

Index

Note: Page numbers set **bold** or *italic* indicate headings or figures, respectively.

A

Adenocarcinoma **263**
Adjacent syrinx **53**
Adjuvant therapy **27**
Adult-type diffuse glioma **199**
Aggressive lytic bone lesion **48**
Aggressive/malignant primary spinal tumors **58**
Allergic reactions **63**
Ambulatory status **29**
Aneurysmal bone cysts (ABCs) **47, 58, 79, 79, 101, 115, 130, 185, 484**
Angiographic embolization of spinal neoplasms
– access of tumor feeding vessels **335**
– complications **337**
– curative treatments for certain lesions **337**
– intraoperative blood loss **336**
– pain relief **337**
– preprocedural imaging **334**
– spinal tumor embolization **333**
– success and complete embolization **336**
– technique
– coils **334**
– embolization material **334**
– liquid agents **335**
– particulate agents **335**
– vascular supply of spinal cord **334**
– vascular supply of spine **333**
– watershed areas in spinal cord **334**
Anterior approach **72**
Anterior column support techniques **486**
Anterior longitudinal ligament (ALL) **6**
Anterior spinal artery **16, 64**
Anterior spinal column fixation **482**
Anterior spinocerebellar tract **15**
Anterior to the psoas **456**
Anterior white matter **16**
Anterolateral approach **380**
Arachnoiditis **64**
Arterial blood supply to the spinal cord **16**
Artery of Adamkiewicz **16**
Astrocytomas **22, 22, 53, 147, 169, 188**
– grade I astrocytoma (pilocytic) **155**
– grade II astrocytoma **156**
– grade III/IV astrocytoma **156**
Asymptomatic patients **77**
Atlantoaxial joint **6**
Atlantoaxial joint articulates **5**
Atlantoaxial spine **4**
Axial skeleton tumor grading **71**

B

Back pain **35**
Bed rest and hydration **63**
Benign bony tumors **58**
Benign intradural neoplasms **27**
Benign primary bony tumors **373**
Benign tumors **52**
Benign tumors of vertebral column in adults, tumors
– aneurysmal bone cysts **79**

– chondroma and osteochondroma **81**
– giant cell tumors **80**
– osteoid osteomas and osteoblastomas **78**
– vertebral hemangiomas **77**
Benign versus malignant spinal tumors
– benign intradural neoplasms **27**
– benign vertebral neoplasms **27**
– malignant spinal tumors **27**
Benign vertebral column neoplasms
– aneurysmal bone cyst **130**
– giant cell tumor of bone **129**
– hemangioma of bone **132**
– osteoblastoma **128**
– osteochondroma **131**
– osteoid osteoma **127**
Benign vertebral neoplasms **27**
Benign vs malignant tumors **69**
Bilsky score **283**
Biomechanical characteristics **481**
Biomechanical forces **481**
Biomechanical superiority **483**
Biomechanical testing **484**
Biopsy needle **63**
Biopsy procedures **69**
Biopsy, role of **69**
Bisphosphonates **100**
Bladder function **38**
Blood loss during reconstruction **487**
Blood patch procedure **63**
Blood supply of spinal cord **16**
Bone island **58**
Bone Islands **98**
Bone Marrow Edema **97**
Bony anatomy **471**
Bony metastatic disease
– hallmarks of cancer **287**
– origins of metastatic disease **288**
– skeletal metastases, pathogenesis of **287**
Bowel and bladder dysfunction **38**
Bowel function **38**
Breast cancer metastases **49**
Breast carcinoma **259**
Breast metastases to the spine **19**
Brown Tumor **98, 98**
Brown tumors **98**

C

Calcific matrix **48**
Carcinomas of digestive system origin
– adenocarcinoma **263**
– cholangiocarcinoma **265**
– neuroendocrine tumors **265**
Cardiac life support **63**
Cauda equina level, tumors at **347**
Cavernomas **24**
Cavernous malformation **55**
Cell-free DNA **41**
Cement augmentation **463**
Cerebrospinal fluid leak **63**
Cervical lesions **364**
Cervical spinal canal **7**
Cervical spine **60**
Cervical spine anatomy
– atlantoaxial spine **4**
– cervical spinal canal **7**
– cervical spine, ligaments of **6**
– cervical spine, neural elements of **8**
– subaxial spine **5**
– vascular anatomy of cervical spine **8**
Cervical spine arterial supply **17**
Cervical spine, ligaments of **6**
Cervical spine, neural elements of **8**
Cervical vertebra (C7) **5**
Cervical vertebral augmentation **444**
Cervicothoracic junction **389**
Cervicothoracic region **399**
Chest tube placement **63**
Cholangiocarcinoma **265**
Chondroma **81**
Chondrosarcomas **58, 69, 88, 122, 137, 478**
Chordomas **20, 27, 48, 48, 58, 89, 121, 134, 190, 473, 477**
Circumferential decompression **29**
Circumscribed astrocytic gliomas
– pilocytic astrocytoma **195**
– pleomorphic xanthoastrocytoma **198**
Closed loop reconstructions **485**
Coagulation parameters **63**
Coccyx (tailbone) **13**
Complete blood cell count **41**
Complications post-sacroctomy **487**
Compression fracture **57**
Compressive myelopathy **77**
Computed tomography (CT) **39, 69**
Computed tomography simulation **315**
Conservative Therapy **98**
Conservative treatment **63**
Contrast material allergy **63**
Contrast preparation **63**
Conus medullaris **14, 17**
Cord puncture **64**
Corpectomy, anterior lateral fixation for tumors **415**
Corticospinal tracts **15, 37**
Costotransverse joint **8**
Costotransversectomy **428, 437**
Costovertebral joint **8**
Cranial meningiomas **27**
Craniocervical junction, tumors of
– anterolateral approach **380**
– benign primary bony tumors **373**
– endonasal approach **376**
– lateral approach **381**
– locally aggressive tumors **373**
– mandibular swing transcranial approach **379**
– metastatic tumors **375**
– posterolateral approach **382**
– primary intradural tumors **375**
– transoral translabiomandibular transpharyngeal approach **377**
– transoral transpharyngeal approach **376**
– transoral transpharyngeal extended maxillotomy approach **378**
Craniospinal radiation therapy **317**
CT findings **48**
CT-guided needle biopsy (CTGNB) **69**
Cuneocerebellar tract **15**
Curettage **72**

