

Contents

Preface xvii

Acknowledgments xviii

1 Introduction to the Practice of Ophthalmology 1

Practicing Ophthalmology	1
Responsibilities of the Resident	2
<i>Stress During Residency Training</i>	3
<i>Recognizing Stress and Its Sources</i>	4
Dealing with Early Discouragement	5
Ethical Considerations	5
Education and Training	6
Pitfalls and Pointers	7
Suggested Resources	7

2 Overview of the Ophthalmic Evaluation 9

History	9
Examination	10
Ophthalmic Equipment	10
Ancillary Equipment	12
Physician Demeanor and Approach to the Patient	12
<i>Pediatric Patients</i>	13
<i>Elderly Patients</i>	13
Medical Record Keeping and Communication	14
Pitfalls and Pointers	15
Suggested Resources	15

3 History Taking 17

Goals of the History	17
Methods of Recording the History	18

Components of the History	18
<i>Chief Concern</i>	18
<i>History of the Present Illness</i>	19
<i>Past Ocular History</i>	22
<i>Ocular Medications</i>	22
<i>General Medical and Surgical History</i>	23
<i>Systemic Medications</i>	23
<i>Allergies</i>	23
<i>Social History</i>	24
<i>Family History</i>	24
<i>Review of Systems</i>	24
Pitfalls and Pointers	24
Suggested Resources	25

4 **Visual Acuity Examination** **27**

Testing Conventions and Materials	27
<i>Measurement Notation</i>	27
<i>Test Targets</i>	28
<i>Standard Abbreviations</i>	29
Testing Procedures	30
<i>Distance Acuity Test</i>	30
<i>Pinhole Acuity Test</i>	31
<i>Near Acuity Test</i>	31
<i>Other Tests of Near Vision</i>	32
Acuity Tests for Patients with Special Needs	32
<i>Low-Vision Testing</i>	33
<i>Testing Children and Special Adults</i>	33
Variables in Acuity Measurements	35
Uncorrectable Visual Acuity	37
<i>Amblyopia</i>	38
Other Tests of Sensory Visual Function	39
Pitfalls and Pointers	40
Suggested Resources	40

5 **Refraction** **47**

Overview of Refraction	47
Overview of Ophthalmic Optics	48
<i>Principles of Vergence</i>	48
<i>Types of Lenses</i>	49

Refractive States of the Eye	53
Lens Notation	54
<i>Lens Transposition</i>	54
<i>Spherical Equivalent</i>	55
Lensmeter	55
Retinoscopy and Refinement	56
<i>Instrumentation</i>	56
<i>Retinoscopy Technique</i>	59
<i>Neutralization with a Retinoscope</i>	61
<i>Determining Cylinder</i>	62
<i>Summary of Retinoscopy Steps</i>	64
<i>Refinement</i>	64
<i>Cycloplegic Refraction</i>	68
<i>Duochrome Test</i>	68
<i>Binocular Balancing</i>	69
<i>Near Point and Reading Add</i>	71
Guidelines for Prescribing Glasses	72
<i>General Prescribing Guidelines</i>	72
<i>Prescriptions for Myopia</i>	73
<i>Prescriptions for Hyperopia</i>	74
<i>Prescriptions for Astigmatism</i>	75
<i>Prescriptions for Presbyopia</i>	75
Optical Fitting Considerations	76
<i>Pantoscopic Tilt</i>	76
<i>Interpupillary Distance</i>	77
Pitfalls and Pointers	78
Suggested Resources	79

6 Ocular Motility Examination 85

Strabismus Terminology	85
Motility Terminology	86
Function of the Extraocular Muscles	88
Ocular Motility Examination	89
<i>Overview of Examination</i>	89
<i>Evaluation of Eye Movements</i>	90
Tests of Alignment	90
<i>Red Reflex Test</i>	91
<i>Corneal Light Reflection Test</i>	91
<i>Cover Tests</i>	92
<i>Other Considerations with Alignment Tests</i>	95

