

**SREE CHITRA TIRUNAL INSTITUTE  
FOR MEDICAL SCIENCES AND  
TECHNOLOGY**

**Course curriculum for Doctor of Medicine  
(D.M) and Master of Chirurgiae (M.Ch)  
Programmes**

**TRIVANDRUM – 695 011  
KERALA INDIA**

Phone +91-471-2443152, 2524269, 2524150

Email: [regoffice@sctimst.ac.in](mailto:regoffice@sctimst.ac.in)

Website: <http://www.sctimst.ac.in>

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# D.M CARDIOLOGY

## SYLLABUS

### PART I

1. **CARDIAC ANATOMY:** Applied anatomy of cardiovascular system, normal variations, embryology, and alterations in disease states.
2. **CARDIAC PHYSIOLOGY:** Normal cardiovascular physiology including electrical activity, cardiac cycle, cardiac metabolism, and physiology of circulation. Range of normal responses, and alterations in health and disease states.
3. **CARDIAC PHARMACOLOGY:** Basic understanding of pharmacokinetics of drugs and pharmacodynamics of drugs used in cardiology. Their mechanism of action, metabolism, adverse effects, drug interactions, drug development, and practice of prescription utilising best scientific evidence.
4. **CARDIAC PATHOLOGY:** Structural alterations- macroscopic and microscopic, due to various diseases primarily and secondarily involving the heart and the vascular system.
5. **CARDIAC INVESTIGATIONS:** A thorough knowledge of basic principles, indications, technique, results, strength and limitations of various diagnostic tests is essential. Proficiency in independently ordering, performing and interpreting some of these investigations is essential, and accrue from a large number of tests performed under supervision and independently as subsequently suggested. These include invasive and non-invasive investigations.

Non-invasive investigations: ECG, Echocardiogram, Chest X-ray, Cardiac CT and CT angiography, Cardiac MRI and MR angiography, Nuclear cardiac imaging, exercise stress testing and Holter monitoring.

Invasive investigations: Cardiac hemodynamics (pressure waveforms, oximetry, cardiac output, vascular resistance, shunts, valve area),

normal and abnormal angiographic anatomy of heart and blood vessels, safety precautions, complications of cardiac catheterizations and their management.

Invasive electrophysiological studies – Basic understanding of electrical signals, interpretations, physics of radiofrequency and pacemaker.

6. EPIDEMIOLOGY AND PREVENTIVE CARDIOLOGY: Principles of epidemiology in relation to cardiac diseases. Concepts of risk factors, population approaches, prevention of diseases and health promotion.
7. Genetics and molecular cardiology
8. Basics of Statistical methods, Research methodology
9. BIOMEDICAL ENGINEERING: Basic understanding of physical principles of various biomedical instruments and devices used in cardiac diagnosis and therapeutics with a view to optimally utilize them.

## **PART II**

1. CORE CARDIOLOGY: The epidemiology, etiopathogenesis, clinical presentation, diagnosis, differential diagnosis, treatment, complications, prognosis and preventive aspects (wherever applicable) of the following heart diseases
  - Atherosclerotic heart disease - acute and chronic coronary artery diseases.
  - Valvular heart disease including rheumatic heart diseases
  - Congenital heart disease in infants, children and adults
  - Heart failure- acute and chronic heart failure
  - Systemic hypertension – primary and secondary
  - Cardiac arrhythmias
  - Sudden cardiac death, syncope
  - Heart muscle disease – myocarditis and cardiomyopathy

- Pericardial disease- acute and chronic Pericarditis,
- Constrictive Pericarditis, pericardial effusion
- Infective endocarditis – diagnosis, treatment and prevention
- Lungs and heart diseases including pulmonary hypertension
- Diabetes mellitus and heart disease
- Pregnancy and heart disease
- Stroke and heart disease
- Cardiac involvement in other systemic diseases
- Diseases of aorta including aneurysms, aortitis, aortic dissection
- Peripheral vascular diseases, venous system diseases including thromboembolism
- Anaesthesia and non-cardiac surgery and heart
- Cardiac trauma
- Cardiac neoplasms

## 2. Recent advances and future of Cardiology

### **REFERENCE TEXTS AND PERIODICALS**

#### **Textbooks – General**

1. Harrison's – Principles of Internal Medicine
2. Braunwald's – Heart Disease
3. Hurst – The Heart
4. Otto – Valvular Heart disease – A companion to Braunwald's Heart disease
5. Opie – Drugs for the Heart (handbook)
6. Alpert – Valvular Heart disease

#### **Interventional Cardiology**

1. Grossman – Cardiac Catheterization, Angiography and Intervention

2. Topol's – Textbook of Interventional Cardiology
3. Kern – Cardiac catheterization handbook
4. Mullin's – Cardiac catheterization and hemodynamics

#### Echocardiography and ECG

1. Feigenbaum – Echocardiography
2. Snidder – Echocardiography in pediatric heart disease
3. Schamroth – An introduction to ECG
4. Marriott – Practical Electrocardiography
5. Chau – ECG in Clinical practice

#### Pediatric Cardiology

1. Rudolph – Congenital disease of the heart
2. Joseph K. Perloff – The clinical recognition of congenital heart disease
3. Moss and Adam's – Heart disease in infants, children and adolescents
4. Mayung Park – Pediatric cardiology for practitioners
5. Anderson – Paediatric Cardiology
6. Freedom – Natural history of congenital heart disease

#### Electrophysiology

1. Ellenbogen – Clinical cardiac pacing, defibrillation and resynchronization therapy
2. Ellenbogen – Cardiac pacing and ICDs
3. Josephson – Clinical cardiac Electrophysiology
4. Zipes/Miller – Cell to Bedside

# D.M NEUROLOGY

## SYLLABUS

### PART I

#### BASIC SCIENCES

##### 1. NEUROANATOMY

Embryonic development and Structure of CNS, PNS, coverings of the nervous system, blood brain barrier.

Functions, connections, applied anatomy including CT and MR anatomy, blood supply and their perturbations in health and disease.

##### 2. NEUROPHYSIOLOGY, NEUROCHEMISTRY AND GENETICS

1. Structure and function of neural membranes, including cell membrane structure and function, membrane transport, various types of ion channels, electrical excitability of cell membrane, lipid biochemistry, structure and function of myelin, biochemistry of myelin. Applied aspects like pathogenesis of various diseases involving myelin, various channelopathies etc.
2. Synaptic transmission, including structure and function of synapse, various types of receptors and signal transduction, G-Proteins and cyclic nucleotides, classes of neurotransmitters, individual neurotransmitters like acetyl choline, catecholamines, serotonin, histamine, opioids, neuropeptides, excitatory amino acids, GABA and glycine, purines, phosphoinositides and eicosanoids, protein phosphorylation and regulation of neuronal function. Applied aspects like neurochemistry of drug abuse, neurotransmitter disorders of basal ganglia, neurochemistry of degenerative diseases like Alzheimer's disease and Parkinson's disease, neurochemistry of epilepsy and anti-epileptic drugs. Biochemistry of vision, olfaction and taste sensations.

3. Muscle Fibre structure, various structural and functional proteins in the muscle fibres. Applied aspects like the genetics and pathogenesis of muscular dystrophies.
4. Axonal transport, neuronal cytoskeleton, development of nervous system, neural plasticity, biochemistry of aging, circulation and energy metabolism in the brain, neuronal hypoxia and ischemia, blood-brain barrier.
5. Disorders of carbohydrate, fatty acid and amino acid metabolism, mitochondrial disorders, urea cycle and its disorders, organic acid disorders, vitamin and other nutritional deficiencies, genetic disorders of lipid, glycoprotein and mucopolysaccharide metabolism, metabolic encephalopathies, biochemistry of psychiatric disorders, biochemistry of learning and memory, relation between endocrine system and nervous system.
6. Molecular basis of heredity, structure and function of DNA RNA, polypeptides and proteins, gene structure and organization, processing of RNA, imprinting and X-inactivation, cell cycle, chromosomal basis of heredity, organization of human genome, mitochondrial genome, genetic polymorphism, the human genome project, technology of cytogenetics and molecular genetics, methods of mutation detection / detecting specific sequence changes, DNA methylation analysis, abnormalities of chromosome number and structure, specific types of chromosome rearrangements, cytogenetic nomenclature, mutation and genetic disorders, types of mutations, effects of mutation on gene function, patterns of inheritance, genetic counselling, genetics of common neurological disorders.

### 3. MICROBIOLOGY AND PATHOLOGY

Infectious agents responsible for nervous system diseases, pathogenesis, consequences and applied aspects including diagnostic tools, their applications and limitations. Pathology of various central and peripheral nervous system disorders-like demyelination, vasculitis, infections, their recognition on gross specimens, basis of tissue preparation, stains, Interpretation



of brain, nerve and muscle biopsy specimens, including special studies like immunohistochemistry and EM.

#### 4. NEUROPHARMACOLOGY

Basic pharmacology of drugs used in various neurological disorders-epilepsy, parkinsonism, vascular diseases, myasthenia, migraine dementia, drugs used in critical care with special emphasis on pathophysiology of disease, mechanism of action, interactions, adverse effects, features of poisoning/overdose. Newer drug delivery systems and recent advances.

