Contents

VOLUME 1

SECTION 1: Pediatric Eye Examination, Oculoplasty and Anterior Segment Abnormalities

1. History Taking and Pediatric Eye Examination **3**
Karthikeyan A.S.

- **HISTORY TAKING 4**
  Informant 5; Reliability 5; Referral Details 5; Chief Complaint 6; Other Complaints Pertaining to Eye 6; Elaborating the History of Complaints 6; Birth History 6; Vaccination Status and Vaccination History 6; Antenatal History 6; Developmental History 6; Glasses 6; Patching 6; Medical History 6; Some Important Questions 7; History of Allergy 7; History of Prior Surgeries 7; Treatment History 7; Family History 7; Rapport 7
- **PEDIATRIC EYE EXAMINATION 10**
  Basic Instruments for Examination 10; Instruments for Neuro-ophthalmological Examination 11; Some Valuable Sterile Surgical Instruments at the Outpatient Department 11; Eye Examination 11; Making a Routine Examination Technique 12; Scan the Face 12; Examining the Glasses 12; Examination of the Head 13; Shape of the Head 19; Dysmorphic Features 20; Anterior Fontanelle 20; Head Nodding 22; Head Posture 22; Anomalous Head Posture 22; Subtarsal Foreign Body 27; Facial Asymmetry 28; Examine for Specific Behavior 28; Bruckner Test 28; Sequence of Examination 28; Some Practical Tips 34; Sleeping Child 34; Crying Child 34; Injured Child 35; Examination with Restraint 37; Glance from Distance 38; Examining a Dummy 38; Getting Assistance from the Parents 39; Patching 39; Examining Old Photographs 40; Importance of Taking Photographs in Clinical Practice 40; Scanning the Patient 45

2. Pediatric Oculoplasty and Lacrimal Disorders **51**
Karthikeyan A.S.

- **INTRODUCTION 52**
  Pediatric Oculoplasty: Perspective from a Pediatric Ophthalmologist 52
- **ABNORMALITIES OF PALPEBRAL APERTURE 53**
  Ephiblepharon 53; Euryblepharon 53; Lid Retraction 53; Eye Popping Reflex 53; Widening of Palpebral Fissure 53; Mongoloid Slant 53; Anti-Mongoloid Slant 53; Nanophthalmos 53; Epicanthus 53; Blepharophimosis Syndrome 56
- **ABNORMALITY OF THE EYEBROWS AND EYELASHES 60**
  Synophrys 60; Sparse Eyebrows 60; Telecanthus 60; Hypertelorism 60; Hypotelorism 60; Lid Coloboma 60; Congenital Entropion 60; Congenital Tarsal Kink 62; Congenital Ectropion 62; Lagophthalmos and Bell's Phenomenon 62; Lid Lag 64
- **PTOSIS EVALUATION 64**
  History 64; Examination 64; Surgical Planning Based on Examination Findings 72
- **ETIOLOGY OF PTOSIS 73**
  Neurogenic 73; Myogenic 73; Aponeurotic 73; Mechanical 73; Others 73
- **SEVERITY OF PTOSIS 76**
- **PTOSIS WITH PUPIL ANOMALIES 77**
  Horner Syndrome 77; Congenital Third Cranial Nerve Palsy 77; Acquired Third Cranial Nerve Palsy 77; Trauma 78
- **VARIABLE PTOSIS 78**
  Myasthenia Gravis 78; Marcus Jaw-Winking Ptosis 78; Phenomenon of Marin Amat 78; Third Cranial Nerve Palsy with Aberrant Regeneration 78
- **FAMILIAL PTOSIS 80**
  Visually Significant Ptosis 80; Visual Rescue 80

- **OCULAR MOTILITY 82**
  Conditions that Cause Limitation of Motility and Ptosis 82
- **STRABISMUS WITH PTOSIS 82**
  Exotropia 82; Hypotropia 82; Esotropia 82; Esotropia and Hypotropia 82; Hypertropia 82
- **PSEUDOPTOSIS 82**
  Ipsilateral Ocular Causes 82; Ipsilateral Lid Causes 82; Contralateral Lid Causes 82
- **LID TUMORS 82**
  Chalazion 82; Molluscum Contagiosum 85; Nevi 86; Viral Wart 86; Dermoid 87; Ocular Dermal Melanocytosis Nevus of Ota 88; Hemangioma 88; Port-wine Stain 89; Vascular Malformations 89; Lymphangioma 89; Neurofibroma of the Lid 91
- **MALIGNANT LID TUMORS IN CHILDREN 91**
  Xeroderma Pigmentosa 91; Basal Cell Nevus Syndrome 91; False Lid Tumors 91
- **LID INFECTION AND INFLAMMATION 92**
  Blepharitis 92; Phthiriasis Palpebrum 94; Distichiasis 94; Trichiasis 97; Blepharochalasis 97; Preseptal Cellulitis 97; Viral Infection 98; Practical Points 98
- **PEDIATRIC LACRIMAL DISORDERS 100**
  Congenital Nasolacrimal Duct Obstruction 100; Acquired Nasolacrimal Duct Obstruction 102; Congenital Dacryocele 102; Lacrimal Abscess 103; Lacrimal Fistula 103; Fluorescein Dye Disappearance Test 104; Acute Dacrocystitis 104
- **PRACTICAL TIPS IN EVALUATING THE LACRIMAL SYSTEM 106**
- **DISORDERS OF THE GLOBE 106**
  Anophthalmos 106; Microphthalmos 107; Cryptophthalmos 109; Fraser Syndrome 109; Cyclophthalmos 111; Anterior Megalophthalmos 111; High Myopia with Posterior Staphyloma 111

