Passed by Academic Council (Resolution No. 365/2006) dtd. 28/06/2006, subject to Uniformity in the Examination pattern.

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 cranium 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. Neuroembroylogy – 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.
2. Differential diagnosis of altered states of consciousness.
3. Neuro ophalmology
4. Neuro Otology

5. Neuro Urology
6. Neuro Pychological assessement of the neurosurgical patient
7. Brain death
8. Legal issues

FUNDAMENTALS OF RADIOLOGY

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

PERIOPERATIVE EVALUATION AND TREATMENT.

1. Neuroanesthesia; Preoperative Evaluation
2. Complication Avoidance in Neurosurgery
3. Neurosurgical Intenive 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
5. Operating Microscope, Cavitron Suction Apparatus, Intraoperative Electrophysiology, Neuronavigation – image guided, Intraoperative MR and DSA, Lasers in Neurosurgery
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
6. Growth factors and brain tumors.
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
12. Brain tumors : Population based epidermiology, Environmental risk factors, and Genetic and Hereditary syndromes.
13. Principles of Gene Therapy
14. Clnical features and Neurology of Brain tumor and Paraneoplastic
15. Radiologic features of Central Nervous System tumors.
16. Endovascular techniques for brain 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.
23. Surgical Navigation for brain tumors.

INTRAAXIAL TUMORS.

1. Low grade gliomas : Astrocytoma, Oligodendroglioma and Mixed Gliomas
2. Malignant gliomas : Anaplastic astrocytoma, glioblastoma Multiforme, Gliosarcoma, Malignant Oligodendroglioma.
3. Primkitive 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

Sponteneous 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
7. Aneurysms of anterior communicating artery, anterior cerebral artery, distal arterior cerebral artery and middle cerebral artery aneurysms.
8. Posterior circulation aneurysms, including the vertebral, basilar and PICA aneurysm.
9. Endovascular Treatment of 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, Anti epileptic medications.
2. Preoperative Evaluation for Epilepsy surgery; Wada Test, Functional Magnetic Resonance Imaging.
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
11. Neurosurgery of psychiatric disorders.
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, Percutenous techniques, Microvascular decompression.
4. Surgical Management of intractable pain.

PEDIATRIC NEUROSURGERY

1. Neurological Examination in Infancy and Childhood.
2. Developmental and Acquired Anamolies – Encephalocele, Myleomeningocele, Tethered spinal cord, occult spinal dysraphism, Dandy Walker Syndrome, Arachnoid cyst.
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 Chidren
11. Pediatric neuro rehabilitation.

PERIPHERAL NERVES

1. History – Physiology, Evaluation, Investigations of Peripheral Nerve disorders.
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
6. Techniques of radiosurgery – linac, Gamma Knife, Proton Radiosurgery, Stereotactic.

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
8. Degenerative disease – cervical spondylosis, lumbar spinal stenosis, occification of posterior longitudinal ligament, spondylolysis and spondylolisthesis, treatment of disc disease.
9. Acquired abnormalities of Craniovertebral junction – basilar invagination, AAD
10. Principles of spinal internal fixation, bone graft harvest and spinal fusion.
11. Instrumentation - anterior cervical, posterior cervical, occipito cervical, anterior thoracic, posterior thoracic, anterior lumbar and posterior lumbar.
12. Image guided spinal navigation.
13. Endoscopic approaches, percutaneous treatment of disc disease.
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
4. Mild head injury in adults.
5. Moderate and severe traumatic brain injury – initial resuscitation and patient evaluation, critical care management, surgical management
6. Sequele of traumatic brain injury – cerebro vascular injury, cranio facial trauma and cerebro spinal fluid fistula.
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
4. Textbook of Operative Neurosurgery, editors Ramamurthi R, Sridhar K, Vasudevan MC.
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