

Table of Contents

1 The Ophthalmic Examination ... 1

(Gabriele E. Lang, Gerhard K. Lang)

- 1.1 Equipment ... 1
- 1.2 History ... 3
- 1.3 Visual Acuity ... 4
- 1.4 Ocular Motility ... 5
- 1.5 Binocular Alignment ... 6
- 1.6 Examination of the Eyelids and Nasolacrimal Duct ... 7
- 1.7 Examination of the Conjunctiva ... 7
- 1.8 Examination of the Cornea ... 10
- 1.9 Examination of the Anterior Chamber ... 11
- 1.10 Examination of the Lens ... 12
- 1.11 Ophthalmoscopy ... 13
- 1.12 Confrontation Field Testing ... 14
- 1.13 Measurement of Intraocular Pressure ... 15
- 1.14 Eyedrops, Ointment, and Bandages ... 15

2 The Eyelids ... 17

(Peter Wagner, Gerhard K. Lang)

- 2.1 Basic Knowledge ... 17
- 2.2 Examination Methods ... 19
- 2.3 Developmental Anomalies ... 20
 - 2.3.1 Coloboma ... 20
 - 2.3.2 Epicanthal Folds ... 21
 - 2.3.3 Blepharophimosis ... 21
 - 2.3.4 Ankyloblepharon ... 22
- 2.4 Deformities ... 22
 - 2.4.1 Ptosis ... 22
 - 2.4.2 Entropion ... 24
 - 2.4.3 Ectropion ... 28
 - 2.4.4 Trichiasis ... 30

2.4.5	Blepharospasm ... 30
2.5	Disorders of the Skin and Margin of the Eyelid ... 30
2.5.1	Contact Eczema ... 30
2.5.2	Edema ... 31
2.5.3	Seborrheic Blepharitis ... 33
2.5.4	Herpes Simplex of the Eyelids ... 34
2.5.5	Herpes Zoster Ophthalmicus ... 35
2.5.6	Eyelid Abscess ... 36
2.5.7	Tick Infestation of the Eyelids ... 37
2.5.8	Louse Infestation of the Eyelids ... 37
2.6	Disorders of the Eyelid Glands ... 38
2.6.1	Hordeolum ... 38
2.6.2	Chalazion ... 39
2.7	Tumors ... 40
2.7.1	Benign Tumors ... 40
2.7.1.1	Ductal Cysts ... 40
2.7.1.2	Xanthelasma ... 40
2.7.1.3	Molluscum Contagiosum ... 42
2.7.1.4	Cutaneous Horn ... 42
2.7.1.5	Keratoacanthoma ... 42
2.7.1.6	Hemangioma ... 43
2.7.1.7	Neurofibromatosis (Recklinghausen's Disease) ... 44
2.7.2	Malignant Tumors ... 45
2.7.2.1	Basal Cell Carcinoma ... 45
2.7.2.2	Squamous Cell Carcinoma ... 47
2.7.2.3	Adenocarcinoma ... 47

3 Lacrimal System ... 49

(Peter Wagner, Gerhard K. Lang)

3.1	Basic Knowledge ... 49
3.2	Examination Methods ... 52
3.2.1	Evaluation of Tear Formation ... 52
3.2.2	Evaluation of Tear Drainage ... 53
3.3	Disorders of the Lower Lacrimal System ... 57
3.3.1	Dacryocystitis ... 57
3.3.1.1	Acute Dacryocystitis ... 57
3.3.1.2	Chronic Dacryocystitis ... 60
3.3.1.3	Neonatal Dacryocystitis ... 60
3.3.2	Canaliculitis ... 61
3.3.3	Tumors of the Lacrimal Sac ... 61
3.4	Lacrimal System Dysfunction ... 62
3.4.1	Keratoconjunctivitis Sicca ... 62

3.4.2	Illacrimation ... 64
3.5	Disorders of the Lacrimal Gland ... 64
3.5.1	Acute Dacryoadenitis ... 64
3.5.2	Chronic Dacryoadenitis ... 65
3.5.3	Tumors of the Lacrimal Gland ... 66

4 Conjunctiva ... 67

(Gerhard K. Lang, Gabriele E. Lang)

