BEYOND GENERAL ANESTHESIA: OPIATES AND PAIN MEDICATIONS

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Declarations

- This presentation will include:
  - off-label use of medications
  - commercial names of medications

- The author:
  - has no conflicts of interest with any of manufacturer medications discussed
  - is a co-investigator on clinical trials of neuromuscular disorders, including myotonic dystrophy type 1
Goals of anesthesia

- To make a procedure or surgery tolerable, by managing:
  - Consciousness
  - Muscle tone
  - Pain

- And to monitor health status:
  - Cardiac
  - Respiratory
  - Metabolic

- These are all taken into consideration in the myotonic patient
  - Prolonged monitoring
Myotonic Dystrophies:
Multi-system vulnerability to medication side effects

Muscle: increased myotonia, slow recovery/rehabilitation

Brain: delirium

Heart: arrhythmia, exacerbation of cardiomyopathy

Gastrointestinal: nausea, GI motility

Pulmonary: impaired breathing and coughing
Cardiac concerns

- Preoperative
  - If you haven’t had one recently, your doctor may want:
    - EKG or Holter (longer duration) EKG monitoring
    - Echocardiogram

- Intraoperative monitoring
  - Cardiac monitoring
  - Blood pressure monitoring
Pulmonary concerns

- **Pre-operative**
  - Condition of your teeth, jaw, airway
  - Pulmonary function testing

- **Intra-operative**
  - Monitor oxygen ($O_2$), carbon dioxide ($CO_2$)
  - Manage ventilation
    - Intubation
    - Non-invasive ventilation
Pulmonary concerns

- Post-operative
  - Monitor for hypoventilation
  - (shallow breathing)
    - Resume or use non-invasive ventilation
  - Prevent aspiration (saliva, food, or fluids going into lungs)
    - Can cause pneumonia, resulting in re-intubation, prolonged hospitalization
    - Use incentive spirometry, cough assist

Incentive spirometry

Respironics, Inc.
Gastrointestinal concerns

- Decreased gut motility leads to:
  - Nausea
  - Vomiting (and risk of aspiration)
  - Delayed gastric emptying
    - Feeling full quickly
    - Decreased appetite
  - Constipation
  - Pseudo-obstruction or Ilius
    - Symptoms same as a bowel blockage
    - Unable to have a bowel movement or pass gas
Muscle concerns

- **Intra-operative**
  - Myotonia exacerbation
    - Potassium imbalance
    - Cautery
    - Electrical stimulation
    - Shivering/low temperature

- **Post-operative**
  - Prolonged bedrest can lead to muscle atrophy
  - Physical therapy/rehabilitation
Brain concerns

- Delirium, also called:
  - Confusion
  - Encephalopathy

- Causes include:
  - Medication side effect
  - Infection
  - Metabolic imbalance

- Increase susceptibility if:
  - Cognitive involvement
General anesthesia

- **Inhaled agents:**
  - halothane
  - flurothane

- **Intravenous agents:**
  - propofol
  - ketamine

- **Muscle relaxants:**
  - Succinylcholine (depolarizing)
  - Etomidate (non-depolarizing)
Local or regional anesthesia

- Nerve block
  - Intra-operative
  - Post-operative

Tom et al. Basic Clinical Anesthesia 2015: 233-251
Local or regional anesthesia

- Cataract surgery
  - Anesthesia of orbit
    (eye and eye socket)

Hamilton et al, Retrobulbar and Peribulbar Anesthesia for Cataract Surgery, Cataract Surgery 2010 C8, 93-103
Spinal or epidural anesthesia

- Spinal
  - Into spinal fluid
- Epidural
  - Around nerve roots
- childbirth
- gynecologic surgery
- lower extremities

Blausen.com staff (2014).
**How do we feel pain?**

<table>
<thead>
<tr>
<th><strong>signals</strong></th>
<th><strong>circuits</strong></th>
</tr>
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<tbody>
<tr>
<td>✅ Inflammatory molecules</td>
<td>✅ Peripheral nerve</td>
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<tr>
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<td>🔄 Un- and thinly myelinated small nerves</td>
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<td>🔄 Cyclooxygenase</td>
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<tr>
<td>🔄 cytokines</td>
<td>🔄 spinothalamic tract</td>
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<tr>
<td>✅ Receptors</td>
<td>🔄 norepinephrine pathways</td>
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<td>🔄 Volt-gated sodium channels</td>
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Anesthetics-lidocaine family

