WARDĘSZKIEWICZ, Marta, MARKOWIAK, Szymon, JABŁOŃSKA, Wiktoria, KASPRZAK, Amelia, ŚWIERCZ, Maciej, TRUCHTA, Monika, MAŃKOWSKA, Aleksandra, KOLANO, Agata and PEJAS, Anna. Parkinson's disease – a frequent cause of dementia. Journal of Education, Health and Sport. 2024;51:92-104. eISSN 2391-8306.
https://dx.doi.org/10.12775/JEHS.2024.51.007
https://apcz.umk.pl/JEHS/article/view/47733
https://zenodo.org/records/10464736

The journal has had 40 points in Ministry of Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).
Punkty Ministerialne z 2019 - aktualny rok 40 punktów. Załącznik do komunikatu Ministra Edukacji i Nauki z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 27.12.2023. Revised: 31.12.2023. Accepted: 06.01.2024. Published: 06.01.2024.

Parkinson's disease – a frequent cause of dementia

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ABSTRACT

Introduction and Purpose.
Parkinson's disease (PD) is a progressive neurodegenerative disorder with characteristic motor symptoms and often overlooked non-motor manifestations, including dementia. This research article aims to enhance our understanding of PD and its complex clinical course, ultimately contributing to improved patient care and management. Moreover, it is important to raise awareness of cognitive impairment associated with Parkinson’s disease, as it is an aspect of social exclusion and disability

Material and method.

This study is based on medical articles collected from the PubMed database spanning the years 2015-2023. The research was conducted through the analysis of keywords such as Parkinson’s disease, dementia, diagnose, tremor, cognitive impairment.

Brief description of the state of knowledge.
Parkinson's disease is established as a movement disorder, primarily attributed to the loss of dopaminergic neurons in the substantia nigra. Although there is no cure for PD, treatment options have expanded, including pharmacological and non-pharmacological approaches.

Early diagnosis is vital for effective management, and a multidisciplinary approach is crucial
in addressing the diverse needs of PD patients.

Summary.
Parkinson's disease, a multifaceted neurodegenerative disorder, presents a complex clinical picture that extends beyond motor symptoms to include dementia. This review highlights the etiology, clinical manifestations, diagnostic criteria, differential diagnosis, various treatment modalities. Understanding of Parkinson's disease, particularly its association with dementia,
is essential for healthcare professionals and researchers to provide comprehensive care.

Keywords: Parkinson's disease, dementia, cognitive impairment

INTRODUCTION

Parkinson's disease (PD) is a chronic and progressive neurodegenerative disorder. PD is characterized by the degeneration of dopaminergic neurons in the substantia nigra within
structures of the brain. It results in dopamine deficiency and impaired motor control. [2] Consequently this disease has always been associated with motor symptoms, including bradykinesia, resting tremor, rigidity, and postural instability. [1] However PD's clinical spectrum is broad and evolving, with a growing acknowledgment of non-motor features, such
as dementia. Understanding that is crucial, because 60-80% of patients face cognitive impairment. [3] This article offers a comprehensive exploration of PD, encompassing its
etiology, clinical presentation, diagnostic criteria, differential diagnosis, treatment options and
prognosis, with a specific focus on the dementia as a significant aspect of the disease.

MATERIALS AND METHODS

This study is based on medical articles collected from the PubMed database spanning the years 2015-2023. The research was conducted through the analysis of keywords such as
Parkinson's disease, dementia, diagnose, tremor, cognitive impairment.

REVIEW AND DISCUSSION

Etiology

The precise etiology of PD remains multifaceted, involving a combination of genetic and environmental factors. The majority of PD cases are considered sporadic. 5% - 10% of cases are associated with monogenetic mutations [4]. There is 90 identified genetic loci that increase risk of PD. Presumably there is much more unidentified genes responsible for the disease [2, 5].

Age and male sex increase risk od PD. Regarding enviromental and behavioural factors, pesticides, tobacco, coffee, head trauma are mentioned [2].

Recent studies identified genetic determinants of PD dementia [6]. One of them is also risk factor for Alzheimer's disease [7].

Pathogenesis

The root cause of PD is an atrophy of melatonin-containing dopaminergic neurons. It affects the substantia nigra. Abnormal protein aggregates, mainly alpha-synuclein, form in neurons. They are known as Lewy bodies. As a result dopamine level in substantia nigra and striatum decreases. Neurodegeneration also occurs in other structures of the brain, such as brainstem, limbic regions, cortex [2].

Symptoms

However Parkinson's disease is most commonly associated with motor symptoms, non-motor symptoms largely affect everyday life and patient's independence. The clinical manifestations of PD encompass a wide range of symptoms, including:

1. Motor Symptoms.

These include bradykinesia (slowness of movement), rest tremor, rigidity, postural instability, altered walking pattern, freezing of gait [2]. Patients walk slowly, have stoop posturę and take small steps [1]. Frequent falls leading to fractures and progressive disability are a major problem. Increased muscle tension (cogwheel rigidity) and micrography, dysphagia,

dysarthria are also characteristic. The symptoms are asymmetrical, especially at the beginning

[2]. In the advanced stages of the disease, it results in considerable disability, necessitating

full reliance on the assistance of others [3].

2. Non-Motor Symptoms.

Parkinson's disease can cause multiple non-motor symptoms . The one that we particularly emphasize in this study is dementia, which develops in about 30% PD cases. [2] Overall, cognitive impairment affects 60-80% of patients. [3] Depression and apathy often precede motor symptoms by several years. Sleep disturbances and limb pain are common features

[8, 9, 10].

