American Journal of Medical Case Reports, 2020, Vol. 8, No. 6, 148-149
Available online at http://pubs.sciepub.com/ajmcr/8/6/3
Published by Science and Education Publishing
DOI:10.12691/ajmcr-8-6-3

New Diagnosis of Myasthenia Gravis Following Magnesium Replacement

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Received February 10, 2020; Revised March 20, 2020; Accepted April 02, 2020

Abstract A 29-year-old female G2P2 with a past medical history of hyperthyroidism and depression was admitted for 2-months of progressively worsening weakness of her bilateral upper and lower extremities. Initial investigations were unremarkable, and the patient's weakness improve the next morning. The patient was thought to have a Somatoform Disorder and was planned for home discharge, however on the day of discharge her magnesium was 1.2 mg/dL. After repletion, she developed seizure-like activity and respiratory failure, requiring mechanical ventilation and transfer to the ICU. In ICU, patient received another dose of replacement magnesium that caused another seizure, code blue and re-intubation. Subsequent lab work revealed reactive Acetylcholine receptor antibodies and subsequent chest imaging demonstrated thymoma, confirming a diagnosis of Myasthenia Gravis in Crisis. The patient improved following plasma exchange and was discharged home with outpatient follow up.

Keywords: *myasthenia gravis, magnesium, seizure*

Cite This Article: Tyler Kemnic, James Choi, Samanjit Kandola, and Khader Herzallah, "New Diagnosis of Myasthenia Gravis Following Magnesium Replacement." *American Journal of Medical Case Reports*, vol. 8, no. 6 (2020): 148-149. doi: 10.12691/ajmcr-8-6-3.

1. Background

• Myasthenia Gravis has an annual diagnosis of 1 in 500,000 people in the US. US prevalence is estimated between 1 in 2500 to 1 in 200000 people. [1]

• 15-20% of all MG patients go into crisis at least once. Median time to first crisis is 8-12 months from diagnosis, however 1-5% of patients are diagnosed during crisis, as this patient was. [2]

• The current mortality rate of Myasthenia Gravis is 4%. [3]

2. Case Presentation

History of presenting illness:

A 29-year-old female G2P2 with past medical history of hyperthyroidism and depression was admitted for weakness in all extremities of two months duration. Patient reported that the weakness had steadily worsened until she was no longer able to ambulate without assistance due to loss of strength in bilateral lower extremities. A fall the night before presentation had caused her to seek medical attention. Also concerning to the patient were new diplopia and blurred vision.

She admitted to mood swings during this time, including feelings of depression since the birth of her most recent child (6 months prior), raising concerns for postpartum depression. Family history was noncontributory, social history was unremarkable and the patient reported no surgical history.

Vital signs: BP 129/73, Temp 98.5 F, HR 87, O2 Sat 99% on room air.

Physical Exam: Remarkable for bilateral upper and lower extremity strength 4-/5, yet patient was unable to stand or walk. Abnormal reflexes throughout. Positive Babinski sign on the left, unable to stand or walk without assistance, and unable to rise without one-person assist.

Imaging: CT brain and head without contrast was unremarkable; MRI of the cervical and lumbar spine demonstrated no acute process.

The patient's weakness improved overnight and by morning she was ambulating well. Her symptoms were believed to be the result of a somatoform disorder and discharge was planned. Before discharge was finalized, the patient's magnesium was found to be 1.2 mg/dL and 6g IV was given as replacement. When magnesium infusion was near completion, the patient began jerking upper and lower extremities, was nonresponsive to sternal rub and O2 sat desaturated in the 20s. Code blue was called, patient was intubated and transferred to neuro critical care unit.

In the ICU, patient was loaded with levetiracetam and placed on BID maintenance levetiracetam dosing. The patient was extubated and, while in the ICU, was given another bolus of IV magnesium, causing another seizure, intubation and code blue. While this occurred acetylcholine receptor antibody was found to be positive and the diagnosis of myasthenia gravis was made.

3. Investigations

CT angiogram of the chest revealed a prominent thymus situated to the left alongside the aorta at the level of the aortic arch. Possible Thymoma
Prolactin: 131.2 ng/ml
ANA positive
UA: Low grade Proteinuria
Acetylcholine Receptor Antibody: 418 nmol/L

4. Treatment *If relevant*

Patient was placed on 5 days of plasmapheresis and started on a regimen of pyridostigmine 60mg each morning, pyridostigmine CR 180 mg nightly and glycopyrronium bromide 0.1 mg every eight hours for myasthenic crisis. Furthermore, the patient had been methimazole for hyperthyroidism which was subsequently was changed to propylthiouracil, as methimazole has been found to potentiate myasthenia gravis into a crisis state. [3] The patient's condition gradually improved with plasma exchange.

5. Outcome and Follow-up

After an extended hospital stay of 17 days the patient was discharged on oral prednisone with outpatient follow scheduled and planned cardiothoracic surgery for thymectomy.

6. Discussion *Include a very brief review of similar published cases*

Myasthenia Gravis progressing into myasthenia crisis is reported in the literature via various triggers, however very few reports cover magnesium replacement as the provoking agent. Fawcett and co-authors describe how high magnesium concentrations inhibited release of acetylcholine at the presynaptic cleft and that magnesium ions have inhibitory effects on postjunctional potentials leading to decreased muscle excitability. [4]

Paramveer and colleges summarized a 62-year-old female with a known metastatic thymoma that was admitted to the ICU for myasthenia crisis and was given 16 mEq of magnesium sulfate resulting in decreased pulmonary function leading to intubation, and mechanical ventilation. After being extubated and a second replacement of 16 mEq magnesium leading to further weakness and decreased vital capacity. After plasma exchange, steroids and pyridostigmine the patient had improved and discharged after a prolonged ICU stay due to magnesium replacement. [5]

The goal of this case is to increase awareness of Myasthenia Gravis in the differential of weakness and the notion that magnesium replacement can provoke Myasthenia Gravis into Myasthenia Crisis.

7. Learning Points/Take Home Messages *3-5 bullet points*

- Myasthenia Gravis should be considered as a differential diagnosis for young patients presenting with unexplained muscle weakness
- Magnesium replacement can exacerbate Myasthenia Gravis
- Hypo and Hyperthyroidism treatments contribute to Myasthenia Gravis progression to Crisis

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