

From the Bedside to the Bench and Back Again, With Corneal Confocal Microscopy

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In this issue of *IOVS*, Davidson and colleagues¹ apply a range of conventional techniques and the novel ophthalmic technique of corneal confocal microscopy (CCM) to phenotype nerve damage in an experimental model of prediabetes and type 2 diabetes. The key findings are that CCM allows a noninvasive demonstration of an early reduction in corneal innervation that correlates with a reduction in both corneal and intraepidermal nerve fiber density derived using invasive corneal and skin biopsy and conventional tissue histology. These abnormalities occur in parallel with a reduction in corneal sensitivity and conventionally accepted end points of thermal nociception latency and sensory nerve conduction velocity. These data build on the concept that CCM allows the rapid, noninvasive, and hence reiterative study of corneal nerves in a variety of animal species,² and in particular in the diagnosis and assessment of therapeutic efficacy in experimental diabetes^{3,4} and patients with diabetic neuropathy.^{5,6}

The current study exemplifies the bedside to bench, *reverse translational* approach, as CCM is predominantly used in clinical research and practice. In so doing it addresses why so many successful experimental therapies have failed to “cross the valley of death” and translate into therapies for our patients with diabetic neuropathy.⁷ A key roadblock appears to be the lack of an adequate surrogate marker in clinical trials of diabetic neuropathy. Hence, CCM may “bridge the gap” as it detects and tracks early nerve damage and the response to therapeutic intervention in experimental diabetes^{3,4} and in diabetic patients.^{5,6} Of traditional “translational” value, that is, bench to bedside, Davidson and colleagues¹ also identify that the earliest corneal nerve damage is at the inferior whorl, providing important insights into the application of CCM in the diagnosis and assessment of therapeutic efficacy in patients with diabetic neuropathy.

References

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