
Contents

Foreword	xi
Foreword	xii
Preface	xiii
Acknowledgments	xiii
Contributors	xiv

I Anatomy

1 Embryology of the Spine	3
<i>Eric Momin, Jared Fridley, and Andrew Jea</i>	
2 Craniovertebral Junction	8
<i>Jonathan Hobbs and Edwin Ramos</i>	
3 Cervical Spine	16
<i>William J. Readdy, Eric Sribnick, and Sanjay S. Dhall</i>	
4 Thoracic Spine	22
<i>Whitney S. James, Jens R. Chapman, and Rod J. Oskouian Jr.</i>	
5 Lumbar Spine	28
<i>Hormuzdiyar H. Dasenbrock, Rafael De la Garza-Ramos, and Ali Bydon</i>	
6 Sacral-Iliac Spine	36
<i>Amit R. Patel, Matthew Chin, Amrit Khalsa, and Ravi K. Ponnappan</i>	

II Clinical Spine Surgery

7 Physical Examination	45
<i>Mark S. Greenberg</i>	
8 Spinal Imaging	53
<i>David Minges and Joon Y. Lee</i>	
9 Radiation Exposure in Spine Surgery	60
<i>Alexander Tuchman and Patrick C. Hsieh</i>	
10 Electrodiagnostic Testing in Spine Surgery	64
<i>Kamakshi Patel and Holli A. Horak</i>	
11 Intraoperative Neurophysiological Monitoring in Spine Surgery	70
<i>Colin R. Bamford</i>	
12 Bedside Procedures	76
<i>Daniel C. Lu and Praveen V. Mummaneni</i>	
13 Pharmacology	83
<i>Mark S. Greenberg</i>	
14 Radiation Therapy in Spine Surgery	90
<i>Alexander Tuchman and Patrick C. Hsieh</i>	
15 Spinal Radiosurgery Therapy	94
<i>Benjamin M. Zussman, Edward A. Monaco III, and Peter Carlos Gerszten</i>	

16 Spinal Navigation	100
<i>Roger Härtl and José A. Corredor</i>	
17 Spine Biologics	107
<i>Zorica Buser, Rahul Basho, and Jeffrey C. Wang</i>	

III Spinal Pathology

18 Congenital Anomalies	115
<i>Jared Fridley, Eric Momin, and Andrew Jea</i>	
19 Cervical Trauma	124
<i>Gregory D. Schroeder and Alexander R. Vaccaro</i>	
20 Thoracolumbar Trauma	138
<i>Wyatt L. Ramey, Jesse Skoch, and Ali A. Baaj</i>	
21 Sacropelvic Trauma	147
<i>Kelley Banagan, Salman Abbasifard, Ali A. Baaj, and Steven C. Ludwig</i>	
22 Infection	156
<i>Arya Giri Varthi, William D. Long III, Jason O. Toy, and Peter G. Whang</i>	
23 Spinal Column and Spinal Cord Tumors	165
<i>C. Rory Goodwin, Camilo Molina, and Daniel M. Sciubba</i>	
24 Cervical and Thoracic Spine Degenerative Disease	175
<i>Clinton J. Burkett and Mark S. Greenberg</i>	
25 Degenerative Lumbar Spine Disease	182
<i>Michael Y. Wang</i>	
26 Congenital and Neuromuscular Scoliosis	191
<i>Marie Roguski, Amer F. Samdani, and Steven W. Hwang</i>	
27 Scheuermann's Kyphosis	199
<i>Jahangir Asghar, Paul D. Kiely, and Harry L. Shufflebarger</i>	
28 Adolescent Idiopathic Scoliosis	206
<i>Lawrence G. Lenke and Todd M. Chapman Jr.</i>	
29 Adult Degenerative Deformity	212
<i>Salman Abbasifard and Ali A. Baaj</i>	
30 Radiographic Parameters of Spinal Deformity	217
<i>Khoi D. Than, Andrei Fernandes Joaquim, and Praveen V. Mummaneni</i>	
31 Vascular Pathology of the Spine	223
<i>Timothy D. Uschold and Steven W. Chang</i>	
32 Spondyloarthropathies	231
<i>Amir A. Ahmadian and Fernando L. Vale</i>	
33 Spinal Emergencies	240
<i>Puya Alikhani, Andreas K. Filis, and Frank D. Vrionis</i>	

IV Surgical Techniques

34 Occipitocervical Fusion	249
<i>Gisela Murray, Edwin Ramos, and Juan S. Uribe</i>	
35 Chiari I Decompression	253
<i>Mark S. Greenberg</i>	

