Stem Cell Approach Ineffective for SDFT Injuries (AAEP 2012)

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Musculoskeletal injuries are an all-too common cause of lameness in horses. Thanks to the advent of biologic therapies, including stem cells, tendon injuries aren't the "death sentence" they once were. Despite the positive results associated with stem cells in equine tendon injuries, however, the "best" way to obtain and use stem cells remains unclear.

In the spirit of evidence-based medicine, one group of researchers put a specific type of stem cell, called "mesenchymal stem cells" head-to-head with a simple "bone marrow supernatant" (a type of bone marrow extract that contains a number of cell types, not just stem cells) to trea superficial digital flexor tendon (SDFT) injuries.

Injury to the SDFT is common in athletic horses, and often refractory to treatment. Strains of the superficial digital flexor tendon (SDFT) account for up to 46% of limb injuries in racing Thoroughbreds and were reported to be the most important reason for retirement of racehorses from racing in Hong Kong. These SDFT strains are often career-threatening events because recovery is slow and recurrence is high. In spite of treatment with long-term rest with or without supportive medical or surgical therapy, return to exercise is associated with a re -injury rate of more than 50%, which veterinarians believe is because the replacement of damaged tendon tissue with scar tissue compromises tendon biomechanical function.

"Implantation of mesenchymal stem cells has become a very popular treatment for tendon and ligament injuries in horses in recent years," explained Michael Schramme, DrMedVet, CertEO, PhD, Dipl. ECVS/ACVS from the National Veterinary School Of Lyon in Marcy L'Etoile, France. "One of the most commonly used stem cell products in both the U.S. and Europe uses the supernatant of the bone marrow aspirate from which the stem cells are cultured to re-suspend the cells prior to injection.

"In order to determine the benefit the cells might bring to the healing process in an injured tendon, we decided to compare the effect of implantation of stem cells suspended in bone marrow supernatant with the effect of injection of the supernatant alone," he added. "In particular we were looking for evidence of regeneration of new tendon tissue in both treatment groups, as opposed to scar tissue that is known to replace the damaged tendon tissue in horses treated with rest alone."

Schramme, together with a global team of veterinary scientists, hypothesized that SDFT lesions would heal better if treated with the mesenchymal stem cells than simply with the bone marrow supernatant.

They created SDFT lesions in the front limbs of six horses. Four weeks later, the researchers treated one of each horse's limbs with mesenchymal stem cells and the other with only bone marrow extract. They assessed healing 12 weeks later using ultrasonography, magnetic resonance imaging (MRI), and histopathology (looking at tissue under a microscope).

"We analyzed a variety of features of healing and not only did we not find any significant differences between the two treatments, we also saw no evidence for regeneration of new tendon tissue but only found scar tissue formation in the tendons of both treatment groups," noted Schramme.

He added, "There are a number of possible reasons that no differences between treatments were observed, including the possibility of insufficient follow-up time, as the study was terminated after three months, which is a relatively early time-point in tendon healing; the possibility that the stem cells did not survive or spread adequately in the damaged tendon, as we did not test this particular aspect of the treatment; or even the possibility that the beneficial aspects of stem cells do not arise from promoting new tissue regeneration, but from a different mechanism.

"A lot of work still needs to be done before it can be established that stem cell therapy is the best current treatment for tendon injuries in horses or whether this is just a passing fashion," he added. "Future studies will need to look at the optimal number of stem cells used for implantation, the optimal time of stem cell implantation after injury, the optimal source of stem cells and whether or not stem cells from a different donor can be used."

Schramme also said the research community would benefit from large follow-up studies of" tightly controlled groups of horses of a similar discipline" to confirm previously reported reductions in re-injury rate among National Hunt racehorses in the United Kingdom following stem cell treatment.