#### 5. OTHERS

1. Fundamentals of Neuropsychology
2. Neuro-Ophthalmology: Ocular Motor System, Afferent Visual System
3. Neuro-Otology
4. Neuro-urology
5. Neuroepidemiology
6. Clinical Neurogenetics, Neuroimmunology, Neuro virology, Neuroendocrinology.

### **PART II - Approach to Common Neurological Problems**

#### 1. DIAGNOSIS OF NEUROLOGICAL DISEASE-BED-SIDE CLINICAL EVALUATION:

Model history taking and comprehensive neurological examination-Focus on clinical demonstrations with ideal techniques and bedside manners. General physical and systemic examination with focussed methodology to evaluate each part of the neuraxis so as to present his evaluation as Anatomical, Patho-physiological and Clinical diagnosis.

#### 2. SYNDROMIC APPROACH

For diagnosis of neurological diseases.

Familiarity with approach to common and uncommon clinical problems like Episodic Impairment of Consciousness, Falls and Drop Attacks, Delirium, Stupor and Coma, Intellectual and Memory Impairments, Global Developmental Delay and Developmental Regression, Behavior and Personality Disturbances, Depression and Psychosis in Neurological Practice, Intentional Motor Disorders and the Apraxias, The Agnosias, Language and Speech Disorder-Aphasia, Dysarthria and Apraxia of Speech, Neurogenic Dysphagia, Vision Loss, Abnormalities of the Optic Nerve and Retina, Eye Movement Disorders: Diplopia, Nystagmus, and Other Ocular Oscillations, Pupillary and Eyelid Abnormalities, Dizziness and Vertigo, Hearing Loss and Tinnitus, Disturbances of Taste and Smell, Cranial and Facial Pain, Brainstem Syndromes, Ataxic Disorders, Movement Disorders: Diagnosis and Assessment, Gait Disorders, Hemiplegia and Monoplegia, Paraplegia and Spinal Cord Syndromes, Proximal, Distal, and Generalized Weakness, Muscle Pain and Cramps, The Floppy Infant, Sensory Abnormalities of the Limbs, Trunk, and Face, Neurological Causes of Bladder, Bowel, and Sexual Dysfunction, Arm and Neck Pain, Lower Back and Lower Limb Pain

### 3. NEUROLOGICAL INVESTIGATIONS AND RELATED CLINICAL NEUROSCIENCES

Laboratory Investigations in Diagnosis and Management of Neurological Disease Clinical Neurophysiology-their performance and interpretation Electroencephalography and Evoked Potentials, Clinical Electroneuro myography, TMS, Neuroimaging-Structural Neuroimaging-Computed Tomographic and Magnetic Resonance, Vascular Imaging, Neuroangiographic Anatomy and Common Cerebrovascular Diseases. Ultrasound Imaging of the Cerebral Vasculature Functional Neuroimaging.

### 4. MANAGEMENT OF NEUROLOGICAL DISEASE AND RECENT ADVANCES

Principles of Neuropharmacology and Therapeutics, Principles of Pain Management, Principles of Neuro intensive Care, Principles of Neurosurgery, Functional Neurosurgery, Principles of Endovascular Surgery, Principles and Practices of Neurological Rehabilitation

## 5. NEUROLOGICAL DISEASES, CLINICAL FEATURES, EVALUATION AND MANAGEMENT OF

1. Neurological complications of systemic diseases in adults and children
2. Trauma of the Nervous System
3. Vascular Diseases of the Nervous System-ischemic cerebrovascular disease, Intracerebral Hemorrhage, Intracranial Aneurysms and Subarachnoid Hemorrhage, Arteriovenous Malformations, Stroke in Children, Spinal Cord Vascular Disease and Central Nervous System Vasculitis and other rare disorders-pathophysiology, features and management.
4. Cancer and the Nervous System
5. Epidemiology of Primary Brain Tumors
6. Clinical Features and Complications, Neuroimaging, Management of Primary Nervous System Tumors in Adults and Infants and Children
7. Nervous System Metastases and Paraneoplastic Disorders of the Nervous System
8. Infections of the Nervous System  
Bacterial Infections, Viral Infections, Fungal Infections, Parasitic Infections, Neurological Manifestations of Human Immunodeficiency Virus Infection in Adults and children, Prion Diseases.
9. Multiple Sclerosis and Other Inflammatory Demyelinating Diseases of the Central Nervous System
10. Hypoxic/Anoxic and Ischemic Encephalopathies
11. Toxic and Metabolic Encephalopathies
12. Deficiency Diseases of the Nervous System

13. Effects of Toxins and Physical Agents on the Nervous System
14. Brain Edema and Disorders of Cerebrospinal Fluid Circulation
15. Developmental Disorders of the Nervous System
16. Developmental Disabilities
17. Inborn Errors of Metabolism of the Nervous System, Mitochondrial Disorders and Channelopathies: Episodic and Electrical Disorders of the Nervous System.
18. Neurocutaneous Syndromes
19. The Dementias
20. The Epilepsies
21. Movement Disorders
22. Sleep and Its Disorders
23. Headache and Other Craniofacial Pain
24. Cranial Neuropathies
25. Disorders of the Cerebellum, Including the Degenerative Ataxias.
26. Disorders of Bones, Joints, Ligaments, and Meninges
27. Disorders of Upper and Lower Motor Neurons
28. Disorders of Nerve Roots and Plexuses
29. Disorders of Peripheral Nerves
30. Disorders of the Autonomic Nervous System
31. Disorders of Neuromuscular Transmission
32. Disorders of Skeletal Muscle
33. Neurological Problems of the Newborn
34. Neurological Problems of Pregnancy

# **D.M NEUROIMAGING & INTERVENTIONAL NEURORADIOLOGY**

## **SYLLABUS**

### **PART I**

#### **BASIC SCIENCES**

1. ANATOMY (gross and radiological anatomy)
  - a. Embryology of brain, spinal cord, and their vascular system
  - b. Basic correlative anatomy of the brain, spinal cord and peripheral nervous system.
  - c. Blood supply of the brain and spinal cord
  - d. Embryology and anatomy of skull, face and head and neck.
  - e. Anatomy of the musculo skeletal system relevant to the disease of nervous system.
  - f. Relevant embryology and anatomy of vascular system mainly related to aorta and brachio cephalic vessels.
  
2. PHYSIOLOGY
  - a. Basic and applied neurophysiology
  - b. Basics of hemodynamics
  
3. PATHOLOGY AND MICROBIOLOGY
  - a. General and specific neuropathology
  - b. Applied use of electron microscopy and virology
  - c. Applied bacteriology, parasitology and virology
  - d. Neuro vascular pathology
  - e. Pathology of congenital malformations, neonatal and perinatal CNS disorders.
  - f. Genetic and metabolic disorders of CNS
  
4. BIOCHEMISTRY AND PHARMACOLOGY
  - a. Applied aspect of the brain chemistry in relation to neuroradiology
  - b. Pharmacology of drug action in relation to neuro radiology

- c. Contrast media
- d. Antihypertensives, antiplatelets, anti coagulants
- e. Vasodilators and vaso constrictors
- f. Embolic agents
- g. Thrombolytic agents
- h. Anesthetics and analgesics with respect to neuro imaging and interventions.
- i. Anti epileptics

## 5. PHYSICAL PRINCIPLES OF IMAGING

- a. Image intensifier and flat pannel detector
- b. Angiography and digital subtraction angiography
- c. Spiral and multislice CT, CT perfusion imaging, and recent advances.
- d. Magnetic resonance imaging – hard wares, pulse sequences, MR spectroscopy, functional MRI, diffusion tensor imaging.
- e. Ultrasound, doppler and colour doppler ultrasound
- f. Image processing in CT and MRI
- g. PACS and digital radiography
- h. Radionuclide scan, SPECT and PET

## 6. INSTRUMENTATION AND BIO MEDICAL ENGINEERING

- a. Knowledge about the various imaging and interventional equipment in the department.
- b. Patient monitoring equipments and various life support systems.
- c. Catheters and other biomaterials used in interventional radiology.
- d. Radiation protection principles and devices

7. STERIODACTIC RADIOTHERAPY AND STERIODACTIC PROCEDURES
  - a. Principle and practice of steriodactic radiotherapy using x-ray source and cobalt source.
  - b. Principle, theory and practice of steriodactic procedures on brain,spine and spinal cord.
  
8. EPIDEMIOLOGICAL STUDIES AND BIOSTATISTICS

## **PART II**

### **CLINICAL SCIENCES**

- a. Neuroradiology: Principles and practice of applied neuroradiology
- b. Interventional neuroradiology: principles and practice of interventional neuroradiology
- c. Neurology, neuro ophthalmology, neuro otorhino laryngology: principles, theory and practice
- d. Neuro surgery : principles and theory
- e. Experimental neuroradiology
- f. Recent advances in neuroradiology.

### **REFERENCE TEXTS AND PERIODICALS**

#### **TEXT BOOKS**

1. Magnetic Resonance Imaging of the Brain and Spine Scott W. Atlas.
2. Diagnostic cerebral angiography Anne G. Osborn
3. Interventional Neuroradiology: Strategies and Practical Techniques J. J. Connors, Joan C. Wojak.

