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Retinal Biomarkers and Precision Ophthalmology: Advancing Early Detection of Systemic and Ocular Diseases

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The retina provides a unique opportunity to visualize the body's microvascular system non-invasively, making it an invaluable source of biomarkers for both ocular and systemic diseases. This presentation explores recent advances in retinal imaging, vascular biomarkers, and artificial intelligence for the early detection of diabetic retinopathy, glaucoma, age-related macular degeneration, cardiovascular disease, and neurodegenerative disorders. High-resolution imaging modalities, including OCT, OCT angiography, and ultra-widefield retinal imaging, are enabling clinicians to detect microscopic retinal changes before visual impairment develops. Recent developments in deep learning algorithms and automated retinal image analysis have significantly improved large-scale screening programs while reducing diagnostic variability. The presentation also discusses the role of retinal biomarkers in personalized medicine, disease prognosis, and monitoring therapeutic responses. Future innovations in teleophthalmology, portable imaging devices, and AI-assisted diagnostics will further strengthen global eye care delivery and improve patient outcomes through earlier intervention.

Biography

Tien Yin Wong is Professor of Ophthalmology at Duke–NUS Medical School, Singapore, and an internationally recognized clinician-scientist specializing in retinal diseases, diabetic retinopathy, retinal imaging, and artificial intelligence. His research has significantly advanced precision ophthalmology and population-based eye disease screening worldwide.

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