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Diabetes and Obesity – A Challenge for Every Ophthalmologist

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The United States has fought many battles, from the Revolution to recent wars on poverty, drugs and terror. Medicine and ophthalmology now face a widening battlefield on diabetes-induced vision loss. Globally, more than 1 billion adults are overweight and least 300 million are obese including 34% of American Adults age over age 20. The rise in obesity has led to a doubling of the prevalence of diabetes in the last decade and up to one third of children born in 2000 will develop diabetes during their lifetime³. Twenty-four million (8%) of Americans have known diabetes, and 57 million have pre-diabetes⁴. By 2050 the number of Americans with diabetic retinopathy is projected to triple from 5.5 to 16 million, and those with vision threatening retinopathy from 1.2 to 3.4 million. The number of cataracts will increase by 235% and glaucoma among elderly Hispanics with diabetes will increase 12 fold⁵!

The economic impact of diabetes-induced ocular disease is profound. Medicare expenditures for persons with nonproliferative diabetic retinopathy are 63% greater than those without retinopathy, and 400% greater for those with proliferative retinopathy than those without retinopathy⁶. Persons with diabetes also have an increased risk of retinal vascular occlusions, neurotrophic keratitis, and cranial nerve palsies. Therefore, the obesity induced diabetes epidemic will create a financially unsustainable burden of diabetic ocular disease.

Current means to screen populations at risk for diabetic retinopathy have succeeded in Europe, but have had minimal impact on the US where persons are more independent, health care delivery is more fractionated and population-based incentives for prevention are less. Hence, many patients still present to eye care providers with advanced eye disease. Scatter photocoagulation and vitrectomy are palliative and do not restore normal visual function. To date no Food and Drug Administration-approved therapy exists for diabetic retinopathy, and the only proven medical treatments are intensive diabetes therapy and control of hypertension⁷. Hence, we still lack proven adjunctive therapies to slow the rate of progression of nonproliferative retinopathy beyond control of diabetes and hypertension, and photocoagulation is only effective when patients develop macular edema or proliferative retinopathy. Medical therapies such as intravitreal steroids or vascular endothelial cell growth inhibitors show modest transient benefits that are no more effective than laser photocoagulation^{8, 9}.

Diabetic retinopathy has been understood as a “microvascular disease” of the eye, but recent studies have established that diabetes impacts the entire neurosensory retina, including ganglion cells, Müller cells, astrocytes, microglial cells, endothelial cells and pericytes¹⁰. Contrast sensitivity, dark adaptation, visual fields, and electroretinographic tests reveal that

visual function is impaired at or before the onset of microaneurysms in many patients with diabetes¹¹. Thus, diabetic retinopathy is a sensory neuropathy involving the retinal parenchyma similar to peripheral neuropathy. Understanding how diabetes impacts the neural retina may improve means to diagnose diabetic retinopathy before symptomatic vision loss and may reduce the personal and economic costs.

The common diseases managed by ophthalmologists, cataracts, glaucoma, macular degeneration, retinal detachment, and strabismus are primarily ocular disorders, and we treat diabetic ocular complications surgically with cataract extraction, photocoagulation, and vitrectomy. By contrast, the primary means to modify the course of diabetic eye diseases lie in the hands of non-ophthalmic physicians. Surgically oriented approaches to late stage eye disease fail to adequately address the current public health problem, so future efforts must focus on prevention and early intervention, and the role of ophthalmologists must evolve.

First, we must emphasize the systemic factors that affect the development and progression of diabetic eye disease, notably poor metabolic and blood pressure control, and understand the medical treatment strategies. Second, ophthalmologists and other physicians must improve two-way communications. For example, ophthalmic evaluation of diabetic retinopathy currently involves primarily features such as the severity of retinopathy and presence of macular edema or proliferative retinopathy. However, patients with any degree of retinopathy and higher HbA_{1c} and blood pressure are more likely to lose vision than those with better control, so ophthalmologists should know the data on the systemic health of their patients to counsel and treat them more effectively. Likewise, physicians should know the ophthalmic status of their patients so they can motivate them towards appropriate self-care measures. Ophthalmologists can also measure blood pressure, or observe ankle swelling from cardiac or renal failure and relay these findings to their patients' physicians.

Third, ophthalmologists should realize that seemingly small differences in systemic risk factors lead to large differences in ocular complications. Each 1% reduction in HbA_{1c} reduces the risk of retinopathy development or progression by 40%,¹² and the effects are long-lasting⁹. A 10 mm Hg reduction in systolic and diastolic blood pressures reduces the risk of developing retinopathy by 3–20%¹³ and the risk of proliferative retinopathy by 14%¹⁴. Encouragingly, nonproliferative retinopathy can improve in 18–36% of patients,^{13, 14} so diabetic retinopathy does not invariably progress to vision loss. These findings show clearly that diabetic retinopathy can be positively influenced by appropriate medical care. In addition, treatment of associated comorbidities such as congestive heart failure, renal failure, anemia, and hyperlipidemia may also improve visual outcome¹⁵.

Recent work has demonstrated the benefits of the Chronic Care Model in which patient-centered care of chronic diseases such as diabetes is enhanced by teams of physicians, nurses, and allied health personnel¹⁶. Diabetes educators can assist overtaxed physicians by monitoring the implementation of screening and care guidelines, and enhance long-term management¹⁷. Patient care visits continue to shorten and the list of guidelines that must be implemented continues to expand, so the only tenable solution involves expanding the definition of the health care team in a more coordinated fashion. For example, ophthalmologic practices might consider an approach to distribute a “know your numbers” brochure; *i.e.* know your HbA_{1c}, LDL cholesterol and blood pressure, so the ophthalmologist can reinforce the importance of risk factors with their patients. Better coordination of care between specialists and primary care teams will enable goals to be reinforced for patients with diabetes. Ophthalmologists have a unique opportunity to influence patient behavior since vision loss is one of the most feared complications of diabetes. Helping patients make the connection between their eye disease and the ABCs of diabetes (A_{1c}, Blood pressure, and Cholesterol) can motivate them to improve their health.

Data sharing by all team members and patients through a web-based registry can facilitate this process for all team members, including ophthalmologists¹⁸.

The importance of this paradigm shifting approach is emphasized by the fact that only 7.3% of diabetic patients meet therapeutic goals for the three most important categories, HbA1c, blood pressure, and LDL cholesterol,¹⁹ but nurse case managers and coordinated teams increase this rate significantly²⁰. We suggest how ophthalmologists and medical teams can help patients with their diabetes and obesity. However, personal responsibility and education about appropriate food intake, weight loss and exercise are also essential, and third-party payers must reward preventive efforts. Now is the time for new strategies to address diabetes related eye disease, and for ophthalmologists to actively participate in these efforts. This shift will require modifications to medical student and ophthalmology resident training and organization of practices with greater emphasis on medical and public health strategies, rather than new lasers or vitrectomy techniques.

Complications begin at the time of diabetes diagnosis, and most patients with diabetes do not have retinopathy, so the greatest therapeutic opportunity is to prevent retinopathy (Dr. Lloyd M. Aiello, personal communication). Diabetic retinopathy is preventable and there is greater opportunity to prevent diabetes-related vision loss than glaucoma or age-related macular degeneration. Ophthalmologists are front line warriors in the fight against diabetes and obesity related vision loss and can win the war using new tactics and weapons for the 21st century.

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