VASCULAR ANESTHESIA BLOCK

THE ROYAL COLLEGE OF PHYSICIANS AND SURGEONS OF CANADA
Objectives of Training and Specialty Training Requirements in Anesthesia

Specific Objectives in CanMEDS Format

ROTATION OBJECTIVES

At the completion of training, the resident will have acquired the following competencies and will function effectively as:

Medical Expert/Clinical Decision-Maker

The resident will be able to:

- Demonstrate knowledge of general internal medicine, anatomy, physiology and pharmacology with particular reference to the cardiovascular, respiratory, hepatic, renal and coagulation systems, blood transfusion, acid–base, fluid and electrolyte balance.
- Demonstrate knowledge of the principles and practice of anesthesia as they apply to patient support during vascular surgery.
- Demonstrate competence in BCLS, ACLS and ATLS.
- Demonstrate knowledge and competence in the following:
  - Anatomy, physiology, and pathophysiology of the peripheral circulation.
  - Vascular disease: epidemiologic, medical, and surgical aspects (pathophysiology of atherosclerosis, natural history of patients with peripheral vascular disease, medical therapy of atherosclerosis, the role of statins in perioperative outcomes).
  - Preoperative evaluation and preparation of the vascular patient: clinical predictors of increased perioperative CVS risk, type of surgery, ACC/AHA Guidelines on perioperative cardiovascular evaluation care of patients undergoing noncardiac surgery, assess and optimize coexisting disease (hypertension, coronary artery disease, heart failure, cardiac valvular disease, diabetes mellitus, COPD and tobacco abuse, renal failure, cerebrovascular disease), coronary revascularization before noncardiac surgery ⇒ risks vs. benefits, PTCA and stenting before noncardiac surgery ⇒ Implications and optimal timing of noncardiac surgery after PTCA and stenting
  - Pharmacological agents used in vascular patients (nitrates, β-adrenergic receptor antagonists, ACE inhibitors, angiotensin II receptor antagonists, digoxin, loop and thiazide diuretics, spironolactone, calcium channel blockers, clonidine, hydralazine, insulin and oral hypoglycemic, cholesterol lowering agents,
Etiology and prevention
Perioperative stress response and risk of myocardial ischemia
Perioperative medical management of coronary artery disease: nitrates, \( \beta \)-adrenergic blockade (\( \alpha_2 \)-agonists, calcium channel blockers, statins, ACE Inhibitors).

- Perioperative Renal Protection (cardiac performance and perfusion pressure, fluid management, mannitol, N-acetylcysteine, fenoldopam)

- Hematologic Considerations in Vascular Surgery (normal hemostasis, laboratory evaluation, congenital bleeding disorders, acquired bleeding disorders, platelet defects, hypercoagulable states and venous thrombosis), antithrombin III deficiency, protein C deficiency, protein S deficiency, defects in fibrinolysis, venous thrombosis, anticoagulant therapy, heparin, LMWH and heparinoids, Coumadin, platelet inhibitors, herbal therapy, thrombolytic therapy, pentoxifylline (procoagulant therapy), tranexamic acid, desmopressin (intraoperative blood loss and replacement, postoperative bleeding and reoperation)

- Monitoring During Vascular Anesthesia
  - Electrocardiography: arrhythmias, conduction defects, myocardial ischemia (three electrode system, modified three electrode system, five electrode system)
  - Pulse Oximetry
  - Capnometry
  - Noninvasive Blood Pressure Monitoring
  - Body Temperature
  - Invasive Hemodynamic Monitoring
  - Advantages, indications, contraindications and complications of the following: arterial pressure monitoring, CVP monitoring, pulmonary artery catheterization, cardiac output, TEE.

- Abdominal Aortic Reconstruction
  - Etiology, Epidemiology and Pathophysiology of AAA and Aortoiliac Occlusive Disease
  - Natural History and Surgical Mortality
  - Pathophysiology of Aortic Occlusion and Reperfusion (cardiovascular changes, renal hemodynamics and renal protection, humoral and coagulation profile, visceral and mesenteric ischemia, central nervous system and spinal cord ischemia and protection).
- Clamp Level: infrarenal, suprarenal, supracentric
- Anesthetic Management: autologous blood procurement, anesthetic drugs and techniques, thoracic epidural.

- Thoracoabdominal Aortic Aneurysm Surgery
  - Etiology
  - Preoperative Preparation and Monitoring
  - Crawford Classification of TAAA’s
  - Morbidity and Mortality
  - Neurologic Complications: anatomy and blood supply of spinal cord, artery of Adamkiewicz, cerebrovascular accidents, spinal cord infarction – paraplegia, Crawford’s classification of TAAA’s and incidence of paraplegia.
  - Spinal Cord Protection: limitation of cross-clamp duration, reattachment of critical intercostal arteries, maintenance of proximal blood pressure, avoid hyperglycemia, CSF drainage, hypothermia, evoked potentials, naloxone infusion, left atrial-to-distal aortic bypass with retrograde perfusion, avoid postoperative hypotension.
  - Renal ischemia and protection
  - Coagulation and metabolic management
  - One lung ventilation
  - Anesthetic management

