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Parkinson's Effects and Research on Treatments

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Abstract

The focus of our research project revolves around Parkinson's disease, a condition that primarily impacts older individuals but can also manifest in younger adults. Its onset is marked by the gradual degeneration of nerve cells in the midbrain region responsible for controlling bodily movements. Initial symptoms tend to be subtle, such as a sense of weakness or stiffness in one limb, or a slight tremor in a hand during rest. As time progresses, the trembling intensifies and spreads, muscles stiffen, movements become slower, and both balance and coordination deteriorate. In the advanced stages of the disease, individuals often grapple with depression, cognitive impairments, and various mental and emotional issues.

Parkinson's disease typically commences between the ages of 50 and 65, afflicting approximately 1% of the population within this age bracket. It appears to affect men slightly more frequently than women. While there is no cure for Parkinson's, medication plays a crucial role in managing its symptoms and reducing disability. Countless clinical trials have been conducted in an effort to find more effective treatments for this debilitating ailment.

Parkinson's disease profoundly impacts a person's ability to perform everyday voluntary movements. In this essay, we will delve into the origins, therapeutic approaches, preventive measures, and the historical context surrounding Parkinson's disease.

Introduction

Parkinson's disease primarily affects the nervous system. Back in 2013, the Mayo Clinic provided valuable insights into the early indicators of this condition. It often commences with symptoms like stiffness, slowed movements, and occasionally, a tremor in just one hand. People with Parkinson's disease encounter significant challenges in walking and executing various physical movements. Initially, one hand may exhibit noticeable tremors. Notably, facial expressions gradually diminish to the point where they become quite limited or nearly absent.

Etiology

The precise cause of Parkinson's disease remains elusive, but medical experts speculate that the symptoms are linked to a chemical imbalance in the brain resulting from the death of brain cells. Parkinson's disease is characterized as chronic, persisting over an extended period, and progressive, with symptoms worsening over time. Genetic factors are believed to play a role in one's susceptibility to developing Parkinson's disease. While researchers have identified certain genetic mutations that can cause Parkinson's, these are relatively rare and primarily observed in cases where multiple family members are affected by the disease. Nevertheless, specific genetic variations appear to heighten the risk of Parkinson's, although the risk associated with each of these genetic markers is relatively small.

Furthermore, environmental triggers, such as exposure to certain toxins and ecological factors, may increase the risk of developing Parkinson's disease later in life. However, it's important to note that the risk associated with these environmental factors is also relatively low.

History

The history of Parkinson's disease has evolved significantly over the years. This condition, often abbreviated as PD, is the most common cause of a group of symptoms known as parkinsonism, which includes characteristics like rest tremor, rigidity, bradykinesia (slowness of movement), and postural instability. The initial recognition of this ailment dates back to 1817 when James Parkinson described it in his work titled "Essay on the Shaking Palsy." While it has been suggested that Parkinson's disease may have arisen due to the industrial revolution, there is evidence that a condition resembling it, known as "kampavata" (comprising shaking or "kampa" and lack of muscular movement or "vata"), existed in ancient Indian Ayurvedic medicine around 4500 years ago. In ancient times, the Mucuna pruriens plant was used to alleviate its symptoms, and it was later found to contain levodopa, a medication that stimulates dopamine production in the brain and remains a vital component of Parkinson's treatment.

James Parkinson's early observations identified three primary symptoms of the disease: tremor, stiffness, and difficulties with maintaining an upright posture. In its early history, Parkinson's disease was considered terminal, as there were no known cures. In the 1940s and 1950s, some neurosurgeons attempted risky procedures on individuals afflicted with the disease, although these interventions were perilous, and several patients did not survive them. As time passed, scientists made critical discoveries linking Parkinson's disease to significantly reduced levels of dopamine in the brain, shedding light on one of the underlying causes of this condition.

Pathology

The pathology of idiopathic Parkinson's disease (PD) has been recognized for a considerable time, with significant recent advancements shedding light on its nature. A crucial development involves the identification of α-synuclein as the primary biochemical component of Lewy bodies, which are characteristic of PD. This discovery has also contributed to a better understanding of the relationships between Parkinson's disease, Alzheimer's disease, and dementia with Lewy bodies, which are all neurodegenerative disorders. This knowledge not only provides insight into the underlying causes of the disease but also holds promise for enhancing treatment methods.

There is presently some debate, as outlined in Dr. Calne's article, regarding the precise definition of Parkinson's disease and the appropriateness of the terminology used. Traditionally, PD has been considered a specific condition characterized by clinical parkinsonism, including rigidity, bradykinesia, and tremor, alongside pathological findings of neuronal loss and the presence of Lewy bodies in the substantia nigra. While this traditional view may soon evolve, no widely accepted alternative definition has emerged. In the subsequent discussion, we will explore the classical pathological changes associated with idiopathic PD, with a particular focus on recent developments and concepts.

