Application of positional techniques in the treatment of animals

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CHAPTER CONTENTS

One of the myths of musculoskeletal medicine is that humans are uniquely susceptible to back pain because they have risen onto their hind legs by adapting a structure designed for four legs. A chat with any vet will dispel this impression, as they frequently encounter animals presenting with physical problems involving the spine and associated structures (Jeffcott 1979) (Fig. 12.1).

On further consideration, this is unsurprising. The forces of gravity and the potential effects of injury are common stressors for humans and animals alike. Animals have the added complication of interacting with people, and may be subjected to diet changes, unnatural exercise regimes and breeding programs.

The clinical challenge for those working with animals is to make a diagnosis without the benefit of direct verbal communication. Veterinary surgeons use their clinical expertise and special investigations such as imaging techniques and blood tests to identify pathology. However, difficulties arise for vets confronted with cases where there is obviously discomfort and dysfunction and yet no pathology can be identified. These cases are the product of an altered physiological state rather than pathological change (Williams 1997). Osteopathy adds another dimension to addressing these problems by using observation and palpatory skills to identify areas of disordered function and using a range of physical treatments to influence the disturbance in the integration of peripheral and central nervous systems.

History of animal treatment

The early years of animal osteopathy were distinguished by isolated pockets of activity with individuals experimenting with techniques. In the 1970s, Arthur Smith in Leicestershire pioneered an approach for treating horses under general anesthetic, encouraged by a vet whose back he had successfully treated. Elsewhere, racehorse trainers looking for optimum performance recruited osteopaths

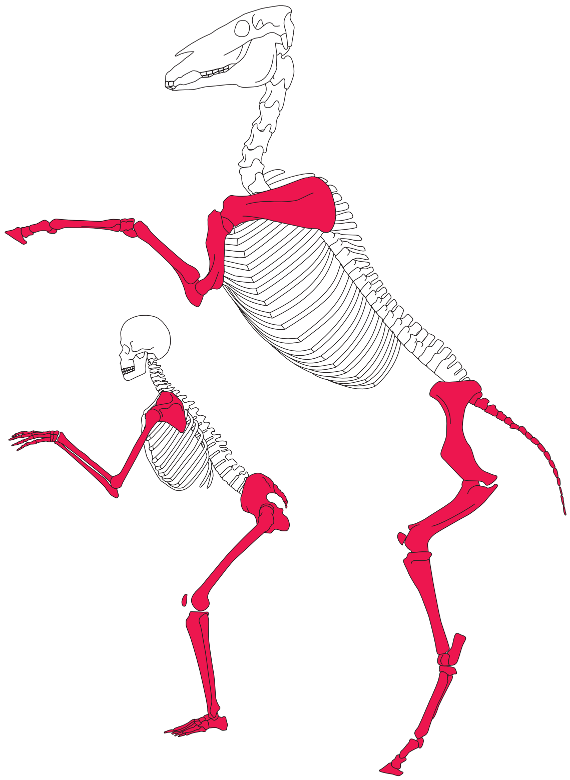

Figure 12.1 Animals and humans are similar in structure.

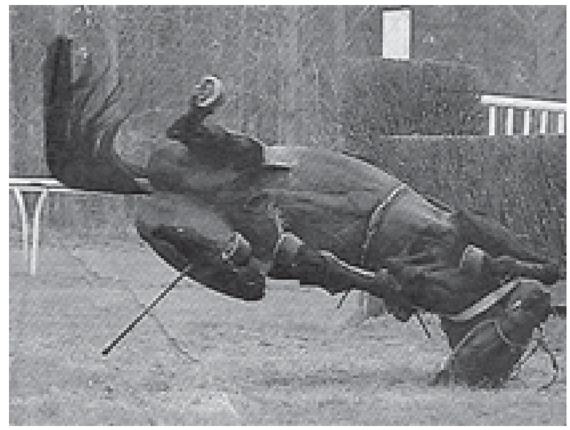

Figure 12.2 A horse may suffer compression rotation injuries that affect the whole spine (with permission from Ed Byrne).

such as Gregg Currie in Epsom and those working in rural areas were approached by local farmers. Latterly, postgraduate courses have provided a forum for disseminating information in this field. At the present time, osteopaths work alongside many forward-thinking veterinary surgeons wishing to offer another approach to musculoskeletal problems, and their services extend to organizations such as the Household Cavalry and even zoos.

