

Contents

Section I

Advanced Rhinology

Chris de Souza and Guy S. Kenyon (Editors)

Anatomy and Imaging

1	Surgical Anatomy of the Nose	5
	<i>Natalie P. Steele and J. Regan Thomas</i>	
	Introduction	5
	Facial Aesthetics	5
	Nasal Aesthetics	6
	Conclusion	12
	References	12
2	Surgical Anatomy of the Paranasal Sinuses	13
	<i>Robert G. Mynatt and Raj Sindwani</i>	
	Introduction	13
	Embryology	14
	The Paranasal Sinuses	14
	Sinonasal Mucosa	14
	General Sinonasal Blood Supply	15
	Innervation	15
	The Lateral Nasal Wall	15
	Inferior Turbinate	15
	Middle Turbinate	15
	Superior and Supreme Turbinates	16
	Sphenopalatine Foramen	16
	Middle Meatus	17
	The Uncinate Process	20
	The Maxillary Line	21
	The Maxillary Sinus	21
	The Ethmoid Sinuses	24
	The Anterior Ethmoids	25
	The Posterior Ethmoids	26
	Sinonasal Roof	27
	The Sphenoid Sinus	27
	The Frontal Sinus	28
	Conclusion	32
	References	32

3	Paranasal Sinuses in Health and Disease	35
	<i>Abhijit A. Raut and Bhavin Jankharia</i>	
	Introduction	35
	Imaging Modalities	36
	Development of Paranasal Sinuses	36
	Anatomy	37
	Mucociliary Apparatus	38
	Normal Nasal Variants	38
	Sinonasal Disease	42
	Complications of Sinusitis	47
	Chronic Sinusitis	47
	Cysts and Polyps	47
	Mucocele	48
	Fungal Sinusitis	48
	Granulomatous Sinusitis	50
	Squamous Cell Carcinoma	51
	Papilloma	53
	Adenocarcinoma	54
	Esthesioneuroblastoma	54
	Juvenile Nasopharyngeal Angiofibroma	56
	Malignant Melanoma	56
	Rhabdomyosarcoma	56
	Odontogenic Cysts	57
	Odontogenic Tumors	57
	Osteoma	57
	Fibrous Dysplasia	60
	Osteosarcoma	60
	Chondrosarcoma	60
	Metastases to the Paranasal Sinuses	61
	References	61

Physiology and Pathophysiology

4	Measurement of Nasal Function	65
	<i>Guy S. Kenyon and John Pickett</i>	
	Introduction	65
	Techniques	66
	Conclusions	71
	References	71

5	Nasal Valve Surgery	75		
	<i>Guy S. Kenyon and Peter Andrew</i>			
	Introduction	75		
	The Internal Nasal Valve	76		
	The External Nasal Valve	76		
	Valve Pathology	77		
	Clinical Assessment	77		
	History and Examination	78		
	Management of Nasal Valve Deficiency	79		
	Conclusions	81		
	References	81		
6	Respiratory Cilia:			
	Principles of Mucociliary Clearance	83		
	<i>Marcelo B. Antunes and Noam A. Cohen</i>			
	Introduction	83		
	Ciliary Structure and Function	83		
	Regulation of Ciliary Beat Frequency	85		
	Inflammatory Mediators	86		
	Mucus and Periciliary Fluid	86		
	Mucociliary Clearance and Disease	86		
	Conclusion	87		
	References	87		
7	The Anatomy and Physiology of Olfaction			
	and Gustation	91		
	<i>Aaron I. Brescia and Allen M. Seiden</i>			
	Olfaction	91		
	Gustation	93		
	Conclusion	95		
	References	95		
8	Olfaction and Gustation: Implications			
	of Viral, Toxic Exposure, Head Injury, Aging,			
	and Drugs	97		
	<i>Erin K. O'Brien and Donald A. Leopold</i>			
	Introduction	97		
	Olfactory Disorders	97		
	Gustatory Disorders	100		
	Conclusion	102		
	References	102		
9	The Electronic Nose in Rhinology	105		
	<i>Erica R. Thaler and C. William Hanson</i>			
	Introduction	105		
	Identification of CSF Rhinorrhea	106		
	Identification of Bacterial Species	107		
	Identification of Patients with Bacterial Rhinosinusitis	109		
	Detection of Biofilms	109		
	Future Directions	109		
	References	110		
	Clinical Assessment, Management,			
	Surgery of the Internal Nose			
10	Clinical Assessment and Management			
	of Olfactory Disorders	115		
	<i>Eric H. Holbrook</i>			
	Introduction	115		
	Assessment	115		
	Management	119		
	References	120		
11	Congenital Malformations of the Nose			
	and Paranasal Sinuses	123		
	<i>Ravindhra G. Elluru and Shyan Vijayasekaran</i>			
	Introduction	123		
	Embryology of the Nose, Paranasal Sinuses, and Anterior Skull Base	123		
	Encephaloceles	124		
	Gliomas	125		
	Nasal Dermoids	128		
	Complete Agenesis of the Nose	130		
	Craniofacial Clefts	130		
	Median Nasal Clefts	131		
	Lateral Nasal Clefts	131		
	Proboscis Lateralis	131		
	Polyrrhinia and Supernumerary Nostril	132		
	Cleft Lip Nasal Deformity	132		
	Choanal Atresia	132		
	Congenital Nasal Pyriform Aperture Stenosis	133		
	Nasolacrimal Duct Cysts	134		
	Nasopharyngeal Teratomas	136		
	References	137		
12	Contemporary Management Strategies			
	for Epistaxis	139		
	<i>Seth J. Kanowitz, Martin J. Citardi, and Pete S. Batra</i>			
	Introduction	139		
	Nasal Vascular Anatomy	139		
	Pathophysiology	141		
	Patient Evaluation	142		
	Management	144		
	References	148		
13	Disorders of the Nasal Septum	151		
	<i>Matthew R. Stumpe and Rakesh K. Chandra</i>			
	Introduction	151		
	Structural Abnormalities	152		
	Infections	155		
	Systemic Inflammatory Disease	157		
	Neoplastic	158		
	Reactive Pathology	160		
	Conclusion	161		
	References	161		