Tests of Binocularity and Fusion	96
<i>Stereopsis</i>	96
<i>Other Tests of Binocular Status</i>	97
Pitfalls and Pointers	100
Suggested Resources	100

7 **Pupillary Examination** **105**

Anatomy of Pupillary Pathways	105
<i>Parasympathetic Pathway (Light-Reflex Pathway)</i>	105
<i>Near-Reflex Pathway</i>	107
<i>Sympathetic Pathway</i>	107
Examination of the Pupils	108
<i>General Pupillary Observation</i>	108
<i>Light-Reflex Test</i>	109
<i>Swinging Flashlight Test</i>	109
<i>Near-Reflex Test</i>	109
Abnormal Pupils	110
<i>Iris Abnormalities</i>	110
<i>Relative Afferent Pupillary Defect</i>	111
<i>Light-Near Dissociation</i>	112
<i>Horner Syndrome</i>	112
<i>The Fixed and Dilated Pupil</i>	113
Pitfalls and Pointers	115
Suggested Resources	115

8 **Visual Field Examination** **119**

The Visual Field	119
Screening Tests	121
<i>Confrontation Fields Testing</i>	121
<i>Amsler Grid Test</i>	121
<i>Special Situations</i>	122
Manual Perimetry	122
Automated Perimetry	123
<i>Test Targets and Strategies</i>	124
<i>Interpretation of a Computerized Printout</i>	124
Common Visual Field Defects	126
<i>Localizing Visual Field Defects</i>	128
<i>Progression</i>	128
Pitfalls and Pointers	128
Suggested Resources	129

9 External Examination 135

Situating the Patient	135
<i>General Observation</i>	135
Inspection	136
<i>Head and Face</i>	138
<i>Orbit</i>	139
<i>Eyelids</i>	141
<i>Lacrimal System</i>	143
<i>Globe</i>	143
Palpation	145
<i>Head and Face</i>	146
<i>Orbit</i>	146
<i>Eyelids</i>	146
<i>Lacrimal System</i>	147
<i>Globe</i>	147
Auscultation	148
Pitfalls and Pointers	148
Suggested Resource	149

10 Slit-Lamp Biomicroscopy 167

Uses of the Slit Lamp	167
Parts of the Slit Lamp	167
<i>The Viewing Arm</i>	168
<i>The Illumination Arm</i>	168
<i>The Patient-Positioning Frame</i>	169
<i>The Base</i>	169
<i>Other Attachments</i>	170
Preparing and Positioning the Patient	170
Principles of Slit-Lamp Illumination	171
<i>Diffuse Illumination</i>	171
<i>Direct Focal Illumination</i>	171
<i>Specular Reflection</i>	172
<i>Retroillumination</i>	174
<i>Indirect Lateral Illumination</i>	175
<i>Sclerotic Scatter</i>	175
Special Techniques	176
<i>The Slit Lamp as a Measuring Device</i>	176
Gonioscopy	177
<i>Fundus Examination with the Slit Lamp</i>	177
<i>Goldmann Tonometry</i>	177
<i>Slit-Lamp Photography</i>	178
Pitfalls and Pointers	178

