

Managing Parkinson's disease in the elderly: Comprehensive approaches and challenges



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Abstract

Parkinson's disease (PD) is a prevalent neurodegenerative disorder characterized by motor and non-motor symptoms, significantly impacting the elderly. This article explores comprehensive management strategies for PD in older adults, emphasizing both pharmacological and non-pharmacological approaches. Advances in surgical techniques, particularly Deep Brain Stimulation (DBS) and minimally invasive procedures, have shown promise in improving patient outcomes. Additionally, the importance of physical and occupational therapy, along with integrative therapies like yoga and mindfulness, is highlighted for their role in enhancing quality of life. Innovations in assistive devices and mobility aids are also discussed, providing crucial support for maintaining independence. The article underscores the need for a multidisciplinary approach to address the complex needs of elderly PD patients, promoting both physical and mental well-being.

Keywords: Parkinson, Elderly Care, PD, Neurodegenerative Disorders, Geriatric Neurology

1. Introduction

Parkinson's disease (PD) is the 2nd most chronic and neurodegenerative disease caused by the loss of dopaminergic neurons and their projections in the substantia nigra. Parkinson's disease affects both motor and non-motor functions. First described by Dr. James Parkinson in 1817 as a "shaking palsy," the main root cause of PD is degradation of striatal dopaminergic neurons, although it also involves degradation of non-dopaminergic neurons. The primary motor symptoms of PD include muscular rigidity, bradykinesia, and resting tremor, while non-motor symptoms can include cognitive changes, sleep disorders like insomnia, and depression can also occur (1,2).

PD is one of the most common neurodegenerative disorders, with approximately 1 million Americans affected. The incidence in the U.S. is about 20 cases per 100,000 people per year with a mean age of onset around 60 years. The prevalence increases with age, affecting about 1% of people aged 60 and older, rising to 1-3% in those over 80 years old. This data, however, may not fully capture undiagnosed cases. Although primarily a disease of the elderly, PD can develop in individuals as young as their 30s and 40s (3).

2. Importance of addressing Parkinson's disease within geriatric healthcare

PD significantly impacts the quality of life (QoL) of elderly patients due to its progressive nature affecting mobility and muscle control. Advanced and end-stage PD associated with various serious complications such as pneumonia, which may enhance the mortality. The progressive degenerative effects of PD also place a considerable burden on patients, families, and caregivers (4).

Effective management of PD involves a combination of pharmacological and non-pharmacological treatments aimed at symptomatic relief and improving QoL. Physical activity (PA) and exercise have been shown to improve QoL in PD patients by enhancing physical function, reducing motor symptoms, and potentially influencing neuroplasticity. Non-pharmacological interventions such as exercise programs, Tai Chi, and aquatic physiotherapy have demonstrated benefits in managing PD symptoms and improving overall well-being (5).

3. Stages of Parkinson's disease

Parkinson's is a chronic neurodegenerative disorder caused by the loss of dopaminergic neurons of the substantia nigra. This loss leads to a deficiency in dopamine, a neurotransmitter that play important role in regulating movement. The pathological markers include the presence of Lewy bodies and Lewy neurites.

The disease progresses through several stages, initial non-motor symptoms such as fatigue, depression, and pain that might appear years before the motor symptoms. With progression of disease, motor symptoms like bradykinesia, resting tremor, and muscular rigidity become evident. Diagnosis typically occurs at this stage (5).

3.1. Unique challenges and symptoms in elderly patients

Elderly patients with PD face unique challenges, as the disease's symptoms can overlap with other age-related conditions. Age is significant risk factor for Parkinson disease shown in figure 1. The presence of comorbidities such as sleep disorders, depression, constipation, and anxiety complicates the early diagnosis of PD in older adults. Additionally, the motor symptoms can be subtle initially, making recognition difficult.

As PD progresses, the elderly are more susceptible to complications like falls due to postural instability, and these complications mainly seen in the later stages of the disease. These falls can lead to severe injuries, adding to the patient's morbidity. Non-motor symptoms such as mood disorders and cognitive impairment also become more pronounced in the elderly, further complicating the management of the disease (6).

