Progress in Neurological Surgery

Volume 2

Editors

H. Krayenbühl, Zürich . P. E. Maspes, Milan . W. H. Sweet, Boston

Assistant Editors

P. Paoletti, Milan . R. L. Wright, Boston

Advisory Board

R. Araña
S. Obrador, Madrid . J. L. Pool, New York
T. Riechert, Freiburg/Br. . K. Sano, Tokyo . A. E. Walker, Baltimore

141 figures and 31 tables

BASEL (Switzerland) S. KARGER NEW YORK

Distributed simultaneously in North and South America, Australia, Japan, New Zealand, Taiwan and the Philippines by

YEAR BOOK MEDICAL PUBLISHERS, Inc., Chicago

Progress in Neurological Surgery

Vol. 1: VIII + 308 pages, 142 figs, 28 tab. sFr./DM 64.50 (1966)
Vol. 2: X + 406 pages, 141 figs, 31 tab. sFr./DM 85.—
Vol. 3: (in preparation). On the subject of spontaneous intracranial hemorrhages
Vol. 4: (in preparation). On pediatric neurosurgery

List of Contributors

Editorial Preface

In the preface to the first volume of this series we emphasized the responsibilities and opportunities of neurosurgeons to apply whole areas of rapidly largening new knowledge to diagnoses and treatment of diseases of the nervous system. The snowballing increases in relevant facts have become even more obvious in the two and a half years since that first preface in November of 1965. At the same time, the clinical demands on the individual neurosurgeon have left him less rather than more time to keep abreast of the data he must master if he is to satisfy himself and his patients that he is providing the best of medical care in his domain. Hence our objective in these volumes of providing a critical summary of a highly circumscribed field seems, if possible, more urgent than ever. The author of each chapter has consecrated himself to the task, not only of summarizing the world literature in the limited domain of his assignment, but has aimed at the even more important goal of evaluating critically these publications. The senior neurosurgeons, and other neuroscientists of the world now have the tremendous advantages of personal meetings with many of their confreres throughout the world. We hope that each in his chapter will be able to distill not only the broad knowledge permitted by his reading, but as well that further appraisal gleaned from manto-man associations. If the selection of authors is judicious and they devote the major length of time necessary to achieve this comprehensive objective, the neurosurgical world will, we trust, have available in wieldy dimensions sources of guidance not elsewhere obtainable. The editors have been especially gratified to have almost no refusals of invitations to contribute chapters to the foregoing demanding specifications. We think that this is eloquent testimony to the general realization of the need for such communications. It attests as
well to the willingness of today’s outstanding men in the field of the nervous system to allocate the necessary effort to this philanthropic scholarly task.

IV

The chapters for Volume III are already finished, and this volume will appear in 6 months. The contributors to Volume IV on Pediatric Neurosurgery are well under way on their essays. Volume V will deal with disorders surgically treated almost exclusively by stereotactic methods. In Volume VI comparisons will be provided between stereotactic and open operative procedures in diseases in which the two general methods are now competitive. We invite critical suggestions from any reader of this, or the previous volume, which might in any way help us better to achieve the objectives we have outlined.

June 1968

H. Krayenbühl
P. E. Maspes
W. H. Sweet

Table of Contents

Pathology and Classification of Gliomas
K.J. Zülch and W. Wechsler, Köln-Merheim

I. Introduction 1
II. Classification of Brain Tumours (Gliomas) 3
1. The Classification of Bailey and Cushing 5
2. The Classification of Del Rio Hortega 6
3. The Classification of Kernohan 6
4. Classification System Proposed by the UICC 8
III. Biological Evaluation of Brain Tumour Prognosis : A Morphological Classification Combined with a Modified Grading System 11
IV. Morphological and Biological Diagnosis 17
V. New Methods for Diagnosis and Classification 20
VI. Hypothesis on the Pathogenesis of Brain Tumours, Particularly of Neuroepithelial Origin 25
VII. Pathology of Neuroectodermal Tumours 29
1. Medulloblastoma 29
2. Glioblastomas 33
3. Astrocytomas 42
4. Spongioblastomas 48
5. Oligodendrogliomas 56
6. Ependymomas 67
VIII. Actual Brain Tumour Diagnosis 72
References 74

Spontaneous Neoplasms of the Nervous System in Animals

Introduction 86
Literature 87
General 87
Incidence 87
Material and Methods 88
Classification 89
Effects of Intracranial and Intraspinal Neoplasms 89
Special Part 90
Neuroectodermal Tumors 91
Medulloblastoma 91
Spongioblastoma 93
Oligodendrogliaoma 94
Astrocytoma 100
Glioblastoma 103
Ependymoma 105

VI

Plexus Papilloma 107
Pinealoma III
Neurinoma III
Gangliocytoma 112
Unclassified Neuroepithelial Tumors 112
Appendix 114
The So-Called Fowl Gliomas 114
Mesodermal Tumors 116
General 116
Meningioma 117
Angioblastoma 122
Fibroma 122
Perineural Fibroblastoma 122
Sarcomas 124
Recent Advances in Chemical Composition and Metabolism of Brain Tumors
P. E. Maspes and P. Paoletti, Milan

