CLINICAL VIGNETTE

Anesthetic Considerations for a Patient with Moebius Syndrome

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Introduction

Moebius syndrome is a rare disease characterized by either unilateral or bilateral facial palsy involving cranial nerves (CN) VI and VII.[1–6] It was first described in 1888 and has estimated incidence of 1 in 250,000 live births.[1,7] Patients are typically diagnosed clinically in infancy, while CT or MRI imaging may show ischemic necrosis, atrophy, or hypoplasia of the brainstem.[8] In 1988, the proposed acronym CLUFT was coined to describe the main features of this syndrome: anomalies of cranial nerves, lower extremities, upper extremities, facial structures, and thorax.[7] Other features include congenital heart disease, peripheral neuropathies, skeletal muscle hypotonia, and seizure disorder.[1–6] The common orofacial features are masked facies, micrognathia, mandibular hypoplasia, congenitally missing teeth, macroglossia, microstomia, TMJ dysfunction, and cleft lip and palate.[1,2,4–6] Mentation ranges from normal intelligence to severe intellectual disability.[2,4,6] The exact etiology of this syndrome is unknown; however, it is theorized the majority of cases are due to vascular disruptions of the brainstem in utero.[4–7] A small fraction of cases are found to have a genetic component.[2,4]

Patients with Moebius Syndrome commonly undergo procedures to address the CLUFT deformities.[1] The high incidence of anatomic deformities and functional changes in patients with Moebius Syndrome present unique anesthesia challenges in the perioperative period. We present a patient with Moebius syndrome who underwent monitored anesthesia care (MAC) for magnetic resonance imaging (MRI) of the brain.

Case Presentation

A 39-year-old female with Moebius syndrome, American Society of Anesthesiologists classification III, underwent MRI of the brain for evaluation of agitation. The patient's medical history was significant for severe developmental delay, aphasia, visual disturbance, agitated behavior, bladder infections, eye infections, insomnia, hypovitaminosis D, and thrombocytopenia. Her intellectual disability required full assistance with activities of daily living. Her past surgical history included gastrostomy tube placement under general anesthesia. Her medications included lorazepam, valproic acid, quetiapine, benztropine, and temazepam. Patient had a penicillin drug allergy.

On the day of the procedure, the patient's BMI was 19.9 kg/m^2 and her vital signs, heart and lung exam were within normal limits. Her airway examination was unable to be completed due to her inability to follow commands. Patient appeared to have syndromic facies with observed hypersalivation.

Shortly after arriving in the MRI holding room, the patient's identifications and consents were verified and confirmed. Then, she was given 2mg of midazolam intravenously for anxiolysis. The patient was placed in the supine position and standard monitors were placed, which included pulse oximetry, non-invasive blood pressure, EKG, and capnography. A face mask with 6 L/min of supplemental oxygen was given. The patient's pressure points were padded, and the arms were tucked. Once the patient was comfortable, propofol was started and titrated to effect. The patient was comfortable for the uneventful 1-hour MRI brain scan. Upon completion of imaging, patient was transported to the Post Anesthesia Care Unit (PACU) and was later discharged home.

Discussion

Patients with Moebius syndrome can present with unique anesthetic challenges due to the wide range of anatomic and functional changes that affect several body systems. Challenges and anesthetic considerations arise within each of the perioperative stages making standardized anesthetic management plan unrealistic.

Preoperative: Although not officially defined in Moebius syndrome, congenial heart diseases have been frequently reported in the literature.[1,4,6] Providers may consider preoperative echocardiogram or cardiology consultation due to incidences of ventricular septal defects, patent ductus arteriosus, pulmonary hypertension, and dextrocardia.[4,6] It is unclear if patients with muscle hypotonia have similar dilated cardiomyopathy risk factors as those with Duchenne muscular dystrophy.[2] Due to terminal limb defects common in these patients, securing a working IV may be difficult and extra care may be needed in proper limb positioning to reduce nerve injury.[1] When indicated, regional anesthesia may be considered; however, skeletal deformities may complicate patient positioning and placement of the nerve block.[1]

Intraoperative: Unilateral or bilateral palsies of CN VI and VII can cause facial paralysis and defective extraocular eye movements. As a result, non-verbal communication with patients is difficult due to masked facies.[1,2] Furthermore, potential intel-

lectual disability and hearing disturbances may be exacerbating factors. Providers may need to observe for sympathetic changes in vital signs and respiratory rate as they may be indicators of pain.[1,2,9] Patients may also have lagophthalmos, which can increase the risk of corneal abrasion and exposure keratopathy.[2] Upon induction of anesthesia, these patients may need eye lubrication and should receive special attention to have complete closure of their eyes.

Facial anomalies, as well as nerve palsies and hypotonia create challenges in managing the airway. Patients often have dysphagia and retention of oral secretions due to palsies of CN IX and X.[1–5] Impaired upper airway and lower esophageal sphincter tone has also been reported.[2] Thus, these patients are at increases risk of aspiration pneumonia and prophylactic medications such as histamine-2 receptor antagonists, antacids, and prokinetic agents may be considered.[2] Reduction of oral secretions may be treated prophylactically with an anti-sialagogue.[1,3,5] Special attention should be made towards having an easily accessible and strong working suction.

