

Chapter 7

Assessment of Gait Disorder in Parkinson's Disease

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ABSTRACT

Neurological disorders are some of the leading chronic disorders that impose a massive burden on low-income and developing countries. The disability resulting from the neurological disorder increases the severity and costs during the primary healthcare and for entire lifetime. Parkinson's disease (PD) is the second most common chronic neurodegenerative disorder which is slowly progressive with decrease in the motor and non-motor function of the nervous system due to cognitive impairment leading to gait abnormality. PD is most common in the age group of 40-65 years leading to increase in gait disorders associated with slowing down of the movement, balance instability, rigidity in the muscles, and difficulty in performing everyday tasks. The assessment of gait plays a significant role in maintaining the balance disorders in Parkinson's disease. In patients with PD, the neurons present in substantia nigra region of the brain get injured, and they progressively decline during their lifetime. Therefore, the patients lose their ability to perform movement and also lose their stability. The symptoms of PD can be monitored and controlled by assessing gait parameters based on gait disorder.

INTRODUCTION

Neurodegenerative disorder primarily affects the neurons present in the human brain leading to the loss or death of the neurons. Aging is one of the greatest risk factor of neurodegenerative disorder. The WHO (World Health Organization) has estimated that the neurological disorder affected more than one billion people worldwide leading to disability and suffering. Gait and balance disorders usually occurs in all major neurological diseases. Parkinson's Disease is the second most progressive neurological disorder which affects the elderly and its prevalence is predicted to increase with respect to the growth of the elderly population. Dr. James Parkinson, a surgeon and physician gave an essay describing the Shaking Palsy which is familiar in the western world. The birthday of Dr. James Parkinson has been chosen as the "World Parkinson's Day" and red tulip flower has been selected as its symbol. The clinical features of the PD combine four major parts of the human body namely changes in the motor function, changes in the cognitive function of the brain, changes in the behaviour and symptoms leading to failure in autonomic nervous systems. Every portion of the brain plays a different and critical role in the human body. The PD develops because there is a loss in the cells present in the basal ganglia portion of the brain. The basal ganglia control the basic human activity like walking and other movements. The abnormality in this portion results in irregular movements of the human. Normally there are certain specific cells present in the basal ganglia which are responsible for the production of dopamine. The dopamine is one of the neurotransmitters produced in the brain which releases a chemical to communicate with different parts of the brain. Therefore, the progression of PD over many years makes these brain cells to die and there will be reduction in the dopamine level of the brain leading to more complication like resting tremor, bradykinesia, rigidity in the body and balance disorders. The symptom related to PD are unilateral which means one side of the body is more affected than the other side. The disease later progresses to the bilateral findings. Tremor usually occurs during the beginning of the PD and limited to one side of the arm or leg for many years. Bradykinesia which is described as the peculiar and most disabling characteristic of PD leads to slow or absent of movement. Rigidity is the resistance to the movement of the individual. Balance disorder is one the major problem in PD patients leading to frequent falling and postural abnormalities. There are also several minor motor and non-motor functions associated with PD patients namely speech impairment, cognitive impairment and psychological disorder. There are variety of medications available to treat the symptom of PD. At the initial stage the individual has already developed disability and therefore pharmacological treatment is required. The second stage is the development of complications and the third stage is the dopamine deficiency treated using dopamine agonists. Gait Rehabilitation are recommended for PD patients who have speech and mobility problems. The economic cost for the PD patients is high and PD reduces the quality of life of the individual and caregivers. The current research focus on building animal models based on gene therapy and stem cell transplantation.

BACKGROUND

Parkinson's disease (PD) is a neurodegenerative disease which mainly affects the human motor system (Rodriguez-Martin, Sama, Perez-Lopez, Catala, Moreno Arostegui & Cabestany, 2017). PD has many symptoms in which the freezing of Gait (FoG) is one among them. In recent years, the classification systems with several classifiers such as Linear Discriminate Analysis, K-nearest neighbour, K-means, Random forest, Naïve Baiyes, Support Vector Machine (SVM), Artificial Neural Network (ANN) etc.

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