

Plasma Exchange in Neuromyelitis Optica Treatment

“Plasma exchange for neuromyelitis optica associated with AQP4-IgG seropositivity is more effective, especially for multiple attacks and glucocorticoid therapy invalid patients.”



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COLUMN ARTICLE

Neuromyelitis optica (NMO, also known as Devic's disease) is a disorder of the central nervous system that involve optic nerve and spinal cord which associated 10-40% of the time with other autoimmune disorders. NMO is characterized by concurrence of optic neuritis (ON) and transverse myelitis (TM), and at least two of three supportive criteria that enhance diagnostic specificity (MRI evidence of a contiguous spinal cord lesion in at least 3 segments; brain MRI not diagnostic of MS; and AQP4-IgG seropositivity [1]).

A highly specific serum marker called antiaquaporin-4 antibody (AQP4-IgG) that found in 2004 demonstrated that the pathophysiology of NMO was different from multiple sclerosis (MS), a more common demyelinating disorder could cause optic neuritis. AQP4 is a bidirectional water channel protein expressed on the plasma membranes of astrocytes, retinal Müller cells, skeletal muscle, and some epithelial cells in kidney, lung and the gastrointestinal tract, especially in the cerebral ventricle filled with cerebrospinal fluid and brain closed to subarachnoid cavity [2]. AQP4-IgG was found that plays a relevant pathogenetic role in NMO by inducing an increase of blood-brain barrier permeability, complement cascade activation and astrocytic cytotoxicity [3].

The diagnostic specificity of AQP4-IgG test is almost 99%, and sensitivity levels have improved to 73-77% [4]. So that patients with an autoimmune optic neuropathy being seropositive for AQP4-IgG should be given a diagnosis of NMO or NMO spectrum disease [5].

Currently the treatment of acute NMO is mostly glucocorticoids, non-specific immunosuppressive agents and intravenous immunoglobulin therapy for patients with chronic phase. Recently some most promising drugs have been reported: AQP4 receptor inhibitor and B-cell specific monoclonal antibody (rituximab) [6]. Plasma exchange (PE) is a better therapeutic option for severe symptoms or glucocorticoid therapy invalid patients during NMO attack and other NMO spectrum disorders patients.

PE is an effective method for the treatment of neuroimmunologic disorders [7], for example: acute disseminated encephalomyelitis, systemic lupus erythematosus(SLE), Guillain-Barré syndrome, myasthenia gravis (MG) and NMO [8].

PE is exporting the blood of patients through instrument, separating plasma and cellular components, removing plasma followed by replacement with fresh frozen plasma, human albumin or other replacements. According the Patient's condition, each PE treatment interval 1 ~ 3d, 2 to 3 times a week. Treatment with PE was beneficial during

the first 4 weeks, but the benefit was greatest when treatment was given early [9].

The mechanisms of PE include: (1) Reducing or eliminating the blood circulation pathogenic factors quickly and timely, such as circulating antibodies and immune complexes. (2) Immunomodulatory effects: reducing inflammatory factors, complement, fibrinogen, excluding the impact of cellular immunity cytokines, and while directly improving the immune function of patients by immunoglobulins in replacement fluid. (3) Supply missing component by input normal human plasma instead of patient plasma [10].

There is some disadvantage in the exchange process because of losing some beneficial substances, consuming large amounts of fresh frozen plasma, and may appear paresthesia, abnormal blood clotting, plasma allergic reaction, hypernatremia, metabolic alkalosis and colloidal osmotic pressure drop [11].

Allergy is the most common reaction of PE because of the following factors: (1) Fresh frozen plasma contains a variety of bioactive substances and variant proteins that cause allergic reaction with antigen or antibody in the body. (2) PE speed is 8 to 10-fold faster than conventional intravenous infusion speed, therefore too much allogeneic substance into the body in a short time inducing antigen - antibody reaction. (3) There are possibility of acquired antibodies passively from plasma in multiple sources [12].

Hypovolemic reactions due to the imbalance of input and output, which led to a decrease in effective circulating blood volume. The key to prevention is to keep the balance of input and output. The aura symptoms of hypovolemia should be pay attention in the PE course, such as fatigue, yawning, sweating, tears, etc. The output speed should be slow down immediately and make the input speed faster if reactions above appear. 5% albumin saline solution, fresh frozen plasma replacement solutions or hydroxyethyl starch sodium is complement better for blood volume. If necessary, the blood should be given back to vessel and vasopressors treatment given [13].

In conclusion, seriously ill patients and atypical or repeated ON should test serum AQP4-IgG which sounds a higher diagnostic specificity. PE might stabilize the clinical course in patients with steroid-refractory NMO. Clinical observations have suggested benefit for PE following high-dose IVMP in cases of refractory vision loss or following NMO exacerbations [1]. It is recommending PE early for large doses of hormones invalid NMO patients [14].

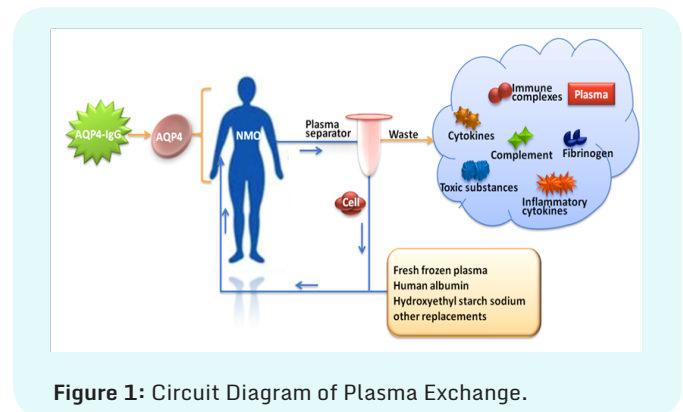


Figure 1: Circuit Diagram of Plasma Exchange.

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