Contents

Volume 1

Section 1: General

1. **History of Neurosurgery** 3
Vincent A Thamburaj

• Ancient Egyptian Period **3** • Ancient Indian Period **3** • Ancient Greek-Roman Period **5**
• Ancient Chinese Period **6** • Ancient Persian Period **7** • Medieval European Period **7**
• European Renaissance Period **8** • Modern Period (18th-20th Century) **8**

2. **Neurological Examination** 17
Narayanan Raghavachari, Dharmarajan N Seeniappa

• History Taking **17** • Cognitive and Speech Evaluation **18** • Physical Examination **20**
• Examination of an Unconscious Patient **29** • Pediatric Neurological Examination **30**
• Arriving at Diagnosis **31** • Anatomical Localization **32** • Pathological Diagnosis **34**

3. **Genetics in Neurosurgery** 36
Vincent A Thamburaj, Bibhas Kar

• Genetics in Neurooncology **36** • Genetics in Neurovascular Disorders **41** • Genetics in Disc Disease **43** • Genetics in Neurodevelopmental Disorders **45**

4. **Ethics in Neurosurgery** 55
Kalyanaraman Subramanian

• Surgeon and Patient **55** • Surgeon and Family **56** • Decision to Withhold Aggressive Treatment **57** • Surgeon and Business Houses **60** • To Summarize... **60**

5. **Evidence-based Medicine for Neurosurgeons** 61
Saroja Srinivasan, Vincent A Thamburaj

• Methodology **61** • Practice of Evidence-based Medicine **62** • Limitations of Evidence-based Medicine **64** • Evidence-based Medicine in Neurosurgery **65**

Section 2: Cerebral Homeostasis and Perioperative Care

6. Cerebral Blood Flow and Metabolism 71
Bapuji Cherukuri

• Cerebral Hemodynamics **71** • Regulation of CBF **72** • Measurements of CBF **77** • Measurement of CMR **80** • Drugs on CBF and CMR **80**

7. Cerebrospinal Fluid Dynamics 87
Avula Chakravarthi

• Formation of CSF **87** • Circulation of CSF **88** • Absorption of CSF **89** • Composition of CSF **89** • Functions of CSF **90** • Blood-CSF Barrier **90** • Metabolic Changes and CSF **91** • Intracranial Pressure and CSF **91** • Laboratory Investigation of CSF **92** • Studies of CSF Dynamics **93** • CSF Dynamics in Pathological Conditions **94**

8. Blood-Brain Barrier 101
Avula Chakravarthi

• Anatomy of Blood-Brain Barrier **101** • Physiology of Blood-Brain Barrier **102** • Functions of Blood-Brain Barrier **103** • Pathological Alterations of Blood-Brain Barrier **103** • Clinical Applications **105**

9. Brain Edema 110
Chandrasekar Kalavakonda

• Types of Brain Edema **110** • Pathophysiology **111** • Clinical Features **112** • Imaging **114** • Management **115**

10. Intracranial Pressure 125
Chandrasekar Kalavakonda

• Intracranial Contents and Pressure **125** • Intracranial Hypertension **127** • Intracranial Hypotension **133**

11. Assisted Ventilation in Neurosurgery 141
Lakshmi Varadharajulu

• Respiratory Center and Reflex Inputs **141** • Airway Management **141** • Types of Intermittent Positive Pressure Ventilation **144** • Management of the Ventilated Patient **145**

12. Sodium in Neurosurgery 152
Dharmarajan N Seeniappa

• Sodium and Water **152** • Hyponatremia **153** • Hypernatremia **158**

13. Nutrition Support in Neurosurgery 164
Kundhala Ravi

• Metabolic Aspects following a Neural Injury **164** • Nutritional Support **165**

14. Non-Neurological Complications in Neurosurgery 174
Ritesh K Bhoot, Prithika Chary

• Pulmonary Complications **174** • Cardiac Complications **177** • Fluid and Electrolyte Disturbances **177** • Gastrointestinal Complications **179** • Thromboembolic Complications **180** • Urinary Tract Complications **181** • Invasive Line Complications **181** • Sepsis **182** • Postoperative Nausea and Vomiting **182**

Section 3: Neurodiagnostics

15. Essentials of Neuroelectrophysiology 189
Sridharan Ramaratnam

• Electroencephalography **189** • Electromyography and Nerve Conduction Studies **195**

