Parkinson Disease: Causes, Symptoms, and Treatments

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Parkinson disease is the second most common neurodegenerative disease after Alzheimer’s disease (Billingsley, Bandres-Ciga, Saez-Atienzar & Singleton, 2018 and Kalia & Lang, 2015). Parkinson’s is pathologically described by “degeneration of nigostrial dopaminergic neurons and the presence of Lewy bodies in surviving neurons” (Aarsland et al., 2017, p. 217). This disease is typically known as a movement disorder, but an individual with Parkinson’s is affected by motor and non-motor symptoms. Parkinson’s disease develops from the influence of genes and the environment (Kalia & Lang, 2015). Grimes et al. (2019) describe how “Parkinson disease is chronic and progressive in nature, decreasing the quality of life for both patients with the disease and their caregivers and placing onerous economic burden on society” (p. E989). There is an estimated 7 to 10 million people worldwide that suffer from Parkinson disease (Bhat, Acharya, Hagiwara, Dadmehr, & Adeli, 2018). This paper will address the causes, symptoms and available treatments for Parkinson disease.

A key feature of Parkinson disease is the loss of dopaminergic neurons, which leads to the motor symptoms of the disease (Kalia & Lang, 2015). Kalia & Lang (2015) state that “each neurodegenerative disease is categorised based according to the protein that is most abundant in the associated protein inclusions” (p. 900). The protein aggregates of abnormally folded proteins are known as Lewy bodies and Lewy pathology is associated with non-motor symptoms of Parkinson’s (Kalia & Lang, 2015). The protein of interest in Parkinson disease is alpha-synclein (Kalia & Lang, 2015 and Deng, Wang, & Jankovic, 2018). According to Deng et al. (2018), “the neuropathy of PD is characterized by selective neuronal loss associated with accumulation and aggregation of alpha-suclein in Lewy bodies (LBs), cytoplasmic inclusions in neurons of specific brain regions including the brainstem and cortical regions” (p. 72). The accumulation of alpha-suclein forms aggregations which leads to the neurotoxic function of Parkinson’s disease (Deng et al., 2018). Neuroprotective therapies will help delay the progression of Parkinson’s as well as, prevent the development of non-motor symptoms (Deng et al., 2018).

**Symptoms**

**Motor**

Parkinson disease is a “continuing neurological disorder where symptoms continue to worsen gradually” (Bhat et al., 2018, p. 234). Early diagnosis of Parkinson disease can be challenging. Often anxiety, depression, fatigue and sleep disorders are observed before a patient is diagnosed with Parkinson disease (Bhat et al., 2018) Some common motor symptoms of an individual with Parkinson disease include resting tremor, rigidity, bradykinesia and postural instability (Aarsland et al., 2017 and Grimes et al., 2019 and Kalia & Lang, 2015). Bradykinesia refers to slowness of movement (Grimes et al., 2019).

**Non-Motor**

There is a wide varietyof non-motor symptoms associated with Parkinson’s disease (Aarsland et al, 2017). Kalia & Lang (2015) state that often non-motor features are recognized before motor symptoms. Olfactory dysfunction, cognitive impairment, psychiatric symptoms, sleep disorders, autonomic dysfunction, pain and fatigue are examples of non-motor symptoms for Parkinson’s disease (Kalia & Lang, 2015). According to Aarsland et al. (2017), the most common and important non-motor symptom is cognitive decline. Individuals with Parkinson’s “exhibit more rapid decline in number of cognitive domains–in particular, executive, attentional and visuospatial domains, but also memory” (p. 217). Each individual who is diagnosed with Parkinson’s will vary in the timing, profile and rate of their cognitive decline (Aarsland et al., 2017).

After ten years of being diagnosed with Parkinson disease, the majority of patients develop dementia (Aarsland et al., 2017). The risk of dementia increases 25-30% in an individual with Parkinson’s and in the advanced stages of the disease dementia is a frequent problem (Aarsland et al., 2017). The occurrence of dementia is “15-20% after 5 years and 46% at 10 years” (Aarsland et al., 2017, p. 218) and after 20 years 83% of patients with Parkinson’s disease will have dementia (Kalia & Lang, 2015).

Another non-motor symptom is when the autonomic nervous system does not work properly, which is also called autonomic dysfunction (Grimes et al., 2019). The autonomic nervous system is responsible for automatically performing everyday functions that keep an individual alive. Autonomic dysfunction includes problems with gastrointestinal, urogenital and thermoregulatory systems (Grimes et al., 2019). Autophagy is a catabolic process where the autonomic nervous system degrades and removes dysfunctional organelles and proteins (Billingsley et al., 2018). Autophagy is the first pathway affected by Parkinson’s which leads to alpha-synuclein not being degraded (Billingsley et al., 2018).

**Risk Factors**

Parkinson disease is among the most common age-related brain disorders (Aarsland et al., 2017) which is most likely to develop in middle age and beyond (Ahlskog, 2018). The article by Kalia & Lang (2015), states that “the prevalence and incidence [of Parkinson disease] increase nearly exponentially with age and peak after 80 years of age” (p. 898). According to Billingsley et al. (2018), 1% of the global population 65 years or older have Parkinson’s and 4-5% of individuals 85 years or older have Parkinson’s. The life expectancy worldwide is increasing and “the number of people with Parkinson’s disease is expected to increase by more than 50% by 2030” (Kalia & Lang, 2015, p. 898). As individual’s grow older the chance of obtaining Parkinson’s increases, not only due to age but also an increased chance of being exposed to environmental factors. Another risk factor is gender, “with the male-to-female ration being approximately 3:2” (Kalia & Lang, 2015, p. 898).

