



Hi Everyone!

I hope you are enjoying Spring (most of you) and Fall (for the rest of you)!

So in this newsletter, I was inspired to look at research 'outside' of our normal focus (i.e. not dogs and not humans). This time, I thought I'd do a wee search to see what was interesting on the equine side of things! So, I think you'll enjoy these articles and my spin on clinical relevance of each. Learn about regenerative medicine and PRP injections, indicators of back pain and spinal manipulation vs mobilizations, and the use of allied health therapies. Yes, I'm biased, but I think it's really interesting stuff!

I hope you enjoy it!
Cheers,
Laurie

Spinal Manipulation and Mobilization

OBJECTIVE

Poor performance, stiffness and asymmetrical spinal motion are common features in horses with back pain. Clinical assessment is subjective and often based on indirect rather than direct or local assessments resulting in back problems often being overlooked during clinical examination.

Spinal mobilization and manipulative techniques have been used on horses to improve the diagnosis and treatment of back pain, muscle hypertonicity and altered spinal kinematics, however, there are limited objective measures of their effects on spinal mobility or stiffness in actively ridden horses. This study compared immediate and longer-term effects of spinal mobilization and spinal manipulative therapy (SMT) on passive dorsoventral spinal mobility and stiffness within the thoracolumbar region of the vertebral column of actively ridden horses.

METHODS

Twenty four actively ridden horses (included 10 females and 14 geldings) without a history of acute back problems or lameness, and judged to be clinically sound during gait evaluation were enrolled in the study.

Horses were randomized into either treatment or control groups. Rhythmic, passive spinal mobilization was applied in a ventral direction within the thoracolumbar region in standing horses in both groups. Vertical displacement, loading and unloading velocities, applied force, stiffness and frequency of the induced spinal oscillations were measured at the 5 intervertebral sites, once a week for 3 weeks. In the treatment group, SMT was applied between measurements, whereas in the control group, no intervention was applied. Within the treatment group, a single application of manually-applied, high velocity, low-amplitude, dorsal-to-ventral thrusts were applied bilaterally at the 5 intervertebral sites of interest. Spinal mobilization and concurrent measures of the outcome parameters were repeated to assess the immediate effects of SMT on measures of spinal flexibility

RESULTS/DISCUSSION

Post intervention displacement amplitudes of the trunk and applied forces were significantly higher in the SMT group, compared to the control group. A similar trend was found for increased spinal stiffness. Both spinal mobilization and manipulation were effective at increasing spinal flexibility at Weeks 2 and 3. SMT produced consistent post intervention increases in displacement within sessions, the effects of spinal mobilization on increasing displacement was evident between sessions, indicating 2 possibly different mechanisms of action for spinal mobilization and SMT.

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...Spinal Manipulation and Mobilization continued

Spinal mobilization (considered a more conservative or low-force technique) had a delayed effect on increasing displacement, whereas SMT (a more aggressive form of manual therapy) had an immediate effect and produced larger increases in displacement.

Within the horses used in this study, SMT increased dorsoventral displacement of the trunk during passive spinal mobilization, indicative of a beneficial effect of increased passive spinal flexibility. SMT also increased the amplitude of applied force, indicative of increased tolerance to pressure in the thoracolumbar portion of the vertebral column, which can be interpreted as a beneficial effect in any ridden horse with saddle and ridden-induced pressures along the dorsal trunk.

Further research is needed to determine the effectiveness of manual therapies in horses with back pain, stiffness and poor performance.

My thoughts on clinical relevance:

Now this paper is saying what human research has been finding! There is no different in end outcome with mobilizations versus manipulations. Yes, this paper says that manips had a faster effect, but overall, both therapies achieved the same result. That's great! So use the skills you have, learn about mobilizations or manipulations and feel comfortable that whichever is your main form of spinal therapy... you are having the same effect!

HAUSSLER KK, MARTIN CE, HILL AE. Efficacy of spinal manipulation and mobilization on trunk flexibility and stiffness in horses: a randomized clinical trial. *Equine vet. J.* (2010) 42 (Suppl. 38) 695-702



Allied Health Therapies

OBJECTIVE

Anecdotal evidence suggests increasing use of allied health therapists in treating equine athletes. There is limited legislation, or literature in New Zealand that addresses the definition of the different allied health practitioners and the qualifications required, resulting in some confusion as to services provided and the qualifications of practitioners. This study examines the use of allied health therapists across three sporting disciplines within New Zealand: competitive show jumping, dressage and Thoroughbred racing, looking at which therapies are used, how widely they are used and the interrelationship between the allied health therapist and the veterinarian.

