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A Comparison Between Acupuncture, Hemilaminectomy and the Combination of Hemilaminectomy and Acupuncture Treatment in Dogs with Thoracolumbar Disk Disease: An Immunological Approach

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ABSTRACT

The thoracolumbar disk disease is the most common neurological disease observed in the small animal practice. Although the diagnostic methods have evolved, specially the image diagnoses and most of the physiologic mechanisms of the disease is already known, the disease has an unstable behavior. It is commonly observed that the intensity of the lesion is not closely related to the image changes, as some animals with a significant nervous compression are able to walk and in other cases small lesions may cause paralysis.

The aim of this study was to analyze 17 cases of thoracolumbar disc disease in dogs, from different breeds and ages, treated at the Acupuncture Ambulatory Unit and Small Animal Surgery Unit at the Faculty of Veterinary Medicine and Animal Science, University of São Paulo State, Botucatu, Brazil, comparing the results obtained after acupuncture, surgical or surgical and acupuncture treatment. A Western diagnosis, based on neurological and complementary exams, such as radiographies, contrasted radiographies (myelography), magnetic resonance image, electroneuromyography, nervous velocity conduction and hematological and biochemical assays and an Eastern approach to the syndrome, based on Zang Fu, Yin-Yang and Meridian theory, were used making correlations between them. The distribution of treatment in the 16 dogs was: 7 (seven) dogs were treated with electrical acupuncture, 3 dogs with electrical acupuncture plus surgery and 6 dogs treated only with surgery. All acupuncture treatments were performed with electrical acupuncture. The points selected for all animals were: Kidney 3, Bladder 18, 23 and 60, Stomach 36, Gall bladder 34. Treatments were performed once a week with the number of sessions varying from case to case. The surgical approach was the technique of hemilaminectomy and lateral fenestration. The immunological implications were discussed based on the absence of correlation between clinical sign and image diagnoses, probably showing a participation of the

immunological inflammatory response in the expression of the clinical sign. Five out of seven dogs treated with electroacupuncture, two out of four treated with surgery and electroacupuncture and two out of six dogs treated with surgery were able to walk after treatment. The remaining two animals treated with electroacupuncture were able to walk a short distance before falling down. The other two animals treated with surgery and electroacupuncture were able to stand up without walking and the other four animals treated with surgery maintained the hind limb paralysed. In conclusion, thoracolumbar disk disease in dogs may be successfully treated with acupuncture at the conditions observed in this study.

1. INTRODUCTION

The use of acupuncture in veterinary medicine is accepted today as a complement for the treatment of many diseases and has been included in many Western medical books as an effective form of therapy when used according to ethical decisions based not only on Chinese medical veterinary pattern of disease, but also on Western complementary and specific exams (ALTMAN, 1992).

STILL (1989) reported a rate of 100% success for pain relief in types I and II thoracolumbar disc disease and 65% of success in treating types III and IV thoracolumbar disc disease. Another study in man using MRI (magnetic resonance image) reported that from 98 volunteers with neither back pain nor history of pain signs, 64% presented disc abnormalities, 50% showed disc protuberance at least in one disc and 27% presented at least one hernia (JENSON, 1994). Similar situation occurs with spondylosis, appointed by some authors as a problem with no clinical signs, although sometimes spinal cord compression may develop (LECOUTEUR & CHILD, 1992).

The aim of this study was to analyze 17 cases of thoracolumbar disk disease in dogs, from different breeds and ages, treated at the Acupuncture Ambulatory Unit and Small Animal Surgery Unit at the Faculty of Veterinary Medicine and Animal Science, University of São Paulo State, Botucatu, Brazil, comparing the results obtained after acupuncture, surgical or surgical and acupuncture treatment.

2. MATERIALS AND METHODS

2.1 Animals

Seventeen male and female dogs, being 13 Teckel and three crossbred, with neurological diseases, from different breeds and ages, treated at the Acupuncture Ambulatory Unit and Small Animal Surgery Unit at the Faculty of Veterinary Medicine and Animal Science, University of São Paulo State, Botucatu, Brazil were studied.

Only animals with complementary exams and conclusive diagnoses were included for investigation.

The distribution of treatment was:

a) Group1: seven dogs underwent electroacupuncture (4 animals with and 3 without deep pain reflex);
b) Group 2: four dogs submitted to electroacupuncture plus surgery (all animals without deep pain reflex and submitted to surgery longer than 48 hours and less than three weeks after the beginning of the clinical signs);
c) Group 3: six dogs treated only with surgery (four animals without deep pain reflex and two with deep pain reflex, submitted to surgery longer than 48 hours less than three weeks after the beginning of the clinical signs. No treatment was performed after surgery.