16. Diagnostic Neuroradiology 200
Nirmala Arulraj, Ravikanth Balaji, Chidambaranathan Natesan

• Evolution of Neuroradiology (Pre CT Era) 200 • Imaging Modalities **200**

17. Neurosurgical Pathology 216
Ashok Parameswaran, Annapurneswari Subramanyan

• Techniques and Methodology in Neuropathology **217** • Brain Tumors **221** • Developmental Mass Lesions Epilepsy **221** • Infections and Inflammations **222** • Prionopathies **222** • Demyelinating Pseudotumors **223**

Section 4: Anesthesia and Adjuncts in Neurosurgery

18. Neuroanesthesia 227
Rammohan M Naidu

• Anesthesia and Intracranial Pressure **227** • Anesthetic Agents **228** • Neuroanesthetic Management **229** • Neuroanesthesia for Specific Conditions **236**

19. Neurophysiologic Monitoring in Neurosurgery 246
Aashit K Shah, Anne Guyot, Sandeep Mittal

• Intraoperative Monitoring **246** • Neurophysiologic Monitoring in ICU **267**

20. Stereotaxy and Image-guided Neurosurgery 272
Samit S Mehta, Murugan Logamuthukrishnan

• Stereotaxy **272** • Intraoperative Imaging **280** • Robotic Neurosurgery **283**

21. Neuroendoscopy 288
Manas Panigrahi, Amit K Thotakura

• Historical Perspectives **288** • Principle and Equipment **289** • Endoscopic Components and Tools **291** • Instruments **291** • Operative Technique **293** • Applications **296** • Complications **300** • Future of Neuroendoscopy **300** • Our Experience **300**

Section 5: Neuro-ophthalmology

22. Papilledema 305
Kanthamani Polisetty

• Pathophysiology **305** • Clinical Features **306** • Investigations **307** • Differential Diagnosis **307** • Management **307** • Ophthalmologist and Neurosurgeon in the Management of Papplledema **310**

23. Traumatic Optic Neuropathy 313
Purav Patel, Prativa Misra

• Optic Nerve Injuries **313** • Other Forms of Post-traumatic Visual Impairment **319** • Post-traumatic Delayed Episodic Blindness **319** • Optochiasmal Arachnoiditis **319** • Post-traumatic Papilledema **319**

24. Idiopathic Intracranial Hypertension 323
Venkatavaradan Raghavan, Krishnaprasad Moodambikana

• Epidemiology **323** • Etiology **323** • Pathophysiology **324** • Clinical Features **324**
• Diagnostic Evaluation **325** • Management **328**

Section 6: Neurodevelopmental Disorders

25. Spinal and Cranial Dysraphisms 337
Spyros Sgouros, Arul Kanagarajan

• Embryology **337** • Pathogenesis **337**

26. Congenital Cortical Malformations 355
Mohan R Sharma

• Neuroembryology **355** • Etiology of Neural Tube Defects **357** • Prenatal Diagnosis **357**
• Neural Tube Fusion Defects (Weeks 3–4) **358** • Brain Segmentation Defects (Weeks 5–10) **358**
• Cortical Defects (Months 2–5) **359** • Combined Malformations **363** • Developmental Myelination Disorders (Months 5–15) **364**

27. Chiari Malformations 368
Prakash Modha

• Chiari I **368** • Chiari II **372** • Chiari III and IV **374** • Chiari Type 0 and 1.5 **374**

28. Syringomyelia (Syrinx) 380
Prakash Modha

• Classification **380** • Pathogenesis **381** • Clinical Features **383** • Imaging **383**
• Treatment **384** • Outcome **385** • Syrinx and Spinal Deformities **385**

29. Dandy-Walker Malformation and Other Neurodevelopmental Cysts 389
Arul Kanagarajan

• Dandy-Walker Malformation **389** • Ependymal Cysts **393** • Rathke's Cleft Cysts **393**
• Neuroenteric Cysts **394** • Porencephalic Cysts **396** • Choroid Plexus Cysts **396**
• Neuroglial Cysts **396** • Pineal Cysts **396** • Mesencephalic and Third Ventricle Cysts **396**
• Frontal Horn Cysts **397** • Enlarged Perivascular Spaces **397**

30. Hydrocephalus and Shunts 401
Chidambaram Balasubramaniam

• Pathophysiology **401** • Hydrocephalus in Children **402** • Hydrocephalus in Adults **405**
• Clinical Features **405** • Investigations **406** • Management **406** • Shunt Surgery **409**
• Endoscopic Third Ventriculostomy (ETV) **414** • Prenatal Shunts **415** • Outcome **415**