Custom prosthesis **486**
Custom-made prosthesis **486**

D

D-wave **344**
Decalcification on immunohistochemistry and molecular studies **255**
Degenerative conditions **35, 97**
Denosumab **81**
Dermoid tumors **189**
Diagnostic criteria **50**
Diagnostic tools for tumors **69**
Diffuse astrocytomas **27**
Diffuse pediatric-type gliomas **203**
Diffusion-weighted imaging (DWI) **57**
Digestive system origin, carcinomas of
– adenocarcinoma **263**
– cholangiocarcinoma **265**
– neuroendocrine tumors **265**
Direct-look/shallow docking technique **456**
Disease-specific workup **408**
Diskitis **63**
Dorsal nerve roots **16, 36**
Dorsal ramus **12**
Dorsal root ganglion (DRG) **12**
Dorsolateral spinal canal **21**
Double iliac screw fixation **483**
Drill trajectory **483**
Drop metastases **268**
Dual iliac screw fixation **483**
Dumbbell appearance **21**
Dumbbell schwannoma **19**
Dural attachment **51**
Dural tail **51**
Dural tails **21**

E

Early mobilization caution **485**
Electromyography **344**
Electrophysiological studies **41**
Electrophysiology **41, 363**
En bloc resection **27, 29, 71, 81**
End arteries **16**
End organ damage **50**
Endonasal approach **376**
Endoscopy **466**
Enneking classification **70**
Enneking oncological staging system **85**
Enneking-appropriate surgery **29**
Enostosis **58, 98, 98**
Eosinophilic granuloma **98, 98, 118, 185**
Ependymal tumors **205**
Ependymoma molecular classification **205**
Ependymomas **22, 22, 53, 147, 156–157, 168, 188**
Epidermoid tumors **189**
Epidural bleeding **63**
Epidural spinal cord compression scale **50**
ESSC scale **28**
Ewing's sarcoma **93, 122, 139, 187**

Exoscopic surgery, for spinal tumors

- advantages of 355
- exoscopes 353
- operating room setup, changes in 354
- spinal tumors 354

Expandable titanium cage 486

Extent of resection 151

External beam radiation therapy, for tumors of spine

- computed tomography simulation 315
- image fusion 316
- imaging 315
- normal tissue structures, contouring of 316
- plan evaluation 318
- planning techniques
- craniospinal radiation therapy 317
- intensity-modulated radiotherapy 317
- particle therapy 317
- radiation doses and fractionation
- primary spinal tumors 319
- spinal metastases 318
- radiation therapy 315
- radiotherapy treatment planning process 315
- referring physicians, collaboration with 316
- target contouring 316
- toxicities 320

Extradural nerve sheath tumors 368

Extradural spinal cord tumors

- aneurysmal bone cyst 185
- eosinophilic granuloma 185
- Ewing's sarcoma 187
- giant cell tumor 185
- hemangiomas 185
- metastatic lesions 187
- osteoblastoma 184
- osteogenic sarcoma 187
- osteoid osteoma 183

Extradural tumors 19, 46

- based on location 20
- osteoblastic versus osteolytic lesions 20

Extramedullary spinal tumors, surgery for

- cervical lesions 364
- electrophysiology 363
- extradural nerve sheath tumors 368
- filum terminale tumors 369
- intradural extramedullary surgery 363
- intradural nerve sheath tumors 366
- lumbosacral 365
- meningiomas 368
- minimally invasive approaches 365
- preoperative preparation 364
- spinal fusion, need for 365
- thoracolumbar 364

Extraventricular neurocytoma 212

F

Fasciculus cuneatus 15

Femoral allograft 485

Fibrosarcoma 88

Fibrous dysplasia 100

Fibular strut allograft 486

Fibular triangular construct (FTC) 486

Filum terminale tumors 369

Fluoroscopic guidance 483

Four-rod reconstruction 484

Four-rod reconstruction (double-rod double iliac screw) 484

Functional lordosis and kyphosis 485

Functional outcomes of sacrectomy 486

G

Galveston and modified Galveston techniques 482

Galveston technique 481, 485

Galveston technique modification 485

Ganglioglioma 148, 210

Genetic syndromes 166

Germ cell tumors (GCTs) 149

Giant cell tumors, of bone 129

Giant cell tumors (GCTs) 25, 47, 58, 80, 80, 118, 185, 473, 478

Glioneuronal tumors

- extraventricular neurocytoma 212
- ganglioglioma 210

Global Spine Tumor Study Group (GSTSG) 31, 31

- risk calculator 278

Gluteus muscle (GLM) flap 487

Grading and scoring systems 39

Gray matter blood supply 16

Greater sciatic notch 483

H

Harrington instrumentation system 436

Headache management 63

Hemangioblastomas 23, 23, 54, 148, 157, 170

Hemangiomas 46, 58, 69, 102, 185, 445

- of bone 132

Hematologic malignancy 58

Hematological malignancy 50

Hematolymphoid malignancies 267

Hematopoietic cancers of the spine 19

Hepatocellular carcinoma 266

High water content 48

Histological grade 27

Histology 79

Horizontal component of spinal cord blood supply 17

Human vertebral column 3–4

Hybrid strategies 31

Hypercellular giant cell tumor of bone 130

Hyperostosis 21

Hyperparathyroidism 99

Hypoalbuminemia 41

I

IDEM tumors (intradurally extramedullary) 19

Idiopathic scoliosis 410

Iliac bones stress 485

Iliac screw fixation 483

Iliolumbar ligament 11

Image guidance 63

Image-guided percutaneous biopsy, for spinal tumors

- cervical spine 60
- complications 63
- imaging approach to spinal tumors 57
- imaging modalities
- computed tomography 59
- magnetic resonance imaging 59
- nuclear medicine 59
- radiographs 59
- lumbar spine 61
- on-site pathology 62
- primary spinal tumors
- aggressive/malignant primary spinal tumors 58
- benign bony tumors 58
- hematologic malignancy 58
- metastatic disease 58
- thoracic spine 60

