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Parkinson's Disease and Anesthesia

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Parkinson's Disease

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What is the Topic

- Parkinson's Disease (PD) is a progressive neurodegenerative brain disorder (Lotankar et al, 2017)

Why Parkinson's

- PD is the fast-growing neurological disorder, it is estimates that the number of PD case will double from about 7 million in 2015 to about 13 million in 2040 (Jankovic & Tan, 2020).
- Neurological disorders Are the leading source of disability (Jankovic & Tan, 2020).
- Growing elderly population (Simon et al, 2019).

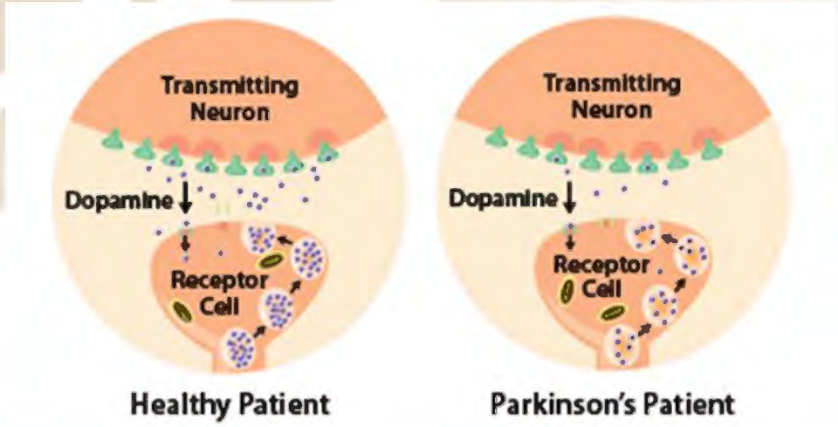
Signs and Symptoms

- PD manifests as tremors, muscle rigidity, bradykinesia, impaired posture, impaired balance, speech changes, impaired fine motor skills and eventually loss of automatic movement (Radhakrishnan & Goyal, 2018).
- Addition's problems associated with PD are difficulties thinks, depression, issues swallowing, chewing, and eating, sleeping disorders, bladder issues, and constipation (Lotankar et al, 2017).
- Patients can also have blood pressure changes, pain, fatigue, loss of smell and sexual dysfunction (Lotankar et al, 2017).

Underlying pathophysiology

- PD is a chronic progressive neurodegenerative disorder characterized by early prominent death of dopaminergic neurons in the substantia nigra pars compacta and widespread presence of alpha synuclein an intracellular protein (Radhakrishnan & Goyal, 2018).
- PD is represented by the presence of neuronal inclusions, termed Lewis Bodies, mainly composed of aggregates of misfolded alpha synuclein which causes cytotoxicity through lipid membrane permeabilization, mitochondrial damage and oxidative stress (Vittorio et al, 2020).
- Several risk factors have been implicated including pesticide and heavy metal exposure, rural living, agricultural occupation, traumatic head injury, history of melanoma, consumption of dairy products, type 2 diabetes mellitus (reduced using antidiabetic drugs), among many others (Jankovic & Tan, 2020).
- Several life-style factors have been associated with reduced risk of developing PD. The most consistent association is a reduced risk of PD in cigarette smokers, caffeine, and exercise (Simon et al, 2019).
- In recent years it has become evident that there is also a genetic contribution to PD and several mutations have been identified (SNCA, Parkin, PINK1, DJ1, LRRK2 and GBA) although in most world regions only a minority cases are explained by genetics (Lotankar et al, 2017).