Mechanisms of injury

Causes of injury are many and varied. A horse may fall at 30 mph driving its half a ton of body weight into the ground (Fig. 12.2), or an elderly dog relives its boisterous youth by playing with a new puppy. A cat may try to cross the road at an inopportune moment, or a hunting owl is swiped by a car aerial as it makes a low night flight. All share an inability to communicate. However, there are other ways of identifying where musculoskeletal problems exist, based on the physiological effects of injury.

Neurophysiological effects of injury

These effects are widespread but may be divided for convenience into peripheral responses at the site of the injury (Bevan 1999), and central responses occurring within the central nervous system (Doubell et al 1999).

Peripheral responses

An injury will result in local tissue changes to give the classic signs of inflammation, pain, heat, erythema and swelling. This site is usually fairly easy to identify clinically by eliciting a pain response by pressure over the area and feeling for increases in temperature and areas of swelling. At this juncture, the animal may be treated successfully with anti-inflammatory drugs. However, the injury will also stimulate the small nerve fibers of the nociceptive system, which send warning signals to the dorsal horn of the spinal cord. Here the fibers arborize within the network of the spinal cord to form a multitude of interconnections.

It is in this central network that changes can occur which may not respond to first-line drug treatment but which are accessible to physical treatments such as osteopathy (Colles & Pusey 2003).

Central responses

On reaching the spinal cord, if the stimulus is of sufficient intensity it will be relayed to the brain to register pain. It will also interconnect with motor neurons of the ventral horn to increase muscle tone (He et al 1988) and, via the lateral horn, increase sympathetic nervous system activity to drive blood from the surface to the muscles (Sato & Schmidt 1973) (Figs 12.3 and 12.4).

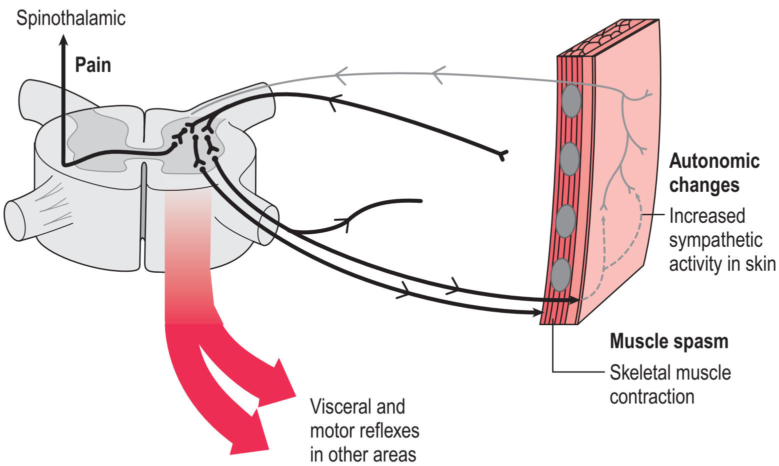

Figure 12.3 Neurophysiological responses to injury.

