

Anaesthesia recommendations for patients suffering from

Neuromyelitis optica spectrum disorder

Disease name: Neuromyelitis optica spectrum disorder

ICD 10: G36.0

Synonyms: Devic's Disease, Devic's Syndrome, Neuromyelitis optica, NMO, NMOSD

Neuromyelitis Optica spectrum disorder refers to a syndrome characterized by recurrent optic neuritis and/or longitudinally extensive transverse myelitis. Having only been recently recognized to be a different clinical entity from multiple sclerosis, there are scant publications regarding appropriate anesthetic and perioperative management of this disease.

Neuromyelitis optica spectrum disorder (NMOSD) is often described as an idiopathic, relapsing, severe demyelinating disease of the central nervous system (CNS) that preferentially affects the optic nerve and spinal cord, although more correctly the pathology reflects an inflammatory astrocytopathy with secondary demyelination. It has recently been recognized as a distinct disease process from multiple sclerosis [1], associated, in most, but not all patients, by the presence of an IgG antibody to aquaporin-4, a water channel found on CNS astrocytes [2]. Patients typically experience repeating bouts of optic neuritis and/or longitudinally extensive myelitis of three or more vertebral segments in length but an area postrema syndrome of sustained nausea and/or and hiccups due to medullary involvement is also recognised [3].

Medicine in progress



Perhaps new knowledge

Every patient is unique

Perhaps the diagnostic is wrong



Find more information on the disease, its centres of reference and patient organisations on Orphanet: www.orpha.net

Disease summary

Recently, the diagnosis criteria for NMOSD have been expanded as AQP4-IgG seropositive status is no longer a requirement for NMOSD [4-6]:

Diagnostic criteria for NMOSD with AQP4-IgG:

1. At least 1 core clinical characteristic
2. Positive test for AQP4-IgG using best available detection method (cell-based assay strongly recommended)
3. Exclusion of alternative diagnoses

Diagnostic criteria for NMOSD without AQP4-IgG or NMOSD with unknown AQP4-IgG status:

1. At least 2 core clinical characteristics occurring as a result of one or more clinical attacks and meeting all of the following requirements
 - a. At least 1 core clinical characteristic must be optic neuritis, acute myelitis with longitudinally extensive transverse myelitis lesions (LETM)
 - b. Dissemination in space (2 or more different core clinical characteristics)
 - c. Fulfillment of additional MRI requirements, as applicable
2. Negative tests for AQP4-IgG using best available detection method, or testing unavailable
3. Exclusion of alternative diagnoses

Core clinical characteristics:

1. Optic Neuritis
2. Acute Myelitis
3. Area postrema syndrome: episode of otherwise unexplained hiccups or nausea and vomiting
4. Acute brainstem syndrome
5. Symptomatic narcolepsy or acute diencephalic clinical syndrome with NMOSD-typical diencephalic MRI lesions
6. Symptomatic cerebral syndrome with NMOSD-typical brain lesions

Additional MRI requirements for NMOSD without AQP4-IgG and NMOSD:

1. Acute optic neuritis: requires brain MRI showing (a) normal findings or only nonspecific white matter lesions, OR (b) optic nerve MRI with T2-hyperintense lesion or T1-weighted gadolinium-enhancing lesion extending over $>1/2$ optic nerve length or involving optic chiasm
2. Acute myelitis: requires associated intradmedullary MRI lesion extending over ≥ 3 contiguous segments (LETM) OR ≥ 3 contiguous segments of focal spinal cord atrophy in patients with history compatible with acute myelitis
3. Area postrema syndrome: requires associated dorsal medulla/area postrema lesions
4. Acute brainstem syndrome: requires associated periependymal brainstem lesions

NMOSD is thought to represent less than 1% of all CNS demyelinating diseases in the Caucasian population, but 20-48% of CNS demyelinating disease in certain non-Caucasian

populations, particular in Asia and Africa [7]. Since NMOSD has been shown to have a different pathophysiology than multiple sclerosis, NMOSD has been observed to behave differently. Immunomodulatory treatments that have been shown to help multiple sclerosis have been also shown to be ineffective in NMOSD, while the inverse is true as well [8].

