Ocular Effects of Diabetes

By: Linda Ward

Being a paraoptometric in a busy practice may be both fun and challenging. There are many different types of patients seen on a daily basis. A small percentage of these patients have diabetes. It is important for the paraoptometric to understand what diabetes is, and the effects it may have on the eyes. In this article, we will discuss diabetes, including related symptoms, along with the ocular effects of diabetes. There are three main types of diabetes. They are Type I, Type 2, and Gestational diabetes.

**Type I Diabetes**

Type I diabetes, which accounts for five to 10 percent of individuals diagnosed in the United States, is a condition in which the immune system attacks and destroys the insulin-producing beta cells in the pancreas. The pancreas reacts by lowering the production of insulin, which makes the individual dependent on insulin injections. They may inject the insulin by shots or wear an insulin-regulating pump. A person with undiagnosed Type I diabetes may lapse into a life-threatening coma, known as diabetic ketoacidosis. Symptoms of diabetes may include: thirst and frequent urination, weight loss, constant hunger, extreme fatigue and blurred vision. Type I diabetes is most commonly found in children and young adults; however, it may occur at any age.

**Type 2 Diabetes**

Type 2 diabetes is the most common form of diabetes. This type of diabetes is often associated with older adults, family history of diabetes, obesity, history of gestational diabetes, certain ethnicities and physical inactivity. About 80 percent of people with Type 2 diabetes are overweight. As obesity has increased in the United States, there has been an increase in children and adolescents being diagnosed with Type 2
diabetes. Unlike Type I diabetes, the pancreas is usually producing enough insulin, but for some unknown reason the body is not able to use the insulin effectively. This is a condition known as insulin resistance. The glucose builds up in the blood and the body is not able to make efficient use of its main source of fuel. The symptoms of Type 2 diabetes are usually gradual. They may include frequent urination, fatigue, increased hunger and thirst, slow healing of sores or wounds, weight loss and blurred vision. Type 2 diabetes is usually controlled by a pill that will help regulate the insulin or by diet control; however, insulin injections may be required.¹

**Gestational Diabetes**

Diabetes that occurs late in pregnancy is known as gestational diabetes. This type of diabetes usually disappears after the birth of the baby. Women who have had gestational diabetes have a 20 to 50 percent chance of getting Type 2 diabetes within five to ten years after the birth of the child.¹ A well balanced physical activity program and maintaining a reasonable body weight may help prevent the onset of Type 2 diabetes. Gestational diabetes is caused by shortage of insulin or hormones of pregnancy. Many times there are no symptoms present.

Self monitoring is an important factor in controlling blood glucose. This is accomplished by pricking the skin to form a drop of blood, which is placed in a meter to measure the level of glucose in the blood at the time of the test. One of the ways to test the blood glucose is by measuring the fasting blood sugar after having not eaten for at least eight hours. Normal range should be 90-130 mg/dl. Non-fasting blood sugar is another measurement used. This occurs two hours after a meal. The levels should be less than 180 mg/dl. If a blood sugar reading is taken at random, the numbers should be 70-145 mg/dl. The numbers should never be above 200 mg/dl.¹

In addition to self-monitoring, lab testing is required at specific intervals. A common lab test performed for monitoring diabetes is A1C testing. The A1C is the mean blood glucose or the average glucose concentration that is in the body over the life span of the red blood cells. Red blood cells live around 90-120 days, therefore, A1C testing is generally performed every three months. The A1C number should be below 7.0 to prevent complications associated with diabetes.¹
Ocular Complications of Diabetes

There are many ocular complications of diabetes such as: increased risk of developing glaucoma and cataracts (Fig.1), unstable visual acuities, neovascularization of the iris, loss of corneal sensitivity, sluggish papillary reflexes and dry eye syndrome. The most serious ocular complication of diabetes is diabetic retinopathy.

Fig. 1 Cataract
(Courtesy of Eyemaginations)

Diabetic Retinopathy

There are two types of diabetic retinopathy (Fig. 2). Non-proliferative and Proliferative. Non-proliferative diabetic retinopathy is the early stage. Small retinal blood vessels break and leak causing micro aneurysms. Micro aneurysms are small areas that cause balloon type swelling in the tiny blood vessels of the retina.