3. Pediatric Corneal Disorders **116**
Karthikeyan A.S.

- **CORNEA AND OCULAR SURFACE DISORDERS 117**
- **ANTERIOR SEGMENT EXAMINATION 117**
- **SLIT LAMP EXAMINATION 117**
  Preparing the Slit Lamp 117; Preparing the Patient 117; Examination Sequence 119; Handheld Slit Lamp 123; Special Maneuvers 123
- **CONJUNCTIVITIS 126**
  Ophthalmia Neonatorum 126; Bacterial Conjunctivitis 126; Granulomatous Conjunctivitis 126; Membranous Conjunctivitis 127; Pseudomembranous Conjunctivitis 127; Adenoviral Keratoconjunctivitis 127; Other Viral Causes of Conjunctivitis 130; Molluscum Contagiosum Induced Conjunctivitis 130; Phlyctenular Conjunctivitis 130; Vernal Keratoconjunctivitis 132; Giant Papillary Conjunctivitis 132; Atopic Keratoconjunctivitis 132; Allergic Rhinoconjunctivitis 132; Floppy Eyelid Syndrome 134; Drug-Induced Allergic Contact Dermatitis 134; Trachoma 134
- **DEVELOPMENTAL ANOMALIES OF CORNEA AND ANTERIOR SEGMENT 136**
  Embryology of the Anterior Segment 136; Megalocornea 136; Microcornea 137; Sclerocornea 137; Peter's Anomaly 137; Congenital Hereditary Endothelial Dystrophy 137; Congenital Hereditary Stromal Dystrophy 141; Aniridia 141; Iridocorneal Endothelial Syndrome 141; Anterior Segment Dysgenesis Syndrome 142; Keratoconus 144; Congenital Anterior Staphyloma 144
- **CONGENITAL CORNEAL OPACITY 145**
  Approach to a Child with Corneal Opacity 145; Examination 145; Causes 145
- **GROWTHS 146**
  Limbal Dermoid 146; Dermolipoma 146; Symblepharon 146; Pigmented Lesions of Conjunctiva 147; Pterygium and Pseudopterygium 149; Pinguecula 153; Episcleritis 153; Cysts 153
- **KERATITIS 154**
  Evaluation of Keratitis 154; Bacterial Keratitis 156; Viral Keratitis 157; Fungal Keratitis 159; Acanthamoeba Keratitis 161; Acne Rosacea Keratitis 162; Phlyctenular Keratitis 164; Interstitial Keratitis 164; Vernal Keratoconjunctivitis 165; Exposure Keratopathy 165; Xerophthalmia 167; Filamentary Keratitis 168; Neurotrophic Keratopathy 168; Marginal Keratitis 171
- **MISCELLANEOUS CORNEAL CONDITIONS 172**
  Band Shaped Keratopathy 172; Corneal Graft 173; Dellen 176; Prominent Corneal Nerves 176; Vortex Keratopathy 176; Corneal Rings and Lines 176; Corneal Hypoesthesia 176; Corneal Crystals 177; Contact Lens 177; Amniotic Membrane Transplantation 178; Keratoprosthesis 17

4. Iris and Anterior Chamber Abnormalities **180**
Karthikeyan A.S.

- **INTRODUCTION 180**
- **ANTERIOR CHAMBER ABNORMALITIES 180**
  Hypopyon 180; Hyperolean 181; Hyphema 183; Candy Stripe Sign 184; Corneal Blood Staining 184;
- **IRIS 184**
  Heterochromia Iridis 184; Iris Freckle 186; Iris Mamillations 186; Lisch Nodules 186; Brushfield Spots 187; Juvenile Xanthogranuloma 187; Iris Transillumination Defect 187; Prominent Iris Vessels 187; Neovascularization of Iris 188; Ectropion Uvea 188; Iris Cyst 188; Anterior Chamber Intraocular Lens 188; Iris-supported Intraocular Lens 190; Peripheral Anterior Synechiae 190; Iris Atrophy 190; Keratic Precipitates 190

5. Pediatric Cataract and Lens Abnormalities **192**
Karthikeyan A.S.

- **INTRODUCTION 193**
  Symptoms of Pediatric Cataract 193; Signs of Poor Vision 193
- **PEDIATRIC CATARACT EVALUATION 194**
  History 194; Examination 194; Pediatrician Referral 194; Investigations 195; Treatment Options 196
- **MORPHOLOGY OF PEDIATRIC CATARACTS 196**
  Importance of Recognizing Morphology 196; Total Cataracts 196; Congenital Morgagnian Cataract 196; Membranous Cataracts 197; Anterior Polar Cataracts 197; Anterior Pyramidal Cataracts 197; Anterior Subcapsular Cataracts 197; Anterior Lenticonus 197; Vossius Ring 197; Zonular Cataracts 197; Ant-Egg Cataracts 198; Central Pulverulent Cataracts 200; Nuclear Cataracts 200; Coralliform Cataracts 200; Sutural Cataracts 200; Coronary Cataracts 202; Crystalline Cataracts 202; Floriform Cataracts 202; Posterior Cataracts 202; Punctate Cataracts 204; Sectoral Cataracts 205; Sunflower Cataract 205; Complicated Cataract 205; Persistent Fetal Vasculature 205; Special Morphological Forms of Cataracts in Metabolic and Systemic Disorders 206
- **ETIOLOGY OF PEDIATRIC CATARACTS 206**
- **OCULAR ASSOCIATIONS OF CONGENITAL CATARACT 207**
  Anterior Segment 207; Posterior Segment 209
- **SYSTEMIC ASSOCIATIONS OF CONGENITAL CATARACT 209**
  Visually Significant Cataract 210; Poor Prognostic Indicators 210
- **ECTOPIA LENTIS 213**
  Causes 213; History 213; Clinical Evaluation 213; Marfan Syndrome 216; Homocystinuria 221; Weill-Marchesani Syndrome 227; Microspherophakia Hernia Syndrome 227; Sulfite Oxidase Deficiency 227; Ectopia Lentis et Pupillae 227; Megalophthalmos 227; Trauma 227; Management 227
- **PEDIATRIC CATARACT SURGERY 237**
  Indications for Surgery 237; Time of Surgery 237; Time Interval between Surgeries 237
- **GUIDELINES FOR INTRAOCULAR LENS POWER CALCULATIONS 242**
- **COMPLICATIONS OF PEDIATRIC CATARACT SURGERY 243**
  Per-operative Complications 244; Postoperative Complications 244; Postoperative Iritis 244; Postoperative Iritis and Fibrin Membrane Formation 244; Endophthalmitis 244; Iris Prolapse 244; Pupil Peaking 245; Decentration of Intraocular Lens 246; Refractive Surprises 246; Hyphema 246; Glaucoma 246; Posterior Capsule Opacification 246; Pupillary Capture 248; Capsular Phimosis 248; Cystoids Macular Edema 248; After Cataract Formation 248; Iridocapsular Adhesions 248; Corneal Decompensation 248; Pediatric Cataract Surgery 250; Intraocular Lens Materials 252
- **VISUAL REHABILITATION 258**
  Aphakic Glasses 258; Pseudophakia 261; Bifocals 263

6. Pediatric Glaucoma **264**
Karthikeyan A.S.

- **INTRODUCTION 265**
- **CHILDHOOD GLAUCOMAS 265**
  Primary Glaucomas 265
- **TONOMETRY 266**
  Recording Intraocular Pressure 266; Tonometry 266; Applanation Tonometer 266
- **GONIOSCOPY 268**
  Technique of Gonioscopy 268; Documentation of Gonioscopy Findings 270; Indications for Gonioscopy 271; Contraindications for Gonioscopy 271

