

Contents

Introduction to the BCSC	xv
Introduction to Section 8	xvii
Objectives	1
1 Structure and Function of the External Eye and Cornea	3
Highlights	3
Eyelids	3
Lacrimal Functional Unit	5
Tear Film	6
Conjunctiva	7
Sclera	8
Cornea	8
Zones of the Cornea	9
Corneal Epithelium	10
Bowman Layer	10
Corneal Stroma	11
Descemet Membrane	12
Corneal Endothelium	13
Limbus	14
Defense Mechanisms of the External Eye and Cornea	14
2 The Approach, Techniques, and Devices for Examination of the External Eye and Cornea	19
Highlights	19
External Eye Exam	19
General Appearance	19
The Eyelids	20
Corneal Sensation	20
Slit-Lamp Biomicroscopy	21
Illumination Techniques	22
Clinical Use	26
Ocular Surface Staining and Evaluation of Tear Function	26
Ocular Surface Staining	27
Evaluation of Tear Production	30
Evaluation of Corneal Contour	32
Keratometry	32
Keratoscopy	33
Corneal Topography	33
Corneal Tomography	36

Corneal Biomechanics	40
Corneal Resistance Factor	40
Newer Technologies	40
Endothelial Appearance and Function	40
Specular Microscopy	40
Pachymetry	41
Other Imaging Modalities	42
Confocal Microscopy	42
Anterior Segment Optical Coherence Tomography	44
Ultrasound Biomicroscopy	45
3 Clinical Approach to Ocular Surface Disease	47
Highlights	47
Common Clinical Findings in Ocular Surface Disease	47
Conjunctival Signs of Inflammation	47
Corneal Signs of Inflammation	52
Clinical Approach to Dry Eye	54
Mechanisms of Dry Eye	57
Aqueous Tear Deficiency	59
Evaporative Dry Eye	63
Treatment of Dry Eye	66
Eyelid Conditions Associated With Ocular Surface Disease	76
Rosacea	76
Seborrheic Blepharitis	78
Staphylococcal Blepharitis	80
Staphylococcal Blepharoconjunctivitis	81
Marginal Keratitis	82
Phlyctenular Keratoconjunctivitis (Phlyctenulosis)	83
Hordeola and Chalazia	84
4 Eyelid, Conjunctival, and Corneal Conditions Associated With Ocular Surface Disorders	87
Highlights	87
Introduction	87
Eyelid Disease	88
Floppy Eyelid Syndrome	88
Distichiasis and Trichiasis	89
Conjunctival Disease	90
Superior Limbic Keratoconjunctivitis	90
Conjunctivochalasis	92
Surface Disorders of the Cornea	93
Exposure Keratopathy	93
Neurotrophic Keratopathy	94
Recurrent Corneal Erosion	97
Dellen	100
Limbal Stem Cell Deficiency	100

Toxic Corneal Epithelial Cell Reactions to Topical Ophthalmic Medications	102
Self-Induced Ocular Surface Disorders	105
5 Therapeutic Interventions for Ocular Surface Disorders	107
Highlights	107
Introduction	107
Conjunctival Interventions for Ocular Surface Disorders	107
Pterygium Excision	107
Autologous Conjunctival Transplantation	114
Conjunctival Flap for Corneal Disease	114
Conjunctival Biopsy	118
Treatment of Conjunctivochalasis	119
Limbal Stem Cell Transplantation	120
Mucous Membrane Grafts	123
Corneal Interventions for Ocular Surface Disorders	125
Superficial Keratectomy and Corneal Biopsy	125
Surgical Management of Recurrent Corneal Erosion	126
Management of Persistent Corneal Epithelial Defects, Thinning, and Perforation	128
Tarsorrhaphy	132
Corneal Tattooing	134
6 Congenital Anomalies of the Cornea and Sclera	137
Highlights	137
Developmental Anomalies of the Anterior Segment	137
Anomalies of Size and Shape of the Cornea	137
Corneal Dystrophies	145
Developmental Anomalies of the Cornea and Associated Anterior Segment Structures	145
Secondary Abnormalities Affecting the Infant Cornea	151
Intrauterine Keratitis: Bacterial and Syphilitic	151
Congenital Corneal Keloid	152
Limbal Dermoid	152
Congenital Corneal Anesthesia	153
Congenital Glaucoma	154
Birth Trauma	154
Metabolic Disorders	155
7 Clinical Approach to Degenerations and Depositions of the Conjunctiva, Cornea, and Sclera	157
Highlights	157
Degenerations and Depositions of the Conjunctiva	157
Age-Related Changes	157
Pinguecula	158
Pterygium	158

