

Contents

Videos	xi
Preface	xii
Contributors	xiii
1. Topographical Anatomy of the Orbit.....	1
<i>A. Schmiedl</i>	
1.1 Introduction.....	2
1.2 Shape, Borders, Orifices, and Topographical Relations	2
1.2.1 Bony Orbital Walls	2
1.2.2 Orbital Foramina.....	3
1.2.3 Topographic Relations of the Orbit	5
1.3 Protective Apparatus of the Eye.....	5
1.3.1 Orbital Septum	5
1.3.2 Eyelids	5
1.3.3 Lacrimal Apparatus	7
1.4 Contents of the Orbit.....	7
1.4.1 Classification	7
1.4.2 Connective Tissue Structures	8
1.4.3 Pars Bulbosa and Bulbus Oculi	10
1.4.4 Topography and Function of Outer Eye Muscles	12
1.5 Topography of Pathways Located Postseptally	14
1.5.1 Topographic Relations to the Common Anular Tendon of Zinn	14
1.5.2 Extraconal Pathways in the Upper Compartment. ...	14
1.5.3 Intraconal Pathways (Medial Compartment).....	15
1.5.4 Extraconal Pathways (Lower Compartment).....	17
1.5.5 Secretory, Parasympathetic Innervation of the Lacrimal Gland	18
References.....	18
2. Pathophysiological Aspects of the Orbit.....	19
<i>H.-J. Welkoborsky and T. Kraft</i>	
2.1 Introduction.....	20
2.2 The Orbit as a Closed Bony Compartment.....	20
2.3 Intraorbital Inflammation	21
2.4 Increased Intraorbital Pressure.....	23
2.5 Pathophysiology of Orbital Trauma.....	24
2.5.1 Direct and Indirect Orbital Trauma.....	24
2.5.2 Avulsion Trauma of the Optic Nerve.....	25
References.....	25
3. Clinical Examination in Patients with Orbital Diseases	27
3.1 Ophthalmologic Examinations	28
<i>B. Wiechens and S. Behrendt</i>	
3.1.1 Introduction.....	28
3.1.2 Case History.....	28
3.1.3 Inspection.....	28
3.1.4 Palpation.....	29
3.1.5 Visual Acuity Test	29
3.1.6 Slit-lamp Biomicroscopy of the Anterior Segment of the Eye	30
3.1.7 Auscultation.....	30
3.1.8 Exophthalmometry	31
3.1.9 Tonometry	31
3.1.10 Motility Testing.....	32
3.1.11 Ophthalmoscopy.....	32
3.1.12 Perimetry	33
3.1.13 Pupil Examination	34
3.1.14 Ocular and Orbital Echography	34
3.1.15 Fluorescein and Indocyanine Green Angiography; Spectral Domain Optical Coherence Tomography	35
3.1.16 Visual Evoked Potentials (VEP).....	35
3.1.17 Biopsy	35
3.2 ENT Examinations.....	35
<i>S. Graß and H.-J. Welkoborsky</i>	
3.2.1 Embryology of the Orbit and the Eye and of Its Related Adnexa	35
3.2.2 Patient's History	36
3.2.3 Clinical Examination	36
3.2.4 Instrument-Based Diagnostics	39
References.....	43
Suggested Further Reading	43

4.	Imaging of the Orbit	45
4.1	Introduction	46
4.2	Conventional Radiography <i>A. Pangalu and A. Valavanis</i>	46
4.3	Computed Tomography (CT) <i>A. Pangalu and A. Valavanis</i>	46
4.3.1	Radiological Anatomy	46
4.3.2	Orbital Trauma	46
4.3.3	Tumors	47
4.4	Magnet Resonance Imaging (MRI) <i>A. Pangalu and A. Valavanis</i>	52
4.4.1	Anatomy	52
4.4.2	Inflammatory Diseases	52
4.4.3	Tumors	54
4.5	Positron Emission Tomography (PET) <i>A. Pangalu and A. Valavanis</i>	58
4.6	Interventional Neuroradiology of Orbital Diseases <i>A. Pangalu and A. Valavanis</i>	59
