

# Ludwig Ophthalmology Centre



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## Ophthalmic issues for the primary health care provider Diabetic retinopathy • Amblyopia • Pregnancy • Aspartame

### Diabetic Retinopathy: Guidelines for the health care provider

Numerous organizations have different recommendations with regard to diabetic retinopathy screening. It is the goal of this clinical update to bring awareness to the various guidelines that are available. The reader can decide which to follow.

**What is diabetic retinopathy?** Diabetic retinopathy is the leading cause of blindness in the United States between the ages of 20-65. Prevalence of diabetic retinopathy increases along with the duration of disease and patient's age.

**Classification:** Diabetic retinopathy is divided into either 1) Non-proliferative diabetic retinopathy (NPDR) which is further subdivided into mild, moderate, severe or very severe; or 2) Proliferative diabetic retinopathy (PDR) which is further subdivided into early, high-risk or advanced.

**Pathogenesis:** Although the cause of microvascular insult from diabetes is not known, it is commonly believed that hyperglycemic exposure over extended periods of time lead to vascular endothelial damage. Within the eye, the first changes noted are loss of pericytes and basement membrane thickening of retinal vasculature which compromise capillary lumen size which lead to eventual decompensation of endothelial barrier function. A number of other abnormalities may also play a role in the pathogenesis of disease such as up-regulation of vascular endothelial growth factor (VEGF), increased platelet adhesiveness and defective fibrinolysis. These changes within the retinal vasculature will cause loss of vision via three general mechanisms; 1) sequelae from ischemia-induced neovascularization, 2) diabetic macular edema, and 3) ischemic macular changes. NPDR will cause macular ischemia via intraretinal capillary closure or macular edema via increased vasculature permeability. PDR, as its name suggests, causes extraretinal fibrovascular proliferation and neovascularization (new vessels) which result in severe vision loss via tractional retinal detachment along with the aforementioned mechanisms of NPDR.

**Treatment: Medical:** Maintenance of glycemic control is essential (i.e., Hemoglobin A1C less than 7%). The Diabetes Control and Complications Trial (DCCT) showed intensive control reduced risk of developing retinopathy by 76% and slowed progression of retinopathy by 54%. The United Kingdom Prospective Diabetes Study (UKPDS) also supports intensive blood glucose along with blood pressure control to slow progression of diabetic retinopathy. Other medical management of diabetic retinopathy may include management of severe carotid artery occlusive disease which can cause ocular ischemia and frequent evaluation of pregnant women with diabetic retinopathy which often worsens during gestation.

**Laser treatment:** Based on findings from the Diabetic Retinopathy Study (DRS), Early Treatment Diabetic Retinopathy Study (ETDRS) and other clinical studies, laser photocoagulation in general, is offered to patients with high risk PDR and clinically significant macular edema (CSME). Laser treatment for diabetic retinopathy is offered to patients as suggested by the DRS which showed pan-retinal (scatter) laser photocoagulation (PRP) reduces risk of severe vision loss compared to no treatment. Treatment should be offered to patients with advanced NPDR and high-risk PDR. PRP is also offered to patients with neovascularization of the iris or anterior chamber angle regardless of retinopathy staging. Another type of laser treatment that is offered to diabetic retinopathy patients is focal laser treatment. Most treatments are offered following the recommendations following the ETDRS which is for CSME which benefits from focal (localized) laser treatment.

**Surgical management of PDR:** Surgical management of PDR should only be performed by a board certified ophthalmologist with vitreo-retinal fellowship training. The two main reasons for surgical intervention include vitreous hemorrhage and tractional retinal detachment. The Diabetic Retinopathy Vitrectomy Study (DRVS) showed that early vitrectomy benefits eyes with severe proliferative diabetic retinopathy.

American Academy of Ophthalmology, BCSC section 12, 2006-2007.

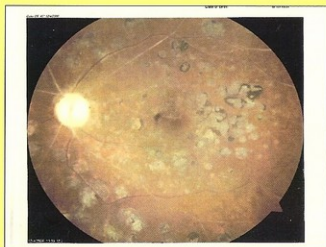
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Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. United Kingdom Prospective Diabetes Study Group. *Br Med J*. 1998; 317:703-713.

Photocoagulation treatment of proliferative diabetic retinopathy: clinical application of Diabetic Retinopathy Study (DRS) findings. DRS report 8. Diabetic Retinopathy Study Research Group. *Ophthalmology*. 1981;88:583-600

Early photocoagulation for diabetic retinopathy. ETDRS report 9. Early Treatment Diabetic Retinopathy Study Research Group. *Ophthalmology*. 1991; 98 (5 suppl):766-785.

Early vitrectomy for severe vitreous hemorrhage in diabetic retinopathy: two-year results of a randomized trial. DRVS report 2. Diabetic Retinopathy Vitrectomy Study Research Group. *Arch Ophthalmol*. 1985; 103: 1644-1652.



Left eye, pale optic nerve head, severe ischemia (attenuated & ghost vessels) along with focal and peripheral laser treatment for previous CSME and PDR

**Diabetic Screening Guidelines:** The American Academy of Ophthalmology (AAO) suggests patients with Type 1 diabetes be screened during the first 5 years after diagnosis. Patients with Type 2 diabetes should be screened at the initial diagnosis. Female patients are at particular risk for progression of retinopathy during pregnancy. It is recommended that these patients be screened during the first trimester and thereafter at the ophthalmologist's discretion. Routine follow up examinations are timed at the ophthalmologist's anticipation of need for treatment. There are modified practice patterns from the AAO for suggested follow-up exams (not shown).