METHODS:

Data were collected during January 2010 at show jumping and dressage championships in the North Island, and from racing yards in the Central Districts of New Zealand. The survey consisted of 30 open, closed and multiple-choice questions, and was conducted by face-to-face or phone interview, by the same interviewer. Information on rider/trainer and horse demographics in each discipline, the use of allied health therapy on horses, and knowledge of training and qualifications of the allied health therapists was obtained. Univariable and multivariable logistic regression were used to examine relationships between demographic variables and the use of allied health therapists.

RESULTS/DISCUSSION:

The use of allied health therapies was widespread across the three disciplines surveyed, with more than half of respondents utilizing them. Use of allied health therapy varied with the respondent's discipline and the number of horses the respondent trained per season. Those with more horses were more likely to use allied health therapies compared with those with fewer.

The contribution of responses across disciplines was 36% for show jumping, 37% for dressage and 27% for Thoroughbred racing. Allied health therapists were used by 62% of respondents to treat their horses.

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...Allied Health Therapies continued

Racehorse trainers primarily used chiropractic treatment, show jumping riders primarily used physiotherapists, and dressage riders used chiropractic treatment, equine muscle-release therapy or Bowen (a form of massage) equally.

The most common types of allied health therapy used were chiropractic (37%) and physiotherapy (24%). The main reasons for using allied health therapies were for back pain (32%) and lameness (25%). Only 7% of respondents chose the therapy type based on veterinary advice, with 72% stating that their veterinarian and allied health therapist did not work together when treating their horses. Surprisingly, 63% of respondents did not discuss using allied health therapies with their veterinarian, and only 3% reported that they would call an allied health therapist based on veterinary advice (94% choosing to use a therapist based on their own personal experience, word of mouth or because they were a friend).

Many respondents did not select allied health therapists based on their level or type of training/qualifications, but said they would be concerned if their allied health therapist was not trained. These findings indicate that a strong driver for use of allied health therapy is the perceived effectiveness of the treatments rather than formal qualifications. The lack of communication between trainer rider, veterinarian and allied health therapist highlights a lost opportunity for the rider or trainer to maximize their horse's performance and welfare. There is an increasing view that an integrative approach should be employed, not just looking at the pathophysiology, but also associated adaptive changes and causative factors. For example, a recent case study (Hesse and Verheyen 2010) indicated that physiotherapy could be used to detect, and recognize signs of, impending fractures in racing Thoroughbreds.

A multidisciplinary approach to maximize performance is not a new concept for managing the human athlete but the incorporation of this approach appears to be slow within the equine industry.

My thoughts on clinical relevance:

Wow! This one hits home! So horse owners are looking for and utilizing complementary therapies. They seek these people out of their own accord (since only 7% sought practitioners because their vets said to do so). And these complementary practitioners and the vets don't communicate.

Okay... so here we go:

1. *Marketing: As I have said for a long time now – you cannot rely on veterinary referrals to drive your business. You need to get in front of your prospective clients and catch their attention and interest.*
2. *Interprofessional Collaboration: How do we move forward so that both veterinarians and non-veterinary practitioners can work together collaboratively, professionally, and even autonomously? Or how do rehab vets get GP vets to want to send cases?*

This article has so many nuances beyond percentages of who used what kind of practitioner.

Meredith K, Bolwell CF, Rogers CW, EK Gee. The use of allied health therapies on competition horses in the North Island of New Zealand. New Zealand Veterinary Journal, (2011) 59:3, 123-127, DOI: 10.1080/00480169.2011.562861

Postural Indicator of Back Pain

OBJECTIVE

Posture has been found useful in describing animals' behaviors and emotional states, however posture is generally characterized based on a limited number of elements and evaluated by visual inspection. To be useful in an assessment of an animal's welfare, measurement needs to be in the animal's home environment and should involve a few reliable, clearly visible markers.

This study evaluated sEMG as a method for the detection of back disorders, and looked at correlations between sEMG and chronic neck postures, proposing that neck posture is a potential visible indicator of back disorders.

METHODS

Evaluations were performed on 18 horses, allocated into one of two groups. The first group were 9 domestic horses kept in stable social groups for several years, used for occasional leisure outdoor "relaxed" riding (with long reins). The second group were 9 riding school horses, kept in individual straw-bedded boxes, exercised in riding lessons for 4–12 h per week with more constraining techniques.