- Endovascular Aortic Repair
  - Stent – Graft Devices and Approval
  - Patient Selection
  - Preoperative Diagnostic Imaging of Aneurysm, Surrounding Anatomy and Device Sizing
  - Endovascular Technique for EVAR and TEVAR
  - Adjunctive Debranching Surgical Procedures when coverage of LSCA or LCA is necessary to provide an adequate proximal fixation site for the stent
  - Anesthetic Management – Regional vs. General
  - Indications for CSF Drainage in TEVAR
  - Complications (damage to access vessels, endoleaks, graft migration, renal ischemia, paraplegia, stroke, aorto - esophageal fistula, conversion to open)
  - Lifelong Radiological Surveillance and Costs
  - Patient Outcomes – OPEN vs. ENDOVASCULAR
Lower Extremity Revascularization
- Epidemiology and Natural History of Peripheral Vascular Disease
- Pathophysiology of Atherosclerosis
- Medical Therapy for Atherosclerosis and Complications of Medical Therapy
- Chronic Medical Problems and Risk Prediction in Peripheral Vascular disease Patients
- Acute Arterial Occlusion
- Chronic Arterial Occlusion
- Surgical Management
- Preoperative Preparation and Monitoring
- Regional versus General Anesthesia
- Neuraxial Anesthesia and Agents Affecting Hemostasis
- Risk of Spinal or Epidural Hematoma
- Anesthetic Management
- Postoperative Considerations

Carotid Endarterectomy
- Surgical indications
- Perioperative Cardiovascular Morbidity and Mortality
- Preoperative Evaluation
- Anesthetic Management
  - General vs. Regional vs. Local
  - Advantages and disadvantages of each
  - Superficial and Deep cervical plexus block
  - Carbon dioxide and glucose management
- Neurologic Monitoring and Cerebral Perfusion
  - Neurologic assessment of awake patient
  - Assessment of cerebral blood flow
    - Stump pressures
    - $^{133}$Xe washout
    - Transcranial Doppler (middle cerebral artery flow)
  - Cerebral electrical activity
    - electroencephalography ± computer processing
  - SSEPs
  - Cerebral oxygenation
  - Jugular venous oxygen saturation
  - Cerebral oximetry
### Postoperative Considerations
- Neurologic injury
- Postoperative hyperperfusion syndrome
- Blood pressure liability
- Cranial nerve and carotid body dysfunction
- Airway and ventilation problems
- Cardiac ischemia/MI

### Endovascular Treatment of Carotid Disease: Carotid Angioplasty and Stenting
- Postoperative Management of Vascular Patients
  - Postoperative Pain Management (Preemptive analgesia, PCA, Epidural, Nerve blocks)
  - Mechanical ventilation and invasive monitoring in ICU for some patients
  - Complications, including: complications of invasive monitoring, complications of surgical procedure (stroke following CEA, Hemodynamic instability following CEA, Cranial nerve injury following CEA, Spinal cord injury, Acute renal failure, Sexual dysfunction, Bleeding, Low cardiac output syndrome, Sepsis), respiratory complications (Risk factors, Pulmonary disease, Cardiac disease, Emergency surgery)
- Technical Skills
  - Be proficient in the provision of thoracic epidural analgesia for upper abdominal and thoracic surgical procedures
  - Be skilled in airway management for bronchoscopy, one-lung ventilation and insertion of spinal drains and CSF monitoring for thoracic aneurysm repair
  - Be skilled in starting large bore intravenous infusions, arterial lines, CVP and PA lines in vascular surgical patients

### Communicator
The resident will be able to:
- demonstrate effective communication with patients and families of description of procedures, informed consent and anesthetic options and risks
- demonstrate effective communication with OR team (vascular surgeons, nurses and other members of the health care team) and postoperative team (ICU, PACU)
- provide clear and concise written consultation and anesthetic records
Collaborator
The resident will be able to:
- seek perioperative consultation with colleagues when required
- contribute effectively to other interdisciplinary team activities
- demonstrate ability to function in the clinical environment using the full abilities of all team members

Manager
The resident will be able to:
- manage OR time by efficiently conducting the anesthetic, continuing education and personal activities
- utilize information technology to optimize patient care and lifelong learning

Health Advocate
The resident will be able to:
- provide patient advocacy for various perioperative issues (i.e., patient safety, analgesia, postoperative monitoring)

Scholar
The resident will be able to:
- demonstrate commitment to continuing personal education
- be able to critically review vascular anesthesia literature and describe the principles of research relevant to this population
- assist in education of other members of the OR team

Professional
The resident will be able to:
- demonstrate a sense of responsibility, integrity, honesty and compassion when caring for patients
- demonstrate respect for patients and colleagues
- deliver highest quality care to patients
- practice medicine ethically consistent with the obligations of a physician
- respect the opinions of fellow consultants and referring physicians in the management of patient problems and be willing to provide means whereby differences of opinion can be discussed and resolved
- show recognition of limits of personal skill and knowledge by appropriate consulting other physicians and paramedical personnel when caring for the patient
READING LIST

Recommended Material:

1. Cardiac Physiology; p.393 – 410; Miller’s Anesthesia (7th Edition).
2. Cardiovascular Pharmacology; p.595 – 632; Miller’s Anesthesia (7th Edition).

Updated: July 2011, Dr. Granton & Dr. Nicolaou