

## Administration of mesenchymal stem cells in reducing the progression of Parkinson's disease

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### **Abstract**

Parkinson's disease (PD) is the second most common neurodegenerative disease characterized by severe dyskinesia due to the progressive loss of dopaminergic neurons along the nigrostriatal pathway. The current focus of treatment is palliation of symptoms through administration of levodopa, such as L-3,4-dihydroxyphenylalanine replacement therapy, administration of dopaminergic agonists, functional neurosurgery, and gene therapy, rather than prevention of dopaminergic neuronal damage. Hence, the application and development of neuroprotective/disease-protective strategies is absolutely necessary. Currently, stem cell therapy is considered for the treatment of PD. As for stem cells, mesenchymal stem cells (MSCs) seem to be the most promising. In this review, we analyzed the mechanisms of action of MSCs in Parkinson's disease. The results of the studies indicated that Mesenchymal stem cells show immunomodulating effects after penetrating the injury sites, so that they can reduce inflammation and heal the tissue and MSC prevents the progression of the disease by reducing the damage of the remaining cells, and on the other hand, it causes recovery by changing the nerve cells.

**Keywords** “Parkinson, cell therapy, Mesenchymal stem cells”.

### **Introduction**

Parkinson's disease (PD) is the second most common neurodegenerative disease in the world, the main cause of which is the loss of dopaminergic neurons in the substantia nigra. The loss of dopaminergic neurons causes a decrease in the level of dopamine and leads to impaired motor function.

Regenerative cell therapy is a new method in Parkinson's treatment that improves the patient's performance by replacing the damaged cell population.

Mesenchymal stem cells (MSCs) are a cell therapy source that can differentiate into dopaminergic neurons and produce neurotrophic substances. MSC can be obtained from the patient himself or from a healthy donor and from mesenchymal tissues such as fat, bone marrow and umbilical cord.

### Search Strategy

This review study was conducted by searching the keywords Parkinson, cell therapy, Mesenchymal stem cells, in Scopus, PubMed, Web of science databases and also in Google Scholar. After applying the inclusion and exclusion criteria, 5 articles in 2016-2024 were finally included in the study

### Results Discussion

Mesenchymal stem cells show immunomodulating effects after penetrating the injury sites, so that they can reduce inflammation and heal the tissue.

Currently, MSC can be administered systemically or locally. Systemic transplant can be done through intravenous, arterial and inhalation infusion of mesenchymal stem cells. Systemic transplantation of MSC affects the whole body, but local transplantation is performed through intramuscular injection or directly into the tissue.

Due to the simplicity and non-invasiveness of the stem cell infusion method, different doses of cells can be used repeatedly. The intranasal application of stem cells allows these cells to enter the central nervous system, and due to the high efficiency of this method, there is no need to use a high dose of cells, and in this method, the systemic spread of these cells to different areas of the body is at least possible.

### Conclusions

By reducing neuroinflammation, MSC protects the remaining cells and prevents the progression of the disease, and on the other hand, by transforming into the targeted nerve cells, it leads to a gradual recovery. Among the existing methods, the intranasal spray method is better tolerated and with increasing number Nerve cells up to 5000 per microliter have had positive therapeutic effects.

### References

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