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The Comparison of the Effects of Adipose-Derived Mesenchymal Stem Cells Delivery by Systemic and Intra-Tracheal Injection on Elastase-Induced Emphysema Model

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Abstract : Pulmonary emphysema is a pathological respiratory condition identified by alveolar destruction which leads to limitation of airflow and diminished lung function. A substantial body of evidence suggests that mesenchymal stem cells (MSCs) have the ability to induce tissue repair primarily through a paracrine effect. In this study, we aimed to determine the efficacy of Intratracheal adipose-derived mesenchymal stem cells (ADSCs) therapy in comparison to this approach with that of Intravenous (Systemic) therapy. Fifty adult male Sprague–Dawley rats weighing between 180 and 200 g were used in this experiment. The animals were randomized to Control groups (Intratracheal or Intravenous vehicle), Elastase group (intratracheal administration of porcine pancreatic elastase; 25 U/kg on day 0 and day 10th), Elastase+Intratracheal ADSCs therapy (1x107 Cells, on day 28) and Elastase+Systemic ADSCs therapy (1x107 Cells, on day 28). The rats which not subjected to any treatment, considered as the control. All rats were sacrificed 3 weeks later. Morphometric findings in lung tissues (Mean linear intercept) confirmed the establishment of the emphysema model via alveolar disruption. Contrarily, ADSCs administration partially restored alveolar architecture. These results were associated with improving arterial oxygenation, reducing lung edema, and decreasing lung inflammation with higher significant effects in the Intratracheal therapy route. These results documented that the efficacy of intratracheal ADSCs was comparable with intravenous ADSCs therapy. Accordingly, the obtained data suggested that intratracheal delivery of ADSCs would enhance lung repair in pulmonary emphysema. Moreover, this method provides benefits over a systemic administration, such as the reduction of cell number and the low risk to engraft other organs.

Keywords : mesenchymal stem cell, emphysema, Intratracheal, systemic
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