31. Arachnoidal Cysts 420
Purav Patel

• Epidemiology **420** • Pathology **420** • Arachnoid Cysts by Location **423**
• Spinal Arachnoid Cysts **424** • Secondary (False) Arachnoid Cysts **427**

32. Craniosynostosis 431
Samit S Mehta, Sridhar Krishnamurthy

• Growth of Brain and Skull **431** • Etiopathogenesis **432** • Classification **432**
• Types of Skull Deformities **433** • Nonsyndromic Craniosynostoses **435**
• Syndromic Craniosynostoses **435** • Clinical Features **437** • Investigations **437**
• Management **437**

33. Craniovertebral Junction Abnormalities 443
Anil Pande

• Embryology **443** • Pathology **444** • Developmental Abnormalities of CVJ **445**
• Developmental Syndromes of CVJ **448** • Acquired Abnormalities of CVJ **448**
• Clinical Features **449** • Imaging **450** • Management **450**

Section 7: Infections in Neurosurgery

34. Bacterial Infections of the Central Nervous System 457
Lakshmi Sarma, Nigel P Symss

• Bacterial Meningitis **457** • "Neurosurgical" Bacterial Meningitis **460** • Brain Abscess **462**
• Subdural and Epidural Empyemas **465** • Pyocephalus **466** • Skull Osteomyelitis **466**

35. Tuberculosis of the Central Nervous System 473
Murali S Mohan

• Pathogenesis **473** • Tuberculous Meningitis **475** • Tuberculomas **478**
• Tuberculous Brain Abscess **479** • Intraspinal Tuberculosis **480**

36. Fungal Infections of the Central Nervous System 486
Abdul Ghafur, Mohit Shidore

• Pathogenesis **486** • Clinical Presentations **487** • Diagnosis **488** • Treatment **490**
• Outcome **491** • Specific Fungal Infections of Central Nervous System **491**

37. Parasitic Infections of the Central Nervous System 502
Nigel P Symss

• Neurocysticercosis **502** • Neuroechinococcosis **507** • Neurotoxoplasmosis **509**
• Cerebral Amoebiasis **510** • Cerebral Malaria **510** • Neurotrichinosis **511**
• Neuroschistosomiasis **511** • Neuroparagonimiasis **511**

38. Viral Infections of the Central Nervous System 516
Hariprakash Chakaravarthy, Sivakumar M Rajappa

• Pathology **516** • Specific Viruses **516** • Other Viruses **524** • Virus Associated Syndromes **524** • Slow Viruses **524**

Section 8: Neurotrauma

39. Traumatic Brain Injuries 535
Chandrasekar Kalavakonda

• Epidemiology **535** • Biomechanics of Head Injury **535** • Pathology **536**
• Management **539** • Rehabilitation **542** • Outcome **543** • Sequelae of Head Injuries **543**

40. Traumatic Intracranial Hemorrhages 550
Krishna Sharma

• Epidural Hematoma **550** • Epidural Hematoma in Children **552** • Posterior Cranial Fossa Epidural Hematoma **553** • Subdural Hematoma **553** • Intracerebral Hematomas **559** • Brain Stem Hemorrhage **561** • Intraventricular Hemorrhage **562** • Subarachnoid Hemorrhage **562**

41. Scalp and Skull Injuries 569
Krishnaprasad Moodambikana

• Scalp Injuries **569** • Skull Fractures **571** • Penetrating Injuries **578**

42. Cerebrospinal Fluid Fistulae 584
Ganesh Krishnamurthy

• Clinical Features **584** • Diagnosis **584** • Classification **586** • Surgical Management of CSF Rhinorrhea **589**

43. Cranial Nerve Injuries 593
Purav Patel 593

• Olfactory Nerve Injuries **593** • Optic Nerve Injuries **594** • Oculomotor Nerve Injuries **594** • Trochlear Nerve Injuries **596** • Trigeminal Nerve Injuries **597** • Abducent Nerve Injuries **598** • Facial Nerve Injuries **598** • Facial Rehabilitation Surgery **601** • Vestibulocochlear Nerve Injuries **601** • Glossopharyngeal Nerve Injuries **602** • Vagus Nerve Injuries **602** • Accessory Nerve Injuries **602** • Hypoglossal Nerve Injuries **603** • Collet-sicard Syndrome **603**

44. Faciomaxillary Injuries 606
Sridhar Krishnamurthy

• Epidemiology **606** • Emergency Treatment **606** • Initial Assessment **608** • Management **609** • Fracture by Sites **611** • Faciomaxillary Injuries in Children **615**

