliferative process, some patients progress despite laser treatment. Other patients may have bleeding (vitreous hemorrhage) occur before laser can be applied which may prevent laser from being delivered to the back of the eye. The vast majority of vitreous hemorrhages that are due to diabetic retinopathy will be absorbed by the body and clear on their own. If a vitreous hemorrhage does not clear on its own after about six weeks, then vitrectomy surgery to remove that blood may be indicated. Vitrectomy surgery is also indicated if the abnormal blood vessels and scar tissue contract and pull enough to cause a tractional retinal detachment.

A vitrectomy is a common retinal surgery in which the vitreous gel is removed with the aid of tiny surgical instruments in the operating room. If scar tissue has accumulated on the retina small instruments are used to peel the scar tissue off of the surface of the retina to relieve the traction. Once the blood is removed, laser is usually added to the side part of the retina during the surgery. The goal of surgery for a traction retinal detachment is to try to stabilize the vision and decrease the chance of the vision worsening.

A vitrectomy is performed in the operating room while you are in a semi–sleep state and your eye is numb. The surgery takes about one to two hours and patients go home that night. The surgeon may place a gas bubble in the eye at the end of surgery to act as a splint to keep things in place as they heal. The gas bubble will be slowly absorbed by your body over several weeks. It is important to note that if a gas bubble is left in the eye patients cannot fly and must stay at sea level until the gas disappears.