Table of Contents

6. Widefield imaging
Introduction
Historical perspective and nomenclature
Historical widefield imaging systems
Modern widefield imaging systems
Overview of imaging capabilities and optical principles
Clinical utility of widefield imaging
Limitations
Future directions
Conclusions
References

7. Advanced imaging technologies
Introduction: Retinal imaging to date
Adaptive optics: Imaging of single cells in the retina
Measuring visual function with adaptive optics
Imaging retinal function (optophysiology)
Vascular imaging and retinal blood flow
Imaging retinal melanin
Conclusions and future directions
Disclosures
References

8. Artificial intelligence and advanced imaging analysis
History of AI
Machine learning
Computer vision and advanced image analysis
Recent advances in computer vision: Deep learning
Components of deep learning model architecture
Deep learning model architectures
Training deep learning models
Beyond traditional deep learning models
The evaluation of AI models
Deep learning using fundus photography
Deep learning using OCT imaging
Deep learning using other retinal imaging
Regulatory
Gaps in technology
Immediate challenges with deployment of AI systems into retina clinics
Ethical questions on the impact of AI
Conclusions
Acknowledgments
References

Part 2. Basic Science and Translation to Therapy

Section 1. Anatomy and Physiology

34. Epigenetic mechanisms of retinal disease
Introduction
Major factors of epigenetic regulation
Interplay between genetic and epigenetic factors
Epigenetic mechanisms in retinal development
Epigenetic mechanisms in retinal diseases
Perspectives and challenges of epigenetics
References

35. Microbiome and retinal disease
Introduction
Dietary patterns are related to the risk for and progression of age-related macular degeneration
Summary
References

Section 4. Translational Basic Science

36. Gene therapy for retinal disease
Background: Preclinical gene therapy studies
History of retinal gene therapy
Current status of retinal gene therapy trials: Retinal diseases evaluated in human clinical trials
Promises and challenges of bringing retinal gene transfer from bench to bedside
Conclusions
References

37. Stem cells and cellular therapy for retinal degenerative diseases
Stem cells as therapeutics to treat retinal degenerative diseases
Definitions
Müller glial cells
Stem cell–derived photoreceptors
Stem cell–derived RPE cells
Human clinical trials using stem cells for the treatment of retinal diseases
Discerning the legitimacy of a human stem cell treatment
Concluding remarks
Acknowledgments
References

38. Nanomedicine in ophthalmology
Introduction
General principles of nanotechnology and nanomedicine
Applications to ophthalmology
Obstacles to incorporation of nanotechnology into ophthalmology
Conclusions
References

50. Proliferative diabetic retinopathy
Pathogenesis of proliferative diabetic retinopathy
Natural course of proliferative diabetic retinopathy
Imaging of proliferative diabetic retinopathy
Origin and early recognition of preretinal new vessels
Relationship of proliferative diabetic retinopathy to type and duration of diabetes
Absence of proliferative diabetic retinopathy in individuals with diabetes of extreme duration
Proliferative diabetic retinopathy and blood glucose control
Early worsening of retinopathy with improved glycemic control
Systemic medications and proliferative diabetic retinopathy
Other risk factors for proliferative diabetic retinopathy
Management of proliferative diabetic retinopathy
Current techniques of panretinal photocoagulation
Regression of new vessels after initial photocoagulation and indications for retreatment
Complications of PRP
Antiangiogenic therapies for proliferative diabetic retinopathy
Indications for vitrectomy
Conclusions
References

51. Telescreening for diabetic retinopathy
Introduction
Guidelines for telescreening program
Steps of telescreening
Technical considerations
Operational considerations
Quality assurance
Evaluating telescreening programs
Advances in telescreening
Conclusions
References

52. Hypertension
Introduction
Hypertensive retinopathy
Hypertensive choroidopathy
Hypertensive optic neuropathy
Emerging imaging technology to evaluate hypertensive retinopathy
Future directions
Conclusions
References

61. Ocular ischemic syndrome
Demographics and incidence
Etiology
Symptoms
Ancillary studies
Systemic associations
Differential diagnosis
Treatment
References

62. Systemic coagulopathy syndromes
Introduction
General considerations
Ophthalmic involvement
Differential diagnosis of choroidal ischemia
Conclusions
References

63. Pediatric retinal vascular diseases
Retinopathy of prematurity
International classification
Current concepts in management of retinopathy of prematurity
Other pediatric retinal vascular diseases
References

Section 3. Choroidal Vascular/Bruch's Membrane Disease

64. Epidemiology and risk factors for age-related macular degeneration
Introduction
Classification
Prevalence and incidence
Quality of life
Sociodemographic factors
Ocular risk factors
Behavioral and lifestyle factors
Cardiovascular-related factors
Hormonal and reproductive factors
Inflammatory factors
Genetic factors
Summary and conclusions
References

65. Pathogenesis of age-related macular degeneration
Introduction: Age-related macular degeneration, a vascular-initiated, deposit-driven disease
Age-related macular degeneration by the layers
Classification of advanced age-related macular degeneration organized by extracellular deposits
Topography of photoreceptors, retinal pigment epithelium, and deposits
The drusen lifecycle: Clinical and lifespan aspects
Vision implicates soft drusen; choriocapillaris exonerates lipofuscin
Learning about subretinal drusenoid deposit using drusen as a model
Cell and molecular mechanisms of deposit formation; role of high-density lipoprotein genes
Role of the complement gene pathway
Conclusions
References

66. Age-related macular degeneration: Non-neovascular early AMD, intermediate AMD, and geographic atrophy
Introduction
Normal aging of the macula
Pathology of non-neovascular AMD
Prognosis and management of non-neovascular AMD
References