Conjunctival Concretions	160
Conjunctival Epithelial Inclusion Cysts.	160
Conjunctivochalasis	162
Conjunctival Vascular Tortuosity and Hyperemia	162
Degenerations and Depositions of the Cornea	162
Age-Related Changes	162
Epithelial and Subepithelial Degenerations and Depositions.	162
Mid- and Deep Stromal Degenerations and Depositions	170
Endothelium	175
Degenerations and Depositions in the Sclera	178
Drug-Induced Depositions and Pigmentations	179
Cornea Verticillata	179
Other Drug-Induced Corneal Deposits.	181
8 Diagnosis and Management of Corneal Dystrophies	183
Highlights	183
General Considerations	183
Major Corneal Dystrophies	187
Epithelial and Subepithelial Dystrophies	187
Epithelial–Stromal <i>TGFBI</i> Dystrophies	192
Stromal Dystrophies.	202
Endothelial Dystrophies	210
9 Clinical Approach to Corneal Ectatic Disease	217
Highlights	217
Keratoconus	217
Pellucid Marginal Degeneration	229
Keratoglobus.	232
Appendix 9.1.	235
Intrastromal Corneal Ring Segments for Treatment of Ectasia	235
Appendix 9.2.	241
Corneal Crosslinking for Corneal Ectasia.	241
10 Systemic Disorders With Corneal and Other Anterior Segment Manifestations	247
Highlights	247
Introduction	247
Inherited Metabolic Diseases	248
Lysosomal Storage Diseases.	248
Disorders of Amino Acid, Nucleic Acid, Protein, and Mineral Metabolism	257
Skeletal and Connective Tissue Disorders	266
Ehlers-Danlos Syndrome.	266
Marfan Syndrome	269
Osteogenesis Imperfecta	270
Goldenhar–Gorlin Syndrome	270
Nutritional Disorder: Vitamin A Deficiency	272

Hematologic Disorders	273
Endocrine Diseases	275
Diabetes	275
Multiple Endocrine Neoplasia.	276
Parathyroid Disease	276
Dermatologic Diseases	277
Ichthyosis	277
Ectodermal Dysplasia	278
Xeroderma Pigmentosum	278
11 Infectious Diseases of the Cornea and External Eye: Viral Infections	281
Highlights	281
Virology	281
DNA Viruses: Herpesviruses	284
Herpes Simplex Virus Eye Diseases	284
Varicella-Zoster Virus Dermatoblepharitis, Conjunctivitis, and Keratitis	298
Epstein-Barr Virus Dacryoadenitis, Conjunctivitis, and Keratitis.	303
Cytomegalovirus Keratitis and Anterior Uveitis	304
Other DNA Viruses	306
Adenoviruses	306
Poxviruses	310
Papillomaviruses	312
RNA Viruses	313
Coronaviruses	313
Paramyxoviruses	314
Picornaviruses	315
Retroviruses	315
Rhabdoviruses	315
12 Infectious Diseases of the Cornea and External Eye: Bacterial, Fungal, and Parasitic Infections	317
Highlights	317
Normal Ocular Flora	317
Pathogenesis of Ocular Infections	318
Diagnostic Laboratory Techniques.	320
Specimen Collection.	321
Infections of the Eyelid Margin and Conjunctiva	322
Staphylococcal Blepharitis	322
Fungal and Parasitic Infections of the Eyelid Margin	322
Bacterial Conjunctivitis in Children and Adults	323
Parinaud Oculoglandular Syndrome	333
Infections of the Cornea and Sclera	334
Bacterial Keratitis	334
Fungal Keratitis	341
Corneal Stromal Inflammation Associated With Systemic Infection	347

