

Contents

Preface ix
Acknowledgments x
List of Abbreviations xi

Section 1 Techniques and Practical Considerations

Approach to Autopsy of the Perinatal Nervous System 1

1 **Clinical Considerations** 1
Rebecca Folkerth

2 **Imaging** 3
Rebecca Folkerth

3 **External Exam of the Fetus/Infant** 5
Rebecca Folkerth

4 **Autopsy and Research Consent** 8
Marc Del Bigio

Ancillary Studies 13

5 **Microbiology** 13
Mirna Lechpammer

6 **Cytogenetics and Molecular Diagnostics** 25
Mirna Lechpammer

7 **Metabolic Studies** 31
Mirna Lechpammer

8 **Toxicology** 39
Mirna Lechpammer

Prosection Techniques 45

9 **Brain Prosection** 45
Marc Del Bigio

10 **Spinal Cord Prosection** 50
Rebecca Folkerth

11 **Neuromuscular Specimens** 53
Mirna Lechpammer

12 **Eye Specimens** 56
Mirna Lechpammer

Tissue Selection 59

13 **Selection of Brain Areas for Microscopic Examination** 59
Mirna Lechpammer and Rebecca Folkerth

14 **Technical Considerations in Perinatal CNS Tissue Processing** 62
Mirna Lechpammer

15 **Staining Techniques** 65
Marc Del Bigio

Reporting 71

16 **Formulation of Diagnosis** 71
Rebecca Folkerth

17 **Reporting Templates** 73
Mirna Lechpammer

18 **Medicolegal Considerations** 79
Rebecca Folkerth

Section 2 Human Nervous System Development

Neuroanatomic Site Development 81

19 **Human Nervous System Development: Embryonic and Early Fetal Events** 81
Marc Del Bigio

20 **Cerebral Cortex, Including Germinal Matrix** 88
Marc Del Bigio

21 **White Matter, Including Myelination** 101
Rebecca Folkerth

22 **Cerebellum: Development of the Rhombic Lip, Cerebellar Cortex, Dentate Nucleus** 107
Rebecca Folkerth

23 **Spinal Cord** 111
Mirna Lechpammer

Contents

24 **Skeletal Muscle and Peripheral Nerve** 115
Mirna Lechpammer

25 **Fetal and Infant Eye** 119
Mirna Lechpammer

Growth Parameters 123

26 **Head Size and Brain Weight** 123
Marc Del Bigio

Section 3 Stillbirth

Autolysis, Artifacts, and Stillbirths 131

27 **Autolysis and Artifacts** 131
Marc Del Bigio

Stillbirths 139

28 **Neuropathology of Stillbirth** 139
Marc Del Bigio and Rebecca Folkerth

Section 4 Disruptions / Hypoxic-Ischemic Injury

Cellular Responses 145

29 **Neuronal Death** 145
Marc Del Bigio

30 **Macroglial Reactions** 155
Marc Del Bigio

31 **Inflammatory Responses** 159
Marc Del Bigio

Gray Matter 165

32 **Supratentorial Gray Matter Damage and Disruptions** 165
Marc Del Bigio

33 **Brainstem and Spinal Cord Disruptions** 178
Rebecca Folkerth

White Matter 183

34 **Periventricular Leukomalacia and Diffuse White Matter Injury** 183
Rebecca Folkerth

Germinal Matrix 193

35 **Periventricular and Intraventricular Brain Hemorrhage** 193
Marc Del Bigio

Cerebellum 205

36 **Cerebellar Lesions** 205
Rebecca Folkerth

Section 5 Malformations

Neural Tube Defects and Patterning Defects 211

37 **Defects of Neural Tube Closure and Axial Mesodermal Defects** 211
Marc Del Bigio

38 **Disorders of Early Midline Patterning** 223
Marc Del Bigio

Hydrocephalus 231

39 **Fetal and Perinatal Hydrocephalus** 231
Marc Del Bigio

Neuronal Migration Disorders 243

40 **Cerebral Cortical Migration Disorders** 243
Rebecca Folkerth

Genetic Syndromes and Phakomatoses 255

41 **Fragile X Syndrome** 255
Mirna Lechpammer

42 **Down Syndrome - Trisomy 21** 260
Mirna Lechpammer

43 **Edwards Syndrome - Trisomy 18** 265
Mirna Lechpammer

44 **Patau Syndrome - Trisomy 13** 269
Mirna Lechpammer

45 **Tuberous Sclerosis Complex** 273
Mirna Lechpammer

46 **Sturge-Weber Syndrome** 278
Mirna Lechpammer

47 **Neurocutaneous Melanosis** 281
Mirna Lechpammer

Section 6 Perinatal Neurooncology

48 **Congenital and Perinatal Brain Tumors** 285
Sanda Alexandrescu

Section 7 Spinal and Neuromuscular Disorders

- Arthrogryposis** 301
- 49 **Arthrogryposis Multiplex Congenita** 301
Mirna Lechpammer
- Spinal Muscular Atrophy** 305
- 50 **Spinal Muscular Atrophy (SMA)** 305
Rebecca Folkerth and Steven A. Moore
- Early-Onset Hereditary Neuropathies** 309
- 51 **Charcot-Marie-Tooth (CMT) Neuropathies** 309
Mirna Lechpammer and Steven A. Moore
- Congenital Muscle Disorders** 313
- 52 **Congenital Myasthenic Syndromes** 313
Rebecca Folkerth and Steven A. Moore
- 53 **Congenital Muscular Dystrophies** 317
Rebecca Folkerth and Steven A. Moore
- 54 **Congenital Myopathies** 324
Rebecca Folkerth and Steven A. Moore
- 55 **Other Congenital Muscle Disorders** 329
Rebecca Folkerth

Section 8 Eye Disorders

- 56 **Congenital Eye Malformations and Deformations** 333
Mirna Lechpammer

Section 9 Infections

- In Utero Infections** 339
- 57 **Congenital Viral, Bacterial, and Parasitic Infections** 339
Marc Del Bigio
- Peri- and Postnatal Infections** 359
- 58 **Meningitis and Encephalitis** 359
Rebecca Folkerth

Section 10 Metabolic / Toxic Disorders

- Storage Diseases** 365
- 59 **Lysosomal Disorders** 365
Mirna Lechpammer
- 60 **Peroxisomal Disorders** 378
Mirna Lechpammer
- Kernicterus** 385
- 61 **Clinicopathological Features of Kernicterus** 385
Mirna Lechpammer
- Mitochondrial Diseases** 391
- 62 **Clinicopathological Features of Mitochondrial Diseases** 391
Mirna Lechpammer
- Maternal Toxin Exposure** 403
- 63 **Ethanol and Other Agents** 403
Marc Del Bigio

Section 11 Forensic Neuropathology

- Trauma** 411
- 64 **Birth Trauma** 411
Marc Del Bigio
- 65 **Accidental and Nonaccidental Death** 421
Rebecca Folkerth
- Sudden Unexpected Death** 431
- 66 **Sudden Unexpected Death in Infancy and Childhood** 431
Rebecca Folkerth

-
- Appendix 1 Technical Considerations in Perinatal CNS* 437
 - Index* 438