When it comes to gross pathology, external examination of the brain typically reveals no significant abnormalities, although PD patients who develop dementia may exhibit mild to moderate cerebral atrophy. On closer inspection, there is often a loss of pigment in the substantia nigra and locus ceruleus, while structures like the caudate, putamen, globus pallidus, thalamus, and other brainstem regions appear normal. The depletion of dopamine in the basal ganglia results in significant disruptions in the connections to the thalamus and motor cortex, giving rise to the hallmark parkinsonian signs such as bradykinesia.

Response and Treatment

The primary objective of medical management in Parkinson's disease is to achieve effective control of its signs and symptoms while minimizing adverse effects, with the aim of enhancing the patient's quality of life. Research indicates that delaying the initiation of treatment after diagnosis or forgoing treatment can lead to a rapid decline in the patient's quality of life.

When it comes to pharmacologic treatment, it can be categorized into two main approaches: symptomatic and neuroprotective (disease-modifying) therapy. It's important to note that, as of now, there is no proven neuroprotective or disease-modifying therapy available for Parkinson's disease.

Levodopa, often administered in combination with carbidopa (a peripheral decarboxylase inhibitor), stands as the gold standard for symptomatic treatment. Carbidopa functions to inhibit the conversion of levodopa into dopamine in the systemic circulation, ensuring more effective delivery of levodopa to the central nervous system. Levodopa is particularly effective in alleviating motor symptoms associated with Parkinson's disease and generally produces fewer short-term adverse effects. However, its long-term usage has been associated with the development of motor fluctuations and dyskinesias, which can be challenging to manage once they become problematic.

In the early stages of the disease, monoamine oxidase (MAO)-B inhibitors can be considered for initial treatment. These medications offer mild symptomatic relief, boast favorable profiles in terms of adverse effects, and have been shown to enhance long-term quality-of-life indicators by 20-25%, according to a Cochrane review.

Dopamine agonists like ropinirole and pramipexole provide moderate symptomatic relief and can delay the onset of dyskinesias compared to levodopa. However, it's essential to proactively monitor patients taking oral dopamine agonists for potential adverse events. Studies have reported a 15% increase in adverse events, including somnolence, sudden-onset sleep episodes, hallucinations, edema, and impulse control disorders such as pathologic gambling, compulsive shopping, excessive internet use, hypersexuality, and hoarding, among those taking these agents.

Symptomatic medications for Parkinson's disease typically offer effective control over motor symptoms for a duration of 4-6 years. Beyond this timeframe, disability often continues to progress, even with the best available medical management. Many patients encounter long-term motor complications, including motor fluctuations and dyskinesias. Late-stage Parkinson's disease is also associated with additional sources of disability, such as postural instability (difficulty maintaining balance) and the development of dementia. As a result, addressing the symptoms in the later stages of the disease requires different therapeutic strategies.

Neuroprotective therapy aims to slow, halt, or potentially reverse the progression of the disease by preventing the loss of dopamine-producing neurons. However, it's essential to note that, as of now, no therapy has definitively demonstrated neuroprotective effects. Nevertheless, there is ongoing interest in examining the long-term effects of MAO-B inhibitors, and other agents, like creatine and isradipine, are currently being investigated for their potential in this regard.

The age of the patient plays a significant role in determining the treatment approach. Younger patients, who have a longer life expectancy and are more likely to develop motor fluctuations and dyskinesias over time, are advised to consider long-term implications when deciding on early treatment strategies. In contrast, for older patients and those with cognitive impairment, the emphasis is placed less on long-term considerations and more on providing effective short-term symptomatic relief with minimal adverse effects.

Socio-politico-economic

The socio-politico-economic aspects of Parkinson's disease present a multifaceted challenge. Currently, there is no long-term cure for Parkinson's, and researchers are diligently working to discover more effective treatments that can either cure or significantly slow down the progression of the disease. While prescription drugs and therapy offer some relief, the ultimate goal is to find a permanent solution that goes beyond symptom management.

One avenue of research involves replacing the brain neurons that are lost in Parkinson's disease with transplanted fetal tissue, which holds the potential for a profound cure. However, this approach raises significant political and ethical concerns, as it relies on the use of aborted human fetuses. This ethical dilemma has prompted considerable debate and poses a hurdle to the widespread adoption of this potential treatment.

Epidemiology

Another approach under consideration is the injection of growth factors into the brains of individuals affected by Parkinson's disease. These growth factors aim to stimulate the regeneration of damaged or degenerating neurons, offering a more ethically acceptable alternative to fetal tissue transplants.

In terms of epidemiology, estimating the global prevalence of Parkinson's disease is a complex task. While it's believed that there are up to 10 million or more people worldwide living with Parkinson's, this figure might be significantly higher due to the challenges posed by incomplete and inconsistent prevalence studies, the lack of a precise definition for the disease, and a substantial number of undiagnosed cases. Consequently, the true extent of the Parkinson's disease burden globally remains uncertain.