4.1	Basic Knowledge ... 67
4.2	Examination Methods ... 68
4.3	Conjunctival Degeneration and Aging Changes ... 69
4.3.1	Pinguecula ... 69
4.3.2	Pterygium ... 69
4.3.3	Pseudopterygium ... 71
4.3.4	Subconjunctival Hemorrhage ... 72
4.3.5	Calcareous Infiltration ... 72
4.3.6	Conjunctival Xerosis ... 72
4.4	Conjunctivitis ... 74
4.4.1	General Notes on the Causes, Symptoms, and Diagnosis of Conjunctivitis ... 74
4.4.2	Infectious Conjunctivitis ... 82
4.4.2.1	Bacterial Conjunctivitis ... 82
4.4.2.2	Chlamydial Conjunctivitis ... 83
4.4.2.3	Viral Conjunctivitis ... 93
4.4.2.4	Neonatal Conjunctivitis ... 95
4.4.2.5	Parasitic and Mycotic Conjunctivitis ... 98
4.4.3	Noninfectious Conjunctivitis ... 98
4.5	Tumors ... 104
4.5.1	Epibulbar Dermoid ... 104
4.5.2	Conjunctival Hemangioma ... 104
4.5.3	Epithelial Conjunctival Tumors ... 105
4.5.3.1	Conjunctival Cysts ... 105
4.5.3.2	Conjunctival Papilloma ... 106
4.5.3.3	Conjunctival Carcinoma ... 107
4.5.4	Melanocytic Conjunctival Tumors ... 108
4.5.4.1	Conjunctival Nevus ... 108
4.5.4.2	Conjunctival Melanosis ... 108
4.5.4.3	Congenital Ocular Melanosis ... 112
4.5.5	Conjunctival Lymphoma ... 113
4.5.6	Kaposi's Sarcoma ... 113
4.6	Conjunctival Deposits ... 114

5 Cornea ... 117

(Gerhard K. Lang)

- 5.1 Basic Knowledge ... 117
- 5.2 Examination Methods ... 120
 - 5.2.1 Slit Lamp Examination ... 120
 - 5.2.2 Dye Examination of the Cornea ... 120
 - 5.2.3 Corneal Topography ... 121
 - 5.2.4 Determining Corneal Sensitivity ... 121
 - 5.2.5 Measuring the Density of the Corneal Epithelium ... 121
 - 5.2.6 Measuring the Diameter of the Cornea ... 124
 - 5.2.7 Corneal Pachymetry ... 125
 - 5.2.8 Confocal Corneal Microscopy ... 125
- 5.3 Developmental Anomalies ... 125
 - 5.3.1 Protrusion Anomalies ... 125
 - 5.3.1.1 Keratoconus ... 125
 - 5.3.1.2 Keratoglobus ... 127
 - 5.3.2 Corneal Size Anomalies (Microcornea and Megalocornea) ... 127
- 5.4 Infectious Keratitis ... 127
 - 5.4.1 Protective Mechanisms of the Cornea ... 127
 - 5.4.2 Corneal Infections: Predisposing Factors, Pathogens, and Pathogenesis ... 128
 - 5.4.3 General Notes on Diagnosing Infectious Forms of Keratitis ... 130
 - 5.4.4 Bacterial Keratitis ... 130
 - 5.4.5 Viral Keratitis ... 132
 - 5.4.5.1 Herpes Simplex Keratitis ... 132
 - 5.4.5.2 Herpes Zoster Keratitis ... 134
 - 5.4.6 Mycotic Keratitis ... 134
 - 5.4.7 Acanthamoeba Keratitis ... 136
- 5.5 Noninfectious Keratitis and Keratopathy ... 137
 - 5.5.1 Superficial Punctate Keratitis ... 138
 - 5.5.2 Exposure Keratitis ... 140
 - 5.5.3 Neuroparalytic Keratitis ... 141
 - 5.5.4 Problems with Contact Lenses ... 141
 - 5.5.5 Bullous Keratopathy ... 143
- 5.6 Corneal Deposits, Degenerations, and Dystrophies ... 145
 - 5.6.1 Corneal Deposits ... 145
 - 5.6.1.1 Arcus Senilis ... 145
 - 5.6.1.2 Corneal Verticillata ... 145
 - 5.6.1.3 Argyrosis and Chrysiasis ... 146
 - 5.6.1.4 Iron Lines ... 146
 - 5.6.1.5 Kayser-Fleischer Ring ... 146

