SYLLABUS FOR M.CH. (NEUROSURGERY)

The syllabus provided below is a brief outline of the topics in the field of neurosurgery that the candidates should be acquainted with for the theory and practical examinations for the examination of M.Ch. (Neurosurgery). Candidates must have read standard textbooks as well as national and international peer reviewed journals on the subject of neurosurgery. A provisional list of such literature is appended below. The examination shall also evaluate knowledge of recent advances that is available in literature.

BASIC NEUROSCIENCES

The candidate is expected to be conversant with the following broad fields with special reference to their application in Neurosurgery. These include General Principles of the basic neurosciences. A wide coverage of Basic Sciences like Anatomy, Physiology, Biochemistry, Pathology, Microbiology, Pharmacology, Immunology, etc pertaining to the nervous system, the cranial vertebral column and its contents.

A brief outline is as follows:

1. Neuroanatomy and embryology
2. Neurobiology
3. Neurophysiology
4. Neuropathology & Microbiology
5. Neurochemistry and Neuropharmacology

BASIC SCIENCE FOR THE NEUROLOGICAL SURGEON

1. Surgical Anatomy of the Brain
2. Neuroembryology – development of the central nervous system
3. Neurons and Neuroglia
4. Astrocytes
5. Cerebral metabolism and the pathophysiology of Ischemic brain damage
6. The blood brain barrier
7. Physiology of the cerebro spinal fluid and intracranial pressure
8. Cellular and molecular mechanism mediating injury and recovery in the nervous system.
9. Electrophysiology properties of the Central Nervous System
10. Neuropathology of brain tumors, Immunohistochemistry, Electron microscopy
11. Neurosurgical epidemiology and outcomes assessment
12. Human genome and gene therapy, Stem Cell therapy in CNS

CLINICAL SCIENCE

HISTORY OF NEUROSURGERY

APPROACH TO THE PATIENTS.

1. History and physical examination.
3. Neuro ophalmology
4. Neuro Otology
5. Neuro Urology
6. Neuro Psychological assessment of the neurosurgical patient
7. Brain death
8. Legal issues

FUNDAMENTALS OF RADIOLOGY

1. Radiology of the skull
2. Computed Tomography
4. Molecular Imaging of the Brain with Positron Emission Tomography
5. Radiology of the Spine
6. Angiography modalities: Digital Subtraction Angiography, CT Angiography, MR Angiography

PERIOPERATIVE EVALUATION AND TREATMENT.
1. Neuroanesthesia; Preoperative Evaluation
2. Complication Avoidance in Neurosurgery
3. Neurosurgical Intensive Care Management

SURGICAL EXPOSURES AND POSITIONING

1. General principles of operative positioning, microneurosurgery instruments
2. Surgical positioning and exposures for cranial procedures
3. Surgical exposures and positioning for spinal surgery
4. Peripheral nerves
6. Stereotaxy Procedures

BASIC SCIENCE OF NEURO ONCOLOGY

1. Brain tumors; general considerations
2. Histopathology classification of brain tumors
3. Central Nervous system immunology
4. Proliferation Marker in Evaluation of Gliomas
5. Molecular Genetics and development of Targets for glioma therapy
7. Tumor suppressor Genes and genesis of brain tumors.
8. Molecular and Cytogenetic techniques
9. Invasion in Malignant glioma.
10. Angiogeneis and brain tumors.
11. Brain Edema and Tumor Host Interactions
13. Principles of Gene Therapy
14. Clinical features and Neurology of Brain tumor and Paraneoplastic
15. Radiologic features of Central Nervous System tumors.
17. Brain tumor during pregnancy
18. Principles of Chemotherapy
19. Aspects of Immunology applicable to brain tumor pathogenesis and treatment
20. Basic principles of Cranial surgery for brain tumors
21. Basic principles of skull base surgery
22. Surgical complications and their avoidance.

INTRAAXIAL TUMORS.

1. Low grade gliomas: Astrocytoma, Oligodendroglioma and Mixed Gliomas
3. Primitive Neuroectodermal tumors.
4. Pineal tumors
5. Medulloblastoma.
6. Ependymoma
7. Haemangioblastoma
8. Lymphoma
9. Metastatic brain tumor

EXTRAAXIAL TUMORS.

1. Meningioma
2. Meningeal haemangio pericytoma
3. Meningeal sarcoma
4. Acoustic neuroma
5. Pituitary tumors: Functioning and non functioning
6. Craniopharyngoma in the Adult
7. Epidermoid, dermoid and neuroenteric cyst
8. Neoplastic meningitis – Diagnosis and Treatment.

VENTRICULAR TUMORS.

SKULL BASE TUMORS

1. Chordoma and Chondrosarcoma.
2. Glomus jugulare tumors.
3. Neoplasms of paranasal sinuses
4. Esthesioneuroblastoma.
5. Trigeminal Schwannoma
6. Juvenile Angiofibroma
7. Osseous tumors
8. Orbital tumors.
9. Skull tumors
10. Scalp tumors.

NON NEOPLASTIC DISORDERS MIMICKING BRAIN TUMORS.

