

Diabetic Retinopathy: Prevalence and Prevention

Either nonproliferative or proliferative, diabetic retinopathy can be caused by a variety of dysfunctions.

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Diabetic retinopathy (DR) is caused by changes in the retinal vasculature induced by frequent or prolonged episodes of hyperglycemia. In its early phases, there is thickening of retinal capillary endothelial cell basement membranes and the loss of pericytes that support the retinal capillaries.¹ These changes ultimately lead to focal areas of weakness in the vessel walls through which red blood cells, lipids and proteins can leak. These changes can cause the appearance of retinal hemorrhages and exudation.

DR can be classified as either nonproliferative or proliferative. The presence of nonproliferative retinopathy is characterized by retinal hemorrhages, exudates and microaneurysms. With worsening disease, focal ischemia of the retina may occur and cause the formation of cotton-wool spots. These lesions are typically whitish in nature and represent focal damming of axoplasmic flow of intracellular organelles.² Common causes of visual loss in patients with nonproliferative retinopathy are macular edema and macular ischemia.

CIRCULATION IN THE RETINA

In the proliferative stage of DR, circulatory problems can cause areas of the retina to become oxygen deprived or ischemic. As the circulatory system attempts to maintain adequate oxygen levels within the retina, angiogenic factors are released that predispose to the formation of retinal neovascularization.³ Clinically, this stage of retinopathy is characterized by the presence of new blood vessels on the surface of the optic nerve head (neovascularization of the disc [NVD]) or retina itself (neovascularization elsewhere [NVE]). New retinal blood vessels are fragile and may bleed into the retina or the vitreous, the jelly portion of the eye. Patients with this stage of

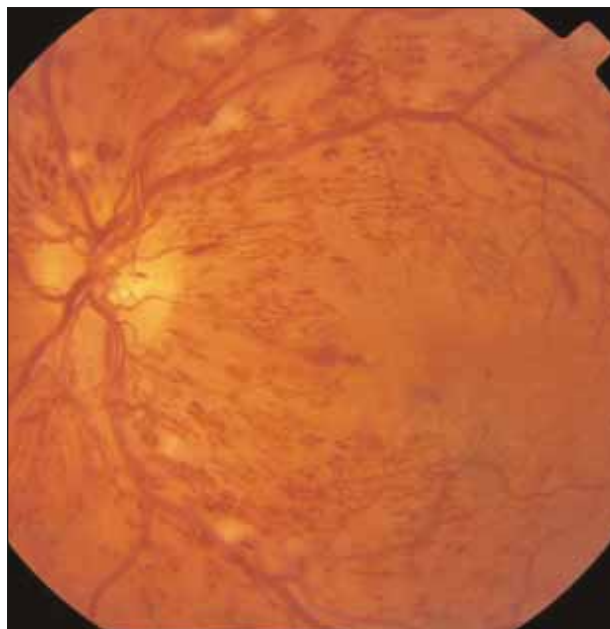


Figure 1. This left eye has numerous cotton-wool spots and intraretinal hemorrhages. In addition to the spots and hemorrhages, extensive neovascularization is noted both in the retina and on the optic disc.

retinopathy may complain of decreased vision or the presence of floaters.

In addition to developing active neovascularization, significant fibrosis can occur with either NVD or NVE. This component of neovascularization can cause retinal traction to the point of retinal tear or detachment. The angiogenic factors that are released in response to retinal ischemia can also migrate anteriorly towards the front of the eye and stimulate the creation of anterior segment

neovascularization. This condition may be present with visible vessels growing on the surface of the iris or with high intraocular pressures, if the vessels grow into trabecular meshwork.

DR is known to have a significant effect on overall health-related quality of life (HRQoL) and vision-specific function. Focus group patients with significant fibrosis reported that loss of independence, mobility, leisure and self-care activities were major concerns to them.⁴ The mean scores of 6 SF-20 dimensions were 11% to 27% lower in the noninsulin dependent diabetic patients than in the control patients ($P<.01$).⁵ Research employing the time tradeoff technique to quantify utilities – a global measure of HRQoL – demonstrated that patients with DR were willing to trade off over 20% of their remaining lifespan in order to eliminate their ocular disease.⁶

PREVALENCE

DR is a leading cause of blindness in the United States, often affecting working-aged adults.⁷ While it is unusual for patients with type 1 diabetes to have signs of DR at the time of diagnosis, the vast majority will develop signs within 20 years.⁸ It is not uncommon, however, for newly diagnosed type 2 diabetics, to have retinopathy at initial diagnosis.⁹ In general, the longer a patient has diabetes, the more likely the evidence of DR.