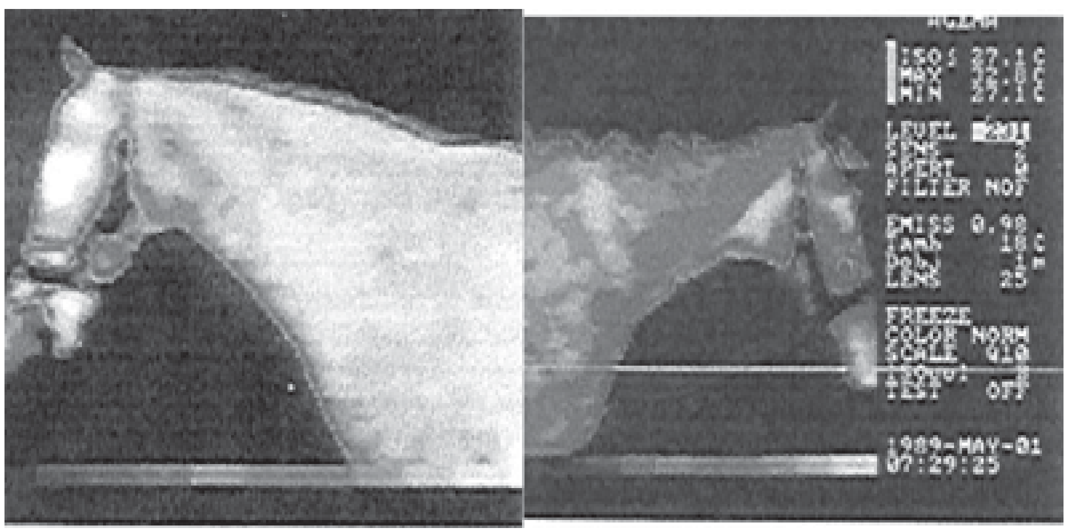

Figure 12.4 Infrared thermography showing reduced blood flow at surface in long-term response to injury 'Normal' neck (left) and upper cervical dysfunction (right). Note: temperature color scale runs from left (lower temperature) to right. Intervals approximately 0.6° (Colles et al 1994).

In the short term this has a protective function by preventing further damage to the injured area. However, the long-term effect may be to leave a neurological footprint of abnormal patterning where the pain circuits maintain their activity after the initial injury has resolved (Patterson & Wurster 1997).

Retaining this abnormal patterning has a number of undesirable effects. One effect is that the threshold at which the pain circuit fires is lowered and a relatively mild stimulus will fire an inappropriately large pain response. It will also alter the way an animal moves as a result of increased tone and asymmetry of tone in the muscles. This is particularly significant in animals as there are strong interconnections between spinal segments to support integrated movement between all four limbs. In fact, unlike the human system, these connections are so strong that in experiments on cats, it was found that crude gait patterns could be generated even when the connection between the spinal cord and brain had been severed (Pearson & Gordon 2000). This integration becomes compromised in the presence of altered patterns of muscular activity.

These changes may be quite subtle, but they leave the animal vulnerable to a recurrence of symptoms or cause other problems by virtue of the altered mechanics of movement.

This combination of neurophysiological responses to injury may be followed through in the natural history of a presenting problem and can be summarized in what may be described as the 'traffic light' effect (Fig. 12.5).

These cases are more difficult to identify clinically as it requires careful observation and palpation of the whole biomechanical structure to detect altered function as opposed to the more obvious changes of acute inflammation.

Diagnostic process

This is a multistage process structured very much along the lines of the human approach but with particular emphasis on the dynamic function of the animal observed in active movements.

Case history

The case history is the first part of this process. It will often require an open mind and critical thinking as this is obtained second hand through the medium of the owner. This will include demographics such as age, breed and work of the animal, which are important in building up a picture of the injuries that the animal may have sustained and the problems to which a particular breed may be susceptible.

With this background knowledge in mind, details of the presenting problem are elicited. This may give a picture of a sudden onset, acute problem as a result of a specific trauma such as a dog leaping awkwardly from a stile. More often, there is a history of increasing impairment of movement without a specific date of onset and no reported injury as a cause. However, in these cases, the owner will often mention minor alterations in activity and behavior such as a dog that prefers to be lifted from a car rather than jumping, or a horse that is sensitive to being groomed on the neck.