14 The Stuffy Nose	165
<i>Jeremy Paul Watkins and Rakesh K. Chandra</i>	
Introduction and Background	165
History and Physical Examination	168
Objective Evaluation and Diagnostic Studies	170
Diagnosis and Management	174
Conclusions	177
References	178
15 Surgery of the Nasal Septum	181
<i>Anand K. Devaiah and Bounmany Kyle Keojampa</i>	
History of Septoplasty	181
Anatomy	181
Preoperative Evaluation	182
Surgical Technique	182
Postoperative Care	184
Complications of Septoplasty	184
Septoplasty Outcomes	185
References	185
Rhinosinusitis – Diagnosis, Differential Diagnosis, Conservative and Surgical Management	
16 Rhinosinusitis	189
<i>Chris de Souza and Rosemarie A. de Souza</i>	
What Is Rhinosinusitis?	190
Pathophysiology of Rhinosinusitis	190
Pathogenesis of CRS	195
Medical Management of CRS	197
Nasal Polyposis	197
How Should CRS Be Treated?	198
Impact of CRS Versus Nasal Septal Deviations	198
Do Nasal Septal Deviations Cause CRS?	198
The Relationship Between Allergy, Bronchial Asthma, and Rhinosinusitis	198
References	200
17 Introduction to Evidence-Based Medicine and Pediatric Rhinosinusitis	203
<i>Anthony E. Magit and Cecilia Canto-Alarcon</i>	
Introduction	203
Pathophysiology	203
Definitions	204
Acute Sinusitis	204
Chronic Sinusitis	206
Summary	208
References	209
18 Bacteriology of the Paranasal Sinuses and the Nose in Health and Disease	211
<i>Itzhak Brook</i>	
Introduction	211
The Normal Flora of the Oral Cavity	211
Interfering Flora	214
Nasal Flora	215
Normal Sinus Flora	215
Microbiology of Sinusitis	216

