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Comparison between the effect of CD34+ stem cells and mesenchymal stem cells in improving pulmonary fibrosis in bleomycin rat model: An experimental and immunohistochemical study

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Introduction: Pulmonary fibrosis is an interstitial lung disease characterized by progressive pulmonary parenchymal fibrosis. Unfortunately, there is no effective therapy available for it. Major accomplishments have been achieved in decoding, diagnosing and treating pulmonary fibrosis as many new drugs and clinical guidelines have been advanced and utilized in these patients, however the dilemma of drug therapies are unable to reduce further disease progression till now but more practically stabilizing lung function and exercise capacity. Stem cell therapy has shed some new lights on the management of parenchymal fibrosis and chronic airway diseases.

Objectives: To assess the ability of human umbilical cord blood (hUCB) CD34+ cells and mesenchymal stem cells (MSCs) to reduce pulmonary fibrosis in bleomycin rat model.

Materials & Methods: Thirty two adult albino Wistar rats divided into 4 equal groups were included; GI: Normal control group, GII: Lung fibrosis group, GIII: CD34+ group and GIV: MSCs group. Pulmonary fibrosis was induced in GII, GIII and GIV by bleomycin hydrochloride in a dose of 1.5 mg/kg as a single dose of intratracheal instillation. On the day of induction, GIII and GIV were treated by IV injection in the tail vein with a dose of 1×106 cells/rat CD34+ cells and MSCs respectively. Lung function was assessed by blood gas analysis. Fourteen days after fibrosis induction, animals were sacrificed and lungs were dissected for histopathology and TGFβ1 assessment.

Results: There was significant improvement of arterial blood oxygen in CD34+ group which varied significantly from GII but did not vary significantly from GI, meaning that CD34+ cells restored arterial blood oxygenation to normal. Treatment with MSCs improved blood oxygenation but could not restore it to normal. Regarding fibrosis grade, there was no significant difference between both treated groups although they varied significantly from GI and GII, meaning that both stem cells could not restore lung morphology to normal. However, they improved histopathological changes when comparing to GII. Both treated groups had significantly lower levels of TGFβ1 than GII but did not vary significantly from GI meaning that both stem cells restored its level to normal and their effect did not vary significantly from each other.

Conclusion: Treatment with (hUCB) CD34+ cells and MSCs improved functional and structural alterations in bleomycin induced lung fibrosis in rats.

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