Changes of potassium channel gene expressions after human umbilical cord blood derived mesenchymal stem cells transfusion in pulmonary hypertension rat models

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Objectives: Pulmonary arterial hypertension (PAH) is difficult to treat and is characterized by increased pulmonary arterial pressure, right heart failure and death. PAH has been shown to be refractory to most of the conventional pharmacological therapies. Human umbilical cord blood-derived mesenchymal stem cells (hUCB-MSCs) are regarded as an alternative source of bone marrow-derived mesenchymal stem cells. hUCB-MSCs have recently been studied for evaluation of their potential as a source of cell therapy. The purposes of this study were to investigate changes of pulmonary pathology, haemodynamics and gene expressions of K+ channels, especially Kv1.7, Kir6.2.

Methods: The rats were grouped as follows: control group (C group), subcutaneous injection of saline; M group, subcutaneous injection of MCT (60 mg/kg); hUCB-MSCs transfusion (U group). hUCB-MSCs (3X10^6/mL/cm2) were transfused by intraperitoneal injection 1 week after MCT injection.

Results: The mean right ventricular pressure (RVP) significantly decreased in the U group compared with the M group in weeks 2 and 4. RV weight and the ratio of RH/LH+septum significantly decreased in the U group compared to the M group. The number of muscular pulmonary arteriole significantly decreased in the U group compared with the M group in weeks 2 and 4. Medial wall thickness of the pulmonary arteriole significantly decreased in the U group compared to the M group in week 2. Gene expressions of Kv1.7 was significantly decreased in M group compared to C group and increased in U group compared to M group in week 4. And Gene expression of Kir6.2 is significantly increased in M group and significantly decreased in U group in week 4. Protein expression of Kv 1.7 was significantly decreased in M group and increased in U group compared to U group.

Conclusions: After hUCB-MSCs transfusion, there was improvement of RVH, mean RV pressure and survival rate. Kv1.7 gene expressions were decreased in M group and increased in U group in week 4. Additional research on the dose and frequency of hUCB-MSCs infusion is needed to determine the optimal parameters for PAH treatment.