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 of PD. Regarding environmental 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 posture 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. In the advanced stages of the disease, it results in considerable disability, necessitating full reliance on the assistance of others.


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. Overall, cognitive impairment affects 60-80% of patients. Depression and apathy often precede motor symptoms by several years. Sleep disturbances and limb pain are common features.

Autonomic dysfunction observed in PD includes sweating, constipation, urinary disorder, excessive salivation, orthostatic hypotension, arrhythmia. Patients experience difficulty swallowing and speaking.

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. Dementia resulting from Parkinson’s disease can severely impact the patient’s quality of life and it may result in burden for caregivers.

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

Two conditions are distinguished: PD dementia and PD-related cognitive impairment. The longer someone suffers from PD, the more likely they are to develop dementia. Other factors that increase the risk of dementia include depression, age, male sex.

Clinically patients with PD dementia present memory loss, visuospatial and executive dysfunction, anhedonia, mood disturbances, excessive daytime sleepiness. The symptoms are resembling the ones in dementia with Lewy bodies. PD dementia in comparison 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 criteria 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 of 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 monotherapy 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 have
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.

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