Multiple Sclerosis

Most common autoimmune inflammatory demyelinating disease of the CNS characterized by inflammation, demyelination and axonal damage. Most commonly follows a relapsing and remitting course.

ANESTHETIC CONSIDERATIONS:

- Neuromuscular weakness:
  - **Aspiration risk**
  - **Respiratory failure** 2° central hypoventilation + restrictive lung disease
- **Autonomic dysfunction**: hemodynamic instability
- Altered pharmacology:
  - SCh - **hyperkalemia**
  - **Increased sensitivity to non-depolarizing agents**
- Perioperative exacerbation of MS:
  - **Hyperthermia** causes decrease in nerve conduction and damages demyelinated nerves
  - RA - SAB > epidural w/ potential concentration dependant neurotoxic effects of LA
- Treatments
  - Immunosuppressive: **steroids – stress dose**, interferon-beta, glatiramer, MTX and others
  - Symptomatic: BZDs, baclofen, dantrolene, TCAs, anti-seizure

ANESTHETIC GOALS:

- Aspiration precautions on induction.
- Careful titration of neuromuscular blocking agents.
- Prevent exacerbation of MS in perioperative period (temp control and anesthetic choice)
- Anticipate hemodynamic instability secondary to autonomic dysfunction
- Consider potential post-op ventilation for respiratory compromise.

HISTORY

- Standard anesthetic Hx
- Course of illness (duration, type, severity, and current symptoms including seizure d/o)
- Baseline neurological function (sensory & motor deficits)
- Exercise tolerance (SOBOE may = respiratory compromise)
- Autonomic dysfunction (postural hTN, syncope, GERD, early satiety, or dysrhythmias)
- Bulbar dysfunction (dysphagia = increased aspiration risk)
- Cough strength
- Medications

PHYSICAL

- **HEENT** – cranial nerves IX, X (pseudobulbar palsy)
- **CVS** – orthostatic vital sign changes (autonomic dysfunction)
- **RESP** – auscultation (aspiration from bulbar dysfunction / seizure)
- **CNS** – mental status exam, neurological exam (esp. motor and sensory)

INVESTIGATIONS

- **Labs**
  - CBC (anemia, leukopenia d/t interferon therapy)
  - Lytes, BUN, Cr if on immunosuppressants
- **Imaging**
  - Consider CXR (atelectasis w/ chronic hypoventilation), PFTs, and ABG if respiratory concerns
  - Baseline ECG for dysrhythmias/conduction defects
  - ? baseline MRI for severity of disease

OPTIMIZATION

- Neurology consult to document baseline neurological status and direct disease modifying treatment optimization
- Steroids if in acute exacerbation
- Aspiration prophylaxis
- D/w pt risk of exacerbation assoc. w/ infection and fever

ANESTHETIC OPTIONS

- GA does NOT cause MS exacerbations (National MS Society statement), however, common perioperative complications DO cause exacerbations:
  - Hyperthermia (as little as 1° C) blocks conduction in & can damage demyelinated nerves
  - Infection
- Altered response to NMB
  - DNMB - hyperkalemia response to SCh 2° up-regulation of nicotinic ACh receptor in symptomatic patients
  - NDNMB - increased sensitivity 2° reduced muscle mass + altered neuromuscular transmission ("myasthenia-like") OR increased resistance 2° to proliferation of extrajunctional ACh receptors seen in upper motor neuron lesions
  - Resistance to NDNMB in pts Tx w/ phenytoin / carbamazepine
- RA has been assoc w/ MS exacerbations:
  - Spinal >> Epidural (peripheral nerve blocks OK)
  - Unknown MOA but theory = direct toxicity of LA on demyelinated nerves
  - Epidural believed safe b/c of lower concentrations of LA in subarachnoid space (high concentrations of LA – i.e. 0.25% bupivicaine have been assoc. w/ exacerbations)

ANESTHETIC SETUP

- **Drugs**
  - Standard w/ NMB free anesthetic if possible
  - Pressors/dilators if autonomic dysfunction
  - Steroid stress dosing as needed
- **Equipment**
  - CAS + temp + PNS
  - A-line if autonomic dysfunction
  - Others as per pt co-morbidities/procedure