Although the pathological changes associated with Parkinson's were initially described nearly a century ago and continue to serve as the basis for diagnosing the disease, recent advances have significantly expanded our understanding of its pathogenesis and its relationship with other neurodegenerative conditions. These insights are poised to refine our concept of Parkinson's disease and, hopefully, lead to tangible improvements in its treatment.

Here are some individuals, both famous and lesser-known, who have been associated with Parkinson's disease:

1.Muhammad Ali: The legendary boxer, born Cassius Marcellus Clay Jr. on January 17, 1942, was renowned for his athleticism and his inspirational quotes. Despite his diagnosis with Parkinson's disease, he remained a symbol of strength and resilience throughout his life.

2.Michael J. Fox: This Canadian-American actor, born Michael Andrew Fox on June 9, 1961, is widely recognized for his roles in iconic films and television series, such as the "Back to the Future" trilogy and "Family Ties." He disclosed his Parkinson's diagnosis to the public in 1998 and has since become an advocate for Parkinson's research and awareness.

3.Linda Maria Ronstadt: The American popular music singer, born on July 15, 1946, in Tucson, Arizona, has received numerous accolades, including Grammy Awards. In August 2013, it was revealed that she had been diagnosed with Parkinson's disease, which tragically left her unable to sing.

4.Adolf Hitler: The German politician and leader of the National Socialist German Workers Party, born on April 20, 1889, is a controversial figure in history. There has been debate regarding Hitler's health, with some suggesting that he may have experienced symptoms consistent with Parkinson's disease.

5.Roger Caron (Mad Dog): Roger Caron, born on April 12, 1938, in Cornwall, Ontario, was a Canadian bank robber and author of the prison memoir "Go-Boy! Memories of a Life Behind Bars." His book chronicles his life in and out of prisons, including his multiple prison escapes. Parkinson's disease has been associated with him in later life.

Parkinson's disease affects people from various walks of life, and these individuals serve as examples of the diverse impact of the condition on different individuals, from renowned athletes and entertainers to historical figures and lesser-known individuals with unique life experiences.

These notable individuals from various fields, including entertainment, politics, and art, all had experiences with Parkinson's disease:

1.Anna Neagle (October 20, 1904 - June 3, 1986): Anna Neagle was a renowned British motion picture actress and singer known for her portrayals of real-life British heroines. Despite her great success in films and on stage, she was diagnosed with Parkinson's disease later in life.

2.Francisco Franco (December 4, 1892 - November 20, 1975): The Spanish General, who led a successful military career and became the head of the Spanish government through dictatorship, had a complex political history. He was associated with supporting Nazi Germany and Fascist Italy during World War II. In his later years, he faced health issues, including Parkinson's disease.

3.James Doohan (March 3, 1920 - July 20, 2005): James Montgomery Doohan, a Canadian actor best known for his role as "Scotty" in the Star Trek series, had a prolific career in entertainment. He lived with Parkinson's disease, diabetes, and pulmonary fibrosis in his later years and was also diagnosed with Alzheimer's disease.

4.Jim Backus (February 25, 1913 - July 3, 1989): This American actor and voice actor had a diverse career in radio, television, and film, with roles ranging from the voice of Mr. Magoo to Thurston Howell III on the sitcom "Gilligan's Island." He co-wrote humorous books with his wife and co-wrote the family film "Mooch Goes to Hollywood." In the later stages of his life, he faced complications from pneumonia, associated with his long battle with Parkinson's disease.

5.Albert J. Whitlock (September 15, 1915 - October 26, 1999): A renowned English motion picture matte artist, Albert J. Whitlock, was known for his work with Disney and Universal Studios. He played a crucial role in creating special effects for films. Unfortunately, his career was cut short due to Parkinson's disease.

6.Mao Zedong (1893-1976): Mao Zedong, a prominent Chinese political leader and the founding father of the People's Republic of China, is a significant figure in modern history. He passed away from amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's Disease, a neurodegenerative condition, which is distinct from Parkinson's disease.

References

1. Decision-Making Cognition in Neurodegenerative Diseases. (2010, November 15). Retrieved from Medscape.

2. An essay on the shaking palsy: Parkinson, James, 1755-1824. (n.d.). Retrieved from Internet Archive.

3. Famous People with Parkinson’s Disease. (n.d.). Retrieved from Disabled World.

4. Parkinson's disease. (2015, July 7). Retrieved from Mayo Clinic.

5. SHOBHA S. RAO M.D., LAURA A. HOFMANN, M.D., and AMER SHAKIL, M.D., (n.d.). University of Texas Southwestern Medical School at Dallas Family Medicine Residency Program, Dallas, Texas.

6.Parkinson's disease. (2013, November 12). In Mayo Clinic. Retrieved March 24, 2014, from [Mayo Clinic](http://www.mayoclinic.org/diseases-conditions/park