4.7	Ultrasonography of the Orbit <i>H.-J. Welkoborsky</i>	59
4.7.1	Technical Conditions for Orbital Ultrasound	61
4.7.2	Ultrasound Anatomy	61
4.7.3	Ultrasound Examination of Particular Orbital Diseases	63
	References	66
5.	Diseases of the Eyelids and the Eye	67
5.1	Diseases of the Eyelids <i>B. Wiechens and M. A. Varde</i>	68
5.1.1	Inflammatory Diseases	68
5.1.2	Malignant Tumors of the Eyelids	68
5.2	Diseases of the Eye <i>B. Wiechens</i>	70
5.2.1	Glaucoma	70
5.2.2	Corneal Diseases	74
5.3	Occlusion of Intraocular and Intraorbital Vessels <i>B. Wiechens</i>	79
5.3.1	Vascular Occlusions of the Retina and the Optic Nerve	80
5.3.2	Arterial Vascular Occlusions of the Retina/Choroid (Central Retinal Artery, Branch Retinal Artery, and Ophthalmic Artery Occlusion)	80
5.3.3	Venous Retinal Vascular Occlusions (Central Retinal Vein, Hemicentral Retinal Vein, and Branch Retinal Vein Occlusion)	81
5.3.4	Anterior Ischemic Optic Neuropathy (Nonarteritic/Arteritic)	82
5.3.5	Occlusion of Intraorbital Vessels	83
	References	83
	Suggested Further Reading	84
6.	Orbital Complications <i>S. Graß and H.-J. Welkoborsky</i>	85
6.1	Introduction	86
6.2	Intraorbital Hemorrhages	86
6.2.1	Iatrogenic Hemorrhage due to Endonasal Surgery of the Sinuses	86
6.2.2	Bleeding into the Orbit as a Result of Trauma	87
6.3	Orbital Complications of Acute Sinusitis	88
6.3.1	Pathogenesis	88
6.3.2	Phases of Orbital Complications	88
6.3.3	Therapy	89
6.4	Orbital Complications of Other Cause	90
6.4.1	Orbital Emphysema	90
6.4.2	Dysthyroid Optic Neuropathy	91
6.4.3	Dentogenic Abscesses	91
6.4.4	Infection of the Cheek Skin	92
6.4.5	Dacryoadenitis	92
6.4.6	Insect Bites	93
6.4.7	Allergic Diseases	93
6.4.8	Conjunctivitis	94
6.4.9	An Unusual Cause for an Orbital Complication	94
6.5	Summary	94
6.6	Special Features of Orbital Complications in Children	94
	References	96

7.	Endocrine Orbitopathy	99
7.1	Etiology and Pathogenesis	100
	<i>George J. Kahaly</i>	
7.1.1	Etiology	100
7.1.2	Pathogenesis	100
7.2	Clinical and Laboratory Investigations	101
	<i>George J. Kahaly</i>	
7.2.1	Clinical Investigations	101
7.2.2	Laboratory Examinations and Medical Imaging	103
7.2.3	Clinical Recommendations for Practical Use	104
7.3	Ophthalmological Findings and Complications	104
	<i>M. A. Varde and B. Wiechens</i>	
7.3.1	Classification of Findings	104
7.3.2	Dry Eye Syndrome	105
7.3.3	Lid Retraction	105
7.3.4	Indicators for Clinical Activity	105
7.3.5	Exophthalmos	105
7.3.6	Lagophthalmos	106
7.3.7	Ptosis	106
7.3.8	Exposure Keratopathy	106
7.3.9	Strabismus	106
7.3.10	Compressive Optic Neuropathy	107
7.3.11	Glaucoma	107
7.4	Therapy	107
7.4.1	Immunosuppressive Therapy	107
	<i>George J. Kahaly</i>	
7.4.2	Radiotherapy of Endocrine Orbitopathy	109
	<i>H. Christiansen and R. M. Hermann</i>	
7.4.3	Orbital Decompression	113
	<i>H.-J. Welkoborsky</i>	
7.4.4	Eyelid Surgery in Endocrine Orbitopathy	120
	<i>M. A. Varde and B. Wiechens</i>	
	References	123
8.	Traumatology and Traumatic Optic Neuropathy	127