- **SYMPTOMS AND SIGNS 271**
- **OCULAR ASSOCIATIONS 271**
  Clinical Conditions Associated with Glaucoma 271
- **EXAMINATION UNDER ANESTHESIA 278**
  Equipments 278; Sequence of Examination Under Anesthesia 282; Practical Tips 285; Corroborating the Findings of the Examination 285
- **DIFFERENTIAL DIAGNOSIS 285**
- **GLAUCOMA RELATED TO UVEITIS 289**
- **SECONDARY GLAUCOMAS 289**
  Malignant Glaucoma 290; Glaucoma Associated with Increased Episcleral Venous Pressure 290; Glaucoma Related to Intraocular Infection 290; Secondary Glaucomas Associated with Hereditary Ocular Conditions 290; Silicone Oil 290; Trauma 290; Hyphema 291; Ghost Cell Glaucoma 291; Lens-Related Glaucoma 291; Intraocular Neoplasm 291; Iris cyst 291; Steroid Induced Glaucoma 293; Neovascular Glaucoma 293; Angle-Closure Glaucoma 293; Glaucoma in Coats' Disease 293
- **DISC EVALUATION 293**
  Normal Disc Appearance 294; Size of the Disc 300; Megalopapilla 300; Color and Contour of the Neuroretinal Rim 300; Nerve Fiber Layer 301; Nerve Fiber Layer Defects 301; Peripapillary Atrophy 301; Differentiating Neuro-Ophthalmological and Glaucomatous Disc 301; Myopia and Glaucoma 302; Myopic Disc and Glaucomatous Disc 302; Advanced Glaucomatous Cupping 302; Differential Diagnosis of the Glaucomatous Disc 302
- **MEDICAL MANAGEMENT 302**
- **SURGICAL OPTIONS 304**
  Goniotomy 305; Complications of Goniotomy 305; Trabeculotomy 306; Complications of Trabeculotomy-Trabeculectomy 307; Complications of Trabeculectomy 307; Shunt Procedures 307; Complications of Shunt Procedures 307

SECTION 2: Pediatric Posterior Segment Abnormalities and Trauma

7. Pediatric Retinal Disorders and Uveitis 313
Karthikeyan A.S., Ragunanthan Byanju

- **INTRODUCTION 314**
- **EXAMINING TECHNIQUE 314**
  Direct Ophthalmoscope 314; Slit Lamp Fundus Biomicroscopy 317; Indirect Ophthalmoscopy in Children 319
- **SEQUENCE OF FUNDUS EXAMINATION 323**
- **PRACTICAL EXAMINATION TIPS FOR RETINOPATHY OF PREMATURITY 323**
  Requirements 323; Examination Technique 323; Choice of Lens/Sequence of Lens 323; Examining Sequence 323
- **RETINITIS PIGMENTOSA 325**
  Typical Retinitis Pigmentosa 325; Ocular Associations 325; Systemic Associations 325
- **SYSTEMIC EVALUATION OF PIGMENTARY RETINOPATHY 327**
  History 327; Examination 327; Ethnicity 328; Age at Presentation 328; Examination 329
- **PSEUDORETINITIS PIGMENTOSA 332**
- **CONGENITAL STATIONARY NIGHT BLINDNESS 332**
  CSNB with Abnormal Fundus 332; CSNB with Myopia, Nystagmus and Reduced Visual Acuity 333
- **INHERITED CHOROIDAL DYSTROPHIES 333**
  Gyrate Atrophy of Choroid 333; Choroideremia 334
- **FLECKED RETINA 335**
  Stargardt's Disease and Fundus Flavimaculatus 337; Retinitis Punctata Albescens 338; Flecked Retina of Kandori 340; Benign Familial Fleck 340; Kyamura Fundus 340; Bietti's Cornea Retinal Dystrophy 341; Dominant Drusen 341
- **INHERITED MACULAR DYSTROPHIES 342**
  Rod Monochromatism 342; Blue Cone Monochromatism 342; Progressive Cone Dystrophy 343; Pattern Dystrophy 343; Best Vitelliform Macular Dystrophy 344

- **LEBER'S CONGENITAL AMAUROSIS 344**
- **HEREDITARY VITREORETINOPATHIES 348**
  Congenital Retinoschisis 348; Goldmann-Favre Syndrome 348; Stickler Syndrome 348; Wagner Syndrome 348; Kniest Syndrome 348; Familial Exudative Vitreoretinopathy 349; Autosomal Dominant Vitreoretinochoroidopathy 349; Autosomal Dominant Neovascular Inflammatory Vitreoretinopathy 349; Snowflake Degeneration 349
- **NIGHT BLINDNESS IN CHILDREN 349**
  History 349; Clinical Examination and Workup 349; Clinical Conditions Causing Night Blindness 349; Steps in the Diagnosis 350
- **VASCULAR ABNORMALITIES 350**
  Coats' Disease 350; Capillary Hemangioma 350; Retinal Cavernous Hemangioma 351; Racemose Hemangioma 351; Congenital Vascular Tortuosity 351; Diabetic Retinopathy 351; Radiation Retinopathy 352; Malignant Hypertension 352; Retinal Vasculitis 352; Dragged Disc 352
- **CHORIORETINITIS AND RETINOCHOROIDITIS 352**
  Toxocariasis 353; Toxoplasmosis 357; Serpiginous Choroiditis 358; Sympathetic Ophthalmia 359; Vogt-Koyanagi-Harada Syndrome 359
- **RETINAL DETACHMENT IN CHILDREN 360**
  Retinal Detachment 361
- **PIGMENTED LESIONS AND BACKGROUND ALTERATIONS IN SPECIFIC CLINICAL CONDITIONS 362**
  Choroidal Nevus 362; Bear Track Lesions 362; Sturge-Weber Syndrome 362; Nevus of Ota 363; Choroidal Tear 363

8. Retinopathy of Prematurity 369
Anamika Tandon

- **RETINAL VASCULARIZATION 369**
- **PATHOGENESIS OF RETINOPATHY OF PREMATURITY 369**
- **CLASSIFICATION OF RETINOPATHY OF PREMATURITY 370**
  Location 370; Extent 370; Staging 370; Plus Disease 371
- **REGRESSION OF RETINOPATHY OF PREMATURITY 371**
- **SCREENING CRITERIA 371**
  Screening Protocol 372
- **TREATMENT 372**
  Criteria 372
- **NEW CONCEPTS 375**
- **RETINOPATHY OF PREMATURITY, PREMATURITY AND VISUAL PROBLEMS 375**

9. Pediatric Ocular Trauma 377
Karthikeyan A.S.

- **OCULAR TRAUMA TERMINOLOGY 378**
- **BIRMINGHAM EYE TRAUMA—CLASSIFICATION 378**
  Type 378; Grading 378
- **LESIONS OF BLUNT OCULAR TRAUMA 379**
  Blunt Trauma 379; Lesions of the Conjunctiva 379; Lesions of the Cornea 379; Lesions of the Iris and Ciliary Body 379; Lesions of the Lens and Zonule 381; Lesions of the Choroid 381; Lesions of the Retina 382; Lesions of the Optic Disc 382
- **BLUNT ORBITAL TRAUMA 384**
  Campbell's Seven Rings of Blunt Trauma 384
- **EYELID LACERATION 384**
- **VALSALVA INDUCED INJURY 384**
- **CHEMICAL INJURIES 384**
  Management 385
- **THERMAL INJURY 390**
- **ELECTRICAL INJURY 390**
- **FOREIGN BODY 390**
- **INTRAOCULAR FOREIGN BODY 390**
  Imaging Modalities 394