Imaging 77

Imaging approach to spinal tumors 57

Imaging findings 50

Imaging modalities 69

- computed tomography 59
- magnetic resonance imaging 59
- nuclear medicine 59
- radiographs 59

Imaging of tumors

- extradural tumors 46
- intradural extramedullary tumors of spine
- meningiomas 51
- peripheral nerve sheath tumors 52
- intramedullary tumors of spine
- cavernous malformation 55
- ependymomas 53
- hemangioblastomas 54
- astrocytoma 53
- metastatic disease 48
- multiple myeloma 50
- peripheral nerve sheath tumors
- neurofibroma 52
- schwannomas 52
- primary osseous tumors
- aneurysmal bone cyst 47
- chordoma 48
- giant cell tumor 47
- hemangioma 46
- osteoblastomas 47
- osteoid osteoma 46
- osteosarcoma 48

Implant loosening 483

Infection control 63

Inferior articulating process 10

Instrumentation failure 481

Intensity-modulated radiotherapy 317

Intervertebral disks 5

Intervertebral foramina 8

Intradural extramedullary dumbbell neurofibroma 187

Intradural extramedullary spinal tumors in adults

- leptomeningeal metastasis 180
- malignant peripheral nerve sheath tumor 179
- myxopapillary ependymoma 178
- neurofibroma 176
- paraganglioma 179
- schwannoma 176
- solitary fibrous tumor/hemangiopericytoma 179
- spinal meningioma 175

Intradural extramedullary surgery 363

Intradural extramedullary tumors 50, 387

- meningioma 149

- meningiomas versus nerve sheath tumors 21
- myxopapillary ependymoma 150, 188
- nerve sheath tumors 150
- neurofibroma 187
- paraganglioma 150
- schwannomas 187

Intradural extramedullary tumors of spine

- meningiomas 51
- peripheral nerve sheath tumors 52

Intradural intramedullary

- astrocytoma 147
- ependymoma 147
- ganglioglioma 148
- germ cell tumors 149
- hemangioblastoma 148
- intramedullary lymphoma 148
- intramedullary spinal metastatic disease 149
- lipoma 149
- melanoma 149
- oligodendroglioma 148

Intradural intramedullary tumors

- astrocytoma 188
- dermoid tumors 189
- ependymoma 188
- epidermoid tumors 189

Intradural nerve sheath tumors 366

Intradural tumors 19, 40, 345

Intralesional resection 29

Intramedullary lymphoma 148

Intramedullary spinal cord tumors in adults

- genetic syndromes 166
- tumor types
- astrocytomas 169
- ependymomas 168
- hemangioblastomas 170
- metastasis 171
- primary CNS lymphoma 171
- rare tumors and mimics 171
- world health organization grading 165

Intramedullary spinal cord tumors, surgery for

- anterior myelotomy approach 360
- lateral myelotomy approach 360
- posterior median sulcus approach 359
- posterolateral sulcus approach 359
- surgical anatomy 357
- transpial approach 360

Intramedullary spinal metastatic disease 149

Intramedullary surgery 27

Intramedullary tumors 19, 22, 345

- astrocytomas 22
- ependymoma 22
- hemangioblastoma 23

Intramedullary tumors of spine

- astrocytoma 53
- cavernous malformation 55
- ependymomas 53
- hemangioblastomas 54

