Detection of the abnormality in light scattering at the basement membrane of the cornea in diabetic patients with a new device

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The classification and diagnosis of diabetes mellitus by the expert committee of the World Health Organization, American Diabetes Association, and Japan Diabetes Society are based on blood glucose concentration. Monitoring of blood sugar is also the basis for management of diabetic patients. A common pathology in various types of diabetic complications, including nephropathy, neuropathy, and retinopathy, is an abnormality of basement membranes. This abnormality is evident even in diabetic individuals who maintain their blood sugar concentration within the normal range and likely arises early in the course of diabetes mellitus. Detection of the basement membrane abnormality may thus prove informative for monitoring the development of diabetic complications. Diabetic keratopathy is an ocular complication of diabetes mellitus characterized by an abnormality of the epithelial basement membrane of the cornea. The cornea is a transparent tissue and does not contain vascular elements, properties that allow optical examination of light scattering at the epithelial basement membrane. We have developed a new light-scattering detection system (LSDS) that was designed specifically to measure light scattering at the corneal epithelial basement membrane. In the present study, we examined the reliability, reproducibility, and significance of the LSDS as well as the relation between the extent of light scattering at the corneal epithelial basement membrane and the stage of diabetic retinopathy. A total of 40 diabetic subjects and 30 nondiabetic subjects were enrolled in the study, and the former individuals were evaluated by opthalmoscopic examination and assigned on the basis of the extent of diabetic retinopathy to either a vascular hyperpermeability group or a vascular occlusion group. The intensity of light scattering at the corneal epithelial basement membrane zone of each eye was measured with the LSDS. The average coefficient of variation for five consecutive measurements with the LSDS was 9.3% (range, 6.4 to 13.6%) and the day-to-day variation of three measurements was 7.9% (range, 2.3 to 19.3%) in 10 nondiabetic subjects. The light-scattering intensity (mean ± SD) was 28.1 ± 4.8 in nondiabetic subjects, 35.7 ± 6.3 in diabetic subjects with vascular hyperpermeability, and 42.7 ± 8.6 in diabetic subjects with vascular occlusion. These data suggest that the reproducibility of the LSDS is sufficient for its use in the clinical setting. Furthermore, light scattering increased in a manner dependent on the stage of diabetic retinopathy. We conclude that the LSDS is a useful device for early detection of the abnormality of the corneal epithelial basement membrane in diabetic patients.

Eosinophils promote the proliferation of and extracellular matrix synthesis by conjunctival fibroblasts

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Vernal keratoconjunctivitis is a severe and chronic ocular allergic disease that threatens vision as a result of associated corneal disorders such as corneal epithelial erosion and shield ulcer. A specific clinical characteristic of vernal keratoconjunctivitis is the formation of fibroproliferative lesions of the conjunctiva, known as giant papillae, at the upper tarsus. These giant papillae develop as the result of excessive deposition of extracellular matrix proteins such as fibronectin and collagen, overgrowth of resident conjunctival fibroblasts, and infiltration of inflammatory cells such as eosinophils. The infiltrated eosinophils are thought to be activated by interleukin (IL)-5, but their role is unclear. We now investigated the possible role of eosinophil-fibroblast interaction in the development of giant papillae by examining the effects of eosinophil conditioned medium (CM) on cultured human conjunctival fibroblasts. CM was collected after culture of human eosinophils for 48 h in the absence or presence of IL-5. Culture of conjunctival fibroblasts with the cell-free CM induced cell proliferation in a manner dependent on the number of eosinophils from which the CM was derived. The mitogenic effect of CM from IL-5-stimulated eosinophils was greater than that of CM obtained from unstimulated eosinophils. Enzyme immunoassays revealed that the eosinophil CM also increased the amounts of both fibronectin and the C peptide derived from procollagen type I released by conjunctival fibroblasts. These effects were also dependent on the number of eosinophils from which the CM was derived. Our results suggest that a factor (or factors) secreted by eosinophils promotes both the proliferation of and the production of extracellular matrix proteins by conjunctival fibroblasts. These effects of eosinophil-fibroblast interaction might thus contribute to the formation of giant papillae in individuals with vernal keratoconjunctivitis.

新しい装置を用いた糖尿病患者における角膜の基底膜散乱光の異常の検出

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