- **OPEN GLOBE INJURY 396**
  Penetrating Injury 396
  Sympathetic Ophthalmia 396
- **CHILD ABUSE 402**
  Ophthalmic Findings in Child Abuse 402; Iatrogenic/Whiplash Injury 402
- **PEDIATRIC EYE TRAUMA EVALUATION 403**
  History 403
  Examination 403
- **PLANNING AND PREPARATION OF EYE TRAUMA PATIENT FOR SURGERY 406**
  Minimize Further Injury 406; Improving Surgical Objectives 408; Minimize Risk of Infection 408; Reduce Risk to Patient's General Health 408; Reduce Medicolegal Risk 408

10. Ultrasonography in Children **409**
Praveen Krishna, Karthikeyan A.S., Vasumathy Vedantham

- **INTRODUCTION 410**
  Indications 410; Contraindications 410; Practical Difficulties in Children 410; Some Practical Tips 410
- **AXIAL LENGTH 410**
  Myopia 410; Nanophthalmos 410; Silicone Oil 411
- **EXCAVATED LESIONS 411**
  Posterior Staphyloma 411; Retinochoroidal Coloboma 411; Morning Glory Disc 411; Disc Coloboma 411; Cupping of Disc 411
- **POINT OR DOT-LIKE ECHOES 411**
  Endophthalmitis 412; Vitreous Hemorrhage 412; Posterior Capsule Rent with Cortex in Vitreous 413
- **MEMBRANOUS ECHOES 413**
  Posterior Vitreous Detachment 413; Retinal Detachment 413; Tractional Retinal Detachment 414; Choroidal Detachment 414; Persistent Fetal Vasculature 415
- **TRAUMA AND INTRAOCULAR FOREIGN BODY 415**
  Penetrating Injury 415; Optic Nerve Avulsion 415; Intraocular Lens 416
- **INTRAOCULAR AND ORBITAL MASS LESIONS 416**
  Retinoblastoma 416; Choroidal Melanoma 416; Choroidal Hemangioma 417; Orbital Cyst 417; Orbital Hemorrhage 419
- **INFLAMMATORY LESIONS 419**
  Posterior Scleritis 419; Elevated lesions 419
- **EXTRAOCULAR MUSCLE EXAMINATION 419**
  Slipped Muscle: Lost/Slipped Muscle 419; Enlarged Rectus Muscle 419

SECTION 3: Visual Acuity, Refraction and Amblyopia

11. Visual Acuity Assessment and Amblyopia Management **423**
Karthikeyan A.S.

INTRODUCTION 424
VISUAL ACUITY ASSESSMENT IN CHILDREN 424
- **INTRODUCTION 424**
- **STANDARD VISION AND NORMAL VISION 424**
- **DIFFERENCE IN VISUAL ACUITY 424**
- **PREVERBAL CHILDREN 425**
  Infants 425; Toddlers 425; HOTV Test 430
- **NEAR VISION TESTING 430**
  Near Visual Acuity Charts 430
- **VISUAL BEHAVIOR 431**
- **PRACTICAL TIPS IN RECORDING VISUAL ACUITY IN CHILDREN 432**
- **IMPORTANT CLINICAL CONSIDERATIONS 433**

AMBLYOPIA MANAGEMENT 433

- **AMBLYOPIA 433**
  Definition 433; Causes 433; Types 433; Risk Factors for Amblyopia 435; Diagnosis 435; Severity 435; Workup 435; Treatment 435
- **CLINICAL CLUES FOR JUDGING THE PRESENCE AND, IN SOME INSTANCES, THE SEVERITY OF AMBLYOPIA IN DIFFERENT CLINICAL SITUATIONS 437**
  Refractive Error 437; Ptosis 437; Cataract 438; Cornea 441; Strabismus 444; Glaucoma 445; Congenital Optic Nerve and Retinal Abnormalities 445; Nystagmus 446; Neuro-ophthalmology 446
- **PEDIATRIC EYE DISEASE INVESTIGATOR GROUP STUDIES 447**
  Congenital Esotropia Observation Study 447; Randomized Trial Comparing Part-Time Versus Minimal-Time Patching for Moderate Amblyopia 447; A Randomized Trial Comparing Part-Time Versus Full-Time Patching for Severe Amblyopia 447; An Observational Study on Recurrence of Amblyopia after Discontinuation of Treatment 448; A Randomized Trial Comparing Daily Atropine Versus Weekend Atropine for Moderate Amblyopia 448; An Evaluation of Treatment of Amblyopia in 7 Years to Less than 18 Years Old 448; A Randomized Trial to Evaluate 2 Hours of Daily Patching for Amblyopia in Children 3 Years to Less than 7 Years Old 448; A Randomized Trial Comparing Atropine to Atropine Plus a Plano Lens for the Sound Eye as Prescribed Treatments for Amblyopia in Children 3 Years to Less than 7 Years Old 448; A Randomized Trial of Near Versus Distance Activities while Patching for Amblyopia in Children 3 years to Less than 7 Years Old 449; A Randomized Trial Comparing Patching to Atropine for Amblyopia in Children 7 Years to Less than 13 Years Old 449; Effect of Amblyopia Treatment on Ocular Alignment 449
- **PATCHING THERAPHY 449**
  Questions to be Asked During Follow-up of Patching Therapy 449; About the Eye 449; About Patching 449; Behavior of Child 449; Questions Regarding Glasses 450; Ask the Parents for the Following 450; Judge the Ability of the Parents in the Following Areas 450; Other Applications of Patching 450

12. Pediatric Refractive Errors, Contact Lens and Low-Vision Rehabilitation 451
Karthikeyan A.S., Sundip Gurung, Ramesh Chandra Giri, Hari Bahadur Thapa

- **PEDIATRIC REFRACTION 451**
  Myopia 452; Hyperopia 453; Astigmatism 454; Anisometropia 455; Important Practical Steps and Tips for Pediatric Refraction 456
- **PEDIATRIC CONTACT LENSES 459**
  Indications 459; Pediatric Aphakia Management 460; Mensuration of the Infant Eye 462; Contact Lens for Pediatric Aphakia 463
- **PEDIATRIC LOW VISION 467**
  Referral to Low-Vision Services 468; Pediatric Eye Disorders that Might Require Low-Vision Evaluation 468; Skills Required for Low-Vision Service Delivery 469; Assessment of Magnification Needed 469; Equipment Needed for Low-Vision Services 469; Guidelines for Referral to Education by Eye Care 469; Assessment of Low-Vision 470; Nonoptical Devices 471; Optical Devices 471

VOLUME 2

SECTION 4: Strabismus

13 Strabismus 477
Karthikeyan A.S.

- **NTRODUCTION 479**
- **STRABISMUS EVALUATION 479**
  History 480; Equipments Required for an Examination 480; Stereopsis 480; Anomalous Head Posture 483; Facial Asymmetry 483; Pseudostrabismus 483; Cover Test/Uncover Test and Alternate Cover Test 485; Clinical Applications 487
- **OCULAR MOTILITY EXAMINATION 490**
  Requirements 490; Technique 491; Postrotatory Nystagmus 495; Action of Extraocular Muscles 495; Terminology 496; Grading of Overaction and Underaction of Muscles 496; Muscle Sequel 499; Parks' Three-Step Test 500; Interpretation 502; Torsion 506