Intraoperative frozen section

- of spinal metastases 253
- on spinal lesions 254

Intraoperative neurophysiological monitoring in spinal tumor surgery

- D-wave 344
- electromyography 344

- intradural tumors 345
 - intramedullary tumors 345
 - intraoperative neurophysiological stimulation 345
 - meps and intraoperative interpretation 344
 - metastatic extradural lesions 346
 - motor-evoked potentials 343
 - peripheral muscular meps 343
 - somatosensory-evoked potentials 343
 - somatosensory-evoked potentials and intraoperative use 344
 - spontaneous free-running EMG and its limitations 344
 - tumors at cauda equina level 347
 - Intraoperative neurophysiological stimulation 345
 - Intraoperative tissue triage 255
 - Intraperitoneal approach 475
 - Intrathecal chemotherapy, for spinal tumors 299
 - Intravertebral tumors 27
- J**
- Jackson intrasacral rod technique 481
 - Johns Hopkins university method 485
- K**
- Kyphoplasty/vertebroplasty for spinal tumors
 - cervical vertebral augmentation 444
 - hemangioma 445
 - multiple myeloma 445
 - osteolytic metastatic tumors 445
 - paraspinal vertebral augmentation 444
 - transpedicular kyphoplasty 443
 - transpedicular vertebroplasty 443
 - Kyphotic curvature 3
- L**
- Laboratory markers 41
 - Laminectomy 427
 - Langerhans cell histiocytosis 98
 - Laser interstitial thermal therapy 467
 - Lateral columns 16
 - Lateral extracavitary approach 429
 - Lateral sacral arteries 14
 - Lateral vestibulospinal tract 16
 - Leptomeningeal metastasis 180
 - Ligaments of the sacral spine 13
 - Lipoma 149
 - Liquid biopsies 41
 - Load transfer mechanism 486
 - Local anatomical extent (T) 70
 - Locally aggressive tumors 373
 - Lordotic curvature 10
 - Lumbar arterial supply 17
 - Lumbar facet joints 10
 - Lumbar pedicles 10
 - Lumbar spinal canal 11
 - Lumbar spinal canal shape 11
 - Lumbar spine 61
 - lumbar spine anatomy
 - lumbar spine, ligaments of 11
 - lumbar spine, ligaments of 11
 - lumbar vertebral column 10
 - neural elements of lumbar spine 11
 - vascular anatomy of lumbar spine 12
 - Lumbar spine anatomy 10
 - Lumbar spine tumors 21
 - Lumbar spine, ligaments of 11
 - Lumbar vertebral column 10
 - Lumbopelvic region 481
 - Lumbopelvic stabilization 481
 - Lumbosacral 365
 - Lumbosacral and pelvic reconstruction in tumor patients
 - closed loop reconstructions 485
 - custom prosthesis 486
 - double iliac screw fixation 483
 - four-rod reconstruction (double-rod double iliac screw) 484
 - Galveston and modified Galveston techniques 482
 - Johns Hopkins university method 485
 - lumbosacral reconstruction 481
 - S2 alar-iliac screw fixation 483
 - soft-tissue reconstruction 487
 - spinopelvic fixation 481
 - triangular frame reconstruction 485
 - Lumbosacral pivot point 481
 - Lumbosacral reconstruction 481, 481
 - Lung carcinoma 256
 - Lung metastases to the spine 19
 - Luque instrumentation system 436
 - Lymphoma 93
 - Lytic lesions 50
- M**
- Magnetic resonance imaging 45
 - Magnetic resonance imaging (MRI) 40, 69, 77
 - Malignancy prevalence 35
 - Malignant fibrous histiocytoma 89
 - Malignant hematological disease 50
 - Malignant osteoblastic lesions 48
 - Malignant peripheral nerve sheath tumor 160, 179
 - Malignant primary spinal tumor 58
 - Malignant spinal tumors 19, 27, 27
 - Malignant transformation 100
 - Malignant tumors of vertebral column in adults
 - chondrosarcoma 88
 - chordoma 89
 - Ewing's sarcoma 93
 - fibrosarcoma 88
 - lymphoma 93
 - malignant fibrous histiocytoma 89
 - osteosarcoma 86
 - plasmacytoma and multiple myeloma 91
 - staging 85
 - Malignant vertebral column neoplasms 133
 - Mammillary process 10
 - Mandibular swing transcervical approach 379
 - Marrow edema 57
 - Mayo technique 486
 - Mechanical back pain 35
 - Mechanical failure factors 485
 - Mechanical failure rate 486
 - Medial longitudinal fasciculus (MLF) 16
 - Medial vestibulospinal tract 16
 - Median sacral artery 14
 - Median sacral artery (middle sacral artery) 14
 - Medullary reticulospinal tract 16
 - Melanoma 149, 267
 - Meningiomas 51, 51, 149, 158, 207, 368
 - Meningiomas versus nerve sheath tumors 21
 - Meps and intraoperative interpretation 344
 - Metastasis 171
 - Metastasis (M) 70
 - Metastatic disease 48, 48, 58
 - Metastatic extradural lesions 346
 - Metastatic lesions 187
 - metastatic neuroblastoma 123
 - Metastatic spinal tumors 19
 - cancer metastasis to distant organ 243
 - development and growth of bone metastasis 243
 - neurological involvement and spinal instability 246
 - scoring systems for predicting life expectancy 246
 - Metastatic spinal tumors, scoring systems and management of
 - Bilsky score 283
 - global spine tumor study group (GSTSG) risk calculator 278
 - New England Spinal Metastasis Score (NESMS) 277
 - new Katagiri score 279
 - Oswestry risk index 277
 - pathfx 278
 - Rades score 280
 - revised Tokuhashi score 275
 - Skeletal Oncology Research Group (SORG) nomogram and algorithm 278
 - spinal tumors Tomita 282
 - spine instability neoplastic score (SINS) 281
 - Tomita score 276
 - van der Linden and Bollen scores 276
 - Metastatic spinal/vertebral column neoplasms
 - breast carcinoma 259
 - carcinomas of digestive system origin
 - adenocarcinoma 263
 - cholangiocarcinoma 265
 - neuroendocrine tumors 265
 - decalcification on immunohistochemistry and molecular studies 255
 - drop metastases 268
 - hematolymphoid malignancies 267
 - hepatocellular carcinoma 266
 - intraoperative frozen section of spinal metastases 253
 - intraoperative frozen section on spinal lesions 254
 - intraoperative tissue triage 255
 - lung carcinoma 256
 - melanoma 267
 - preoperative patient workup in metastasis of unknown origin 254
 - prostate carcinoma 261
 - renal cell carcinoma 262
 - Metastatic tumors 375, 416
 - Metastatic tumors of sacrum in adults
 - bony metastatic disease
 - hallmarks of cancer 287
 - origins of metastatic disease 288
 - skeletal metastases, pathogenesis of 287
 - clinical presentation 289
 - diagnosis 290
 - imaging 289
 - management
 - ablative techniques 292
 - radiation and radiotherapy 290
 - sacroplasty 292
 - selective arterial embolization 292
 - surgical considerations 291
 - surgical management 290
 - Metastatic vertebral tumors 69
 - Metastatic/systemic disease of lumbar spine 458
 - Micturition center 38
 - Mid-/lower lumbar spine, anterior approaches for tumors 450
 - Middle sacral artery 14
 - Mimicking vertebral tumors 103
 - Mini-open technique 456
 - Minimally invasive approaches 365
 - Minimally invasive strategies, for spinal tumor treatment
 - cement augmentation 463
 - endoscopy 466
 - laser interstitial thermal therapy 467
 - percutaneous pedicle screw stabilization 463
 - stereotactic radiosurgery 461
 - tubular approaches 465
 - Minimally invasive technique 388
 - Minimally invasive transposas technique 455
 - Mixed intra- and extradural tumors 19
 - Modified Galveston technique 483
 - Monoclonal gammopathies 50
 - Monoclonal plasma cells 50
 - Motor-evoked potentials 343
 - Motor/sensory deficits 37
 - MRI evaluation 50
 - MRI of the spine 63
 - Multiple myeloma 50, 50, 91, 445
 - Myelography 45
 - Myelopathy 36, 36
 - Myxopapillary ependymoma 53, 150, 157, 178, 188
 - Myxopapillary ependymoma (MPE) 22
- N**
- Neck pain 35
 - Neoadjuvant chemotherapy 27
 - Nerve conduction studies 41
 - Nerve roots 16, 16
 - Nerve sheath tumors 150
 - Nerve sheath tumors (nsts) 21
 - Neural elements of lumbar spine 11
 - Neural elements of sacral and coccygeal spine 14
 - Neural foramina anatomy 11
 - Neuroblastomas in pediatric cases 19
 - Neuroendocrine tumors 265
 - Neurofibromas 21, 52, 160, 176, 187
 - Neurofibromatosis type 1 (NF1) 21
 - Neurofibromatosis type 2 51
 - Neurogenic claudication 38
 - Neurologic compromise 98
 - Neurological complications 27