## Diabetic Retinopathy Screening Guidelines (Type 1 Diabetes)

Organization	Initial Exam	Follow up	Examiner/Method
AAO	5 year after diagnosis	Annual	Ophthalmologist/Slit lamp & funduscopy
AAP	3-5 year after diagnosis if > 9 yoa, if <9 yoa no screen needed	Annual	Not specified
ADA	3-5 year after diagnosis pediatrics unspecified	Annual	Ophthalmologist or Optometrist for dilated eye exam

AAO= American Academy of Ophthalmology; AAP= American Academy of Pediatrics; ADA= American Diabetes Association

\*Table partially adapted from Retinopathy Reporter, Fall 2006, page 4.

### Amblyopia: When is it too late to treat?

Amblyopia or "lazy eye" is a decrease in visual function in one eye in comparison to the fellow eye. There are different types of amblyopia (organic, anisometric, deprivation, strabismic). It is commonly thought that the older a child is at diagnosis the decreased chance for recovery of vision. The response to therapy is related to many variables which include, 1) type of amblyopia, 2) depth of amblyopia, 3) age at initiation of therapy, 4) duration of amblyopia therapy, 5) method of treatment, and 6) compliance. Most eye care providers would agree the typical "cut-off" age for subjecting a child to penalization therapy for amblyopia would be somewhere near 7 years of age. It is thought that the plasticity of the visual center is lost after this age and that penalization to increase vision in the amblyopic eye is pointless.

In 2000, my mentor and fellowship director, Helen A. Mintz-Hittner, MD and Kristina M. Fernandez, MA reported successful amblyopia therapy initiated after age 7 years. The authors reported a consecutive series of 36 compliant children older than 7 years of age (ranging from age 7 to 10.3) attaining final best visual acuities between 20/20 and 20/30 for all 36 patients. Final best binocularity was reportedly maintained or improved for 61% of the group which was made up of anisometric, strabismic and a combination of both strabismus and anisometropia. They concluded that given compliance, therapy for anisometric and strabismic amblyopia could be successful after age 7 years!

The Atropine Treatment Study 3 (ATS3) also supports treatment of amblyopia in older children ages seven to twelve years of age and consideration of treatment up to seventeen years of age if not previously treated. Treatment for amblyopia would include traditional forms such as optical correction augmented with patching, increased near vision activity and atropine therapy. Overall benefits of amblyopia treatment appear to outweigh the low chances of complication.

Mintz-Hittner, HA, Fernandez KM, Successful amblyopia therapy initiated after age 7 years. *Arch Ophthalmol.* 2000;118:1535-1541.

Ophthalmology Times, Vol 32, No 5, March 1, 2007; Amblyopia Study Provides New Insight for Older Children, Cheryl Guttman.

## Ophthalmologic concerns during pregnancy

During pregnancy, changes occur in the woman's physiology which may affect their eyes. Eye care providers are certainly aware of these potential changes which could include some of the following; 1) ocular surface changes in tear film may cause dry eye symptoms or contact lens intolerance, 2) changes in refraction are common as the pregnant woman's corneal curvature may change along with her generalized edematous state, 3) hypercoagulability associated with pregnancy increases the chances of branch and central retinal artery occlusions and rarely retinal vein occlusions. Ultimately, an extremely rare complication would include vascular occlusion as a result of amniotic fluid causing anaphylaxis and a disseminated intravascular coagulopathy, 4) central serous retinopathy, which presents with blurry vision and metamorphopsia is not uncommonly seen during pregnancy. The etiology is not known but fortunately, the condition typically resolves on its own after pregnancy and treatment is usually not indicated, 5) hypertension associated with preeclampsia and eclampsia can cause visual problems with hypertensive retinopathy as a result of retinal edema, serous retinal detachments, vascular occlusions or even cortical blindness.

Some pre-existing disease entities are affected by pregnancy and are occasionally associated with eye conditions and may warrant monitoring. For example, autoimmune diseases such as sarcoidosis and juvenile rheumatoid arthritis patients often improve systemically during pregnancy but may relapse. Eye findings may be uveitis. Interestingly, multiple sclerosis may also stabilize during pregnancy but the risk of relapse increases after delivery. This is important to the eye care provider as multiple

sclerosis is known to be associated with optic neuritis. Lastly, as mentioned in the aforementioned note, pre-existing diabetics may need closer follow-up during pregnancy.

One last concern for obstetricians and ophthalmologists are the potential teratogenicity of ocular medications. In general, little is known about risk of ocular medications during pregnancy and nursing women. In general, it would be best to avoid beta blockers, carbonic anhydrase inhibitors and mydriatics during pregnancy and breast-feeding. Some other commonly used medications such as topical corticosteroids or antibiotics such as erythromycin and polymyxin B are considered Category B but should be used sparingly. If it is absolutely necessary to dilate a pregnant patient's eyes as in the case of diabetic retinopathy, then using the minimum amount of mydriatics is advised along with punctal occlusion to minimize systemic absorption.

OSN, December 15, 2006. Pregnant women require observation for new, existing ocular conditions by Katrina Alterstiz, interview with Elizabeth A. Davis, MD, FACS and Bhavna P. Sheth, MD

## Just for Fun: Can diet soda decrease cataract formation?

In an article written by Cheryl Guttman interviewing Ralph J. Falkenstein, MD in *Ophthalmology Times*, November 15, 2006. Dr. Falkenstein noted that a study investigating the hypothesis of ingesting diet soda containing aspartame may delay the onset of cataract formation. The results showed that a greater number of younger soda drinkers consume diet soda and that older patients consume more non-diet soda. As expected the older subset (regular soda drinkers) had an increased incidence of cataracts. However, interestingly, in a subset of patients whom had cataracts, the mean age was significantly older in the diet soda drinking group.

Laboratory findings of aspartic acid and aspartame reduce lens protein glycolation, which is a major contributor in cataract formation, which may support the findings.