The effectiveness of Osteopathic Manual techniques (OMT) in the management of distal limb injuries in equines

Thesis

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Contents

Introduction

Hippocrates once stated that “Healing is a matter of time.” In today's society of leisure horse ownership, the challenge horse owners now face is two-fold. The cost of owning a horse, which is under Veterinary consultation and review and the “quick fix” mentality of not wanting/being able to afford to wait. The use of therapeutic modalities in the day to day management of equines in rehabilitation centres is frequent with physiotherapy, chiropractic and osteopathic modalities being seen and prescribed.

Rehabilitation has been defined as the “optimisation of function and reduction of disability in a patient suffering from a health condition (disease, disorder, injury, or trauma)” (World Health Organisation, 2017).

Whilst this is a generic statement applied to the rehabilitation of humans, it can be applied to any animal and in this case the horse.

The focus of today's equine rehabilitation centres and indeed its staff is to restore the injured horse to the previous state of good health and ideally, workload be this leisure or competitive activities.

Physical therapy employs physical methods to treat pain, disease, or injury by physical means (Evans, R. Merriam-Webster’s 2014) . Osteopathy is considered a suitable physical therapy in equines.

Origins of Osteopathy

Osteopathy as a medical philosophy was developed in the 1880's by Andrew Taylor Still. The word "osteopathy" comes from the Greek words bone (osteon) and suffering (pathos). Dr. Still's studies placed emphasis on the structural integrity of the body as core relevance to the well being of the organism. Dr Still promoted his thinking that by correcting the problems that occur in the body's structure that the body's capability to function and heal itself could be improved by use of osteopathic manipulative techniques ("Manual Osteopath " 2018) .

Just like an engine, Dr Still found that any breakdown in the working machine, will result in a failure elsewhere with consequences, malfunction and even breakdown. In terms of the body this could be the muscular, musculoskeletal or lymphatic system. Just like a mechanic works on the electrical, motor and component parts of an engine to improve functionality, harmony and balance, an Osteopath works to restore the same through 3 major branches.

- Inner Organ and associated soft tissues known as visceral osteopathy
- Restorative balance known as cranio-sacral osteopathy
- Joints, muscles and soft tissue known as parietal osteopathy

It was not until the early 1980's, that in response to the profession itself and the general public that the Registrar of the regulating body, the GCRO, requested compilation of a list of Osteopaths with a special interest in treating animals, which subsequently became the Society of Osteopaths in Animal Practice (SOAP) in 2004.

Osteopathic Principles

Dr Still's osteopathic principles are as relevant whether treating human or an animal and provide the foundation to which an Osteopath approaches every consultative process. The osteopathic philosophy embraces the idea of unity and structure and function through four main principles ("Manual Osteopath" 2018)

The Four Principles of Osteopathy are

1) The body is a unit

The body is considered as a whole. Each part affects each and every other part and the whole is greater than simply the sum of its parts.

2) Structure governs function

If the structure of the body is compromised (strain, injury, overuse), then it is very likely to have an adverse effect on its function (stiffness, pain, lacking range of movement).

3) The body is its own "toolkit"'

The body can self heal, self regulate and can maintain health, once restrictive barriers have been removed. The body's own "built in" healing mechanisms are usually able to resolve most, if not all situations bar serious conditions.

4) The "Rule of the Artery" is paramount

Without sufficient blood supply to the area of issue, the circulatory system is unable to provide sufficient immune cells and nutrients to restore function and balance.

As an Equine Osteopath the aim of the modality is to deal with all organs and processes, making it one of the most effective therapies for the equine.

Osteopathic Manual Techniques in the equine

Osteopathic manual techniques in the equine take a number of forms including soft tissue stretch, inhibition, articulation, high velocity thrusts, positional release and functional and cranio-sacral therapy techniques (Ward 1997)

These techniques may be performed with the horse non sedated. Occasionally long standing more complex matters may be required to be treated under sedation or indeed general anaesthetic, as prescribed and directed by a Veterinary Surgeon. The therapist's ability to have a constant dialogue with the equines muscles, tissue, joints and overall body through their hands, enables effective feedback and response.