45. Cranial Defects and Cranioplasty 618
Murugan Logamuthukrishnan

• Clinical Problems of Skull Defect **618** • Cranioplasty **620**

46. Brain Death 629
Ganapathy Krishnan

• Concept of Brain Death **629** • Incidence of Brain Death **630** • Pathophysiology of Brain Death **630** • Need for Declaration of Brain Death **630** • Clinical Evaluation of Brain Stem Death **631**

Section 9: Cerebrovascular Disorders

47. Transient Ischemic Attacks and Cerebral Revascularization 641
Vincent A Thamburaj, Balaji Venugopal

• Etiology of Cerebral Ischemia **641** • Clinical Profile of Cerebral Ischemia **642** • Investigations **643** • Surgery for TIAs **646**

48. Acute Ischemic Stroke 661
Panneer Adhinarayanan, Mohit Shidores

• Risk Factors **661** • Etiology **662** • Pathophysiology **662** • Management **663** • Surgery in Acute Stroke **668** • Surgery in Stroke Rehabilitation **672** • Pediatric Stroke **673**

49. Cerebral Venous Thrombosis 679
Deepak Arjundas

• Cerebral Venous Anatomy **679** • Etiopathogenesis **679** • Clinical Features **680**
• Imaging Studies **680** • Management **683** • Outcome **684**

50. Spontaneous Intracerebral Hemorrhage 687
Krishna Sharma

• Etiology **687** • Pathophysiology **688** • Clinical Features **689** • Investigations **689**
• Management **690** • Outcome **693**

51. Vasculitis of the Central Nervous System 699
Sivakumar M Rajappa

• Pathology **699** • Clinical Features **699** • Diagnosis **700** • Causes of CNS Vasculitis **702**
• Treatment **705**

52. Subarachnoid Hemorrhage 709
Prithika Chary, Ritesh K Bhoot

• Traumatic Subarachnoid Hemorrhage **709** • Nontraumatic/Spontaneous Subarachnoid Hemorrhage **709** • Aneurismal Subarachnoid Hemorrhage **711**

53. Intracranial Aneurysms 724
Anil Sangli, Hirotoshi Sano

• Pathology **724** • Clinical Presentation **727** • Imaging **727** • Management **729**

54. Cerebral Arteriovenous Malformations 744
Ketan R Bulsara

• Pathology **744** • Investigations **746** • Management **748**

55. Intracranial Dural Arteriovenous Fistulae 755
Samit S Mehta, Ketan R Bulsara

• Pathology **755** • Clinical Features **756** • Investigations **756** • Management **758**

56. Carotid Cavernous Fistulae 761
Anil P Karapurkar, Nishant K Aditya

• Cavernous Sinus Anatomy **761** • Etiology **761** • Pathology **761** • Clinical Features **762**
• Investigations **764** • Management **764**

57. Cavernomas of the Central Nervous System 771
Anil Sangli, Yoko Kato

• Epidemiology **771** • Pathology **771** • Natural History **772** • Clinical Features **773**
• Imaging **773** • Management **774** • Spinal Cavernomas **775**

58. Venous and Capillary Malformations of the Central Nervous System 781
Ramnarayanan Ramachandran

• Venous Angiomas **781** • Vein of Galen Malformations **782** • Capillary Telangiectasia **786**

59. Genetics of Cerebrovascular Lesions 790
Mahmoud Rayes, Monika Mittal, Fadi Delly, Sandeep Mittal

• Intracranial Aneurysms **790** • Intracranial Arteriovenous Malformations **795**
• Cerebral Cavernous Malformations **797**

60. Stereotactic Radiosurgery for Cerebral Arteriovenous Malformations 805
Ganapathy Krishnan

• Clinical Profile **806** • Decision Making **806** • Procedure **807** • Procedure Related Complications **810** • Follow-up **810** • Outcome **810** • Causes of Treatment Failure **811** • Complications **812** • Technical Issues **813**

61. Endovascular Neurosurgery 821
Santhosh Joseph, Ravindra Kamble

• Intracranial Aneurysms **821** • Arteriovenous Malformations **824** • Vein of Galen Malformations **826** • Dural Arteriovenous Fistulas or Malformations **829** • Carotid Cavernous Fistulae **830** • Stroke **831** • Extracranial Vascular Disease **833** • Intracranial Vascular Disease **835** • Preoperative Embolization of Head and Neck Tumors **836** • Spinal Vascular Malformations **837** • Percutaneous Spinal Interventions **840**