The Role of Fungi in Sinusitis	222
Nasopharyngeal Flora in Health and Disease	223
References	225
19 Chronic Rhinosinusitis and Superantigens	231
<i>Kristin A. Seiberling, Leslie C. Grammer, and Robert C. Kern</i>	
Introduction	231
What Are Superantigens?	232
Staphylococcal Superantigens	232
MHC Class II Binding	232
T Cell Interaction with SAg-MHC Class II	233
Superantigen Response	233
Effects of Superantigens on Pro-Inflammatory Cells	234
Superantigens in Human Disease	235
Superantigens and CRSwNP	235
Conclusion	237
References	237
20 Biofilms	241
<i>Bradford A. Woodworth, Noam A. Cohen, and James N. Palmer</i>	
Introduction	241
Biofilms and Chronic Disease	243
Pathophysiology of Bacterial Biofilms	243
Treatments for Biofilm-Associated CRS	244
References	245
21 Allergic Rhinitis	247
<i>John H. Krouse</i>	
Introduction	247
Classifications of Allergic Rhinitis	247
Epidemiology of Allergic Rhinitis	249
Pathophysiology of Allergic Rhinitis	249
Diagnosis of the Patient with Allergic Rhinitis	249
Treatment of the Patient with Allergic Rhinitis	250
Summary	253
References	254
22 Fungal Rhinosinusitis	255
<i>Chris de Souza and J. Peter Rodrigues</i>	
Introduction	255
Diagnosis of Invasive Fungal Rhinosinusitis	256
Principles of Treatment of Fungal Infections	256
How Do Fungi Cause Disease?	256
Diagnosing Fungal (Mycotic) Infections	256
Prevention and Prophylaxis in the Immunocompromised Patient	256
Diagnosis and Management of Rhinosinusitis Before Scheduled Immunosuppression	257
Mucormycosis of the Nose and Paranasal Sinuses	257
Chronic Invasive Fungal Rhinosinusitis	258
Invasive Fungal Rhinosinusitis in the Acquired Immunodeficiency Syndrome	259
Allergic Fungal Rhinosinusitis	260
Agents for the Treatment of Invasive Fungal Infections	262
References	264

23 Nasal Polyposis	267	28 Granulomatous Diseases of the Sinonasal Tract	321
<i>Melissa Statham and Allen M. Seiden</i>		<i>Glenn B. Williams, Raj Sindwani,</i>	
Introduction	268	<i>and Rakesh K. Chandra</i>	
Histopathology	268	Introduction	321
Polyp Formation and Growth	268	Inflammatory	321
Polyps, Allergy, and Eosinophilic Inflammation	268	Infectious	326
Aspirin Sensitivity	271	Nasal-type NK/T-cell Lymphoma	330
Infectious Etiology	271	Conclusion	331
Bacterial Superantigens	271	References	331
Diagnosis	271		
Role of Imaging	272	29 Diagnosis, Evaluation and Management	
Antral Choanal Polyp	273	of Facial Pain	335
Inverted Papilloma	274	<i>A. Daudia and Nicholas S. Jones</i>	
Cystic Fibrosis	275	Introduction	335
Primary Ciliary Dyskinesia	275	Taking a History	335
Churg-Strauss Syndrome	275	Rhinological Pain	336
Peutz-Jeghers Syndrome	276	Dental Pain	337
Medical Therapy	276	Vascular Pain	337
Surgical Management	279	Neuralgias	339
Surgical Complications	280	Pain Caused by Tumours	340
References	281	Tension-type Headache	340
		Midfacial Segment Pain	340
		Atypical Facial Pain	341
		Conclusion	342
		References	342
24 Complications of Rhinosinusitis	287		
<i>Seth M. Brown, Abtin Tabae, and Vijay K. Anand</i>		30 Evidence-based Medicine in Rhinosinusitis	345
Orbital Complications	287	<i>Seth M. Brown, Abtin Tabae, and Vijay K. Anand</i>	
Intracranial Complications	289	Introduction	345
Cavernous Sinus Thrombosis	291	Antibiotics	346
Mucocele	292	Steroids	348
Bony Complications	293	Saline Rinses/Washes	349
Systemic Complications	293	Decongestants	349
References	294	Antifungal Treatment	349
		Complementary Therapy	350
		Others	350
		References	351
25 Macrolides and Their Role in the Treatment			
of Chronic Rhinosinusitis	295		
<i>Anders Cervin and Ben Wallwork</i>		Lacrimal Drainage System and Orbit	
Introduction	295		
In Vitro Studies	296	31 Management of Nasolacrimal Duct Obstruction	357
Clinical Background	297	<i>Douglas D. Reh, Ralph B. Metson, and Raj Sindwani</i>	
Macrolides and Their Role in the Treatment		Introduction	357
of Chronic Rhinosinusitis	300	Patient Evaluation	357
References	303	Anatomy	358
		Surgical Technique	359
		Surgical Results	363
		Surgical Complications	363
		Revision Endoscopic Dacryocystorhinostomy	364
		Conclusions	364
		References	365
26 The Frontal Sinus	307		
<i>Parul Goyal and Peter H. Hwang</i>		32 Conventional and Endoscopic Approaches	
Anatomy	307	to the Orbit and Optic Nerve	367
Frontal Sinus Surgical Techniques	308	<i>Kevin Christopher McMains</i>	
References	311	<i>and Stilianos E. Kountakis</i>	
		Introduction	367
27 The Lothrop and Extended Lothrop Procedures	313		
<i>Abtin Tabae, Seth Brown, and Vijay K. Anand</i>			
Introduction	313		
Anatomy of the Frontal Recess	313		
Algorithm for Frontal Sinus Surgery	314		
Endoscopic Modified Lothrop Procedure	315		
Image Guidance	317		
References	318		