I. Introduction 204
II. Respiration and Biological Oxidations 205
   A. Oxygen Consumption 205
   B. Coenzymes of the Respiratory Chain 208
      1. Nicotinamide Adenine Dinucleotides 208
      2. Flavoproteins 209
      3. Cytochrome Oxidase 210
   C. High Energy Compounds and Phosphate Transfer 210
      D. Tricarboxylic Acid Cycle 211
III. Carbohydrates 214
   A. Contents and Composition 214
   B. Metabolism 215
      1. Phosphorylation of Glucose 215
      2. Hydrolysis of Glucose-6-Phosphate 217
      3. Glycolysis 217
      4. Pentose-Phosphate Route 220
      5. Glycogen Synthesis and Breakdown 221
IV. Lipids 223
   A. Contents 223
   B. Composition 224
      1. Fatty Acids 224
      2. Phospholipids 225
      3. Glycolipids 227
      4. Neutral Fats 228
5. Sterols 228
   C. Histochemical Localization of Lipids in Brain Tumors 233
   D. Metabolism 234
     1. Synthesis 234
     2. Deposition and Turnover 237
   E. Drugs Affecting Lipids in Brain Tumors 237
V. Proteins 240
   A. Protein and Aminoacid Composition 240

VIII
B. Metabolism 241
   C. Protein Uptake in Brain Tumors 242
VI. Nucleic Acids 244
   A. Contents 244
   B. Biosynthesis 245
VII. Miscellaneous Enzymes and Components 245
   A. Beta-Glucuronidase 245
   B. Glutamic-Oxalacetic Transaminase 246
   C. Phosphomonoesterases 246
     1. Alkaline Phosphatase 246
     2. Acid Phosphatase 247
   D. Cholinesterases 248
   E. Sulphydryl Groups 248
   F. Catecholamine Metabolites 249
   G. Serotonin 249
   H. Gamma-Aminobutyric Acid 249
I. Steroids 250
J. Sodium and Potassium 250
VIII. Conclusions 250
References 252

Immunological Aspects of Brain Tumors
L. C. Scheinberg and Judith M. Taylor, New York, N.Y.

Introduction 267
Immunological Problems of Tissue Transplantation 269
Normal Tissue 269
Survival of Grafts 270
Tumor Transplantation 278
Tumor Immunization 281
Brain Tumor Immunization 285
Relative Value of Air Studies, Angiography and Radioisotope Scanning in the Diagnosis of Glial Intracranial Tumors
G. Di Chiro, Bethesda, Md.

Introduction 292
A. Supratentorial Hemispheric Gliomas 294
1. Detection and Localization 294
2. Diagnosis of Tumor Type 298
3. Assessment of Extension 300
B. Central and Paraventricular Gliomas 300
1. Detection and Localization 300
2. Diagnosis of Tumor Type 304
3. Assessment of Extension 304
C. Suprasellar Gliomas 305
1. Detection and Localization 305
2. Diagnosis of Tumor Type 305
3. Assessment of Extension 308
D. Infratentorial Gliomas 308
1. Detection and Localization 308

IX

2. Diagnosis of Tumor Type 314
3. Assessment of Extension 316

Radiotherapy of Intracranial Neoplasms. With a Special Section on the Radiotherapeutic Management of Central Nervous System Tumors in Children
M. D. Schulz, Chiu-Chen Wang, G. F. Zinninger and M. Tefft, Boston, Mass.

Introduction and General Principles 319
The Role of Radiotherapy: Indications, Contraindications, Complications 320
Effect of Ionizing Radiation on the Central Nervous System 325
The Radiosensitivity of Brain Tumors 330
Modalities and Techniques in the Treatment of Brain Tumors 332
Techniques 333
Preoperative Irradiation of Brain Tumors 336
Evaluation of the Site of Radiotherapy in the Management of Specific Intracranial
Neoplasms 337
Glioblastoma Multiforme 337
Astrocytomas 339
Ependymomas 340
Oligodendrogliomas 341
Medulloblastomas 342
Midbrain and Brain Stem (Pontine) Tumors 344
Tumors of Optic Nerve and Chiasm 345
Meningiomas 346
Neuromas 346
Chordomas 346
Craniopharyngiomas 348
Intracranial Vascular Tumors 349
Chemodectomas 350
Pinealomas 351
Metastases to Brain 352
Malignant Lymphomas and Related Diseases 354
Pituitary Tumors 355
Radiotherapeutic Management of Central Nervous System Tumors in Children 358
Medulloblastoma 358
Cerebellar Astrocytoma 361
Ependymoma 362
Brain Stem Glioma 362
Cerebral Gliomas: Supratentorial 363
Miscellaneous 363
Spinal Cord Tumors 364
References 364
Subject Index 371
Names Index 395