Neurological deficit 64
 Neurological deficits 36, 40
 Neurological status 29
 Neurological symptoms 77
 Neurosurgical consultation 63
 New England Spinal Metastasis Score (NESMS) 277
 New Katagiri score 279
 NOMS framework 28, 28
 Non-neoplastic lesions of vertebral column
 – aneurysmal bone cysts 101
 – Brown tumor 98
 – enostosis 98
 – eosinophilic granuloma 98
 – fibrous dysplasia 100
 – hemangiomas 102
 – mimicking vertebral tumors 103
 – Paget's disease of bone 99
 – Schmorl's nodes 97
 Nonbreather mask 63
 Normal tissue structures, contouring of 316
 Notochord remnants 48

O

Odontoid process 5
 Oligodendroglioma 148
 On-site pathology 62
 Osseointegration 486
 Osseous venous malformations 58
 Osteitis Fibrosa Cystica 98
 Osteoblastic lesions 20
 Osteoblastic versus osteolytic lesions 20
 Osteoblastomas 47, 78, 78, 118, 128, 184
 Osteochondroma 58, 81, 118, 131
 Osteoclasts 99
 Osteogenic sarcoma 187
 Osteoid osteomas 46, 46, 58, 69, 78, 78, 117, 127, 183
 Osteolytic lesions 20
 Osteolytic metastatic tumors 445
 Osteomyelitis 63
 Osteoporosis treatment 99
 Osteoporotic fracture 57
 Osteosarcomas 48, 48, 58, 69, 86, 122, 135
 Osteotomy in iliac wings 486
 Oswestry risk index 277
 Overall survival (OS) 27, 29

P

Paget's disease 48, 99
 Paget's disease of bone 99
 Pain management 78
 Paraganglioma 150, 179, 214
 Paraspinal vertebral augmentation 444
 Partial transverse sacrectomy 481
 Particle therapy 317
 Pathfx 278
 Patient-specific techniques 484
 Peak incidence 48
 Pediatric spinal cord neoplasms 183
 – chordomas 190
 – extradural spinal cord tumors
 – aneurysmal bone cyst 185
 – eosinophilic granuloma 185
 – Ewing's sarcoma 187
 – giant cell tumor 185

– hemangiomas 185
 – metastatic lesions 187
 – osteoblastoma 184
 – osteogenic sarcoma 187
 – osteoid osteoma 183
 – intradural extramedullary tumors
 – myxopapillary ependymoma 188
 – neurofibroma 187
 – schwannomas 187
 – intradural intramedullary tumors
 – astrocytoma 188
 – dermoid tumors 189
 – ependymoma 188
 – epidermoid tumors 189
 – sacrococcygeal teratomas 191
 Pedicle screw fixation 436, 484
 Pedicle screw placement 437–438
 Pedicle signal abnormality 57
 Pelvic reconstruction, in tumor patients
 – closed loop reconstructions 485
 – custom prosthesis 486
 – double iliac screw fixation 483
 – four-rod reconstruction (double-rod double iliac screw) 484
 – Galveston and modified Galveston techniques 482
 – Johns Hopkins university method 485
 – lumbosacral reconstruction 481
 – S2 alar-ilial screw fixation 483
 – soft-tissue reconstruction 487
 – spinopelvic fixation 481
 – triangular frame reconstruction 485
 Percutaneous pedicle screw stabilization 463
 Percutaneous spinal tumor ablation
 – complications 311
 – computed tomography 306
 – imaging 305
 – magnetic resonance imaging 306
 – planar skeletal scintigraphy 306
 – positron emission tomography/computed tomography 306
 – post-treatment imaging 310
 – radiographs 306
 – spinal ablation
 – bipolar radiofrequency ablation 308
 – cryoablation 308
 – laser interstitial thermal therapy 310
 – microwave ablation 309
 – thermal protection techniques and thermal monitoring 310
 – tumor embolization 310
 – vertebral augmentation 310
 Peripheral muscular meps 343
 Peripheral nerve sheath tumors 52, 52, 214
 – neurofibroma 52
 – schwannomas 52
 Pilocytic astrocytoma 195, 197–198
 Plain film radiographs 45
 Planning techniques
 – 3D-CRT 316
 – craniospinal radiation therapy 317
 – intensity-modulated radiotherapy 317
 – particle therapy 317
 Plasma cell infiltration 50
 Plasma cell myeloma 133
 Plasmacytoma 91, 133, 133

