

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY,
CHENNAI.

SYLLABUS FOR
POST - DOCTORAL FELLOWSHIP PROGRAMME SPECIALITIES OF
“NEURO ANAESTHESIA”

NEURO ANESTHESIA

- i) **Anatomy** - Gross and applied anatomy of the central and autonomic nervous system.
- ii) **Physiology** - This would include brain, spinal cord cerebrospinal fluid, cerebral blood flow, mechanism of transmission of pain in different acute and chronic pain conditions, cardio-respiratory physiology in patients with neurologic and neurosurgical diseases, and endocrine function of the pituitary and pineal gland. Revision of cardiovascular, respiratory and neuro muscular functions.
- iii) **Pharmacology** - This would include drugs affecting the functions of brain, spinal cord, CSF and cerebral blood flow and action of drugs on transmission of different stimuli, including pain, and pharmacology of drugs used in neuro intensive care for management of both cardio-respiratory dysfunctions and brain protection.
- iv) **Monitoring** - This would include indication, technique and interpretation of different types of monitoring devices.
- v) **Fluid-electrolyte and acid - Base** disturbance in general with special emphasis on neurosurgical and neurological patients including patients with stroke, subarachnoid haemorrhage, patients with acid-base disturbances. Management of fluid and electrolytes therapy in Diabetes insipidus and SIADH and various nephrologic disorders.
- vi) **Temperature regulation** - In paediatric neurosurgical/ neurological patients and use of hypothermia in head injured patients and during surgery.
- vii) **Nutritional considerations** - in neurosurgical and neurological patients requiring prolonged intensive care management. Evaluation of nutrition and complications of these therapies.
- viii) **Principle of airway management** - The type of airway the patient requires, when to intubate, how to maintain the patency of airway for a long period, when to extubate, indications management and complication of tracheostomy.

ix) **Principles of ventilatory therapy** - What type of ventilation the patient requires, care of the patient during ventilatory care, prevention and treatment of complications during ventilatory therapy, when and how to wean the patients from ventilator.

x) **Principles of cardiac support** - Care of the arterial pressure, treatment of arrhythmia, management of different types of heart failure and treatment of cardiac arrest.

xi) **Basic guideline for establishing Neuro ICU** - Arrangement of beds, monitoring systems, air-conditioning, its administration aspects and infection control.

A) Anaesthetic problems related to raised intracranial pressure either due to space-occupying lesions or due to hydrocephalus. Anaesthetic and post-operative management of such patients.

B) Perioperative anaesthetic problems of pituitary tumours, craniopharyngioma and other endocrine disorders of neuro-surgical origin. Management of patients with pituitary apoplexy, hypothalamic disorders, diabetes insipidus and SIADH.

C) Anaesthetic management of vascular tumours like meningiomas, aneurysms and arteriovenous malformations. Control of haemodynamic responses, control of ICP, care during excessive bleeding and care of patients in presence of ischemia.

D) Management of patients undergoing cervical spine surgery.

E) Paediatric anaesthesia – Congenital hydrocephalus, encephalocele, meningomyelocele, craniosynostosis and other congenial deformities and brain tumours.

F) Anaesthetic management of posterior fossa lesions, like midline tumours, C-P-angle tumours, meningioma. The challenges of different abnormal positions like (prone, park bench and sitting).

G) Anaesthetic management of patients with head trauma and polytrauma patients. Management of these patients with full stomach cervical spine and chest injury.

H) Neuroradiological procedures – Anaesthesia for myelogram, angiogram, intervention neuroradiology and MRI.

I) Intensive care of post operative neurosurgical patients like head injury, C-P-angle tumour, vascular lesions and patients who deteriorated during the postoperative period. Intensive care of neurological patients like, myasthenia gravis, ascending polyneuritis, encephalitis, stroke, status epilepticus etc.

J) Infection control in neuro ICU and neuro operation theatre, sterilization of anaesthetic equipments, monitors, ventilators circuits and intensive care equipments.

K) Management of patients with trigeminal neuralgia, causalgia, myofascial pain and cancer pains.

L) Assessment for brain death.

RECENT ADVANCES AND EMERGENCY MANAGEMENT

1) Emergency management of patients with raised intracranial pressure, head injured patients and patients with polytrauma.

2) Management of patients with haemorrhagic shock, airway problems and ventilatory failure.

3) Management of patients with stroke, myasthenic crisis or cholinergic crisis and other neurologic diseases with cardio-respiratory distress or failure.

4) Barbiturate or diazepam coma for patients with status epilepticus or management of patients with malignant intracranial hypertension.

5) Hypotensive anaesthetic techniques to control excessive blood loss and at the same time preserve the neurologic functions.

6) Hypothermia and cardio-pulmonary bypass for patients with giant aneurysm.

7) Institution and management of hypothermia to control increased intracranial pressure in patients with head injury.

8) Brain protective measures during management of patients with subarachnoid haemorrhage or during and following aneurysmal clipping.

9) Role of different therapeutic modalities like exchange transfusion or plasmapheresis for treatment of patients with myasthenia or polyneuritis.

10) Detailed knowledge on evoked potentials, extracranial doppler, ultra-sound, cerebral blood flow measurement techniques and newer methods of imaging to assess brain functions e.g. PET scan.

- 11) Anaesthesia for awake craniotomies for patients with epilepsy.
- 12) Anaesthetic management of patients with extensive skull base surgery.
- 13) Pre-op, intra-op and post-operative care of patients with carotid artery stenosis for carotid endarterectomy.
- 14) Indication and technique of selective neurectomy or cordotomy for intractable pain of any origin.