Injury in the equine distal limb

The anatomical region of the equine most susceptible to injury is the limb. In the case of equine lameness, 50% of lameness cases arise in the front limb with 80% of musculoskeletal injuries involving the forelimb in the racing industry (Rhoades, 2008). Of these injuries 46% involved the suspensory apparatus (Williams et al., 2001). However, injuries are not just found within the competing equines, but also those engaging in leisure and limited work activities.

Ground reaction forces on a single forelimb at the gallop gait can reach 2.5 times body weight (Schamhart 1998) with SDFT experiencing double the strain of the DDFT .

Unlike humans, the equine, as a quadruped, places around 60% of its body weight through the front limbs, with recent research suggesting that the horse's centre of mass is level with the 13th rib. This corresponds with the normality of a horse resting a hind limb, however the resting of a forelimb is usually a sign of injury.

Conformation of the equine athlete is widely known to influence their ability to perform, regardless of the sporting discipline (Gutnik et al., 2015) or short third metacarpals (MCIII) being less likely to injure (Davies & Watson, 2005; Delahunty et al., 1991). It should be noted that equine lameness, however, is not limited to sports related activity but associates to conformation, foot load , concussive forces and balance, fitness and condition as well errors in rider management and direction.

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The distal limb of the horse in both the fore and hind limb are very similar, with the difference being the shape and broadness of the hind foot. The limb has three phalanges, often referred to as P1 (long pastern) P2 (short pastern) and P3 (pedal bone) together with metacarpals(forelimb) and metatarsals (hindlimb). The proximal limb and girdle region hosts the majority of the bulk muscle. Distally to the limb are the carpals/tarsals, ligaments, tendons and the equine hoof/foot.

The key structure of the distal limb comprises of the cannon bone, the splint bone, P1, P2, P3, the suspensory ligament, collateral ligaments of the fetlock, pastern and coffin joint, distal sesamoidean ligaments, the superficial and deep flexor tendons and the extensor tendon. Just as found across the equines musculoskeletal system the distal limb also features deep fascial membranes known as retinaculums and annular ligaments.

The foot of the horse, constructed with amongst other structures, horn, is not forgiving when it withstands excessive concussive forces and shear/torque force and can act as an informative window into any abnormal limb flight, with visible changes to the horn being indicated.

Horses of today experience and work over many different surfaces, with in particular the use of surfaced arenas being commonplace. Arena construction has been a concern for many years and has been subject to great debate and research. With your average leisure horse being used to engage in dressage, jumping (grass and surfaced), hacking and road work. Not only does this pose an issue for farriers, who are now attempting to shoe for multi surface conditions but also does play a detriment to the horses distal limb.

In the 1960s research was undertaken in humans and how artificial surfaces may affect injury (Nigg and Yeadon, 1987). Synthetic surfaces compared to turf or dirt were associated with having negative effects on the body. The increasing use of artificial surfaces in the equine industry has also been associated with an increase in reported injuries.

A number authors, considering multiple equine disciplines (Dyson, 2002; Boswell et al., 2011; Parkes et al., 2013), dressage horses (Gibson et al., 2002; Murray et al., 2006; Murray et al., 2010b; Parkes et al., 2013) reported whilst limb injuries may have been caused by a specific issue, that hard surfaces were found to increased joint-related injury in the distal limb, in part, due to the high frequency vibrations and concussive forces associated with primary impact (Radin et al., 1973; Barrey et al., 1991; Bailey et al., 1998).

Superficial digital flexor tendon (SDFT), deep digital flexor tendon (DDFT) and suspensory ligament injuries in the forelimb will be influenced by the high strain on the SDFT of the trailing forelimb in the last approach stride to the fence (Dutto et al., 2004) and the leading and trailing forelimbs during landing (Meershoek et al., 2001a) (described in section 4.2).