X Table of Contents

5.6.2	Corneal Degeneration ... 146
5.6.2.1	Calcific Band Keratopathy ... 146
5.6.2.2	Peripheral Furrow Keratitis ... 147
5.6.3	Corneal Dystrophies ... 148
5.7	Corneal Surgery ... 150
5.7.1	Curative Corneal Procedures ... 152
5.7.1.1	Penetrating Keratoplasty (Fig. 5.18a) ... 152
5.7.1.2	Lamellar Keratoplasty (Fig. 5.18b) ... 153
5.7.1.3	Phototherapeutic Keratectomy (Fig. 5.18c) ... 154
5.7.2	Refractive Corneal Procedures ... 155
5.7.2.1	Photorefractive Keratectomy (Fig. 5.18d) ... 155
5.7.2.2	Radial Keratotomy (Fig. 5.18e) ... 155
5.7.2.3	Photorefractive Keratectomy Correction of Astigmatism ... 156
5.7.2.4	Holmium Laser Correction of Hyperopia ... 156
5.7.2.5	Epikeratophakic Keratoplasty (Epikeratophakia) ... 156
5.7.2.6	Excimer Laser In Situ Keratomileusis (LASIK) ... 156

6 Sclera ... 157 (Gerhard K. Lang)

6.1	Basic Knowledge ... 157
6.2	Examination Methods ... 157
6.3	Color Changes ... 157
6.4	Staphyloma and Ectasia ... 158
6.5	Trauma ... 158
6.6	Inflammations ... 158
6.6.1	Episcleritis ... 159
6.6.2	Scleritis ... 161

7 Lens ... 165 (Gerhard K. Lang)

7.1	Basic Knowledge ... 165
7.2	Examination Methods ... 168
7.3	Developmental Anomalies of the Lens ... 169
7.4	Cataract ... 170
7.4.1	Acquired Cataract ... 173
7.4.1.1	Senile Cataract ... 173
7.4.2	Cataract in Systemic Disease ... 179
7.4.3	Complicated Cataracts ... 180
7.4.4	Cataract after Intraocular Surgery ... 180

7.4.5	Traumatic Cataract ...	180
7.4.6	Toxic Cataract ...	182
7.4.7	Congenital Cataract ...	182
7.4.7.1	Hereditary Congenital Cataracts ...	183
7.4.7.2	Cataract from Transplacental Infection in the First Trimester of Pregnancy ...	185
7.4.8	Treatment of Cataracts ...	185
7.4.8.1	Medical Treatment ...	185
7.4.8.2	Surgical Treatment ...	185
7.4.8.3	Secondary Cataract ...	192
7.4.8.4	Special Considerations in Cataract Surgery in Children ...	192
7.5	Lens Dislocation ...	195

8 Uveal Tract (Vascular Pigmented Layer) ... 199

(Gabriele E. Lang, Gerhard K. Lang)

8.1	Basic Knowledge ...	199
8.1.1	Iris ...	199
8.1.2	Ciliary Body ...	201
8.1.3	Choroid ...	201
8.2	Examination Methods ...	201
8.3	Developmental Anomalies ...	202
8.3.1	Aniridia ...	202
8.3.2	Coloboma ...	203
8.4	Pigmentation Anomalies ...	206
8.4.1	Heterochromia ...	206
8.4.2	Albinism ...	206
8.5	Inflammation ...	208
8.5.1	Acute Iritis and Iridocyclitis ...	208
8.5.2	Chronic Iritis and Iridocyclitis ...	212
8.5.3	Choroiditis ...	213
8.5.4	Sympathetic Ophthalmia ...	214
8.6	Neovascularization in the Iris: Rubeosis Iridis ...	215
8.7	Tumors ...	216
8.7.1	Malignant Tumors (Uveal Melanoma) ...	216
8.7.2	Benign Choroidal Tumors ...	217

9 Pupil ... 219

(Oskar Gareis, Gerhard K. Lang)

- 9.1 Basic Knowledge ... 219
- 9.2 Examination Methods ... 221
 - 9.2.1 Testing the Light Reflex (Table 9.1) ... 221
 - 9.2.2 Evaluating the Near Reflex ... 223
- 9.3 Influence of Pharmacologic Agents on the Pupil (Table 9.2) ... 224
- 9.4 Pupillary Motor Dysfunction ... 226
 - 9.4.1 Isocoria with Normal Pupil Size ... 227
 - 9.4.2 Anisocoria with Dilated Pupil in the Affected Eye ... 228
 - 9.4.3 Anisocoria with a Constricted Pupil in the Affected Eye ... 229
 - 9.4.4 Isocoria with Constricted Pupils ... 230
 - 9.3.5 Isocoria with Dilated Pupils ... 231

10 Glaucoma ... 233

(Gerhard K. Lang)

