Revised: 6/7/07 Objectives #10

Rotation Title: Anesthesia for Neuroanesthesia

I. Definition: This rotation is a 1 month rotation in the CA-2 year. Electives may be taken in the CA-3 year, and includes anesthesia for all forms of neurosurgery and interventional neuroradiology.

II. Curriculum: The clinical elements of neuroanesthesia include providing anesthesia intracranial, stereotactic, spine, and interventional neuroradiology, within and outside the operating room.

III. Performance Assessments:

A. Self Assessment
You (the resident) are to check off each criterion as the material is mastered. Self reflection on your own competencies is critical.

B. Faculty Assessment
Faculty will periodically review your self assessment and discuss their assessments of your competencies. The overall scores on the six competencies will be reported to you at least weekly.

C. Mentor Assessment
Your mentor should meet with you quarterly and review your entire portfolio. The mentor should report areas in which you have deficiencies (for your level of training). This report may be to you and/or to the program director as determined by your mentor.

IV. Competencies Assessed (Performance Criteria):

A. Patient Care: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Set up for a major intracranial procedure
2. Manage the airway with appropriate choices for cervical spine surgery
3. Place arterial lines and large bore intravenous access in the majority of cases; without assistance
4. Place CVP catheters in the majority of cases with minimal assistance
5. Conduct the induction of general anesthesia with staff supervision for major intracranial procedures
6. Demonstrate skill with fiberoptic intubation
7. Conduct hypotensive anesthesia when indicated
8. Provide anesthetic care for diagnostic procedures after surgery (MRI, CAT Scan)
9. Diagnose postoperative complications of neurosurgery in the PACU

B. Medical Knowledge: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Preoperative assessment of the patient for intracranial surgery
2. Risks of intracranial surgery
3. Monitoring for major intracranial procedures
4. Preparation for airway management for cervical spine procedures
5. Anesthetic choice for neuroanesthesia
6. Approaches to emergence from anesthesia after craniotomy
7. Creation of anesthetic plan that allows for neurophysiologic monitoring
8. Understanding treatment options for increased intracranial pressure
9. Neuroanatomy

10. Cerebral circulation
11. Circulatory arrest for neurosurgery
12. Craniotomy for tumor
13. Intracranial vascular surgery
14. Diagnosis of spinal cord compression
15. Management of increased intracranial pressure
16. Deep brain stimulation
17. Stereotactic neurosurgery
18. Neurophysiologic monitoring

The CA-2 resident on their neuroanesthesia rotation shall be responsible for mastering all material listed in Appendix A. These will be assessed by written and oral examinations.

C. Practice Based Learning and Improvement: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Reviewing the effects of cerebral vascular disease on the postoperative course of anesthetized patients
2. Reviewing the surgical procedure and anesthetic of completed cases and compare with the anesthetic plan to determine whether the best plan had been formulated
3. Track case counts showing involvement in variety of cases so that comfort level extends to all types of neurosurgery, including intracranial vascular surgeries
4. Becoming acquainted with neuroanesthesia and neurosurgical literature
5. Reviewing scientific evidence for the appropriate surgical and anesthetic care of the patient having neurosurgical surgery. This should be done at least weekly on a selected case. A copy of this report may be placed in your portfolio.

D. Interpersonal and Communication Skills: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Correct identification of the procedure, positioning needs and special issues by
   a. Consultation with the neurosurgery team
   b. Dialogue between the surgical team and the monitoring technicians
2. Neurophysiologic monitoring
3. Identification of information from diagnostic studies necessary for anesthetic planning
4. Participation in the planning for postoperative monitoring in critically neurosurgical patients

E. Professionalism: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Recognize the urgency of various neurosurgical cases
2. Provide consultative services for neurosurgical patients

F. Systems-Based Practice: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Impact of head trauma on society
2. Resources for head-injured patients

V. Additional Materials:

The resident should read and understand the material contained in the neuroanesthesia module material prior to the rotation.