Figure 1. Parkinson's patients have reduced dopamine levels in the synaptic cleft between neurons effecting the patient's movement (Radhakrishnan & Goyal, 2018). Image credit: Parkinson Association of the Carolinas



Significance of Pathophysiology

- Dopamine deficiency in the basal ganglia leads to classical Parkinsonian motor symptoms viz, bradykinesia, tremor, rigidity, and later postural instability (Radhakrishnan & Goyal, 2018).
- While it is a rare condition, patients with Parkinson's disease can suffer from vocal cord paralysis during intubation (Kim et al, 2020).
- The pharmacological treatments for PD lose their efficacy as the disease progresses and are unable to block or reduce the neurodegenerative process (Vittorio et al, 2020).
- The pathogenesis of PD involves neuroinflammation, which is affected by both innate and adaptive immunity. They have shown that the levels of proinflammatory cytokines are elevated in PD patients (Hwang et al, 2020).
- Patients with PD also have higher rates of postoperative morbidity, which can be related to postural instability places these patients at greater risk of falling, whilst dysphagia increases susceptibility to aspiration pneumonia (Roberts & Lewis, 2018).

Treatment

- To date, the therapies available for the treatment of PD are addressed to reduce the motor symptoms and include the administration of drugs able to restore the level of dopamine (Vittorio et al, 2020).
- Levodopa, the most effective drug in the treatment of PD, is almost always combined with carbidopa or benserazide, aromatic acid decarboxylase inhibitors that prevent its peripheral metabolism and markedly reduce the risk of nausea (Jankovic & Tan, 2020).
- Dopamine receptor agonists stimulate dopamine receptors when introduced early during PD treatment, they delay levodopa related complications such as motor fluctuations and dyskinesias (Jankovic & Tan, 2020).
- Subthalamic nucleus deep brain stimulation is an effective treatment for patients with Parkinson's disease with motor fluctuations, but clinical outcomes are critically dependent on accurate placement of the stimulating electrode (Tsai et al, 2020).
- General anesthesia does not impair electrode placement accuracy or affect long-term clinical outcome (Tsai et al, 2020).
- There is currently no cure for PD (Lotankar et al, 2017).
- New research shows that inhibition of a-syn aggregation by small molecules proved to be a valid approach for the development of new therapeutics for the treatment of PD (Vittorio et al, 2020).

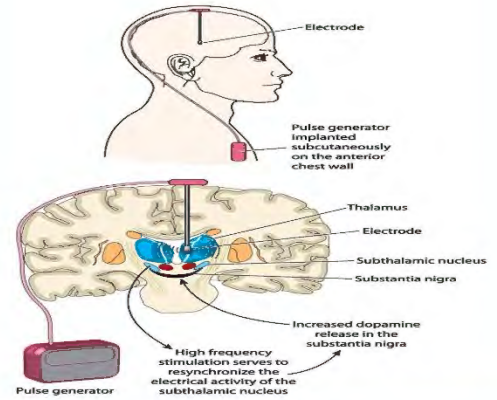
Implications of Nursing Care

- Recommend that evaluation of respiratory function should be performed carefully prior to surgery and antiparkinsonian drugs should be continued (Kim et al, 2020).
- Recommend anesthetist to prepare for life-threatening upper airway obstruction during the perioperative period in patients with PD (Kim et al, 2020).
- Several retrospective studies have found an association between anesthetic exposure during infancy and adverse neurodevelopmental outcomes (Roberts & Lewis, 2018).
- Carefully reviewing a patient's medication regimen so staff understand the importance of adhering to specific dosing intervals (Roberts & Lewis, 2018).

Conclusion

- PD is a complex disorder, with both environmental and genetic factors converging on a common set of pathways (Simon et al, 2019).
- While studies show a connection to anesthesia and adverse neurodevelopmental outcomes, there is not enough data to drawl a correlation between anesthesia and PD (Roberts & Lewis, 2018).
- The inhibition of a-syn aggregation has emerged as promising new therapeutic strategy for the treatment of PD PD (Vittorio et al, 2020).
- current PD research demands a search for unique biomarkers that can be useful to discriminate between PD and other diseases with higher sensitivity and specificity (Lotankar et al, 2017).

Figure 2.. Subthalamic nucleus deep brain stimulation are surgically implanted into the patient's brain to help stimulate the brain an reduce tremors (Tsai et al, 2020). Image credit: Smith 2021



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