

# Mesenchymal stem cells and microfracture in the equine chondral lesions treatment: an experimental model

Ana Lúcia M. Yamada<sup>[a]</sup>, Luiz Henrique L. Mattos<sup>[a]</sup>, Marina Landim e Alvarenga<sup>[a]</sup>, Jaqueline B. de Souza<sup>[a]</sup>, Angie Paola L. Carvajal<sup>[a]</sup>, Carlos Alberto Hussni<sup>[a]</sup>, Celso Antonio Rodrigues<sup>[a]</sup>, Marcos J. Watanabe<sup>[a]</sup>, Ana Liz G. Alves<sup>[a][b]</sup>

<sup>[a]</sup> Department of Veterinary Surgery and Anesthesiology, College of Veterinary Medicine and Animal Science, São Paulo State University (UNESP), Botucatu, SP – Brazil

## Abstract

Articular cartilage defects represent a challenge for veterinary medicine due to the limited intrinsic potential for repair. Over the past decade, tissue engineering approaches have been developed. Mesenchymal stem cells (MSCs) have been used to repair cartilage, promote chondrogenic differentiation, act in an immunomodulatory capacity and to decrease the degradation of articular cartilage and subchondral sclerosis. This work aims to study the use of intralesional implantation of adipose MSCs (AD-MSCs) and microfracture in the treatment of articular chondral injuries in horses, noticing the benefits and challenges of this regenerative therapy. For this purpose, the patellofemoral joints of 12 healthy adult horses were approached by arthroscopy surgery to perform a 15 mm cartilage defect on medial femoral trochlea. The experiment was designed with 2 groups of 6 animals (group A and B). The treatment of AD-MSCs (GA) consisted of 6 microfracture perforations and 107 autologous and the control group was treated with only microfracture (GB). Arthroscopy for the induction of cartilage lesions was defined as zero time of the experiment (D-0). Evaluations of the synovial fluid of all groups were performed in several moments up to day 150 (D-150). The animals were submitted to magnetic resonance on D150. Macroscopic analysis of the joint was done by arthroscopic surgery as well as biopsy of cartilage sample for histopathological analysis; both procedures were made at the beginning and at the end of the experiment (D-0 and D150). The treatment was intralesionally for all animals in D-30 through arthroscopic surgery. Arthroscopy examination revealed a newly formed tissue, which was white in appearance, mechanically soft and adhered firmly and filled the chondral lesion in all groups. However, GA had an optimum filling of the lesion with repair tissue, proliferation with an intense grip on the borders of the lesion and the subchondral bone. In the Histopathological exam both groups showed the formation of fibrocartilage, with different levels of fibrous tissue at the site where the lesion was induced. GA showed more formation of cellular alignment, a larger number of cells similar to chondrocytes into the fibrocartilage and more type II collagen expression, comparing with GB. The use of stem cells and microfracture together in the treatment of chondral injuries resulted in repair tissue with characteristics similar to a cartilage tissue, verified by gross examination and histopathology. Treatment with AD-MSCs minimized joint inflammation and provided better macroscopic aspect of the chondral lesion suggesting that AD-MSCs were beneficial in the treatment of chondral lesions.

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