Intraoperative Management and Considerations for Myasthenia Gravis

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KEY WORDS

- Myasthenia Gravis
- Autoimmune disease
- Muscle Weakness
- Neuromuscular Disease
- Myasthenia Crisis

PREANESTHETIC EVALUATION

A 72 yo male present for a colostomy takedown. Pt has a past medical history of ocular Myasthenia Gravis in remission, HLD, GERD, chronic low back pain, BPH, and recent history of perforated diverticulitis. Patient has been eating and maintaining his weight. Not as active as prior to surgery, walking 18 holes of golf with pain from lower back. Pt discovered his MG due to visual issues during golfing. No prior heart or lung issues. Patient reports having issues with anesthesia, taking longer than normal to walk up. Pt currently takes ASA 81mg, Centrum, Ezetimibe, Gralise, Lansoprazole, Lunesta, magnesium gluconate, MiraLax, Naproxen, Nasacort, Phazyme, pitastatin, tamsulosin, valacyclovir, Vitamin C and D3. Most recent labs WNL
Notes from medical record about status of Myasthenia Gravis: Symptoms began in July 2020. Noticed diplopia while golfing, and later his wife noted ptosis. Had a normal MRI, and AChR binding protein positive. CT negative for thymoma, but did find an incidental thyroid nodule. Started Mestinon (Pyridostigmine) 30mg TID with plans to increase to 60 mg if necessary.
Patient interview present no new information that would alter anesthetic or surgical management of this patient. This patient and his wife were very understanding and very informed about Myasthenia Gravis, and present Anesthesia with a printed out copy of the medications that could potentiate weakness in this patient.

PREOPERATIVE EVENTS

Patient was brought into room, properly positioned supine on the bed. The patient was then hooked up to ASA monitors, and preoxygenated to above 90% end tidal oxygen. The patient was then administered 100 mg Lidocaine, 100mcg Fentanyl, 150mg Propofol, and 200mg Succinylcholine. Once apneic, a few small breaths were given to verify that the patient could be BMV. Patient was successfully intubated with a MaGrath 3, 7.0 tube, and had a grade one view, no complications. Pt remained in supine, low lithotomy position. A second PIV was obtained, bairhugger, and temperature probe were applied to the patient, and antibiotics were given, and 18 F O/G was inserted. Then, surgery was started shortly after.

INTRAOPERATIVE EVENTS

At the beginning of the procedure started the patient began to become hypotensive, was corrected multiple times with a decrease in Sevoflurane and subsequently ephedrine. 8 mg of Decadron was administered in hopes of helping prevent a Crisis. Maintenance continued to be uneventful. Surgeon was aware of patient having Myasthenia Gravis and understood the effects of NDMR was on this patient population. He was willing to tolerate no paralysis as long as possible and tolerate non-perfect surgical conditions. Ultimately ended up only about an hour, until he informed us that the patient's movement is interfering, and 10mg of Rocuronium was administered. This was a continued cycle of administering the bare minimum to achieve ideal surgical conditions for this patient. At the end of the case, the patient received only 30mg of Rocuronium. A twitch monitor was used on the ulnar nerve, and sugammadex was dosed based on twitches present.

Surgery was finished and patient received TAP blocks for pain management. Patient received 40mL of 0.5% bupivacaine each side. Then successfully extubated without any issues. Patient was transported to PACU on 6 LPM O2 nasal cannula.
Followed up after surgery, and patient appear to be back to pre-surgery baseline regarding weakness.

Figure 1: Summary of all drug given through out surgery

Name	Total
ceFOXitin Inj 2 GM/20 mL (IV) IV	4 GM
Lidocaine Inj *PF* 2% 100 mg/5 mL Syringe IV	100 mg
fentaNYL Inj 50 mCg/mL 5 mL (UD) IV	100 mCg
Propofol Inj 10 mg/mL 20 mL premix IV	150 mg
Succinylcholine Inj 20 mg/mL 10 mL (UD) IV	200 mg
Dexamethasone Inj 4 mg/1 mL (UD) IV	8 mg
ePHEDrine Inj 50 mg/1 mL (UD) IV	20 mg
Rocuronium Inj 10 mg/mL 5 mL (UD) IV	30 mg
Ondansetron Inj 2 mg/mL 2 mL (UD) IV	4 mg
Sugammadex Inj 100mg/mL 2mL (UD) IV	200 mg

DISCUSSION

Myasthenia Gravis is an autoimmune disease that affects the post-synaptic acetylcholine receptors at the neuromuscular junction. Resulting in reduced number of receptors and degradation of their function, which can lead to damage to the postsynaptic end plate. Antibodies generate against these are IgG, typically. Typically, not associated with cancer, like Lambert-Eaton Syndrome. Patients will have increasing weakness with repeated effort, and improvement with rest.