Armed with this information, examination is the next phase.

Examination

Examination of the animal at rest and in movement is used to identify alterations in whole movement patterns and specific levels of dysfunction.

Static examination

This looks at the animal's weight-bearing and muscle development, which gives a visual record as to how the body is being used. For example, wasted muscle in the hip region of a Labrador may suggest stiffness in this area with the result that the dog tends to favor other limbs in weight-bearing. A horse with apparently well-developed shoulders and neck but rather weedy hind quarters may be compensating for poor hind limb and lumber spine function by overuse of the front half.

Active examination

In order to establish how the animal is using its body, it is observed in active movement from a number of viewpoints and at different speeds. For most domestic animals a routine can be developed for observing from behind, in front and from the side at walk and trot.

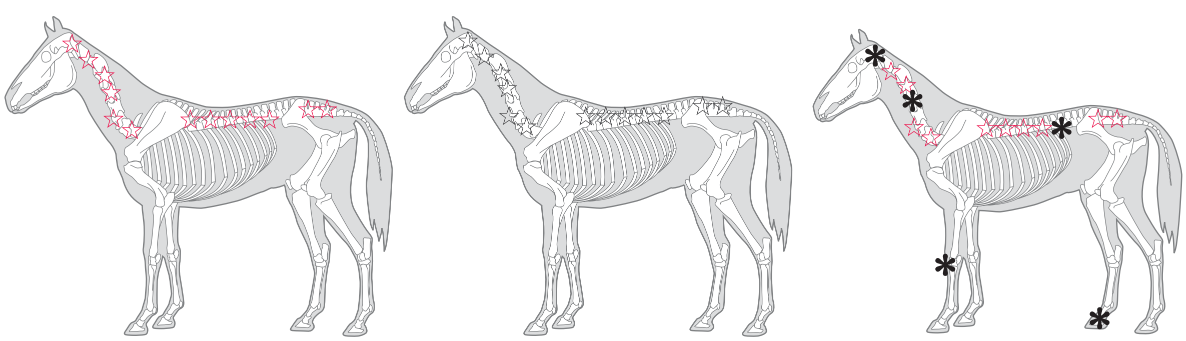

Figure 12.5 (A) In the normal horse appropriate screening of sensory input takes place at the level of the spinal cord. (B) Old injuries have left neurological footprints – regions of spinal cord which, despite being asymptomatic, have retained elements of abnormal patterning, with lowered threshold to external stimuli and altered muscular activity. (C) Minor stresses on the system, such as a slight injury or increasing the amount or level of work, may result in acute symptoms at levels of abnormal patterning.

The osteopath is looking for fluidity and symmetry of movement, whereby activity is transmitted from one part of the body to another in a smooth, easy way. Where dysfunction occurs there can be very obvious breaks in the transmission of movement, identified by observations such as a puckering of the skin in the cervical spine or short stubby action of the limbs.

Balance, coordination and flexibility can be assessed by observing more complex movements such as turning short in a tight circle.

Palpatory examination

Passive motion testing and palpation of the soft tissue are used to identify specific regions of dysfunction. Skin drag, where the fingers are pulled slowly along the paravertebral muscles, will pick up alterations in tissue texture, and regions of muscle spasm (Fig. 12.6). Joints at each level can be tested for the expected range of movement and asymmetries and reduced ranges may be identified.

Treatment

Once a full diagnostic routine has been completed and a biomechanical diagnosis proposed, treatment can begin.