Some patients present with orofacial deformities, such as ear deformities, micrognathia, mandibular hypoplasia, cleft lip, cleft palate, and temporomandibular joint dysfunction.[1–6] As a result, ill-fitting mask due to these deformities may cause difficulties in mask ventilation. There are higher rates of severe airway obstruction with micrognathia. This may be addressed by positioning the patient to their side and using alternative airway devices other than the endotracheal tube, such as an oral or nasopharyngeal airway or laryngeal mask airway.[5,10] Patients with Moebius syndrome are frequently reported to be difficult intubations due to an anterior larynx, Cormack-Lehane grade IV, and restricted mouth opening.[1] Tracheomalacia and palatal weakness also increase the risk of airway loss.[4] If the patient is deemed a difficult intubation, fiberoptic intubation, glidescope or airway bougie may be considered.[1,10]

Although not a part of the diagnostic criteria, patients sometimes present with seizures. Those who are on anticonvulsant medications should continue medications on the day of their procedure. However, some anticonvulsant medications including phenytoin, carbamazepine, and phenobarbital have been reported to cause resistance to non-depolarizing neuromuscular blockers (NDNMBs).[2,11] As a result, higher doses of NDNMBs may be required to achieve desired effect of muscle relaxation.[2,11] Considerations should be made towards choice of neuromuscular blocking agents as well due to their ability to exacerbate patient's poor baseline respiratory function. Titration of NDNMB doses is recommended due to the high risk of respiratory failure from thoracic musculature hypotonia.[2,3] Gondipalli et al reported using mivacurium as the NDNMB of choice due to its short duration of action. This decision was based on patients with Duchenne muscular dystrophy. At this time, the pathophysiology of Moebius patients' hypotonia is unknown and succinylcholine is not recommended for use due to the risk of rhabdomyolysis, hyperkalemia, and malignant hyperthermia.[2]

Postoperative: Respiratory function in these patients continues to pose risk during extubation and in the postoperative period. Just like during intubation, they are at increased risk of aspiration during extubation due to their oropharyngeal hypotonia and retention of oral secretions.[3,4] Additionally, these patients may hypoventilate due to hypoplasia of the respiratory centers in the pons and the medulla. Patients should be monitored for hypoventilation after operation, as many of the anesthetic agents used intraoperatively can exacerbate respiratory depression. When possible, alternatives to narcotics should be considered to reduce further central respiratory depression.[1,2]

Challenges in monitoring pain persist into the postoperative period. Providers may have to rely on collateral information and assistance from caregivers to assess patient's pain status.

Conclusion

Our patient had an uneventful MRI under monitored anesthesia care. Although Moebius syndrome is a rare disease characterized by CN VI and VII degeneration, the wide array of anatomic and functional changes affecting multiple organ systems highlight the importance of awareness of the potential anesthesia challenges throughout all perioperative stages.

REFERENCES

1. **Ferguson S**. Moebius syndrome: a review of the anaesthetic implications. *Paediatr Anaesth*. 1996;6(1):51-6. doi: 10.1111/j.1460-9592.1996.tb00354.x. PMID: 8839089.
2. **Gondipalli P, Tobias JD**. Anesthetic implications of Möbius syndrome. *J Clin Anesth*. 2006 Feb;18(1):55-9. doi: 10.1016/j.jclinane.2005.05.005. PMID: 16517335.
3. **Krajcirik WJ, Azar I, Opperman S, Lear E**. Anesthetic management of a patient with Moebius syndrome. *Anesth Analg*. 1985 Mar;64(3):371-2. PMID: 3977098.
4. **Ha CY, Messieha ZS**. Management of a patient with Möbius syndrome: a case report. *Spec Care Dentist*. 2003; 23(3):111-6. doi: 10.1111/j.1754-4505.2003.tb01671.x. PMID: 14650560.
5. **Nashibi M, Sezari P, Safari F, Naderi A, Mottaghi K**. Möebius syndrome, what anesthesiologist should consider about: a case report. *JARSS*. Published online 2020. doi:10.5222/jarss.2020.18480. Available at: https://jag.journalagent.com/anestezi/pdfs/JARSS_28_3_213_216.pdf.
6. **Budić I, Šurdilović D, Slavković A, Marjanović V, Stević M, Simić D**. Moebius syndrome: challenges of airway management. *Acta Clin Croat*. 2016 Mar;55 Suppl 1:94-7. PMID: 27276780.
7. **Picciolini O, Porro M, Cattaneo E, Castelletti S, Masera G, Mosca F, Bedeschi MF**. Moebius syndrome: clinical features, diagnosis, management and early intervention. *Ital J Pediatr*. 2016 Jun 3;42(1):56. doi: 10.1186/s13052-016-0256-5. PMID: 27260152; PMCID: PMC4893276.
8. **Chowdhury S, Sarkar S, Guha D, Dasgupta MK**. Moebius Syndrome: A Rare Entity or a Missed Diagnosis?

J Pediatr Neurosci. 2020 Apr-Jun;15(2):128-131. doi: 10.4103/jpn.JPN_72_19. Epub 2020 Jun 27. PMID: 33042246; PMCID: PMC7519742.

9. **Arbour C, Choinière M, Topolovec-Vranic J, Loiselle CG, Gélinas C**. Can fluctuations in vital signs be used for pain assessment in critically ill patients with a traumatic brain injury? *Pain Res Treat*. 2014;2014:175794. doi: 10.1155/2014/175794. Epub 2014 Jan 22. PMID: 24639895; PMCID: PMC3929987.
10. **Brooker GE, Cooper MG**. Airway management for infants with severe micrognathia having mandibular distraction osteogenesis. *Anaesth Intensive Care*. 2010 Jan;38(1):43-9. doi: 10.1177/0310057X1003800109. PMID: 20191776.
11. **Soriano SG, Martyn JA**. Antiepileptic-induced resistance to neuromuscular blockers: mechanisms and clinical significance. *Clin Pharmacokinet*. 2004;43(2):71-81. doi: 10.2165/00003088-200443020-00001. PMID: 14748617.