Proliferative retinopathy is the advanced stage. New blood vessels in the retina grow abnormally. This new growth may cause scarring or a retinal detachment. A retinal detachment occurs when the retina peels away from the underlying layer of support tissue. This may lead to vision loss. New blood vessels may also grow or bleed into the vitreous humor, the gel that fills the eyeball in front of the retina. Proliferative retinopathy is much more serious than non-proliferative retinopathy and may lead to total blindness. At this time there is no cure for diabetic retinopathy. Early treatment may slow progression; however, it is not likely to reverse vision loss

When a patient comes to an optometrist for a diabetic exam there are many tests used to assess the patient. Eye drops will likely be used to dilate the eyes. This allows for a close up look at the retina and optic nerve.
Other Considerations

Refractive changes that are transient in diabetes are well recognized by eye doctors. They seem especially noticeable with young Diabetes I patients but are also seen with Diabetes II patients. A dramatic refractive change over a short period of time warrants a more thorough check of a patient’s history including the questions: “Lately, are you drinking a lot of water? Are you urinating often? Are you seemingly very hungry?” All the questions relate that in a person with hyperglycemia there is a need to drink more fluids, urinate more frequently and have some drain in their energy levels. Blood sugar tests with their internist would be warranted.

Myopia is more often associated with hyperglycemia and hyperopia with hypoglycemia. So, the rapid change in blood sugar swells and contracts the lens of the eye causing refractive changes. The blood sugar should be stabilized for a few weeks before a reliable refraction is noted. Most eye doctors may tell stories of patients with frustrating refractive changes over a short period of time that was noted to be those from the physiological changes to their blood sugar.

Patient History Information

As blurred vision is a common symptom of diabetes, many patients are first diagnosed at an optometrist’s office. For this reason, it is important that both the patient’s medical and family history to be discussed during the history portion of the patient exam. If the paraoptometric completes the history portion of the exam he or she should provide the doctor with as much patient history as possible for the best assessment of the patient’s current condition.

If the patient is a known diabetic, the date, time and results of the last blood sugar test, along with the last A1C test result should be documented. It is also important to find out how many years the patient has been diagnosed with diabetes along with a family history of the disease. If the patient has recently been diagnosed as diabetic, it may be helpful to explain the importance of keeping a record of blood sugars as well as the significance of the A1C and what it measures. It is important to ask about the over-all health and any vision episodes the patient recently experienced. It is also imperative to send an eye health report to the patients general practice doctor and diabetes doctor. Some patients may also want a personal copy of their eye health exam for their records.
Diabetic Emergencies

The doctor should be made immediately aware of any patient who is having signs or symptoms of distress, such as heavy sweating, shortness of breath, dizziness, weakness or faintness, or confusion. The office should keep orange juice or some type of fast-acting sugar product handy to assist in low-sugar emergencies. The office staff should also be aware of any staff members that have diabetes. When all staff are aware of their role should a medical problem arise, they are able to act promptly and effectively to address it.

As a paraoptometric it is important to keep up-to-date on new information about diabetes. This will help with the not only eye care of a diabetic patient, but could also improve their overall health. Working with diabetic patients can be very challenging but also rewarding.

Resources

There are many resources available to both the office staff and the patient. It is important to keep diabetes pamphlets, resource numbers, and websites available to the patient in the office at all times. The American Diabetes Association is a very good source of information, with both a help line and a Web site. (www.diabetes.org) Another Web site that is helpful is the National Diabetes Information Clearinghouse. (ndic@info.niddk.nih.gov).

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Sources for article

1 Lawrence, L. What Every Ophthalmic Tech Should Know about Diabetic Patients presented at SECO; February 2008; Atlanta GA
“Ocular Effects of Diabetes”

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Select the option that best answers the question.

1. How many main types of diabetes are there?
   a. two
   b. three
   c. four
   d. five

2. What is the most common type of diabetes?
   a. Type 2
   b. Type A
   c. Type B
   d. Type 1

3. What is the most serious ocular complication of diabetes?
   a. glaucoma
   b. diabetic retinopathy
   c. dry eye
   d. cataract
4. Non-proliferative diabetic retinopathy is found in what stage of diabetes?
   a. intermediate
   b. early
   c. late
   d. stage 4

5. In what demographic group is Type 1 diabetes most commonly found?
   a. the elderly
   b. certain ethnicities
   c. children and young adults
   d. none of the above

6. With what demographic group is Type 2 associated?
   a. older adults
   b. obesity
   c. neither a or b
   d. both a and b

7. Which of the following is not an ocular complication of diabetes?
   a. unstable acuities
   b. macular degeneration
   c. neovascularization of the iris
   d. dry eye syndrome

8. Which of the following is a symptom of distress?
   a. severe sweating
   b. dizziness
   c. confusion
   d. all of the above

9. What may cause diabetic refractive changes?
   a. diabetic retinopathy
   b. rapid changes in blood sugar
   c. new blood vessels in the retina growing abnormally
   d. infection in the eye

10. Which of the following are true of proliferative diabetic retinopathy?
    a. new growth of blood vessels may cause retinal detachments
    b. may lead to total blindness
    c. new blood vessels grow abnormally
    d. all of the above

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