Plastic reconstructive surgeon team 487
 Pleomorphic xanthoastrocytoma 198
 Plexiform neurofibroma 52
 Pontine reticulospinal tract 16
 Positron emission tomography 40
 Posterior approach 72
 Posterior longitudinal ligament (PLL) 6
 Posterior pelvic ring fixation 482
 Posterior sacrectomy 476
 Posterior spinal arteries 16
 Posterior spinocerebellar tract 15
 Posterolateral approach 382
 Preoperative neurological status 151
 Preoperative patient workup in metastasis of unknown origin 254
 Prevalence 77
 Primary benign tumors
 – aneurysmal bone cyst 115
 – eosinophilic granuloma 118
 – giant cell tumor 118
 – osteoblastoma 118
 – osteochondroma 118
 – osteoid osteoma 117
 Primary bone tumors 48
 Primary CNS lymphoma 171
 Primary germ cell tumors of spinal cord 224
 Primary histiocytic tumors of spinal cord 222
 Primary intradural spinal tumors 25
 Primary intradural tumors 25, 375
 Primary lymphoma of spinal cord 220
 Primary malignant tumors
 – chondrosarcoma 122
 – chordoma 121
 – Ewing's sarcoma 122
 – osteosarcoma 122
 Primary non-Hodgkin's lymphoma of bone 138
 Primary osseous tumors
 – aneurysmal bone cyst 47
 – chordoma 48
 – giant cell tumor 47
 – hemangioma 46
 – osteoblastomas 47
 – osteoid osteoma 46
 – osteosarcoma 48
 Primary sacral tumors 107
 Primary spinal column tumors, surgical grading of
 – axial skeleton tumor grading 71
 – biopsy, role of 69
 – diagnostic tools 69
 – spine column tumors statistics 69
 – staging and grading of 70
 – staging for surgical planning, utilization of 72
 Primary spinal tumors
 – aggressive/malignant primary spinal tumors 58
 – benign bony tumors 58
 – hematologic malignancy 58
 – metastatic disease 58
 Primary spine tumors 386
 Primary tumors 416
 Primary tumors of sacrum in adults
 – chondrosarcoma 110–111
 – chordoma 108
 – Ewing's sarcoma 110–111
 – giant cell tumors 109
 – hematologic neoplasms 112
 – high-grade osseous tumors 110

– neurogenic tumors 109
 – osteosarcoma 110, 112
 Primary versus secondary spinal tumors
 – primary intradural tumors 25
 – primary vertebral tumors 25
 – secondary spinal tumors 26
 Primary vertebral body tumors 69
 Primary vertebral column neoplasms
 – benign vertebral column neoplasms
 – aneurysmal bone cyst 130
 – giant cell tumor of bone 129
 – hemangioma of bone 132
 – osteoblastoma 128
 – osteochondroma 131
 – osteoid osteoma 127
 – chondrosarcoma 137
 – chordoma 134
 – Ewing's sarcoma 139
 – malignant vertebral column neoplasms 133
 – osteosarcoma 135
 – plasmacytoma and plasma cell myeloma 133
 – primary non-Hodgkin's lymphoma of bone 138
 Primary vertebral column tumor 77
 Primary vertebral malignancies (WBB system) 29
 Primary vertebral tumors 25, 25
 Primary vertebral tumors based on cell of origin 25
 Primitive notochord 48
 Prognosis of tumors 71
 Prognostic indices 29, 29
 Prognostic scoring systems 39
 Progression-free survival 27
 Prostate carcinoma 261
 Prostate metastases to vertebrae 19
 Prostate-specific antigen 41
 Pseudarthrosis 481

R

Rades score 280
 Radiation doses and fractionation
 – primary spinal tumors 319
 – spinal metastases 318
 Radiation therapy 48, 78
 Radical resection 71
 Radicular arteries 17
 Radiculopathy 36, 36
 Radiographic Appearance 98
 Radiographic evaluation 39
 Radiotherapy treatment planning process 315
 Rare tumors and mimics 171
 Red flags of back pain 35
 Referring physicians, collaboration with 316
 Renal cell carcinoma 262
 Reticulospinal tracts 16
 Retroperitoneal anterolateral approach 419
 Retroperitoneal approach 450
 Retropleural thoracotomy approach 418
 Revised Tokumashi score 275
 Rexed laminae 14
 Rod contouring 483
 Rod fracture risk 484
 Rostral spinocerebellar tract 15
 Rubrospinal tract 16

