Therapeutic use of mesenchymal stem cells in the treatment of medullar aplasia secondary to chronic kidney disease in the cat

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Abstract

The renal cortex is responsible for approximately 90% of the erythropoietin production in the body. In advanced stages of kidney disease animals have reduced ability to synthesize erythropoietin, consequently, there is a deficiency of erythropoietin, resulting in erythroid hypoplastic anemia. In such cases, the animals are being treated with synthetic erythropoietin. Prolonged treatment with synthetic erythropoietin results in the development of resistance, leading to the medullar aplasia. We studied a 4 year old female cat (indeterminate breed) presenting the stage 2 of chronic kidney disease. After 2 years of conventional treatment, the animal developed aplastic anemia responsive to symptomatic treatment with blood transfusions. The cat had 5 blood transfusions in the period and no improvement was observed. Objective: To investigate the effect of the applications of alogenic adipose stem cells (ADSCs) in a cat affected by aplastic anemia as a consequence of kidney disease. Methods and Results: The adipose tissue collected was isolated and evaluate the proliferative potential of the stem cells. It was also assessed their ability to differentiate into osteogenic, chondrogenic or adipogenic. The data showed that after stem cells from adipose tissue melt, they remained as "fibroblast-like" morphology. Osteogenic differentiation was evidenced by the mineralization of extracellular matrix at day 11, which became stronger at day 21 and by positive Von Kossa staining. After induction of adipogenic differentiation, the cells morphology changed within 24 hours from elongated fibroblastic cells to oval-shaped cells. After 4 days, vacuoles in the cytoplasm of the oval-cells were observed. At the day 6, it was observed an increased number of these cells by positive Oil Red O staining. Chondrogenic differentiation was observed 21 days after induction, visualized by the staining of the extracellular cartilage matrix proteoglicans. The cat was treated with three applications of 4×10^6 ADSCs through the cephalic vein and one intramedullary. The applications of ADSCs resulted in stability of the bone marrow response and increased percentage of hematocrit (45%). Currently, the female cat is not subjected to any treatment and remains stable in her vital functions. This study demonstrated that in the case of medullar aplasia/chronic kidney disease, stem cell therapy combined with conventional treatment can improve the health condition of the cat, as well as increase its life expectancy.

Note: The owner was aware and in accordance with the treatment.