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RESEARCH ARTICLE

Retrospective Study of a New Standardized Acupuncture Treatment Protocol on Thoracolumbar Spinal Cord Diseases in 84 Dogs

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A B S T R A C T

Acupuncture is a conservative treatment for neurologic deficits expressing pain, paraparesis, or paralysis in dogs. There are many Traditional Chinese Veterinary Medicine (TCVM) experiences and theories. This retrospective study was conducted in 84 dogs of different breeds divided into two main groups: the non-surgery (n=65) and post-intervertebral disc disease (IVDD) surgery (n=19) groups, which were referred to our practice for TCVM treatment due to thoracolumbar spinal cord disease. A new standardized protocol of four options comprised mainly of the *Hua-tuo-jiaji* (HTJJ), GB30, GB34, LIV3, LI4 acupoints was performed. These options consisted of gradual treatment with dry needle acupuncture (AP) and electro-acupuncture (EAP) applied to the thoracolumbar spinal cord area depending on the disease severity. Duration of sign, improvement time, and recovery time were recorded. In the non-surgery group, the success rate was 95%. The mean improvement time was 13.1 days, the average number of acupuncture sessions was 4 while the mean recovery time was 27.5 days, with 6.5 sessions. In the post-IVDD surgery group, good outcomes were achieved in 74% of the dogs. The mean improvement time was 18.6 days, with an average of 6.1 sessions while the mean recovery time was 53 days, with an average of 11.6 sessions. We concluded that there was no significant statistical difference between AP and EAP in the efficacy without breed predisposition and the severity impacted the prognosis. This new acupuncture method had favorable efficacy in clinical cases.

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INTRODUCTION

Cases of thoracolumbar spinal cord diseases which cause back pain, paraparesis, or paraplegia are commonly encountered by *canine* practitioners. The causes are structural compression such as intervertebral disc disease (IVDD), vertebral dislocation, tumor, spondylosis, and other conditions, or non-structural compression such as degenerative changes, fibrocartilaginous embolism, infection, and others (Kline, 2002).

Conservative intervention and surgery are the two main treatment modalities. Cases of severe structural compression require surgery. Certain others are responsive to acupuncture treatment. There is an increasing tendency to use acupuncture as an alternate treatment due to its less invasive character and its effectiveness in certain cases. Regardless of whether it is combined with conventional treatment (with or without surgery) or not, or acupuncture alone, it is a good treatment option (Janssens, 1992; Kline, 2002).

There are many choices of acupoints based on clinical experiences and text theories. These include local points (i.e. acupoints around the lesion) and distant points (i.e. acupoints distal from the lesion). Both in human and animal, these points belong to the Bladder (BL) channel (from BL18 to BL25 depending on the lesion) which runs parallel to the spinal cord, the Governing Vessel (GV) channel (from GV14 to lumbar *Bai-Hui* along with the lesion) which runs parallel to the spinal cord, the Gall Bladder (GB) channel (GB30, GB34) which runs lateral to the body, the Stomach (ST) channel (ST36), the Liver (LIV) channel (LIV3), the Large Intestine (LI) channel (LI4), which are located on the pelvic limbs and the ear points which are on the ears (Hayashi *et al.*, 2007; Liang *et al.*, 2012). *Hua-tuo-jiaji* points located bilaterally along the central spinous processes are widely used in human

acupuncture for treatment of back pain (Deng and Cai, 2011; Huang, 2012). They are also used to treat thoracolumbar spinal diseases in animals (Wang *et al*., 2005). To TCVM practitioners, it is sometimes difficult to decide which points to choose as well as the stimulation methods and to predict their efficacy in animal.

In this report, we retrospectively studied a standardized acupuncture protocol aimed at treating *canine* thoracolumbar spinal cord disease. The new method comprises simple points and uses two methods to stimulate the selected acupoints, in combination with Chinese herbs, enhancing the treatments' success. The efficacy of this standard TCVM treatment needed confirmation. In the selected cases, we also evaluated the efficacy and compared their differences.