36	Transoral Odontoidectomy	258
	<i>Steven M. Presciutti, Martin Quirno, Colin B. Harris, and Frank M. Phillips</i>	
37	C1–C2 Techniques	265
	<i>Jau-Ching Wu, Khoi D. Than, and Praveen V. Mummaneni</i>	
38	Direct Fixation of Odontoid Fractures	272
	<i>Rajiv Saigal and Dean Chou</i>	
39	Cervical Arthroplasty	277
	<i>Jau-Ching Wu, Ali A. Baaj, and Praveen V. Mummaneni</i>	
40	Anterior Cervical Corpectomy	283
	<i>Colin B. Harris and Frank M. Phillips</i>	
41	Anterior Cervical Discectomy	290
	<i>Daniel C. Lu, Khoi D. Than, Kevin T. Foley, and Praveen V. Mummaneni</i>	
42	Cervical Laminectomy with and without Fusion	295
	<i>Shyam M. Shridharani and F. Andrew Rowan</i>	
43	Cervical Laminoplasty	302
	<i>Glen R. Manzano and Allan D. Levi</i>	
44	Posterior Cervical Foraminotomy	308
	<i>Andreas K. Filis and Frank D. Vrionis</i>	
45	Cervical Open Reduction Techniques: Anterior and Posterior Approaches	315
	<i>Harminder Singh, George M. Ghobrial, and James S. Harrop</i>	
46	Anterior Cervical–Thoracic Junction Technique	321
	<i>Muhammad M. Abd-El-Barr, Viren S. Vasudeva, and Michael W. Groff</i>	
47	Freehand Thoracic Pedicle Screw Placement Technique	328
	<i>Sheri Palejwala, Jesse Skoch, and Ali A. Baaj</i>	
48	Transpedicular Approach	333
	<i>Vinko Zlomislic and Steven R. Garfin</i>	
49	Costotransversectomy	338
	<i>Hasan A. Zaidi and U. Kumar Kakarla</i>	
50	Lateral Extracavitary Approach	343
	<i>Marco Ferrone and Christopher M. Bono</i>	
51	Pedicle Subtraction Osteotomy/Smith–Petersen Osteotomy	351
	<i>Frank La Marca, Paul Park, and Juan M. Valdivia</i>	
52	Thoracoscopic Approaches to the Spine	356
	<i>Meic H. Schmidt and Ricky Kalra</i>	
53	Lateral Approaches to the Thoracolumbar Spine	363
	<i>Jay Rhee, C. Rory Goodwin, and Jean–Paul Wolinsky</i>	
54	Open and Minimally Invasive Spinal Lumbar Microdiscectomy	370
	<i>Ali A. Baaj and Mark S. Greenberg</i>	
55	Lumbar Foraminotomy	375
	<i>Ali A. Baaj and Juan S. Uribe</i>	
56	Posterolateral Endoscopic Discectomy	378
	<i>Christopher Yeung and Anthony T. Yeung</i>	
57	Lumbar Laminectomy	387
	<i>Benjamin D. Elder and Timothy F. Witham</i>	

58	Posterior and Transforaminal Lumbar Interbody Fusion	393
	<i>Zachary J. Tempel, Hazem A. Mashaly, and Adam S. Kanter</i>	
59	Minimally Invasive Transforaminal Lumbar Interbody Fusion	399
	<i>Michael Y. Wang</i>	
60	Percutaneous Pedicle Screw Placement	405
	<i>Michael Y. Wang</i>	
61	Minimally Invasive Lateral Retroperitoneal Transpsoas Interbody Fusion	411
	<i>Gisela Murray, Ali A. Baaj, and Juan S. Uribe</i>	
62	Anterior Lumbar Interbody Fusion	416
	<i>Junyoung Ahn, Krzysztof Siemionow, Dustin H. Massel, Benjamin C. Mayo, William D. Long III, Krishna D. Modi, and Kern Singh</i>	
63	Facet Screw Fixation/Fusion	421
	<i>Justin W. Miller and Rick C. Sasso</i>	
64	Interspinous Process Decompression	426
	<i>Jason O. Toy, Ravi Ramachandran, Arya Giri Varthi, and Peter G. Whang</i>	
65	Lumbar Arthroplasty	432
	<i>Keith Jackson and Joon Y. Lee</i>	
66	Lumbosacroiliac Fixation	439
	<i>Phillip Horne, William D. Long III, and Andrew A. Sama</i>	
67	Iliosacral Percutaneous Fixation (Iliosacral Screws)	446
	<i>Jonathan G. Eastman and Eric O. Klineberg</i>	
68	Sacroiliac Joint Fusion	456
	<i>Kornelis Poelstra and Jessica Sosio</i>	
69	Sacrectomy	468
	<i>Thomas Kosztowski, Mohamad Bydon, C. Rory Goodwin, and Ziya L. Gokaslan</i>	
70	Vertebral Body Augmentation	476
	<i>Andrey Alex Volkov, Ioannis Papanastassiou, and Frank D. Vrionis</i>	
71	Spinal Cord Tumor Resection	483
	<i>Mari L. Groves and George I. Jallo</i>	
72	Surgical Resection of Spinal Vascular Lesions	490
	<i>Timothy D. Uschold, Alim P. Mitha, and Steven W. Chang</i>	

Appendices

I	Positioning	499
	<i>Tien V. Le, Juan S. Uribe, and Fernando L. Vale</i>	
II	Selected Spinal Orthoses	505
	<i>Tien V. Le, Juan S. Uribe, and Fernando L. Vale</i>	
III	Outcome Scales	516
	Index	521