
Contents

Part I Warm-Up: Basic Concepts

1	Compartmental Approach to Spinal Tumors	3
1.1	Extradural Versus Intradural Tumor.....	3
1.2	Intradural Extramedullary Versus Intramedullary Tumor.....	4
1.3	Illustrations: Compartmental Approach to Spinal Tumors.....	5
1.3.1	Four Compartments of the Spine.....	5
1.3.2	Extradural Versus Intradural Tumor.....	6
1.3.3	Intradural Extramedullary Versus Intramedullary Tumor.....	8
	Bibliography.....	10
2	Histologic Basis for Imaging Appearances of Spinal Tumors	11
2.1	Tumors with Fatty Component.....	11
2.2	Red Marrow Component.....	12
2.3	Tumors with Vascular Component.....	12
2.4	Tumors with High Cellularity.....	12
2.5	Tumors with Hemorrhagic Component.....	12
2.6	Tumors with Calcification/Ossification.....	12
2.7	Illustrations: Histologic Basis for Imaging Appearances of Spinal Tumors.....	13
2.7.1	Tumors with Fatty Component.....	13
2.7.2	Red Marrow Component.....	15
2.7.3	Tumors with Vascular Component.....	17
2.7.4	Tumors with High Cellularity.....	20
2.7.5	Tumors with Hemorrhagic Component.....	22
2.7.6	Tumors with Calcification/Ossification.....	23
	Bibliography.....	24
3	Systematic Approach for Image Interpretation of Spinal Tumors	25
3.1	Intraosseous Tumors.....	25
3.1.1	Incidence-Based Approach for Intraosseous Tumors.....	26
3.1.2	Age-Based Approach for Intraosseous Tumors.....	26

3.1.3	Location-Based Approach for Intraosseous Tumors	26
3.1.4	Imaging Pattern-Based Approach for Intraosseous Tumors	26
3.2	Extradural Non-osseous Spinal Tumors.	26
3.2.1	Incidence-Based Approach for Extradural Non-osseous Tumors	26
3.2.2	Imaging Pattern-Based Approach for Extradural Non-osseous Tumors	26
3.3	Intradural Extramedullary (IDEM) Tumors.	27
3.3.1	Incidence-Based Approach for IDEM Tumors	27
3.3.2	Age-Based Approach for IDEM Tumors.	27
3.3.3	Location-Based Approach for IDEM Tumors	27
3.3.4	Imaging Pattern-Based Approach for IDEM Tumors	27
3.4	Intramedullary (IM) Tumors	27
3.4.1	Incidence-Based Approach of IM Tumors.	27
3.4.2	Age-Based Approach for IM Tumors	27
3.4.3	Location-Based Approach for IM Tumors.	27
3.4.4	Imaging Pattern-Based Approach for IM Tumors	27
3.4.5	IM Tumors Versus Non-tumorous Myelopathy	28
3.5	Infant/Childhood Spinal Tumors	28
	Bibliography	28

Part II Advanced Steps: Tumor Details

4	Top 3 Spinal Tumors of Each Compartment	31
4.1	Intraosseous Tumors	31
4.1.1	Hemangioma	31
4.1.1.1	Illustrations: Hemangioma	33
4.1.2	Metastasis.	35
4.1.2.1	Illustrations: Metastasis	36
4.1.3	Multiple Myeloma	40
4.1.3.1	Illustrations: Multiple Myeloma	41
4.2	Extradural Non-osseous Tumors or Tumorlike Lesions	43
4.2.1	Schwannoma	43
4.2.1.1	Illustrations: Schwannoma	44
4.2.2	Neurofibroma.	47
4.2.2.1	Illustrations: Neurofibroma.	48
4.2.3	Herniated Intervertebral Disc (HIVD) (Sequestration).	51
4.2.3.1	Illustrations: HIVD (Sequestration)	52
4.3	Intradural Extramedullary (IDEM) Tumors.	55
4.3.1	Schwannoma	55
4.3.1.1	Illustrations: Schwannoma	56
4.3.2	Meningioma.	59
4.3.2.1	Illustrations: Meningioma.	60
4.3.3	Myxopapillary Ependymoma.	62
4.3.3.1	Illustrations: Myxopapillary Ependymoma	63