All the animals were examined and in some cases medicated by the University Veterinary Surgery Unit and other professionals before been referred to acupuncture treatment or surgery.

2.2 Complementary exam

All patients were submitted one of the following complementary exams such as radiographies, radiographies with contrast (myelography), magnetic resonance imaging, blood count and urinalyses. The minimal complementary exam performed in all animals was simple radiography. According to the situation, other exams were performed, such as, biochemical assays and electromyography. The plain films were evaluated by a radiologist from the Image Diagnose Unit of the University and independently reviewed by one of the authors. The diagnoses were performed based on clinical signs and complementary exams. The diagnoses also followed the protocol of PELLEGRINO et al (2003).

2.3 Neurological exam

A veterinary neurologist performed the neurological evaluation weekly and every time a visual improvement was observed or when the owner claimed for some new aspect observed in the dog. A basic examination was performed in all acupuncture sessions, consisting of a local exam related to the disease symptoms. The more detailed examination, performed by the veterinary neurologist, consisted of the general and specific tests described below:

1. General: History of the animal and physical exam.
2. Head evaluation: position, coordination, sensitivity, mental status.
3. Cranial Nerves: observation, motor observation, muscle tone, muscle strength, coordination and gait.

4. Reflexes: plantar response (Babinski), sensory, position sense (postural reaction), dermatomal testing (cutaneous trunci reflex), pain (deeper and superficial), flexor and extensor reflex (patellar, tibialis, etc), Schiff-Sherrington and others if required.

All animals, which were treated, had paraparesia, loss of position sense (postural reaction), reduced reaction at the dermatomal testing (cutaneous trunci reflex) and superficial pain reflex. The deep pain reflex was absence in eight dogs.

2.4 Treatment

2.4.1 Medications

All animals, before been referred to acupuncture or surgery treatment were medicated with prednisolone acetate (Meticorten® PDS 1mg/kg) given orally twice a day for five days and then once a day for five days and finally 0,5mg/kg once a day for five days. After that, if no improvement was observed, the animals were referred to acupuncture. Ten cases were referred to acupuncture or surgery before been medicated with corticosteroids for longer than three days.

2.4.2 Surgery

The surgical approach was the technique of hemilaminectomy (to access and decompress the medullar space) and lateral fenestration (to curette the rest of the disc material) according to FOSSUN et al (2002). The removal of the material extruded inside de channel is important to avoid persistent neurological deficiencies as it is not sufficient to perform just a “window” in the vertebral channel such single surgery performance like hemilaminectomy or dorsal laminectomy (CHIERICHETTI & ALVARENGA, 1999; FOSSUM et al., 2002).

2.4.3 Electroacupuncture

Points were selected to tonify Blood and Yang and also surround the lesion site above the spinal column. The points selected for all animals were:

K3 (kidney three – in the depression caudal to the medial malleolus of the tibia and cranial to the calcanean tuberosity), Bl 60 (bladder sixty – in the depression between the lateral malleolus of the tibia and the attachment of the common calcanean tendon to the calcaneal tuber), Bl 18 (bladder eighteen – lateral to the caudal border of the spinous process of the tenth thoracic vertebra), Bl 23 (bladder twenty three - lateral to the caudal border of the spinous process of the second lumbar vertebra), St 36 (stomach thirty six – located 3 tsun below St 35 or 0.5 tsun lateral to the tibial crest), GB34 (gall bladder thirty four – in the depression cranial and ventral to the head of the fibula at the interosseous space) (MACIOCIA, 1996; YANG et al., 2002).

Treatment was performed once a week with the number of treatment sessions varying from case to case. The frequency was 3Hz alternated with 15Hz, during 20 (twenty) minutes, using a dense-disperse model. The voltage was increased until twitching was observed.

2.5 Evaluation

2.5.1 Neurological examination

The animals were evaluated once a week on motor function by position sense (postural reaction), muscle tone, coordination and gait. The sensory function was evaluated by superficial and deep pain reflexes (YANG et al., 2002).

3. RESULTS

Table 1 Neurological outcome and average of sessions in dogs treated with electroacupuncture.

Number of Animals	**Neurological recovery**	**Average of sessions – once a week**
5 (animals with deep pain reflex integrity)	Able to walk	11
2 (animals with absence of deep pain reflex)	Able to walk a short distance before falling down	10

Table 2 - Neurological outcome and average of sessions in dogs treated with electroacupuncture and hemilaminectomy.