- Lidocaine
- marcaine
- bupivicaine

- Used in spinal, epidural, and local anesthesia
- Topical patches, ointments and creams
Mexiletine

- Oral medication
- Anti-arrhythmic medication (1b)
- Sodium channel blocker (voltage-gated)
- Myotonia treatment

- Studied in post-operative pain management
- Chronic diabetic neuropathic pain
Opiates and opioids

- Opioid epidemic
Opiates and opioids

- **Natural (opiate)**
  - morphine
  - heroin
- **Synthetic**
  - fentanyl
  - hydromorphone
  - hydrocodone
  - oxycontin
  - methadone
- **in combination with other drugs**
  - Vicodin
  - Norco
  - Lortab
Opiates and opioids

- Effects and side effects
  - Mu receptors
- Sedation, delirium
- Respiratory depression and failure
  - Cause of overdose deaths
- Itching
- Nausea
- Slows GI motility
  - Constipation or pseudo-obstruction
- Pain sensitization
- Withdrawal
Non-steroidal anti-inflammatory drugs (NSAIDs)

- Acetylsalicylic acid (Aspirin)
- Ibuprofen (Advil, Motrin, Nurofen)
- Naproxen (Aleve, Naprosyn)

- Selective COX-2 inhibitors
  - Celecoxib (Celebrex)
  - Inhibit prostaglandins, cyclo-oxygenases

- Excreted by kidneys

- Side effects:
  - Causes bruising
  - Can compete with aspirin cardioprotective effect
Acetaminophen

- paracetamol (Tylenol)
- Mechanism: Weak cyclo-oxygenase inhibitor
  - Not fully understood
- Metabolized by liver
Neuropathic pain medications

- Best for chronic pain
- Modulate pain perception and sensitization
- Delayed onset of action
  - Can take weeks to a month to see effect
  - Increase dose slowly to avoid side effects
Antidepressants for chronic pain

- **Tricyclic antidepressants**
  - Amitriptyline (Elavil)
  - Imipramine (Tofranil)
  - Nortriptyline (Pamelor)

- **Serotonin-norepinephrine reuptake inhibitors (SNRIs)**
  - Duloxetine (Cymbalta)
  - Venlafaxine (Effexor)
  - Desvenlafaxine (Pristiq)
  - Milnacipran (Savella)
Antiepileptics for chronic pain

- gabapentin (Neurontin, Gralise)
- gabapentin enacarbil (Horizant)
- pregabalin (Lyrica)
Non-medication pain management

- Heat/Ice
- Stretching
- Massage
- Physical therapy, exercise
- Electrical nerve stimulation
- Biofeedback
- Mindfulness/meditation
- Adequate sleep
- Integrative/multidisciplinary pain management clinic
General recommendations

- When having surgery
  - Close monitoring not only during, but after
  - For sedating medications,
    - Start low, go slow
- If something doesn’t seem right, say so
- Communication between care team
  - Neurologist
  - Anesthesiologist
  - Surgeon
  - Patient
  - Caregivers
For your wallet or Smartphone

**RECOMMENDATIONS FOR SURGERY AND ANESTHESIA**

Patients with myotonic dystrophy often exhibit adverse reactions to sedatives, anesthetics, and neuromuscular blocking agents. Serious complications and fatalities can be avoided by careful preoperative assessment, avoidance of certain drugs, careful monitoring and good postoperative patient care throughout their hospitalization. It is especially important during post-op to monitor the heart and the respiratory system for ventilatory function and airway protection. Complications are not proportional to the severity of the disease; they often arise in seemingly mildly affected patients and it is worth considering whether regional anesthesia is a viable alternative or even if the surgical procedure is really necessary.