General considerations

Treatment can take many forms. Some are adapted from human techniques, and others have been developed for a particular species of animal (Brooks et al 2001). As in the approach to children, for treatment to be effective a degree of cooperation is necessary,

By spending a little time with the owner and animal, a relationship built on trust can be achieved. Domestic pets, particularly dogs, are very accepting of treatment and, having assured themselves that you intend to do them no harm, will abandon themselves, often achieving a trance-like state. By contrast, herbivores such as horses are instinctively more suspicious and vigilant. Indeed, this characteristic in the wild may be the very key to their survival. In these cases, treatment may be facilitated by giving a light sedative, particularly where refined changes in joint complex movement are required and a position held for some time. An effective agent, which allows the horse to remain standing while giving a good level of sedation, is a mixture of opioid and an alpha-2-adrenoceptor agonist. The latter reduces the sympathetic drive so decreasing overlying muscle tone and making the deeper structures of the joint complex accessible to examination and treatment. The opioid works through the central pain-inhibiting pathways which in combination with inhibitory input from the peripheral large fiber system (Melzak & Wall 1965) resulting from osteopathic treatment gives a dual beneficial effect.

Figure 12.6 Skin drag test identifies areas of altered tissue texture and muscle tone.

Another consideration when choosing techniques is the complexity of the problem. Unless the problem is very short term and localized, treatment will have to address dysfunction of the animal as a whole rather than being directed merely to the area that appears to be symptomatic. Positional techniques are particularly useful in complex strain patterns where there is involvement at many levels.

Positional release techniques in animals employ the idea of 'ease' and 'bind'. A normal joint has a point, usually at the middle of its range of movement, where there is minimum tension on the capsular ligaments and the overlying muscles, i.e. the point of 'ease'. Movement away from this point will increase tension or 'bind'. This information is processed in the central nervous system to map joint position and to generate an appropriate pattern of motor activity. Where abnormal neural patterning follows an injury, the normal relationship between joint structures is disturbed, and this point of ease will be offset. Sensory information from that joint is subsequently changed at rest and for any given movement. Difficulties arise with imposing new reference points on well-established networks and the joint complex is less able to react appropriately or coordinate movement with other joints.

This new abnormal resting position may be isolated by testing each range of movement – flexion/extension, side-bending, rotation, translocation from side to side, traction/compression. These vectors are combined together at the point of ease. With the joint held in the position of minimum tension, there is minimum sensory input into the spinal cord. This appears to reduce conflicting information entering the network and allows the normal pattern to reassert itself. A change in neural activity is signaled by a relaxation of the muscles surrounding the joint complex accompanied often by a deep sigh and altered breathing pattern.

This technique of finding the point of ease can be used on whole body parts, such as a limb, or on specific joint complexes at strategic points of the skeleton.

Regional approaches

Certain regions are more susceptible to injury and have a greater impact on the function of the animal.

Cervical spine

The head and neck are especially vulnerable, particularly in horses. Huge forces are generated during a fall and occipito-atlantal-axial dysfunction is common.

One way of starting the technique is to lift the horse's head onto ones shoulder and move along the line of the jaw to find a point of balance. The jaw can then be used as a lever to take the cervical joints through their ranges of movement. Often, upper cervical joint complexes are dealt with together by introducing elements of flexion and extension, the main movement of the occipito-atlantal articulation, alongside rotation at the atlanto-axial level. In this way, the point of ease can be isolated. This can be refined further by placing the hands up on the subocciput in order to introduce secondary vectors of compression, traction and translocation (Fig. 12.7).

Temporomandibular joint

Intimately associated with the top of the neck not only mechanically but neurologically by virtue of trigeminal innervation, is the jaw. Dogs are particularly susceptible to strains in this region resulting perhaps from their predilection for carrying over-large sticks. Using fingers on the medial surface of the mandible, trigger point inhibition can be used while introducing traction or compression through the ramus into the jaw itself (Fig. 12.8).

Figure 12.7 Using the mandible as a lever, the point of minimum tension in the upper cervical complex can be isolated.

The limbs

The limbs are also susceptible to alterations in normal relationships. Dogs move with rapid changes in directions, and strain patterns which reflect these forces may be followed up the leg, starting with the phalanges, and working up through the limb into the thorax.