	<i>C. Deichmueller and H.-J. Welkoborsky</i>	
8.1	Introduction	128
8.2	Patient History	128
8.3	Clinical Examination	128
8.4	Instrumental Diagnostics	128
8.5	Symptoms	128
8.6	Orbital Soft Tissue Injuries	129
8.6.1	Lacerations	129
8.6.2	Orbital Foreign Bodies	130
8.7	Orbital Wall Fractures	130
8.7.1	Medial Orbital Wall Fracture	130
8.7.2	Lateral Orbital Wall Fracture and Zygomatic Fracture (Lateral Midfacial Fracture)	130
8.8	Isolated Orbital Floor Fractures	133
8.8.1	Blow-out Fracture	133
8.8.2	Blow-in Fractures	135
8.9	Orbital Roof	136
8.9.1	Orbital Roof Fractures	136
8.10	Combined Fractures	137
8.10.1	Combined Fractures of Midface, Bony Orbit, and Skull Base	137
8.11	Injuries of the Optic Nerve	138
8.11.1	Traumatic Optic Neuropathy (TON)	138
8.12	Orbital Injuries in Children	140
8.12.1	Orbital Fractures	140
	References	141
9.	Pathology of the Orbit	145
	<i>L. Wilkens</i>	
9.1	Introduction	146
9.1.1	General	146
9.1.2	Observations on Classification	146
9.2	Inflammations	147
9.2.1	Acute Inflammations	147
9.2.2	Chronic Inflammations	147
9.3	Systemic Diseases Involving the Orbit	148
9.4	Neoplasias (Arranged Topographically)	148
9.4.1	Tumors of the Optic Nerve	148
9.4.2	Tumors of the Conjunctiva and Caruncula	151
9.4.3	Tumors of the Eyelids	156
9.4.4	Tumors of the Lacrimal Glands	164
9.4.5	Tumors of the Lacrimal Duct System	166
9.4.6	Tumors of the Soft Tissue of the Orbit	166
9.4.7	Tumors of the Eyeball	171
	Suggested Further Readings	173

10. Orbital Malformations.....	175
<i>Paul Schumann, Harald Essig, and Martin Rücker</i>	
10.1 Congenital Orbital Malformations	176
10.1.1 Hypertelorism.....	176
10.1.2 Hypotelorism	176
10.1.3 Cyclopia and Synophthalmia	176
10.1.4 Anophthalmia and Microphthalmia.....	176
10.1.5 Facial Clefts	177
10.1.6 Craniosynostoses.....	177
10.1.7 Syndromes of the First and Second Branchial Arches	178
10.2 Acquired Orbital Malformations	181
10.2.1 Trauma-Induced Orbital Malformations.....	181
10.2.2 Tumor-Induced Orbital Deformities.....	182
References	184
11. Tumors of the Orbit and the Eye	187
11.1 Malignant Tumors of the Eye	188
<i>B. Wiechens</i>	
11.1.1 Tumors of the Eye with Potential Orbital Involvement	188
11.1.2 Intraocular Metastases.....	192
11.2 Tumors of the Lacrimal Glands and Lacrimal Ducts	197
<i>H.-J. Welkoborsky</i>	
11.2.1 Tumors of the Lacrimal Glands	197
11.2.2 Tumors of the Lacrimal Ducts.....	198
11.3 Tumors of the Sinuses with Spread to the Orbit....	198
<i>H.-J. Welkoborsky</i>	
11.3.1 Symptoms	199
11.3.2 Pseudo Tumors	199
11.3.3 Benign Tumors of the Paranasal Sinuses with Orbit Involvement	201
11.3.4 Malignant Tumors of the Paranasal Sinuses with Orbit Involvement	202
11.3.5 Infiltration of the Orbit	203
11.3.6 Treatment of Malignant Tumors	203
11.3.7 Prognosis	204
References	204
Suggested Further Readings.....	208
12. Tumors of the Fronto-orbital Skull Base, the Optic Nerves, and the Intracranial Optic Pathways	209
