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Neuromyelitis Optica (NMO) — Study Review

Zapalenie nerwów wzrokowych i rdzenia Devica (NMO) — przegląd badań

Justyna Chojdak-Łukasiewicz

Department and Clinic of Neurology, Wrocław Medical University, Poland

Abstract

Neuromyelitis optica (NMO, Devic's disease) is a rare autoimmune, demyelinating disease of the central nervous system (CNS), mainly affecting the optic nerves and spinal cord. For a very long time it was considered as a variant of multiple sclerosis (MS). In 2004 antibodies against aquaporin 4 (AQP4) were discovered. AQP4 is a water channel which plays a central role in the pathogenesis of NMO. Typical NMO is characterized by optic neuritis (ON) with longitudinal extensive transverse myelitis (LETM). Recommended therapeutic options for acute attacks of NMO include high doses of corticosteroids and/or plasma exchange. In long-term treatment a lot of immuno-suppressants are used. In recent years there has been an increased range of treatment options, which may prevent relapses and allow a better outcome. In NMO, as for MS, the role of the nurse is very important. **(JNNN 2021;10(2):82–85)**
Key Words: aquaporin 4, demyelinating diseases, neuromyelitis optica, nurse

Streszczenie

Zapalenie nerwów wzrokowych i rdzenia kręgowego (NMO, choroba Devica) jest rzadką autoimmunologiczną chorobą OUN o charakterze demielinizacyjnym, zajmującą nerwy wzrokowe i rdzeń kręgowy. Do czasu odkrycia w 2004 r. przeciwciał przeciwko akwaporynie typu 4, NMO uważano za formę stwardnienia rozsianego. Choroba charakteryzuje się współwystępowaniem zapalenia pozagałkowego nerwu wzrokowego i podłużnego zapalenia rdzenia. Leczenie rzutów choroby opiera się na podawaniu kortykosteroidów w formie dożylnej i/lub plazmaferezy. W zapobieganiu nawrotom stosuje się leki immunosupresyjne. W ostatnich latach obserwuje się coraz więcej nowych metod terapii, mających na celu zmniejszenie częstości rzutów choroby oraz poprawiających rokowanie. W opiece nad pacjentami, podobnie jak w stwardnieniu rozsianym rola pielęgniarki jest bardzo ważna. **(PNN 2021;10(2):82–85)**
Słowa kluczowe: akwaporyna 4, choroby demielinizacyjne, zapalenie nerwu wzrokowego, pielęgniarka

Introduction

Neuromyelitis optica (NMO), also known as Devic's disease and neuromyelitis optica spectrum disorders (NMODS) are a rare autoimmune, demyelinative disorder of the central nervous system (CNS). The first description of the disease manifests itself with optic neuritis and myelitis, and was presented by Eugene Devic and his student Fernand Gault in 1894. For many years, NMO was considered as a form of multiple sclerosis (MS) [1]. In 2004 the discovery of specific IgG antibodies to aquaporin 4 (AQP4) helped to classify NMO as a separate disease and not a variant of MS [2]. AQP4 is the most widely expressed water channel in brain, spinal cord and optic nerves.

The term NMO spectrum disorder is a wider term and includes diseases with symptoms of NMO with or without anti-aquaporin-4-autoantibody (anti-AQP4-Ab) [3,4]. Typical NMO is characterized by optic neuritis (ON) with longitudinal extensive transverse myelitis (LETM). In 2015, Wingerchuk et al. published an international consensus on diagnostic criteria for NMOSD. Based on this recommendation NMOSD includes: classical NMO (ON+LETM), isolated ON or LETM, ON and/or LETM associated with autoimmune systemic diseases, ON and LETM

accompanied by symptoms of brainstem, diencephalon or cerebral involvement, Asian oculospinal form of multiple sclerosis [1].

