

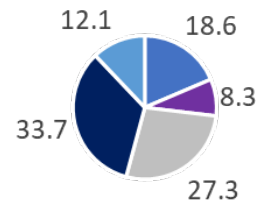
Anesthesia Considerations for Patients With Paralysis

Nathan Tackett, SAA, Nova Southeastern University

Introduction

Studies indicate that nearly 2% of the population in the United States is afflicted with some sort of paralysis. Potentially 1 out of 50 patients that an anesthesia provider may encounter will experience paralysis and it is important for the provider to know how to properly care for these patients. The main causes of paralysis include stroke (33.7%), spinal cord injury (27.3%), multiple sclerosis (18.6%), and cerebral palsy (8.3%) (Armour et al., 2016). These conditions can lead to different forms of paralysis such as monoplegia, hemiplegia, paraplegia, and quadriplegia. Since there is not a cure for any of the main causes for paralysis, it is important to distinguish how to treat paralyzed patients depending on the cause of the paralysis and what type of paralysis has occurred. The goal is to define the indications, contraindications, and risks for each of the named causes and types of paralysis in order to outline the best quality of care that can be given by anesthesia providers. Hemodynamic instabilities are a concern for most of these patients so continuous monitoring should be considered in appropriate cases, especially if there was a past stroke or spinal cord injury (Karnick, 2018; Bajaj, 2009).

Cause of Paralysis



- Multiple Sclerosis ■ Cerebral Palsy
- Spinal Cord Injury ■ Stroke
- Other

Considerations for Paralysis

Succinylcholine is highly likely to cause hyperkalemia which can lead to cardiac arrest due to higher proliferation of nACh receptors (Edgar, 2011). Comorbidities can increase the risk for complications, risk prevention involves timing the surgery correctly, close monitoring, and careful titration of anesthetics (Karnik, 2018). Continuous monitoring is vital for favorable patient outcomes, but paralysis may affect the reading of the monitor as it does with nerve stimulators. Most patients will have muscle weakness that increases risk of aspiration and respiratory depression. For all patients, clinicians should consider an RSI or an awake intubation if necessary. Post op mechanical ventilation may be necessary. Regional anesthesia is a good choice to help prevent rapid hemodynamic changes and will help prevent issues such as autonomic hyperreflexia but should be avoided in patients with multiple sclerosis or cognitive impairment. (Stoelting, 2012).

Stroke

Patients with a history of stroke tend to have co-existing vascular disease and are prone to co-morbidities such as diabetes mellitus, hypertension, and ischemic heart disease. The brain is very vulnerable to secondary injury, so it is important to maintain normal to high blood pressure to protect against ischemic stroke. Systolic blood pressure should be greater than 90 mm Hg intraoperatively or MAP should be greater than 70-80mmHg. It is also imperative that hypoxia is avoided. The goal is to protect the patient from risk of another stroke and limit any further organ damage from hypoperfusion. Invasive monitoring should be used if possible and the patients should be watched closely postoperatively. If the patient takes low dose aspirin (75mg) for anti-thrombosis, it can be continued for surgeries with minimal estimated blood loss. The sudden withdrawal of aspirin could potentially cause hypercoagulation leading to thrombosis during surgery. Clopidogrel should be stopped 5-7 days before surgery because it has been associated with a high risk of intraoperative bleeding. Heparin may be useful for clotting factors. Anti-thrombolytics should be resumed once surgical bleeding has been controlled (Karnik, 2018).

Spinal Cord Injury

The effects of spinal cord injuries are different depending on the location of the lesion. C3-C5 involve the phrenic nerve so the patient is more prone to apnea and will require intubation and mechanical ventilation. Below C5 or C6 will have an impaired ventilation and oxygenation, up to a 70% decrease in vital capacity. Cardio-accelerator fibers are located at T1-T4, patients may be prone to AV block, bradycardia, bradydysrhythmias, and cardiac arrest. An injury above T7 will result in alveolar ventilation impairment (Ezekiel, 2003). Autonomic hyperreflexia is a complication that can occur in patients with spinal cord injury. The anesthesia providers should be responsible for educating the patient about autonomic hyperreflexia before a surgery and aware of the best treatment for their patient (de la Rica, 2014).

