Effects of Wharton’s Jelly-derived Mesenchymal Stem Cells on Chronic Obstructive Pulmonary Disease

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Objectives:
Chronic obstructive pulmonary disease (COPD) is a fatal disease that shortens one’s life expectancy, and reduces the quality of life of patients. The current known treatments for COPD can only act to alleviate the symptoms. Recently, stem cells have demonstrated efficacy in various medical areas. The aim of this study was to investigate the possibility of using human Wharton’s jelly-derived mesenchymal stem cells (MSCs) for lung recovery in a COPD mouse model.

Methods:
Human Wharton’s jelly was obtained during natural delivery or caesarean section from healthy women. Wharton’s jelly-derived MSC was confirmed with expression of CD14, CD34, CD45, CD73, CD90, and CD105 using flow cytometry. Mice model (C57BL/6) of COPD were induced by injecting 10 µL elastase into the trachea and they were divided into three treatment groups (sham, vehicle, stem cell). The sham group was not induced COPD, nor provided any treatment; the vehicle group comprised of COPD-induced mice treated with normal saline; the stem cell group comprised of COPD-induced mice treated with Wharton’s jelly-derived MSCs. The vehicle and mesenchymal stem cells (5 × 10⁴ cells) were injected in tail vein 7 days following COPD induction. Mice were euthanized 7 days after vehicle and stem cell injection, and pathologic findings were confirmed. Mean Linear Intercept (MLI) was measured after emphysema-induced alveoli were identified.

Results:
Cell surface markers were positive for CD105, CD90, and CD73 and negative for CD45, CD34, and CD14. Pathological tests showed that COPD-induced mice had significantly increased emphysema volume as compared with that in the sham group. The degree of emphysema in the stem cell group was reduced based on pathologic findings. The mean MLI of the sham group was measured as 38.85±6.45. The mean MLI of the vehicle and stem cell groups were 163.05±48.94 and 123.59±30.53, respectively, and there was a statistically significant difference between the two groups (p=0.008).

Conclusions:
Though the number of mice in the experiment was not large, human Wharton’s jelly-derived MSCs showed pulmonary regenerative effects in the COPD mouse model. Although we cannot confirm the effects of Wharton’s jelly-derived MSCs in COPD through this experiment, it can be used as a basis for a larger clinical experiment.