11 Anterior Segment Examination 179

Overview of the Anterior Segment Examination	179
Lacrimal Gland and Periorbital Skin	180
Eyelid and Eyelashes	181
<i>Benign Lesions of the Eyelid</i>	181
<i>Blepharitis</i>	182
<i>Malignant Tumors of the Eyelid</i>	184
Conjunctiva	184
<i>Palpebral Conjunctiva</i>	184
<i>Limbal Conjunctiva</i>	188
<i>Bulbar Conjunctiva</i>	189
<i>Other Conjunctival Abnormalities</i>	192
Episclera and Sclera	193
<i>Episcleritis</i>	193
<i>Scleritis</i>	193
<i>Pigmentations</i>	195
<i>Involucional Hyaline Plaques</i>	195
Tear Film	196
<i>Overall Wetness</i>	196
<i>Tear Meniscus</i>	196
<i>Tear Film Breakup Time</i>	197
<i>Other Tear Film Abnormalities</i>	197
Cornea	197
<i>Epithelium</i>	197
<i>Bowman Layer</i>	199
<i>Stroma</i>	199
<i>Descemet Membrane</i>	202
<i>Endothelium</i>	202
Anterior Chamber	203
<i>Anterior Chamber Depth</i>	203
<i>Flare and Cell</i>	204
<i>Hyphema and Hypopyon</i>	204
Iris	205
<i>Nodules</i>	205
<i>Neovascularization</i>	206
<i>Tumors</i>	206
<i>Persistent Pupillary Membrane Remnants</i>	207
<i>Other Abnormalities</i>	207
Crystalline Lens	207
<i>Cataract</i>	208
<i>Subluxation and Luxation</i>	212
<i>Other Conditions</i>	212

Retrolental Space and Anterior Vitreous	213
Gonioscopy	213
Stains	216
<i>Fluorescein</i>	216
<i>Rose Bengal</i>	217
<i>Lissamine Green</i>	217
Pitfalls and Pointers	218
Suggested Resources	218

12 Tonometry 223

IOP Measurement Conventions and Population Means	223
Types of Tonometers	223
<i>Applanation Tonometers</i>	224
<i>Indentation Tonometers</i>	224
Goldmann Applanation Tonometry	225
<i>Disinfection of the Applanating Tip</i>	226
Corneal Pachymetry	226
Pitfalls and Pointers	227
Suggested Resources	228

13 Posterior Segment Examination 233

Anatomical Landmarks	233
Pupillary Dilation	237
Instrumentation for Examination	238
<i>Indirect Ophthalmoscope</i>	238
<i>Slit-Lamp Biomicroscope</i>	238
<i>Direct Ophthalmoscope</i>	240
Indirect Ophthalmoscopy	241
<i>Headset Adjustment</i>	242
<i>Choosing and Positioning the Condensing Lens</i>	243
<i>Changing Position to View Different Fundus Areas</i>	244
<i>Sequence of the Examination</i>	244
<i>Scleral Depression</i>	246
Posterior Segment Examination with the Slit Lamp	249
<i>Indirect Slit-Lamp Biomicroscopy</i>	249
<i>Contact Lens Biomicroscopy</i>	250
Direct Ophthalmoscopy	251
<i>Overview of the Examination</i>	251

The Fundus Record	253
Imaging Studies	255
<i>Photography</i>	257
<i>Angiography</i>	257
<i>Ultrasonography</i>	258
<i>Optical Coherence Tomography</i>	258
The Normal Fundus and Its Common Variations	260
<i>Optic Disc</i>	261
<i>Posterior Pole</i>	262
<i>Retinal Blood Vessels</i>	262
<i>Fundus Background</i>	263
<i>Peripheral Fundus</i>	263
<i>Vitreous Humor</i>	265
Pitfalls and Pointers	265
Suggested Resources	267

14 Ophthalmic Emergencies 279

Emergency Equipment and General Evaluation	279
<i>Pediatric Evaluation</i>	280
Ocular Trauma in the Emergency Setting	281
<i>Corneal Abrasion</i>	281
<i>Corneal Foreign Body</i>	282
<i>Eyelid Laceration</i>	283
<i>Closed-Globe Injuries</i>	283
<i>Traumatic Hyphema</i>	284
<i>Orbital Fracture</i>	285
<i>Open-Globe Injuries</i>	286
<i>Retrobulbar Hemorrhage</i>	287
Ocular Infections in the Emergency Setting	287
<i>Acute Conjunctivitis</i>	288
<i>Ophthalmia Neonatorum</i>	288
<i>Microbial Keratitis</i>	289
<i>Dendritic Keratitis</i>	290
<i>Preseptal and Orbital Cellulitis</i>	291
<i>Endophthalmitis</i>	293
Other Ocular Emergencies	293
<i>Acute Angle-Closure Glaucoma</i>	293
<i>Ocular Chemical Burn</i>	295
<i>Central Retinal Artery Occlusion</i>	296
<i>Arteritic Anterior Ischemic Optic Neuropathy</i>	297

