Patients with either type 1 or type 2 diabetes are at risk of developing neurovascular complications that can lead to diabetic retinopathy and/or diabetic macular edema (DME). Researchers have found that nonproliferative diabetic retinopathy (NPDR) was present in 25% of patients 5 years after they were diagnosed with diabetes, 60% at 10 years, and 80% at 15 years.\(^1,2\) These studies also found that the incidence of proliferative diabetic retinopathy (PDR) varied from 2% in those who had diabetes for less than 5 years to 15.5% in those who had diabetes for 15 or more years.\(^3\)

As an optometrist, you treat and observe the only place in the human body where physical damage to blood vessels caused by systemic diseases can be viewed noninvasively. This explains the importance of monitoring all patients with diabetes and working with primary care physicians (PCPs) or endocrinologists to help manage these patients.

The American Optometric Association’s Practice Guidelines and the American Diabetes Association both state that patients with type 1 diabetes should have a comprehensive dilated eye examination within 5 years of disease onset.\(^2,4\) Patients with type 2 diabetes should receive a comprehensive dilated eye examination at the time of diagnosis and yearly thereafter.\(^2,4\)

- Patients with mild NPDR do not need to be referred to a retina specialist unless you are concerned about or have confirmed a diagnosis of DME.
- Patients with moderate NPDR have a 12% to 27% risk of developing PDR within 1 year and should be seen every 6 to 8 months.
- Patients with severe NPDR have a 52% risk of developing PDR within 1 year, are at a high risk of disease progression and permanent vision loss, and are most likely experiencing neuropathy elsewhere.
Women who were previously diagnosed with type 1 or 2 diabetes should have a comprehensive dilated eye examination before becoming pregnant or within the first trimester.2,4

This article provides tips on caring for patients with diabetes, including advice calibrated to the specific stages of diabetic retinopathy (Table).

**WHAT TO LOOK FOR**

Patients with NPDR generally present with hemorrhages of varying sizes, microaneurysms (MAs), hard exudates, soft exudates (cotton wool spots) intraretinal microvascular abnormalities (IRMAs), and venous looping or beading.2,5,6 MAs are saccular outpouchings of retinal capillaries that have been weakened by a loss of intramural pericytes.3 The weakened capillary walls can leak or rupture, causing hemorrhages.2 IRMAs are either new vessel growth within the retina or pre-existing vessels with proliferative endothelial cells that are moving through areas of nonperfusion. Presence of IRMA indicates ischemia and is a precursor to neovascularization.2 Venous looping and beading are caused by severe retinal hypoxia and indicate an increased risk for progression to neovascularization.2 When patients with diabetes are in your chair, it’s important to gather as much information about their condition as possible (see Questions to Ask Your Patients).

**STAGE 1: MILD NPDR**

These patients have at least one MA but no other findings (Figure 1).2,5,6 Findings are often subtle, so close inspection and monitoring are essential. These patients should have a dilated eye examination every 12 months.2 There is a 5% risk that mild NPDR will progress to PDR within 1 year.2 If one or more MAs are present in the eye of a patient not yet diagnosed with diabetes, he or she should be considered a diabetes suspect and should see his or her PCP for further testing. Documenting subtle findings and noting their exact locations will help you to monitor patients for disease progression. Use fundus photography, if available, for easier future comparison.

Patients with mild NPDR do not need to be referred to a retina specialist. However, patients with diabetes should have a comprehensive dilated eye examination before becoming pregnant or within the first trimester.2,4

**TABLE.** Diagnosing Diabetic Retinopathy

<table>
<thead>
<tr>
<th>DIABETIC RETINOPATHY LEVEL</th>
<th>RETINAL FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild NPDR</td>
<td>MAs only</td>
</tr>
<tr>
<td>Moderate NPDR</td>
<td>At least one hemorrhage or MA and/or at least one of the following: Retinal hemorrhages, Hard exudates, Cotton wool spots, Venous beading</td>
</tr>
<tr>
<td>Severe NPDR</td>
<td>Any of the following but no signs of PDR (4-2-1 rule): &gt; 20 intraretinal hemorrhages in each of four quadrants, Definite venous beading in two or more quadrants, Prominent IRMA in one or more quadrants</td>
</tr>
<tr>
<td>PDR</td>
<td>One of either: Neovascularization, Vitreous/preretinal hemorrhage</td>
</tr>
</tbody>
</table>

Abbreviations: IRMA, intraretinal microvascular abnormality; MA, microaneurysm; NPDR, nonproliferative diabetic retinopathy; PDR, proliferative diabetic retinopathy

Women who were previously diagnosed with type 1 or 2 diabetes should have a comprehensive dilated eye examination before becoming pregnant or within the first trimester.2,4

This article provides tips on caring for patients with diabetes, including advice calibrated to the specific stages of diabetic retinopathy (Table).
unless you are concerned about or have confirmed a diagnosis of DME (see The 411 on DME). It is important to discuss findings with patients, especially those who were recently diagnosed with diabetes, to ensure that they understand that MAs indicate early end organ damage from their disease and that they are educated on its possible ramifications. Encourage them to monitor their blood sugar and diet. Send a detailed report to the patient’s PCP and/or endocrinologist so that they are aware of the findings, which will aid their decision making on treatment.

**STAGE 2: MODERATE NPDR**

These patients have hemorrhages or MAs in one to three retinal quadrants and/or cotton wool spots, hard exudates, or venous beading (Figure 2).2,5-7 Patients with moderate NPDR should be seen every 6 to 8 months.2,7 There is a 12% to 27% risk that they will develop proliferative diabetic retinopathy (PDR) within 1 year.2 The use of fundus photography is suggested for these patients, and you may obtain macular OCT images at your discretion if you suspect DME. These patients do not need to be referred to a retina specialist unless you have confirmed DME or you believe OCT imaging is warranted but do not have access to this technology.