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...Postural Indicator of Back Pain continued

Back evaluations involved manual examination and sEMG measures along the spine. Neck roundness was measured on 16 of the horses. Data included the proportion of vertebrae affected, horses being classified into 3 categories: totally exempt, slightly affected (1 vertebral site affected) and severely affected (more than one vertebral site affected out of the 7 cervical, 18 thoracic, 6 lumbar, 5 sacral and 15 coccygeal vertebral sites present in horses). Neck Posture Measurements were also recorded using photographs and self adhesive markers.

RESULTS/DISCUSSION:

The chiropractic evaluation indicated that 55% of the horses were severely affected, 6% were slightly affected and 39% had no back disorders. The sEMG evaluation indicated that 50% of horses were severely affected, 11% were slightly affected, and 39% (N = 7) horses were not affected. The overall evaluation of the spine showed a high correlation between chiropractic and sEMG evaluations.

Elevated and concave neck postures were associated with higher sEMG values, reflecting muscular activities that correlated with back disorders found during manual evaluations In the cases of "affected" horses. sEMG measures and neck postures therefore appeared to be potential indicators of back disorders.

In this study posture was not found to be related to, suggesting that working conditions may have a greater impact than aging. Explanations of these findings may include:

- a) Horses in natural conditions graze most of the time, and walk with lowered head. In contrast, in riding schools, horses are fed from elevated buckets and stalls typically having high doors. Horses thus tend keep their head and neck high to see their environment. The postural modifications imposed by these conditions may lead to chronic postural disturbances, explaining the differences between horses kept under semi-natural conditions and riding school horses.
- b) Living conditions (isolation in a stall vs pastured with other animals may impact stress levels, leading to muscle stiffness.
- c) Riding techniques are also certainly important. Horses ridden with low hands and slack reins (leisure riding) have a lowering of the neck, increased gaps between thoracic spinal processes, and consequently to an extension of the longissimus dorsi and of the entire spine compared to horses ridden with high hands and tight reins (riding school) .

sEMG measures and neck "roundness" seemed therefore to be reliable indicators of the status of the equine back. These measures are easy to evaluate in field conditions. This study highlights the accuracy of using postural elements during assessment of a horse's wellbeing.

My thoughts on clinical relevance:

This is an interesting study from the perspective that this is very clinically useful for horse owners, and is a study that validates clinical impressions. There are likely a number of 'little things' that we notice as canine rehab practitioners in regards to posture... and this study provides a model for which someone could try to replicate a research study for dogs! Head posture... tail carriage... limb placement... It really gets you thinking, eh?

Lesimple C, Fureix C, De Margerie E, Seneque E, Menguy H, et al. (2012) Towards a Postural Indicator of Back Pain in Horses (*Equus caballus*). PLoS ONE 7(9): e44604. doi:10.1371/journal.pone.0044604695..703

PRP in Digital Flexor Tendons**OBJECTIVE**

Tendon injuries are notorious for slow, functionally inferior healing. Platelets are known to play a pivotal role in the cascade of tissue healing by delivering growth factors to the injury site, releasing growth factors when activated. Platelet rich plasma (PRP) has been used successfully in maxillofacial surgery to accelerate soft tissue and bone healing and investigation is underway into its use as a therapy for the treatment of tendon injuries.

This trial tested the hypothesis that that a single PRP treatment 7 days after the original trauma would result in better biochemical, mechanical, and histological properties of the repair tissue than in placebo-treated controls.

**METHODS**

Six 3–5-year-old Standardbred horses free of lameness, and without any signs of present or previous tendon injuries on ultrasound had surgically created lesions made in the Superficial Digital Flexor Tendons (SDFT) of both front limbs. A Robert Jones bandage was applied to the limbs for 14 days. Horses were box rested for 3 weeks, and seven days post-surgery, one randomly assigned front limb was treated with PRP, whereas the contralateral limb was placebo treated (saline). From week 4 on, an increasing exercise protocol was started (walking and trotting).

After 24 weeks, horses were scored for lameness by an equine orthopedist, unaware of treatment site. SDFTs were assessed for signs of pain or irregularities. The tendons were harvested for biochemical, biomechanical, and histological evaluations.

RESULTS/DISCUSSION:

All horses developed bilateral tendon injuries with features identical to clinical cases of SDFT injury. At 24 weeks, five horses were sound and one horse showed slight lameness of the placebo-treated limb. The score for pain and deformation of the PRP-treated tendons did not differ significantly from the placebo treated tendons.

