The use of stem cell therapy in the treatment of bone marrow aplasia improves blood biochemical parameters in a dog

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Abstract

Animals suffering from bone marrow aplasia (BMA) exhibit clinical signs such as lower tissue oxygenation, decreased production or destruction of red blood cells and blood cells loss due to hemorrhage. As a result, it is observed pallor of mucosal membranes, lethargy, reduced exercise tolerance, dyspnea, increased heart rate and puffs induced by increased turbulence of blood. Nowadays is not yet described an effective treatment to cure BMA. Therefore, the aim f this study was toWe studied a 4 year old female dog, Pekingese breed, that showed symptoms of apathy and lack of estrous cycle. The clinical examination showed severe pale mucosal membranes. The dog also presented reticulocytosis insufficient for the recovery of erythroid values and normocytic/normochromic red cells, which is the characteristic of anemic non-regenerative processes. Blood count indicated severe anemia and hematocrit value of 4%. The myelogram showed the presence of myeloid anemia. The dog was treated with transfusions, as well as standard protocols for the control of hemolytic anemia. No improvement was observed with this treatment. Methods and Results: Stem cells from dental pulp were isolated and their proliferative potential was evaluated. It was also assessed their ability to differentiate into osteogenic, chondrogenic or adipogenic. The data showed that after stem cells from dental pulp melt, their morphology remained "fibroblast-like". The 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 cell 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 dog was treated with five applications of 4 x 106 alogenic DPSCs. The first 4 applications were conducted via the cephalic vein and the last by intramedullary route. The applications of DPSCs resulted in stability of the bone marrow response and increased percentage of the hematocrit. Six months after the last injection of DPSCs it was initiated the gradual reduction of the conventional medication. Currently, the female dog maintains the hematological values below the reference values, presenting

mucosal membranes with normal color, feeding normally and performing normal physical activities. Our findings reveal that stem cell therapy combined with conventional treatment can improve the condition of the dog, as well as increase its life expectancy in the case of myeloid aplasia.