Autoimmune neurological disorders: From pathogenesis to novel therapeutic approaches.

Onteddu Vasuki*

Department of Neurology, University of Arkansas for Medical Sciences, Little Rock, USA

Introduction

Autoimmune neurological disorders encompass a group of conditions in which the immune system mistakenly targets components of the nervous system, leading to inflammation, dysfunction, and damage. These disorders pose significant challenges in diagnosis and management due to their diverse clinical manifestations and the complexity of immune-mediated mechanisms. This essay aims to provide an overview of autoimmune neurological disorders, exploring their underlying pathogenesis, clinical presentations, and available treatment options. Understanding the intricate interplay between the immune system and the nervous system in these disorders is crucial for advancing our knowledge and developing effective therapeutic strategies [1].

Multiple Sclerosis (MS): Multiple Sclerosis is a chronic autoimmune neurological disorder characterized by inflammation, demyelination, and neurodegeneration in the Central Nervous System (CNS). The pathogenesis of MS involves a complex interplay of immune cells, including autoreactive T cells, B cells, and innate immune cells [2].

a. **Autoimmune attack on myelin**: In MS, autoreactive T cells recognize myelin proteins as foreign, triggering an immune response against myelin sheaths. Activated T cells release pro-inflammatory cytokines and recruit other immune cells, leading to myelin destruction and axonal damage. B cells also play a role by producing antibodies against myelin components, further exacerbating the autoimmune response.

b. **Clinical presentations and disease course**: MS can present with a wide range of symptoms, including fatigue, motor dysfunction, sensory disturbances, and cognitive impairment. The disease course can vary, with relapsing-remitting MS being the most common form initially, followed by secondary progressive MS in some cases. The heterogeneity of MS highlights the complex nature of the immune-mediated mechanisms involved [3].

c. **Treatment approaches**: Disease-Modifying Therapies (DMTs) are the primary treatment option for MS. These therapies aim to modulate the immune response, reduce inflammation, and slow disease progression. DMTs include immunomodulatory drugs, monoclonal antibodies targeting specific immune cells or molecules, and immune reconstitution therapies [4].

Guillain-Barré Syndrome (GBS): Guillain-Barré Syndrome is an acute autoimmune neurological disorder characterized by rapidly progressing weakness, sensory disturbances, and in severe cases, respiratory and autonomic dysfunction. The pathogenesis of GBS involves immune-mediated attack on peripheral nerves and nerve roots.

a. **Molecular mimicry and immune response**: In GBS, the immune system is triggered by molecular mimicry, where microbial antigens resemble components of peripheral nerves. The immune response involves activation of T cells, production of autoantibodies, and complement-mediated destruction of myelin and axons.

b. **Clinical presentations and subtypes**: GBS typically presents as a progressive ascending weakness, often preceded by an infection. It can be classified into several subtypes based on clinical and electrophysiological characteristics, including acute inflammatory demyelinating polyneuropathy (AIDP), axonal subtypes (Acute Motor Axonal Neuropathy [AMAN] and Acute Motor-Sensory Axonal Neuropathy [AMSAN]), and Miller Fisher Syndrome (MFS).

c. **Treatment approaches**: Treatment of GBS involves supportive care and Immunomodulatory Therapies. Intravenous Immunoglobulin (IVIG) and plasma exchange are commonly used to modulate the immune response and promote nerve regeneration. Early initiation of treatment is crucial to improve outcomes [5].

Autoimmune Encephalitis: Autoimmune encephalitis refers to a group of disorders characterized by inflammation in the brain parenchyma due to autoimmune mechanisms. These disorders often present with a combination of neurological and psychiatric symptoms.

Conclusion

Autoimmune neurological disorders pose significant challenges in diagnosis and management. Advances in understanding the immune mechanisms and developing targeted therapies have improved outcomes for many patients. Continued research, multidisciplinary collaboration, and individualized approaches to diagnosis and treatment are essential for further progress in this complex field.

***Correspondence to:** Onteddu Vasuki, Department of Neurology, University of Arkansas for Medical Sciences, Little Rock, USA, E-mail: vasuki@uams.edu

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