Revised: June 7, 2007

Appendix A: Medical Knowledge expected to be mastered during CA-2 Neuroanesthesia Rotation

Lecture 49

Controlled Hypothermia

1) Techniques
2) Systemic Effects
3) Shivering
4) Rewarming
5) Complications

Lecture 86

Vascular Diseases - Intracranial

1) cerebral circulation; luxury perfusion, steals, infarcts, intracranial hemorrhage

Lecture 87

Vascular Diseases - Extracranial

1) abdominal aneurysm resection: anesthetic management
2) peripheral arteriosclerotic disease
3) aneurysms of ascending, descending and arch of aorta, thoracoabdominal aneurysms
   (a) endovascular repair techniques

Lecture 88

Carotid Endarterectomy

1) carotid endarterectomy: anesthetic management, monitoring of cerebral perfusion, complications

Lecture 89

Neurophysiology

1) Brain
   a) cerebral cortex; functional organization
   b) subcortical areas: basal ganglia, hippocampus, internal capsule, cerebellum, brain stem, reticular activating system
2) Spinal Cord
   a) general organization
   b) spinal reflexes
   c) spinal cord tracts
   d) evoked potentials

Lecture 90

Electroencephalography (EEG)

1) wave patterns, frequency and amplitude, raw and processed, spectral edge
2) sleep, convulsions; O_2 and CO_2; hypothermia, brain death
3) depth of anesthesia; burst suppression, electrical silence, specific anesthetic and drug effects

Lecture 91

Evoked Responses

1) morphology, effects of ischemia and anesthetics
2) sensory: somatosensory, visual, brainstem auditory
3) motor

Lecture 92

Intracranial Pressure and Cerebral Blood Flow

1) ICP
   (a) brain volume, elastance and compliance
   (b) increased ICP, herniation
2) metabolism: substrates, aerobic and anaerobic
3) cerebral blood flow
   (a) effect of perfusion pressure, pH, $PaCO_2$, PaO_2, and Cerebral Metabolic Rate for O_2 ($CMRO_2$); inverse steal; gray vs. white matter
   (b) autoregulation: normal, altered, and abolished
   (c) pathophysiology of ischemia/hypoxia: global vs. focal, glucose effects, effects of brain trauma or tumors

Lecture 93

CSF and Cerebral Protection

1) Intracranial CSF
   (a) formation, volume, composition, flow and pressure

(b) blood-brain barrier, active and passive molecular transport across, causes of disruption
(c) relation to blood composition and acid-base balance

2) Spinal Cord CSF
   (a) formation, volume, composition, flow and pressure
   (b) blood-brain barrier
   (c) brain volume, compliance
   (d) relation to blood chemistry and acid-base balance
3) cerebral protection
   (a) hypothermia
   (b) anesthetic and adjuvant drugs

Lecture 100

Epilepsy

Lecture 102

Neurologic Disease and Anesthesia

1) paraplegia, quadriplegia, spinal shock, autonomic hyperreflexia
2) neuromuscular diseases
3) tetanus

Lecture 103

Special Problems of Anesthesia for Neurosurgery

1) increased intracranial pressure: tumors, hematomas, hydrocephalus
2) positioning: prone, sitting, other, head stabilization in tongs
3) air embolism
4) cerebral protection from hypoxia, ischemia, glucose effects

Lecture 104

Aneurysms, AVMs and Transphenoidal Hypophysectomy

1) aneurysms and A-V malformations, cerebral vasospasm
2) interventional neuroradiology; coils and embolization
3) pituitary adenomas, trans-sphenoidal hypophysectomy

Lecture 105

Controlling CSF and ICP

1) anesthetic and ventilatory effects on cerebral blood flow and metabolism
2) fluid management: hypertonic vs. isotonic saline vs. balanced salt solutions
3) spinal fluid drainage
3) pituitary adenomas, trans-sphenoidal hypophysectomy

Lecture 106

Advanced Neurosurgical Techniques

1) stereotactic and gamma-knife techniques, deep brain stimulator placement, intra-operative wake-up techniques
2) ventriculostomy

Lecture 160

Anesthesia for Electroconvulsive Therapy

Lecture 162

Anesthesia for Radiologic Procedures

1) CT Scan: Anesthetic Implications/Management
2) MRI: Anesthetic Implications/Management
3) Anesthesia In Locations Outside The Operating Rooms