Trauma to the Visual Axis	367		
Anatomy/Physiology	368		
Diagnosis	368		
Non-surgical Treatment	369		
Surgical Approaches	369		
Surgical Data from Traumatic Optic Neuropathy	371		
Conclusion	372		
References	372		
Tumors of the Nose, Paranasal Sinuses, Jaws, Skull Base and Related Problems			
33 Benign Tumors of the Nasal Cavity and Paranasal Sinuses	377		
<i>Bernhard Schick and Julia Dlugaczky</i>			
Introduction	377		
Osteoma	377		
Juvenile Angiofibroma	379		
Inverted Papilloma	382		
References	383		
34 Malignant Tumors of the Nose and Paranasal Cavity	387		
<i>Gabriel G. Calzada and Randal S. Weber</i>			
Introduction	387		
Etiology	387		
Patient Evaluation	387		
Staging	388		
Squamous Cell Carcinoma of the Nasal Cavity and Paranasal Sinuses	390		
Sinonasal Adenocarcinoma	390		
Sinonasal Undifferentiated Carcinoma	390		
Olfactory Neuroblastoma (Esthesioneuroblastoma)	391		
Sinonasal Adenoid Cystic Carcinoma	391		
Sinonasal Melanoma	392		
Sinonasal Sarcomas, Lymphomas, and Metastasis to the Sinonasal Tract	392		
References	393		
35 Benign Cysts and Tumors of the Jaw Bones	395		
<i>Pushkar Mehra</i>			
Introduction	395		
Cysts of the Jaws	395		
Benign Jaw Tumors	408		
Miscellaneous Bony Lesions of the Jaws	423		
Surgical Management of Benign Jaw Pathology	424		
References	428		
36 Midfacial Degloving Approach to the Nose, Sinuses, and Skull Base	431		
<i>Daniel M. Zeitler and Gady Har-El</i>			
Introduction	431		
Technique	432		
Technical Considerations	435		
Complications	436		
References	437		
37 Craniofacial Approaches to the Anterior Skull Base	439		
<i>Jannis Constantinidis</i>			
Introduction	439		
Anterior Skull Base Approaches	439		
Postoperative Care and Complications	443		
References	444		
38 Surgical Procedures for the Treatment of Malignant Neoplasms of the Nose and Paranasal Sinuses	447		
<i>Christopher N. Prichard, Gabriel G. Calzada, and Randal S. Weber</i>			
Introduction	447		
Caldwell-Luc Approach (Anterior Antrostomy)	448		
Lateral Rhinotomy Approach/Medial Maxillectomy	448		
Midfacial Degloving Approach	448		
Transoral Approach/Infrastructure Maxillectomy	448		
Weber-Ferguson Approach/Total and Radical Maxillectomy	449		
Transcranial/Craniofacial Resection	449		
Endoscopic Approach	450		
Conclusions	450		
References	451		
39 Combined Approaches for Excision of Complex Anterior Skull-Base Tumors	453		
<i>Ziv Gil and Dan M. Fliss</i>			
Introduction	453		
Surgical Approaches	454		
Reconstruction	457		
Surgical Results and Survival	457		
Conclusions	458		
References	459		
40 Skull-Base Reconstruction Following Oncological Procedures	461		
<i>Ziv Gil and Dan M. Fliss</i>			
Introduction	461		
Types of Reconstruction	462		
A Comprehensive Algorithm for Skull-Base Reconstruction	463		
Surgical Results and Complications	465		
Healing Processes in Avascular Flap Reconstruction	466		
New Frontiers in Skull-Base Reconstruction	466		
Conclusions	467		
References	468		
41 Skull-Base Surgery in Children and Adolescents	469		
<i>Ziv Gil and Dan M. Fliss</i>			
Introduction	469		
Anatomy	469		
Pathology	470		
Surgical Techniques	471		
Reconstruction	473		
Surgical Results	473		
Adjuvant Treatment	473		