The debate continues as to the hard v soft balance of surfaces. The former potentially creates too much concussive force, yet allowing the horse support and leverage, with the latter absorbing and reducing concussion, yet allowing for the distal limb to sink possibly too low, affecting push off.

The frequency of injuries now to the distal limb leads the equine community to seek effective rehabilitation and therefore the question thus far is “ Can OMT Techniques assist in the rehabilitation of distal limb injuries”

Effectiveness of OMT in the rehabilitation management of distal limb injuries

" Take the skeleton of a man, tilt the pelvis, shorten the femur, legs and arms, elongate the feet and hands, fuse the phalanges, elongate the jaw while shortening the frontal bone and finally elongate the spine and the skeleton will cease to represent the remains of a man and will be the skeleton of the horse"

George- Louis Leclerc, Comte de Buffon 1753

The joints, ligaments, tendons and bones of the distal limb are easily palpable and the use of OMT enables the therapist to assess and evaluate

- Range of joint movement
- Muscle fasciculations
- Hypo/Hypertonicity
- Proprioception
- Marked and subtle somatic dysfunction
- Altered mechanics

The objective in the osteopathic approach therefore is the complete restoration of the structural integrity in the body (Stoddard 1980, pp 9-10)

When a horse is diagnosed with a distal limb injury, the Veterinarian's role is to restore soundness in the horse. This could involve several processes including surgery. However even after the injury has healed, the horse may not have the same mobility, stability or range of movement as before.

In the instance where soft tissue injury has occurred to the distal limb, standard Veterinary advice consists of peripheral modifications, box rest of the equine to prevent further damage, usually supported by anti-inflammatory medicine to modify the chemical reaction at the site of injury to the distal limb. However, such methods often lead to further complications due to the lack of mobility of the body structure as a whole. Periods of immobility in horses can lead to restricted nerves, blood and lymph vessels, causing congestion, stasis, edema, and swelling.

Following the three stages of healing, during the inflammatory stage with the characteristics of heat, pain and swelling, activity at a cellular level constricts blood vessels for immediate hemostasis, whilst white blood cells act to minimise any infection and digest necrotic tissue by phagocytosis. The importance of then increased blood flow to the injury is activated by the release of histamine and oxygen by mast cells. OMT aims to mobilise and treat these areas, enabling the body to return to homeostasis.

During the proliferative phase, fibroblasts migrate to the site of injury and proliferate, and matrix proteins in particular type 1 collagen, which is found in tendons and ligaments. The final remodelling stage sees the tendon cells and collagen fibres become aligned in the direction of the injury. Care is required at this stage as fibrous tissues, produced by paratenon and endotendon cells change to resemble scarlike, haphazardly arranged Type III collagen, which will never have the same properties as previous to injury. It remains weaker and has less elasticity than its adjacent tendon, which in turn can cause additional strain concentration at the junction between the normal tendon and the scar tissue.

The rehabilitation of tendinopathy in humans has been focussed on the loading of the muscle and tendon eccentrically. This has produced good clinical results over a 12 week period (Alfredson et al. 1998)

Eccentric calf muscle training in patients with mid portion Achilles tendinosis resulted in decreased tendon thickness and normalised structure on imaging . When compared though to the equine, whose distal tendons are already under eccentric loading in a normal weight bearing situation, a rehabilitation plan that involves a gradual increase in eccentric loading, post injury should be carried out. Mobilisation is preferable to a programme of immobilisation.

The practice of OMT based palpation can help identify and indicate sheath effusion, scar adhesions with the inability to mobilise the structures as expected.

Agreed delivery of combined OAB techniques will enable the ability to enhance tissue flexibility, reduce adhesions and optimise the biomechanical function of the distal limb.

As an example of the potential application of manual therapy, it has been shown that when sound horses had one fore fetlock joint immobilised in a cast for 7 weeks, followed by cast removal and 8 weeks of progressively increasing exercise, the treated fetlock retained 20% reduction in range of motion at the end of the study (Van Harreveld, P.D.; Lillich, J.D.; Kawcak, C.E.; Gaughan, E.M.; Mclaughlin, R.M.; Debowes, R.M, 2002).

