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Stem cell therapies for equine tendinopathy

Terapias con células madre para la tendinopatía equina

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Abstract

Tendons can be injured through over-strain at a number of different sites. When injured outside a synovial cavity (extra-thecal), injuries frequently repair by fibrosis, but this tissue is functionally deficient compared to normal tendon. Stem cells offer the prospect of improving this repair to restore function and enable a successful restoration of activity while minimizing the risk of re-injury. Naturally occurring equine Superficial Digital Flexor Tendon (SDFT) overstrain injuries usually have a contained lesion, thereby enabling simple intra-tendinous injection and, by the time of stem cell implantation, is filled with granulation tissue which acts as a vascularized scaffold. An anabolic drive is provided by mechanical loading of the tendon and the suspension of mesenchymal stem cells (MSCs) in bone marrow supernatant, which we have shown to have significant anabolic effects in vitro. To test the hypothesis that stem cells will enhance tendon healing, a controlled experimental study of naturally occurring SDFT injuries (n=12) has been performed (Smith *et al.* 2013). MSC treatment appeared to 'normalize' the tissue parameters so that they were closer to the contralateral, relatively normal, and untreated tendons than saline-injected controls, in spite of labelling experiments showing the majority of cells being lost within 24 hours (Becerra *et al.* 2013; Sole *et al.* 2013). A second adequately powered and independently analyzed study evaluated the clinical outcome of naturally occurring SDFT injuries treated using this technique (n=113), which showed a significantly reduced re-injury rate (Godwin *et al.* 2012). Intrasynovial (intra-thecal) tendon tears usually communicate with the synovial cavity where the synovial environment is particularly challenging for successful repair. However, MSCs administered intra-synovially failed to improve healing in either equine (naturally occurring) and ovine (induced) deep digital flexor tendon (DDFT) tears (Khan *et al.* 2018). Labelling of the implanted cells showed them to lodge within the synovium with no cells present in the tendon defect. Scaffolds are likely to offer better advantages for enhancing repair of intra-thecal tendon tears.

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