#### **Periodicals**

1. American Journal of Neuroradiology
2. Neuroradiology
3. Journal of magnetic resonance imaging
4. Neuro Imaging Clinics of North America
5. Neurology
6. Neurosurgery

# D.M CARDIOTHORACIC AND VASCULAR ANESTHESIA

## SYLLABUS

### PART I

#### 1. APPLIED ANATOMY:

- Basic and correlative cardiac, thoracic and vascular anatomy
- Embryological development of heart great vessels, lung, esophagus and other thoracic structures

#### 2. APPLIED PHYSIOLOGY

- Cardiac cycle, cardiac output, blood pressure and blood volume, cardiac contractility, preload, afterload, cardiac failure, coronary circulation, autonomic control of heart and vasculature
- Pulmonary circulation, acid-base balance, physiological function of lung, pulmonary function tests.
- Physiology during extracorporeal circulation, assisted circulation and hypothermia
- Body water, oxygen transport, shock
- Perioperative physiology of liver, kidney, brain, and hematology

#### 3. PHYSICS

- Gas laws; compressed gases; medical gas cylinders, laminar flow.
- Fluid dynamics
- Physics of anaesthetic apparatus; principles of anaesthetic agent vaporization.
- Physics related to mechanical ventilators
- Principles of ultrasound



#### 4. APPLIED PHARMACOLOGY

- Basic and correlative pharmacology of drugs acting on heart, lung, vasculature and other vital organs.
- Pharmacological principles: Pharmacokinetics, pharmacodynamics, drug distribution, biodisposition, elimination, pharmacological actions and adverse reactions.
- Cardiac glycosides, antihypertensives, vasopressors, diuretics, beta-blockers, calcium channel blockers, inotropic agents, antiarrhythmic agents, drugs for coronary artery diseases.
- Inhalational and intravenous anaesthetic drugs, drugs acting on neuromuscular transmission, analgesics, sedatives and hypnotics, premedicants.
- Drugs acting on tracheobronchial tree, pulmonary parenchyma and pulmonary circulation.

#### 5. APPLIED PATHOLOGY AND PATHOPHYSIOLOGY

- Congenital heart diseases: Cyanotic and acyanotic heart diseases, intracardiac shunts, patent ductus arteriosus, Fontan circulation, anomalous venous connections, anomalies of pulmonary vasculature, anomalies of great vessels.
- Rheumatic heart diseases, valvular heart diseases, coronary artery diseases, myocardial infarction, myocarditis, cardiomyopathies, pericarditis, infective endocarditis, hypertensive heart disease, pulmonary embolism, cardiac tumors.
- Diseases of vascular system: Aortic aneurysms, aortic dissection, coarctation of aorta, vascular pseudoaneurysms, peripheral vascular diseases, carotid artery diseases, renal artery stenosis.
- Thoracic injuries, thoracic tumors, diseases of tracheobronchial tree, COPD, restrictive lung diseases, pulmonary infections, pulmonary tuberculosis, thymectomy, benign and malignant diseases of esophagus, reflux esophagitis.
- Clinical laboratory tests

## 6. APPLIED MICROBIOLOGY

- Pulmonary infections, infective endocarditis, infection following open-heart surgeries, lung surgery; nasocomial infection in the intensive care units.
- Sepsis, clinical microbiological investigations, antimicrobials.

## 7. CARDIOVASCULAR ENGINEERING

- Concept of flow, pressure gradient and its relationship to flow; heart as a pump, efficiency of heart valves, hemodynamic assessment.
- Prosthetic valves, extracorporeal circulation, mechanical assist devices, intraaortic balloon pump.
- Material in cardiovascular application, biocompatibility.

## 8. PERIOPERATIVE MONITORING

- Hemodynamic monitoring,
- Transesophageal echocardiography
- Coagulation monitoring,
- Respiratory system monitoring
- Neurological monitoring
- Monitoring of vital organs

## 9. VENTILATORY THERAPY

- Modes of ventilation
- Principles of ventilatory therapy

## 10. MEDICAL STATISTICS

- Basic terminology, study designs, statistical analysis, statistical tests.

## **PART II**

- Clinical features, diagnostic aspects, therapeutic strategies, principles of perioperative care, anaesthesia management and surgical principles in patients subjected to surgery involving chest wall, pleura, lung, tracheobronchial tree,

esophagus, mediastinum, diaphragm, pericardium, heart, great vessels, peripheral vessels.

- Postoperative intensive care of patients following Cardiothoracic and Vascular surgery: Vital organ care, homeostasis, management of surgical bleeding, ventilatory therapy, invasive and noninvasive monitoring, nutrition, management of postoperative infections, management of medical emergencies, transportation of critically ill patients, physiotherapy and nursing care.
- Intensive care of patients admitted for nonsurgical or medical treatment.
- Anaesthetic management of cases subjected to cardiac investigations and therapeutic procedures in cardiac catheter laboratories and radiology suites.
- Training in echocardiography: Principles of ultrasound; knobology; evaluation of left ventricular systolic and diastolic function, valvular heart diseases, ischemic heart diseases, right heart and pulmonary arterial function, aortic diseases, prosthesis, hemodynamic assessment, evaluation of complex congenital heart diseases, postoperative evaluation for hemodynamic instability.
- Recent advances in the Cardiothoracic and Vascular Anesthesia specialty.

### **RECOMMENDATIONS OF TEXTBOOKS AND JOURNALS**

**Textbooks:** A trainee is expected to gain the academic knowledge through standard textbooks related to the specialties like Anesthesia, Cardiac anesthesia, echocardiography, Critical care, Cardiothoracic & vascular surgery, and Cardiology.

**Journals:** A trainee is expected to upgrade his/her academic knowledge through published article of various journals related to the Anesthesia, Cardiac anesthesia, echocardiography, Critical care, Cardiothoracic & vascular surgery, and Cardiology.

# D.M NEUROANESTHESIA

## SYLLABUS

### PART I

#### BASIC SCIENCES

1. **APPLIED ANATOMY:** Basic and correlative anatomy of the Nervous system (brain, spinal cord, cranial and peripheral nerves), neurovascular anatomy. Embryological development of brain, spinal cord, skull and spinal structures.
2. **APPLIED PHYSIOLOGY:** Basic and correlative neurophysiology, positioning and its complications, ventilation & ABG, cardiovascular and respiratory physiology in relation to nervous system temperature control, autonomic function
3. **APPLIED PHARMACOLOGY:** Basic and correlative pharmacology of drugs acting on the nervous system and principles of neurotherapeutics, drugs used in anesthesia and pain management, drug interactions.
4. **APPLIED PATHOLOGY:** General and Medical neuropathology. (eg ICP, cerebral edema, neurogenic pulmonary edema, ARDS, disorders of fluid, electrolyte, blood glucose, biomarkers, basics of tumors affecting nervous system).
5. **APPLIED MICROBIOLOGY :** Pulmonary infections, infection of brain and its meninges, infection following Neurosurgery, and nosocomial infection in the intensive care units.
6. **NEURO APPLIED ENGINEERING :** Concept of developing hydrocephalus shunt, emphasis on types of investigative facilities for assaying various drug levels in the brain and CSF and their clinical correlates.
7. **BIOSTATISTICS :** Sensitivity, specificity, type 1& 2 errors, means, frequency, chi square test, correlation coefficient, Regression

analysis, odds ratio, survival analysis, planning and conducting a study

## **PART II**

### **CLINICAL SCIENCES**

1. Clinical and anesthetic (perioperative) management of patients undergoing surgery of brain, spinal cord, skull, spine and peripheral nerves. (eg Tumors, trauma, vascular, movement disorders, epilepsy, endoscopy, image guidance, head injury).
2. Intensive care of patients following Neuro surgery, neurotrauma, neurological intensive care, fluids, electrolyte, ventilator management.
3. Anesthetic management of cases undergoing Neuro investigation and therapeutic interventional procedures.
4. Recent advances in Neuroanesthesia, Neurosurgery.
5. Monitoring: Hemodynamic monitoring, respiratory monitoring, basics of echocardiography and its use in non-cardiac settings, Neuromonitoring techniques, principles, interpretation.
6. Neuroradiology including basics and interpretation of CT scans, Ultrasound, MRI, DSA.
7. Neuroprotection, neuronal plasticity, gene therapy
8. Basics and Management of Acute Pain, Chronic pain syndromes, Neuropathic Pain, Trigeminal neuralgia etc- management.
9. Patient Safety, Occupational hazards.

### **REFERENCE TEXTS AND PERIODICALS**

1. Miller's Textbook of Anesthesiology
2. Cotterel and Young 'Textbook of Neuroanaesthesiology'
3. Dorsch and Dorsch 'Understanding Anesthesia Equipment'
4. Calvey and Williams 'Principles and Practice of Pharmacology for Anaesthetists'

5. Trauma (A text book of Trauma society)
6. Aage R Moller 'Intraoperative neurophysiological monitoring'
7. David Sidebottom 'Practical perioperative echocardiography'
8. Paul Brazis 'Localization in neurological diseases'
9. Tobey 'Neurocritical care'
10. Greenberg's 'Handbook of Neurosurgery'
11. Aviva Petrie 'Medical statistics at a glance'
12. Stephen Waxman 'Clinical Neuroanatomy'
13. Arun K. Gupta, Adrian W. Gelb 'Essentials of neuroanaesthesia and neurointensive care'.
14. Steve Waldman 'Pain Management'

## **JOURNALS**

1. Journal of Neurosurgical Anesthesiology
2. Anesthesia and Analgesia
3. British Journal of Anaesthesia
4. Anesthesiology
5. Acta Anaesthesiologica Scandinavica
6. Neurocritical care
7. Neurosurgery
8. Journal of Neurosurgery, Spine and Pediatrics
9. Pain

# M.Ch CARDIO VASCULAR AND THORACIC SURGERY

## SYLLABUS

### PART I

#### 1. CARDIAC SURGERY

##### **Fundamentals**

Surgical Anatomy of the heart, Cardiac surgical anatomy and physiology, cardiac Embryology, Cardiac Surgical Pharmacology, Pathology of Cardiac Surgery, Cardiac Surgical Imaging, Risk Stratification and Co morbidity, Statistical Treatment of Surgical Outcome Data.

