The Effect of Bone Marrow–Derived Mesenchymal Stem Cells on Collagen Fibril Size

Christopher J. Caniglia, BS*; Michael C. Schramme, DrMedVet, CertEO, PhD, Diplomate ECVS, ACVS; and Roger Smith, MA, VetMB, PhD, DEO, Diplomate ECVS, MRCVS

Treatment of surgically induced core lesions in the superficial digital flexor tendon with bone marrow–derived mesenchymal stem cells does not reestablish a normal bimodal distribution of collagen fibrils 12 weeks after implantation. Authors’ addresses: Department of Clinical Sciences, North Carolina State University, College of Veterinary Medicine, Raleigh, NC 27614 (Caniglia, Schramme); Department of Veterinary Clinical Sciences, The Royal Veterinary College, North Mymms, Hertfordshire, UK (Smith); e-mail: cjcanigl@ncsu.edu. *Corresponding author. © 2011 AAEP.

1. Introduction
Normal tendon matrix is composed of both large, strong collagen fibrils and small, elastic fibrils. After injury, tendon heals with an absence of large fibrils, potentially predisposing to reinjury. This study evaluated the effect of intralesional injection of bone marrow (BM)-derived mesenchymal stem cells (MSCs) on collagen fibril size in surgically induced core lesions in the superficial digital flexor tendon, hypothesizing that it would result in a bimodal distribution of collagen fibrils.

2. Materials and Methods
Core lesions were created in both forelimbs and injected 4 weeks after with either $10^6$ autologous BM-derived MSCs or BM supernatant alone (control). Twelve weeks later, tendon samples from the injured and adjacent normal areas at the maximum injury zone were evaluated with electron microscopy.

3. Results
There were no significant differences between treated injured and control injured groups with respect to mass average diameter, collagen fibril index, percentage of fibril size distribution, or percentage of area covered by fibrils of a given size. This was also true when comparing treated normal and control normal groups. Differences between normal and injured regions were significant with respect to these parameters.

4. Discussion
This study confirmed that normal superficial digital flexor tendon consists of populations of small- and large-diameter fibrils and that by 16 weeks, injured tendon heals with a predominance of small-diameter fibrils, regardless of treatment with BM-derived MSCs.