- **PRISMS 507**
  Principle of Prism 507; Parts of a Prism 507; Angle of Deviation Depends on 507; Nature of Image 507; Material of Prism 507; Clinical Availability 507; Based on the Mechanism of Action 507; Power of a Prism 507; Placing the Prism for Examination 507; Prism Placement 507; Effect of Spectacle Lens Power on Measurement of Deviation 510; Tests Involving Prisms 514
- **MEASUREMENT OF DEVIATION 514**
  Pitfalls in Measuring the Deviation 514; Selecting the Prism 516
- **TESTS WITH PRISMS 516**
  Krimsky Test 516; Modified Krimsky 516; Simultaneous Prism Cover Test 516; Alternate Prism Cover Test 518; Four Prism Diopter Test 518; To Find Fixation Preference 518
- **ASSESSMENT OF TORSION 518**
  Subjective Test 518; Objective Assessment 519; Indirect Ophthalmoscope View 519
- **FIXATION PATTERN 519**
  Binocular Fixation Pattern: Grading 521; CSM Notation 522
- **FORCE DUCTION TEST 522**
  Requirements 522; Procedure and Interpretation 522
- **SENSORY ASPECTS OF STRABISMUS 522**
  Worth Four-Dot Test 525; Bagolini Striated Glasses 525; Fusion 525; Monocular Clues for Depth Perception 526; Confusion 526; Diplopia 526; Eccentric Fixation 527; Anomalous Retinal Correspondence 527; Suppression 527
- **ACCOMMODATIVE CONVERGENCE/ACCOMMODATION RATIO 527**
  Methods of Detection 527; Clinical Accommodative Convergence/Accommodation 528
- **MYOPIA AND STRABISMUS 528**
  Squint Assessment 528; Management 528; Surgical Considerations 528
- **HYPERMETROPIC EYE 528**
  Squint Assessment 528; Management 528; Surgical Considerations 528
- **EVALUATION OF ASTHENOPIA IN CHILDREN 528**
  Symptoms 528; History 529; Examination 529; Normal Fusional Amplitude Range 529
- **ESODEVIATIONS 530**
  Classification 530; Approach to a Child with Esotropia 531; Essential Infantile Esotropia 532; Acquired Esotropia 534; Accommodative Esotropia 536; Recent Classification 536; Partial Accommodative Esotropia 536; Decompensated Accommodative Esotropia 538
- **BASIC ESOTROPIA 538**
- **MICROTROPIA OR MONOFIXATIONAL ESOTROPIA 538**
- **SENSORY ESOTROPIA 538**
- **EXODEVIATIONS 538**
  Classification of Exodeviations 538; Infantile Exotropia 540; Intermittent Exotropia 541; Constant Exotropia 544; Sensory Exotropia 544
- **VERTICAL DEVIATIONS 545**
  Dissociated Strabismus Complex 545; Horizontal and Vertical Strabismus 549
- **PATTERN STRABISMUS 549**
  Head Posture 549; Workup 549
- **CYCLOVERTICAL HETEROTROPIAS 549**
  Apparent Oblique Muscle Dysfunction 549
- **INFERIOR OBLIQUE OVERACTION 562**
  Clinical Features 562; Workup 562; Management 562
- **INFERIOR OBLIQUE PALSY 562**
- **SUPERIOR OBLIQUE UNDERACTION 563**
- **SUPERIOR OBLIQUE OVERACTION 563**
- **COMMON CONDITIONS WITH DIFFERENT PATTERN DEVIATIONS 563**
  V-Esotropia 563; V-Exotropia 563; A-Esotropia 563; A-Exotropia 563; Management 563

- **PALPEBRAL FISSURE IN STRABISMUS PATIENT 563**
  Ptosis 563; Lid Retraction 564; Cogan's Lid Twitch and Lid Hop 564; Narrowing of Lid Fissure 564; Widening of Lid Fissure 564; Higher Position of Lower Lid 564; Lower Lid Retraction 564; Mongoloid and Anti-Mongoloid Slant 564; Epicanthic Folds 564; Iatrogenic 564; Mongoloid Slant and Anti-Mongoloid Slant 564
- **RESTRICTIVE STRABISMUS 564**
  Dysthyroid Ophthalmopathy 564; Buckle Related Strabismus 573; Muscle Entrapment 575; Glaucoma Drainage Implant Related Strabismus 575; Strabismus Fixus 575; Myopic Restrictive Strabismus 576
- **MONOCULAR ELEVATION DEFICIT 581**
  Clinical Features 581; Differentiating the Three Types 581; Congenital and Acquired Monocular Elevation Deficit 584
- **PARALYTIC STRABISMUS 587**
  Oculomotor Nerve Palsy 587; Isolated Oculomotor Nerve Palsy 587; Congenital Third Nerve Palsy 598; Trochlear Nerve palsy 600; Bilateral Superior Oblique Palsy 603; Abducens Nerve Palsy 603
- **MULTIPLE CRANIAL NERVE PALSY 613**
  Cavernous Sinus Thrombosis 617; Superior Orbital Fissuritis 617; Orbital Apex Syndrome 617; Carotid-Cavernous Fistula 617
- **STRABISMUS SYNDROMES 617**
  Duane Retraction Syndrome 619; Brown Syndrome 632; Möbius Syndrome 639; Lid Retraction 639
- **OCULAR MOTILITY IN NEURO-OPHTHALMOLOGICAL DISORDERS 639**
  Internuclear Ophthalmoplegia 642; Wall-Eyed Bilateral Internuclear Ophthalmoplegia 642; One-and-Half Syndrome 642; Gaze Palsy 642; Oculogyric Crisis 645; Skew Deviation 645; Wernicke's Encephalopathy 645; Convergence Insufficiency 645; Myasthenia Gravis 645; Myotonic Dystrophy 653; Chronic Progressive External Ophthalmoplegia 657; Progressive Supranuclear Palsy 660; Congenital Fibrosis of the Extraocular Muscles 662; Strabismus in Other Neurological Disorders 664; Dorsal Midbrain Syndrome 664
- **ORBITAL CAUSE OF STRABISMUS 664**
  Blowout Fracture 664; Orbital Tumors 671; Postorbitotomy—Inferior Rectus Weakness 671; Strabismus in Craniosynostosis 671
- **MISCELLANEOUS 677**
  Lost Muscle/Slipped Muscle 677; Re-surgeries 683; Abnormal Angle Kappa 684; Complications of Strabismus Surgery 684; Anti-elevation Syndrome 686

