



Clinical Application of MSCs for COVID-19 Treatment

Megan Navara*

Department of Biology, University of Texas, San Antonio, United States

DESCRIPTION

COVID-19 disease has been a worldwide health problem since 2019. There are many worries about the fast spreading of this disease, and yet, there is no appropriate treatment for COVID-19. Numerous biological interferences have been under study newly to investigate well-organized treatment for this viral disease. Also various efforts have been made to discover a safe way to avoid and vaccinate people against COVID-19 disease. In extreme cases, patients suffer from severe respiratory distress syndrome commonly associated with an augmented level of inflammatory cytokines, known as a cytokine storm.

Mesenchymal Stem Cells (MSCs) have been recently under research in this regard, and the received clinical results show hopeful evidence for stem cell-based therapy of COVID-19. MSCs are known for their ability for immunomodulation, protect against virus infection, and tissue regeneration. MSCs are a newly emerged stage for scheming vaccines and demonstrate promising evidence in this area. In the recent study, a thorough research study is provided on the recent clinical records based on stem cells in the treatment of COVID-19 while offering stem cell exclusivities for use as an immune disorder or lung cell therapy and its possible application for protection and vaccination against COVID-19.

Both experimental studies on the effect of stem cell-based approaches for COVID-19 treatment and clinical trial were included in this study. Besides, the most applicable documents considering “stem cell biology,” “immunomodulatory effects of stem cells,” and “regenerative and anti-apoptotic effects of stem cells” were also included for the clarification of documented results.

One of the important features of ARDS is the disturbance of the alveolar-capillary membrane and apoptosis of alveolar epithelial and endothelial cells. Apoptotic cells cause attracts inflammatory cells and lung tissue renewal. Based on recent studies, MSCs can inhibit from apoptosis of the alveolar epithelial cells and endothelial cells due to the discharge of growth factors such as Keratinocyte Growth Factor (KGF), Angiopoietin-1 (Ang1), and Hepatocyte Growth Factor (HGF) and reduction of Tumor Necrosis Factor (TNF). Due to the reduced pulmonary porousness and increased alveolar edema and intrapulmonary pushing, ARDS is usually associated with hypoxemia. MSCs can be stirred in response to the hypoxic stress from the lung tissue. It has been verified that in hypoxic situations, the secretome of adipose-derived MSCs is enriched with angiogenic factors and recovers angiogenesis

in an *in vitro* mouse model. Raised secretion of Ang1 and KGF from bone marrow-derived MSCs was freshly reported to reduce inflammation and inhibit alveolar epithelial cells from apoptosis. It seems that MSCs are promising applicants for airway treatment seeing their angiogenic properties and their ability to reduce alveolar cell apoptosis. According to earlier studies, MSCs have been verified in animal models and clinical trials for the treatment of lung diseases and immune disorders. It has been confirmed that MSCs can be use an immunomodulatory effect on mice with LPS-mediated lung damage through stanniocalcin-2 protein. MSC therapy is now an accepted medication for the treatment of variety of immune diseases like multiple sclerosis and Crohn’s disease. Also, hopeful results are accessible for MSCs application in animal models for the treatment of lung disease (idiopathic pulmonary fibrosis, bronchopulmonary dysplasia and chronic obstructive bronchiolitis).

According to current studies, MSC therapy likes to be an advanced treatment for COVID-19, as it involves lung tissue and is associated with inflammatory responses. Stem cells are considered a choice in the treatment of diseases with high morbidity rates, based on FDA regulations. By the time of preparing this paper, 88 stem cell-based clinical trials were registered in clinicaltrials.gov and ICTRP portal for treatment of COVID-19. Various sources have been used for removal and expansion of MSCs in these trials according to the details provided by clinicaltrials.gov and ICTRP portal. Most of these clinical trials were lead in China, and the results presented the security of stem cell-based treatments to treatment severe cases of COVID-19. Stem cell-based therapies for COVID-19 are mainly managed as an intravenous injection of MSCs check; however, the application of extracellular vesicles secreted by stem cells has also been reported.

CONCLUSION

According to recent reports, MSC-based treatments seem to be a unique biological involvement for the treatment of COVID-19. Considering the uniqueness of MSCs to protect against viruses, immunomodulatory properties, and their possibility for tissue regeneration, MSC-based treatments deserve more attention from researchers and seem to be applied more to treat COVID-19. Though, there are some challenges related with cell-based treatments. Maybe, using an average and creative method to stem cell operation can solve previous challenges.

Correspondence to: Megan Navara, Department of Biology, University of Texas, San Antonio, United States, E-mail: navaramegan09@gmail.com

Received: 31-Dec-2022, Manuscript No. JSCRT-22-15522; **Editor assigned:** 03-Jan-2022, Pre QC No. JSCRT-22-15522(PQ); **Reviewed:** 17-Jan-2022, QC No JSCRT-22-15522; **Revised:** 21-Jan-2022, Manuscript No. JSCRT-22-15522(R); **Published:** 28-Jan-2022, DOI: 10.35248/2157-7633.22.12.512.

Citation: Navara M (2022) Clinical Application of MSCs for COVID-19 Treatment. J Stem Cell Res Ther. 12:512.

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