##### **Preoperative/Intraoperative Care**

Preoperative Evaluation for Cardiac Surgery, Cardiac Anesthesia, transfusion Therapy and Blood Conservation, Deep Hypothermic Circulatory Arrest, Myocardial protection, Postoperative Care of Cardiac Surgery Patients, Cardiopulmonary Resuscitation.

Temporary Mechanical Circulatory Support, Late Complications of Cardiac Surgery.

##### **Cardiopulmonary bypass**

History, Equipment, Physiology and pathology, Hematology, Clinical applications, Cardiopulmonary bypass in neonates, infants and children.

##### **Pathophysiology**

Atherosclerosis, Coronary artery disease, Valvular heart disease, Rheumatic fever, Aortic aneurysm, Aortic dissection, Congenital heart disease, Congestive Heart failure, Pericardial diseases.

##### **Immunobiology of Heart and Heart-lung transplantation**

#### 2. THORACIC SURGERY

##### **The Lung, Pleura, Diaphragm and Chest Wall**

Anatomy of the Thorax, Embryology of the Lungs, ultrastructure

and Morphometry of the Human Lung, Cellular and Molecular Biology of the Lung, Surgical Anatomy of the Lungs, Anatomy of the Thoracic Duct and Chylothorax, Lymphatics of the Lungs, Pulmonary Gas Exchange, Mechanics of Breathing.

### **Thoracic Imaging**

Radiographic Evaluation of the Lungs and Chest, Computed Tomography of the Lungs, Pleura, and Chest Wall, Magnetic Resonance Imaging of the Thorax, Positron Emission Tomography in Chest Diseases, radionuclide Studies of the Lung.

### **Diagnostic Procedures**

Laboratory Investigations in the Diagnosis of Pulmonary Diseases, Molecular Diagnostic Studies in Pulmonary Disease, Bronchoscopic Evaluation of the Lungs and Tracheobronchial Tree, Invasive Diagnostic Procedures, Video-Assisted Thoracic Surgery as a Diagnostic Tool.

### **Assessment of the Thoracic Surgical Patient**

Pulmonary Physiologic Assessment of Operative Risk, Preoperative Cardiac Evaluation of the Thoracic Surgical Patient

### **Anesthetic Management of the General Thoracic Surgical Patient**

Preanesthetic Evaluation and Preparation, Conduct of Anesthesia, Management of the Patient with Airway Pathology, Anesthesia for Pediatric General Thoracic Surgery.

### **Postoperative Management of The General Thoracic Surgical Patient**

General Principles of Postoperative Care, Mechanical Ventilation of the Surgical Patient.

### **Embryology and anatomy**

Lung, Tracheobronchial tree, Diaphragm, Pleura

### **Lung cancer**

Epidemiology and Carcinogenesis, Screening for Lung Cancer:



Challenges for Thoracic Surgery, Pathology of Carcinoma of the Lung, Present Concepts in the Molecular Biology of Lung Cancer, Clinical Presentation of Lung Cancer, Radiologic Evaluation of Lung Cancer, Diagnosis and Staging of Lung Cancer.

## **Mediastinum**

### **Anatomy**

The Mediastinum, Its Compartments, and the Mediastinal Lymph, Nodes, The Thymus, Mediastinal Parathyroids, Neogenic Structures of the Mediastinum.

### **Noninvasive Investigations**

Radiographic, Computed Tomographic, and Magnetic Resonance

### **Investigation of the Mediastinum**

Radionuclide Studies of the Mediastinum, Mediastinal Tumor Markers

### **Pathology of mediastinal tumors**

## 3. VASCULAR SURGERY

### **Applied Anatomy**

Regional and developmental - of Aorta and arteries and branches. Exposure of blood vessels at every body part in the chest, abdomen, and neck, Veins in extremities and inferior vena cava.

### **Applied Physiology**

Blood pressure, Cardiac output, regional circulation especially those of subsystem and peripheral in the extremities, carotid arteries and cerebral circulation.

### **Applied Pathology**

Pathology of diseases of Aorta, Arteries, Pathology of Deep Venous thrombosis, AV malformation.

### **Applied Bacteriology**

Infection in Vascular Surgery, prosthetic graft infection, primary and secondary aorto-enteric fistula.

## **Cardiovascular Engineering**

Concept of flow, pressure gradient, heart as pump, prosthetic heart valves, extracorporeal circulation, biocompatibility, materials in cardiovascular application, medical physics, electronics in transducers, clinical monitoring and medical imaging.

## **Biostatistics**

Methodology and design of clinical research, Statistical Inference, Biostatistics for clinical Research-sample size, statistical approach, statistical significance, sensitivity, specificity, Univariate and multivariate analysis, actuarial survival.

## **PAR II**

### **Ischemic Heart Disease**

Indications for Revascularization

Myocardial Revascularization with Percutaneous Devices, with and without Cardiopulmonary, with Carotid Artery Disease, after Acute Myocardial Infarction, Minimally Invasive Myocardial Revascularization, Coronary Artery Reoperations, Transmyocardial Laser Revascularization and Extravascular Angiogenesis Techniques to Increase Myocardial Blood flow.

Surgical Treatment of Complications of Acute Myocardial Infarction: Postinfarction Ventricular Septal Defect and Free Wall Rupture, Ischemic Mitral Regurgitation, Left Ventricular Aneurysm.

### **Valvular Heart Disease**

Aortic Valve Replacement with a Mechanical Cardiac Valve Prosthesis, Bioprosthetic Aortic Valve Replacement: Stented Valves, Stentless Aortic Valve Replacement: Autograft/Homograft, Stentless Aortic Valve Replacement: Porcine and Pericardial, Aortic Valve Repair and Aortic Valve-Sparing Operations, Surgical Treatment of Aortic Valve Endocarditis, Minimally Invasive Aortic Valve Surgery, Percutaneous Aortic Valve Interventions, Mitral Valve Repair, Mitral Valve Replacement, Surgical Treatment of Mitral Valve Endocarditis, Minimally Invasive and Robotic Mitral Valve Surgery, Percutaneous Catheter-Based Mitral Valve Repair, Tricuspid Valve Disease, Multiple Valve Disease, Reoperative Valve Surgery, Valvular and Ischemic Heart Disease.

## **Diseases of the Great Vessels**

Aortic Dissection, Ascending Aortic Aneurysms, Aneurysms of the Aortic Arch, Descending and Thoracoabdominal Aortic Aneurysms, Endovascular Therapy for the Treatment of Thoracic Aortic Disease, Pulmonary Embolism and Pulmonary Thromboendarterectomy, Trauma to the Great Vessels.

## **Surgery for Cardiac Arrhythmias**

Cardiac Rhythm Disturbance, Interventional Therapy for Atrial and Ventricular Arrhythmias, Surgical Treatment of Atrial Fibrillation, Surgical Implantation of Pacemakers and Automatic Defibrillators.

## **Other Cardiac Conditions and Operations**

Adult Congenital Heart Disease, Pericardial Disease, Cardiac Neoplasms, Hypertrophic Obstructive Cardiomyopathy, Heart Failure.

## **Critical Care**

### **Transplant and Circulatory Support**

Heart Transplantation, Mechanical Circulatory Support & Total Artificial Heart, Nontransplant Surgical Options for Heart Failure, Tissue Engineering for Cardiac Valve Surgery, Stem Cell-Induced Regeneration of Myocardium.

## **CONGENITAL HEART SURGERY**

Atrial Septal Defect and Partial Anomalous Pulmonary Venous Connection, Total Anomalous Pulmonary Venous Connection, Cor Triatriatum, Unroofed Coronary Sinus Syndrome, Atrioventricular Septal Defect, Ventricular Septal Defect, Congenital Sinus of Valsalva Aneurysm, Aortico-Left Ventricular Tunnel, Patent Ductus Arteriosus, Ventricular Septal Defect with Pulmonary Stenosis or Atresia, Pulmonary Stenosis or Atresia and Intact Ventricular Septum, Tricuspid Atresia and Management of Single-Ventricle Physiology, Ebstein Anomaly, Truncus Arteriosus, Aortopulmonary Window, Origin of Right or Left Pulmonary Artery from Ascending Aorta, Anomalies of the Coronary Arteries, Congenital Aortic Stenosis, Coarctation of the Aorta and Interrupted Aortic Arch, Aortic Atresia and Other Forms of Hypoplastic Left Heart

Physiology, Congenital Mitral Valve Disease, Vascular Ring and Sling, Complete Transposition of the Great Arteries, Double Outlet Right or Left Ventricle, Congenitally Corrected Transposition of the Great Arteries and Other forms of Atrioventricular Discordant Connection. Double Inlet Ventricle and Atretic Atrioventricular Valve. Anatomically Corrected Malposition of the Great Arteries, Atrial Isomerism, Critical Care.