Volume 2

Section 10: Brain Tumors and Tumor-Like Lesions

62. Brain Tumors: An Overview 851
Reginald John

• Etiology **851** • Classification **854** • Epidemiology **854** • Pathology **855** • Clinical Features **856** • Investigations **858** • Management **859** • Outcome **861**

63. The Spectrum of Gliomas 865
Vincent A Thamburaj, Annapurneswari Subramanyan

• Pathology **865** • Clinical Presentation **872** • Imaging **873** • Management **874** • Outcome **878**

64. Intracranial High-grade Gliomas 884
Sandeep Mittal, Mark Hoeprich, William J Kupsky, Geoffrey R Barger

• Epidemiology **884** • Clinical Presentation **885** • Neuroimaging **885** • Neuropathologic Evaluation **887** • Molecular Analysis of Glioblastomas **888** • Primary Versus Secondary Glioblastomas **890** • Molecular Analysis of Anaplastic Gliomas **891** • Clinical Prognostic Factors **891** • Management **893** • Adjuvant Therapies **897** • Treatment Options for Recurrent Gliomas **903** • Treatment of Patients with Poorest Prognosis **906** • Treatment Related Effects **906**

65. Intracranial Low-grade Gliomas 918
Sandeep Mittal, Andrew M Lozen, William J Kupsky, Geoffrey R Barger

• Epidemiology **919** • Clinical Presentation **919** • Neuroimaging **920** • Neuropathological Evaluation **922** • Molecular Genetics of Low-grade Gliomas **926** • Clinical Prognostic Factors **927** • Treatment **928** • Treatment of Recurrent Low-grade Gliomas **935** • Treatment of Low-grade Gliomas in Elderly Patients **935**

66. Brainstem Gliomas 941
Arul Kanagarajan

• Pathology **941** • Clinical Features **942** • Investigations **943** • Management **943** • Prognosis **946**

67. Optic Gliomas 950
Sunil Perera

• Pathology **950** • Clinical Features **951** • Investigations **952** • Management **952**

68. Neuronal and Glioneuronal Tumors 956
Feda A Makkiyah

• Ganglioglioma **956** • Desmoplastic Infantile Ganglioglioma **958** • Gangliocytoma or Ganglioneuroma **958** • Dysplastic Gangliocytoma of the Cerebellum (Lhermitte-Duclos Disease) **959** • Dysembryoplastic Neuroepithelial Tumor **959** • Central Neurocytoma **960** • Cerebellar Liponeurocytoma **960** • Paraganglioma of Filum Terminale **961**

69. Ependymomas 965
Mohit Shidore, Ravi Bhatia

• Pathology **965** • Classic Ependymomas **965** • Myxopapillary Ependymoma **969** • Subependymoma **970**

70. Choroid Plexus Papillomas 976
Vasudevan M Chakravarthi

• Pathology **976** • Genetics **977** • Clinical Features **978** • Imaging **978** • Management **979** • Prognosis **980**

71. Hemangioblastomas 984
Mahmood Hassan

• Pathology **984** • Clinical Features **986** • Investigations **986** • Treatment **988** • Outcome **989**

72. Medulloblastomas and Other Embryonal Tumors of the Central Nervous System 993
Gerard Plans

• Medulloblastomas **993** • Supratentorial Primitive Neuroectodermal Tumors **997** • Medulloepithelioma **998** • Ependymoblastoma **998** • Central Nervous System **998** • Neuroblastoma **998** • Atypical Teratoid or Rhabdoid Tumors **999**

73. Germ Cell Tumors of the Central Nervous System 1005
Michael Brzozowski, Radoslaw Rola

• Pathology **1005** • Clinical Features **1007** • Investigations **1008** • Management **1008**

74. Intracranial Meningiomas 1011
Anil Sangli, Tetsuo Kanno

• Epidemiology **1011** • Genetics **1011** • Etiology **1012** • Pathology **1012** • Clinical Features **1014** • Imaging **1015** • Management **1018** • Meningiomas by Location **1019**

75. Intracranial Schwannomas 1038
Vasudevan M Chakravarthi

• Vestibular Schwannomas **1038** • Trigeminal Schwannomas **1045** • Facial Nerve Schwannomas **1048** • Jugular Foramen Schwannomas **1048** • Hypoglossal Schwannomas **1048** • Other Intracranial Schwannomas **1049**

76. Familial Tumor Syndromes of the Central Nervous System 1056
Thomas L Beaumont, Monika Mittal, Fadi Delly, Sandeep Mittal