67. Neovascular age-related macular degeneration
Introduction
Histopathology
Etiology and classification
Diagnosis and characterization of macular neovascularization
Complications
Prevention and risk factors for development of neovascular exudative age-related macular degeneration
Treatment
Patient education and rehabilitation
References

68. Pharmacotherapy of age-related macular degeneration
Introduction
Neovascular age-related macular degeneration
Non-neovascular AMD
Summary
References

69. Pathologic myopia
Epidemiology
Pathogenesis
Histopathology
Animal models
Optical coherence tomograhy-based classification of myopic maculopathy
Conclusions
References

70. Angioid streaks
Introduction
Histopathology
Systemic associations
Ocular manifestations and clinical course
Ocular imaging and diagnosis
Optical coherence tomography angiography
Therapy
Conclusions
References

71. Ocular histoplasmosis
Historical perspective
Clinical features of ocular histoplasmosis
Relationship of ocular disease to systemic infection
Epidemiology of ocular histoplasmosis
Pathogenesis
Natural history of ocular histoplasmosis and public health implications
Treatment
References

72. Pachychoroid disease and its association with polypoidal choroidal vasculopathy
Introduction and definition
Evolving concept of pachychoroid as a potential pathogenic mechanism
Pachychoroid disease spectrum
Pachychoroid pigment epitheliopathy
Pachychoroid neovasculopathy
Polypoidal choroidal vasculopathy/aneurysmal pachychoroid neovasculopathy
Peripapillary pachychoroid syndrome
Management considerations
Pachychoroid phenotypes and age-related macular degeneration
Future research and conclusions
Financial disclosures
References

81. Rheumatic disease
Introduction
Disease-specific section
Ocular complications of rheumatologic therapies
References
Infections

82. HIV-associated infections
Introduction
Epidemiology of HIV infection and AIDS
Occupational exposure to HIV
HIV virology and pathogenesis
Therapy of HIV infections
Clinical spectrum of HIV
Infection control related to HIV
Ocular findings in AIDS: An overview
Noninfectious retinopathy
Infectious retinopathy
Fungal diseases
Bacterial retinitis
Invasive diagnostic techniques for retinal disease
Antiretroviral therapy
References

83. Mycobacterial infections
Introduction
Pulmonary and extrapulmonary tuberculosis
Ocular tuberculosis
Adnexal tuberculosis
Laboratory evaluation
Treatment
References

84. Eales disease
Introduction
Clinical features and natural history
Pathology and pathogenesis
Differential diagnosis
Diagnostic workup for eales disease
Epidemiologic spectrum of retinal vasculitis
Management
Summary
References

Section 3. Complicated Forms of Retinal Detachment

Sympathetic ophthalmia
Application of online resources and newer technology to ocular trauma
Prevention
References

114. Surgery for proliferative diabetic retinopathy
Introduction
Requirements for surgery in diabetic patients
Indications and timing of surgery
Surgical procedure in diabetic patients
Complications of surgery in diabetic patients
Postoperative care
Results of surgery as reported and indicated by medical surveys
Conclusions
References

115. Management of combined inflammatory and rhegmatogenous retinal detachment
Introduction
Epidemiology
Pathophysiology
Clinical examination and findings
Management
Prognosis
Conclusions
References

116. High myopia and the vitreoretinal complications
Introduction
Retinal detachment from peripheral breaks
Epidemiology of surgical macular complications
Etiology and pathophysiology
Clinical findings
Treatment of foveoschisis and macular holes with or without retinal detachment
Postoperative complications
Conclusions
References

117. Surgical management of retinopathy of prematurity
Introduction
Classification system
Histopathologic features, clinically relevant cell biology, and pathophysiology
Clinical considerations
Surgical therapy
References

Section 4. Vitreous Surgery for Macular Disorders

144. Overview of management of posterior uveal melanoma
Introduction
Conditions that predispose to uveal melanoma
Zimmerman hypothesis
Posterior uveal melanoma management
Radiotherapy
Laser photocoagulation
Transpupillary thermotherapy
Photodynamic therapy
Local resection
Enucleation
Orbital exenteration
Observation
AURA-011 (AU-011) nanoparticle therapy
Genetic testing
Management and prevention of systemic metastasis
Conclusions
References

145. Enucleation for choroidal melanomas
Introduction
Purpose of enucleation
Enucleation technique
Conclusions
Acknowledgments
References

146. Brachytherapy for choroidal melanoma
Introduction
Dosimetry
Isotope selection
Plaque design
Indications for treatment
Plaque placement technique
Local tumor response
Recurrences
Visual outcomes and radiation complications
Management of radiation-related complications
Adjuvant therapy
Conclusions
References

147. Charged-particle irradiation of uveal melanoma
Introduction
Treatment
Results
Conclusions
References

148. Surgical resection of choroidal melanoma
Introduction
Exoresection
Endoresection
Secondary local resection for toxic tumor after radiotherapy
Conclusions
Acknowledgments
References

149. Laser treatment of choroidal melanoma
Introduction
Transpupillary thermotherapy
Photodynamic therapy
Photoactivated therapy
Experimental laser techniques
References

150. Systemic evaluation and management of patients with metastatic uveal melanoma
Introduction
Physical examination
Pathology, genetics, and molecular biology
Ethical considerations of screening and biopsy
High-risk disease
Treatment of metastatic disease
References

151. Collaborative ocular melanoma study
Introduction
Background
Design of the collaborative ocular melanoma study (COMS)
Methods
Chronology of the COMS
Findings from the COMS trial of I-125 brachytherapy for medium choroidal melanoma
Findings from the COMS trial of pre-enucleation radiation for large choroidal melanoma
Findings from the COMS nonrandomized prospective study of small choroidal melanoma
Histopathologic findings from enucleated eyes
Other published findings
Conclusions