## THORACIC SURGERY

### **Pulmonary Resections**

Thoracic Incisions, General Features of Pulmonary Resections, Technical Aspects of Lobectomy, Sleeve Lobectomy, Pneumonectomy and Its Modifications, Tracheal Sleeve Pneumonectomy, Segmentectomy and Lesser Pulmonary Resections, Emphysema Surgery.

Instruments and Techniques of Video-Assisted Thoracic Surgery, Video-Assisted Thoracic Surgery for Wedge Resection, Lobectomy And Pneumonectomy, Median Sternotomy and Parasternal Approaches to the Lower Trachea and Main Stem, Bronchi, Extended Resection of Bronchial Carcinoma in the Superior.

Anterior Approach to Superior Sulcus Lesions, Complications of Pulmonary Resection, Management of Perioperative Cardiac Events.

### **Chest Wall**

Chest Wall Deformities, Infections of the Chest Wall, Thoracic Outlet Syndrome, Thoracoscopic Sympathectomy, Anterior Transthoracic Approaches to the Spine, Chest Wall Tumors, Chest Wall Reconstruction.

### **The Diaphragm**

Diaphragmatic Function, Diaphragmatic Paralysis, and Eventration of the Diaphragm, Pacing of the Diaphragm, Congenital Posterolateral Diaphragmatic Hernias and Other Less, Common Hernias of the Diaphragm in Infants and Children, Foramen of Morgagni Hernia, Tumors of the Diaphragm.

## **The Pleura**

Pneumothorax, Parapneumonic Empyema, Postsurgical Empyema, tuberculous and Fungal Infections of the Pleura, Fibrothorax and Decortication of the Lung, Thoracoplasty: Indications and Surgical Considerations.

Localized Fibrous Tumors of the Pleura, Diffuse Malignant Mesothelioma, Technique of Extrapleural Pneumonectomy for Diffuse Malignant, Pleural Mesothelioma, Uncommon Tumors of the Pleura, Malignant Pleural Effusions, Malignant Pericardial Effusions.

## **Thoracic Trauma**

Blunt and Penetrating Injuries of the Chest Wall, Pleura and Lungs. Barotrauma and Inhalation Injuries, Acute Respiratory Distress Syndrome, Management of Foreign Bodies of the Airway, Diaphragmatic Injuries.

## **The Trachea**

Tracheostomy, Techniques of Resection and Reconstruction of trachea, Management of Nonneoplastic Diseases of the Trachea, Benign and Malignant Tumors of the Trachea, Compression of the Trachea by Vascular Rings.

## **Congenital, Structural, and Inflammatory Diseases of the Lung**

Congenital Lesions of the Lung, Pulmonary Complications of Cystic Fibrosis, Congenital Vascular Lesions of the Lungs, Chronic Pulmonary Emboli, Bullous and Bleb Diseases of the Lung, Emphysema of the Lung and Lung Volume Reduction Operations, Bacterial Infections of the Lungs and Bronchial Compressive Disorders, Pulmonary Tuberculosis and Other Mycobacterial Diseases of the Lungs.

Surgery for the Management of *Mycobacterium Tuberculosis* and Nontuberculous Mycobacterial Infections of the Lung. Thoracic Mycotic and Actinomycotic infections of the Lung, Pleuropulmonary Amebiasis, Hydatid Disease of the Lung, Pulmonary Paragonimiasis and Its Surgical Complications, Solitary Pulmonary Nodule, Diffuse Lung Disease. Lung Transplantation.

## **Carcinoma of the Lung**

Surgical Treatment of Non-Small Cell Lung Cancer, Mediastinal Lymph Node Dissection, Endoluminal Management of Malignant Airway Disease, Basic Principles of Radiation Therapy in Carcinoma of the Lung, Radiation Therapy for Carcinoma of the Lung,, Chemotherapy of Non-Small Cell Lung Cancer, Multimodality Therapy for Non-Small Cell Lung Cancer, Novel Systemic Therapy for Advanced Non-Small Cell Lung cancer, Small Cell Lung Cancer, novel Strategies for Lung Cancer Immunotherapy.

**Other Tumors of the Lung :** Carcinoid Tumors, Adenoid Cystic Carcinoma and Other Primary Salivary Gland-Type, Tumors of the Lung, Benign Tumors of the Lung, Uncommon Primary Malignant Tumors of the Lung, Secondary Tumors of the Lungs, Lung Tumors in the Immunocompromised Host.

## **Mediastinum**

### **Invasive Diagnostic Investigations and Surgical Approaches**

Cervical Substernal “Extended” Mediastinoscopy, Sternotomy and Thoracotomy for Mediastinal Disease, Posterior Mediastinotomy, Video-Assisted Thoracic Surgery for Mediastinal Tumors and Cysts and Other Diseases within the Mediastinum, Mediastinal Infections, Overview of Mass Lesions in the Mediastinum and Control of Vascular Obstructing Symptomatology. Acute and Chronic Mediastinal Infections. Overview of Primary Mediastinal Tumors and Cysts, Diagnostic Investigation of Mediastinal Masses, Lesions Masquerading as Primary Mediastinal Tumors or Cysts, Vascular Masses of the Mediastinum; Superior Vena Cava Syndrome: Clinical Features, Diagnosis, and Treatment. Vein Grafts for the Superior Vena Cava, The Use of Prosthetic Grafts for the Replacement of the Superior Vena Cava.

### **Primary Mediastinal Tumors**

Myasthenia Gravis, Standard Thymectomy, Transcervical Thymectomy, Video-Assisted Thymectomy, Extended Transsternal Thymectomy, Transcervical-Transsternal Maximal Thymectomy for Myasthenia Gravis, Evaluation of Results of Thymectomy for Nonthymomatous Myasthenia Gravis, Benign Lymph Node Disease Involving the Mediastinum, Bio-

logical Markers and Pathology of Mediastinal Lymphomas, Diagnosis and Treatment of Mediastinal Lymphomas, Benign Germ Cell Tumors of the Mediastinum, Primary Seminomas of the Mediastinum, Nonseminomatous Malignant Germ Cell Tumors of the Mediastinum, Poorly Differentiated Carcinoma of the Mediastinum, Benign and Malignant Neurogenic Tumors of the Mediastinum in Children and Adults, Excision of Hourglass Tumors of the Paravertebral Sulcus, Mediastinal Paragangliomas and Pheochromocytomas, Mesenchymal Tumors of the Mediastinum, Mediastinal Parathyroid Adenomas and Carcinomas.

### **Mediastinal Cysts**

Foregut Cysts of the Mediastinum in Infants and Children, Foregut Cysts of the Mediastinum, Gastroenteric Cysts and Neurenteric Cysts in Infants and Children, Mesothelial and Other Less Common Cysts of the Mediastinum.

### **VASCULAR SURGERY**

Clinical vascular surgery, endovascular intervention, Recent advances in Vascular & Endovascular Surgery Clinical and operative surgery of Aorta, all arteries, veins, inferior vena cava. Endo Vascular intervention like Angioplasty, Stenting, Endo Vascular stent graft repair of aneurysm of arteries and abdominal aorta. Vascular medicine including prophylaxis, treatment of deep vein thrombosis and pulmonary embolism.

### **TEXTS AND JOURNALS**

Textbooks:

- Cardiac Surgery: morphology diagnostic criteria, natural history, techniques, results and indications. Kirklin JW, Barrat-Boyes BG. Churchill-Livingstone
- Text Book of Adult Cardiac surgery-Dr Lawrence Cohn
- Surgery of the Chest. Sabiston, David C, Spencer. Saunders
- Surgery for Congenital Heart Defects. Stark J, De Leval M. Saunders

- Cardiopulmonary Bypass, Principles and Practice- Glenn P Gravelee.
- General Thoracic Surgery- Thomas W Shields
- Vascular Surgery-Rutherford.
- Comprehensive Surgical Management of Congenital Heart Diseases-Richard Jonas.

Journals:

- Annals of Thoracic Surgery
- Journal of Thoracic and Cardiovascular Surgery
- European Journal of Cardio-Thoracic Surgery
- Asian annals
- Circulation
- JACC
- Journal of Heart Valve disease



# M.Ch VASCULAR SURGERY

## SYLLABUS

### PART - I

#### 1. APPLIED ANATOMY

Regional and developmental - of Aorta and arteries and branches. Exposure of blood vessels at every body part in the chest, abdomen, and neck, Veins in extremities and inferior vena cava.

#### 2. APPLIED PHYSIOLOGY

Blood pressure, Cardiac output, regional circulation especially those of subsystem and peripheral in the extremities, carotid arteries and cerebral circulation.

#### 3. APPLIED PATHOLOGY

Pathology of diseases of Aorta, Arteries, Pathology of Deep Venous thrombosis, and AV malformation.

#### 4. APPLIED BACTERIOLOGY

Infection in Vascular Surgery, prosthetic graft infection, primary and secondary aorto-enteric fistula.