SKILLS NEUROANESTHESIA

I. Goals

- A. Administer anaesthesia safely to patients with neurologic disease who are undergoing neurologic or non-neurologic surgery, diagnostic procedures requiring anaesthesia, or nonsurgical interventions requiring anaesthesia.
- B. Understand the basic concepts of central nervous system (CNS) physiology as they relate to neuroanaesthesia, specifically, mastery of autoregulation of blood flow, blood flow response to CO₂, blood flow response to cerebral oxygen (CMRO₂) and glucose (CMRglu) metabolic rates, and cerebrospinal fluid physiology.
- C. Know the effect(s) of commonly used anaesthetic agents and adjuvant agents, for example antihypertensives, on cerebral physiology.
- D. Understand the anaesthetic implications of the most common neurosurgical procedures, that is, what is likely to happen during neurosurgery that will affect anaesthetic management.
- E. Understand the basic concepts behind electrophysiologic monitoring of the brain and spinal cord.
- F. Understand how concurrent medical illnesses affect anaesthesia during neurologic surgery.

II. Objectives

- A. Review the medical history and physical examination of patients; assess their major neurosurgical problem. Evaluate the patients Glasgow Coma Scale as well as other medical problems that may affect anaesthetic care; and know what information about nervous system function and pathology as important to the anaesthesiologist.

1. Recognize both the adult and paediatric patient with poor elastance of increased intracranial pressure (ICP).

2. Evaluate the patient with subarachnoid haemorrhage and intracranial aneurysm by means of the Hunt-Hess and Fischer gradings systems; recognize preoperative vasospasm; and anticipate which patients are likely to require special techniques such as barbiturate protection, hypotension, induced hypertension, or temporary vessel occlusion.

3. Differentiate between radiculopathy and myelopathy and understand the anaesthetic implications of each, that is, which patients require awake intubation and positioning.

4. Know the basic differences between the following types of brain, spinal cord, and metastatic tumours of the CNS and their association with oedema and intraoperative blood loss.

Know the anaesthetic implications of:

- Acoustic neuroma, Ependymoma, Gliomas, Meningioma, Pituitary tumours. Understand the following different types of spinal operations as well as their anaesthetic implications:
- Anterior cervical discectomy and fusions, anterior cervical corpectomies, posterior cervical fusions, laminectomies, and foramenotomy, Laminectomies for excision of spinal cord tumours, both intramedullary and extramedullary, Lumbar laminectomies, microdiscectomies, corpectomies, and fusions with instrumentation, Thoracic laminectomies and discectomies.
- Anticipate premedication for and anaesthetic considerations during electrocorticography
- Anticipate airway and sedation requirements for stereotactic neurosurgical procedures conducted with either general anaesthesia or monitored anaesthesia care.

Perform the following specific procedures and monitoring techniques necessary to care for the neurosurgical patient.

1. Choose appropriate premedication and agents for anaesthetic induction and maintenance based on a knowledge of their effects on cerebral physiology and on neuropathology

2. Choose and place the following monitors and monitoring devices for use during spinal and intracranial surgery:

- a. Arterial line, central venous (CVP) or pulmonary artery (PA) pressure catheters by all approaches, especially the basilic or cephalic veins
 - b. Observe/know about Precordial Doppler and interpretation of sounds
3. Perform techniques for awake intubation and positioning of the neurosurgical patient with either an unstable neck or myelopathic signs and symptoms
- a. Assess when awake intubation and positioning are needed
 - b. Intubate an awake patient such that coughing or movement are minimal
 - c. Master anaesthesia for awake intubation, including but not limited to, superior laryngeal and glossopharyngeal nerve blocks and transtracheal injection of lidocaine
4. Detect and treat air embolism during neurosurgery:
- a. Know use of monitors to detect air embolism and what monitoring patterns are associated with air embolism.
 - b. Recognize the relative risks of different procedures and positions for air embolism.
5. Know general principles of positioning the patient for neurologic surgery and the advantages and disadvantages of each position:
- a. Lateral
 - b. Prone
 - c. 3/4 prone
 - d. Supine-head turned
 - e. Sitting position
6. Know anaesthetic effects on the electroencephalogram (EEG) and evoked potentials and basic implications of and appropriate responses to changes in each.
7. Understand the basic indications and techniques, and, if possible, perform the following special procedures used during neuroanaesthesia:
- a. Induced hypotension
 - b. Induced hypertension
 - c. Moderate Hypothermia

Barbiturate cerebral protection, Cardiopulmonary bypass and circulatory arrest — theoretical knowledge only in most instances.

8. Know the differential diagnoses and treatment alternatives of intraoperative intracranial hypertension (—tight brainII).

9. Reverse general anaesthesia rapidly with a minimum of hemodynamic change to allow early postoperative assessment of the patient and recognize when failure to emerge from anaesthesia is not likely an anaesthetic effect.

10. Know the management of Head Trauma, and its anaesthetic management.

REFERENCE BOOKS :

1).Handbook of Neuroanesthesia

Philippa Newfield (Author), James E. Cottrell (Author)

Publisher: Lippincott Williams and Wilkins; 5th Revised edition edition (1 October 2012)

2). Cottrell and Young's Neuroanesthesia, 5th Edition

By James E. Cottrell, MD, Professor and Chair, Department of Anesthesiology, State University of New York, Health Science Center at Brooklyn, Brooklyn,

NY and William L. Young, Professor and Vice Chair, Department of Anesthesia and Perioperative Care, University of California, San Francisco, California, USA

3).Essentials of Neuroanesthesia and Neurointensive Care

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and Adrian W. Gelb, MBChB, DA, FRCPC