Anesthetic Management of a Child With Rapid-Onset Dystonia-Parkinsonism (DYT12-ATP1A3): A Case Report

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Rapid-onset dystonia-parkinsonism also known as DYT12-ATP1A3 is an extremely rare neurological disease. Patients develop dystonia, bradykinesia, postural instability, dysarthria, and dysphagia. Injection of botulinum toxin is the first-choice treatment for focal dystonia. We report the case of a 14-year-old patient diagnosed with rapid-onset dystonia-parkinsonism who was scheduled for injection of botulinum toxin in his upper limbs under general anesthesia. To our knowledge, there is no previous report about the anesthetic management of patients with rapid-onset dystonia-parkinsonism. (A&A Practice. 2021;15:e01440.)

GLOSSARY

CARE = CAse REport; **EQUATOR** = Enhancing the QUAlity and Transparency Of health Research; **GABAb** = gamma-aminobutyric acid type b

Rapid-onset dystonia-parkinsonism, also known as DYT12-ATP1A3 (or dystonia 12), is an extremely rare neurological disease. Fewer than 100 cases have been reported until now. Rapid-onset dystonia-parkinsonism is caused by heterozygous mutations in the *ATP1A3* gene (19q13.2) encoding the alpha-3 subunit of the Na^+K^+ATPase pump, which is essential in maintaining the electrochemical gradients of potassium and sodium across the plasma membrane. These mutations appear to lead to neuronal dysfunction. Other genes that have not yet been identified may also be involved.[1] Diagnosis is usually suspected on a clinical basis and confirmed with genetic testing.

Abrupt onset in childhood or early adulthood is typical and often triggered by a psychological or physical stress. Patients develop severe generalized dystonia and prominent bulbar symptoms. Nontremulous Parkinsonian syndrome with postural instability, dysarthria, and dysphagia is also present.[2,3] Affected patients do not respond significantly to the usual symptomatic treatments for dystonia, including levodopa and trihexyphenidyl.[3] Tetrabenazine can alleviate dystonia to a small extent.

Deep brain stimulation has not been demonstrated to be effective in rapid-onset dystonia-parkinsonism. However, botulinum toxin has been proposed to selectively treat limb dystonia, with good results.[4] Guidance techniques such as electroneuromyography or ultrasound can be used to improve the efficacy of the injections as the dystonic pattern may be complex.

This article adheres to the applicable Enhancing the QUAlity and Transparency Of health Research (EQUATOR) guideline and the 2013 CAse REport (CARE) checklist. Written informed consent for publication was obtained from the patient and his parents.

CASE REPORT

We report the case of a 14-year-old, 165-cm, 48-kg boy, American Society of Anesthesiologists physical status III, diagnosed with rapid-onset dystonia-parkinsonism at the age of 12 years. After a fight at school at 10 years of age, he rapidly developed a severe generalized dystonia. Over the course of a few weeks, the patient became wheelchair bound. The dystonia worsened, and he lost the use of his hands. After 1 year of investigation, the diagnosis was suspected by the neurologists based on clinical findings and confirmed with genetic testing.

Due to a severe, particularly painful and disabling dystonia affecting his hands, he asked for botulinum toxin injections as a focal treatment.

Because of the large number of injections needed, the associated pain, and to optimize the chances of successful treatment, it was decided to perform these injections under general anesthesia in the operating room.

During the preoperative assessment, physical examination revealed a normal cardiorespiratory status and generalized dystonia with severe cervical dystonia. The abnormal position of the neck, characterized by antecollis, torticollis, and sternocleidomastoid hypertrophy, was almost fixed, preventing any mobilization. The airway was evaluated as Mallampati class I with good mouth opening despite dystonia. The patient already had functional scoliosis due to axial dystonia. He was under medical treatment with 10 mg baclofen 3 times a day and had not undergone any previous surgery.

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Special care was taken to communicate and explain the procedure to reduce his anxiety as it is well known that any stressful situation can lead to an abrupt worsening of the symptoms. No premedication was given, and the patient received his usual treatment with baclofen in the morning.

In the operating room, standard monitoring was used with a pulse oximetry and noninvasive blood pressure cuff placed on the lower limb. The patient was placed supine with careful positioning of the head because of the severe cervical dystonia. Sevoflurane and nitrous oxide by facemask were used for induction. A 20-gauge intravenous catheter was inserted in the foot. Anesthesia was maintained with 1 minimum alveolar concentration of sevoflurane in a 50/50 mixture of nitrous oxide and oxygen. Dexamethasone was used for antiemetic prophylaxis and paracetamol for analgesia. Optimal muscle relaxation was obtained with 10 mg diazepam, allowing the neurologist to perform injections. Four hundred units of incobotulinum toxin type A were injected in the flexor digitorum profundus, flexor digitorum superficialis, flexor carpi ulnaris, and flexor pollicis longus of both forearms, under combined ultrasound and electroneuromyography guidance, to increase the chances of successful treatment. Eight injections were necessary, and the procedure lasted for 30 minutes. In the case of laryngospasm, we had planned to administer a small dose of propofol and or 0.3 $mg \cdot kg^{-1}$ rocuronium.

The patient awoke 2 minutes after the end of the procedure. The postoperative course was complicated with nausea and vomiting, which was successfully treated with 4 mg ondansetron. He was discharged after 1 hour with no pain and no more nausea.

One month later, his left hand was free from dystonia, easy to mobilize, and much less painful. He was able to pick up little objects. The effect of botulinum toxin was sustained for at least 3 months, as expected.

To date, the patient has had 5 similar sessions of injections. The anesthetic care was almost identical each time, satisfying both the patient and the neurologist. After the first anesthetic, ondansetron was given prophylactically before awakening the patient who did not complain anymore of nausea in the recovery room. No serious side effects have been observed during the anesthetic care.

DISCUSSION

To our knowledge, this is the first report of the anesthetic management of a patient with rapid-onset dystonia-parkinsonism. The most serious complication for anesthesia management from generalized dystonic crises is laryngeal dystonia with complete adduction of the vocal cords.[5] This complication can also be seen during status dystonicus. It could be caused by stress or drugs interfering with the dopaminergic system in the basal ganglia. Antidopaminergic antiemetic agents, such as dehydrobenzperidol and metoclopramide, are contraindicated and were not used in this case. Propofol-induced dystonia, whether due to its subcortical effects or induced by pain on injection, is a rare but well-documented side effect that may involve any muscle group with a wide range of clinical manifestations, specifically in children.[6] Therefore, propofol should be used cautiously in this particular situation.

As the neurologist performing the injections needed to use neurostimulation to identify the dystonic muscles, neuromuscular blocking agents could not be used.[7] Therefore, we used benzodiazepine to achieve some muscle relaxation. Treatment with baclofen was maintained, considering its myorelaxant properties, to avoid worsening the patient's condition. Baclofen acts on the spinal cord as a gamma-aminobutyric acid type b (GABAb) receptor agonist. Benzodiazepines and baclofen do not interfere with botulinum toxin or electroneuromyography.

Anesthetic management in patients with rapid-onset dystonia-parkinsonism is challenging because of the potential aggravation of dystonic features and the risks related to medications frequently used in anesthesia. As toxin efficacy only lasts 3 months, patients will need to return to the operating room regularly. Optimal management, minimization of risks, and proper collaboration with the neurologist are mandatory. The anesthetic management of such rare diseases is always a challenge.[8]

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