Typical surgery

Patients with NMOSD are neither at any particular elevated risk for any type of surgical intervention nor are they likely to require specific surgical therapies as all treatments are focused on modulating the immune system with medication. In severe cases that are refractory to standard medical treatment, autologous hematopoietic stem cell transplantation has been shown to be beneficial, at least for a period of time [9], which would require administration of an anaesthetic.

Type of anaesthesia

Both neuraxial and general anaesthetics in patients with NMOSD have been reported in the literature [10-15], with a majority of cases involving pregnant women, although not all. While two of these case reports describe two cases of neuromyelitis optica flares in women after spinal anesthetics [10,11], subsequent case reports have also demonstrated spinal anesthetics that did not have any neurological sequelae. Because the disease has a relapsing nature, it is difficult to know if these case reports are observing coincidental findings and inappropriately inferring a causal relationship between administration of a spinal anesthetic and development of- or relapse of disease.

As the use of regional anesthesia has been shown to be safe in patients with multiple sclerosis [16,17], it is reasonable to think that regional anesthesia is also safe in patients with NMOSD. Although unsupported by any evidence, it also seems reasonable to avoid regional anesthesia only in the instance that the regional anesthetic would require needle placement through any existing lesions during a flare of NMOSD.

Necessary additional diagnostic procedures (preoperative)

If a regional anaesthetic is considered during a flare of NMOSD and current symptoms suggest neurological lesions in the same general anatomical area as the administration of the neuraxial anaesthetic, an MRI of the area to ensure avoidance of active NMOSD lesions should strongly be considered. A thorough preoperative neurological examination, including a neurology consultation, is crucial to understanding a patient's current disease process, which will help with any subsequent development of neurological symptoms.

Particular preparation for airway management

The presence of NMOSD does not by itself affect airway management in any particular way.

Particular preparation for transfusion or administration of blood products

As patients with NMOSD are typically undergoing immunomodulatory treatments, a clear understanding of the patient's immune function to facilitate appropriate irradiation, leukocyte reduction, and cytomegalovirus testing of any donor products.

Particular preparation for anticoagulation

The presence of NMOSD does not by itself affect anticoagulation in any particular way.

Particular precautions for positioning, transport or mobilisation

Patients with active symptoms of transverse myelitis may have motor and/or sensory deficits, careful attention should be paid to positioning, and assistance with mobilization may be necessary before and after anaesthesia administration.

Probable interaction between anaesthetic agents and patient's long-term medication

Treatment of an NMOSD exacerbation is typically started with high dose intravenous methylprednisolone [18,19]. If initial treatment with methylprednisolone is unsuccessful, plasma exchange is the next line of treatment. In order to prevent bouts of NMOSD from occurring, patients are typically maintained on azathioprine [20], mycophenolate [21], rituximab [22], methotrexate [23], mitoxantrone [24], and oral corticosteroids [25]. Unless anaesthetics have been shown to interact with the above drugs, which currently is not the case, no additional consideration should be necessary.

Anaesthesiologic procedure

Patients with NMOSD are likely to have a history of chronic pain related to either optic neuritis and/or transverse myelitis. Whether or not a general, neuraxial or regional anaesthetic is chosen, patients with chronic pain should be offered analgesic and antihyperalgesic therapies; these may include the administration of NMDA antagonists (nitrous oxide, ketamine) perioperatively as reported in a patient with a severe relapse of NMOSD undergoing a cesarean delivery under spinal anesthesia [15]. In this case report, the patient received substantial benefit by the acute addition of 50% nitrous oxide via face -mask to manage a severe hyperalgesic response to viscerally-mediated pain.

Particular or additional monitoring

The presence of NMOSD does not by itself suggest any additional monitors be used perioperatively.

Possible complications

While one case report suggests a causal relationship between neuraxial anesthesia and the occurrence or flare of NMOSD [10], subsequent reports have not seen this relationship [11-15]. Treatment should be focused on minimizing perioperative inflammation, and taking into account a patients' immune system at the time of care.