- 10.1 Basic Knowledge ... 233
- 10.2 Examination Methods ... 238
 - 10.2.1 Oblique Illumination of the Anterior Chamber ... 238
 - 10.2.2 Slit-Lamp Examination ... 238
 - 10.2.3 Gonioscopy ... 238
 - 10.2.4 Measuring Intraocular Pressure ... 240
 - 10.2.5 Optic Disk Ophthalmoscopy ... 244
 - 10.2.6 Visual Field Testing ... 246
 - 10.2.7 Examination of the Retinal Nerve Fiber Layer ... 250
- 10.3 Primary Glaucoma ... 251
 - 10.3.1 Primary Open Angle Glaucoma ... 251
 - 10.3.2 Primary Angle Closure Glaucoma ... 265
- 10.4 Secondary Glaucomas ... 270
 - 10.4.1 Secondary Open Angle Glaucoma ... 271
 - 10.4.2 Secondary Angle Closure Glaucoma ... 271
- 10.5 Childhood Glaucomas ... 273

11 Vitreous Body ... 279

(Christoph W. Spraul, Gerhard K. Lang)

- 11.1 Basic Knowledge ... 279
- 11.2 Examination Methods ... 281
- 11.3 Aging Changes ... 282

11.3.1	Synchysis ...	282
11.3.2	Vitreous Detachment ...	282
11.4	Abnormal Changes in the Vitreous Body ...	284
11.4.1	Persistent Fetal Vasculature (Developmental Anomalies) ...	284
11.4.1.1	Mittendorf's Dot ...	284
11.4.1.2	Bergmeister's Papilla ...	285
11.4.1.3	Persistent Hyaloid Artery ...	285
11.4.1.4	Persistent Hyperplastic Primary Vitreous (PHPV) ...	285
11.4.2	Abnormal Opacities of the Vitreous Body ...	287
11.4.2.1	Asteroid Hyalosis ...	287
11.4.2.2	Synchysis Scintillans ...	287
11.4.2.3	Vitreous Amyloidosis ...	287
11.4.3	Vitreous Hemorrhage ...	287
11.4.4	Vitritis and Endophthalmitis ...	290
11.4.5	Vitreoretinal Dystrophies ...	293
11.4.5.1	Juvenile Retinoschisis ...	293
11.4.5.2	Wagner's Disease ...	293
11.5	The Role of the Vitreous Body in Various Ocular Changes and Following Cataract Surgery ...	293
11.5.1	Retinal Detachment ...	293
11.5.2	Retinal Vascular Proliferation ...	293
11.5.3	Cataract Surgery ...	294
11.6	Surgical Treatment: Vitrectomy ...	294

12 Retina ... 299

(Gabriele E. Lang, Gerhard K. Lang)

12.1	Basic Knowledge ...	299
12.2	Examination Methods ...	304
12.2.1	Examination of the Fundus ...	304
12.2.2	Normal and Abnormal Fundus Findings in General ...	308
12.2.3	Color Vision ...	311
12.2.4	Electrophysiologic Examination Methods (electroretinogram, electrooculogram, and visual evoked potentials; see Fig. 12.2a) ...	312
12.3	Vascular Disorders ...	314
12.3.1	Diabetic Retinopathy ...	314
12.3.2	Retinal Vein Occlusion ...	318
12.3.3	Retinal Arterial Occlusion ...	320
12.3.4	Hypertensive Retinopathy and Sclerotic Changes ...	323
12.3.5	Coats' Disease ...	325
12.3.6	Retinopathy of Prematurity ...	326

12.4	Degenerative Retinal Disorders ...	328
12.4.1	Retinal Detachment ...	328
12.4.2	Degenerative Retinoschisis ...	333
12.4.3	Peripheral Retinal Degenerations ...	334
12.4.4	Central Serous Chorioretinopathy ...	335
12.4.5	Age-Related Macular Degeneration ...	337
12.4.6	Degenerative Myopia ...	339
12.5	Retinal Dystrophies ...	340
12.5.1	Macular Dystrophies ...	340
12.5.1.1	Stargardt's Disease ...	340
12.5.1.2	Best's Vitelliform Dystrophy ...	341
12.5.2	Retinitis Pigmentosa ...	343
12.6	Toxic Retinopathy ...	345
12.7	Retinal Inflammatory Disease ...	346
12.7.1	Retinal Vasculitis ...	346
12.7.2	Posterior Uveitis Due to Toxoplasmosis ...	348
12.7.3	AIDS-Related Retinal Disorders ...	349
12.7.4	Viral Retinitis ...	351
12.7.5	Retinitis in Lyme Disease ...	351
12.7.6	Parasitic Retinal Disorders ...	352
12.8	Retinal Tumors and Hamartomas ...	353
12.8.1	Retinoblastoma ...	353
12.8.2	Astrocytoma ...	355
12.8.3	Hemangiomas ...	356