Another important area is where the scapula and forelimb connect with the thorax. This is particularly important in horses as, unlike humans, there is no actual bony connection between forelimb and rib cage. The human clavicle is represented rather by a fibrotendinous band in the brachiocephalicus muscle. Instead the muscles of the thorax, notably the pectorals, form a muscular sling in which the thoracic cage can rotate, so allowing much of the lateral movement occurring in the horse. Fascial binding in this region clamps the scapula to the thorax and restricts limb movement and lateral flexibility. A combination of stretch and fascial unwinding through the foreleg is a backbreaking but rewarding way of improving movement (Fig. 12.9).

A similar procedure can be used for the hind limb. Problems here are often associated with lumbosacral and sacroiliac involvement.

Figure 12.8 The temporomandibular joint is an important site of dysfunction.

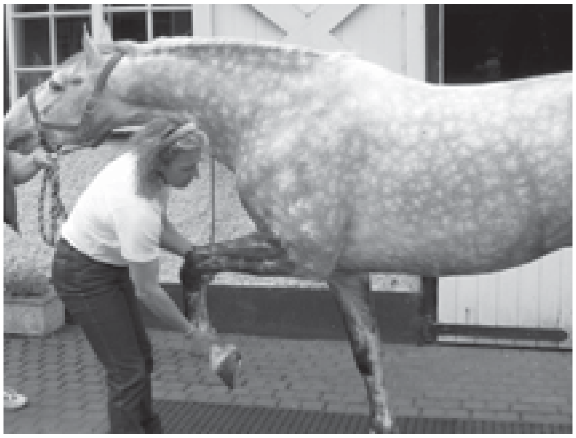

Figure 12.9 Fascial unwinding through the forelimb into the thorax. (Photo courtesy of Annabel Jenks DO.)

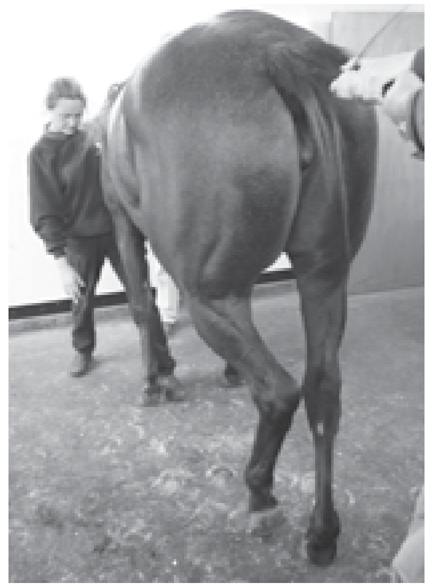

Figure 12.10 The horse shifts its pelvic balance in response to functional traction through the tail. (Photo courtesy of Jonathan Cohen BSc(Hons) Osteopathy.)

Lumbosacral and pelvic region

Another way of accessing the lumbosacral and pelvic complex that is not available in human osteopathy is via the tail. This is formed by approximately 18 caudal vertebrae which, after the first three, start to lose shape and articulations to form simple rods joined with cartilaginous discs. The muscles of the tail, particularly the sacrocaudalis dorsalis, link with the multifidus muscles of the lumbar spine and sacrum, which have an important role in the segmental stabilization of the spine (Geisler et al 1996). As these muscles have been implicated in recurrent back pain, the tail is a good 'handle' on these structures.

By gently taking up the tension in the root of the tail and taking it through all its possible ranges of movement, an idea of the fascial tension from the tail into the pelvis can be identified. In fact, this can be seen quite clearly, particularly in horses where the tail may be held to one side of the midline. When a point of ease has been established, traction can be increased, and this is often accompanied by quite dramatic maneuvering of the pelvic girdle by the animal itself as it shifts its weight from one hind limb to the other (Fig. 12.10).

The pelvic girdle may also be accessed via the pelvic diaphragm. By using a shoulder medial to the ischial tuberosity in the horse or fingers in the dog, trigger points can be identified. The animal will often lean into the pressure being applied, and this can be used to introduce ranges of movement in the sacroiliac articulation, using the ischial tuberosity as a lever (Fig. 12.11).