SECTION 5: Orbit and Pediatric Ocular Oncology

14. Pediatric Orbital Disorders **691**
Karthikeyan A.S.

- **INTRODUCTION 692**
- **PROPTOSIS EVALUATION 692**
  History 692
- **CLINICAL EXAMINATION 692**
  Requirements 692; Technique of Examination 692
- **BENIGN ORBITAL TUMORS 700**
  Dermoid 700; Epidermoid Cysts 700; Lipodermoids 700; Lymphangioma 702; Orbital Venous Malformation 703; Optic Nerve Tumor 705; Optic Nerve Glioma 705
- **TRAUMATIC PROPTOSIS 707**
  Retrobulbar Hemorrhage 707
- **INFECTION AND INFLAMMATION 711**
  Orbital Cellulitis 711; Parasitic Infection 713; Idiopathic Orbital Inflammation (Pseudotumor of Orbit) 713
- **CONGENITAL LESIONS 714**
- **SYSTEMIC DISORDERS 714**
  Dysthyroid Ophthalmopathy 714; Craniosynostosis 714
- **MALIGNANT TUMORS 717**
  Leukemia 717; Proptosis 717; Rhabdomyosarcoma 717

- **INTRAOCULAR TUMOR PRESENTING AS PROPTOSIS 719**
- **SINUS DISEASE PRESENTING AS PROPTOSIS 720**
- **NASOPHARYNGEAL TUMORS 720**
- **INTRACRANIAL LESIONS PRESENTING AS PROPTOSIS 722**
- **SYSTEMIC MALIGNANCY PRESENTING AS PROPTOSIS 722**
  Metastatic Neuroblastoma 722; Orbital Procedures and Surgery for the Pediatric Ophthalmologist 723; Dermoid Surgery 723
- **RARE CAUSES OF PROPTOSIS AND ORBITAL TUMORS IN CHILDREN 724**
  Congenital Teratoma of the Orbit 724; Aneurysmal Bone Cyst 726; Fibrous Dysplasia of Orbit 727; Ossifying Fibroma 728; Ewing's Sarcoma 728

15. Pediatric Ocular Oncology: Retinoblastoma and Leukemia 730
Karthikeyan A.S., Manoj V Parulekar, Marie-Anne Brundler

RETINOBLASTOMA 731
- **INTRODUCTION 731**
- **ROLE OF PEDIATRIC OPHTHALMOLOGIST 731**
- **CLINICAL PRESENTATIONS 732**
  Symptoms 732; Signs 732; Atypical Presentations 732
- **LEUKOCORIA 732**
  History 732; Examination 735; Investigations 735; Leukocoria: Differential Diagnosis 735
- **INTERNATIONAL INTRAOCULAR RETINOBLASTOMA CLASSIFICATION 739**
- **INTERNATIONAL STAGING OF RETINOBLASTOMA 739**
- **13q DELETION SYNDROME 739**
- **MANAGEMENT 741**
  Chemotherapy 741; Indications 743; Chemotherapy Protocols 743; Investigations Prior to Commencing Chemotherapy 744; Side Effects of Chemotherapy 744; Management of Intraocular Relapses Following Prior Treatment with Standard First-Line Chemotherapy 745
- **PERIOCULAR CHEMOTHERAPY 746**
  Indications 746; Technique 746; Dose 746; Advantages 746; Side Effects and Complications 746; Alternatives 747
- **INTRA-ARTERIAL CHEMOTHERAPY 747**
  Indications 747; Technique 747; Advantages 747; Disadvantages and Complications 747
- **CRYOTHERAPY 748**
  Indications 748; Technique 748; First Treatment 748; Second Treatment 748; Limitations 748
- **LASER PHOTOCOAGULATION 748**
  Transpupillary Thermotherapy 749; Limitations 749
- **BRACHYTHERAPY (PLAQUE RADIOTHERAPY) 749**
  Indications 749; Types of Plaque 750; Dosage 750; Placement of the Plaque 750; Advantages of Plaque 750; Disadvantages 751
- **ENUCLEATION 751**
  Indication 751; Important Points to be Considered Prior Enucleation 751; Practical Tips 752; Technique 752; Orbital Implants 752; Artificial Eye 753
- **DERMIS FAT GRAFT 753**
  Indications 753; Contraindications 753; Complications 753
- **EXTERNAL BEAM RADIOTHERAPY 753**
  Indications 753
- **SCHIPPER TECHNIQUE 753**
  Whole Eye 753; Other Primary Tumor Formation 753
- **OTHER NEW TECHNOLOGIES 755**
  Proton Beam Radiation Therapy 755; Conformal Radiation 755
- **PATHOLOGY OF RETINOBLASTOMA 755**
  Examination of Enucleation Specimens for Retinoblastoma 755; Molecular Genetic Studies 756; Risk of Metastasis 756; Prognostic Indicators 756; Flexner-Wintersteiner Rosettes 757; Homer-Wright Rosettes 761; Fleurettes 761; Retinocytoma 761; Histopathology of Conditions that Clinically Mimic Retinoblastoma 761

- **GENETICS OF RETINOBLASTOMA 761**
  The Retinoblastoma gene 761; Importance of Genetic Testing 763; Algorithm 763
- **RISK ASSESSMENT 765**
  Sporadic Somatic 765; 13q Deletion 766; Bilateral/Hereditary 766
- **FOLLOW-UP PROTOCOLS WHERE GENETIC TESTING IS CURRENTLY NOT AVAILABLE 766**

OCULAR MANIFESTATIONS OF LEUKEMIA 767
- **INTRODUCTION 767**
- **CLASSIFICATION 767**
- **OPHTHALMOLOGICAL MANIFESTATIONS 770**
  Anterior Segment 770; Orbit Involvement 770; Posterior Segment Involvement 771; Systemic Manifestations 771; Practical Pearls 771

SECTION 6: Neuro-Ophthalmology

16. Neuro-Ophthalomology (Pediatric and Adult) 775
Karthikeyan A.S., Vikrant Agarwal

INTRODUCTION 778
EXAMINATION TECHNIQUES 778
- **PUPIL EXAMINATION 778**
  Requirements 778; Technique 778; Swinging Flash Light Test 780; Testing for Relative Afferent Pupillary Defect 780; Total Afferent Pupil Defect 780; Relative and Total Afferent Pupil Defect 780; Light Near Dissociation 781; Horner Syndrome 784; Oculomotor Nerve Palsy 784; Pupil Gaze Dyskinesis 784; Uveitis 784; Paradoxical Pupil Response 784; Anisocoria 787
- **CORNEAL SENSATION 788**
  Requirements 788; Practical Tips 788
- **CONFRONTATION FIELDS 788**
  Some Clues from History 791; Importance of Confrontation Visual Fields 792; Test Requirements 792; Procedure 793; Color Desaturation Test 793; Blind Spot 793; Periphery Testing 793; Normal Values 793; Homonymous Hemianopia/ Quadrantic Field Defects 793; Bitemporal Hemianopia 793; Optic Tract Lesion 793; Optokinetic Nystagmus Tape in Detecting the OKN Response in a Patient with Field Defect 794; Effect of Strabismus Surgery on Visual Fields 795
- **NEUROLOGICAL EXAMINATION 795**
  Higher Functions 795; Pupil 796; Motor System 796; Sensory System 796; Cerebellar System 797; Auscultation 797; Testing the Integrity of the Neurological System 797; Diagnosis 798; Field Defects: Significance in Localization 799; Cranial Nerves 799