Epidemiology

The incidence of NMO per 100,000 population ranges from 0.053 to 0.40, while the prevalence is 0.5–10/100,000 population and is the highest in the populations of the Far East [5]. The reported incidence and prevalence of NMOSD are dependent on geographical location and ethnicity. In the past many patients (>20%) with NMO were misdiagnosed with MS [6]. The NMO are more often men (9:1) [1]. The median age of onset is 39.7 years which differs from most patients with MS. However Devic's disease can be also diagnosed in children and the elderly [6,7].

Most cases of NMO are sporadic, although a few familial cases have been described in the literature [8]. Several HLA variants and other polymorphisms have been reported in association with NMO, and about 3% of patients have affected relatives [8,9]. NMO has been associated in approximately 10–40% with other autoimmune disorders, including myasthenia gravis, systemic lupus erythematous, Sjögren's syndrome, and celiac disease [6,10].

Clinical Characteristics

The typical clinical features of NMO are recurrent acute attacks of transverse myelitis and/or uni- or bilateral optic neuritis. Clinical characteristics of optic neuritis is ocular pain exacerbated by eye movement, loss of central vision and positive visual phenomena called photopsias (spontaneous flashing black squares, flashes of light or showers of sparks, sometimes precipitated by eye movement). Optic neuritis in NMO have a more severe course than in MS and is associated with persistent visual loss. Longitudinally transverse myelitis (LETM) is defined as myelitis affecting at least 3 spinal segments. Transverse myelitis is typical with paraparesis, bilateral sensory loss and sphincter dysfunction. Symptoms of TM range from mild sensory deficits to severe sensorimotor tetraparesis. In a 30% recurrent form of NMO, symptoms such as radicular pain, paroxysmal tonic spasms, persisting itching and Lhermitte's sign occurred. In 15% of patients with NMO encephalopathy, brainstem dysfunction and hypothalamic abnormalities are observed. Brainstem lesions can cause respiratory insufficiency.

Table 1. Diagnostic criteria Neuromyelitis Optica Spectrum Disorders

Core clinical syndromes	
1. Optic neuritis. 2. Acute myelitis. 3. Area postrema syndrome — unexplained hiccups, nausea or vomiting. 4. Acute brainstem syndrome (oculomotor disturbances, bulbar syndrome, respiratory failure). 5. Symptomatic narcolepsy or acute diencephalic syndrome (apathy or agitation, hypersomnia, obesity, autonomic dysfunction) with NMOSD-typical changes in MRI. 6. Symptomatic cerebral syndrome (confusion, seizures) with NMOSD-typical brain lesions.	
NMOSD with AQP4-IgG positive	**NMOSD with AQP4-IgG negative or unmarked**
1. ≥1 core clinical syndrome. 2. Seropositivity for AQP4-IgG. 3. Exclusion of other diagnosis.	1. ≥2 core clinical symptoms present as a result 1 or more clinical attacks of the following: a. at least 1 of core clinical symptoms: optic neuritis, acute myelitis with LETM or area postrema syndrome, b. dissemination in space (≥2 core clinical symptoms), c. fulfillment of additional MRI criteria. 2. AQP4-IgG negative or test unavailable. 3. Exclusion of other diagnosis.
MRI criteria for NMOSD without AQP4	
1. Acute optic neuritis: a. no change or non-specific changes in the white matter of the brain or b. optic nerve with T2-hyperintense lesion or T1-weighted gadolinium enhancing lesion extending over >1/2 optic nerve length or involving optic chiasm. 2. Acute myelitis: a. intramedullary MRI lesion extending over ≥3 contiguous segments (LETM) or b. ≥3 contiguous segments of focal spinal cord atrophy in patients with history compatible with acute myelitis. 3. Area postrema syndrome: dorsal medulla/area postrema MRI lesion. 4. Acute brainstem syndrome: peri-ependymal brain-stem lesions.	

Table 1 shown an international consensus on diagnostic criteria for NMOSD, published by Wingerchuk in 2015. According to these, NMOSD includes: classical NMO (optic neuritis–ON+longitudinal extensive transverse myelitis — LETM), isolated ON or LETM, ON and/or LETM associated with autoimmune systemic diseases, ON and LETM accompanied by symptoms of brainstem, diencephalon or cerebral involvement, Asian oculospinal form of multiple sclerosis.