#### 5. VASCULAR PROSTHESIS AND TISSUE ENGINEERING for development of small diameter vascular grafts.

### PART II

#### 1. Clinical vascular surgery

#### 2. Endovascular intervention

#### 3. Recent advances in Vascular & Endovascular Surgery Clinical and operative surgery of Aorta, all arteries, veins, inferior vena cava. Endo Vascular intervention like Angioplasty, Stenting, and Endo Vascular stent graft repair of aneurysm of arteries and abdominal aorta.

Vascular medicine including prophylaxis, treatment of deep vein thrombosis and pulmonary embolism

Practical / Clinical / Laboratory experience to be imparted at year I, year II, Year III

To detect early signs and symptoms of vascular diseases and to streamline management protocols.

To update recent knowledge and to keep in pace with rapid advances in the progress of vascular Surgery and endovascular techniques.

To sensitize the trainee to newer learning methods and research tools & to encourage clinical research.

To plan and execute mass screening programmes and organize preventive methodologies.

To publish. papers in indexed journals e.g., Article, short papers, short case reports, clinical reviews, research papers during the training period.

- To expose the trainee to diagnose and work-up outpatients cases.
- To plan and prepare inpatients for major surgical procedures.
- To conduct interactive ward rounds and to assess the trainee with regard to clinical skills.
  
- Objective in the operating room is to infuse confidence and impart surgical skills in a graded manner.
  
- The first year candidate would be exposed to operate on minor surgical procedures.
  
- The second and third year candidates would be trained to assist critical procedure and finally to independently operate major procedure under supervision of Senior Professors and faculty.

Towards the conclusion of this period, the candidate shall have carried out a minimum 50 vascular procedures.

### **Exposure to vascular and endovascular procedures-**

Candidates would be familiarizing indexed and complex open as well as endovascular procedures performed in their respective centers and one or two centers they will be visiting as part of outstation postings.

Following procedures are mentioned, although from center to center, clinical practice and case volume would vary.

1. Embolectomy
2. Femoro-popliteal bypass
3. Aorta-femoral bypass
4. Femoro-distal bypass
5. Aorta-renal bypass
6. Aorta-visceral bypass
7. Repair of abdominal aortic aneurysm & Thoraco-abdominal aortic aneurysm.
8. Repair of popliteal artery aneurysm
9. Carotid endarterectomy
10. Decompression of thoracic outlet syndrome
11. AV access surgery
12. Repair of arteries and veins(Trauma)
13. Extra-anatomic bypass
14. Thrombectomy/ Re-do procedures.
15. Surgical and non-surgical management of Varicose veins
16. Angioplasty with or without stenting of FP, Iliac, aortic stenosis
17. Carotid stenting
18. Iliac vein stenting
19. Endovascular repair of AAA, Thoracic aortic aneurysm, peripheral aneurysms.
20. Thrombolysis

**Procedures to be performed by Senior Residents at minimum in 3 years**

- |                                            |    |
|--------------------------------------------|----|
| 1. AV Fistula:                             | 10 |
| 2. Exposure of peripheral arteries:        | 10 |
| 3. Embolectomy:                            | 3  |
| 4. Femoro-Popliteal / Aorta-Femoral graft: | 5  |
| 5. Abdominal Aortic aneurysm:              | 3  |
| 6. Carotid Endarterctomy:                  | 3  |
| 7. Peripheral arterial aneurysms:          | 2  |

8. Hybrid / Endovascular Aortic Aneurysm Repair:	2
9. Vascular graft anastomosis:	5
10. Thoracotomy (to facilitate exposure of Descending Thoracic Aorta)	5
11. Saphenous vein harvest	10
12. Femoral / Aortic Cannulation	5

## **RECOMMENDATIONS OF TEXTS AND JOURNALS**

- Text book of Vascular Surgery – By Robert B. Rutherford.
- Text book of Vascular Surgery – By Henry Haimovici
- Text book of Vascular Emergencies - By Henry Haimovici
- Moore, Wesley S. Vascular and Endovascular Surgery: A Comprehensive Review. 7<sup>th</sup> edn. Philadelphia. Saunders Elsevier. 2006.
- Text book of Vascular Surgical Emergencies – John J. Bergen & James S. I. Yao.
- Investigation of Vascular Diseases – By Andrew N. Nicolaides & James Yao.
- Rob & Smith Operative Surgery Text book of Vascular Surgery – James Deeweese.
- Comprehensive Vascular Exposures – By Ronald J. Sloney & David J. Effeney
- Wylie’s Atlas of Vascular Surgery& Organ Transplantation – Wayne Flye
- Atlas of Vascular Surgery – Rutherford
- CVS & Vascular diseases of the Aorta

### Journals:

- a. Journal of Vascular Surgery
- b. Annals of Vascular Surgery
- c. Journal of Vascular and Endovascular Therapeutics

# **M.Ch NEUROSURGERY**

## **(3 YEAR PROGRAMME)**

### **INTRODUCTION**

This curriculum reflects the body of knowledge which should be attained by an individual completing residency training in Neurological Surgery. It serves to create an organizational structure of academic, clinical, and technical criteria for the training of residents in Neurological Surgery. The goal is to improve patient care by assuring residents completing training have achieved the highest possible level of competency in Neurological Surgery.

The curriculum is constructed in such a manner that the educational experience is divided into two levels - Junior and Senior. The resident should display competency in each level before progressing to the next. Those individuals who do not stay on track will be promptly identified in an objective manner, thereby enabling more timely remedial attention or dismissal. The program is structured to allow residents to act independently at various tasks commensurate with their skills and the specific medical situation.

### **SYLLABUS**

#### **PART 1**

##### **1. NEUROANATOMY**

Demonstrate knowledge of anatomy that is pertinent to the diagnosis of diseases of the nervous system and the practice of neurological surgery.

1. Review the embryological development of the brain, cerebellum, brain stem, glial elements, spinal cord, conus medullaris, cauda equina, sympathetic and parasympathetic systems and the peripheral nervous system.
2. Discuss the embryologic development of the skull, craniovertebral junction, and spine.
3. Describe and differentiate the different types of neurons.

## 2. NEUROPHYSIOLOGY

Demonstrate knowledge of physiology that is pertinent to the understanding of neurological disease.

## 3. NEUROPATHOLOGY

Demonstrate knowledge of neuropathology that is pertinent to the diagnosis of diseases of the nervous system and practice of neurological surgery.

## 4. NEUROPHARMACOLOGY

Demonstrate knowledge of pharmacology that is pertinent to the treatment of neurological disorders and diseases which affect the nervous system.

## 5. FLUIDS, ELECTROLYTES, AND NUTRITION

Demonstrate an understanding of normal and pathologic fluid and electrolyte homeostasis. Demonstrate an ability to maintain normal electrolyte balance. Demonstrate an understanding of the basics of nutritional management in neurosurgical patients.

## **PART-II**

### 1. NEUROLOGY

Demonstrate an understanding of the neurologic examination, diagnostic neurologic testing, neurologic diseases and their treatment.

### 2. NEURORADIOLOGY

Demonstrate an understanding of neuroradiological imaging and interventions as they specifically relate to neurosurgical patients.

### 3. GENERAL CRITICAL CARE

Demonstrate an ability to triage neurosurgical patients to and from a critical care setting. Demonstrate a knowledge of and the ability to manage neurosurgical patients in the critical care setting.

### 4. INFECTION

Demonstrate an understanding of the factors related to the acquisition, diagnosis, and treatment of infections as they pertain to neurosurgical patients. Describe the typical presentation and treatment of common neurosurgical infections. Review the methods used to minimize infectious complications in neurosurgical patients.

Demonstrate an understanding of the techniques to minimize the risk of spread of viral infections, including hepatitis and human immunodeficiency virus (HIV).

#### 5. CEREBROVASCULAR SURGERY

Demonstrate an understanding of the anatomy, physiology, pathophysiology and presentation of cerebrovascular diseases, including ischemic and hemorrhagic stroke, and other diseases and malformations of intracranial, extracranial, and spinal vasculature. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for cerebrovascular diseases, including medical and surgical management.

#### 6. NEUROSURGICAL ONCOLOGY

Demonstrate an understanding of the anatomy, physiology, pathophysiology, and presentation of tumor-related diseases of the cranium. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for tumor-related diseases of the cranium that are amenable to surgical intervention.

#### 7. NEUROTRAUMA AND NEUROSURGICAL CRITICAL CARE

Demonstrate an understanding of the anatomy, physiology, pathophysiology, and presentation of traumatic injuries of the brain, spinal cord, and peripheral nervous system, including their supporting structures. Demonstrate the ability to formulate and implement appropriate diagnostic and treatment plans for traumatic injuries to the nervous system, including both surgical and nonsurgical management.

#### 8. SPINAL SURGERY

Demonstrate an understanding of the anatomy, physiology, pathophysiology, and presentation of disorders of the spine, its connecting ligaments, the spinal cord, the cauda equina, and the spinal roots. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for diseases of the spine, its connecting ligaments, the spinal cord, the cauda equina, and the spinal roots that are amenable to surgical intervention.

#### 9. PEDIATRIC NEUROSURGERY

Demonstrate an understanding of the anatomy, physiology,

pathophysiology, and presentation of diseases in children which a neurosurgeon may be called upon to diagnose and treat. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for these diseases.

#### 10. STEREOTACTIC AND FUNCTIONAL NEUROSURGERY

Define neurosurgical stereotactic procedures and recognize their proper application. Describe the appropriate anatomy, physiology, and presentation of patients that are candidates for stereotactic procedures.

