



REVIEW

Misdiagnosis of Multiple Sclerosis: Past, Present, and Future

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Abstract

Purpose of Review Misdiagnosis of multiple sclerosis (MS) is a prevalent worldwide problem. This review discusses how MS misdiagnosis has evolved over time and focuses on contemporary challenges and potential strategies for its prevention. **Recent Findings** Recent studies report cohorts with a range of misdiagnosis between 5 and 18%. Common disorders are frequently misdiagnosed as MS. Overreliance on MRI findings and misapplication of MS diagnostic criteria are often associated with misdiagnosis. Emerging imaging biomarkers, including the central vein sign and paramagnetic rim lesions, may aid diagnostic accuracy when evaluating patients for suspected MS.

Summary MS misdiagnosis can have harmful consequences for patients and healthcare systems. Further research is needed to better understand its causes. Concerted and novel educational efforts to ensure accurate and widespread implementation of MS diagnostic criteria remain an unmet need. The incorporation of diagnostic biomarkers highly specific for MS in the future may prevent misdiagnosis.

Keywords Multiple Sclerosis · Diagnosis · Misdiagnosis · Diagnostic Errors · Biomarkers

Introduction

The past two decades have witnessed a rapid evolution in the diagnosis and treatment of multiple sclerosis (MS). Revisions to the diagnostic criteria for MS have allowed for earlier diagnosis, which in turn has resulted in earlier initiation of disease modifying therapy (DMT) [1, 2]. Over time, these changes have prevented long-term disability accumulation in patients with MS [3]. Although sensitivity has continually improved with revisions to MS diagnostic criteria, diagnostic specificity continues to rely on the clinical acumen required to rule out a “better explanation” other than MS [4, 5]. More broadly, MS diagnostic criteria are comprised of iterative clinical assessments that are also frequently prone to misinterpretation and misapplication [6–8]. As a result, MS misdiagnosis (the incorrect assignment of the diagnosis of MS) has remained a frequent and

persistent problem [9]. Thus despite compelling data supporting the clinical benefit of early diagnosis, in practice, a new diagnosis of MS must be approached cautiously given the risk of misdiagnosis.

Misdiagnosis of MS has harmful consequences for patients and the healthcare systems [10]. This review examines data concerning MS misdiagnosis over time with a lens towards its prevention in contemporary clinical practice and highlights recent developments in the field that may improve the accuracy of diagnostic approaches to MS in the future.

Past: MS Misdiagnosis in the Pre-McDonald Criteria Era

Frequency of MS Misdiagnosis

Reports of MS misdiagnosis are found in the literature from the time of the first widely adopted diagnostic criteria for MS (the Schumacher criteria) [11] through the present. Prior to the 2001 McDonald criteria, the frequency of misdiagnosis was reported between 6% and 17% in a variety of cohorts (Table 1) [12–15]. However, these data were influenced by a number of biases and methodological limitations that limit their interpretation and generalizability. For

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Multiple Sclerosis Present And Future

G. Scarlato, W.B. Matthews



Multiple Sclerosis Present And Future:

Multiple Sclerosis G. Scarlato, W.B. Matthews, 2013-03-14 This book is based on the papers delivered at an International Workshop on Multiple Sclerosis held in Erice Italy from 29th August to 1st September 1983 The Meeting was organized with great efficiency in the delightful setting of the Centro di Cultura Scientifica Ettore Majorana by its Director Antonino Zichichi and was directed by the Editors of the Proceedings and by Professor C Alvisi of the University of Bologna The emphasis was deliberately on the contributions of laboratory science to the understanding of multiple sclerosis its etiology pathogenesis diagnosis and treatment Where so much is unknown disagreement was expected and indeed welcome and it is regrettable that it was not possible to publish verbatim the often animated and always interesting discussion Differing views on the relevance of experimental allergic encephalomyelitis to multiple sclerosis were expressed by Dr Wisniewski Professor Seitelberger and Professor Alvord who graphically illustrated his changing beliefs over the years Professor Seitelberger laid much greater emphasis on remyelination in remission in multiple sclerosis than had previously been the accepted view The disorder of both humoral and cellular immunity in multiple sclerosis was discussed by Dr Roos and Professor Link Dr Gilden described how recombinative techniques might be applied to the detection of a virus in multiple sclerosis The continued inability to detect any antigen to match the oligoclonal IgG bands in the CSF in multiple sclerosis patients was disappointing and there was an increasing tendency to regard the bands as nonsense antibodies

