

ADVANCES IN THE DIAGNOSIS AND MANAGEMENT OF MYASTHENIA GRAVIS

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Abstract: Myasthenia gravis (MG) is a chronic autoimmune neuromuscular disorder characterized by fluctuating muscle weakness and fatigue caused by impaired transmission at the neuromuscular junction. The disease is most commonly associated with antibodies directed against acetylcholine receptors or other postsynaptic membrane proteins. Recent advances in immunology, neurophysiology, and molecular diagnostics have significantly improved the early detection and management of myasthenia gravis. Modern therapeutic approaches, including immunosuppressive agents, monoclonal antibodies, thymectomy, and individualized treatment strategies, have contributed to better clinical outcomes and quality of life for patients. This article reviews current developments in the diagnosis and management of myasthenia gravis, highlighting recent innovations and future perspectives in patient care.

Keywords: Myasthenia gravis, autoimmune disease, neuromuscular junction, acetylcholine receptor antibodies, diagnosis, treatment, immunotherapy, thymectomy, neurology.

Introduction

Myasthenia gravis is one of the most common autoimmune disorders affecting the neuromuscular junction. It results from an immune-mediated attack on postsynaptic membrane components, leading to impaired neuromuscular transmission and muscle weakness. The prevalence of myasthenia gravis has increased over recent decades, partly due to improved diagnostic methods and greater awareness among healthcare professionals. Clinically, the disease presents with fluctuating weakness of skeletal muscles, particularly affecting ocular, bulbar, respiratory, and limb muscles. Symptoms often worsen with activity and improve with rest. Early diagnosis is essential because untreated myasthenia gravis may lead to severe complications, including myasthenic crisis and respiratory failure. Advances in serological testing, electrophysiological studies, and imaging techniques have enhanced diagnostic accuracy. Furthermore, the development of targeted biological therapies and personalized treatment approaches has transformed the management of this condition. Understanding these advances is crucial for improving patient outcomes and reducing disease-related morbidity. The aim of this article is to review recent progress in the diagnosis and management of myasthenia gravis and to discuss emerging therapeutic strategies that may further improve patient care in the future.

Materials and Methods

This study was conducted as a narrative review of the current literature on myasthenia gravis, focusing on recent advances in diagnostic methods and treatment strategies. Scientific articles were retrieved from PubMed, Scopus, Web of Science, and Google Scholar databases. Publications published between 2015 and 2025 were selected to ensure the inclusion of up-to-date information. The search terms included “myasthenia gravis,” “neuromuscular junction,” “autoantibodies,” “diagnosis,” “electrophysiology,” “immunotherapy,” “thymectomy,” and “targeted treatment.” Original articles, systematic reviews, meta-analyses, clinical trials, and international guidelines were included in the study. Articles with insufficient scientific evidence, duplicate publications, and studies unrelated to the objectives of the review were excluded. The collected data were analyzed according to diagnostic techniques, serological markers, electrophysiological findings, imaging methods, conventional treatment approaches, and emerging biological therapies. Information from the

selected studies was synthesized to identify current trends and advancements in the diagnosis and management of myasthenia gravis.

Results

The review demonstrated significant improvements in the diagnosis of myasthenia gravis. Advances in antibody testing have increased diagnostic accuracy, particularly through the detection of acetylcholine receptor (AChR), muscle-specific kinase (MuSK), and lipoprotein receptor-related protein 4 (LRP4) antibodies. These biomarkers have enabled earlier diagnosis and more precise classification of disease subtypes. Electrophysiological studies remain essential diagnostic tools. Single-fiber electromyography and repetitive nerve stimulation were found to have high sensitivity in detecting abnormalities of neuromuscular transmission. In addition, modern imaging techniques have improved the identification of thymic abnormalities, including thymic hyperplasia and thymoma. Regarding treatment, pyridostigmine remains the first-line symptomatic therapy, while corticosteroids and immunosuppressive agents continue to be widely used for long-term disease control. Recent clinical studies have shown that targeted biological therapies, including complement inhibitors and monoclonal antibodies, provide substantial benefits for patients with refractory disease. These therapies were associated with improved muscle strength, reduced disease activity, and fewer exacerbations.

Discussion

The findings indicate that the diagnosis and management of myasthenia gravis have evolved considerably during the last decade. The availability of highly sensitive antibody assays has reduced diagnostic delays and improved patient outcomes. Earlier diagnosis allows timely initiation of treatment, thereby reducing the risk of severe complications such as respiratory failure and myasthenic crisis. Targeted biological therapies represent a major breakthrough in the treatment of myasthenia gravis. Unlike traditional immunosuppressive agents, these therapies specifically target the immune mechanisms involved in disease pathogenesis. As a result, they may provide greater efficacy while reducing treatment-related adverse effects. However, their high cost and limited accessibility remain important challenges in many healthcare settings. Another important development is the growing emphasis on personalized medicine. Treatment decisions are increasingly based on antibody status, disease severity, patient characteristics, and thymic pathology. Such individualized approaches may enhance therapeutic effectiveness and improve quality of life. Despite substantial progress, several challenges remain. Some patients continue to experience refractory disease, and the pathophysiological mechanisms underlying certain seronegative forms of

myasthenia gravis are not yet fully understood. Further research is needed to identify novel biomarkers and develop more effective therapeutic strategies. Future advances in immunology and molecular medicine are expected to further improve the diagnosis, treatment, and long-term prognosis of patients with myasthenia gravis.

Conclusion

Myasthenia gravis is a complex autoimmune neuromuscular disorder that continues to present diagnostic and therapeutic challenges. Recent advances in serological testing, electrophysiological techniques, and imaging modalities have significantly improved diagnostic accuracy and facilitated earlier disease detection. The identification of disease-specific autoantibodies has enhanced the understanding of disease mechanisms and contributed to more precise patient classification. In addition, the development of targeted biological therapies has transformed the management of myasthenia gravis, offering new treatment options for patients with refractory disease. Personalized treatment strategies based on clinical characteristics and antibody profiles have further improved patient outcomes and quality of life. Despite these achievements, challenges remain regarding accessibility to advanced therapies, long-term treatment safety, and the management of seronegative cases. Continued research into disease pathogenesis, novel biomarkers, and innovative therapeutic approaches is essential for optimizing patient care. Future developments in precision medicine are expected to further enhance the diagnosis and management of myasthenia gravis and improve long-term prognosis.

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