Effect of Skull-Base Surgery on Facial Growth in Children	474
Conclusions	475
References	475
42 Diagnosis, Evaluation and Management of CSF Rhinorrhea	477
<i>Jeffrey B. LaCour and Brent A. Senior</i>	
Introduction	477
Normal CSF Physiology	477
Pathophysiology	478
Diagnosis of CSF Fistula	479
Treatment Modalities	480
Conclusions	483
References	483
43 Conventional and Endoscopic Approaches to the Pituitary	485
<i>Karen A. Kölln and Brent A. Senior</i>	
Introduction	485
Pituitary Anatomy	485
Surgical Indications	486
Preoperative Evaluation	486
Conventional Approaches to the Pituitary	487
Endoscopic Approach to the Pituitary: Minimally Invasive Pituitary Surgery	487
Outcomes	489
Complications	489
Conclusions	489
References	490

Section II

Endonasal Endoscopic Surgery

Bernhard Schick (Editor) and

Wolfgang Draf (Senior Editor)

Anatomy and Imaging

44 Nasal and Paranasal Sinus Anatomy for the Endoscopic Sinus Surgeon	495
<i>Andreas Prescher</i>	
Introduction	495
Nasal Cavity	496
Paranasal Sinuses	498
References	503
45 Radiology of the Nose and Paranasal Sinuses for the Endoscopic Sinus Surgeon	507
<i>Erich Hofmann</i>	
Introduction	507
Computed Tomography	507
Magnetic Resonance Imaging	510
Digital Subtraction Angiography	511
References	511

Instrumentation

46 Instrumentation for Endonasal Sinus Surgery. From Basic to Advanced	515
<i>Amir Minovi and Dominik Brors</i>	
Introduction	515
Basic Instrumentation	515
Soft-Tissue Shavers	517
Bone-Cutting Drills	517
Conclusion	518
References	518
47 Powered Instrumentation and Image Guidance Technology: State of the Art	519
<i>Joshua C. Demke, Farhad Ardeshipour, and Brent A. Senior</i>	
Introduction	519
Endoscopes	520
Microdebriders	521
Drills	522
Image-Guided Surgery	522
References	525
Introduction	527
48 Image-Guided Surgery of the Paranasal Sinuses	527
<i>Dary Costa, Thomas Sanford, and Raj Sindwani</i>	
History of Image Guidance	528
Imaging of the Paranasal Sinuses	529
IGS Components	529
IGS Indications and Applications	533
Expanded Applications	535
IGS and Preoperative Surgical Planning	536
Cost of Image Guidance	537
Limitations of IGS	537
The Future of IGS	538
Conclusion	539
References	540

Endoscopic Surgery of the Nose, Paranasal Sinuses, and Orbit

49 Endoscopic Management of Inferior Turbinate Hypertrophy	545
<i>Iordanis Konstantinidis and Jannis Constantinidis</i>	
Introduction	545
Causes of Turbinate Disease	546
Medical Management	546
Preoperative Evaluation	546
Surgical Treatment	547
Surgical Techniques	547
Conclusion	549
References	550
50 Endonasal Maxillary Sinus Surgery	553
<i>Jannis Constantinidis</i>	
Introduction	553
Preoperative Endoscopy and Radiographic Evaluation	554