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...PRP in Digital Flexor Tendons continued

Collagen, glycosaminoglycan, and DNA content (cellularity) was higher in PRP-treated tendons. The repair tissue in the PRP group showed a higher strength at failure and histologically, PRP-treated tendons featured better organization of the collagen network and signs of increased metabolic activity

The exact mechanisms of action of PRP remain unclear, however this study shows that a single injection of PRP can influence the repair of surgically induced tendon lesions, the repair tissue from the treated tendons having significantly different biomechanical and biochemical properties compared to placebo-treated controls at the end of the study period.

When evaluating tendon repair it is important to consider long-term functionality. In this study while only one horse showed a slight lameness at the end of the study, and the biomechanical properties of tissue taken from the core of PRP-treated tendons were closer to those of healthy tendons compared to the placebo-treated tissue, it cannot be stated that functional repair was achieved, as tendon loads at trot are much less than during heavy athletic activities. Palpable abnormalities were present on re-evaluation, indicating an ongoing repair process.

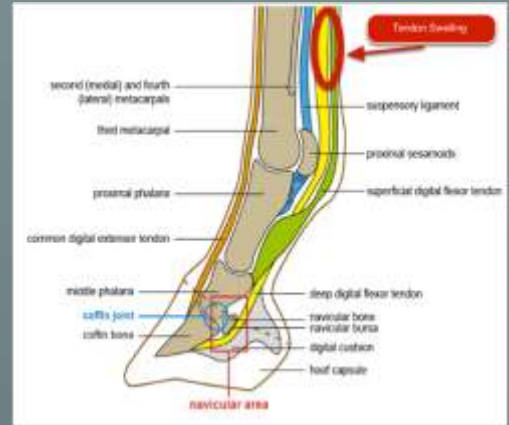
The hypothesis that a single intratendinous PRP treatment, administered early in tendon healing in surgically induced core lesions in SDFTs of horses could be confirmed. Based on these findings, PRP treatment is likely beneficial for the treatment of acute clinical tendon injuries, although further research is needed to determine the timing for PRP treatment in relation to the phase of repair. The effect on more chronic lesions also requires further research.

The results of the study may indicate a need to adapt current rehabilitation protocols after PRP treatment, since it is known that loading plays an important role during the repair process of tendon injuries.

My thoughts on clinical relevance:

Interesting on a couple of different levels. 1. The placebo horses also improved. I have heard arguments that the injections themselves were therapeutic (i.e. sort of like 'dry needling'). And from this standpoint, we should keep that in mind (since PRP is not a mainstay of all rehab practices). 2. The PRP injected horses showed improvements in the organization of the tissues. That's great and nice justification for utilizing this procedure. 3. I like that the author discussed rehab protocols... since that's right up our alley! Load tendons in order for them to heal... (NOT rest)... relative rest yes, and specific tendon loading exercises are needed. It would have been interesting to compare PRP and placebo to a rehab only group!

Bosch G, van Schie HTM, de Groot MW, Cadby JA, van de Lest CHA, Barneveld A, van Weeren PR. Effects of Platelet-Rich Plasma on the Quality of Repair of Mechanically Induced Core Lesions in Equine Superficial Digital Flexor Tendons: A Placebo-Controlled Experimental Study. J Orthop Res 28:211-217, 2010



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Regenerative Medicine for Tendinous and Ligamentous Injuries of Sport Horses.

After tendon injury, the scar tissue which replaces the damaged tendon results in reduced performance and a substantial risk for reinjury. To avoid poor functional outcome the injured tissue needs to be replaced with a matrix more like tendon and less like scar tissue. Regenerative therapies aim to restore normal structural function to injured tissue.

Three components: scaffold, growth factors, and cells are necessary for regeneration of complex tissues such as tendon and ligaments

Scaffold-based therapies

Urinary bladder matrix (UBM) are derived from the urinary bladder of pigs and are processed into sheets or powder. UBM is thought to provide an inductive scaffold for tissue replacement and to stimulate neovascularization in the injury site.

In the United States, several hundred horses with tendonitis and suspensory ligament desmitis have been treated with UBM. Preliminary reports suggest that treatment with UBM successfully returns approximately 85% of horses to their original level of performance.