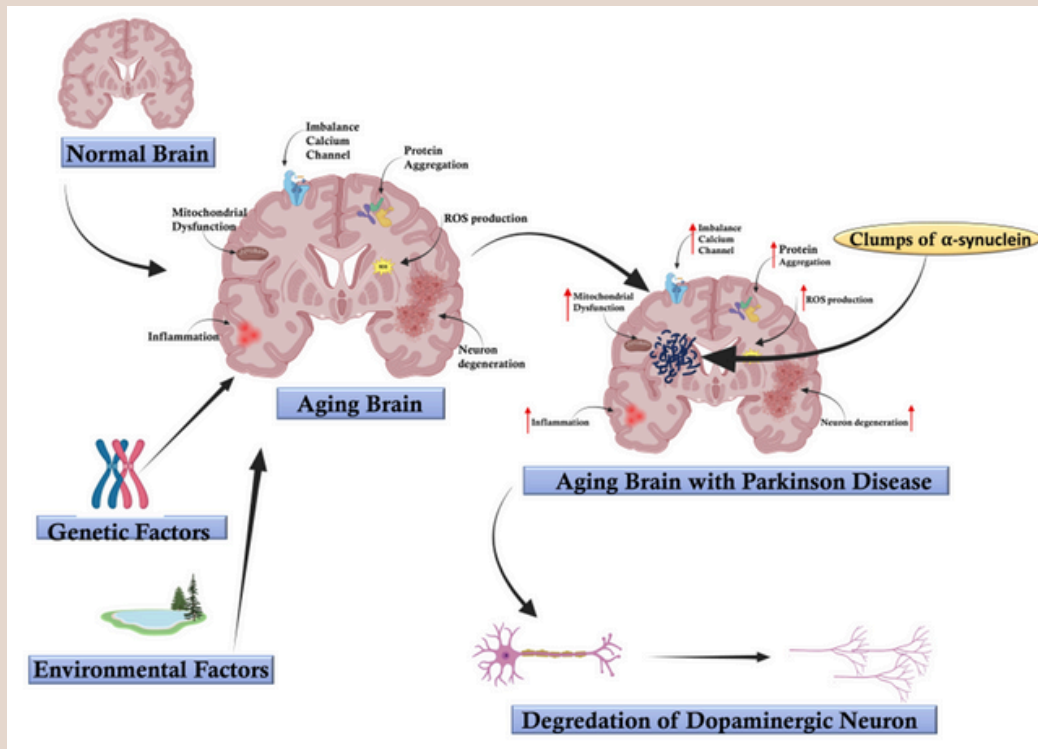


Figure 1. Age is significant risk factor for Parkinson disease

4. Risk factors and causes particularly relevant to the aging population

Age is the most significant risk factor for PD, because most of PD cases diagnoses after the age sixty-five. The etiology of PD includes combination of genetic and environmental factors but the exact root cause is still unknown. Environment factors like exposure to pesticides and heavy metals have been implicated but not conclusively proven. Interestingly, lifestyle factors such as caffeine intake and cigarette smoking have been associated with a reduced risk of developing PD (5,7).

Genetic predispositions account for a smaller percentage of cases, usually involving younger onset of the disease. Common genetic mutations associated with PD include those in the alpha-synuclein gene (SNCA) and leucine-rich repeat kinase 2 (LRRK2) gene loci.

The prevalence of PD increases after the age of sixty-five, therefore concern for the aging population is needed. This increased prevalence, combined with the progressive nature of the disease and the potential for severe complications, underscores the importance of early recognition and comprehensive management strategies tailored to the elderly (5).

5. Treatment approaches

Levodopa: The gold standard for PD treatment. It is effective in managing motor symptoms by replenishing dopamine. However, long-term use can lead to motor complications such as dyskinesias and motor fluctuations.

Dopamine agonists: These are used when motor symptoms are not adequately controlled by levodopa. They can delay the onset of motor complications but are often associated with adverse effects like confusion, hallucinations, and orthostatic hypotension, especially in older adults.

5.1. Traditional drug therapy

New treatment approaches like inhaled levodopa: A new symptomatic treatment approved by the FDA for diminish "off" periods in later-stage PD. It offers a rapid onset of action, which is beneficial for managing sudden symptoms.