4.4 Intramedullary (IM) Tumors 66

 4.4.1 Ependymoma 66

 4.4.1.1 Illustrations: Ependymoma 67

 4.4.2 Astrocytoma 70

 4.4.2.1 Illustrations: Astrocytoma 71

 4.4.3 Hemangioblastoma 74

 4.4.3.1 Illustrations: Hemangioblastoma 75

4.5 Multi-compartment Tumors 77

 4.5.1 Lymphoma 77

 4.5.1.1 Illustrations: Lymphoma 78

 4.5.2 Leukemia 80

 4.5.2.1 Illustrations: Leukemia 81

 4.5.3 Hemangioma 84

 4.5.3.1 Illustrations: Hemangioma 85

4.6 Infant/Childhood Spinal Tumors 86

 4.6.1 Sacrococcygeal Teratoma 86

 4.6.1.1 Illustrations: Sacrococcygeal Teratoma 87

 4.6.2 Langerhans Cell Histiocytosis 89

 4.6.2.1 Illustrations: Langerhans
 Cell Histiocytosis 90

 4.6.3 Ewing’s Sarcoma 93

 4.6.3.1 Illustrations: Ewing’s Sarcoma 94

Bibliography 96

5 Common Spinal Tumors Outside the Top 3 Lists

(in Alphabetical Order) 99

5.1 Aneurysmal Bone Cyst (ABC) 99

 5.1.1 Illustrations: Aneurysmal Bone Cyst (ABC) 100

5.2 Benign Notochordal Cell Tumor (BNCT) 101

 5.2.1 Illustrations: Benign Notochordal Cell Tumor
 (BNCT) 102

5.3 Bone Island 105

 5.3.1 Illustrations: Bone Island 106

5.4 Cavernous Malformation (Intramedullary Cavernous
Hemangioma, Cavernoma) 109

 5.4.1 Illustrations: Cavernous Malformation 110

5.5 Chondrosarcoma 114

 5.5.1 Illustrations: Chondrosarcoma 115

5.6 Chordoma 119

 5.6.1 Illustrations: Chordoma 120

5.7 Giant Cell Tumor 123

 5.7.1 Illustrations: Giant Cell Tumor 124

5.8 Lipoma 128

 5.8.1 Illustrations: Lipoma 129

5.9 Osteoblastoma 132

 5.9.1 Illustrations: Osteoblastoma 133

5.10 Osteochondroma 136

 5.10.1 Illustrations: Osteochondroma 137

5.11	Osteoid Osteoma	140
5.11.1	Illustrations: Osteoid Osteoma	141
5.12	Osteosarcoma	144
5.12.1	Illustrations: Osteosarcoma	145
5.13	Plasmacytoma	147
5.13.1	Illustrations: Plasmacytoma	148
	Bibliography	151
6	Rare But Interesting Spinal Tumors	
	(in Alphabetical Order)	153
6.1	Angiolipoma	153
6.1.1	Illustrations: Angiolipoma	154
6.2	Atypical Teratoid/Rhabdoid Tumor (ATRT)	155
6.2.1	Illustrations: Atypical Teratoid/Rhabdoid Tumor (ATRT)	156
6.3	Chondroblastoma	157
6.3.1	Illustrations: Chondroblastoma	158
6.4	Epidural Hemangioma	159
6.4.1	Illustrations: Epidural Hemangioma	160
6.5	Epithelioid Angiosarcoma	163
6.5.1	Illustrations: Epithelioid Angiosarcoma	164
6.6	Epithelioid Hemangioendothelioma	166
6.6.1	Illustrations: Epithelioid Hemangioendothelioma	167
6.7	Ganglioglioma	168
6.7.1	Illustrations: Ganglioglioma	169
6.8	Ganglioneuroma	170
6.8.1	Illustrations: Ganglioneuroma	171
6.9	Undifferentiated Pleomorphic Sarcoma	172
6.9.1	Illustrations: Undifferentiated Pleomorphic Sarcoma	173
6.10	Malignant Peripheral Nerve Sheath Tumor	175
6.10.1	Illustrations: Malignant Peripheral Nerve Sheath Tumor	176
6.11	Oligodendroglioma	177
6.11.1	Illustrations: Oligodendroglioma	178
6.12	Paraganglioma	179
6.12.1	Illustrations: Paraganglioma	180
6.13	Primitive Neuroectodermal Tumor (PNET)	181
6.13.1	Illustrations: Primitive Neuroectodermal Tumor (PNET)	182
6.14	Solitary Fibrous Tumor (Hemangiopericytoma)	183
6.14.1	Illustrations: Solitary Fibrous Tumor (Hemangiopericytoma)	184
6.15	Teratoma	186
6.15.1	Illustrations: Teratoma	187
	Bibliography	188