**Preoperative:**
1. Cardiological assessment: ECG essential, 24 hour Holter monitor if any indication of arrhythmia from ECG or history
2. Respiratory assessment: a) FEV1 and FVC both lying and standing b) chest x-ray, noting atelectasis, areas of atelectasis
3. Premedication: avoidance of opiates, and caution with benzodiazepines

**Intraoperative:**
1. Induction: preferably general; avoid hypnotic agents with slow metabolism such as Thiopentone. Adverse reactions have also been reported with Propofol; lower doses are likely to be required. Careful titration of intravenous induction agents to avoid hypotension
2. Relaxation: a) avoid Succinylcholine chloride b) short-acting, non-depolarizing muscle relaxants are best used and may be needed in smaller doses; recovery from these may be prolonged
3. Reversal: neostigmine may produce ACh-induced depolarization blockade
4. Protection of airway to minimize risk of aspiration; tendency to temporomandibular dislocation - can be alleviated by manipulating jaw
5. Neuromuscular and capnography monitoring
6. ECG monitoring essential due to risk of arrhythmia
7. Monitor core temperature; to avoid postoperative shivering, maintain normothermia by using warming pads
8. Avoid Potassium (K+) containing fluids

**Postoperative:** (first 24 to 48 hours)
1. Ensure respiration is fully re-established
2. Cardiac monitoring
3. Respiratory monitoring: pulse oximetry, arterial blood gas analysis
4. Use of a high dependency bed is preferable
5. Early chest physiotherapy: these patients are especially prone to postoperative atelectasis
6. Minimal use of opiates for analgesia; instead explore other methods, e.g. local anesthetic blocks or non-steroidal anti-inflammatory agents and paracetamol

*The extent to which these precautions are taken will depend on the length and nature of the procedure.
Recommendations:

- MDF website
- Short and long form guidelines

Myotonic dystrophy (DM) is a genetic disorder that affects CNS, cardiac, respiratory, gastrointestinal, endocrine and muscular systems in ways that increase the risk of anesthesia.

Anesthesia Guidelines for pre-operative, intra-operative and post-operative care of DM patients, summarized below, are in the “Resources” section at www.myotonic.org.

Anesthetic Risks, as detailed in the Guidelines, result from DM effects that include:

- Cardiac conduction defects and potentially fatal arrhythmias
- Ventilatory insufficiency and poor airway protection
- Gastrointestinal dysmotility that frequently results in pseudo-obstruction
- Erratic responses to succinylcholine - though DM does not increase true malignant hyperthermia reactions, this drug should not be used in DM patients
- Prolonged and heightened sensitivity to sedatives and analgesics so that serious complications, including heightened risk of aspiration, are most common in the post-anesthesia period due to drug induced:
  - Reduction in level of consciousness
  - Exaggerated ventilatory weakness
  - Pharyngeal dysfunction with reduced airway protection
  - Gastrointestinal dysmotility and potential pseudo-obstruction

Methods to mitigate risk, detailed in the Guidelines, are summarized below:

- Preoperatively evaluate pulmonary, cardiac and gastrointestinal DM features in addition to its neurological and neuromuscular effects
- Use regional anesthesia when possible, to reduce or eliminate the need for general anesthesia
- Avoid pre-medications (e.g. sedatives and opioids) to the extent possible
- Keep the patient warm
- Consider precautionary application of defibrillator/pacer pads
- On induction, anticipate aspiration, and avoid the use of succinylcholine
- Adhere to strict extubation criteria. Given DM effects on CNS, GI, ventilatory and pharyngeal function, prepare the patient for prolonged post-anesthesia mechanical ventilation, commonly after having fully regained consciousness
- Prepare the patient for prolonged ventilatory assistance, for example by prior initiation of BiPAP with a mask that is immediately available post-anesthesia
- Plan for continuous SpO2 and ECG monitoring post-anesthesia until the patient fully regains pre-operative status, or longer if analgesics or sedatives are used in the post-anesthesia period
- Manage postoperative pain without narcotics when possible
- Encourage aggressive pulmonary toilet after anesthesia, including by use of a mechanical cough-assistance device if necessary

www.myotonic.org
To receive a PDF copy of the Anesthesia Guidelines via email, contact info@myotonic.org
A shout out for research!

- Biobanking
  - If you are having a surgery (which involves removing any tissue)
    - We are interested!