Number of Animals	**Neurological recovery**	**Average of sessions – once a week**
2 (animals with deep pain reflex integrity)	Able to walk	20
2 (animal with absence of deep pain reflex)	Able to stand up only	10

Table 3 - Neurological outcome and average of sessions in dogs treated with hemilaminectomy.

Number of Animals	**Neurological recovery**	None acupuncture or physical treatment was done
2 (animals with deep pain reflex integrity)	Able to walk	
4 (animals with absence of deep pain reflex)	Hind limb paralysis	

4. DISCUSSION

Treatment was considered successful when they recovered the normal movement capacity with neuromuscular control and ambulatory capacity to walk more than ten meters without falling down. As reported in the material and methods section, specific neurological evaluation was performed every time the animal showed any visible improvement and basic and local symptomatic exam were performed every acupuncture session. All treatments were initiated more than 48 hs after the beginning of the symptoms and after the first tentative of conservative treatment based on resting and steroid therapy.

The high percentage of recovery after electroacupuncture treatment demonstrates that acupuncture may be used to treat neurological problems related to disc disease. It also leads to a conclusion that the regulation of the immunological reaction might be as important as the surgical removal of the herniated disc. The low percentage of recovery after surgery (33,3%) is the same as previous reports, as the absence of deep pain reflex (in 66% of the cases) have poor prognosis for recovery (FOSSUN, 2002; PELLEGRINO et al., 2003).

STILL (1989) also had a good rate of success to treat thoracolumbar disc disease in dogs, which was proportional to the severity of the problem.

The Traditional Chinese perspective for neurological disturbances

The Chinese medicine treatment for local trauma with loss of motor function is to improve Blood and Qi circulation, to nourish the muscles/flesh and joints. The Xue/Blood disease in Chinese medicine must be differentiated between the patterns of Deficiency observed in lumbosacral, thoracolumbar and cervicothoracic syndrome (upper/low motor neuron deficits) and Stagnation (neurogenic pain such as radiculoneuritis) observed in disc disease (MACIOCIA, 1996; BRAUND, 1999; THOMAS & LUNDEBERG, 2001).

Ataxia, weakness, postural reaction deficits in pelvic limb, hyperesthesia of pelvic limbs which correspond to the Western patterns associated with thoracolumbar and cervicothoracic syndromes (BRAUND, 1999), is characterized in the Chinese patterns as general Yang

Deficiency, the Du Mai Empty of Qi and Blood. The causes may vary from Damp Accumulation, Heat Invasion drying the fluids, local trauma obstructing Qi and Blood, bad nutrition, advanced age, Jing Deficiency and others (YAMAMURA, 1993 apud JOAQUIM, 2003).

Paresis is considered in traditional Chinese medicine as a pattern of Blood Deficiency (MACIOCIA, 1996) and might be also due to the factors cited above.

Electrical stimulation

Prevalence of electroacupuncture stimulation in the acupuncture treatments in this study was higher than manual acupuncture. The choice between each other was based on muscular atrophy, neurological lesion grade and period of paresia/ataxia.

The literature suggests that the use of low frequency stimulation is helpful when it's necessary to induce the organism to produce some substances or restore some functions that have been affected by a pathological circumstance (KIKUCHI, et al, 1985).

Besides many other techniques for acupuncture treatment, the electrical stimulation is considered necessary by some authors (BRUNNER, 1976) to improve neuromuscular disorders. YANG et al (2002), comparing the effects of corticosteroid and electroacupuncture on experimental spinal cord injury in dogs, observed a better result when using the combination of the corticosteroid with electroacupuncture. In man, electrical stimulation is also an effective adjuvant in the treatment of movement recovery on complete spinal cord injured patients as showed by WONG et al. (2003), when established in the early/acute stages of the disease using the points Small Intestine 03 and Bladder 62 bilaterally.

Physiotherapic benefits of electroacupuncture

Electrical stimulation may also be used in dogs with neurological disorders, to produce muscle strengthening, reduction of muscle atrophy, muscle re-education, relief of contractures, relief of muscle spasm and trigger points, and pain relief (STEISS, 2002).

The electrical stimulation of acupuncture motor points may revert joint cartilage abnormalities (SALTER et al, 1980) due to immobilization or immobility.

