Subchondral bone cyst surgical treatment using the application of stem progenitor cells combined with alginate hydrogel in small joints in horses

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Abstract

One of the most common reasons for horse lameness is subchondral bone cysts (SBCs), which are especially evident in young horse athletes. It is believed that SBC development is strongly associated with an individual's bone growth and/or bone microstructure impairment. Current methods of SBC treatment include pharmacological treatment or surgical procedures which may allow the bone within the cyst to rebuild and be restored to properly developed bone tissue. Thus, we propose filling the SBCs with a 3D complex of alginate hydrogel and autologous adipose derived mesenchymal stem cells (ASCs). We have observed at the in vitro level, that this hydrogel complex induces osteogenic and chondrogenic differentiation potential through the upregulation of bone morphogenetic protein, osteopontin, collagen type I and aggrecan mRNA levels. Moreover, we detected the creation of a 3D extracellular matrix (EM). To investigate the complex in vivo, we chose 8 horses of varying age suffering from SBC, which resulted in lameness, to undergo experimental surgery. We documented the horses' clinical appearance, lameness and radiographic appearance, to determine that there was clinical improvement in 87.75% of the patients (n=7, out of 8 horses) 6 months postoperatively and 100% (n=8, out of 8 horses) a year after surgery. These results are promising for the potential of this procedure to become the standard in SBC treatment.

Key words: subchondral bone cyst, autologous stem cells, minimal invasive surgery

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