MATERIALS AND METHODS

Selection of dogs: From 2009 to 2014, the clinical records of a University Veterinary Hospital were searched for canine cases of thoracolumbar spinal cord disease in which the dogs were treated with acupuncture for at least 4 sessions and over 3 months of treatment time until recovery. Eighty-four cases meeting the inclusion criteria were identified. The breeds included in the study were Dachshund (n=29), Shih Tzu (n=10), French bulldog (n=8), toy Poodle (n=8), Maltese (n=4), Beagle (n=4), miniature Schnauzer (n=3), Pekinese (n=2), Japanese Spitz (n=2), Pomeranian (n=1), Bichon (n=1), Corgi (n=1), Yorkshire terrier (n=1), Golden Retriever (n=1), and Mixed (n=9). Their average body weight was 8.0±5.0 kg (range, 2.5–36.9 kg), and their average age was 7.5±4.2 years (range, 0.75–17 years). Each dog underwent complete physical, neurological, and imaging examinations, localizing T3–L3 lesions and ruling out the need for immediate surgery. The dogs were divided into two main groups: the non-surgery group and the post-IVDD surgery group. Group 1 (non-surgery) consisted of dogs referred for acupuncture (n=65) while group 2 (post-IVDD surgery) consisted of dogs that had undergone IVDD surgery (n=19).

Treatment protocol: The selected acupoints were categorized as local points and defined as the points around the lesion while distant points were defined as the points away from the lesion. Local points were designated *Hua-tuo-jiaji* (HTJJ) points according to the localization. Distant points were GB30 (*Huan-tiao*), GB34 (*Yang-ling-quan*), LI4 (*He-gu*), LIV3 (*Tai-chong*), and *Liu-feng* (Fig. 1). The degree of neurologic dysfunction was graded as described previously (Hayashi, 2007).

Treatment option 1: AP in local HTJJ points and distant points LIV3, LI4; **Treatment option 2:** Option 1 with the addition of distant points GB30, GB34; **Treatment option 3:** Option 2 with the addition of EAP in local HTJJ points, distant points GB30 + GB34 (connects GB30 to GB34) and **Treatment option 4:** Option 3 with the addition of the hind limb *Liu-feng* points.

The *Liu-feng* acupoints were added to generate the strongest stimulation to the extremity of the limb. With the dry needle method, needles were inserted and stayed for 15 minutes. With the EAP method, the procedure was identical to that of AP, except that electrical stimulation was applied to the needle while inserted. An electrostimulator (Ching Ming Tens Model-05B, Ching Ming Corp., New Taipei, Taiwan) was used to provide stimulation for 15 minutes at 0.2 Vp-p (voltage peak to peak) at a frequency of 20 Hz (interrupted wave type).

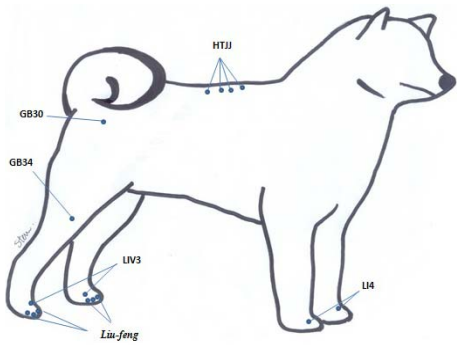

Fig. 1: Acupoint locations used for thoracolumbar spinal cord diseases in dogs. HTJJ (*Hua-tuo-jiaji*) acupoints are located on back area 0.5 cun[a)] bilateral to the dorsal spinous process of each vertebrae from T1-L7, GB30 (*Huan-tiao*) acupoints are located on around hip in between the greater trochanter of the femur and the tuber ischii, GB34 (*Yang-ling-quan*) acupoints are located on lateral stifle area cranial and distal to the head of the fibula, LI4 (*He-gu*) acupoints are located on dorsal fore paws between the 2nd and 3rd metacarpal bones at the midpoint of the 3rd metacarpal bone, LIV3 (*Tai-chong*) acupoints are located on dorsal hind paws proximal to the metatarsophalangeal joint between 2nd and 3rd metatarsal bone, and *Liu-feng* acupoints are located on hind interdigital area at the skin fold crossing the metatarsophalangeal joint between digits 2-3, 3-4, 4-5. [a)]cun: the width of the last rib is equal to 1 cun in small animal.

Chinese herbs consisted of Double PII (Jing Tang, Gainesville, FL, USA) and *Bu Yang Huan Wu Tang* (Sun Ten Pharmaceutical Co., Taipei, Taiwan); they were used for all dogs. The dosage was 0.1 g per 5 to 10 kg of body weight given orally twice daily until recovery.