Autonomic dysfunction observed in PD includes sweating, constipation, urinary disorder, excessive salvitation, orthostatic hypotension, arrhythmia. Patients experience difficulty

swallowing and speaking [2, 11].

Dementia

More than half of patients with Parkinson's disease experience cognitive impairment, which

can manifest itself long before motor symptoms and serve as an early warning sign [12]. Dementia resulting from Parkinson's disease can severely impact the patient's quality of life

and it may result in burden for caregivers [13].

The etiology is mainly associated with Lewy body-type degeneration. To a lesser extent, frontal atrophy and cholinergic deficits may also occur [14].

Two conditions are distinguished: PD dementia and PD-related cognitive impairment. The longer someone suffers from PD, the more likely they are to develope dementia. Other

factors that increase the risk of dementia include depression, age, male sex [3].

Clinically patients with PD dementia present memory loss, visuospatial and executive dysfunction, anhedonia, mood disturbances, excessive daytime sleepiness [12]. The symptoms

are resembling the ones in dementia with Lewy bodies. PD dementia in comaprison with

Alzheimer's disease is characterised by more frequent hallucinations and difficulties with sleep [3].

Number of studies showed link between low MMSE score and depression [8].

Diagnosis

No universally agreed critera for diagnosis have been established currently. Diagnosing PD is challenging, especially in the earliest stages. It relies on clinical evaluation and for many years it was typically based on the Queens Square Brain Bank Criteria. Due to frequent misclassification, these criteria have been revised by the International Parkinson and Movement Disorder Society (MDS). Diagnosis is based on the main manifestation which is defined as bradykinesia and one of the following: rigidity or asymmetric 5-Hz resting tremor.

In a second step, supportive and exclusionary features are considered. MDS criteria divide patients into two categories: „clinically established" and „clinically probable"[2].

Neuroimaging, such as transcranial sonography, dopamine transporter scans (DAT SPECT), may aid in diagnosis. Structural MRI, PET is useful to exclude secondary or atypical parkinsonian syndromes [2, 15].

Patients with family history od PD or who present symptoms before the age of 40 should undergo genetic testing [2].

A useful tool for diagnosing dementia is Mini-Mental State Examination. It evaluates cognitive function and level of cognitive impairment [16].

Differential diagnosis

PD should be distinguished from other neurological disorders, such as: atypical parkinsonism, essential tremor, dementia, depression, hemiparesis, rheumatoid arthritis, drug-induced parkinsonism (neuroleptics). The excluding symptoms are recurrent cerebrovascular accidents, brain tumour, frequent head injuries, Babinski sign, cerebellar syndrome, poor response to L-dopa, early marked dysarthria, rapid progression, early postural

instability. Patients under 50 years of age with suspected PD should be tested for Wilson's disease.

Accurate diagnosis is essential to guide appropriate treatment strategies [2].

Treatment

As there is still no treatment for the cause of the disease or preventive therapy, the most vital

aspect is to reduce the symptoms. The management of PD is multifaceted and includes:

1. Pharmacological Treatment:

Levodopa is used to treat Parkinson's disease from the very first symptoms. After a short

period of time, it is necessary to increase the dose of this medication. Unfortunately, the higher the dose taken, the more side effects there are, such as dyskinesia, motor fluctuations

or orthostatic hypotension.

Dopamine agonists are increasingly used as monotherapy in younger patients. This delays the start of levodopa treatment. As a result, motor side effects are also delayed. Nevertheless dopamine agonists are recommended as adjunct to levodopa treatment.Selegiline and rasagiline (MAO-B inhibitors) are effective both as monotheraphy and as

addition to levodopa [17].

2. Non-Pharmacological Approaches:

Physiotherapy plays a critical role in the management of PD by improving mobility, balance, and overall physical function. It helps to reduce the impact of motor symptoms and enhances the patient's quality of life. Various forms of physiotherapy have been shown to improve gait,

including conventional physiotherapy, treadmill training and Nordic walking. Hydrotherapy

has good results in improving balance [18].

3. Deep Brain Stimulation (DBS):

Surgical interventions, such as DBS, maybe considered in advanced cases to manage motor

fluctuations when other therapies have not been successful [2].

4. Cognitive Enhancement:

Medications targeting cognitive impairment and dementia associated with PD are available

such as cholinesterase inhibitors, rivastigmine and donepezil. Memantine maybe used in certain cases [3, 19]. SSRIs and SSNRIs are useful if patient with PD also hase symptoms of depression [8]. Non-pharmacological methods such as behavioural therapy are recommended [20].

Prognosis

The prognosis of Parkinson's disease is highly variable, with disease progression and outcomes differing among individuals. Although there is no cure, early diagnosis and multidisciplinary management can significantly improve quality of life and prolong independence. As PD progresses, the onset of dementia can have a significant impact on cognitive function and overall prognosis.

CONCLUSION

Parkinson's disease is a complex neurodegenerative disorder with evolving clinical features and an emerging recognition of dementia as a significant aspect of the disease. This review encompasses its etiology, clinical presentation, diagnostic criteria, differential diagnosis, treatment options and prognosis, offering insights into the multifaceted nature of PD and its management.

Statement of the authors' contribution

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All authors have read and agreed with the published version of the manuscript.

Funding Statement

The study did not receive special funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Conflict of Interest Statement

No conflict of interest.

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