13 Optic Nerve ... 359

(Oskar Gareis, Gerhard K. Lang)

13.1	Basic Knowledge ...	359
13.1.1	Intraocular Portion of the Optic Nerve ...	360
13.1.2	The Intraorbital and Intracranial Portion of the Optic Nerve ...	361
13.2	Examination Methods ...	362
13.3	Disorders that Obscure the Margin of the Optic Disc ...	363
13.3.1	Congenital Disorders that Obscure the Margin of the Optic Disc ...	363
13.3.1.1	Oblique Entry of the Optic Nerve ...	363
13.3.1.2	Tilted Disc ...	364
13.3.1.3	Pseudopapilledema ...	364
13.3.1.4	Myelinated Nerve Fibers ...	365
13.3.1.5	Bergmeister's Papilla ...	366
13.3.1.6	Optic Disc Drusen ...	366
13.3.2	Acquired Disorders that Obscure the Margin of the Optic Disc ...	367

- 13.3.2.1 Papilledema ... 368
- 13.3.2.2 Optic Neuritis ... 370
- 13.3.2.3 Anterior Ischemic Optic Neuropathy (AION) ... 374
- 13.3.2.4 Infiltrative Optic Disc Edema ... 379
- 13.4 Disorders in which the Margin of the Optic Disc is Well Defined ... 380
- 13.4.1 Atrophy of the Optic Nerve ... 380
- 13.4.2 Optic Nerve Pits ... 383
- 13.4.3 Optic Disc Coloboma (Morning Glory Disc) ... 385
- 13.5 Tumors ... 385
- 13.5.1 Intraocular Optic Nerve Tumors ... 385
- 13.5.2 Retrobulbar Optic Nerve Tumors ... 387

14 Visual Pathway ... 389

(Oskar Gareis, Gerhard K. Lang)

- 14.1 Basic Knowledge ... 389
- 14.2 Examination Methods ... 391
- 14.3 Disorders of the Visual Pathway ... 394
- 14.3.1 Prechiasmal Lesions ... 394
- 14.3.2 Chiasmal Lesions ... 396
- 14.3.3 Retrochiasmal Lesions ... 400

15 Orbital Cavity ... 403

(Christoph W. Spraul, Gerhard K. Lang)

- 15.1 Basic Knowledge ... 403
- 15.2 Examination Methods ... 405
- 15.3 Developmental Anomalies ... 409
- 15.3.1 Craniofacial Dysplasia ... 409
- 15.3.1.1 Craniostenosis ... 409
- 15.3.2 Mandibulofacial Dysplasia ... 410
- 15.3.2.1 Oculoauriculovertebral Dysplasia ... 410
- 15.3.2.2 Mandibulofacial Dysostosis ... 410
- 15.3.2.3 Oculomandibular Dysostosis ... 410
- 15.3.2.4 Rubinstein–Taybi Syndrome ... 410
- 15.3.3 Meningoencephalocele ... 410
- 15.3.4 Osteopathies ... 411
- 15.4 Orbital Involvement in Autoimmune Disorders: Graves' Disease ... 411
- 15.5 Orbital Inflammation ... 413
- 15.5.1 Orbital Cellulitis ... 414

15.5.2	Cavernous Sinus Thrombosis ...	415
15.5.3	Orbital Pseudotumor ...	416
15.5.4	Myositis ...	416
15.5.5	Orbital Periostitis ...	417
15.5.6	Mucocele ...	417
15.5.7	Mycoses (Mucormycosis and Aspergillomycosis) ...	417
15.6	Vascular Disorders ...	418
15.6.1	Pulsating Exophthalmos ...	418
15.6.2	Intermittent Exophthalmos ...	419
15.6.3	Orbital Hematoma ...	419
15.7	Tumors ...	420
15.7.1	Orbital Tumors ...	420
15.7.1.1	Hemangioma ...	420
15.7.1.2	Dermoid and Epidermoid Cyst ...	420
15.7.1.3	Neurinoma and Neurofibroma ...	420
15.7.1.4	Meningioma ...	420
15.7.1.5	Histiocytosis X ...	421
15.7.1.6	Leukemic Infiltrations ...	421
15.7.1.7	Lymphoma ...	421
15.7.1.8	Rhabdomyosarcoma ...	421
15.7.2	Metastases ...	421
15.7.3	Optic Nerve Glioma ...	422
15.8	Orbital Surgery ...	422