The duration of signs prior to TCVM treatment (defined as the time from disease onset to TCVM treatment start) was recorded. After TCVM treatment, improvement time was defined as the time from pain to no pain or the time needed to walk without assistance. Recovery time was defined as the time required to return to normal daily life. These time intervals were recorded for later analysis.

SPSS (SPSS, version18.0, IBM Corp., New York, NY, USA): Independent Samples T-tests was used to analyze the data. Statistical differences were considered significant at a value of $P<0.05$.

RESULTS

Among the 65 dogs in group 1, one Dachshund dog with 90 days' duration of sign became spinal reflex walk after treatment. The time needed to be ambulatory was 210 days. Two dogs which were Beagle and mixed did not improve after 10 months and 22 months separately (the owner gave up on treatment). In the post-IVDD surgery group (19 dogs), three dogs which were 1 Shih Tzu and 2 Dachshund walked by spinal reflex with ambulation times of 8, 7, and 9 months, respectively. Two dogs which were toy Poodle and Dachshund did not improve over 3.5 months and 10 months; these owners gave up treatment at that time. Of the 65 dogs in group 1, 62 dogs recovered. In group 2, 14 dogs recovered (Fig. 2). Table 1 lists the summary statistics of recovered dogs in non-surgery and post-IVDD surgery.

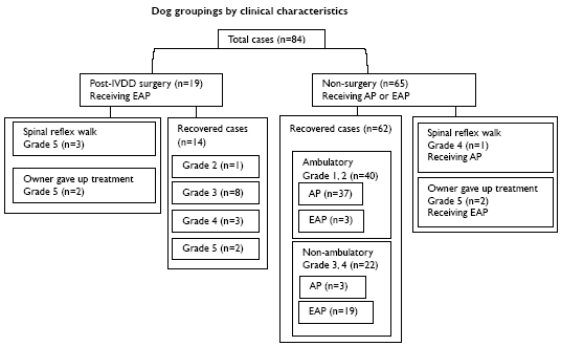

Fig. 2: Dog groupings by clinical characteristics. In total, 84 dogs received the new acupuncture treatment. The 2 main groups were post-IVDD (intervertebral disc disease) surgery cases and non-surgery cases. In the post-IVDD surgery branch, recovered cases included grade 2, 3, 4, and 5 dogs. Three grade 5 dogs only walked by spinal reflex and a further two grade 5 dogs gave up acupuncture treatment. In the non-surgery branch, dogs recovered from ambulatory and non-ambulatory groups which were grade 1, 2 and grade 3, 4 respectively. One grade 4 dog walked by spinal reflex. Two dogs from grade 5 gave up acupuncture treatment.

Among the 76 recovered dogs, there were 15 breeds divided into 9 groups (Table 2). The only groups containing both surgical and non-surgical components were the Dachshund and Shih Tzu groups. There were similar durations of sign of about 5 days (range, 1 20) in Dachshund without surgery, French bulldog, and miniature Schnauzer groups. There was the longest duration of sign at 29.4 days (range, 7 180) in mixed breed. The shortest improving time was in the Shih Tzu group with post-IVDD surgery, which was 6 days (range, 5 7) while the longest was 33 days (range, 18 59) in the miniature Schnauzer group. There was the shortest recovery time in Dachshund without surgery, which was 17.1 days (range, 6 41). There was the longest recovery time in Shih Tzu with post-IVDD surgery group, which was 50.5 days (range 30 71).

Based on improvement time and recovery time, in recovered cases containing non-surgery and post-IVDD surgery dogs, there was no difference (P>0.05) between AP and EAP. Subdivided from the recovered cases was the non-surgery group. There was no difference between AP and EAP. Comparing to the treatment of the same grade levels, AP or EAP did not differ in terms of time to improvement and recovery time. There was no difference (P>0.05) when comparing AP and EAP for treatment of grade 2 dysfunction. There was no difference comparing AP and EAP for treatment of grade 3 dysfunction (Table 3).