Pimavanserin: For treating PD psychosis, a novel selective-serotonin inverse agonist Pimavanserin is developed. Unlike other antipsychotics, it does not block dopamine receptors, making it a safer option for PD patients (5).

Cannabis-based therapies: These are gaining interest for managing both motor and non-motor symptoms of PD, although robust clinical trials are still needed to ensure the effectiveness and safety (5).

5.2. Innovations in drug delivery systems

Transdermal rotigotine patch: An alternative to oral medications, especially useful when the oral route is compromised. It provides a continuous delivery of medication, potentially improving symptom control.

Levodopa-carbidopa intestinal gel: Delivered directly to the small intestine via a percutaneous endoscopic gastrostomy tube, used to manage advanced PD with severe motor fluctuations. However, it is associated with complications like tube dislocation and infections.

While traditional treatments like levodopa and dopamine agonists remain first line managing PD, recent developments offer alternatives and adjunctive therapies specially for older adults (4).

5.3. Surgical options for Parkinson’s disease

Deep brain stimulation (DBS): Deep Brain Stimulation is a surgical treatment in which electrodes in specific brain areas are implanted. The electrical impulses are generated from these electrodes that affect chemicals and certain cells in brain. DBS in advanced PD has been shown significant improvement in motor symptoms of patients. However, the effectiveness of DBS can be limited in older adults due to higher risks associated with surgery.

Lesioning surgery: Lesioning is a surgery that destroys a small part of the brain to reduce symptoms. Two types are Pallidotomy and Thalamotomy. These surgeries can help with tremors and stiffness, but they are done less often now because they are permanent (6).

5.4. Non-pharmacological approaches

5.4.1. Importance of physical therapy and exercise in managing Parkinson’s in seniors

Physical therapy and specialized exercise programs play a significant role in managing Parkinson's Disease (PD) in seniors, providing both motor and non-motor benefits. Regular physical activity (PA) can improve motor symptoms and improve cognitive function (6). Summary of approaches for management of Parkinson’s disease is given in Table 1.

Table 1. Approaches for management of Parkinson’s disease

Treatment Approaches	Class/ Category	Agents/ methods	Action	Side effects	Ref.
Traditional Pharmacological Approach	Dopamine Precursor	Levodopa	Effective in managing motor symptoms by restoring dopamine.	Nausea, vomiting or orthostatic hypotension	(8)
	Dopamine agonists	Bromocriptine, Ropinirole	Dopamine agonists directly stimulate the post-synaptic dopamine receptors.	Nausea, Sedation and hallucination.	(8)

Traditional Pharmacological Approach	COMT inhibitor	Entacapone, Tolcapone	COMT breaks down levodopa: therefore, COMT inhibitors allows more levodopa to reach the brain.	Increased dopaminergic stimulation, diarrhoea and elevated liver enzymes.	(9)
	Peripheral Decarboxylase inhibitor	Carbidopa	Carbidopa inhibits the decarboxylase enzyme	Nausea, dizziness, dry mouth, vomiting and mood changes.	(10)
	MAO B inhibitor	Selegiline, Rasagiline	MAO-B metabolize dopamine, therefore MAO-B inhibitors, block the MAO-B enzymes resulting in reduced metabolism of dopamine.	Sleeplessness, nausea, confusion micturition dysfunction and hallucination	(11)
	Anti-Histamine	Promethazine	FDA approved drug Promethazine have potentially neuroprotective effect.	Sedation, disorientation, and confusion	(12)
Novel Pharmacological Approach	Inhaled Levodopa	Xadago	It reversibly inhibits the MAO-B, thus reducing the degradation of dopamine.	Hypertension, indigestion, hypersensitivity, insomnia and hallucination	(13)
	Selective serotonin inverse agonist	Pimavanserin	Pimavanserin is a potent agonist, which acts like an agonist in that it binds to the same receptor as an agonist but produces the opposite effect.	Nausea and vomiting	(14)
	Carbidopa Levodopa Enteral suspension	Duopa	Carbidopa use with levodopa largely prevents the peripheral metabolism of levodopa and lessens peripheral dopaminergic side effects.	Bladder pain, chest pain, confusion and irritability	(15)
	Cannabis-based Therapy	Marijuana	Acts via two types of G protein-coupled receptor, known as cannabinoid type 1 (CB1) and type 2 (CB2).	Cognitive impairment, weight gain, and dependence in long term.	(16)
Surgical Approach	Deep brain Stimulation	VIM thalamus, Globus pallidus internus	Electrodes are implanted that generate electrical impulses that regulates abnormal impulses	Intracerebral haemorrhage and postoperative infections	(17)
	Lesioning Surgery	Pallidotomy, thalamotomy	Selective destruction of a targeted brain tissue volume in order to interrupt maladaptive neural network.	Intracranial haemorrhage, stroke, infection and postoperative confusion	(18)
	Transplants	Xenotransplants, genetical engineered transplant	Fetal neurons, human stem cell and engineered modified cells are transplanted into the brain	Infection transmission from transplanted cell and postoperative infections	(19)