16 Optics and Refractive Errors ... 423

(Christoph W. Spraul, Gerhard K. Lang)

16.1	Basic Knowledge ...	423
16.1.1	Uncorrected and Corrected Visual Acuity ...	423
16.1.2	Refraction: Emmetropia and Ametropia ...	423
16.1.3	Accommodation ...	425
16.1.4	Adaptation to Differences in Light Intensity ...	428
16.2	Examination Methods ...	429
16.2.1	Refraction Testing ...	429
16.2.2	Testing the Potential Resolving Power of the Retina in the Presence of Opacified Optic Media ...	431
16.3	Refractive Anomalies (Table 16.2) ...	432
16.3.1	Myopia (Shortsightedness) ...	432
16.3.2	Hyperopia (Farsightedness) ...	436
16.3.3	Astigmatism ...	440
16.3.4	Anisometropia ...	444
16.4	Impaired Accommodation ...	445
16.4.1	Accommodation Spasm ...	445

16.4.2	Accommodation Palsy ...	446
16.5	Correction of Refractive Errors ...	447
16.5.1	Eyeglass Lenses ...	447
16.5.2	Contact Lenses ...	451
16.5.2.1	Advantages and Characteristics of Contact Lenses ...	451
16.5.3	Prisms ...	455
16.5.4	Magnifying Vision Aids ...	455
16.5.5	Aberrations of Lenses and Eyeglasses ...	456

17 Ocular Motility and Strabismus ... 459

(Doris Recker, Josef Amann, Gerhard K. Lang)

17.1	Basic Knowledge ...	459
17.2	Concomitant Strabismus ...	465
17.2.1	Forms of Concomitant Strabismus ...	467
17.2.1.1	Esotropia ...	467
17.2.1.2	Abnormal Accommodative Convergence/Accommodation Ratio ...	470
17.2.1.3	Exotropia ...	471
17.2.1.4	Vertical Deviations (Hypertropia and Hypotropia) ...	471
17.2.2	Diagnosis of Concomitant Strabismus ...	471
17.2.2.1	Evaluating Ocular Alignment with a Focused Light ...	471
17.2.2.2	Diagnosis of Infantile Strabismic Amblyopia (Preferential Looking Test) ...	472
17.2.2.3	Diagnosis of Unilateral and Alternating Strabismus (Unilateral Cover Test) ...	473
17.2.2.4	Measuring the Angle of Deviation ...	474
17.2.2.5	Determining the Type of Fixation ...	476
17.2.2.6	Testing Binocular Vision ...	476
17.2.3	Therapy of Concomitant Strabismus ...	477
17.2.3.1	Eyeglass Prescription ...	477
17.2.3.2	Treatment and Avoidance of Strabismic Amblyopia ...	477
17.2.3.3	Surgery ...	479
17.3	Heterophoria ...	480
17.4	Pseudostrabismus ...	481
17.5	Ophthalmoplegia and Paralytic Strabismus ...	481
17.6	Nystagmus ...	494

18 Ocular Trauma ... 497

(Gerhard K. Lang)

- 18.1 Examination Methods ... 497
- 18.2 Classification of Ocular Injuries by Mechanism of Injury ... 498
- 18.3 Mechanical Injuries ... 498
 - 18.3.1 Eyelid Injury ... 498
 - 18.3.2 Injuries to the Lacrimal System ... 499
 - 18.3.3 Conjunctival Laceration ... 499
 - 18.3.4 Corneal and Conjunctival Foreign Bodies ... 503
 - 18.3.5 Corneal Erosion ... 505
 - 18.3.6 Blunt Ocular Trauma (Ocular Contusion) ... 506
 - 18.3.7 Blowout Fracture ... 507
 - 18.3.8 Open-Globe Injuries ... 514
 - 18.3.9 Impalement Injuries of the Orbit ... 515
- 18.4 Chemical Injuries ... 517
- 18.5 Injuries Due to Physical Agents ... 523
 - 18.5.1 Ultraviolet Keratoconjunctivitis ... 523
 - 18.5.2 Burns ... 523
 - 18.5.3 Radiation Injuries (Ionizing Radiation) ... 524
- 18.6 Indirect Ocular Trauma: Purtscher's Retinopathy ... 525

19 Cardinal Symptoms ... 527

(Gerhard K. Lang)

Index ... 563