Multiple Sclerosis

Triggers of symptoms and muscle weakness include stress, heat, infection, hyponatremia, and sometimes anesthetic agents. It may be useful to use a sedative that does not have respiratory depressant effects such as Precedex on these patients to prevent the triggering of symptoms. Hypotension is a concern with these patients so low dose propofol should be used on induction. Non-depolarizing muscle relaxants have an exaggerated effect on these patients and should be used at a lower dose to avoid residual blockade; Suggamadex should be considered for full reversal of these patients. Atropine and scopolamine should be avoided due to their ability to cross the blood brain barrier and reduce sweating, increasing temperature and worsening symptoms. Spinal anesthesia should be avoided due to its ability to worsen symptoms since the nerve fibers in the spinal cord are demyelinated and more sensitive to local anesthetic toxicity. If an attack occurs treat with corticosteroids, immunosuppressants, glatiramer acetate, and interferon-beta (Fleisher, 2012).

Cerebral Palsy

The significant challenge in all of these patients is controlling spasticity and avoiding contractures. Up to 50% of CP patients have epilepsy and are at high risk for perioperative seizures. Aspiration pneumonia is associated with CP and may result in further respiratory complications. Nearly 50% of those suffering from CP have an intellectual disability affecting the anesthetic plan. They are also prone to excessive salivation and chronic pain. Glycopyrrolate and scopolamine are commonly used anticholinergics pre-operatively. It is imperative to use multimodal analgesia to control post operative pain and avoid opioids that have respiratory depressant effects (Prosser, 2010).

Discussion

Many paralyzed patients will have coexisting comorbidities which need to be accounted for when creating a plan for the patient. Regardless of the cause, any patient with paralysis should be monitored closely for hemodynamic changes and should be treated accordingly in order to prevent secondary injury and other fatal outcomes. Maintaining proper blood pressure, glucose levels, and oxygen levels were key concerns with patients with paralysis. Some of the monitoring that is used will be affected by the paralysis, mainly nerve stimulators which will affect the process of emergence, providers should always consider the need for mechanical ventilation post operatively in these patients. Succinylcholine, which is normally used for rapid sequence inductions should be avoided in all paralyzed patients to prevent inducing hyperkalemia and potential cardiac arrest. Each cause of paralysis has its own risks which can be prevented and treated with proper care.

Conclusion

Though patients with paralysis have their own set of considerations it is important to further breakdown the cause of their paralysis in order to provide the best quality of care for the patient. It is beneficial to use continuous invasive monitoring, when possible, in paralyzed patients in order to avoid potential complications associated with the causes of paralysis and prevent secondary injury. The continuous monitoring will alert the clinician of potential complications such as autonomic hyperreflexia or stroke and allow for quick and efficient treatment. No matter the cause of the patient's paralysis, it is important to consider their other symptoms and their wishes when creating an anesthetic plan.

References

- Armour, B. S., Courtney-Long, E. A., Fox, M. H., Fredine, H., & Cahill, A. (2016). Prevalence and Causes of Paralysis-United States, 2013. *American journal of public health*, 106(10), 1855-1857. <https://doi.org/10.2105/AJPH.2016.303270>
- de la Rica, A. S., Ontoria, J., & Gilsanz, F. (2014). Hypobaric spinal anesthesia in a paraplegic patient. *Journal of Anaesthesiology, Clinical Pharmacology*, 30(2), 292. <https://doi.org/10.4103/0970-9185.130120>
- Edgar, P. (2011). Some old truths are still true ... succinylcholine in spinal cord injury. *British Journal of Anaesthesia*, 106(3), 417-418. <https://doi.org/10.1093/bja/aer014>
- Ezekiel MR. Handbook of Anesthesiology, 2002-2003 Edition. Current Clinical Strategies Publishing, pp. 165-66
- Fleisher, L. (2012). Anesthesia and Uncommon Diseases 6th Ed; pp. 267-270
- Karnik, H. S., & Jain, R. A. (2018). Anesthesia for Patients with Prior Stroke. *Journal of Neuroanaesthesiology and Critical Care*, 05(03), 150-157. <https://doi.org/10.1055/s-0038-1673549>
- Prosser, D., & Sharma N. (2010). Continuing education in anesthesia critical care and pain, volume 10, issue 3. pp 72-76
- Stoelting, R. K., Hines, R. L., & Marshall, K. E. (2012). Stoelting's anesthesia and co-existing disease. Philadelphia: Saunders/Elsevier.