Among an estimated 10.2 million adults in the United States aged 40 years and older known to have diabetes,



Figure 2. Note the presence of blot type intraretinal hemorrhage and exudation.

the estimated crude prevalence rates for retinopathy and vision-threatening retinopathy were 40.3% and 8.2%, respectively.¹⁰ The prevalence of DR among

If proliferative DR goes untreated,
there is a significant risk of developing
severe visual loss secondary to vitreous
hemorrhage.

patients with diabetes varies modestly among racial groups. For instance, Hispanic subjects have a higher prevalence of DR than African-Americans. The prevalence of DR in the United States is high; an estimated 4.1 million people aged 40 years and older in the US general population have DR.¹⁰

PREVENTION AND TREATMENT

Control of various systemic factors, such as blood pressure, lipid levels, blood sugar levels and renal function, is recommended for managing patients with DR. The following research studies support these recommendations:

- The Wisconsin Epidemiologic Study of Diabetic Retinopathy¹¹ and the UK Prospective Diabetes Study¹² both showed that tight control of blood pressure slowed progression of DR.
 - In the Early Treatment Diabetic Retinopathy Study,¹³ patients who had elevated total cholesterol levels were significantly more likely than those with normal levels to have retinal hard exudates. Hyperlipidemia can contribute to the progression of DR as accumulation of retinal exudates can lead to vision loss from a foveal lipid plaque.
 - The Diabetes Control and Complications Trial¹⁴ demonstrated that intensive insulin therapy effectively delayed the onset and slowed the progression of DR.
- Nonproliferative DR, in itself, requires no ocular treatment. When accompanied by clinically significant macular edema, however, grid or focal laser photocoagulation is warranted, as this treatment has been proven to prevent further visual loss in a large randomized clinical trial.¹⁵ Other treatments that have been used for recalcitrant macular edema include intravitreal injection of corticosteroids¹⁶ and pars plana vitrectomy.¹⁷

Patients with untreated proliferative DR are at a significant risk for the development of severe visual loss secondary to vitreous hemorrhage or tractional retinal detachment. Panretinal laser photocoagulation has been

demonstrated to be efficacious for the treatment of proliferative disease, when associated with vitreous hemorrhage.¹⁸ For cases of prolonged nonclearing vitreous hemorrhage, vitrectomy – surgical removal of the vitreous that contains blood – is recommended, as this treatment significantly reduces chances of severe visual loss.¹⁹

EMERGING TREATMENTS

While retinal laser and vitreous surgery have been the mainstay of treatment for DR for the past 20 years, other treatments for this condition are emerging. One treatment, acting through protein kinase inhibition, is being evaluated in two phase III randomized controlled

clinical trials attempting to evaluate the efficacy of vitrectomy in preventing the progression or inducing regression of “nonclinically significant” DME and of severe non-proliferative DR. ■

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DIABETIC RETINOPATHY FACTS

- **Nearly all patients who have type 1 diabetes** for about 20 years will have evidence of DR.
- **Up to 21% of people with type 2 diabetes** have retinopathy when they are first diagnosed with diabetes, and most will eventually develop some degree of DR.
- **Diabetes is responsible for 8% of legal blindness in the United States**, making it the leading cause of new cases of blindness in adults aged 20 to 74 years. Between 12,000 to 24,000 people each year lose their sight due to diabetic microvascular complications.
- **People with type 1 diabetes should see their eye care professional annually** for a dilated eye examination beginning 5 years after the onset of diabetes.
- **Women with type 1 diabetes who are pregnant should have a comprehensive eye examination** in the first trimester and close follow-up throughout pregnancy.
- **People with type 2 diabetes should see their eye care professional for a dilated eye examination** shortly after diagnosis of diabetes and annually thereafter.
- **Reimbursement for eye examinations and diabetes education is essential.** To reduce the cases of blindness due to diabetes, early detection is important. Patient education, health care team education, and affordable eye care can make this possible.

Source: American Diabetes Association

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