In an article by Bhat et al. (2018), they state that “scientists speculate that the interaction between gene mutations and environmental exposures can contribute to PD progression” (p. 235). However, only 20% of patients with Parkinson disease are due to genetics (Bhat et al., 2018). There are various genes, LRRK2, PRKN, PINK1 or SNCA, that if develop a mutation will increase an individual’s chance of Parkinson’s (Bhat et al., 2018). Mutations to the LRRK2 gene are the most common cause of genetic Parkinson disease (Kalia & Lang, 2015). GBA is also a gene that is assumed to alter the risk of Parkinson’s in families (Bhat et al., 2018). Mutations in GBA can lead to a reduction of GBA activity which causes alpha-suclein levels to increase. Some environmental factors that increase an individual’s risk of getting Parkinson disease include pesticide exposure, prior head injury, rural living, beta-blocker use, agricultural occupation, and well-water drinking (Kalia & Lang, 2015 and Bhat et al., 2018).

**Treatments**

**Physical Activity**

Physical activity has the ability to improve motor and non-motors in individual with Parkinson’s disease (Aarsland et al., 2017). Aerobic physical exercise has “a range of beneficial effects on the brain, with potential relevance to cognition” (Aarsland et al., 2017, p. 227). A regular exercise program started early for someone with Parkinson’s has shown benefits (Grimes et al., 2019). Unfortunately, exercise prescription is often overlooked and discarded (Ahlskog, 2018). Exercise “improves not only how people with Parkinson disease feel, but also their ability to perform activities of daily living” (Grimes et al., 2019, p. E1001). Physical therapy specific to patients with Parkinson disease would include gait re-education, improvement of balance and flexibility, enhancement of aerobic capacity and strength and the improvement of movement initiation (Grimes et al., 2019). Physical activity can help slow the progression of Parkinson’s and it is important that patients are informed of the benefits when they are initially diagnosed.

**Medicine**

There are no medications that have proven to stop the progression of Parkinson’s (Ahlskog, 2018). The most effective medication for patients with Parkinson disease Levodopa (Grimes et al., 2019). Levodopa is absorbed into the blood by the small intestine and travels to the brain through the blood (Parkinson’s Foundation, n.d.). In the brain, levodopa is synthesized into dopamine which is needed for body movement (Parkinson’s Foundation, n.d.). Levodopa treatment is focused on motor symptoms and is used as a “symptomatic treatment for people with early Parkinson disease” and “there is no reason to delay its use for those with bothersome motor symptoms” (Grimes et al., 2019, p. E1000). The response to Levodopa is sometimes used to determine if an accurate diagnosis was given (Grimes et al., 2019). Carbidopa is often combined with levodopa as it acts as a levodopa enhancer which lowers the needed dose of levodopa (Parkinson’s Foundation, n.d.). Levodopa often causes patients to have nausea and theses side effects are reduced by the addition of carbidopa (Parkinson’s Foundation, n.d.). According to Ahlskog (2018), “appropriate carbidopa/levodopa administration is the single most crucial medication strategy” (p. 360).

**Deep Brain Stimulation**

Deep brain stimulation is another treatment factor used to manage motor symptoms (Grimes et al., 2019 and Kalia & Lang, 2015). The “progression of Parkinson’s disease is characterized by worsening of motor features, which initially can be managed with symptomatic therapies” (Kalia & Lang, 2015, p. 897). Deep brain stimulation is the “surgical treatment of choice in appropriately selected patients with substantial motor complications when optimized medical treatment has failed in treating motor symptoms” (Grimes et al., 2019, p. E1001). Treatment, especially surgical treatment, should only be an option when the symptoms are causing the patient discomfort or disability (Kalia & Lang, 2015). Typically, after 10-13 years of being diagnosed an individual with Parkinson disease will undergo surgical treatment (Kalia & Lang, 2015). Treatments should have the goal of improving the individual’s function and quality of life (Kalia & Lang, 2015). Parkinson Canada will “play an important role in advocating for more resources and the dissemination of knowledge to improve the care and support” of all individuals affected by Parkinson’s (Grimes et al., 2019, p. E1003).

Parkinson disease is typically diagnosed in individuals at an older age because it is hard to diagnosis early on. The major symptoms of Parkinson’s include tremor, postural instability, muscle rigidity and slowness of movements (Bhat et al., 2018). The diagnosis of Parkinson disease for a majority of patients is due to environmental factors with the minority being from genetics. There are no known treatments available to cure Parkinson’s, but there are available therapies and medications to reduce and treat some of the symptoms. Parkinson disease is the second most common neurodegenerative disease and it is important that people are aware of the risk factors associated with obtaining it.

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**Personal Connection**

 I choose to do this paper on Parkinson disease because my grandpa was recently diagnosed. My grandpa will be turning 80 this year. My grandparents live on an acreage in Abbotsford, requiring lots of maintenance. Before my grandpa was diagnosed with Parkinson’s, I did not know anything about it. By writing this paper I have gained an understanding of the causes and symptoms of Parkinson disease. I have also learned what happens pathologically in an individual with Parkinson’s. Through writing the paper I have learned of various treatments available and certain benefits of each. I had the opportunity of living with my grandparents for the past two summers in July and August because I was working on the mainland. By living with them, I saw my grandpa struggle to perform certain tasks. Each morning my grandpa goes for a walk and my grandma goes for a bike ride. However, my grandpa does not always want to go for the walk, but my grandma “forces” him too. After writing this paper, I can confidently inform both my grandparents about the benefit of physical exercise for patients with Parkinson’s. I will also be able to educate other members of my extended family about Parkinson disease.