Postoperative care

A thorough postoperative neurological examination is recommended, especially if there are patient-reported changes from the preoperative neurological exam.

Information about emergency-like situations / Differential diagnostics

caused by the illness to give a tool to distinguish between a side effect of the anaesthetic procedure and a manifestation of the disease

There are no specific emergency-like situations in NMOSD, and while a misdiagnosis is unlikely, other demyelinating disease include multiple sclerosis, acute disseminated encephalomyelitis, systemic lupus erythematosus and Behcet disease can have similar presentations [26-28].

Ambulatory anaesthesia

The presence of NMO does not by itself affect ambulatory care or recovery from anaesthesia, other than management of acute and chronic pain, in any particular way.

Obstetrical anaesthesia

While there are case reports [10;11;13-15] on the management of parturients with NMOSD, there is also a case series [12] of patients with NMOSD, reporting various findings with the administration of general and regional anaesthesia. In contrast to multiple sclerosis, exacerbations tend to increase in frequency and severity during pregnancy in women with pre-existing NMOSD [12]. While two case reports have suggested a causal relationship between neuraxial anaesthesia and exacerbation or development of NMOSD, subsequent reports have not shown this relationship. Higher risks of relapse have been established in both multiple sclerosis and NMOSD after delivery, and as such, there is a need to determine what may be associated with an anesthetic exposure (which typically occurs right before a delivery) and what is a consequence of delivery itself [29-31]. There is not enough evidence to firmly establish or refute the presence of any type of association.