• Neurofibromatosis Type 1 **1056** • Neurofibromatosis Type 2 **1061** • Tuberous Sclerosis **1064**
• Von Hippel-lindau Disease **1068** • Gorlin Syndrome **1070** • Li-fraumeni Syndrome **1073**
• Cowden Syndrome **1075** • Turcot Syndrome **1079**

77. Pituitary Tumors 1095
Vincent A Thamburaj

• Anatomical Aspects **1095** • Pituitary Adenomas **1096** • Specific Tumor Types **1106**

78. Craniopharyngiomas 1119
Selvakumar Kumaravelu

• Incidence **1119** • Pathology **1119** • Immunohistochemistry **1122**
• Clinical Presentation **1123** • Differential Diagnosis **1123** • Neuroimaging **1124**
• Management **1124** • Outcome **1127** • Follow-up **1128**

79. Empty Sella Syndrome 1134
Abhijit K Hazra

• Primary Empty Sella Syndrome **1134** • Secondary Empty Sella **1135**
• Clinical Features **1135** • Imaging **1136** • Management **1136**

80. Colloid Cysts 1141
Nigel P Symss, Ravi Ramamurthi

• Regional Embryology of Third Ventricle **1141** • Pathology **1141** • Clinical Features **1142**
• Investigations **1143** • Differential Diagnosis **1144** • Management **1144**

81. Inclusion Tumors of the Central Nervous System 1150
Sundar Venkataraman

• Epidermoids **1150** • Dermoids **1153** • Teratomas **1155** • Lipomas **1155**

82. Primary Central Nervous System Lymphomas 1158
Siddhartha Ghosh

• Epidemiology **1158** • Pathology **1159** • Clinical Features **1160** • Diagnosis **1161**
• Treatment **1162** • Prognostic Factors **1164** • Our Experience **1164**

83. Melanotic Tumors of the Central Nervous System 1168
Abhijit K Hazra

• Melanomas **1168** • Phakomatoses (Neurocutaneous Syndromes) **1171** • Other Melanotic Central Nervous System Tumors **1172**

84. Cerebral Metastases and other Neurological Manifestations of Systemic Cancers 1177
Kazadi KN Kalangu

• Intraparenchymal Metastasis **1177** • Dural Metastases **1183** • Leptomeningeal Metastases **1183** • Peripheral Nervous System Metastases **1186** • Nonmetastatic Central Nervous System Manifestations **1186** • Treatment Complications **1187**

85. Intraventricular Tumors 1194
Tanuj Nayyar, Ravishankar V Emani

• Clinical Evaluation **1194** • Investigations **1195** • Management **1196**

• Lateral Ventricles **1196** • Third Ventricle **1202** • Fourth Ventricle **1205**
• Endoscopic Surgery **1206** • Stereotactic Surgery **1206**

86. Pineal Region Tumors 1209
Manoj K Tewari, Suresh N Mathuriya

• Historical Perspective **1209** • Clinical Features **1210** • Diagnosis **1210**
• Specific Tumors **1211** • Management **1212** • Surgical Anatomy **1214**
• Operative Approaches **1215**

87. Orbital Tumors 1221
Sunil Perera

• Regional Anatomy **1221** • Clinical Features **1223** • Investigations **1224**
• Management **1224** • Pathology **1228** • Tumor Types **1228**

88. Jugular Foramen Tumors 1237
Siddartha Ghosh

• Anatomical Considerations **1237** • Pathology **1238** • Clinical Manifestations **1239**
• Specific Approaches **1242** • Postoperative Complications **1247** • Summary of Author's Experience **1248**

89. Skull Tumors 1253
Balaganapathy K Thiruvillamalai

• Clinical Features **1253** • Imaging **1254** • Management **1254**

90. Skull Base Surgery 1273
Rayappa Chinnasamy, Vincent A Thamburaj

• Surgical Anatomy **1273** • Clinical Features **1276** • Pathology **1276** • Imaging **1276**
• Cerebral Blood Flow Evaluation **1277** • General Considerations of Skull Base Surgery **1278**
• Approaches to Anterior Skull Base **1279** • Approaches to Middle Skull Base **1284** • Approaches to Posterior Skull Base **1289** • Postoperative Care **1298** • Endoscopic Skull Base Surgery **1299**

91. Radiotherapy for Central Nervous System Tumors 1305
Mahadev Potharaju

• Radiobiology of Central Nervous System Tissue **1305** • Clinical Applications of Radiotherapy **1307**
• Forms of Radiotherapy **1308** • Radiotherapy and Specific Tumors **1312**