#### 11. SURGERY OF THE PERIPHERAL NERVOUS SYSTEM

Demonstrate an understanding of the anatomy, physiology, pathophysiology, and presentation of peripheral nerve diseases. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for diseases of the peripheral nerves that are amenable to surgical intervention.

#### 12. PAIN MANAGEMENT

Illustrate an understanding of the anatomical and physiological substrates of pain and pain disorders. Demonstrate an ability to formulate and execute diagnostic and therapeutic plans for management of pain and disorders giving rise to pain.

### REFERENCE TEXTS AND PERIODICALS

#### Clinical Neurology/Neurosurgery

1. Paul W. Brazis, Joseph C. Masdeu, José Biller - Localization in clinical neurology.
2. William Wesley Campbell, Russell N. DeJong, Armin F. Haerer - DeJong's The Neurological Examination.

#### Neurosurgery

1. Mark S. Greenberg, Nicolas Arredondo - Handbook of Neurosurgery
2. H. Richard Winn - Youman's Neurological Surgery
3. Robert H. Wilkins, Setti S. Rengachary - Neurosurgery
4. Ravi Ramamurthi, PN Tandon - Text Book of Neurosurgery



5. H. Hunt Batjer, Christopher M. Loftus - Textbook of neurological surgery: principles and practices
6. Marc Sindou - Practical handbook of Neurosurgery

### **Operative Neurosurgery**

1. Henry Schmideck, David Roberts - Schmidek and Sweet's Operative Neurosurgical Techniques
2. Laligam Sekhar, Richard Fessler - Atlas of Neurosurgical Techniques: Brain
3. Richard Fessler Laligam Sekhar - Atlas of Neurosurgical Techniques: Spine and Peripheral nerves.
4. Michael Apuzzo - Brain Surgery: Complication Avoidance and Management
5. Andrew Kaye, Peter Black - Operative neurosurgery

### **Neurology**

1. Walter G. Bradley, Robert B. Daroff, Gerald Fenichel, Joseph Jankovic - Neurology in Clinical Practice
2. Allan Ropper, Martin Samuels - Adams and Victor's Principles of Neurology

### **Neuroradiology**

1. Anne G. Osborn - Diagnostic Imaging: Brain
2. Jeffrey Ross - Diagnostic Imaging: Spine
3. Anne G. Osborn - Diagnostic Cerebral Angiography

### **Neuropathology**

1. Louis, D.N., Ohgaki, H., Wiestler, O.D., Cavenee, W.K - WHO classification of tumours of the central nervous system, 4th edition
2. Seth Love, David N Louis, David W Ellison - Greenfield's Neuropathology

## **Neuropharmacology**

1. Laurence Brunton, Bruce Chabner - Goodman and Gilman's The Pharmacological Basis of Therapeutics, Section II- Neuropharmacology (pgs 169-649)

## **Neuroanaesthesiology and neurocritical care**

1. Cotrell, Young - Cottrell and Young's Neuroanesthesia
2. Basil F. Matta, David Menon, John M. Turner - Textbook of Neuroanaesthesia and Critical Care
3. Paul L. Marino and Kenneth M. Sutin - The ICU book

## **Neuroanatomy**

1. Albert Rhoton - Rhoton's Cranial Anatomy and Surgical Approaches
2. Richard Snell - Clinical neuroanatomy

## **Neurophysiology**

1. Kim E. Barrett, Susan M. Barman - Ganong's Review of Medical Physiology (Sections II,III pgs.79-289)

## **Journals**

1. Neurosurgery (Official journal of the congress of neurological surgeons)
2. Journal of Neurosurgery (Official journal of the American association of neurological surgeons)
3. Acta Neurochirurgica (Official journal of the European association of neurological surgeons)
4. Neurology India (Official journal of the Neurological Society of India)
5. Child Nervous system
6. British Journal of Neurosurgery (Official journal of the British Neurosurgical Society)
7. Neurosurgery Quarterly
8. Advances and Technical Standards in Neurosurgery

# **M.Ch NEUROSURGERY**

## **(5 YEAR PROGRAMME)**

### **INTRODUCTION**

This curriculum reflects the body of knowledge which should be attained by an individual completing residency training in Neurological Surgery. It serves to create an organizational structure of academic, clinical, and technical criteria for the training of residents in Neurological Surgery. The goal is to improve patient care by assuring residents completing training have achieved the highest possible level of competency in Neurological Surgery.

The curriculum is constructed in such a manner that the educational experience is divided into two levels - Junior and Senior. The resident should display competency in each level before progressing to the next. Those individuals who do not stay on track will be promptly identified in an objective manner, thereby enabling more timely remedial attention or dismissal. The program is structured to allow residents to act independently at various tasks commensurate with their skills and the specific medical situation.

### **SYLLABUS**

#### **PART 1**

##### **1. NEUROANATOMY**

Demonstrate knowledge of anatomy that is pertinent to the diagnosis of diseases of the nervous system and the practice of neurological surgery.

##### **2. NEUROPHYSIOLOGY**

Demonstrate knowledge of physiology that is pertinent to the understanding of neurological disease.

##### **3. NEUROPATHOLOGY**

Demonstrate knowledge of neuropathology that is pertinent to the diagnosis of diseases of the nervous system and practice of neurological surgery.

#### 4. NEUROPHARMACOLOGY

Demonstrate knowledge of pharmacology that is pertinent to the treatment of neurological disorders and diseases which affect the nervous system.

#### 5. FLUIDS, ELECTROLYTES, AND NUTRITION

Demonstrate an understanding of normal and pathologic fluid and electrolyte homeostasis. Demonstrate an ability to maintain normal electrolyte balance. Demonstrate an understanding of the basics of nutritional management in neurosurgical patients.

### **PART-II**

#### 1. NEUROLOGY

Demonstrate an understanding of the neurologic examination, diagnostic neurologic testing, neurologic diseases and their treatment.

#### 2. NEURORADIOLOGY

Demonstrate an understanding of neuroradiological imaging and interventions as they specifically relate to neurosurgical patients.

#### 3. GENERAL CRITICAL CARE

Demonstrate an ability to triage neurosurgical patients to and from a critical care setting. Demonstrate a knowledge of and the ability to manage neurosurgical patients in the critical care setting.

#### 4. INFECTION

Demonstrate an understanding of the factors related to the acquisition, diagnosis, and treatment of infections as they pertain to neurosurgical patients. Describe the typical presentation and treatment of common neurosurgical infections. Review the methods used to minimize infectious complications in neurosurgical patients. Demonstrate an understanding of the techniques to minimize the risk of spread of viral infections, including hepatitis and human immunodeficiency virus (HIV).

#### 5. CEREBROVASCULAR SURGERY

Demonstrate an understanding of the anatomy, physiology, pathophysiology and presentation of cerebrovascular diseases,

including ischemic and hemorrhagic stroke, and other diseases and malformations of intracranial, extracranial, and spinal vasculature. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for cerebrovascular diseases, including medical and surgical management.

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Demonstrate an understanding of the anatomy, physiology, pathophysiology, and presentation of disorders of the spine, its connecting ligaments, the spinal cord, the cauda equina, and the spinal roots. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for diseases of the spine, its connecting ligaments, the spinal cord, the cauda equina, and the spinal roots that are amenable to surgical intervention.

#### 9. PEDIATRIC NEUROSURGERY

Demonstrate an understanding of the anatomy, physiology, pathophysiology, and presentation of diseases in children which a neurosurgeon may be called upon to diagnose and treat. Demonstrate the ability to formulate and implement a diagnostic and treatment plan for these diseases.

Myelomeningocele and its Variants, Meningocele, Encephalocele, Chiari Malformations, Occult Spinal Dysraphism, Split Cord Anomalies, Segmentation Anomalies, Craniofacial Syndromes and Phakomatosis.

## 10. STEREOTACTIC AND FUNCTIONAL NEUROSURGERY

Define neurosurgical stereotactic procedures and recognize their proper application. Describe the appropriate anatomy, physiology, and presentation of patients that are candidates for stereotactic procedures.

## 11. SURGERY OF THE PERIPHERAL NERVOUS SYSTEM

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## 12. PAIN MANAGEMENT

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4. Ravi Ramamurthi, PN Tandon - Text Book of Neurosurgery
5. H. Hunt Batjer, Christopher M. Loftus - Textbook of neurological surgery: principles and practices
6. Marc Sindou - Practical handbook of Neurosurgery

## **Operative Neurosurgery**

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2. Laligam Sekhar, Richard Fessler - Atlas of Neurosurgical Techniques: Brain
3. Richard Fessler Laligam Sekhar - Atlas of Neurosurgical Techniques: Spine and Peripheral nerves.
4. Michael Apuzzo - Brain Surgery: Complication Avoidance and Management
5. Andrew Kaye, Peter Black - Operative neurosurgery

## **Neurology**

1. Walter G. Bradley, Robert B. Daroff, Gerald Fenichel, Joseph Jankovic - Neurology in Clinical Practice
2. Allan Ropper, Martin Samuels - Adams and Victor's Principles of Neurology

## **Neuroradiology**

1. Anne G. Osborn - Diagnostic Imaging: Brain
2. Jeffrey Ross - Diagnostic Imaging: Spine
3. Anne G. Osborn - Diagnostic Cerebral Angiography

## **Neuropathology**

1. Louis, D.N., Ohgaki, H., Wiestler, O.D., Cavenee, W.K - WHO classification of tumours of the central nervous system, 4th edition.
2. Seth Love, David N Louis, David W Ellison - Greenfield's Neuropathology.