Challenging the Functional Connectivity Disruption in Neurodegenerative Diseases: New Therapeutic Perspectives through Non-Invasive Neuromodulation and Cutting-Edge Technologies

Giancarlo Zito, Takashi Hanakawa, Luca Berdondini, Lorenzo Masia, Lorenzo Natale, 2018-10-05 The neurorehabilitation field is increasingly focused on understanding how to efficiently revert the effects that acute i.e stroke or traumatic brain injury or chronic i.e neurodegenerative diseases insults play either on small or large scale networks encompassing motor sensory and cognitive domains The link between the disrupted neuronal pulse generators and their effectors is being reshaped through a wide scenario that embraces biorobotics robot aided rehabilitation non invasive neurostimulation nanoprosthetics and neuroengineering For the past decade and at an amazing speed large investments and efforts allowed enthusiastic and only apparently heterogeneous researchers to borrow theories from neurophysiology pharmacology physics and quantum mechanics in order to generate together highly sophisticated tools that restore resemble or even substitute the basic biological architecture The idea of actually reverting weakened functions and or replacing the faulty parts either of the human body or the central and peripheral nervous system is becoming a new reality opening a fascinating era in this field In this Research Topic several researchers showed how the above principles became reality from theory to the bedside of patients providing full explanations of the whole mechanistic processes and how they were implemented up to the final stage

Multiple Sclerosis Immunology Takashi Yamamura, Bruno Gran, 2013-09-14 The availability of powerful genome wide association study technology during the last five

years has shown that most of the new MS susceptibility loci are immune response genes. It is clear that there is much novelty in the field of MS immunology which has served as an impetus to invest in new therapies. Notably, most if not all of these are immunotherapies. Even the equally exciting field of cell-based therapies and neuro regeneration may well rely on cells or growth factors that are no less immunomodulators than restorative of myelin and neural cell function. Multiple Sclerosis Immunology looks at MS immunology as the basis for the present and even more the future of treatments for this complex autoimmune condition. Both editors are immunologists as well as clinical neurologists and appreciate the importance of a sustained dialogue between basic and clinical scientists to ensure that translation is real and not just virtual. *Multiple Sclerosis* Institute of Medicine, Board on Neuroscience and Behavioral Health, Committee on Multiple Sclerosis: Current Status and Strategies for the Future, 2001-07-10. Multiple sclerosis is a chronic and often disabling disease of the nervous system affecting about 1 million people worldwide. Even though it has been known for over a hundred years, no cause or cure has yet been discovered, but now there is hope. New therapies have been shown to slow the disease progress in some patients, and the pace of discoveries about the cellular machinery of the brain and spinal cord has accelerated. This book presents a comprehensive overview of multiple sclerosis today as researchers seek to understand its processes, develop therapies that will slow or halt the disease, and perhaps repair damage, offer relief for specific symptoms, and improve the abilities of MS patients to function in their daily lives. The panel reviews existing knowledge and identifies key research questions focusing on Research strategies that have the greatest potential to understand the biological mechanisms of recovery and to translate findings into specific strategies for therapy. How people adapt to MS and the research needed to improve the lives of people with MS. Management of disease symptoms: cognitive impairment, depression, spasticity, vision problems, and others. The committee also discusses ways to build and financially support the MS research enterprise, including a look at challenges inherent in designing clinical trials. This book will be important to MS researchers, research funders, health care advocates, for MS research and treatment, and interested patients and their families. **Acta Neurologica Scandinavica**, 1984

Oligoclonal IgG Bands in Cerebrospinal Fluid Vasilios K. Kostulas, 1985 23/03/2024 Francisco Javier Quintana, 2024-06-11. Mechanisms of Disease: Pathogenesis in Multiple Sclerosis summarizes our current understanding on MS and its clinical features and monitoring with available biomarkers, focusing on mechanisms that drive disease pathogenesis and their control by genetic, environmental factors, and novel therapies for disease management. The book is written for neurologists, neuroimmunologists, and clinical, translational, and basic researchers interested in mechanisms of neurodegeneration. Multiple Sclerosis (MS) is an autoimmune disease which targets the central nervous system (CNS). It is the most common cause of non-traumatic neurological disability in young adults, with a prevalence of 1 in 1000 and increasing, hence the importance of this book. Summarizes our current understanding of Multiple Sclerosis. Discusses clinical features and available biomarker monitoring. Focuses on mechanisms that drive disease pathogenesis. **Immunological and**

