Understanding the Relationship Between Diabetes and Dry Eye

BY PAUL M. KARPECKI, OD

Ocular surface diseases such as dry eye are commonplace in daily ophthalmic practice. Most patients respond well to typical treatments like anti-inflammatory medications, punctal plugs, nutritional supplementation, and artificial tears. Some of the most unresponsive cases occur, however, because the patient’s ocular surface disease is associated with a systemic condition like diabetes. Until the systemic disease is controlled, the ocular surface will not fully respond to treatment. More than 50% of patients with diabetes also have dry eyes.1

DIABETES AND OTHER SYSTEMIC CONDITIONS

The rate of diabetes is rising to epidemic proportions in the United States; it affects more than 11% of the US population, and the cost of treatment exceeds $200 billion per year. The prevalence of diabetes is expected to grow at 6% per year for the foreseeable future.2

Dry eye disease is one of the most common manifestations in this population. One study showed that 55% of patients with diabetes had dry eye signs and symptoms at least some of the time.3 Other systemic diseases, including thyroid eye disease/Graves ophthalmopathy, arthritis, lupus, and dermatological conditions such as psoriasis, are associated with onchodercal skin disease manifestations.4,8

Because of diabetes’ growing prevalence, eye care specialists must recognize it as a potential precursor to ocular surface problems. Although diabetic retinopathy (DR) is often thought of as the main ocular condition associated with diabetes, early studies have shown that the most common manifestations are related to ocular surface issues and dry eye in particular.9 The Beaver Dam Eye Study showed that almost 20% of individuals with type 2 diabetes aged between 43 and 86 years had dry eyes.10

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Hom and De Land showed that 52.9% of patients with either diabetes or borderline diabetes had self-reported clinically relevant dry eyes.11

MANAGEMENT CAN HALT VISION LOSS

The potential for diabetes-associated comorbidities makes it crucial that clinicians manage treatable ocular symptoms. Tumosa showed that between 12,000 and 24,000 diabetic patients become legally blind in the United Stated from DR; however, more than three times this number of patients have comorbidities that result in significant vision loss because of dry eye and ocular surface problems that are compounded by DR.12

As DR advances, so does tear dysfunction as measured by topographical analysis. According to Yu et al, patients with proliferative DR had a significantly lower tear film function than those with nonproliferative DR.13 An extensive study of 199 patients with type 2 diabetes revealed a prevalence of dry eye syndrome in 54.3% of the population, and Yu et al concluded that the assessment of dry eye should be an integral part of the diabetic eye examination.

CAUSES

Theories as to why dry eye is prevalent in diabetic patients include the development of autonomic dysfunction and the involvement of the enzyme aldose reductase in the sorbitol pathway.14,15 A more recent mouse study
showed diabetes-induced histological alterations in the lacrimal gland, suggesting that hyperglycemia-related oxidative stress may play a role in diabetic dry eye syndrome.\textsuperscript{16}

**TREATMENT**

When treating ocular conditions that stem from systemic diseases, the systemic disease must also be well managed. Because diseases such as diabetes mellitus suggest that metabolic, neuropathic, and vascular tissue damage lead to an inflammatory process and functional degeneration of the lacrimal gland and ocular surface,\textsuperscript{17} potential treatments include antioxidants (ie, nutrition), anti-inflammator\textsuperscript{y agents (ie, topical corticosteroids, such as loteprednol, and immunomodulatory agents, such as topical cyclosporine), and anabolic agents that mimic insulin's effects such as autologous serum.\textsuperscript{18}

The combination of topical ocular medications and systemic diabetes management is key to achieving successful results. Autologous serum has been shown to significantly improve the ocular surface of patients with diabetes who have corneal epithelial abrasions.\textsuperscript{19} In diabetic patients, autologous serum eye drops induced earlier closure of the corneal epithelium after intraoperative abrasions compared with artificial tears (even those containing hyaluronic acid).\textsuperscript{20}

These data, however, do not negate the use of artificial tears containing hyaluronic acid, such as Blink Tears (Abbott Medical Optics Inc., Santa Ana, CA) or Oasis Tears (Oasis Medical, Glendora, CA). A study involving cases of advanced dry eye in patients with Sjögren syndrome suggested that artificial tears with hyaluronic acid were promising ocular lubricants.\textsuperscript{21} Although caution should be taken when extrapolating these data to patients with diabetes, studies have shown that medications treating diabetic hyperglycemia can significantly improve the ocular surface of patients with diabetes.\textsuperscript{22,23} Abbuzzese et al investigated the use of these gel dressings with hyaluronic acid and found a statistical improvement in the healing rates of neuropathic leg ulcers in diabetic individuals.\textsuperscript{24}

Diabetic patients with poor wound healing have been shown to have deficiencies in hyaluronan concentration and collagen density.\textsuperscript{15} Although it is unclear how this may or may not apply to artificial tears that contain hyaluronic acid and their effects on the ocular surface, numerous studies illustrate the agent's benefits in systemic diabetes management and wound healing.\textsuperscript{25,26} Baudouin et al\textsuperscript{21} showed that therapy with topical cyclosporine and other immunomodulating agents produced relevant progress in the treatment of dry eye associated with systemic diseases and should be included in the management of dry eye associated with diabetes.

**CONCLUSION**

The prevalence of diabetes in the United States continues to increase at a staggering rate. Understanding the association between dry eye and systemic diseases like diabetes will help eye care specialists better diagnose and manage these patients.\textsuperscript{27}

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