

# Parkinson's Disease

Parkinson's disease is a chronic neurodegenerative disorder of unknown etiology resulting in muscular "cogwheel" rigidity, movement disorders (tremor & bradykinesia) and autonomic dysfunction

## ANESTHETIC CONSIDERATIONS:

- Increased risk of aspiration and / or laryngospasm
- Skeletal muscle rigidity can interfere with ventilation
- Autonomic instability: orthostatic hypotension, dysrhythmia, hypertension
- Volume depletion d/t increased peripheral dopamine activity with L-DOPA treatment
- Pharmacologic considerations:
  - Ensure perioperative anti-Parkinson medications
  - Avoid medications which exacerbate / precipitate parkinsonism – droperidol, metoclopramide, phenothiazines and typical antipsychotics
  - Use direct acting pressors, since norepinephrine stores can be depleted
  - Do not use meperidine in patients on MAO inhibitors (selegiline)
- Increased risk of postoperative complications such as ventilatory failure and delirium

## ANESTHETIC GOALS:

- Minimize risk of aspiration / laryngospasm and postoperative ventilatory failure
- Minimize risk of autonomic dysfunction
- Optimize Parkinsonian symptoms pre- / intra- / postoperative

## HISTORY

- Nature of symptoms (movement disorder, bulbar symptoms)
- Exact names, dose, and timing of meds
- How well are symptoms controlled & do symptoms change near the time when the next dose is due? (i.e. morning symptoms if meds not taken in the middle of the night)
- Any history of aspiration pneumonia?
- Orthostatic symptoms?
- Prior anesthetic history
- Nature and severity of movement disorder, rigidity, facial immobility etc.

## PHYSICAL

- HEENT – mouth opening, neck ROM (cervical / facial muscle rigidity)
- CVS – postural vitals
- RESP – rales, wheezing, fever, ability to cough / take deep breath (aspiration Hx, obstructive lung disease, ↓ VC)
- CNS – mental status exam
- MSK – document severity / nature of movement disorder
- RENAL – bladder distention

## INVESTIGATIONS

- Labs
  - None specifically needed for Parkinson's, governed by age, surgery and co-morbidities
- Imaging
  - Baseline ECG
  - Other tests guided by age and co-morbidities
- Special
  - PFTs may be helpful for some patients with severe disease undergoing major surgery

## OPTIMIZATION

- Continue meds pre-, intra-, and postoperative (can only be given by GI route)
  - Particularly levodopa: withdrawal can lead to exacerbation of rigidity or even NMS like crisis called parkinsonism-hyperpyrexia syndrome
- If symptoms fluctuate between doses, ask patient's neurologist if dosing and / or meds should be optimized preoperatively
- Fluid bolus prior to induction

\*If patient coming for PD related surgery:

1. Do not administer anti-PD medications AM of surgery
2. Avoid medications which attenuate features of PD (e.g. propofol, anticholinergics)

## ANESTHETIC OPTIONS

- Local, regional, general all have been used safely
  - If appropriate, local or regional anesthesia may be beneficial d/t multiple interactions
  - Caution with epinephrine containing LAs due to sensitization to cardiac dysrhythmias with levodopa therapy

## ANESTHETIC SETUP

- Drugs
  - Anti-Parkinson drugs as above (particularly levodopa)
  - Avoid phenothiazines, butyrophenones (e.g. droperidol), metoclopramide
- Equipment
  - Standard CAS monitors
  - Consider lower threshold for invasive ABP monitoring

## MANAGEMENT OF ANESTHESIA

- **Induction**
  - Consider risks for hypotension and cardiac irritability
    - Depleted intravascular volume
    - Depleted norepinephrine stores
    - Higher circulating dopamine levels
  - All of the usual meds have been used successfully, with rare and / or theoretical caveats such as cardiac irritability with halothane or high doses of ketamine
  - Propofol should be avoided for PD related surgery as case reports have demonstrated abolition of tremor
  - Single case report of Sch related hyperkalemia in PD but other case series have failed to show this association
- **Maintenance**
  - **Inhalational agents**
    - Volatiles inhibit synaptic reuptake of DA
    - In patients taking L-DOPA, should avoid Halothane as this sensitizes the heart to the action of catecholamines
    - Other inhalational agents are okay, but patients may be sensitive to hypotensive effects due to:
      - Hypovolemia related to decreased PO intake
      - Norepinephrine depletion
      - Autonomic dysfunction
      - Interaction with bromocriptine or pergolide which cause vasodilation
  - Avoid medications which exacerbate / precipitate parkinsonism
    - Droperidol, metoclopramide, phenothiazines and typical antipsychotics
    - Use gravol, steroids, and 5HT3 inhibitors for nausea
    - Can use newer antipsychotics with fewer Parkinsonian side effects:
      - Olanzapine, risperidone, quetiapine
- **Emergence**
  - Ability to protect the airway, and adequacy of ventilation must be carefully assessed
    - Risk of respiratory failure
  - Ability to dose Parkinson's meds in the context of ileus or vomiting is very important
    - Some meds are absorbed in the small intestine, making a feeding tube necessary if gut motility is not assured
  - Delirium should not be treated with typical antipsychotics such as haloperidol, as it may exacerbate symptoms

## DISPOSITION & MONITORING

- Nothing specific, based on individual cases

## COMPLICATIONS

- Skeletal muscle tremor may mimic VFIB on ECG monitor
- **Respiratory Failure**
  - Due to upper airway dysfunction (see above)
  - Ensure patients adequately optimized for extubation
  - Consider intra-operative administration of L-DOPA
- **Worsening of Parkinsonian**
  - Consider intra-op or early post-op administration of anti-PD meds
- **Delirium**
  - Tradition anti-psychotics can exacerbate neurologic manifestations of PD
  - Can use newer antipsychotics with fewer Parkinsonian side-effects:
    - Olanzapine
    - Risperidone
    - Quetiapine

## PATHOPHYSIOLOGY

- Adult onset (50-70 y/o), progressive neuro-degenerative disease of the extrapyramidal system
- Characterized by loss of dopaminergic fibers and dopamine depletion in the basal ganglia (substantia nigra)
  - Results in increased GABA activity, leading to suppression of the motor system
- Classic clinical manifestations include: **akinesia, rigidity, tremor**
  - **Seborrhea, sialorrhea** - therefore these patients should be considered a high risk for aspiration pneumonitis
  - **Respiratory complications** - poor coordination of upper airway musculature may result in obstruction
    - Chronic aspiration leads to parenchymal damage, atelectasis
    - Increased risk of postoperative laryngospasm and postoperative respiratory failure
  - **Orthostatic hypotension** - both secondary to the disease process and as a side effect of meds,
  - **Dementia and mental depression** - high risk for perioperative confusion / hallucinations
- **Treatment directed at symptoms:**
  - Anticholinergics for mild tremor (e.g. amantadine or selegiline)
  - Levodopa (dopamine precursor / dopamine doesn't cross BBB) most effective Tx
    - Used for akinesia
    - Side effects: nausea / vomiting, cardiac irritability, orthostatic hypotension
  - Dopamine decarboxylase inhibitor (carbidopa / Sinemet)
    - Decreases peripheral conversion of levodopa therefore decrease side-effects and relative increase in central levodopa availability
  - Direct dopamine agonists: (bromocriptine or pergolide) beneficial in some patients

## REFERENCES

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