The course of the disease could be monophasic (no relapses in the future), recurrent (attacks of transverse myelitis, optic neuritis), or both at the same time [4,11]. In most cases NMO starts with ON (in 45% patients with AQP4-IgG) or TM (in 47% patients with AQP4-IgG). Simultaneous ON and TM at onset is observed in 4.4% of patients with AQP4-IgG.

In 80–90% of patients, NMO is characterised by a relapsing course. During a relapse, the symptoms subacutely increase to reach a plateau phase and then gradually subside, usually with incomplete remission. Accumulation of residual symptoms after relapses results in stepwise deterioration in motor, sensory, and visual function [4,12].

Many diseases, including inflammatory, infectious, vascular or neoplastic conditions, can mimic the clinical and radiological phenotypes of NMOSD.

Treatment

A NMOSD therapeutic approach comprises of treatment of acute relapses and long-term therapy that prevents further exacerbations and accumulation of disability. The treatment of relapses includes intravenous pulse methylprednisolone (IVMP), plasma exchange (PLEX), Intravenous immunoglobulin (IVIG) and immuno-adsorption therapy (IA).

IVMP at a dose of 1000 mg for 3–5 days with or without oral tapering remains the first line of relapse treatment [13]. In patients with contra-indications or insufficient response to IVMP, therapeutic plasma exchange (plasmapharesis PLEX) is recommended. The treatment of NMOSD exacerbation usually comprises 5–7 sessions within 10–14 days. The side effects of plasmapheresis include: infection of central venous catheter, electrolyte abnormalities and bleeding due to depletion of coagulation factors. In some cases also immuno-adsorption (IA), which is a more selective method of apheresis, can be used. A good option for patients with a poor response to steroids/PLEX/IA are intravenous immunoglobulins (IVIG). The treatment course is a dosage of 0.4 g/kg/d within 5 days [14].

Preventive Treatment

Preventive therapy should be included shortly after treatment of relapse, in order to prevent stepwise disability deterioration. The B-cells play a large role in the pathogenesis of the NMO, therefore B-cell depletion therapy is a therapeutic option. Multiple immunosuppressive therapies have been used for NMOSD as monotherapy or in conjunction with low-dose corticosteroids. The most commonly used first-line treatment in NMO are azathioprine and rituximab. For long-term therapy immunosuppressive drugs, such as mitoxantrone, methotrexate, cyclophosfamide, mykophenolane mofetil and cyclosporine are used. Based on better knowledge of pathogenesis of the disease, there are novel drugs being studied, targeting complement activation (eculizumab), interfering with interleukin-6 receptor activation (tocilizumab, satralizumab) and depleting antibody-producing plasma cells. Also the new direction of therapies are documented.

A new direction based on a monoclonal antibody, such as aquaporumab and ublituximab are well documented [6,15,16].

Conclusions

NMO is a severe neurological disorder, clinically characterised by severe optic neuritis and transverse myelitis. The multidisciplinary team, in which a nurse plays an important role, helps patients to resume a normal lifestyle.

Implications for Nursing Practice

Neuromyelitis optica is a devastating disease, associated with progression of disability. Symptoms of NMO typically has strong negative effects on physical functioning. Patients have a lower quality of life, because a lot of factors such as disability, fatigue, depression have a negative impact on QOL. Patients need a multidisciplinary approach to care. The role of the nurse is important at all stages of the disease to support patients. The nursing care plan goals for patients is to shorten exacerbations and relieve neurologic deficits and the patient can resume a normal lifestyle. Nurses are taking part in the educational process of patients and their families. The nurse also has a role in screening for factors such as cognitive difficulties and health literacy issues, and adapt teaching as appropriate.

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Corresponding Author:

Justyna Chojdak-Łukasiewicz

Department and Clinic of Neurology,
Wrocław Medical University, Poland
Borowska 213 street, 50-556 Wrocław, Poland
e-mail: justyna.chojdak-lukasiewicz@umed.wroc.pl

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