Loiasis	349
Microbial Scleritis	349
13 Diagnosis and Management of Immune-Related Disorders of the Cornea and External Eye	353
Highlights	353
Definition	353
Immune-Mediated Diseases of the Eyelid	354
Contact Dermatoblepharitis	354
Atopic Dermatitis	355
Immune-Mediated Disorders of the Conjunctiva	356
Seasonal Allergic Conjunctivitis and Perennial Allergic Conjunctivitis	356
Vernal Keratoconjunctivitis	358
Atopic Keratoconjunctivitis	361
Ligneous Conjunctivitis	364
Stevens-Johnson Syndrome, Stevens-Johnson Syndrome/Toxic Epidermal Necrolysis Overlap, and Toxic Epidermal Necrolysis	365
Mucous Membrane Pemphigoid	368
Ocular Graft-vs-Host Disease	374
Conjunctivitis/Episcleritis Associated With Reactive Arthritis	375
Immune-Mediated Diseases of the Cornea	376
Thygeson Superficial Punctate Keratitis	376
Interstitial Keratitis Associated With Infectious Diseases	377
Cogan Syndrome	379
Marginal Keratitis	380
Peripheral Ulcerative Keratitis Associated With Systemic Immune-Mediated Diseases	382
Mooren Ulcer	385
Immune-Mediated Diseases of the Episclera and Sclera	387
Episcleritis	387
Scleritis	388
14 Clinical Approach to Neoplastic Disorders of the Conjunctiva and Cornea	395
Highlights	395
Introduction	395
Approach to the Patient With a Neoplastic Ocular Surface Lesion	396
Management of Patients With Ocular Surface Tumors	397
Observation	397
Surgery	397
Topical Chemotherapy	398
Other Treatment Options	399
Treatment Follow-Up	400
Tumors of Epithelial Origin	400
Benign Epithelial Tumors	400
Ocular Surface Squamous Neoplasia	402

Glandular Tumors of the Conjunctiva	407
Oncocytoma	407
Sebaceous Carcinoma	407
Tumors of Neuroectodermal Origin	408
Benign Pigmented Lesions	409
Preinvasive Pigmented Lesions	412
Malignant Pigmented Lesions	414
Neurogenic and Smooth-Muscle Tumors	416
Vascular and Mesenchymal Tumors	416
Benign Tumors	416
Malignant Tumors	418
Lymphocytic Tumors	419
Lymphoid Hyperplasia	419
Lymphoma	420
Metastatic Tumors	421

15 Clinical Aspects of Toxic and Traumatic

Injuries of the Anterior Segment	423
Highlights	423
Chemical Injuries	423
Alkali Burns	424
Acid Burns	425
Management	429
Thermal and Radiation Injuries	432
Thermal Burns	432
Ultraviolet Radiation	433
Ionizing Radiation	434
Injuries Caused by Animal and Plant Substances	435
Insect and Arachnid Injuries	435
Plant Injuries	436
Blunt Trauma	436
Subconjunctival Hemorrhage	436
Corneal Involvement	437
Traumatic Anterior Uveitis	439
Traumatic Mydriasis and Miosis	439
Iridodialysis and Cyclodialysis	440
Traumatic Hyphema	440
Penetrating and Perforating Ocular Trauma	446
Conjunctival Laceration	446
Conjunctival Foreign Bodies	447
Corneal Foreign Bodies	448
Evaluation and Management of Perforating Ocular Trauma	450
Evaluation	450
Nonsurgical Management	451
Surgical Management	452

16 Clinical Approach to Corneal Transplantation	463
Highlights	463
Corneal Transplantation	463
Corneal Transplant Procedures and Trends	465
Keratoplasty and Eye Banking	465
Tissue Processing and Preservation	465
Donor-Cornea Selection	467
Transplantation for the Treatment of Corneal Disease	469
Preoperative Evaluation and Preparation of the Transplant Patient	470
Penetrating Keratoplasty	472
Intraoperative Complications	476
Postoperative Care and Complications	476
Control of Postoperative Corneal Astigmatism and Refractive Error	485
Lamellar Keratoplasty	488
Anterior Lamellar Keratoplasty and Deep Anterior Lamellar Keratoplasty	488
Complications	490
Endothelial Keratoplasty	491
Advantages	495
Disadvantages	495
Intraoperative Complications	496
Postoperative Care and Complications	497
Emerging Methods for Treatment of Endothelial Dysfunction	506
Pediatric Corneal Transplantation	507
Corneal Autograft Procedures	509
Keratoprosthesis	510
Additional Materials and Resources	513
Requesting Continuing Medical Education Credit	515
Study Questions	517
Answers	525
Index	533