DISCUSSION

Myasthenia Crisis can present in this patient population with generalized muscle weakness, dilated pupils, ineffective cough, aspiration, and dyspnea. Treatment for a crisis can vary depending on the severity of the disease state. In individuals with minimum effects more anticholinergic medication may resolve symptoms. As with those who have severe symptoms aggressive treatment with ventilator management, and administration of plasmapheresis and/or IVIG may be necessary until they are in remission and weakness improves. Myasthenia Crisis can be confused with a cholinergic crisis but can easily be differentiated by administering anticholinergic and muscle weakness will improve with a Myasthenia Crisis. While in a cholinergic crisis the weakness can remain the same or worsen. Cholinergic crisis is characterized by DUMBBELS.
Myasthenia Crisis used to be diagnosed with an Edrophonium test. Edrophonium prolonging presence of Ach in the neuromuscular junction which will improve muscarinic effects. Thus, ocular ptosis will improve with administration, see Figure 1 below. Edrophonium test is no longer used do to the drug being unavailable, and the test had a high false negative and positive test.

Considerations for Myasthenia Gravis in the preoperative period is important to determine if an elective procedure is safe the patient. Recognition that there are associated autoimmune disease (thyroiditis, myocarditis, etc) should be ruled out. Elective surgeries should be performed when the patient is in remission. Assume that laryngeal/pharyngeal involvement predisposes the patient to pulmonary aspiration and inability to clear secretions. Post operative ventilation may be required if: preop vital capacity is less than 15mL/kg, disease duration longer than 6 years, Pyridostigmine dose greater than 750mg per day, and coexisting COPD. Controversial if cholinesterase inhibitor should be continued perioperatively, defer to neurologist for decision.

The Anesthesia Guide >Chapter 31. Myasthenia Gravis

Arthur Atchabahian, Ruchir Gupta+

Medications to Avoid in Patients with MG

Do not use	Use with caution
•Beta-blockers (even eye drops)	•Nondepolarizing NMB
•Chloroquine, quinine, quinidine, procainamide	•Benzodiazepines
•IV magnesium	•Phenothiazines, lithium, carbamazepine
•Phenytoin	•PO cycline antibiotics
•Dantrolene (except if MH)	•PO magnesium
•Antibiotics: aminoglycosides, quinolones, macrolides, colimycine, IV cycline antibiotics	•Local anesthetics in large amounts
•Botulinum toxin	•Penicillamine (unlikely to be used by anesthesiologist)

DISCUSSION

Intraoperatively it is important to minimize the risk of a crisis or worsen current symptoms. Regional anesthesia is a favorable option in this population, but ester local anesthetics should be avoided due to prolonged half life due to being metabolized by cholinesterase. Patients are typically very sensitive to non-depolarizing muscle relaxant. When used a twitch monitor should be used but avoiding the orbicularis oculi due to overestimation of the neuromuscular blockade. Succinylcholine has been found to be resistant, due to the patient taking cholinesterase inhibitors.
Postoperative it is important to be honest with these patients and their families about expectations postoperatively. These patients could have more weakness after and this is may lead to a new crisis, and they may need to stay intubated after the procedure. Extubation criteria for this populations is slightly different. The recommendation is to compare strength and respiratory perimeters to perioperative values via PFTs, ABG, vital capacity, negative inspiratory force, and most stage III and IV will need postoperative ventilatory support. Remember other factors can interfere with neuromuscular transmission, like antibiotics, respiratory acidosis, local anesthetics, electrolyte levels, and inhaled anesthetics. Best to avoid neostigmine and use sugammadex. Remember that MG patient with weakness can be suffering cholinergic crisis, myasthenia crisis, and residual NMB. Being able to differentiate this is critical.

SUMMARY

In summary, severe Myasthenia Gravis patients can pose a challenge for anesthesia in the OR but being informed about the disease and associated comorbities will be detrimental. Taking the time to talk to the patient about current status and post procedure expectation. Also, making sure their neurologist is involved and potentially even a discussion of how to manage this specific patient to ensure the best outcome possible.

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