## **Neuropharmacology**

1. Laurence Brunton, Bruce Chabner - Goodman and Gilman's The Pharmacological Basis of Therapeutics, Section II- Neuropharmacology (pgs 169-649).

## **Neuroanaesthesiology and neurocritical care**

1. Cottrell, Young - Cottrell and Young's Neuroanesthesia
2. Basil F. Matta, David Menon, John M. Turner - Textbook of Neuroanaesthesia and Critical Care
3. Paul L. Marino and Kenneth M. Sutin - The ICU book

## **Neuroanatomy**

1. Albert Rhoton - Rhoton's Cranial Anatomy and Surgical Approaches.
2. Richard Snell - Clinical neuroanatomy

## **Neurophysiology**

1. Kim E. Barrett, Susan M. Barman - Ganong's Review of Medical Physiology (Sections II,III pgs.79-289).

## **Journals**

1. Neurosurgery ( Official journal of the congress of neurological surgeons)
2. Journal of Neurosurgery (Official journal of the American association of neurological surgeons).
3. Acta Neurochirurgica (Official journal of the European association of neurological surgeons).
4. Neurology India (Official journal of the Neurological Society of India).
5. Child Nervous system
6. British Journal of Neurosurgery ( Official journal of the British Neurosurgical Society).
7. Neurosurgery Quarterly
8. Advances and Technical Standards in Neurosurgery



## **EVALUATION OF CANDIDATES**

The evaluation is based on internal and external evaluations. A total of 1000 marks is distributed as follows

Internal evaluation-200 marks

Part 1 (Two theory papers) =200 marks

Part 2 (Two theory Papers) =200 marks

Clinical, Practical and Viva Voce Examination =400 marks

### **A. Internal Evaluation**

Total marks for internal evaluation is 200. This will be derived from the marks scored in the academic activities. The total marks will be divided as 50 marks for 1<sup>st</sup> year, 50 marks for 2<sup>nd</sup> year and 100 marks for 3<sup>rd</sup> year. Each academic activity's mark will be based on the credit assigned to the activity. The marks scored will be finally converted to a score out of 200, which will be converted to grade. The total marks for that year will be assigned at the end of each year based on the students' academic performance of that year and will be recorded in the E-portfolio. It will be made available to students at the end of each year. Pass requirement is 50%. If a student gets less than 50%, he/she cannot appear for final exams and will have to repeat the course for 6 months and fulfill the requirement.

### **Grading**

All academic programs will be evaluated. Each academic activity and module will be evaluated and marks allocated according the credits for the activity or module. The final marks at the end of each year will be converted to absolute grades

**A = >80%, B=60 to 80%, C = 50 to 59%, D =<50%.**

## **B External examination**

**Part 1:** At the end of 1 ½ years the candidate will appear for Part 1 examination which consists of two theory papers (each 100 marks). Pass requirement 50% for each paper. If a candidate fails to get 50% in the first attempt, he/she should pass the exam within a year. (maximum 3 attempts for Part I). If not the candidate will not be eligible to appear in the Part II exam.

**Part 2:** At the end of three years of training (and 5 years for 5-years programme) the candidate will take up Part 2 exam which consists of

1. Two theory papers (each 100 marks). Pass requirement is 50% for each paper.
2. Practical and Clinical examination (400 marks)

The practical examination consists of Clinical Case discussion, Practical evaluation and Viva Voce. Pass requirement is 50%.

**MANDATORY COURSES**

**I. Course at Biomedical Technology Wing of the Institute**

**Programme:** Introductory Course

**Duration:** Six working days (full day). The lectures are grouped into four major categories,

- 1) Medical devices: Development to commercialization
- 2) Biomaterials
- 3) Medical device safety / efficacy evaluation
- 4) Advanced topics in medical research

During the course, the participants will identify atleast one unmet clinical need and come up with a presentation on the final day.

**II Course at Achuta Menon Centre for Health Science Studies**

**Programme:** Bio-Statistics course for Senior Residents

**Duration:** 16 hours

**Objective:** To familiarize with common statistical terminologies and design issues in biomedical and clinical research. By the end of the course, the participant should be able to critically review, interpret and understand journal articles that are based on quantitative analysis using statistics.

**Evaluation:** The marks for these 2 courses will be included in the total internal assessment mark of 200.

**SCHEME OF EXAMINATION D.M /M.Ch COURSES**

**Syllabus:** As mentioned in the document

**Part-I** (At the end of 18 months of study)

**Paper-I** - 3hrs - 10 short essay type of questions (10 marks each)

**Paper-II** - 3hrs - 10 short essay type questions (10 marks each)

**Part-II** (To be taken at the end of the course and after passing Part-I)

**Paper-I** - 3hrs. 10 short essay types (10 marks each)

**Paper-II** - 3hrs. 10 short essay type (10 marks each)

**Clinical / Practical** : 400 marks (distributed as relevant to the speciality concerned)

**CLARIFICATIONS ISSUED ON AVAILABILITY OF CHANCES FOR  
PASSING PART-I & PART-II EXAMINATIONS**

- (a) No candidate will be allowed to take more than 3 chances to pass the Part-I examination or will be allowed to be on rolls beyond the span covering three consecutive chances.
- (b) No candidate will be allowed to take more than 3 chances to pass the Part-II examinations. Such chances will be counted consecutively.
- (c) The 3 chances will also include attempts missed viz. withheld on account of shortfall of attendance, or on account of minimum number of procedures at or withdrawal or non appearance by the candidate of his own volition before or during the examination and such like acts.
- (d) The candidates who have exhausted the chances would be deregistered forthwith from the DM/M.Ch programme without any further notice.

**MINIMUM ATTENDANCE REQUIREMENT**

The minimum attendance requirement will be 85%. This will be computed on the basis of actual number of working days for the Senior Residents in each year i.e. excluding the number of closed holidays of the Institute and Sundays.

Only those Senior Residents who satisfy the minimum attendance requirement will be allowed to appear in the examinations (or will be deemed to have satisfactorily undergone the course). Senior Residents who are short of attendance will be required to make up only the deficiency in attendance during the extended period (without stipend) and take the examination when conducted next.

Senior Residents who join the course late, will also have to satisfy the minimum attendance required for the whole year / course to appear for the exams.

General guidelines as to how to apply for leave etc. are given below.

**1. LEAVE ENTITLEMENT**

- |                                 |                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------|
| (a) D.M/M.Ch (3 year) Course    | 24 days during the first and 30 days during the second and third years.                                      |
| (b) Certificate (1 year) Course | 24 days during the year                                                                                      |
| (c) M.Ch (5 year) Course        | 21 days during the first year<br>24 days during the second year<br>30 days during the third and fourth years |
| (d) P.D.F. Course               | 30 days during the year                                                                                      |

**2. INSTITUTE'S CLOSED HOLIDAYS AND SUNDAYS**

They are entitled to closed holidays of the Institute and Sundays. However, they could be placed on duty.

### 3. COMBINATION OF LEAVE AND HOLIDAYS.

The leave can be combined with closed holidays

### 4. APPLICATION FOR LEAVE

Leave of short duration not exceeding 2-3 days can be applied twenty four hours in advance and those of long duration should be applied at least a week in advance. The leave should be got sanctioned before availing the same.

### 5. CREDITING OF LEAVE

The leave cannot be carried forward from year to year. Ordinarily on the first day of the commencement of academic session 50% days leave will be credited and the balance on the first day of July that year.

### 6. MAXIMUM SPAN OF LEAVE PERMISSIBLE AT A TIME

Ordinarily the maximum period of absence (that is leave and closed holidays) should not exceed fifteen days at a time. However, in individual deserving cases the limit of total absence could be extended up to twentyone days.

### 7. REGULATION OF SALARY

Ordinarily subject to other conditions stipulated in these rules a senior resident will continue to get his salary during the period of leave to which he is entitled. The days of absence beyond the maximum permissible leave of absence at a stretch will be treated leave without stipend.

### ***SOME ILLUSTRATIONS***

Dr. X has 15 days leave to his credit.

- (a) He proceeds on 7 days of total leave of absence (5 days leave and 2 Institute's holidays), he will be paid for all the seven days.
- (b) He proceeds on 25 days leave of total absence including three closed holidays. Let us assume that he has been sanctioned leave of absence due to extraordinary circumstances. He will be paid for 15 days (leave on credit) and the Institute's closed holidays falling within the first 15 days.

## 8. LEAVE APPLICATION FORM

Leave should be applied for only in the prescribed application form.

## 9. MATERNITY LEAVE

Maternity leave to women senior residents of three year programmes during course of their study is available. This can be availed in any proportion before and after the confinement with reference to the probable date of confinement. During the said period the senior residents will be eligible for salary. However, grant of maternity leave will not in any case interfere or modify the rules governing the minimum attendance requirements laid down for appearing in Part-1 & Part-II DM/ MCh examinations and the rules regarding the maximum number of chances available for passing part I & II examinations. Should the pursued programme be extended under any circumstances, it shall be without stipend.