DISCUSSION

In this study, 84 paraparetic dogs underwent acupuncture treatment. The selection of acupoints and stimulation methods were made according to the previously published literature. Compared with previous studies (Wang *et al.*, 2005; Hayashi *et al.*, 2007; Liang *et al.*, 2012), we developed a standardized acupuncture protocol to treat paraparetic dogs. The choice of acupoints and method used depended on the grade of severity, onset period, and weakness of limbs. AP method was used in dogs presenting with only grade 1 dysfunction of short-term duration or in dogs presenting with grade 1 or 2. EAP method was used in dogs presenting with chronic dysfunction of a long duration (>2 weeks), dogs under sedation, post-IVDD surgery or for dogs with presentations more severe than grade 3.

The use of EAP theoretically replaces manipulation of the needles by hand (Yu *et al*., 2014) and empirically strengthens the effects of AP. According to some studies, EAP is more effective than AP (Ulett *et al.*, 1998; Leung, 2012). Additionally, the stimulation current was 20 Hz (interrupted wave) for 15 minutes to help with nerve healing. As an *in vivo* study in cats revealed, peripheral stimulation at 20 Hz elevated the maximal release of substance P which is associated with the regulation of neurogenesis (Park *et al*., 2007). In our study, there was no difference in efficacy between AP and EAP. The duration of sign and severity in EAP cases were 2 possible factors.

Table 1: Statistics on recovered dogs in non-surgery (n=62) and post-IVDD surgery (n=14)

Parameters	Receiving AP or AP+EAP from non-surgery	Receiving AP+EAP from post-IVDD surgery
Age (year)	8.1±4.6	5.6±2.3
BW (kg)	8.2±5.6	6.5±1.5
DT (day)	12.32±25.12	9.7±4.9
IT (day)	13.1±10.6	18.6±13.9
Sessions to improvement	4	6.1
RT (day)	27.5±22.2	53±28.3
Sessions to recovery	6.5	11.6

Values (Mean±SD); DT: Duration of sign; IT: Improvement time; RT: Recovery time.

There was no statistical difference between breeds in improvement time and recovery time (Table 2). In the Dachshund group, the improvement time and recovery time were longer in post-IVDD surgery part than in non-surgery part, P<0.05. This was because of referred cases which did not improve from surgery over 7 days. These cases were either severe in grade or had longer duration of sign than non-surgery cases. In the Shih Tzu group, the age and duration of sign had less impact on recovery time than the severity did between non-surgery and post-IVDD parts. The former was far older than the last and duration of sign was longer than the last. The severity issue was an affecting factor. In the French bulldog group with congenital hemivertebrae which affected T3-L3 spinal cord, the onset was very acute, thus the predisposed age was earlier compared to the others, and the duration of sign was short. Hence they had good improvement time. The Maltese group had the lightest BW and the Beagle group had the heaviest BW. Both groups had average improvement and recovery times, indicating that BW was not an important factor influencing prognosis. The miniature Schnauzer group had the second-most severe grade. Although their duration of sign was shortest, the improvement and recovery times were long. The toy Poodle group had the least severe grade, and the medium duration of sign, the recovery times were second short. This means that the severity factor influenced the healing time more than the duration of sign did.

Table 4 provides a comparison with previously published reports of acupuncture treatments in dogs with thoracolumbar spinal cord diseases. Without surgery, for dogs with grade 1 and 2 dysfunction, our standardized method produced longer recovery times compared to those reported by Janssens (1992) and Still (1998). However, for dogs with grade 3 dysfunction, our method resulted in shorter recovery times than by Janssens (1992).

Table 2: Summary of statistics (mean±SD) on recovered dogs by breeds

Breeds	Age (year)	BW (kg)	Grade	Duration of sign (day)	Improvement time (day)	Recovery time (day)
Dachshund						
without surgery (n=16)	6.1±3.0	5.9±1.4	2.5±0.6	5±3.9	8.2±5.9	17.1±9.8
post-IVDD surgery (n=9)	5.4±1.7	7.0±1.6	3.2±0.8	10.1±5.7	18±11.7	48.6±28.5
Shih Tzu						
without surgery (n=7)	13.2±4.1	6.3±1.9	2±0	23.4±30.8	18.7±10.6	35.1±28.9
post-IVDD surgery (n=2)	3.8±0.3	5.7±0.4	3.5±0.7	10.5±6.4	6±1.4	50.5±29
French bulldog (n=8)	3.1±1.2	10.2±1.5	2.5±0.8	5.8±7.4	7.4±5.2	23.6±14.4
mixed (n=8)	10.3±4.6	12.1±7.0	2±0.5	29.4±60.9	16.4±10.4	23.9±9.1
toy Poodle (n=7)	7±4.0	6.0±2.4	1.9±0.7	11.4±9.2	9.6±4.0	17.4±9.2
Maltese (n=4)	9.8±4.3	3.7±1.3	3±0.8	11.3±12.6	27±20.5	47.5±38.9
Beagle (n=3)	7.3±0.6	13.6±7.3	2.3±1.2	14.7±13.3	14.3±12	36.3±4.5
miniature Schnauzer (n=3)	9.7±4.0	6.4±0.9	3.3±1.5	5±3.5	33±22.6	49.7±17.7
others (n=9)	10.2±4.8	10.4±10.4	2.2±0.8	8.8±5.1	14.4±8.5	48.9±39.3