92. Chemotherapy for Central Nervous System Tumors 1317
Ranjan K Mohapatra

• Chemotherapeutic Agents **1317** • Hurdles to Effective Chemotherapy of CNS Tumors **1319**
• Methods of Administering Chemotherapy **1320** • Investigative Techniques **1321**
• Chemotherapy of Specific Tumors **1323**

SECTION 11: Spine and Spinal Cord Disorders

93. Biomechanics of Spinal Stabilization 1333
Vincent A Thamburaj

• Spinal Stability **1333** • Diagnosis of Instability **1338** • Types of Instability **1339**
• Spinal Stabilization **1339** • General Considerations of Stabilization **1343**
• Regional Considerations **1347**

94. Lumbar Disc Prolapse 1357
Natarajan Perumal

• Pathophysiology **1357** • Clinical Features **1358** • Diagnosis **1360** • Nonoperative Management **1361** • Surgical Discectomy **1362** • Minimally Invasive Procedures **1363** • Outcome **1364** • Disc Prolapse in Children **1365**

95. Lumbar Spondylolisthesis 1371
Natarajan Perumal

• Pathophysiology **1371** • Clinical Features **1374** • Imaging **1375** • Management **1376**

96. Lumbar Spinal Canal Stenosis 1384
Samit S Mehta, Krzysztof Gil

• Outcome **1380** • Anatomy of Spinal Canal **1384** • Pathogenesis **1385** • Clinical Features **1386** • Imaging **1387** • Treatment **1388** • Outcome **1391**

97. Degenerative Thoracic Spine 1396
Michael Brzozowski

• Pathophysiology **1396** • Clinical Features **1397** • Diagnosis **1397** • Management **1397** • Outcome **1399**

98. Cervical Spondylosis 1401
Anil Pande

• Pathogenesis **1401** • Clinical Features **1403** • Investigations **1407** • Management **1408** • Complications **1411** • Outcome **1411**

99. Surgery of the Craniovertebral Junction 1417
Vincent A Thamburaj

• Surgical Anatomy of Craniovertebral Junction **1417** • Biomechanics of Craniovertebral Junction **1418** • Surgery of Craniovertebral Junction **1420** • Anterior Approaches **1420** • Postoperative Stabilization **1426**

100. Bacterial Infections of the Spine and Spinal Cord 1436
Murali S Mohan

• Vertebral Osteomyelitis **1436** • Discitis **1439** • Spinal Canal Infections **1440** • Outcome **1441**

101. Tuberculous Spondylitis 1445
Anil Pande

• Pathology **1445** • Clinical Features **1446** • Investigations **1447** • Management **1448** • Specific Locations **1450**

102. Primary Tumors of the Spine 1455
Anil Sangli, Junichi Mizuno

• Pathology **1455** • Clinical Features **1455** • Investigations **1457** • Management **1457** • Benign Tumors **1459** • Malignant Tumors **1462**

103. Spinal Metastases 1471
Tanuj Nayyar

• Pathology **1471** • Clinical Features **1472** • Investigations **1473** • Management **1474**

104. Spinal Fractures 1484
Sammandam Karunagaran, Sajan K Hegde

• Surgical Stabilization **1485** • Spinal Fractures by Location **1486** • Traumatic Spondylolisthesis of the Axis **1489** • Axis Body Fractures **1490** • Subaxial Cervical Spine Fractures **1490** • Thoracic Spine Fractures **1493** • Lumbar Spine Fractures **1496** • Sacral Fractures **1498** • Outcomes of Treatment of Spinal Injury **1498** • Spinal Fractures in Children **1498**

105. Spinal Cord Injury 1502
Abhijit K Hazra

• Pathophysiology **1502** • Emergency Care **1502** • Neurological Assessment **1504** • Pharmacological Neuroprotection **1505** • Radiological Assessment **1506** • Spinal Stabilization **1507** • Early Rehabilitation **1507** • Further Rehabilitation **1509**

106. Spinal Cord Tumors 1515
Tanuj Nayyar, Suresh Bapu R Kandallu

• Pathology **1515** • Tumors by Type **1517** • Clinical Features **1520** • Imaging **1521** • Treatment **1523**

107. Vascular Malformations of the Spinal Cord 1527
Ramnarayanan Ramachandran

• Vascular Anatomy of the Spinal Cord **1527** • Epidemiology **1528** • Classification of Spinal Arteriovenous Lesions **1528** • Clinical Presentation **1528** • Imaging **1528** • Management **1529** • Outcome **1530** • Types of Arteriovenous Lesions **1530** • Spinal Aneurysms **1534**

