In Vivo Confocal Microscopy of Corneal Nerves in Health and Disease

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Abstract

In vivo confocal microscopy (IVCM) is becoming an indispensable tool for studying corneal physiology and disease. Enabling the dissection of corneal architecture at a cellular level, this technique offers fast and noninvasive in vivo imaging of the cornea with images comparable to those of ex vivo histochemical techniques. Corneal nerves bear substantial relevance to clinicians and scientists alike, given their pivotal roles in regulation of corneal sensation, maintenance of epithelial integrity, as well as proliferation and promotion of wound healing. Thus, IVCM offers a unique method to study corneal nerve alterations in a myriad of conditions, such as ocular and systemic diseases and following corneal surgery, without altering the tissue microenvironment. Of particular interest has been the correlation of corneal subbasal nerves to their function, which has been studied in normal eyes, contact lens wearers, and patients with keratoconus, infectious keratitis, corneal dystrophies, and neurotrophic keratopathy. Longitudinal studies have applied IVCM to investigate the effects of corneal surgery on nerves, demonstrating their regenerative capacity. IVCM is increasingly important in the diagnosis and management of systemic conditions such as peripheral diabetic neuropathy and, more recently, in ocular diseases. In this review, we outline the principles and applications of IVCM in the study of corneal nerves in various ocular and systemic diseases..

Keywords

Corneal dystrophies, Corneal nerves, Corneal sensitivity, Corneal surgery, Diabetes, In vivo confocal microscopy, Keratoconus, Pain, Peripheral neuropathy..