MANAGEMENT OF ANESTHESIA

- **Induction**
  - Consider IV preload for autonomic dysfunction
  - Consider RSI for aspiration risk
  - Consider need for NMB and variable response to DNMB/NDNMB vs. NM free anesthetic
- **Maintenance**
  - Tight temperature control
  - Judicious narcotic usage if poor respiratory reserve
- **Emergence**
  - Ensure NMB reversal

DISPOSITION & MONITORING

- May need post-op ventilating if poor respiratory reserves
- Consider monitored PACU/step-down unit for actuated pts w/ autonomic dysfunction or poor respiratory function
- Neurology F/U re perioperative Tx

COMPLICATIONS

- HD instability 2° to autonomic dysfunction
- Respiratory failure 2° to central hypoventilation + restrictive lung disease (muscle weakness)
- Aspiration 2° poor airway reflexes & inability to clear airway
- Hyperkalemia with SCh
- Altered response to NMB
- Exacerbation of MS symptoms with hyperthermia
- Unpredictable appearance of new neurological deficits perioperatively
- Adrenal crisis
- Emotional lability and need for sedative premedication

PATHOPHYSIOLOGY

- Most common demyelinating neurological disease = 1 in 1000
- Unknown cause or immunopathogenic processes w/ theories = combo of genetic, infectious, and environmental factors
- Characterized by inflammation, demyelination, and axonal damage in CNS followed by plaque formation
- RF:
  - 2 women : 1 men
  - Northern latitudes
  - Caucasian 85% : 15% Ethnic
  - 1st degree relatives (1 in 250)
  - ? smoking (60% increase in incidence compared to non-smokers - causality not proven yet)
- Rate of relapse decreases during 3rd trimester of pregnancy and increases in 1st 3 months post-partum
- Symptoms develop over several days, stabilize for several weeks, then improve
- Because re-myelination does NOT occur, improvement in symptoms most likely reflects correction of chemical and physiologic disturbances that interfered w/ nerve conduction
- Manifestations reflect sites of demyelination:
  - Visual disturbances include pain and scotoma (optic neuritis)
  - Nystagmus (brainstem occulomotor paths)
  - Autonomic dysfunction (brainstem)
  - Cognitive changes (cortex)
  - Lhermitte's sign - electrical sensation running up/down legs in response to neck flexion (intramedullary c-spine)
  - Ataxia (cerebellum)
  - Limb parasthesias & spastic skeletal muscle weakness (spinal cord) - worse in legs
  - Urinary incontinence & GI dysfunction (spinal cord)
- Dx is made on basis of clinical features, oligoclonal abnormalities of CSF-IgG, evoked potential latencies, or MRI (> 90% sensitivity)
- 6 types of MS:
  - RRMS (relapsing-remitting) = 80% of pts w/ exacerbations lasting 1-3 months followed by remissions
  - Secondary progressive MS = second phase of RRMS w/c affects 90% of RRMS pts w/in 25 years w/ worsening of symptoms independent of exacerbations
  - Primary progressive MS = 20% of pts w/ steady, progressive accumulation of neurological problems w/out exacerbations or remissions
  - Other 3 = less common = Benign MS (few exacerbations/changes over 20 yrs), Progressive-remitting MS, and Malignant MS
- Disease modifying Tx = NOT curative:
  - Steroids = mainstay Rx = anti-inflammatory that shortens duration of exacerbation by restoring blood-brain barrier, decreasing edema and improving nerve conduction
  - Interferon-beta = RRMS Rx of choice = anti-inflammatory w/c decreases exacerbations up to 30% (leukopenia/anemia)

    - Glatiramer acetate = myelin mimic protein that blocks myelin destruction
    - Azithioprine (Imuran) = immunosuppressant that decreases rate of exacerbations but NOT progression
    - MTX = Secondary progressive MS Rx
    - Others = cyclophosphamide and cyclosporine (ARF)
- Symptom Tx:
    - Muscle spasticity = BDZs, dantrolene, baclofen
    - Seizure = carbamazepine
    - Mood/cognition = TCAs

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