Clinical cases involving contracture or limitation of the range of motion after injury or post-surgically may therefore benefit from manual therapy.

In the case of the distal limb, tendon and ligament structures have by nature poor blood supply compared to muscles, the delivery of cells and cell components to the region along with adequate circulation is important for recovery. In “ The rule of the artery is sovereign".

A compromised and impaired area cannot fulfil its function. The ability for osteopathy to deliver neurophysiologic based techniques, stimulating the AP and ATP process to encourage cellular regeneration and activation, assisting the body to commence the “self heal” stage is imperative.

Whilst the equine is engaged in a more restrictive position (box rest) it is expected that the lack of mobility will cause stiffness and other body compensatory issues. Therefore the use of OMT as a general body “MOT” is encouraged. The soft tissue techniques used also stimulate the all important fascia. Where dysfunction has occurred within the facia, the ground substance does not allow for free glide and recoil, therefore affecting range of motion and movement. By enabling the rebalance of the fascia, not only is movement restored but stimulation of the lymphatic system occurs, allowing drainage of toxins and replacement with fresh oxygenated blood. Haussler described the benefits of massage in alleviating muscle hypertonicity, soft tissue restrictions and pain demonstrating the value of soft tissue mobilisation for soft tissue restrictions and pain. A descriptive clinical trial in which the application of effleurage was interspersed by a 3 × 30 s circular kneading for 30 min significantly increased passive and active hind limb protraction (Hill, C.; Crook, T.) T

The use of joint mobilisation applies a force manually to induce passive physiologic or accessory movements, and active mobilisations of joints. Professor Stuart McGregors use of OAB sees circumduction, protraction and retraction through mobilisation techniques. Small rhythmic oscillations and gliding movements across the joint directed perpendicular or parallel to the joint’s normal direction of movement to improve motion and normalise joint function with a consequent reduction of stiffness and pain (Haussler, K.K 2016). In rehabilitation of equine articular structures, the recommended techniques were passive mobilisation at different amplitudes, velocities, and positions within the available range of

motion, integration of both physiological and accessory movements, and the integration of passive accessory mobilisation with active movement (Goff, L.M. 2009)

Haussler further indicated the value of joint mobilisation in cases of joint stiffness and pain.

In a case study of a radial fracture, manual passive joint mobilisation starting 8 weeks post-surgery seemed beneficial, but no in this instance no treatment parameters were reported (Guedes,2017) Guedes described manual therapy and movement as “elective techniques in painful conditions” but did not present any parameters of such usage.

Conclusion

Osteopaths use their education, knowledge and hands to deliver through a wide range of methodical techniques to improve the equines whole body, improving joint mobility and strength, muscle tone and quality and reduction in inflammation. In the case of the equine distal limb, due to its considerable weight bearing requirement, osteopathic therapy supports the body's function to self heal, restoring mobility, stability and range of movement. The ability to deliver sympathetic yet effective osteopathic techniques to the equine whilst injured, enables not only for treatment of the presenting problem but also holistic treatment of the horse. Other therapeutics focus on the sole cause of the issue with little consideration for neural network, sensory information and motor responses that osteopathy does. An osteopath has the ability to form a neuromusculoskeletal diagnosis rather than just a physical one . The variety of stretching, mobilising, combined with manipulative techniques, together with soft tissue massage, are used to treat the injury as well as providing overall body restoration and balance. As such the ability for the body to restore and rebalance and utilise the ability to self heal, looks to speed up recovery time. Working together with the Vet, Farrier, Saddler and Owner, the osteopath can deliver a range of exercises to promote healing, improve and increase range of motion and prevent muscle atrophy. The prescribed methods adopted will enhance tissue flexibility, reduce adhesions and optimise the biomechanical function of the injured distal limb, to support the healing process.

Therefore the application of OMT speeds and improves recovery and reduces pain in the equine.

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