Again, it is important to educate these patients on the findings and what they suggest about the disease process. Depending on their recent blood sugar control and last diabetes examination with their PCP or endocrinologist, it may be necessary to refer patients back to those providers sooner than scheduled so that they can consider changes in treatment.

**STAGE 3: SEVERE NPDR**

These patients have intraretinal hemorrhages (> 20 in each quadrant), venous beading in two or more quadrants, or an IRMA in one or more quadrants (Figure 3).2,5-7 This is known as the 4:2:1 rule. These findings must be in the absence of neovascularization, which would indicate PDR.

Patients with severe NPDR should be monitored using both macular OCT and fluorescein angiography to detect any DME or early neovascularization.2,7 Referral to a retina specialist is recommended, and patients should be monitored every 3 to 4 months with dilated fundus examination.2,7 You may be able to work with a retina specialist by alternating appointments to monitor these patients.

Patients with severe NPDR have a 52% risk of developing PDR within 1 year, so it is important to discuss with them the importance of blood sugar control and close observation.2,5 A call to the patient’s PCP or endocrinologist to discuss retinal findings is also warranted. These patients are at a high risk of disease progression and permanent vision loss, and they are most likely experiencing neuropathy elsewhere at this point.

**STAGE 4: PROLIFERATIVE DIABETIC RETINOPATHY**

These patients had NPDR that has progressed to PDR, and they exhibit either neovascularization of the disc/elsewhere or vitreous/preretinal hemorrhage.2,5-7 These patients require immediate referral to a retina specialist for further testing and treatment. Peripheral neovascularization is usually treated with laser panretinal photocoagulation (PRP, Figure 4).7 They also often receive anti-VEGF intravitreal injections that may be performed in conjunction with PRP.7

Until their disease stabilizes, these patients need to be monitored monthly by a retina specialist.7 Thereafter, they may be seen every 6 to 12 months.7 Communicate all findings to the patient’s PCP and/or endocrinologist. A phone call is warranted if the patient has new-onset PDR.

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**QUESTIONS TO ASK YOUR PATIENTS**

My staff and I ask every patient with diabetes or borderline diabetes the following questions.

- When were you diagnosed with diabetes?
- How often do you check your blood sugar?
- What was your last blood sugar level?
- What were your highest and lowest blood sugar levels during the past month?
- What was your last A1C test result, and when did you have that test?
- Were any changes made to your medical regimen at that time?

The answers to these questions provide valuable information about a patient’s disease and how well controlled it is. This discussion also provides an opportunity to emphasize to patients the importance of a diabetic eye examination and of monitoring their disease.
Patients with diabetic macular edema (DME) exhibit retinal thickening within 2 disc diameters (DDs) of the center of the macula.\(^1\)\(^-\)\(^4\) It is considered clinically significant macular edema (CSME) if one of the conditions below is met.

- Thickening of the retina is 500 µm or less (1/3 DD) from the center of the macula.
- Hard exudates are 500 µm or less (1/3 DD) from the center of the macula with thickening of adjacent retinal tissue.
- Zone or zones of retinal thickening are 1 or more DDs in size, any portion of which is 1 or less DD from the center of the macula.\(^1\)\(^-\)\(^4\)

Regardless of the level of their diabetic retinopathy, these patients should be observed for a decrease in vision and monitored with macular OCT and fluorescein angiography, especially if they have CSME. If you suspect but are unable to confirm the presence of DME or CSME with these tests, refer the patient to a retina specialist. Patients with confirmed or suspected CSME also require an immediate referral to a retina specialist for possible treatment and monthly monitoring.\(^1\)\(^-\)\(^4\) Those with mild or moderate NPDR and DME should be seen every 4 to 6 months.

Historically, patients with DME and CSME were treated with either focal laser photocoagulation of the macula or intravitreal injections of anti-VEGF agents.\(^3\) Most retina specialists no longer perform laser treatment in these patients because it causes more scarring and overall permanent loss of vision compared with anti-VEGF treatment (Figure 1). Intravitreal injections of anti-VEGF agents have become the first line of treatment for these patients and generally resolves the CSME (Figure 2).\(^6\)


**THE 411 ON DME**

![Figure 1. This patient was treated with focal laser photocoagulation in the macula for CSME. Note the faint circular scarring in a grid pattern.](image)

For a dilated fundus examination and macular OCT scan.\(^1\) Those who have severe NPDR or PDR with DME should be seen every 2 to 3 months.\(^1\)

Figure 1. This patient was treated with focal laser photocoagulation in the macula for CSME. Note the faint circular scarring in a grid pattern.

![Figure 2. Macular OCT scan of a patient with CSME prior to treatment (A). The same patient shown 1 month after receiving the first anti-VEGF intravitreal injection (B). Note the decrease in macular edema and macular thickening.](image)

Figure 2. Macular OCT scan of a patient with CSME prior to treatment (A). The same patient shown 1 month after receiving the first anti-VEGF intravitreal injection (B). Note the decrease in macular edema and macular thickening.

JOIN FORCES TO DELIVER PROPER CARE

As the number of US patients with diabetes grows, it is important for optometrists to collaborate with PCPs, endocrinologists, and retina specialists on managing these patients’ disease. This teamwork, combined with effective communication among caregivers and with patients, will enhance the care that they receive.


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