

ADIPOSE-DERIVED STEM AND REGENERATIVE CELL THERAPY IN EQUINE JOINT INJURIES: A RETROSPECTIVE ANALYSIS OF 60 CASES

INTRODUCTION: The use of regenerative cells from adipose tissue to support the repair of damaged or diseased tissue and the growth of healthy tissue is already being realized in human orthopedic medicine. Conventional therapies for equine joint injury and repair have not yielded satisfactory outcomes. This retrospective analysis reviews equine athletes treated for joint injuries with autologous stem and regenerative cells derived from adipose stromal vascular tissue. Thirty-five percent of the horses involved in the study exhibited chronic injuries and prior to regenerative cell therapy had been previously treated with one or more conventional modalities (i.e. arthroscopy, steroids, shockwave, or IRAP). The specific technique for using adipose-derived cells has been investigated in a controlled, blinded study in a collagenase-induced tendonitis model of the superficial digital flexor tendon in the horse.¹ The current report presents the outcomes of using regenerative cell therapy to treat 60 horses with joint injury over a two year period (2004-2006) in 9 clinical equine practices in the United States.

MATERIALS AND METHODS: All cases with medical records and known outcomes diagnosed with osteochondritis dissecans (OCD), subchondral bone cysts, osteoarthritis (OA) and meniscal tears that were treated with regenerative cell therapy from 2004-2006 from participating clinics were included. Injury data included the specific joint involved, concurrent surgery, chronicity, and the severity of injury. With consideration of multiple injury sites, notations were made for cases with complications such as bilateral disease, soft tissue injuries, or concurrent treatment with other modalities. All cases studied involved horses that were at least 9 months post treatment (except 3 months for OA cases) and were diagnosed with lameness (no asymptomatic cases were included). All horses were treated with a heterogeneous mixture of regenerative cells including mesenchymal stem cells, pericytes, and preadipocytes that had been extracted from an autologous adipose sample. The laboratory (VetStem, Inc., Poway, Ca), isolated the regenerative cells using a method adapted from Zuk et al² using a combination of enzymatic digestion, washing and centrifugation. The clinician injected the cells into the site of injury and monitored the horse's clinical progress. Investigators determined the horse's return-to-work history by reviewing medical records for soundness and conducting an owner/trainer evaluation survey of the animal's level of athletic performance after treatment.

RESULTS:

| Veterinary Diagnosis | Full-Work Prior Level | Full-Work Lower Level | Non-responsive | Total |
|----------------------|-----------------------|-----------------------|-------------------|-----------|
| Cyst | 8 (80.0%) | 1 (10.0%) | 1 (10.0%) | 10 |
| OA | 14 (66.7%) | 6 (28.6%) | 1 (4.8%) | 21 |
| OCD+Cyst | 4 (50.0%) | 2 (25.0%) | 2 (25.0%) | 8 |
| OCD | 6 (37.5%) | 5 (31.3%) | 5 (31.3%) | 16 |
| Meniscal Tear | 2 (40.0%) | 2 (40.0%) | 1 (20.0%) | 5 |
| Totals | 34 (56.7%) | 16 (26.7%) | 10 (16.7%) | 60 |

DISCUSSION/CONCLUSION: Thirty-five percent of the horses involved in the study exhibited chronic injuries and were previously treated with one or more conventional modalities (i.e. arthroscopy, steroids, shockwave, or IRAP) before treatment with regenerative cell therapy. The stifle joint was most frequently affected (75%) and 65% of those cases were bilateral. Several important findings were demonstrated from this study: (1) 80.0% (8/10) of cyst-only cases returned to their prior level of activity; (2) 95.2% (20/21) of OA cases in the study (returned to prior level or lower level) benefited from regenerative cell therapy; (3) the average time for horses in the study from treatment to return-to-full work at prior level of performance was 6.2 months or 5.8 months for those horses returning to a lower level of work; and (4) 83.4% (50/60) with joint injuries returned to prior level of performance or at least to a reduced performance level, with only 16.7% (10/60) being non-responsive to treatment. There were six additional animals that were evaluated, but had unrelated injuries and were excluded from this analysis. These findings support the use of adipose-derived regenerative cell therapy for the treatment of joint diseases in the performance horse.

REFERENCES:

- 1 Dahlgren LA. Use of adipose derived stem cells in tendon and ligament injuries. American College of Veterinary Surgeons Symposium Equine and Small Animal Proceedings, October 18, 2006.
- 2 Zuk PA, Zhu M, Ashjian P, De Ugarte DA, Huang JI, Mizuno H, Alfonso ZC, Fraser JK, Benhaim P, Hedrick MH. Human adipose tissue is a source of multipotent stem cells. *Mol Biol Cell.* 2002 Dec;13(12):4279-95.

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