S

- S2 Alar-Iliac Screw Fixation 483, 483
 Sacral and coccygeal nerve roots 14
 Sacral and coccygeal spine anatomy 12
 Sacral foramina 13
 Sacral laminectomies 476
 Sacral neuroanatomy 472
 Sacral rod loosening 485
 Sacral rod reconstruction (SRR) 486
 Sacral rods 485
 Sacral spinal canal 14, 14
 Sacral spine blood supply 17
 Sacral tumor treatment 481
 Sacral tumors, surgical approaches to
 – biopsy 475
 – bony anatomy 471
 – chondrosarcoma 478
 – chordomas 473
 – giant cell tumors 473, 478
 – intraperitoneal approach 475
 – posterior sacrectomy 476
 – sacral laminectomies 476
 – sacral neuroanatomy 472
 – sacrectomy operative technique overview 475
 – vascular anatomy 471
 Sacral vertebrae 12
 Sacral/coccygeal spine, ligaments of 13
 Sacrectomy operative technique overview 475
 Sacrococcygeal joint 13
 Sacrococcygeal region 48
 Sacrococcygeal teratomas 191
 Sacroiliac joint 12
 Sacroiliac joint stability 481
 Sacroplasty 292
 Sagittal computed tomography 29
 Sarcomas 58
 Schmorl's Nodes 97, 97
 Schwannomas 21, 52, 159, 176, 187
 Schwannomatosis 160
 Sciatic notch guidance 483
 Sclerotic lesion 48
 Screw lengths and diameters 483
 Screw purchase 483
 Screw trajectory 483
 Secondary osteosarcomas 48
 Secondary spinal tumors 26
 Segmental arteries 12
 Segmental medullary arteries 17
 Selective arterial embolization 292
 Sensory modalities 38
 Serum alkaline phosphatase 100
 SI joint disruption 481
 Simpson grade I 27
 Simpson grade II 27
 Single iliac screws 485
 Single-stage posterolateral transpedicular approach 431
 SINS (Spinal Instability Neoplastic Score) 29
 Sinuvertebral nerve 12
 Skeletal Oncology Research Group (SORG) nomogram and algorithm 278
 Skeletal system 50
 Soft-tissue defects 487
 Soft-tissue mass 48
 Soft-tissue reconstruction 487
 Solitary fibrous tumor/hemangiopericytoma 179
 Somatosensory-evoked potentials 343
 – and intraoperative use 344
 Spinal cord anatomy
 – blood supply of spinal cord 16
 – nerve roots 16
 – spinal cord topography 14
 – spinal cord tracts 15
 Spinal cord compression 99
 Spinal cord compression severity 28
 Spinal cord in axial view 15
 Spinal cord infarct 64
 Spinal cord neoplasms
 – adult-type diffuse glioma 199
 – circumscribed astrocytic gliomas
 – pilocytic astrocytoma 195
 – pleomorphic xanthoastrocytoma 198
 – diffuse pediatric-type gliomas 203
 – ependymal tumors 205
 – glioneuronal tumors
 – extraventricular neurocytoma 212
 – ganglioglioma 210
 – meningioma 207
 – paraganglioma 214
 – peripheral nerve sheath tumors 214
 – primary germ cell tumors of spinal cord 224
 – primary histiocytic tumors of spinal cord 222
 – primary lymphoma of spinal cord 220
 Spinal cord neoplasms, staging of
 – extent of resection 151
 – intradural extramedullary
 – meningioma 149
 – myxopapillary ependymoma 150
 – nerve sheath tumors 150
 – paraganglioma 150
 – intradural intramedullary
 – astrocytoma 147
 – ependymoma 147
 – ganglioglioma 148
 – germ cell tumors 149
 – hemangioblastoma 148
 – intramedullary lymphoma 148
 – intramedullary spinal metastatic disease 149
 – lipoma 149
 – melanoma 149
 – oligodendroglioma 148
 – preoperative neurological status 151
 Spinal cord radiosensitivity 329
 Spinal cord topography 14
 Spinal cord tracts 15
 Spinal deformities 410
 Spinal ependymomas 27
 Spinal fusion, need for 365
 Spinal instability neoplastic score (SINS) 29, 39
 Spinal instability neoplastic score scoring system 50
 Spinal meningioma 175
 Spinal metastases 28
 Spinal metastases (Tomita) 30
 Spinal neoplasms
 – benign versus malignant spinal tumors
 – benign intradural neoplasms 27
 – benign vertebral neoplasms 27
 – malignant spinal tumors 27
 – extradural tumors
 – based on location 20
 – osteoblastic versus osteolytic lesions 20
 – global spine tumor study group (GSTSG) 31
 – intradural extramedullary tumors, meningiomas versus nerve sheath tumors 21
 – intramedullary tumors
 – astrocytomas 22
 – ependymoma 22
 – hemangioblastoma 23
 – NOMS framework 28
 – primary versus secondary spinal tumors
 – primary intradural tumors 25
 – primary vertebral tumors 25
 – secondary spinal tumors 26
 – primary vertebral malignancies (WBB system) 29
 – prognostic indices 29
 – spinal cord compression severity 28
 – spinal instability neoplastic score (SINS) 29
 – spinal metastases (Tomita) 30
 Spinal osteosarcomas 48
 Spinal Pseudotumors 97
 Spinal stereotaxis 323
 Spinal tumors Tomita 282
 Spinal tumors, radiologic evaluation of
 – imaging of tumors
 – extradural tumors 46
 – intradural extramedullary tumors of spine
 – meningiomas 51
 – peripheral nerve sheath tumors 52
 – intramedullary tumors of spine
 – astrocytoma 53
 – cavernous malformation 55
 – ependymomas 53
 – hemangioblastomas 54
 – metastatic disease 48
 – multiple myeloma 50
 – peripheral nerve sheath tumors
 – neurofibroma 52
 – schwannomas 52
 – primary osseous tumors
 – aneurysmal bone cyst 47
 – chordoma 48
 – giant cell tumor 47
 – hemangioma 46
 – osteoblastomas 47
 – osteoid osteoma 46
 – osteosarcoma 48
 – magnetic resonance imaging 45
 – myelography 45
 – plain film radiographs 45
 Spinal venous drainage 12
 Spine and spinal cord anatomy
 – cervical spine anatomy
 – atlantoaxial spine 4
 – cervical spinal canal 7
 – cervical spine, ligaments of 6
 – cervical spine, neural elements of 8
 – subaxial spine 5
 – vascular anatomy of cervical spine 8
 – ligaments of sacral and coccygeal spine 13
 – lumbar spine anatomy
 – lumbar spinal canal 11
 – lumbar spine, ligaments of 11
 – lumbar vertebral column 10
 – neural elements of lumbar spine 11
 – vascular anatomy of lumbar spine 12
 – neural elements of sacral and coccygeal spine 14
 – sacral and coccygeal spine anatomy 12
 – sacral spinal canal 14
 – spinal cord anatomy
 – blood supply of spinal cord 16
 – nerve roots 16
 – spinal cord topography 14
 – spinal cord tracts 15
 – thoracic spine anatomy
 – thoracic spinal canal 10
 – thoracic spine, ligaments of 9
 – thoracic spine, neural elements of 10
 – thoracic vertebral column 8
 – vascular anatomy of thoracic spine 10
 – vascular anatomy of sacral and coccygeal spine 14
 Spine column tumors statistics 69
 Spine instability neoplastic score (SINS) 281
 Spine tumors 39
 Spine tumors, neurological presentation and clinical diagnosis of
 – bowel and bladder function 38
 – electrophysiology 41
 – grading and scoring systems 39
 – laboratory markers 41
 – motor and sensory deficits 37
 – myelopathy 36
 – neck or back pain 35
 – radiculopathy 36
 – radiographic evaluation 39
 Spinocerebellar tracts 15
 Spinopelvic fixation 481
 Spinopelvic fixation history 481
 Spinopelvic reconstruction 485
 Spondylectomy 395
 Spontaneous free-running EMG and its limitations 344
 Stabilization techniques 420
 Staging 85
 Staging of cancer 70
 Stereotactic body radiotherapy and radiosurgery for spinal tumors
 – delivery methods 324
 – evolution of 323
 – radiobiology 324
 – radiosurgical treatments 325
 – spinal cord radiosensitivity 329
 – spinal stereotaxis 323
 Stereotactic radiosurgery 461
 Stereotactic radiosurgery (SRS) 27
 Sterile technique 64
 Stress concentration on implants 485
 Structural rigidity 483
 Sub-endplate fluid 57
 Subaxial spine 5
 Subaxial vertebrae 5
 Subependymoma 157
 Sulcal arteries 17
 Supraclavicular approach 390
 Surgical classification of spinal metastases 30
 Surgical grade (G) 70
 Surgical intervention 78
 Surgical margins 72
 Surgical planning 71