1. Pseudotumor cerebri
2. Sarcoidosis, Tuberculosis and Xanthogranuloma
3. Multiple Sclerosis.

VASCULAR

1. Cerebral blood flow and metabolism
2. Acute Medical Management of Ischemic disease and Stroke
3. Anesthesia in Cerebro vascular disease
4. Intraoperative Cerebral protection
5. Deep Hypothermic Circulatory Arrest
6. Transcranial Doppler ultra sonography
7. Neurosonology
8. Xenon computed tomography
9. Magnetic Resonance Angiography
10. Positron Emmission Tomography

OCCLUSIVE VASCULAR DISEASE

Carotid occlusive Disease, Carotid Endarectomy, Angioplasty, Stenting, Traumatic Carotid Injury, Vertebral Artery disease, Intracranial arterial disease, Moya Moya, Cerebral Venous and Sinus Thrombosis

INTRA CEREBRAL HEAMORRHAGE

Spontaneous intracerebral hemorrhage; non arteriovenous malformation, non aneurysm

HEMMORRHAGIC VASCULAR DISEASE; ANEURYSMS

1. Genetic of Intracranial aneurysm.
2. Natural History of Unruptured Saccular Cerebral aneurysm.
3. Management of Subarachnoid hemorrhage
4. Cerebral vasospasm
5. Surgical approaches for anterior circulation aneurysm
6. Treatment of Intracavernous and paraclinoid internal carotid artery aneurysm
8. Posterior circulation aneurysms, including the vertebral, basilar and PICA aneurysm.
10. Giant Aneurysm.
11. Infectious intracranial aneurysm.
12. Revascularization techniques for complex aneurysm and skull base tumors

ARTERIO VENOUS MALFORMATION

1. Natural History of intracranial vascular malformations
2. Classification and treatment, surgical and radiosurgical
3. Endovascular management of AVM
4. Surgical Treatment
5. Dural AVMs

CAVERNOUS MALFORMATIONS
Epidemiology and Natural History, Genetics, Surgical management of intracranial cavernous malformation.

Cavernous Carotid Fistulas.

Spinal AVM
Classification, Endovascular Treatment, Surgery
EPILEPSY

1. General, Historical, Basic Science, Classification, Approaches to Diagnosis, Antiepileptic medications.
3. Candidates for epilepsy surgery
4. Intraoperative Mapping and Monitoring for cortical resections
5. Epilepsy surgery: outcome and complications.
6. Amygdalohippocampectomy, topectomy, multiple subpial resection, Vagus Nerve Stimulation for intractable epilepsy.

FUNCTIONAL NEUROSURGERY

1. History
2. Anatomy of Basal Ganglia
3. Neuropathology of Movement disorder
4. Rationale for surgical interventions in Movement Disorders
5. Approach to Movement Disorders, patient selections
6. Thalamotomy for tremor
7. Pallidotomy for Parkinson’s Disease
8. Surgery for Dystonia
9. Deep brain stimulation
10. Cellular Transplantation, Stem Cell Therapy
12. Neurosurgical treatment of spasticity, spasmodic torticollis, intractable vertigo

PAIN

1. Physiologic anatomy of pain
2. Chronic Pain – Medical Management
3. Trigeminal Neuralgia – Non operative management, Percutaneous techniques, Microvascular decompression.

PEDIATRIC NEUROSURGERY

1. Neurological Examination in Infancy and Childhood.
3. Craniosynostosis, Chiari Malformation and Achondroplasia.
4. Hydrocephalus
5. Vein of Galen Malformations, AVM and aneurysm in childhood
6. Head and Brain trauma
7. Birth Trauma
8. Tumors – Optic Gliomas, Germ Cell tumors, Choroid plexus tumors, ependymomas, medulloblastomas, cerebellar astrocytoma, brain stem glioma, craniopharyngioma, intraspinal tumors, skull tumors.
9. Cerebral palsy
10. Surgical treatment in Epilepsy in Children
11. Pediatric neuro rehabilitation.
PERIPHERAL NERVES

2. Carpel Tunnel Syndrome, Entrapment syndromes Peripheral Nerve tumors, Acute Peripheral nerve injury

RADIATION THERAPY AND RADIOSURGERY

1. General, Historical considerations
2. Radiobiology
3. Principles of Radiotherapy
4. Radiosurgery for tumors, functional radiosurgery, Radiosurgery for AVMs
5. Interstitial and Intracavitary irradiation for brain tumors

SPINE

1. Overview and History
2. Concepts and Mechanisms of Biomechanics
3. Intraoperative of Electrophysiology - Monitoring
4. Bone metabolism
5. Approach to patient with spinal disorder
6. Failed back syndrome
7. Infections of spine and spinal cord
9. Acquired abnormalities of Craniovertebral junction – basilar invagination, AAD
10. Principles of spinal internal ﬁxation, bone graft harvest and spinal fusion.
12. Image guided spinal navigation.
14. Tumors of spine – Haemangiomas, multiple myeloma, metastases
15. Spinal trauma, approach and diagnosis, treatment of fractures and spinal cord trauma

PERIPHERAL NERVES

Acute and chronic injuries of peripheral nerves, brachial plexus and lumbosacral plexus Electromyography, nerve conduction studies
Peripheral nerve tumors and compressive neuropathies
TRAUMA

1. Modern neurotraumatology – brief historical review
2. Cellular basis of injury and recovery from trauma.
3. Clinical pathophysiology of traumatic brain injury
5. Moderate and severe traumatic brain injury – initial resuscitation and patient evaluation, critical care management, surgical management
7. Rehabilitation and prognosis after traumatic brain injury

INFECTIONS OF THE CENTRAL NERVOUS SYSTEM

Diagnosis and Management
Acute: Pyogenic and viral meningitis
Chronic: Tuberculous, Fungal, Parasitic
Human Immunodeficiency related pathologies

LIST OF STANDARD TEXTBOOKS AND JOURNALS IN NEUROSURGERY

1. Neurosurgery, editors RH Wilkins and SS Rengachary
2. Operative Neurosurgical Techniques. Schmidek and Sweet
3. Youman’s Neurological Surgery edited by H. Richard Winn
5. Textbook of Neurosurgery, editors Ramamurthi B, Tandon PN
6. Journal of Neurosurgery
7. Neurosurgery
8. British Journal of Neurosurgery
9. Acta Neurochirurgica
10. Journal of Clinical Neurosciences
11. Neurology India