Surgical Indications	554		
Endonasal Surgery of the Maxillary Sinus	554		
Postoperative Care	556		
Conclusions	557		
References	557		
51 Ethmoid Sinus Surgery	559		
<i>Alessandro Varini</i>			
Aims and Objectives	559		
Imaging	561		
Preoperative Care	561		
Principles	562		
Postoperative Care	564		
References	565		
52 The Frontal Sinus	567		
<i>Bernhard Schick and Wolfgang Draf</i>			
Introduction	567		
Aims and Objectives	567		
Surgical Anatomy	569		
Radiology	569		
How to Do it	569		
Postoperative Care	572		
Summary	572		
References	573		
53 The Sphenoid Sinus	575		
<i>Paolo Castelnuovo, Francesca De Bernardi, Giorgio Minonzio, Giovanni Delù, and Maurizio Bignami</i>			
Radiology	575		
How to Do it	579		
54 Complications of Endonasal Endoscopic Sinus Surgery	587		
<i>Amir Minovi, Bernhard Schick and Wolfgang Draf</i>			
Introduction	587		
Synechiae and Adhesions	588		
Nasolacrimal Duct	588		
Orbital Complications	589		
CSF Leak	590		
Major Vessel Injury and Brain Haemorrhage	590		
References	591		
55 Endoscopic Sinus Surgery for Nasal Polyposis	593		
<i>Philippe Gevaert, Sofie Claeys, and Claus Bachert</i>			
Introduction	593		
Indications for Endoscopic Sinus Surgery in NP	593		
Polypectomy Versus Extended Endoscopic Sinus Surgery in NP	594		
Microdebriders Versus Classical Instruments in Endoscopic Sinus Surgery in NP	595		
Post-operative Follow-up and Treatment	595		
Symptom Control and Recurrences	598		
Long-Term Management of Recurrent NP	598		
Summary	598		
References	599		
56 Endoscopic Sinus Surgery on the Patient Without the Usual Landmarks	601		
<i>Rainer Weber</i>			
Introduction	601		
Preoperative Evaluation and Radiology	601		
How to Do it – Ethmoid and Sphenoid Sinus	602		
How to Do it – Maxillary Sinus	603		
How to Do it – Frontal Sinus	604		
How I Do it? Frontal Sinus Additional Procedures	604		
Pre- and Postoperative Care	604		
References	605		
57 Role of Aetiology in Revision Endoscopic Sinus Surgery	607		
<i>Susanne Mayr and Bernhard Schick</i>			
Introduction	607		
Aims and Objectives	607		
Preoperative Assessment	608		
Timing of Surgery and Conservative Treatment	611		
Pre-surgical Conservative/Medical Management	611		
Surgical Management	612		
Post-surgical Conservative/Medical Management	612		
Summary	613		
References	614		
58 Endoscopic Surgery on the Lacrimal Apparatus	617		
<i>Gert Jeunen and Mark Jorissen</i>			
Introduction	617		
Anatomy/Physiology of the Lacrimal System	618		
Pathology of the Lacrimal System	618		
Diagnosis and Evaluation	619		
How to Do it	620		
Pre- and Postoperative Care	622		
Results	623		
Conclusion	624		
References	624		
59 Epistaxis: Diagnosis, Evaluation, and Treatment	627		
<i>Piero Nicolai, Davide Tomenzoli, Johnny Cappiello, and Cesare Piazza</i>			
Introduction	627		
Blood Supply of the Nose and Paranasal Sinuses	628		
Therapeutic Strategy	630		
Management of Epistaxis in Rendu-Osler-Weber Syndrome	632		
Arterial Embolization for Epistaxis	632		
Summary	633		
References	633		
60 Endoscopic Surgery of the Orbit	637		
<i>Olaf Michel</i>			
Aims and Objectives	637		
Surgical Anatomy	637		
Indications for a Transnasal Approach to the Orbit	638		
Complications	644		
Pre- and Postoperative Care	644		
Conclusion	645		
References	645		

61	Endoscopic Optic Nerve Decompression	647
	<i>Bernhard Schick</i>	
	Introduction	647
	Anatomy	648
	Pathophysiological Aspects	648
	Preoperative Diagnostics	648
	How to Do it	648
	Postoperative Care	649
	References	650

Endoscopic Surgery of the Skull Base

62	Endoscopic Management of Rhinobasal Cerebrospinal Fluid Fistulae	653
	<i>Andrew C. Swift</i>	
	Introduction	653
	Pathogenesis	653
	Clinical Features	654
	Investigation	654
	Surgical Location and Repair	655
	Perioperative Management	657
	Complications and Outcome	657
	Conclusions	658
	References	658
63	Endonasal Microendoscopic Tumor Surgery at the Anterior Skull Base	661
	<i>Ulrike Bockmühl</i>	
	Introduction	661
	General Principles of Endonasal Tumor Surgery	662
	Preoperative Management	662
	Surgical Procedure	662
	Postoperative Management	663
	Outcome	664
	References	665
64	Beyond the Sphenoid Sinus	669
	<i>Paolo Castelnuovo, Andrea Pistochini, Giorgio Minonzio, and Davide Locatelli</i>	
	Objectives	669
	Radiology	670
	How to Do it	672
	Pre- and Post-operative Care	681
	References	682
65	Congenital Choanal Atresia	685
	<i>Cristina Molina-Martínez, José-María Guilemany-Toste, Javier Cervera-Escario, and Manuel Bernal-Sprekelsen</i>	
	Introduction	685
	Nasal Embryology	685
	Etiology	686
	Diagnosis	686
	Surgical Treatment	687
	References	689