Inflammatory Disorders of the Central Nervous System Neil Scolding, 1999 A variety of diseases which are driven by immunological and inflammatory disturbances can affect the central nervous system some are primary neurological conditions e g multiple sclerosis whilst other CNS diseases reflect an inflammatory disorder e g vasculitis The clinical features immunological background and treatment of these primary and secondary disorders of the CNS are the subject of this book *Principles of Drug Therapy in Neurology* Michael V. Johnston, Robert Gross, 2008-05 Principles of Drug Therapy Second Edition provides comprehensive coverage of current drug therapy in neurology while providing the background information that neurologists and other clinicians need to understand its rationale The range of new drugs available for treatment of neurological disorders is expanding rapidly along with rapid advances in the neurosciences that are uncovering disease mechanisms Although there are many sources of drug information most are limited to basic information about indications dose and side effects However the complexity of the nervous system is enormous and the information needed to understand drug effects is accordingly often not readily available in a single source The book addresses that issue by presenting 18 focused disease related chapters by authors who are expert clinical sub specialists as well as experts on drug therapy The first chapter on fundamentals of drug therapy in neurology provides a readable synopsis of how the classic pharmacology concepts such as pharmacodynamics and pharmacokinetics are related to therapy in neurology This section also discusses the pathogenesis of potentially serious side effects such as skin rashes and liver disorders and the role of pharmacogenetics in both drug effect and side effects Outstanding chapters on movement disorders epilepsy and headaches cover major areas of drug treatment in neurology practice Additional chapters cover stroke increased intracranial pressure in the intensive care unit dementia multiple sclerosis spinal cord injury and spasticity neuromuscular disorders and pain Sleep central nervous system infections and HIV and drug intoxications are also covered Areas of special interest to child neurologists covered in the book include treatment of genetic metabolic disorders and use of stimulants and other medications for childhood cognitive disorders An excellent chapter is also provided on drug treatment of psychiatric disorders because of the important of psychiatric drugs in neurology practice This edition has been completely re written from the successful edition published in the 90s and enlarged commensurate with the exciting progress in treatment in neurology **Marijuana, Medicine & the Law** Robert C. Randall, United States. Drug Enforcement Administration, 1988

Orthoptics, Past, Present, Future Sally Moore, Joyce Mein, Lynn Stockbridge, 1976 Physical Therapeutics, 1928

Clinical Immunology and Serology Christine Dorresteyn Stevens, 2009-08-24 Western Carolina University Cullowhee North Carolina Introduction to clinical immunology for second and fourth year level clinical laboratory science students Combines essential theoretical principles with commonly used serological techniques Chapters include objectives outlines and glossary *McGraw-Hills NPTE National Physical Therapy Exam, Second Edition* Mark Dutton, 2012-04-02 Everything you need to pass the NPTE on your first try is right here McGraw Hill's NPTE National Physical Therapy Examination will

help you study more effectively use your preparation time wisely and get the best score possible With this unmatched review you ll sharpen your subject knowledge strengthen your thinking skills and build your test taking confidence It delivers exactly what you need to excel a concise outline review of the curriculum that s consistent with the APTA s Physical Therapy Practice important information about the NPTE can t miss test taking strategies a comprehensive practice exam Includes Easy to follow outline review of every topic found on the exam Valuable test taking strategies and exam overview Study pearls that highlight must know material Companion website with 600 NPTA style questions answer explanations and references

Multiple Sclerosis Walter Bryan Matthews,Margaret Rice-Oxley,2001 This work explains in a clear and accessible manner the symptoms diagnosis and possible causes of multiple sclerosis This edition discusses the treatment options including the results from trials of Interferon

Handbook of Clinical Neurology P. J. Vinken,G. W. Bruyn,1968

Journal of Health, Physical Education, Recreation ,1955 **Acta psychiatrica et neurologica Scandinavica** ,1951

Interstate Medical Journal ,1905 *Neurological Bulletin* ,1918

Multiple Sclerosis Present And Future Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Multiple Sclerosis Present And Future**," compiled by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve to the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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