Retinal Tears and Rhegmatogenous Retinal Detachments 298
Vitreous Hemorrhage 300
 Pitfalls and Pointers 300
 Suggested Resources 301

15 Common Ocular Medications 305

Anesthetic Agents 306
 Dyes 306
 Anti-Infective Agents 306
 Anti-Inflammatory Agents 306
 Corticosteroids 306
 Immunomodulating Drugs 310
 Nonsteroidal Anti-Inflammatory Drugs 310
 Mydriatics and Cycloplegics 310
 Glaucoma Medications 311
 More Commonly Used Agents 313
 Less Commonly Used Agents 315
 Decongestant, Vasoconstrictive, and Anti-Allergy Agents 315
 Lubricating Medications and Tear Substitutes 316
 Corneal Dehydration Medications 316
 Agents Delivered by Intravitreal Injection 316
 Anti-Vascular Endothelial Growth Factor (anti-VEGF) Agents 316
 Anti-Inflammatory Agents 317
 Anti-infective Agents 318
 Suggested Resources 318

Index 321

Activities

5-1	Retinoscopy Simulator	64
6-1	Extraocular Muscles	89
6-2	Strabismus Simulator	90

Clinical Protocols

4-1	Testing Distance Visual Acuity	41
4-2	Testing Pinhole Visual Acuity	42
4-3	Testing Near Visual Acuity	42
4-4	Testing for NPA and NPC	43
4-5	Testing Acuity for Patients With Low Vision	43
4-6	Testing an Infant's Fixing and Following Behavior	44
4-7	Performing the Induced Tropia Test in Nonstrabismic Infants	45
5-1	Using the Manual Lensmeter	79
5-2	Measuring Bifocal Power	81
5-3	Measuring Prism Power and Orientation	81
5-4	Measuring Optical Centration of Spectacle Lenses	82
5-5	Measuring Vertex Distance	83
6-1	Assessing Versions	101
6-2	Performing the Corneal Light Reflex (Hirschberg) Test	101
6-3	Performing the Krimsky Test	101
6-4	Performing the Cover-Uncover Test	102
6-5	Performing the Prism Alternate Cover Test	102
6-6	Testing Fixation Preference in Strabismic Patients	103
6-7	Testing for Stereoacuity Using the Titmus Fly Stereopsis Test	103
7-1	Performing the Light-Reflex Test	115
7-2	Performing the Swinging Flashlight Test	116
7-3	Performing the Near-Reflex Test	117
8-1	Performing the Confrontation Fields Test	129
8-2	Performing the Amsler Grid Test	133
9-1	Performing a Neurosensory Examination of the Head and Face	149
9-2	Measuring Binocular Interpupillary Distance	151
9-3	Performing Exophthalmometry	151
9-4	Measuring Globe Displacement	153
9-5	Measuring Eyelid Position	154

9-6	Everting the Eyelid	155
9-7	Estimating Anterior Chamber Depth	159
9-8	Illuminating the Inner Eye for External Viewing	160
9-9	Palpating the Orbit	162
9-10	Measuring Lacrimal Outflow in the Tearing Patient	163
9-11	Conducting Tear Production Tests for the Dry Eye	164
10-1	Measuring Lesions Linearly with the Slit-Lamp Beam	178
11-1	Sweeping the Conjunctival Sac for Foreign Bodies	219
11-2	Measuring Tear Film Breakup Time	219
11-3	Evaluating Flare and Cell	219
11-4	Performing Gonioscopy	220
12-1	Performing Goldmann Applanation Tonometry	229
12-2	Disinfecting the Applanating Tip	230
12-3	Performing Corneal Pachymetry	231
13-1	Obtaining a Fundus Image in Indirect Ophthalmoscopy	268
13-2	Performing Scleral Depression	270
13-3	Performing Indirect Slit-Lamp Biomicroscopy	273
13-4	Performing Contact Lens Biomicroscopy	274
13-5	Evaluating the Fundus with the Direct Ophthalmoscope	276
13-6	Drawing the Indirect Ophthalmoscopic Fundus	277
14-1	Applying Patches and Shields	301
14-2	Removing Foreign Bodies from the Cornea	302
14-3	Irrigating the Ocular Surface	303
14-4	Performing Anterior Chamber Paracentesis	304
15-1	Performing an Intravitreal Injection	319