CLINICAL CONDITIONS 799
- **CONGENITAL OPTIC DISC ANOMALIES 799**
  Retinochoroidal Coloboma 800; Dysplastic Disc 800; Optic Disc Pit 800; Coloboma of the Optic Disc 800; Morning Glory Disc 800; Peripapillary Staphyloma 800; Optic Disc Drusen 803; Myelinated Nerve Fibers 805; Bergmeister's Papilla 806; Optic Nerve Hypoplasia 806; De Morsier Syndrome 807; Megalopapilla 808; Tilted Disc Syndrome 808; Situs Inversus 808; Disc in Myopia 812; Dragged Disc 812; Disc in Down Syndrome 812; Vascular Anomalies 812; Tumors 817
- **PAPILLEDEMA 819**
  Symptoms 819; Causes of Increased Intracranial Tumors 819; Fundus Signs 819; Stages of Papilledema 819; Workup 820; Differential Diagnosis 821; Management 822
- **PAPILLEDEMA IN CHILDREN 823**
  Evaluation 823; Examination 825; Special Points to Remember 825; Pseudotumor Cerebri 826; Management 826
- **INTRACRANIAL TUMORS 826**
  Introduction 826; Frontal Lobe 827; Parietal Lobe 827; Temporal Lobe 828; Occipital Lobe 828; Meningioma 828; Olfactory Groove Meningioma 828; Sphenoid Wing Meningioma 828; Parasagittal Meningiomas 830; Suprasellar Mass 833; Pitutary Tumors 834; Craniopharyngioma 838; Cavernous Sinus Tumors 839; Cerebellar Tumors 842; Cerebellopontine Angle Tumors 844; Midbrain and Pineal Gland Tumors 844; Pontine Tumors 850; Tumors of the Third Ventricle 852; Tumors of the Ventricle System 854; Intraocular Tumor Presenting with Intracranial Manifestation/Extension 858; Tumors Arising from Olfactory Tract 858; Central Nervous System Lymphoma 858; Multiple Intracranial Tumors 859; Optociliary Shunt Vessels 859

- **DISC EDEMA DIFFERNTIAL DIAGNOSIS 860**
- **HYDROCEPHALUS 860**
  Types 860; Causes of Hydrocephalus 860; History 860; Macrocephaly 860; Examination 860; Investigations 861; Follow-up 862; Practical Tips 862
- **OPTIC NEURITIS 865**
  Symptoms 865; Signs 865; Workup 866; Typical Optic Neuritis/Atypical Optic Neuritis 866; Multiple Sclerosis 866; Devic's Disease 866; Summary of Findings of the Optic Neuritis Treatment Trial 869; Treatment 869
- **NEURORETINITIS 869**
  Symptoms 869; Signs 869; Workup 870; Management 870
- **ANTERIOR ISCHEMIC OPTIC NEUROPATHY 870**
  Decision Making 870
- **NON-ARTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY 871**
  Symptoms 871; Signs 871; Risk Factors 871; Differential Diagnosis 872; Workup 872; Management 873; Practical Tips 873
- **ANTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY—GIANT CELL ARTERITIS 874**
  Presentation 874; History 874; Symptoms 874; Signs 874; Workup 874; Management 874 Practical Pearls 874
- **DISC PALLOR 875**
  Decisions to Arrive 875; History 875; Examination 877; Hereditary Optic Atrophy 879
- **LEBER'S HEREDITARY OPTIC NEUROPATHY, NUTRITIONAL, TOXIC, COMPRESSIVE AND INFILTRATIVE OPTIC NEUROPATHY 879**
  Leber's Hereditary Optic Neuropathy 879; Nutritional and Toxic 879; Compressive Optic Neuropathy 879; Infiltrative Optic Neuropathy 882
- **TRAUMATIC OPTIC NEUROPATHY 883**
  History 883; Symptoms 883; Signs 884; Workup 884; Management 885; Practical Points 886
- **OCULAR FINDINGS OF HEAD INJURY 886**
- **OCULAR FINDINGS IN A COMATOSE PATIENT 888**
- **NYSTAGMUS 890**
  History 890; Examination 890; Neurological Nystagmus 890; Typical Congenital Nystagmus 891; Periodic Alternating Nystagmus 891; Dissociated Nystagmus 891; Seesaw Nystagmus 891; Upbeat Nystagmus 891; Downbeat Nystagmus 891; Convergence Retraction Nystagmus 891; Superior Oblique Myokymia 892; Management 893; Surgery 893; Surgery Guidelines 893; No Face Turn and No Strabismus, Only Nystagmus 893; Nystagmus with Esotropia 893; Nystagmus Blockage Syndrome 893; Nystagmus with Esotropia and Face Turn 893; Neurological 894; Sensory Nystagmus 894
- **HEADACHE IN CHILDREN 894**
  Important Decision Making 894; History 894; Associated Complains 894; Examination 894; Referrals 895; Vision-threatening 895; Life-threatening 895
- **THE NEUROLOGICALLY IMPAIRED CHILD 895**
  Causes 895; Decision Making 895; Workup 895; Examination 895; Management 896; Cerebral Palsy 896; Cortical Visual Impairment 896; Periventricular Leukomalacia 896; Delayed Visual Maturation 897; Metabolic Encephalopathy 897
- **MALINGERING AND HYSTERIA 897**
  Symptoms 897; Tests for Malingering 897; Tests Involving Binocularity 898; Tests Based on Use of Complementary Colors 898; Pupil Reaction 898; Optokinetic Nystagmus 898; Other Methods 898; Workup 898; Conditions that could be Misdiagnosed as Malingering 899; Practical Pearls 899
- **FACIAL NERVE PALSY 899**
  Symptoms 899; Signs 899; Decision Making 899; Workup 899; Imaging 900; Referrals 900; Treatment 900
- **ESSENTIAL BLEPHAROSPASM AND HEMIFACIAL SPASM 902**
  Benign Essential Blepharospasm 902; Hemifacial Spasm 903
- **BOTULINUM TOXIN 903**
  Properties 903; Mechanism of Action 903; Indications in Ophthalmology 905; Contraindications 905; Complications 905; Technique 905; Dosage 905

- **TEMPORAL ARTERY BIOPSY 905**
  Indications 905; Biopsy 905; Technique 906; Complications 908; Biopsy Findings 908
- **OPTIC NERVE SHEATH FENESTRATION/OPTIC NERVE SHEATH DECOMPRESSION 908**
  Pseudotumor Cerebri 908