7	Other Tumor-like Lesions	191
7.1	Epidural Abscess	191
7.1.1	Illustrations: Epidural Abscess	193
7.2	Arachnoid Cyst	195
7.2.1	Illustrations: Arachnoid Cyst.....	196
7.3	Arachnoiditis	198
7.3.1	Illustrations: Arachnoiditis.....	199
7.4	Cysticercosis	200
7.4.1	Illustrations: Cysticercosis.....	201
7.5	Discal Cyst.....	202
7.5.1	Illustrations: Discal Cyst	203
7.6	Echinococcosis.....	204
7.7	Extramedullary Hematopoiesis	204
7.7.1	Illustrations: Extramedullary Hematopoiesis.....	205
7.8	(Vertebral Tophaceous) Gout.....	207
7.8.1	Illustrations: (Vertebral Tophaceous) Gout	208
7.9	Idiopathic Hypertrophic Pachymeningitis	209
7.9.1	Illustrations: Idiopathic Hypertrophic Pachymeningitis	210
7.10	Perineural (Root Sleeve) Cyst	212
7.10.1	Illustrations: Perineural (Root Sleeve) Cyst.....	213
7.11	Pigmented Villonodular Synovitis (PVNS).....	214
7.11.1	Illustrations: Pigmented Villonodular Synovitis (PVNS).....	215
7.12	(Focal) Red Marrow (Hematopoietic Marrow)	216
7.12.1	Illustrations: (Focal) Red Marrow (Hematopoietic Marrow)	217
7.13	Retro-odontoid (Periodontoid) Pseudotumor.....	218
7.13.1	Illustrations: Retro-odontoid (Periodontoid) Pseudotumor	219
7.14	Facet Synovial Cyst	220
7.14.1	Illustrations: Facet Synovial Cyst	221
7.15	Tuberculosis.....	223
7.15.1	Illustrations: Tuberculosis	224
7.16	Ventriculus Terminalis	225
7.16.1	Illustrations: Ventriculus Terminalis	226
	Bibliography	227

Part III Final Steps: Differential Diagnosis

8	Practical Tips for Differential Diagnosis	231
8.1	Focal Red Marrow Versus Metastasis	232
8.2	Hemangioma Versus Benign Notochordal Cell Tumor (BNCT).....	233
8.3	Aggressive Hemangioma Versus Metastasis	234
8.4	Hemangioma Versus Focal Fat Deposition	235

8.5	Metastasis Versus Schmorl's Node	236
8.6	Osteoblastic Metastasis Versus Bone Island	237
8.7	Ependymoma Versus Astrocytoma	238
8.8	Multiple Myeloma Versus Lymphoma	239
8.9	Intramedullary Metastasis Versus Ependymoma	240
8.10	Hemangioblastoma Versus Vascular Malformation	241
8.11	Schwannoma Versus Meningioma	242
8.12	Herniated Intervertebral Disc (Sequestration) Versus Schwannoma	243
8.13	Sacral Tumors: Chordoma Versus Giant Cell Tumor	244
8.14	Spinal Cord Tumor Versus Non-tumorous Myelopathy	245
8.15	Osteoblastoma Versus Osteosarcoma	246
8.16	Chondrosarcoma Versus Osteosarcoma	247
8.17	Primary Versus Secondary Aneurysmal Bone Cyst (ABC)	248