



DENTAL MANAGEMENT OF PATIENTS WITH PARKINSON'S DISEASE

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ABSTRACT

Parkinson's disease is a progressive disorder of the nervous system that affects the motor function. However, the pathogenesis of this disease is complex and involves many molecular, cellular and physiological pathologies. Parkinson's disease can affect the mouth and subsequently oral health is affected. The clinical features, pathophysiology, medical management, dental findings and management of patients with parkinson's disease in dental office has been discussed in this review article.

KEYWORDS: Parkinson's disease, oral health, signs, dental management

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INTRODUCTION

Parkinson's disease also known as "the idiopathic or primary parkinsonism, hypokinetic rigid syndrome(HRS), or paralysis agitans", is "a chronic progressive neurological disorder chiefly of later life that is linked to decreased dopamine production in the substantia nigra and is marked especially by tremor of resting muscles, rigidity, slowness of movement, impaired balance, and a shuffling gait".¹ In 1817, an English doctor, James Parkinson published an essay on the shaking palsy² that described the characteristic resting tremor, abnormal posture, gait, diminished muscle strength and paralysis. In 1912, Frederic Lewy described about the micro particles in the affected brain through microscopic examination which was later named as "Lewy bodies".³ In 1919, Konstantin Tretiakoff reported that the substantia nigra was the main cerebral structure affected. However, this finding was accepted only after the confirmational studies done by Rolf Hassler in 1938.³ In 1997, α -synuclein was found to be the main component found in Lewy bodies.⁴ Parkinson's disease most commonly occurs after 50years of age. Oral health may decline because of tremors, muscle rigidity and cognitive deficits. The most common dental findings include dental caries, periodontal disease, difficulty in swallowing, dry mouth, and drooling of saliva.⁵

PARKINSON'S DISEASE- GENETIC CAUSES

Parkinson's disease (PD) in most people is idiopathic. Some, may occur due to genetic factors. Parkinson's disease, traditionally has been considered as the non-genetic disorder. However, around 5% of the cases occurs due to the mutation of one of several specific genes.⁶ Other genes include parkin (PRKN), Leucine-rich repeat kinase 2 (LRRK2 or dardarin), PTEN-induced putative kinase 1 (PINK1). Mutations in genes including SNCA, LRRK2 and GBA (glucocerebrosidase) have been found to be the risk factors of sporadic PD.⁷ These genes code for α -synuclein (SNCA- synuclein, alpha non A4 component of amyloid precursor), which is the main component of Lewy bodies.⁷ Mutations in LRRK2 are the most common causes for

familial and sporadic PD, accounting 5% of individuals with family history and 3% of sporadic cases.⁸

PARKINSON'S DISEASE- PATHOPHYSIOLOGY

The primary symptoms occurs due to the reduced activity of dopamine-secreting cells caused by cell death in the pars compacta region of the substantia nigra.⁹ There are 5 major pathways in the brain connecting other brain areas with the basal ganglia which includes; motor, ocular-motor, associative, limbic and orbitofrontal circuits. All these pathways are affected in PD. In parkinson's disease, the most commonly affected pathway is the motor pathway and a study was put forth to explain the alterations in motor circuit with PD. In this study, low level dopamine are the reasons to cause PD.⁹

MECHANISM OF CELL DEATH IN PARKINSON'S

There are several mechanism that could explain about the causes for brain cell death.¹⁰ One mechanism defines that brain cell death occurs due to the abnormal accumulation of the protein α -synuclein bound to ubiquitin in the damaged cells. This insoluble protein accumulates inside neurons forming inclusions called Lewy bodies. These bodies appear initially in the olfactory bulb, medulla oblongata and pontine tegmentum. As the disease progress, it later develops in the substantia nigra, areas in midbrain and basal forebrain and neocortex. Other mechanism include proteosomal and lysosomal system dysfunction and decreased mitochondrial activity.¹⁰

CLASSIFICATION

The parkinson's disease or the parkinson's syndrome or parkinsonism is further classified into 4 subtypes based on their origin.