SECTION 7: Radiology

17. Radiology for the Ophthalmologist **913**
Vikrant Agarwal, Karthikeyan A.S.

- **INTRODUCTION 914**
- **INDICATIONS FOR IMAGING 914**
  When to Image? 915; Pediatric ophthalmology 915; Neuro-ophthalmology 915; What to Image? 916; What Modality of Imaging to Order? 916; What to Tell the Radiologist? 917; What to Ask the Radiologist? 918; Can this Patient Afford for the Imaging Modality? 918; What to Tell the Patient? 918
- **APPROACH TO CT SCAN OF ORBIT 919**
  Common Things to Know about a CT Scan 919; Scan Orientation 919; Scout Film 919; Points for Evaluating an Orbital Scan 920; Some Points for MRI 920
- **NORMAL IMAGING 920**
  Computed Tomography 920; Magnetic Resonance Imaging 920
- **CAVERNOUS HEMANGIOMA 928**
- **LYMPHANGIOMA 929**
- **RHABDOMYOSARCOMA 930**
- **RETINOBLASTOMA 931**
- **ORBITAL LYMPHOMA 933**
- **ORBITAL CELLULITIS 934**
- **ORBITAL CYSTICERCOSIS 935**
- **OPTIC NEURITIS 936**
- **DYSTHYROID OPHTHALMOPATHY 937**
- **IDIOPATHIC ORBITAL INFLAMMATION 938**
- **BLOWOUT FRACTURE 939**
- **OPTIC DISC DRUSEN 940**
- **CONGENITAL MALFORMATIONS OF THE BRAIN 941**
- **INTRAOCULAR FOREIGN BODY 941**
- **CENTRAL NERVOUS SYSTEM INFECTIONS AND SEQUEL OF INFECTIONS 958**
- **HYPOXIA 967**
- **HYPOGLYCEMIA 968**
- **CAVERNOUS ANGIOMA 969**
- **BASILAR ARTERY ANEURYSM 970**
- **INTERNAL CAROTID ARTERY ANEURYSM 971**
- **SUBARACHNOID HEMORRHAGE 972**
- **CAROTID CAVERNOUS FISTULA 973**
- **CRANIOSYNOSTOSIS 975**
- **SUMMARY FOR INTERPRETATION 978**
  Some Practical Tips in Competitive Examinations 978; Some Practical Tips in Clinical Setting 978

SECTION 8: The Eye in Systemic Disorders

18. Systemic Disorders **981**
Karthikeyan A.S., Shriraam Mahadevan, Subha Elango

- **INTRODUCTION 982**
- **SKIN AND EYE DISORDERS 982**
  Introduction 982; Classification of Skin Diseases 983; Oculocutaneous Albinism 983; Xeroderma Pigmentosa 985; Organoid Nevus Syndrome and Nevus of Jadassohn 985; Incontinentia Pigmenti 985; Developmental Abnormalities 988;

Sturge-Weber Syndrome 988; Nevus of Ota 988; Tuberous Sclerosis (EPILOIA) Bourneville Disease 989; Neurofibromatosis 991; Varicella 991; Herpes-Zoster Ophthalmicus 993; Steven-Johnson Syndrome 993; Staphylococcal Impetigo 993; Vitiligo 996; Human Papilloma Virus 996; Hypohidrotic/Anhidrotic Ectodermal Dysplasia 996; Nance-Horan Syndrome 996; Congenital Syphilis 999; Ocular Side Effects of Treatment for Skin Diseases 1000

- **EYE FINDINGS IN METABOLIC DISORDERS 1000**
  Introduction 1000; Suspecting a Metabolic Disorder 1001; Mucopolysaccharidosis 1001; Fabry Disease 1002; Gaucher's Disease 1004; Tay-Sachs Disease 1004; X-linked Adrenoleukodystrophy and Schilder's Disease 1005; Wilson's Disease 1006; Niemann-Pick Disease 1007; Leigh's Disease 1008; Neuronal Ceroid Lipofuscinosis 1009; Adult Neuronal Ceroid Lipofuscinosis 1009; Mitochondrial Myopathy Kearn-Sayre Syndrome 1010
- **SYNDROMES 1010**
  Introduction 1010; Down Syndrome 1012; Treacher Collins Syndrome 1012; Turner Syndrome 1012; Parry-Romberg Syndrome 1014; Hemifacial Microsomia 1016; Wildervanck Syndrome 1016; Möbius Syndrome 1018; Waardenburg Syndrome 1019; CHARGE Syndrome 1021; Fraser Syndrome 1022; Branchio-Oculo-Facial Syndrome 1024; Branchio-Oto-Renal Syndrome 1025
- **THE EYE IN ENDOCRINOLOGICAL DISORDERS 1025**
  Introduction 1025; Hypothyroidism 1025; Hyperthyroidism 1027; Pituitary Abnormalities 1028; Nelson Syndrome 1030; Wolfram Syndrome 1030; Adrenal Diseases: Pheochromocytoma 1030; Cushing's Syndrome/ Iatrogenic Cushing's Syndrome 1031; Addison's Disease 1031; Multiple Endocrine Neoplasia Syndrome 1031; Diabetes Mellitus 1032; Obesity 1032; Pinealoma 1032; Parathyroid Disorders 1032; Thymus 1032
- **EYE FINDINGS IN RENAL DISEASE 1033**
  Introduction 1033; Renal Lesions and Eye Disease 1033; General Ocular Features of Renal Failure or Renal Disease 1033; Eye Findings that need to be Looked for, Based on Specific Renal Diagnosis 1034; Urine Tests Used to Diagnose Ophthalmological Conditions 1034; Drugs to be used with Caution/Contraindicated in Renal Impairment 1035
- **THE EYE IN CARDIAC DISEASES 1035**
  Introduction 1035; The Oculo-Cardiac Connection 1035; Some Ocular Findings Associated/Related with Cardiac Abnormalities 1035; Strabismus 1035; Cornea 1035; Lens and Cataract 1035; Pupil 1036; Horner Syndrome 1036; Specific Cardiac Abnormality and Ocular Conditions to Look for 1036; Infective Endocarditis 1038; Arrhythmias 1038; Cardiac Tumors 1038; Some Syndromes with Cardiac Abnormalities 1038; Congenital Rubella Syndrome 1038
- **RESPIRATORY SYSTEM 1039**
  Introduction 1039
- **THE EYE IN GASTROINTESTINAL DISORDERS 1039**
  Blindness and Deafness 1039
- **CRANIOSYNOSTOSIS 1041**
  Introduction 1041; Clinical Types 1041; Crouzon Syndrome 1041; Apert Syndrome 1044

Appendices

I. PROTOCOLS FOR CROSS REFERRAL IN PEDIATRIC EYE CARE 1049
II. SCOPE OF WORK AND CAREER OPPORTUNITIES FOR THE PEDIATRIC OPHTHALMOLOGIST 1056
III. PEDIATRIC ANTIBIOTIC DOSES 1057
IV. FORTIFIED ANTIBIOTICS 1058
V. INTRAVITREAL ANTIBIOTICS 1059
VI. SUGGESTED READING AND INTERNET RESOURCES 1060

Index *1065*