Figure 12.11 With the shoulder medial to the horse's ischial tuberosity, the fascia, muscles and joints of the sacrum and pelvis can be influenced. (Photo courtesy of Jonathan Cohen.)

Treatment under general anesthetic

In a number of cases, the complexity and long-standing nature of the problem may require treatment to be carried out under a general anesthetic. This is particularly relevant in horses where the speed and weight of the animal mean that huge forces are often involved in injury.

The horse is anesthetized, intubated and supported on its back. In this position, examination and treatment resembles even more closely the procedure used in human practice. It is interesting to note that under these conditions it is often possible to detect marked restrictions in joint function that were not apparent on examination of the conscious horse. This indicates the effectiveness of some of the compensatory mechanisms that develop over time.

Another point of interest is that some of these cases are unable to lie squarely on their back. The fascial and muscular patterns developed as a result of injury and subsequent compensation produce a functional scoliosis that is maintained even under full anesthetic.

These cases are ideal candidates for the 'whole body unwind' technique. With someone on each leg, the limbs are put through ranges of movement to reach a point of minimum tension (Fig. 12.12). This position often reflects the directional forces involved in the original trauma. This is maintained until there is a sense of relaxation often accompanied by a change in breathing pattern.

Is equine osteopathy (positional release) effective?

Osteopathic treatment appears to be successful according to anecdotal evidence. In order to obtain more information, a clinical audit was carried out in 1995. This established details concerning the case load referred to the clinic in terms of demographics and symptom presentation, as well as whether owners and veterinary surgeons felt that osteopathic intervention had been of long-term benefit to their animals.

Figure 12.12 Fascial patterns may be 'unwound' by using all four limbs. (Photo courtesy of Jonathan Cohen.)

A retrospective study of 127 cases showed that horses presented to the clinic principally with back pain, non-specific and shifting lameness, and back stiffness, and were unable to perform work expected of them (Pusey et al 1995). These problems had been present for over 2 years in 30%, and over 6 months in 71% of cases (Table 12.1). A follow-up at least 12 months after the last osteopathic treatment showed that 95 (75%) had maintained improvement and were working at the expected level or above according to owners' and veterinary surgeons' reports (Fig. 12.13). Three cases were lost to follow-up.

The next step was to consider physiological markers to identify any changes that may result from osteopathic treatment.

One response to injury and pain is muscle hypertonia (He et al 1988) and this may be expressed as shortened stride length (Jeffcott 1979).

A pilot study showed that horses presenting to the clinic had a significantly reduced step length by a mean of 11.4 cm ($P < 0.001$) in trot compared with controls (Woodleigh 2003). After osteopathic treatment, there was a significant increase of mean 12.5 cm ($P < 0.05$) in step length in the clinical cases.

Table 12.1 Duration of symptoms where known in cases presenting to an osteopathic clinic (in some cases the duration of symptoms was unknown)

	Duration (months)						
	<6	6–11	12–17	18–23	24–29	30–35	≥36
Frequency	32	16	21	9	9	0	24
Percentage	29	14	19	8	8	0	22

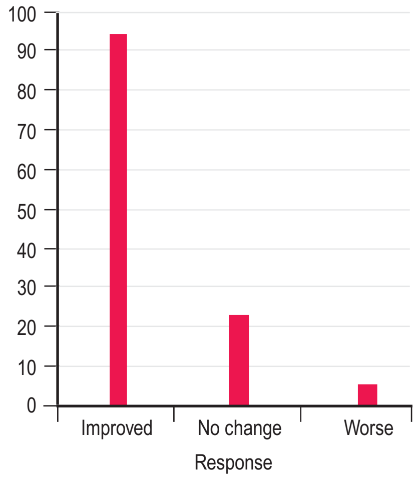

Figure 12.13 Outcome following osteopathic treatment at least 12 months after the last treatment.

