Assessing Diabetic Neuropathy Using Corneal Confocal Microscopy

Nathan Efron
Institute of Health and Biomedical Innovation, and School of Optometry and Vision Science, Queensland University of Technology, Kelvin Grove, Queensland, Australia; n.efron@qut.edu.au.

Neuropathy is a frequent complication of diabetes and is a major cause of morbidity and mortality, potentially affecting distal sensory, motor, and autonomic nerves. Sequelae of diabetic neuropathy (DN) include foot ulceration, which can lead to the devastating consequence of lower limb amputation. Accurate and timely detection, characterization, and quantification of DN are critical in order to identify at-risk patients, anticipate deterioration, monitor progression, assess new therapies, and, ultimately, to reduce the incidence, cost, and social impact of these unwelcome consequences.

The eye accords a unique site for assessing DN because it is the only organ in the body in which nerves can be observed directly and noninvasively. Indeed, research conducted over the past decade has demonstrated that DN is associated with corneal subbasal nerve fiber loss (assessed using corneal confocal microscopy), reduced corneal sensitivity (noncontact corneal esthesiometry), retinal nerve fiber layer thinning (optical coherence tomography), and visual field loss (automated perimetry), and that these changes correlate with degenerative changes in peripheral nerves in patients with DN.

The animal model of corneal nerve fiber loss in DN of Davidson et al. extends our understanding of the potential application of corneal confocal microscopy for assessing DN. The finding of these workers that deficits in the morphology of corneal epithelial nerves precede deficits in subbasal nerves is plausible because epithelial nerves are more distal than subbasal nerves, and peripheral nerve degeneration in DN starts with the most distal nerves. The suggestion that imaging corneal epithelial nerves in vivo therefore may be an even more sensitive measure of DN has merit. The other important finding in this article is that treatment of diabetic rats with ilepatril prevents and/or improves many of the corneal and vascular changes associated with early diabetes. Translation of this finding to humans would represent a significant therapeutic advance.

References