108. Spinal Arachnoiditis 1538
Balamurugan Mangaleswaran

• Historical Perspectives **1538** • Etiology **1538** • Pathology **1539** • Clinical Features **1540** • Investigations **1541** • Management **1541**

Section 12: Peripheral Nerve Disorders

109. Peripheral Nerve Injuries 1547
Sridhar Krishnamurthy

• Outcome **1542** • Peripheral Nerve Anatomy **1547** • Etiology of Nerve Injuries **1548** • Classification of Nerve Injuries **1549** • Nerve Response to Injury **1549** • Clinical Assessment **1551** • General Principles of Management **1552** • General Principles of Surgical Repair **1554** • Lesions in Continuity **1556** • Postoperative Care **1556** • Rehabilitation **1556** • Outcome **1557**

110. Brachial Plexus Injuries 1561
Ganapathy Krishnan, Sridhar Krishnamurthy

• Anatomy **1561** • Etiology **1562** • Traumatic Brachial Plexus Injuries **1562** • Obstetric Brachial Plexus Injuries **1569**

111. Entrapment Neuropathies 1573
Krishnaprasad Moodambikana, Ganapathy Krishnan

• Pathophysiology **1573** • Diagnosis **1573** • Management **1574** • Specific Entrapment Neuropathies in the Upper Limb **1574** • Specific Entrapment Neuropathies in the Lower Limb **1579** • Others **1580** • Differential Diagnosis **1580**

Section 13: Functional Disorders

112. Epilepsy—Pathophysiology and Principles of Management 1587
Yogaraj Subramanian

• Pathophysiology **1587** • Classification of Seizures **1588** • Causes of Seizures **1590**
• Differential Diagnosis **1591** • Investigations **1592** • Medical Management **1592**
• Status Epilepticus **1593** • Children with Epilepsy **1597** • Women with Epilepsy **1597**
• Surgery for Intractable Epilepsy **1598** • Other Therapies **1598**

113. Surgery for Epilepsy 1603
Sandeep Mittal, Aashit K Shah

• Definition of Epilepsy **1603** • Types of Epilepsy **1603** • Epidemiology **1604**
• Medical Treatment **1604** • Consequences of Intractable Epilepsy **1604**
• Medical Management of Epilepsy **1605** • Epilepsy Surgery **1614**
• Types of Surgical Procedures **1621**

114. Cranial Neuropathies 1643
Tanuj Nayyar, Suresh Bapu R Kandallu

• Trigeminal Neuralgia **1643** • Glossopharyngeal Neuralgia **1653** • Geniculate Neuralgia **1654**
• Hemifacial Spasm **1654** • Spasmodic Torticollis **1656** • Hypoactive Cranial Neuropathies **1657**

115. Pain—Pathophysiology and Management 1663
Mohan Sampath Kumar

• Physiology **1663** • Management of Chronic Pain **1665** • Chronic Pain of Neurosurgical Interest **1673**

116. Spasticity—Pathophysiology and Management 1681
Mohan Sampath Kumar

• Pathophysiology **1681** • Clinical Features **1682** • Assessment **1683** • Management **1683**

117. Functional Stereotactic Neurosurgery 1694
Sudheer K Tyagi

• Present Uses of Functional Stereotactic Neurosurgery **1694** • Parkinson's Disease **1695**
• Essential Tremors **1699** • Dystonia and Other Movement Disorders **1699**
• Intractable Pain **1700** • Epilepsy **1701** • Psychiatric Illnesses **1702**
• Cerebral Palsy **1703**

Section 14: Neurorehabilitation

118. Stem Cells in Neurology 1709
Lakshman Vaidhyanathan, Narayanan Raghavachari 1709

• Classification **1709** • Stem Cell Sources **1710** • Applications in Neurology **1713**
• Stem Cells in Specific Central Nervous System Disorders **1714**

119. Normal Pressure Hydrocephalus and Dementia 1723
Mahmood Hassan

• Dementia **1723** • Normal Pressure Hydrocephalus **1724**

120. Neurogenic Bladder 1735
Ravishankar L Subramaniam

• Epidemiology **1735** • Pathophysiology **1735** • Classification of Neurogenic Bladder **1737**
• Clinical Features **1737** • Clinical Examination **1738** • Investigations **1739**
• Management 1740 • Long-term Treatment **1741**

121. Neurological Physiotherapy 1747
Marina Rassou

• Brain Injuries **1747** • Spinal Injuries **1751** • Peripheral Nerve Injuries **1753**
• Other Conditions **1755** • Physiotherapy Modalities **1755**

Index 1761