<i>I. E. Sandalcioglu and U. Sure</i>	
12.1 Introduction.....	210
12.2 Meningiomas of the Frontal Skull Base and the Orbit.....	210
12.3 Malignant Tumors of the Frontal Skull Base and the Orbit.....	210
12.4 Gliomas of the Optic Nerves and the Intracranial Optic Pathways.....	213
12.5 Vascular Malformations.....	214
12.6 Miscellaneous Lesions.....	215
References	217
13. Intraconal Orbital Tumors.....	219
<i>Michael L. Hinni, Devyani Lal, and Karel De Leeuw</i>	
13.1 Introduction.....	220
13.2 Anatomy.....	220
13.3 Evaluation/Diagnosis.....	220
13.4 Classification of Tumors.....	221
13.5 Orbital Neoplasia	223
13.5.1 Benign Lesions	223
13.5.2 Primary Malignant Tumors.....	223
13.6 Secondary Orbital Tumors.....	225
13.6.1 Esthesioneuroblastoma	225
13.6.2 Nasopharyngeal Carcinoma	226
13.6.3 Metastatic Tumors.....	226
13.7 Surgical Approaches to the Orbit	226
13.8 Conclusion	227
References	227
14. Radiotherapy of Orbital Diseases.....	229
<i>H. Christiansen and R. M. Hermann</i>	
14.1 Introduction.....	230
14.2 Technique.....	230
14.2.1 Percutaneous Radiotherapy (External Beam Radiotherapy).....	230

14.3	Radiotherapy of Malignant Neoplasias of the Orbit . . .	233	14.5	Radiogenic Side Effects and Toxicities in the Orbit Area	247
14.3.1	Metastases in the Area of the Orbit.	233	14.5.1	Eyelid	247
14.3.2	Orbit Lymphomas.	236	14.5.2	Tear Ducts.	248
14.3.3	Uveal Melanomas.	238	14.5.3	Conjunctiva	248
14.3.4	Retinoblastoma.	242	14.5.4	Cornea	248
14.4	Radiotherapy of Benign Diseases of the Orbit	243	14.5.5	Iris.	248
14.4.1	Optic Nerve Meningiomas.	243	14.5.6	Lens	249
14.4.2	Idiopathic Inflammation of the Orbit	243	14.5.7	Retina.	249
14.4.3	Choroidal Hemangiomas	244	14.5.8	Optic Nerve	249
14.4.4	Pterygium.	245	14.5.9	Radiogenic Tumor Induction.	250
14.4.5	Age-Related Macular Degeneration	246		References.	250
15.	Surgery of the Lacrimal Drainage System	255			
15.1	Anatomy, Clinical Evaluation, and Treatment of Common Lacrimal Drainage Disorders.	256	15.2.1	Introduction.	263
	<i>M. A. Varde and B. Wiechens</i>		15.2.2	Etiology of Obstructions of the Lacrimal Pathways	264
15.1.1	Anatomical Considerations	256	15.2.3	Preoperative Diagnosis	264
15.1.2	Examination of the Lacrimal Pathway	256	15.2.4	Surgical Technique of DCR.	265
15.1.3	Congenital NLDO	257	15.2.5	Alternative Procedures	268
15.1.4	Acquired Lacrimal Stenoses.	261	15.2.6	Follow-up	269
15.2	Endoscopic Dacryocystorhinostomy.	263	15.2.7	Stenting.	269
	<i>Andreas Neumann, Mauricio López-Chacón, and Manuel Bernal-Sprekelsen</i>		15.2.8	Complications	269
			15.2.9	Results	270
				References.	270
16.	Lid Surgery in Orbital Disorders	275			
	<i>M. A. Varde and B. Wiechens</i>				
16.1	Anatomy	276	16.3.3	Reconstruction of the Upper Lid	284
16.2	Traumatology	276	16.3.4	Reconstruction of the Lateral Canthus.	287
16.2.1	Case History	276	16.3.5	Reconstruction of the Medial Canthus.	287
16.2.2	Examination.	277	16.4	Facial Nerve Palsy	288
16.2.3	Diagnostic Measures	278	16.4.1	Temporary Facial Palsy	288