- i. Primary or idiopathic
- ii. Secondary or acquired
- iii. Hereditary parkinsonism
- iv. Parkinson plus syndromes or multiple system degeneration.¹¹

SIGNS AND SYMPTOMS OF PARKINSON'S DISEASE

Parkinson's affects both the motor and the non-motor system.¹¹ Motor symptoms include four cardinal signs; tremor, rigidity, slowness of movement and postural instability. Tremor is common symptom seen in about 30% of the individuals.¹² Bradykinesia (slowness of movement) is another characteristic feature of PD. Rigidity of the muscles thereby causing stiffness and resistance to limb movement.¹³ Postural instability is seen in the final stages of the disease, leading to impaired balance and frequent falls. Up to 40% of the people may experience frequent falls with the number of falls being related to the severity of PD.¹⁴ Other motor signs include gait and posture disturbances such as festination (rapid shuffling steps and forward-flexed posture when walking), speech and swallowing disturbances including voice disturbances, mask-like face expression and writing disorders. Neuropsychiatric disturbances can range from mild to severe. This includes disorders of speech, cognition, mood, behaviour and thought. Cognitive disturbances can occur in the initial stages of the disease and sometimes prior to diagnosis. The most common cognitive deficit is executive dysfunction which can include problems in planning, cognitive flexibility, abstract thinking, and rule acquisition. Fluctuations in attention and slowed cognitive speed are seen. Memory is affected, specifically in recalling learned information. A person has 2-6 times the risk of dementia compared to the general population. The prevalence of dementia increases with duration of the disease. Behaviour and mood alterations are common. Frequent mood difficulties include depression, apathy, and anxiety.¹⁵ The most common symptoms include dementia, decreased facial expression, decreased movement, a state of indifference and slurred speech. Psychotic symptoms include hallucination or delusion which occur in 4% of the people with parkinson's disease.¹⁶ Symptoms can manifest as daytime drowsiness, disturbances in rapid eye movement (REM) sleep or insomnia. Alterations in autonomic nervous system can lead to orthostatic hypotension, urinary incontinence, oily skin and excessive sweating, altered sexual function, constipation

and gastric dysmotility can cause discomfort and endanger health. PD can also cause dry eyes, deficient ocular pursuit, blurred or double vision.¹¹

RISK FACTORS

*Age- young adults rarely experience PD. It ordinarily begins in the middle or late life and the risk increases with age. However, PD is most commonly seen in older people at the age of 60 years.

*Heredity- close relative with PD increases the chance of developing PD.

*Sex- men are more affected.

*Exposure to toxins like herbicides and pesticides can increase the risk of developing PD.¹⁷

DIAGNOSIS

To diagnose PD, the physician takes a careful neurological history and performs examination. There are specific tests to diagnose PD. The diagnosis is purely based on thorough clinical examination. The physician must check for any animated expressions, arms should be observed for tremors, stiffness of limbs and neck, walk normally or not and regaining of balance without any support. The finding of Lewy bodies in the midbrain on autopsy is usually considered as a proof which confirms that the person is suffering from PD. Computed Tomography (CT) and Magnetic Resonance imaging (MRI) brain scans of people with PD appears normal. Diffusion MRI has been reported to discriminate between typical and atypical parkinsonism. Dopaminergic function in the basal ganglia can be measured with PET and SPECT radiotracers.¹⁸

TREATMENT STRATEGIES

However, there is no cure for Parkinson's disease, medications, surgery and multidisciplinary management can provide relief from symptoms. The most commonly used drugs include, levodopa, dopamine agonists and MOA-B inhibitors (monoamine oxidase inhibitors). Levodopa is most commonly used drug. L-DOPA is converted into dopaminergic neurons by dopa decarboxylase.¹⁹ Since motor functions are affected due to the lack of dopamine, Levodopa can temporarily reduce the motor

symptoms. Dopamine agonists bind to the dopaminergic post-synaptic receptors in the brain and produce similar effects like levodopa. It includes bromocriptine, cabergoline, pramipexole and lisuride.¹⁹ MAO-B inhibitors increases the level of dopamine in the basal ganglia. This includes selegiline and rasagiline.¹⁹ Other drugs such as amantadine and anticholinergics may be useful in treating the motor symptoms.¹⁹ Surgery for PD can be divided into two as; lesional and deep brain stimulation (DBS). The target areas include the thalamus, globus pallidus, or subthalamic nucleus. Deep brain stimulation is the commonly performed surgery, developed in 1980 by Alim-Louis Benabid. It involves the implantation of brain pacemaker, that sends electrical impulses to different parts of the brain.²⁰ Speech and mobility problems can be improved with rehabilitation. Regular physical exercise, physiotherapy, diaphragmatic breathing and meditation techniques can be beneficial to maintain the motor activities. It is recommended that persons affected with PD should perform exercises for about 45 minutes to 1 hour after medications.²¹