Switch/sucrose nonfermentable complex (SWI/SNF) 159
 Symptomatic pneumothorax 63
 Systemic chemotherapy, for spinal tumors 299

T

Target contouring 316
 Tectospinal tract 16
 Thecal sac puncture 63
 Thoracic and lumbar spine
 – posterior instrumentation for tumors of
 – costotransversectomy 437
 – Harrington instrumentation system 436
 – Luque instrumentation system 436
 – pedicle screw fixation 436
 – pedicle screw placement 437–438
 – posterolateral surgical approaches to tumors
 – costotransversectomy 428
 – laminectomy 427
 – lateral extracavitary approach 429
 – total en bloc spondylectomy 430
 – transpedicular approach 428
 Thoracic disk herniation 411
 Thoracic region 396
 Thoracic spinal canal 10
 Thoracic spine 60
 – anatomy
 – thoracic spinal canal 10
 – thoracic spine, ligaments of 9
 – thoracic spine, neural elements of 10
 – thoracic vertebral column 8
 – vascular anatomy of thoracic spine 10
 – ligaments of 9
 – neural elements of 10
 Thoracic spine arterial supply 17
 Thoracic spine chordoma 74
 Thoracic spine meningiomas 21
 Thoracic spine vertebrae 8
 Thoracic vertebral column 8
 Thoracolumbar 364
 Thoracolumbar Injury Classification and Severity (TLICS) 29
 Thoracolumbar spine 48
 Tokuhashi score 29, 39
 Tomita classification 30

Tomita score 29, 39, 276
 Tomita scoring system 30
 Tomita surgical classification of spinal metastases 31
 Total en bloc spondylectomy 430, 452
 Total sacrectomy 485
 Total spondylectomy, for tumors of cervical and thoracic spine
 – cervicothoracic region 399
 – spondylectomy 395
 – thoracic region 396
 – upper cervical region 401
 Toxicities 320
 Track seeding 63
 Trans-sternal approach 390
 Transabdominal flap transfer 487
 Transiliac bar 485
 Transitional lumbosacral vertebrae 13
 Transmanubrial transclavicular approach 390
 Transoral translabiomandibular transpharyngeal approach 377, 378
 Transoral transpharyngeal approach 376
 Transoral transpharyngeal extended maxillotomy approach 378
 Transpedicular approach 428
 Transpedicular kyphoplasty 443
 Transpedicular vertebroplasty 443
 Transperitoneal anterior approach 420
 Transpleural thoracoscopic approach 419
 Triangular frame reconstruction 485
 Triangular frame reconstruction (TFR) 485
 Tubular approaches 465
 Tumor excision challenges 481
 Tumor grading 70
 Tumor involvement zones 72
 Tumor-related pain 35
 Tumors of cervical spine, surgical approaches for
 – cervicothoracic junction 389
 – intradural extramedullary tumors 387
 – minimally invasive technique 388
 – primary spine tumors 386
 – supraclavicular approach 390
 – trans-sternal approach 390
 – transmanubrial transclavicular approach 390
 Typical hemangiomas 77

U

U-shaped rod fixation 485
 Upper cervical region 401
 Upper cervical vertebrae 6
 Upper lumbar spine tumors, anterior approaches for 449
 Upper motor neuron lesion 38

V

van der Linden and Bollen scores 276
 Vascular anatomy 471
 – of cervical spine 8
 – of lumbar spine 12
 – of sacral and coccygeal spine 14
 – of thoracic spine 10
 Vascular injury 64
 Vasocorona 17
 Venous drainage of the spinal cord 18
 Ventral nerve roots 16
 Ventral root compression 36
 Ventrolateral spinal canal 21
 Vertebra plana 98
 Vertebral arteries 16
 Vertebral body 48
 Vertebral body reconstruction 452
 Vertebral body tumors 19
 Vertebral column tumors in pediatric population
 – metastatic lesions, metastatic neuroblastoma 123
 – primary benign tumors
 – aneurysmal bone cyst 115
 – eosinophilic granuloma 118
 – giant cell tumor 118
 – osteoblastoma 118
 – osteochondroma 118
 – osteoid osteoma 117
 – primary malignant tumors
 – chondrosarcoma 122
 – chordoma 121
 – Ewing's sarcoma 122
 – osteosarcoma 122
 Vertebral hemangiomas 21, 77, 77
 Vertebral neoplasms
 – benign versus malignant spinal tumors
 – benign intradural neoplasms 27
 – benign vertebral neoplasms 27
 – malignant spinal tumors 27
 – extradural tumors
 – based on location 20
 – osteoblastic versus osteolytic lesions 20
 – global spine tumor study group (CSTSG) 31
 – intradural extramedullary tumors, meningiomas versus nerve sheath tumors 21
 – intramedullary tumors
 – astrocytomas 22
 – ependymoma 22
 – hemangioblastoma 23
 – NOMS framework 28
 – primary versus secondary spinal tumors
 – primary intradural tumors 25
 – primary vertebral tumors 25
 – secondary spinal tumors 26
 – primary vertebral malignancies (WBB system) 29
 – prognostic indices 29
 – spinal cord compression severity 28
 – spinal instability neoplastic score (SINS) 29
 – spinal metastases (Tomita) 30
 Vertebroplasty 98
 Vertebroplasty for spinal tumors
 – cervical vertebral augmentation 444
 – hemangioma 445
 – multiple myeloma 445
 – osteolytic metastatic tumors 445
 – paraspinal vertebral augmentation 444
 – transpedicular kyphoplasty 443
 – transpedicular vertebroplasty 443
 Vertical component of spinal cord blood supply 16
 Vertical rectus abdominis myocutaneous (VRAM) flap 487
 Vestibulospinal tracts 16
 Visceral injury complications 487
 Von Hippel Lindau disease (VHL) 23

W

WBB classification 30, 71
 Weight-bearing screws 483
 Weinstein boriani biagini classification system 31
 Whole-body CT 50
 World health organization grading 165
 Wound complications 484