Tables

4-1	Visual Acuity Notations and Abbreviations	30
4-2	Visual Impairment and Estimates of Visual Disability	38
5-1	Typical Spectacle Prescription Notations	54
5-2	Frequently Used Refractor Controls	59
5-3	Systemic Effects of Topical Cycloplegic Medications	69
5-4	Average Accommodation Amplitudes for Different Ages	73
6-1	Clinical Abbreviations Used in Evaluation of Strabismus	87
6-2	Actions of Extraocular Muscles from Primary Position	89
6-3	Sample Recording Results of Alternate Cover Testing	94
7-1	Pupillary Findings in Common Clinical Situations	110
8-1	Terms Used to Describe Visual Field Defects	126

9-1	Equipment for Examining the External Eye	137
9-2	Common Abnormalities and Characteristics of the Skin	139
9-3	Common Abnormalities of the Eyelids, Eyelashes, and Eyebrows	142
9-4	Normal Adult Values of Eyelid Structure and Function	142
9-5	Method of Grading Degree of Upper Eyelid Blepharoptosis	143
9-6	Method of Grading Degree of Upper Eyelid Retraction	143
9-7	Method of Grading the Anterior Chamber Angle	145
11-1	The SUN Working Group Grading System for Anterior Chamber Flare	204
11-2	The SUN Working Group Grading System for Anterior Chamber Cells	204
11-3	Shaffer Method for Grading Anterior Chamber Angles	215
13-1	Anatomical Features of the Posterior Pole	235
13-2	Agents for Pupillary Dilation	237
13-3	Cycloplegic Protocol for Infants and Children	238
13-4	Comparison of Instruments for Posterior Segment Examination	239
13-5	Illumination Openings of the Direct Ophthalmoscope	251
13-6	Focusing the Direct Ophthalmoscope	252
13-7	Color Code for Fundus Drawing	256
13-8	Major Features of the Posterior Segment	261
13-9	Normal Degenerative Changes of the Aging Eye	261
13-10	Common Problems During Indirect Ophthalmoscopy	266
15-1	Common Antifungal Agents	307
15-2	Common Topical Ophthalmic Antibacterial Agents	308
15-3	Common Antiviral Medications	309
15-4	Common Mydriatics and Cycloplegics	311
15-5	Common Glaucoma Medications	312

Videos

CP 4-1	Visual Acuity	41
5-1	Retinoscopy Basics	60
5-2	Retinoscopy: Plus Cylinder Technique	62
CP 5-1	Neutralization of Spectacles	80
6-1	Krimsky Test	92
6-2	Cover-Uncover Test	93
6-3	Cross-Cover Test (Alternate Cover Test)	94

6-4	Prism Alternate Cover Test	94
6-5	Simultaneous Prism Alternate Cover Test	94
CP 6-1	Motility Examination	101
CP 7-1	Evaluation of Pupils	117
CP 8-1	Confrontation Visual Fields	133
CP 9-5	Eyelid Measurements	154
CP 9-6	Eyelid Eversion	159
CP 9-7	Slit-Lamp Assessment of Angles	160
CP 12-1	Applanation Tonometry	230
CP 12-3	Corneal Pachymetry	231
15-1	Instilling Eyedrops	305
CP 15-1	Intravitreal Injection Technique	319