Growth factor-enhanced regeneration

Many medical approaches to equine tendonitis/desmitis have centered on delivery of growth factors to the injury site. Growth factors regulate cellular metabolism. They enhance tendon and ligament healing by stimulating cell proliferation, increasing extracellular matrix synthesis, and promoting vascular ingrowth.

Growth factors are available as recombinant purified proteins, or within a less defined slurry of bone marrow (BM) aspirate or platelet-rich plasma (PRP).

A prospective 3-year study examining the efficacy of transforming growth factor-b (TGF-b1) to augment healing of equine SDFT tendonitis and suspensory found all horses returned to their previous level of performance, but 40% injured the contralateral untreated SDFT and 60% of horses had palpably enlarged tendons in the treatment area.

Intralesional Insulin-like growth factor-I (IGF-I) has been reported to enhance return of tendon fiber pattern and improve mechanical characteristics.

One retrospective study of racehorses found 23% of study animals raced more than five times without further tendon or ligament injury, 33% rebowed the injected limb and 25% were retired for injuries to musculoskeletal tissues other than tendon.

Platelet-rich plasma (PRP) is an attractive tool to enhance tendon and ligament regeneration. Platelets are also a natural reservoir of growth factors which have been to enhance tendon regeneration.

Platelet degranulation is believed to release growth factors and other substances that promote tissue repair and influence vascular and other blood cells in angiogenesis and inflammation. The primary disadvantage of using PRP is the lack of a cell source and that it delivers a mix of growth factors associated with scar healing.

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... Regenerative Medicine for Tendinous and Ligamentous Injuries continued

Stem cell therapies

To improve healing further current efforts are focused on the delivery of stem cells to the site of injury

Studies in laboratory have shown favorable effects on tissue organization, composition, and mechanics with the use of bone marrow derived mesenchymal stem cells (MSCs). Bone marrow can be injected immediately after isolation using a direct aspiration-injection approach. The primary disadvantage of this technique is the small number of stem cells contained in raw bone marrow aspirates.

A second type of procedure using bone marrow derived MSCs aims to increase the concentration of MSCs for direct injection. Bone marrow aspirate is collected into syringes containing heparin to prevent coagulation, aspirate then being centrifuged to concentrate mononuclear cells prior to implantation.

In the final technique, bone marrow derived MSCs are implanted after expansion of the nucleated adherent cell population through culturing in the laboratory. The aim of this technique is to implant after the inflammatory phase but before fibrous tissue formation.

More than 500 horses have been treated using bone marrow derived MSCs. Follow up on National Hunt racehorses found a reinjury rate of 13%. Comparing horses that reinjured themselves with those that did not, there was a significantly longer interval between injury and implantation for the reinjury horses. It is hypothesized that this is due substantial fibrosis being present within the tendon before implantation, which may have compromised the efficacy of the treatment.

An adipose-derived mesenchymal stem cell technique is based the suggestion that adipose-derived MSCs (A-MSCs) exhibited a similar degree of multipotentiality to bone marrow-MSCs (BM-MSC). Currently, a mixture of cells derived from the adipose tissue are implanted once the cells containing fat have been removed. There is no culture step. A large numbers of cells are provided however the number of MSC's is unknown.

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... Regenerative Medicine for Tendinous and Ligamentous Injuries continued

Surgical manipulations: adjunctives to therapies for tendon and ligament regeneration

Tenoscopic desmotomy of the accessory ligament of the SDFT should be considered for animals with SDFT lesions as transection of the check ligament lengthens the musculotendinous unit, which should help to compensate for the loss of elasticity associated with tendon scar formation, reducing the incidence of rebowing and relocating the point of maximal strain within the tendon.

In such areas where tendon and ligament are anatomically confined by surrounding structures and could be compressed, surgical release of the restricting fascia has been suggested. This enhances neurovascular supply and decreases abnormal mechanical compression to the affected region, enhancing regeneration and diminishing pain.

My thoughts on clinical relevance:

The whole concept of regenerative medicine in dogs is very new. So, I think that we should take note of what has been learnt in other species. Equine medicine has been using these therapies for quite now... however this paper is really just a primer to understand what each therapy is really about. So, perhaps no clinical relevance... just brain expansion on this one!

Fortier LA, Smith RKW. Regenerative Medicine for Tendinous and Ligamentous Injuries of Sport Horses. Vet Clin Equine 24 (2008) 191–201.703

It's a Jungle out there!

by HAGEN



Just badly sprained thank goodness...
I was so scared it might be broken...

Hagen Cartoons: <http://www.hagencartoons.com>

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