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Non-Pharmacological Approach	Physical Therapy	Sensorimotor agility boot camp includes exercise involving activities like lungs, agility courses, Tai Chi, boxing and Pilates, Dance therapy	Regular physical exercise can improve motor symptoms, improve cognitive functions and contribute to overall well being	NA	(5)
	Occupational Therapy	Mindfulness, integrative Therapies, and home-based exercise	Occupational therapy aims to enhance the ability of individuals to perform daily activities and improving quality of life.	NA	(6)
	Acupuncture & Message therapy	Acupuncture techniques and various message techniques	Acupuncture help in managing symptoms in older adults, particularly pain and anxiety, message therapy reduces stress, alleviating pain and improve mood.	NA	
	Dietary & Nutritional intervention	Nutritional supplements and maintain balanced diet	Various nutritional supplements such as vitamin C, creatine, vitamin E and coenzyme Q10 help in managing neurodegenerative diseases.	NA	
	Holistic Approach	Yoga and Mindfulness	Yoga improved flexibility, reduced bradykinesia and stiffness, enhanced cognitive function and better emotional well-being.	NA	

6. Benefits of social engagement and mental stimulation for elderly patients

Social engagement and mental stimulation play crucial roles in managing non-motor symptoms of PD. Engaging in group exercises and activities like dance therapy has shown benefits in improving cognitive functions, emotional well-being, and social support. These activities not only enhance mental health but also promote physical health by reducing symptoms of depression and anxiety, and improving memory and concentration. Additionally, with the help of integrative therapies such as mindfulness meditation and yoga, psychospiritual outcomes is improved, directly mitigating symptoms of anxiety and depression, and enhancing cognitive performance.

7. Role of preventive healthcare and regular check-ups in managing Parkinson's

Preventive healthcare and regular check-ups are essential in managing Parkinson's Disease (PD). Routine assessments using tools like the Unified Parkinson's Disease Rating Scale (UPDRS) help in monitoring the progression of both motor and non-motor symptoms, enabling timely interventions and adjustments in treatment plans. This proactive approach ensures that patients receive comprehensive care, addressing issues like rigidity, postural instability, and other motor symptoms that significantly impact their quality of life (6).

Strategies to manage daily activities and routine for elderly patients, especially those with PD, include tailored exercise programs that improve mobility and muscle strength. Activities like resistance exercises and high-intensity workouts have shown significant benefits in enhancing mobility, muscle strength, and reducing bradykinesia. Additionally, incorporating mindfulness and cognitive activities into daily routine can improve concentration, memory, and performance in activities of daily living (ADLs), thereby enhancing independence and quality of life. These approaches underscore the importance of a multidisciplinary and integrative care plan to manage the complex needs of elderly patients with PD, promoting both physical and mental health to improve their overall well-being.

8. Conclusion

Parkinson's disease (PD) poses significant challenges for elderly patients, impacting their motor and non-motor functions and overall quality of life. Addressing PD within geriatric healthcare is crucial due to the increasing prevalence of the disease in the aging population and the unique challenges faced by elderly patients. Comprehensive management strategies that combine pharmacological treatments, surgical interventions, non-pharmacological approaches, alternative therapies, and lifestyle modifications are essential for improving the health and independence of elderly individuals with PD.

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