Section III

Rhinoplasty and Facial Plastic Surgery

Fred J. Stucker and Timothy S. Lian (Editors)

Rhinoplasty

66	Surgical Anatomy of the External Nose	695
	<i>Fred J. Stucker, Jack W. Pou, and Trang Vo-Nguyen</i>	
	Introduction	695
	Aesthetic Nasal Proportions	696
	Nasal Anatomy (Framework)	696
	Soft Tissue Support	697
	References	699
67	Septorhinoplasty: Management of the Nasal Vault and Septum	701
	<i>Randolph B. Capone and Ira D. Papel</i>	
	Introduction	701
	Anatomy of the Upper Two Thirds of the Nose	701
	Nasal Analysis	703
	Defects of the Nasal Vaults	705
	Management of the Cartilaginous Vault	705
	Management of the Bony Vault	707
	Septum	709
	Conclusion	711
	References	712
68	The Endonasal Approach to Rhinoplasty	713
	<i>Robert L. Simons and Lisa D. Grunebaum</i>	
	Introduction	713
	The Importance of the Initial Patient Consultation	713
	Nasal Analysis and Preoperative Planning for the Endonasal Approach	714
	Intraoperative Details for the Endonasal Approach	715
	Postoperative Care and Instructions	721
	References	721
69	Nasal Tip Management Utilizing the Open Approach	723
	<i>Russell W.H. Kridel and Peyman Soliemanzadeh</i>	
	Introduction	723
	Nasal Analysis	724
	Surgical Technique	728
	Conclusion	744
	References	745
70	Revision Septorhinoplasty	747
	<i>Scott B. Roofe, Bryan T. Ambro, and Wayne F. Larrabee, Jr.</i>	
	Introduction	747
	Surgical Approach	748
	Surgical Anatomy	748
	Upper Third Deformities	748
	Surgical Management of the Upper Third Deformities	748
	Osteotomies	748
	Camouflage	749
	Cartilage and Bone Grafts	750
	Middle Third Anatomy and Associated Deformities	750

Surgical Management of the Middle Third Deformities	750	Evaluation of the Patient with Nasal Injuries	794
Profile Deformities of the Middle and Upper Third of the Nose	751	Injury Patterns and Classifications	795
Lower Third Deformities	751	Management	795
Surgical Management of Lower Third Deformities	751	Surgical Management Options	796
Nasal Septal Revision	751	Postoperative Care	798
Cases	751	Complications and Limitations	798
Conclusion	759	References	798
References	759		
71 Aesthetic Reconstruction of the Platyrhine Nose	761	76 Fractures of the Zygomaticomaxillary Complex	801
<i>Thomas Romo and Paul Presti</i>		<i>Emre A. Vural and Mimi S. Kokoska</i>	
Introduction	761	Background and Anatomy	801
Nasal Structural Anatomy	761	Diagnosis	802
Porous High Density Polyethylene Implants in Aesthetic Reconstruction of the Platyrhine Nose	763	Classification	804
Results	765	Treatment	804
Conclusion	766	Complications	807
References	768	References	807
72 Management of the Crooked Nose Deformity	769	77 Treatment of Frontal Sinus and Nasoethmoid Orbital Fractures	809
<i>Philip A. Young and Fred J. Stucker</i>		<i>Fred G. Fedok, David Goldenberg, and Sunny S. Park</i>	
Introduction	769	Introduction	809
The Crooked Nose in the Acute Setting	770	Pertinent Anatomy	809
Delayed Management of the Crooked Nose	772	Evaluation and Classification of Injuries	810
Fred J. Stucker's Approach	777	Classification of Fractures	810
References	778	Goals of Treatment and Priorities	811
73 Nasal Valve Surgery	781	Management of Frontal Sinus Fractures and Nasoethmoid Orbital Fractures	811
<i>Richard L. Goode</i>		Specific Management Techniques	812
Introduction	781	The Pediatric Patient	814
Diagnosis of Nasal Obstruction	782	Complications and Management of Complications	814
Diagnosis of Valve Obstruction	782	References	814
Surgical Treatment	782		
Complications	785	Aesthetic Facial Surgery	
References	786	78 Concepts of Facial Beauty	819
74 Pediatric Septorhinoplasty	787	<i>Philip Young</i>	
<i>Gary Y. Shaw</i>		Introduction	819
Background	787	Previous Theories and Thoughts	820
Nasal Embryology	787	Unlocking the Answers	820
Nasal Growth	788	Circles of Prominence:	
Acute Nasal Injury	788	A New Theory on Facial Aesthetics	821
Chronic Nasal Deformity	788	Conclusion	829
Summary	789	References	830
References	789	79 Implants and Fillers for Facial Plastic Surgery	831
		<i>William E. Silver, Mathew J. Dickson, and Louis M. DeJoseph</i>	
Facial Trauma		Introduction	831
75 Management of Trauma to the Nasal Bones and Septum	793	Implant Materials	831
<i>Fred G. Fedok, Michael P. Ondik, Todd W. Preston, and David Goldenberg</i>		Facial Fillers	836
Epidemiology	793	References	838
Anatomy	793	80 Botox: Its Use in Facial Lines and Wrinkles	839
		<i>Jerome S. Schwartz, Phillip C. Song, Andrew Blitzer, and William Binder</i>	
		Introduction	839
		Historical Perspective of Botulinum Toxin	839