DENTAL FINDINGS IN PARKINSON'S

There is an increase in dental cavities and accumulation of dental plaque, associated with a marked increase in gingival inflammation and periodontal disease, overt tooth mobility and pain. This occurs mainly due to the reduced hand to mouth mobility in PD and the loss of skill of tooth brushing. When people wear removable partial or complete denture, it results in ill fitting and often causes ulceration and inflammation in the gingival tissue. PD can affect the oral health in several ways. This includes;

- *Xerostomia can cause dental caries, ulcerations in the oral cavity and poor digestion of food,
- *Sialorrhoea occurs due to poor mouth closure, reduced frequency of swallowing and poor posture,
- *Tremors and Bradykinesia affecting the tongue and lips finally results in poor oral hygiene,
- *Dyskinesia affects the lips resulting in inappropriate smiling and
- *Poor lip closure can result in sialorrhoea, mouth breathing and xerostomia.²²

DENTAL MANAGEMENT OF PARKINSON'S PATIENT

Oral hygiene instructions should be offered to the Parkinson's disease affected patients. Recommend the use of electric tooth brush or water irrigation instrument coupled with plaque-revealing tablets. Running a washcloth through the vestibule can help to reduce the accumulation of food matter. Patients with PD may not be able to effectively communicate their needs, so a family member or a caregiver should be present when treatment is planned. Severe tremors and involuntary jaw movements can present difficulty in management of these patients. To gain maximum cooperation, patient should medications as scheduled and dental appointments should be framed in a short span of time. Decreased facial expression is commonly seen in patients affected with PD, so it is important for the treating clinician to be sympathetic and attentive to eye and limb movements that could suggest pain during procedure. Adequate suction is required during treatment as bradykinesia causes swallowing difficulties in patients with PD. Dental reconstruction that involves the occlusal surfaces needs to be tailored, as bruxism is common in these patients. Care should be taken not to overstress the patient. Short appointments are helpful. Dental appointments should be scheduled atleast once in every 6 months.²³

CLINICAL CONSIDERATIONS IN DENTAL OFFICE

Restoration of oral health is best completed as early as possible because of the patient's ability to cooperate. PD patients should be scheduled appointments no longer than 45 minutes, preferably early in the mornings. Before entering the dental office, patient should empty their bladders as urinary incontinence is commonly seen in Parkinson's patient. The patient chair should not be inclined more than 45 degrees. This is done to avoid patients swallowing of the fluids. Using an extraoral ratchet type prop or intraoral rubber bite block can help in keeping their mouth open, manage salivary flow and restricts head and tongue movements. Suction tips have to be used and stabilized by an assistant for managing the salivary flow and

preventing the contamination of restorations. Care should be taken while using local anaesthetic agent containing epinephrine in patients being treated with levodopa and entacapone, because these patients may experience an exaggerated effect on blood pressure and heart rate. It is prudent to administer not more than 0.05mg of epinephrine as found in three cartridges of 2% lidocaine with 1:100,000 epinephrine per 30 minutes with careful aspiration to avoid intravascular administration. The dental chair should be slowly raised to allow the patient get adapted to the upright position and prevent syncopal episodes. Parkinsonism tremors of the orofacial musculature and use of levodopa containing medications may cause bruxism. Therefore, the dentist should look for the excessive loss of tooth structure. Glass ionomer and resin modified glass ionomer cements should be used for restoring the lost carious tooth structure and lesions involving the root surfaces because, these cements bond to both the dentin and cementum and release fluoride. In advanced PD, treatment can be carried out under intravenous sedation or general anaesthesia. Use of electric scheduled frequently to maintain good oral

health. High fluoride tooth paste and topical fluoride should be used by patients with xerostomia to prevent root caries. Personal care providers should be educated about their role in assisting oral hygiene. In patients taking MAO-B inhibitors such as selegiline and rasagiline, avoid meperidine.²⁴

SUMMARY

People in all stages of PD can play an active role in maintaining or improving their oral and dental health. Regular visits to a dentist atleast once in 6 month, will aid in the maintainence of the oral hygiene status of these patients. Regular periodic examination atleast once in a year and use of special tooth brushes will help in the maintainence of the oral health of these patients. Proper education on oral hygiene maintainence should be given to the caregivers. However, there is no cure for Parkinson's disease, monitoring of changes in oral functions like changes in speech, swallowing or nutritional habits should be done routinely to avoid any further development of dental diseases.

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