Literature and internet links

1. Barnett MH, Sutton I. Neuromyelitis optica: not a multiple sclerosis variant. *Current opinion in neurology*. 2012;25(3):215-220
2. Ransohoff RM. Illuminating neuromyelitis optica pathogenesis. *Proceedings of the National Academy of Sciences of the United States of America*. 2012;109(4):1001-1002
3. Wingerchuk DM. Neuromyelitis optica. *Advances in neurology*. 2006;98:319-333
4. Krupp LB, Banwell B, Tenenbaum S. Consensus definitions proposed for pediatric multiple sclerosis and related disorders. *Neurology*. 2007;68(16 Suppl 2):S7-12
5. Wingerchuk DM, Lennon VA, Pittock SJ, Lucchinetti CF, Weinshenker BG. Revised diagnostic criteria for neuromyelitis optica. *Neurology*. 2006;66(10):1485-1489
6. Wingerchuk DM, Banwell B, Bennett JL, et al. International consensus diagnostic criteria for neuromyelitis optica spectrum disorders. *Neurology*. 2015;85(2):177-189
7. Wingerchuk DM, Lennon VA, Lucchinetti CF, Pittock SJ, Weinshenker BG. The spectrum of neuromyelitis optica. *Lancet neurology*. 2007;6(9):805-815
8. Wingerchuk DM. Neuromyelitis optica. *International MS journal / MS Forum*. 2006;13(2):42-50
9. Greco R, Bondanza A, Oliveira MC, et al. Autologous hematopoietic stem cell transplantation in neuromyelitis optica: a registry study of the EBMT Autoimmune Diseases Working Party. *Mult Scler*. 2015;21(2):189-197
10. Hosseini H, Brugieres P, Degos JD, Cesaro P. Neuromyelitis optica after a spinal anaesthesia with bupivacaine. *Mult Scler*. 2003;9(5):526-528
11. Facco E, Giorgetti R, Zanette G. Spinal anaesthesia and neuromyelitis optica: cause or coincidence? *European journal of anaesthesiology*. 2010;27(6):578-580
12. Bourre B, Marignier R, Zephir H, et al. Neuromyelitis optica and pregnancy. *Neurology*. 2012;78(12):875-879
13. Gunaydin B, Akcali D, Alkan M. Epidural anaesthesia for Caesarean section in a patient with Devic's Syndrome. *Anaesthesia*. 2001;56(6):565-567
14. Sadana N, Houtchens M, Farber MK. Anesthetic management of a parturient with neuromyelitis optica. *International journal of obstetric anaesthesia*. 2012;21(4):371-375
15. Greene N, Dinges E, Ciliberto C, Sedensky M, Landau R. Spinal anesthesia for cesarean delivery in a woman with neuromyelitis optica. *A A Case Rep*. 2014;2(9):108-110
16. Drake E, Drake M, Bird J, Russell R. Obstetric regional blocks for women with multiple sclerosis: a survey of UK experience. *International journal of obstetric anaesthesia*. 2006;15(2):115-123
17. Vukusic S, Hutchinson M, Hours M, et al. Pregnancy and multiple sclerosis (the PRIMIS study): clinical predictors of post-partum relapse. *Brain : a journal of neurology*. 2004;127(Pt 6):1353-1360
18. Trebst C, Jarius S, Berthele A, et al. Update on the diagnosis and treatment of neuromyelitis optica: recommendations of the Neuromyelitis Optica Study Group (NEMOS). *Journal of neurology*. 2014;261(1):1-16
19. Merle H, Olindo S, Jeannin S, et al. Treatment of optic neuritis by plasma exchange (add-on) in neuromyelitis optica. *Arch Ophthalmol*. 2012;130(7):858-862
20. Costanzi C, Matiello M, Lucchinetti CF, et al. Azathioprine: tolerability, efficacy, and predictors of benefit in neuromyelitis optica. *Neurology*. 2011;77(7):659-666
21. Huh SY, Kim SH, Hyun JW, et al. Mycophenolate mofetil in the treatment of neuromyelitis optica spectrum disorder. *JAMA neurology*. 2014;71(11):1372-1378
22. Kim SH, Jeong IH, Hyun JW, et al. Treatment Outcomes With Rituximab in 100 Patients With Neuromyelitis Optica: Influence of FCGR3A Polymorphisms on the Therapeutic Response to Rituximab. *JAMA neurology*. 2015;72(9):989-995
23. Kitley J, Elson L, George J, et al. Methotrexate is an alternative to azathioprine in neuromyelitis optica spectrum disorders with aquaporin-4 antibodies. *Journal of neurology, neurosurgery, and psychiatry*. 2013;84(8):918-921
24. Cabre P, Olindo S, Marignier R, Jeannin S, Merle H, Smadja D. Efficacy of mitoxantrone in neuromyelitis optica spectrum: clinical and neuroradiological study. *Journal of neurology, neurosurgery, and psychiatry*. 2013;84(5):511-516
25. Watanabe S, Misu T, Miyazawa I, et al. Low-dose corticosteroids reduce relapses in neuromyelitis optica: a retrospective analysis. *Mult Scler*. 2007;13(8):968-974

26. Graham D, McCarthy A, Kavanagh E, O'Rourke K, Lynch T. Teaching NeuroImages: longitudinally extensive transverse myelitis in neuro-Behcet disease. *Neurology*. 2013;80(18):e189-190
27. White C, Leonard B, Patel A. Longitudinally extensive transverse myelitis: a catastrophic presentation of a flare-up of systemic lupus erythematosus. *CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne*. 2012;184(3):E197-200.
28. Kitley JL, Leite MI, George JS, Palace JA. The differential diagnosis of longitudinally extensive transverse myelitis. *Mult Scler*. 2012;18(3):271-285
29. Zare-Shahabadi A, Langroodi HG, Azimi AR, Sahraian MA, Harirchian MH, Baghbanian SM. Neuromyelitis optica and pregnancy. *Acta Neurol Belg*. 2016.
30. Fabian M. Pregnancy in the Setting of Multiple Sclerosis. *Continuum (Minneap Minn)*. 2016;22(3):837-850
31. Levesque P, Marsepoil T, Ho P, Venutolo F, Lesouef JM. [Multiple sclerosis disclosed by spinal anesthesia]. *Ann Fr Anesth Reanim*. 1988;7(1):68-70.

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