Pharmacologic Basis	840	84 Blepharoplasty	877
Storage and Reconstitution of Botulinum Toxin	841	<i>Stephen W. Perkins and Rami K. Batniji</i>	
Preprocedural Evaluation	842	Introduction	877
Treatment of the Upper Face	842	Relevant Surgical Anatomy of the Upper and Lower Lids	877
Treatment of the Midface	845	The Aging Eyelid Complex	878
Treatment of the Lower Face and Neck	846	Preoperative Assessment	878
Postprocedural Care	850	Upper Lid Blepharoplasty	878
Adverse Effects of Botulinum Toxin	851	Lower Lid Blepharoplasty	881
Conclusions	851	Postoperative Course	884
References	852	Complications of Blepharoplasty	884
81 Chemical Facial Resurfacing: The Modified Phenol-CrotinOil Peel	855	Adjunctive Procedures	885
<i>James R. Shire and Edwin A. Cortez</i>		Conclusions	887
Background	855	Acknowledgements	887
Technique	856	References	887
Pre-peel Considerations	856	85 Rhytidectomy	889
Formula Preparation	857	<i>Jon B. Chadwell and Devinder S. Mangat</i>	
The Peel Procedure	857	Introduction	889
Post-peel Care	858	History	889
Complications	858	Patient Evaluation	890
Conclusion	859	The Face-lift Procedure	892
References	859	Complications	899
82 Laser Facial Resurfacing	861	Secondary Rhytidectomy	901
<i>Edmund A. Pribitkin</i>		References	901
Basic Principles	861	86 Otoplasty	903
Initial Consultation and Pretreatment Regimen	862	<i>Alan R. Burningham and Fred J. Stucker</i>	
Operative Technique	864	Introduction	903
Complications	867	Surface Anatomy of External Ear	903
Conclusion	868	Preoperative Evaluation	904
References	868	Surgical Technique—Lateral Conchal Resection with Mattress Suture Placement	904
83 Soft Tissue Augmentation with Injectable Fillers	869	Summary	906
<i>David A. F. Ellis and Evelyn Linda Maxwell</i>		References	908
Introduction	869	87 Cleft Lip and Palate	909
Indications	869	<i>Samson Lee and Jonathan Sykes</i>	
The Ideal Injectable Filler	870	Introduction	909
Adverse Events	870	Embryology and Anatomy	909
Xenogenic Fillers	870	Incidence and Genetics	910
Allogeneic and Autogeneic Fillers	871	Classification	911
Permanent Injectable Fillers: Artecoll, Dermalive, Silicone, Bio-Alcamid	871	Preoperative Assessment	911
Temporary Injectable Fillers: Perlane, Restylane, Restylane Fine Lines, Restylane Sub Q, Juvederm, Hyalform	874	Procedure Unilateral Cleft Lip Repair and Rhinoplasty (Millard Rotation and Advancement Flap)	912
Conclusion	875	Bilateral Cleft Lip Repair	913
References	875	Unilateral Cleft Palate Repair by Two-Flap Palatoplasty [24]	913
		Secondary Cleft Plate Repair with Furlow Palatoplasty [25]	914
		References	915
		Subject Index	917