Table 3: The statistical data comparing AP and EAP based on improvement and recovery time

cases grouping	Option		n	Mean	SD	t	P-value
Total recovered cases (n=76)	improvement time (day)	AP	41	13.0732	9.30965	-0.866	0.389
		EAP	35	15.3429	13.43381		
	recovery time (day)	AP	41	29.3171	25.01943	-1.078	0.285
		EAP	35	35.5714	25.43421		
Cases without surgery from the recovered cases (n = 62)	improvement time (day)	AP	41	13.0732	9.30965	-0.037	0.971
		EAP	21	13.1905	13.00623		
	recovery time (day)	AP	41	29.3171	25.01943	0.901	0.371
		EAP	21	23.9524	14.98158		
Grade 2 cases without surgery from the recovered cases (n = 33)	improvement time (day)	AP	30	14.0000	9.50136	0.358	0.723
		EAP	3	12.0000	3.60555		
	recovery time (day)	AP	30	28.5333	25.64174	0.721	0.476
		EAP	3	17.6667	7.57188		
Grade 3 cases without surgery from the recovered cases (n = 21)	improvement time (day)	AP	3	5.6667	1.52753	0.932	0.363
		EAP	18	13.3889	14.04254		
	recovery time (day)	AP	3	15.0000	6.55744	1.063	0.301
		EAP	18	25.0000	15.78532		

Table 4: Comparison of selected acupoints and methods for treatment of canine thoracolumbar spinal cord diseases and the efficacy

	Janssens (1992)	Still (1998)	Hayashi *et al.* (2007)	Joaquim *et al.* (2010)	Han *et al.* (2010)	Jeong *et al.* (2013)	Liu *et al.* (2015)
Local points	BL points around lesion	BL18-BL27 around lesion GV6-GV4 around lesion	BL20, BL23, BL25	BL18, BL23	BL points around lesion	BL points around lesion	HTJJ points around lesion
Distant points	BL60, GB30, GB34	BL25- BL35, lumbar *Bai-hui*, GV2, GV1, GB30, GB34, BL40, BL60, BL67, LIV3, ST36, CV6-CV3, CV1, *Wei-jian*, Ear points	SI3, BL60, BL62, GB30, KI3, ST36, lumbar *Bai-hui*, GV1, LI4	BL40, KID3, GB30, GB34, ST36	GB30, GB34, ST36	SI3, BL62, BL40, GB34, BL60, BL64, lumbar *Bai-hui*	GB30, GB34, LIV3, LI4, *Liu-feng*
EAP pairs	None	Variable depends on severity. Applied on body and limbs points.	BL20 to BL23 or BL25, lumbar *Bai-hui* to GV1 or GB30, ST36 to BL60 + KI3, 3 and 100Hz dense-disperse wave 20 minutes	BL18 to BL23, GB34 to ST36, 2 and 15Hz, dense disperse wave 20 minutes	GV7 to lumbar *Bai-hui*, 2 and 15Hz, dense disperse wave 25-30 minutes	none	HTJJ, GB30 to GB34, 20 Hz interrupted wave 15 minutes
Medication	None	None	Steroid	None	Steroid	None	Herbs
Grade 1 recover days (sessions)	n=30 13 (2)	n=7 3.4 (2)	-	-	-	n=1 5 (1)	n=7 39 (8)
Grade 2 recover days (sessions)	n=17 24 (3.4)	n=22 9.2 (3.4)	-	-	-	n=1 49 (8)	n=33 27.5 (6.2)
Grade 3 recover days (sessions)	n=19 32 (4.8)	n=1 23.4 (7.4)	n=10 10.1 (2)	-	n=39 15.2 (6.5)	n=6 38.7 (12.5)	n=21 23.6 (3.9)
Grade 4 recover days (sessions)	-	n=1 32.8 (9.3)	-	n=19 77 (11)	-	-	n=1 28 (6)
Grade 5 recover days (sessions)	-	-	n=3 14.7 (5)	-	-	n=1 49 (15)	-

EAP: Electro-acupuncture; - : Not reported.