This study was useful in that it indicated that the intervention appeared to have changed stride length and the order of the change has provided information concerning the sample size required for further studies (Fig. 12.14).

Another physiological marker is the change in sympathetic nervous system activity in response to a painful stimulus (Sato & Schmidt 1973). This is manifested by alterations in surface temperature, which can be detected by infrared thermography. There is general agreement on normal patterns of cutaneous heat distribution (Turner et al 1986), with surface temperatures throughout the body remaining consistent to within 1°C. Although acute injuries are detected as 'hot spots' by virtue of local inflammatory changes, increased activity of the sympathetic network in response to a painful stimulus will act on the arteriovenous shunts to move blood away from the surface to the muscles and are shown as cooler regions (Fig. 12.4). Where this pattern of activity is retained in the network after the initial injury has resolved, areas of cooling almost along dermatomal distribution may be detected (Fig. 12.15) (Colles et al 1994).

A further study of 46 horses looked at thermal patterns in the gluteal regions. These were found to be significantly cooler ($P < 0.02$) than expected in cases presenting to the osteopathic clinic. These regions showed a significant increase in temperature following treatment (Brooks 2003).

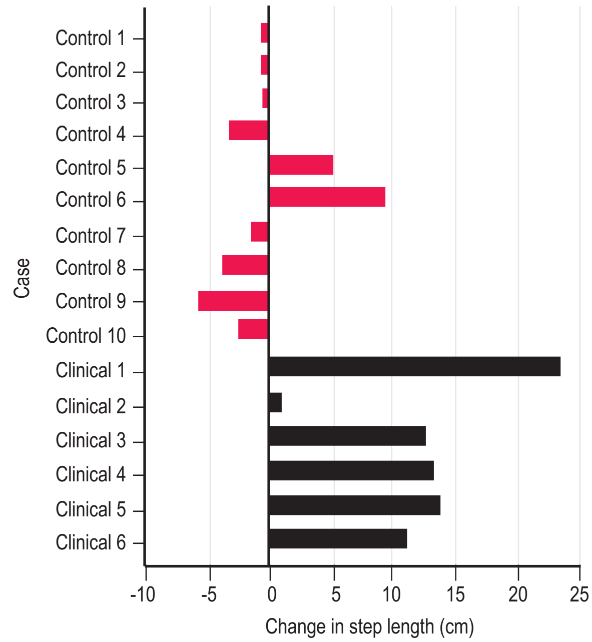

Figure 12.14 Change in step length from initial reading to follow-up for controls and clinical cases.

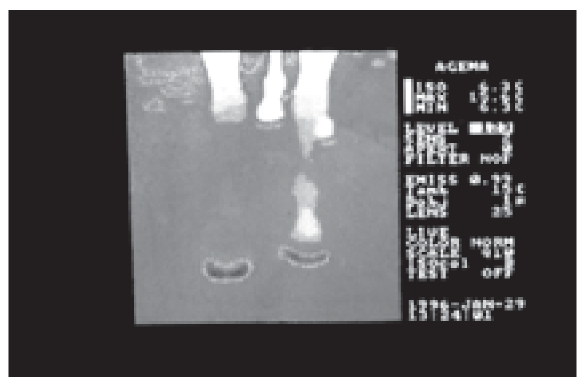

Figure 12.15 Cooling of distal forelimb: Abnormal patterns of sympathetic nervous system activity may cause cooling along almost dermatomal distribution.

Conclusion

Treatment of animals is a rewarding field for those wishing to extend the boundaries of practice. There are the challenges of working where verbal communication is not possible, and where techniques must be adapted to highly variable body sizes and shapes between species. There is considerable overlap in human and animal practice and both aspects have something to offer in the areas of clinical reasoning, palpatory skills and technique development – a case of the whole being greater than the sum of the parts.

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