16.2.4	Surgical Treatment of Lid Injuries	279	16.4.2	Persistent Facial Palsy	289
16.3	Reconstruction of Eyelid Defects	281	16.5	Cicatricial Ectropion, Cicatricial Entropion, Cicatricial Lagophthalmos	290
16.3.1	Reconstruction of Defects of the Anterior Lamella of the Periorbital Region.	281		References.	292
16.3.2	Reconstruction of Full-Thickness Defects of the Lower Lid	282			
17.	Anesthesiological Aspects of Orbit Surgery	293			
	<i>Jan-Peter A.H. Jantzen and Bernd Schwefler</i>				
17.1	Introduction.	294	17.4.2	Hypnotics	296
17.2	Clinical Anatomy.	294	17.4.3	Inhalational Anesthetics.	297
17.3	Clinical Physiology	294	17.4.4	Analgesics.	297
17.3.1	Hemodynamics.	294	17.4.5	Muscle Relaxants	297
17.3.2	Intracranial Pressure	294	17.5	Clinical Anesthesiology.	298
17.3.3	Intraocular Pressure.	295	17.5.1	Preoperative Preparation	298
17.4	Clinical Pharmacology.	296	17.5.2	PONV	298
17.4.1	Sedatives.	296	17.5.3	Securing the Airway	299
			17.5.4	Positioning	299
			17.5.5	Ventilation	300

17.5.6	Hemodynamic Management	300	17.5.9	Emergence and Postoperative Period	302
17.5.7	Temperature Management	301	17.5.10	Neuroprotection	302
17.5.8	Monitoring	301		References	303
18.	Surgical Approaches to the Orbit	305			
18.1	Introduction	306	18.5	Anterior Orbitotomy	310
	<i>H.-J. Welkoborsky</i>			<i>B. Wiechens</i>	
18.2	Endonasal Transethmoidal Approach (Medial Orbitotomy)	306	18.5.1	Transpalpebral Approach	310
	<i>H.-J. Welkoborsky</i>		18.5.2	Transconjunctival Approach	312
18.2.1	Indications	306	18.5.3	Advantages and Disadvantages of the Transconjunctival vs. Transpalpebral Approach	314
18.2.2	Procedure	306	18.6	Transcranial Extradural and Intradural Approaches	316
18.2.3	Complications	307		<i>I. E. Sandalcioglu and U. Sure</i>	
18.3	Transantral Approach	307	18.6.1	Introduction	316
	<i>H.-J. Welkoborsky</i>		18.6.2	Frontolateral Craniotomy (Pterional Craniotomy) ..	316
18.3.1	Indications	307	18.6.3	Frontal Unilateral Craniotomy (Subfrontal Approach)	317
18.3.2	Procedure	307	18.6.4	Supra-orbital "Keyhole Approach"	317
18.3.3	Complications	308	18.6.5	Bifrontal Craniotomy	317
18.4	Lateral Orbitotomy	308	18.7	Orbital Exenteration	318
	<i>H.-J. Welkoborsky</i>			<i>H.-J. Welkoborsky</i>	
18.4.1	Indications	308	18.7.1	Enucleation	318
18.4.2	Procedure	308	18.7.2	Orbital Exenteration	318
18.4.3	Complications	309		References	321
				Suggested Further Readings	322
19.	Reconstructive Orbital Surgery	323			
	<i>N. C. Gellrich and M. Rana</i>				
19.1	Introduction	324	19.6	Individualization of Implant Materials for Orbital Reconstruction	329
19.2	Principles of Orbital Reconstruction	324	19.7	Restitution of the Medial Telecanthus Using the Hammer Technique	329
19.3	Summary History of the Development Reconstructive Orbital Surgery	324		References	331
19.4	Shape and Volume Reconstruction of the Orbit	325		Suggested Further Readings	332
19.5	Digital 3D Analysis and Virtual Models	326			
Index		333			