Additionally, our recovery time was shorter than those reported by Jeong (2013) (38.7 days), but longer than those of Han (2010) (15.2 days) who used steroid + EAP. In our study, there was only one dog with grade 4 dysfunction in the non-surgery group. The recovery time for this dog was 28 days (6 sessions). This recovery time was shorter than that reported by Still (1998), which was 32.8 days (9.3 sessions).

In group 1 (non-surgery), one dog did not improve after 10 months due to unknown causes. Another dog did not improve after 22 months because of spinal dislocation. Among the dogs that recovered, the 22 non-ambulatory

dogs containing grade 3 and 4, the average recovery time was 23.6 28 days (3.9 6 sessions), which was shorter than in a previous study (Joaquim *et al.*, 2010) of 19 non-ambulatory dogs where the recovery time was 77 days (11 sessions) using only EAP. In another study (Han *et al.*, 2010) reported the results of 39 non-ambulatory dogs that received steroid + EAP treatment and whose recovery time was 15.2 days (6.5 sessions), shorter than our study. This recovery time was also longer than that of another study (Hayashi *et al*., 2007) of 13 non-ambulatory dogs that also received steroid plus EAP treatment and whose recovery time was 10.1 14.7 days (2 5 sessions). The difference was that in our study, although the average recovery time was longer than theirs, the dogs had no gastrointestinal side effects using herbs.

In our study, two Chinese herb formulas were prescribed; they were Double PII and *Bu Yang Huan Wu Tang*. According to TCVM text, the treatment principles of Double PII (the classical antecedent was *Da Huo Luo Dan*) are to break down stasis in the spine, move *Qi*, and relieve pain. The *Bu Yang Huan Wu Tang* tonifies *Qi* and smooths the channels. There was no gastrointestinal side effect till the day of collecting data.

In a study (Bush *et al.*, 2007) aimed at the functional outcomes after hemilaminectomy in 51 non-ambulatory dogs, the improvement time from non-ambulatory to ambulatory was 10 days (90% of the dogs). In our study, the reason to have acupuncture treatment after IVDD surgery was that non-ambulatory status lasted for an average of 11.8±6.5 days [range, 2–28 days; 16/19 (84%) over 7 days] even after surgery, which worried the owners. After treatment, the success rate of 74% (14/19) was better than that reported by Joaquim *et al.* (2010) who compared three groups of treatments for a total of 40 neurologic deficits in which the success rates were 40% (4/10) in the decompressive surgery group and 73% (8/11) in the decompressive surgery + EAP group. Nonetheless, the outcome was less than 79% (15/19) in the EAP group by 6 months after surgery.

In our study, four dogs recovered with spinal reflex walking (Olby *et al*., 2003). The longest time needed to be ambulatory was 9 months (range, 7-9 months). One dog was in non-surgery group while another three dogs were in post-IVDD surgery group. In an investigation of nine mongrel dogs, long-term (6-39 months) observations were made following spinal transection. The average time needed to be spinal reflex walking was 4 months, and one dog could not stand or walk using its hind limbs 9 months after the spinal transection. This means that it is worthwhile to continue acupuncture treatments for least 9 months. In our study, while 9 months of treatment did not guarantee recovery, there was still had a chance for the dog to become ambulatory. The longest time in our study was 9 months to ambulation; thus, treatment for at least 9 months deserves a try. In the future, we need greater case numbers to support the effects of acupuncture on spinal healing. It is important to have this valid statistical base for practitioners and owners so that they may decide how long to continue acupuncture treatment.

Conclusion: The standardized treatment containing HTJJ as local points, GB30, GB34, LIV3, and LI4 as distant points are a set of reliable acupuncture points for the treatment of thoracolumbar spinal disorders in paraparetic dogs. The step-by-step, cumulative treatment levels in combination with the herbal therapy showed prominent efficacy especially in non-ambulatory paraparesic cases, and there was no significant difference in treatment results between AP and EAP. There was no significant difference in prognosis by breeds. The severity of disease affected prognosis more than the duration of sign did.