The clinical response to treatment also depends on the psychopathology of pain. The use of electrostimulation for neurogenic pain such as the ones caused by a disc disease should be performed with high frequency for better results of pain relief comparing to low frequency

electrostimulation. The high frequency electrostimulation (above 100Hz) stimulates the type II afferent fibers leading to the sensation of paresthesia without muscle contractions, and by segmentary spinal mechanisms generating local analgesia (THOMAS & LUNDEBERG, 2001, WALSH, 2001). Electrostimulation with low frequency has been used for conditions such as detrusor hypereflexia in spinal cord injured patients (PRÉVINAIRES, 1996) and musculoskeletal disorders (THOMAS & LUNDEBERG, 2001). Low frequency electrostimulation also stimulates the types III and IV nociceptive fibers and the small motor fibers leading to sensation of paresthesia and muscular contraction (WALSH, 2001). In the present study, a low frequency (5 to 15 Hz) was used because of the sings of paresia, ataxia, weakness and hyperesthesia.

Immunologic perspective for neurological signs

McCARRON et al (1987) apud YAMAMURA et al (1996) in a study with dogs observed that the nucleus pulposus extruded in the epidural space suffer an inflammatory process due to an immunologic reaction. This can start, in humans, with a sneeze, bad posture and rupture of the dorsal ligament, which can produce overflow of the discal glycoprotein causing an immunologic reaction and pain.

Another study in humans with MRI in ninety eight healthy volunteers with absence of lumbago and history of pain signs showed that 64% showed discal abnormalities, 50% discal protrusion at least in one disc and 27% showed at least one herniation (JENSON, 1994).

Other studies also lead to the same conclusion about discal problems and immunologic reaction, according to the statements that methods which reduce the inflammatory reaction have more therapeutic benefits than the surgical removal of the protrusion according to PRATA (1981) and JANSSENS (1990) apud JANSSENS (1991). Severe protrusions can be founded in post mortem animals that have never showed clinical signs of discal problems (JANSSENS, 1990).

YAMAMURA et al (1996) in a study with humans has shown that there was not a correlation between the herniation volume and the severity of clinical signs.

Those statements can be observed in the figure 1, a NMR (Nuclear Magnetic Resonance) where despite the animal had little compression, he was not able to walk and figure 2, a NMR where the animal had great compression but was able to walk. Both animals belonged to group one, treated with acupuncture.

Figure 1 – A Teckel dog with little anatomical changes but with expressive neurological signs.

Figure 2 – A Teckel dog with important medullar compression but without great neurological signs.

Scientific perspective for neurological signs

As showed by several authors (JANSSENS, 1983; LECOUTEUR & CHILD, 1992), the absence of pain sensitivity is a poor prognosis for the patient recovery and after 48 hours the surgery prognosis is reserved (CHIERICHETTI & ALVARENGA, 1999; FOSSUM et al., 2002). The results observed with surgery (only 33.3% of improvement) in this study are compatible with the literature.

When locomotion rehabilitation happens in animals with absence of deep pain, it might be related to a trigger of central pattern generator (CPG) for locomotion, observed in mammals. This CPG was first studied and showed in an acute spinal cat study and was characterized as arythmic stepping like activity and not a succession of reflexes (BROWN, 1911; PERRET, 1976; BUSSEL et al, 1996), which could be activated by adequate training (BUSSEL et al, 1996) and maybe by acupuncture treatment. This CPG contains neural mechanisms that are necessary to generate coordinated rhythm signs at the motor neurons, which innervates the effective organs. In short words it consists of an interneuron group, which can inhibit or excite in a sequential way the flexors and extensors neurons, generating a determined rhythm of locomotion. This CPG is activated and controlled by descending fibers from superior motor centers in the cortex or in the trunk (PELLEGRINO, 2003).

Other studies conducted by HIRABAYASHI et al (1990) apud YAMAMURA et al (1996) showed another mechanism of improvement of the herniated disc disease, which could be associated with the acupuncture effect of increasing circulation and the conservative treatments. They observed, in micro dissection of extruded disc herniation in dogs, the formation of neo capillaries that could promote the lysis and digestion of the herniated material and also promote the cicatrisation of the dorsal longitudinal ligament. According to that the extruded mass can be completely reabsorbed by the organism (PELLEGRINO et al., 2003) and the efficacy of acupuncture treatment in the disc problems may be based on these mechanisms.

5. CONCLUSION

The stimulation of acupoints St 36, GB 34, Bl 18, Bl 23, K 3 and Bl 60 was efficient to treat the Western pattern of neurological disease associated with thoracolumbar disk disease in the animals studied in this investigation. The results of the treatment of disc disease in dogs with absence of deep pain reflex with acupuncture are very promising. The participation of the immunologic inflammatory response in the expression of the clinical signs may play a role on the thoracolumbar disk disease. More studies are necessary to elucidate the mechanisms of acupuncture effect in such diseases.

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