Author's contribution: CML conceived the study design, performed the treatments, analysed the data, and drafted the manuscript for publication. CTL was accountable for all aspects of the work, ensuring the accuracy and integrity of the work. All authors read and approved the final version of the manuscript.

REFERENCES

Bush WW, DM Tiches, C Kamprad, RJ Murtaugh and CS Barr, 2007. Functional outcome following hemilaminectomy without methylprednisolone sodium succinate for acute thoracolumbar disk disease in 51 non-ambulatory dogs. J Vet Emerg Crit Care, 17: 72-76.

Deng W and LH Cai, 2011. Electro-acupuncture mainly at Jiaji point in the treatment of prolapse of lumbar intervertebral disc: an analysis of 60 cases. J Clin Acupunct Moxib, 27: 40-42. (In Chinese)

Han HJ, HY Yoon, JY Kim, HY Jang, B Lee *et al*., 2010. Clinical effect of additional electroacupuncture on thoracolumbar intervertebral disc herniation in 80 paraplegic dogs. Am J Chin Med, 38: 1015-1025.

Hayashi AM, JM Matera and AC Fonseca Pinto, 2007. Evaluation of electroacupuncture treatment for thoracolumbar disc disease in dogs. J Am Vet Med Assoc, 231: 913-918.

Huang DF, 2012. 60 cases of treatment of lumbar disc herniation pain acupuncture jiaji points. J Pract Trad Chin Intern Med, 26: 79-81. (In Chinese)

Janssens LAA, 1992. Acupuncture for the treatment of thoracolumbar and cervical disk disease in the dog. Probl Vet Med, 4: 107-116.

Jeong JH, JY Song, HG Jo, JM Kim, SS Yoon *et al*., 2013. Simple acupoints prescription flow chart based on meridian theory: a retrospective study in 102 dogs. Evid Based Complement Alternat Med, 2013: 129315.

Joaquim JG, SP Luna, JT Brondani, SR Torelli, SC Rahal *et al*., 2010. Comparison of decompressive surgery, electroacupuncture, and decompressive surgery followed by electroacupuncture for the treatment of dogs with intervertebral disk disease with long-standing severe neurologic deficits. J Am Vet Med Assoc, 236: 1225-1229.

Kline KL, 2002. Complementary and alternative medicine for neurologic disorders. Clin Tech Small Anim Pract, 17: 25-33.

Leung L, 2012. Neurophysiological basis of acupuncture-induced analgesia-an updated review. J Acupunct Meridian Stud, 5: 261-270.

Liang YY, YM Guo and JQ Gu, 2012. Clinical observation on effect of deep electroacupuncture on jiaji points on treating lumbar disc herniation. Chin Arch Trad Chin Med, 30: 1352-1353. (In Chinese)

Olby N, J Levine, T Harris, K Muñana, T Skeen *et al.*, 2003. Long-term functional outcome of dogs with severe injuries of the thoracolumbar spinal cord: 87 cases (1996-2001). J Am Vet Med Assoc, 222: 762-769.

Park SW, YP Yan, I Satriotomo, R Vemuganti and RJ Dempsey, 2007. Substance P is a promoter of adult neural progenitor cell proliferation under normal and ischemic conditions. J Neurosurg, 107: 593-599.

Still J, 1998. Acupuncture treatment of grade III and grade IV canine thoracolumbar disc disease (hind limb paralysis). Am J Acupunct, 26: 179-187.

Ulett GA, S Han and JS Han, 1998. Electroacupuncture: mechanisms and clinical application. Biol Psych, 44: 129-138.

Wang L, SX Jiang, FQ Xie, JR He and DG Lin, 2005. Therapy with acupuncture for thoracolumbar intervertebral disc protrusion/ extrusion in dogs: 90 cases (2000- 2002). Chin J Anim & Vet Sci, 36: 195-197. (In Chinese)

Yu Z, L Luo, Y Li, QF Wu, SF Deng *et al*., 2014. Different manual manipulations and electrical parameters exert different therapeutic effects of acupuncture. J Tradit Chin Med, 34: 754-758.