

## Retrospective Studies

# Comparison of Conventional Medical Treatment to Electro-Acupuncture Combined with Chinese Herbal Medicine for the Treatment of Hind Limb Paresis and Paralysis in Dogs and Cats: A Retrospective Study

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### ABSTRACT

This study investigated electro-acupuncture (EAP) combined with Chinese herbal medicine (CHM) for the treatment of hindlimb paresis/paralysis in dogs and cats. Study subjects (50 dogs, 6 cats) diagnosed with hindlimb paresis and/or paralysis over a one-year period were divided into three treatment groups. Group A received conventional medical treatment only. Group B received traditional Chinese veterinary medicine (TCVM) treatment only. Group C received both conventional and TCVM treatment. Results were recorded as successful or unsuccessful. Successful treatment was defined as return to mobility of non-ambulatory dogs or improvement of at least 1 neurological grade in dogs ambulatory at study start. If successful, the number of weeks of treatment required was recorded. Study results demonstrated treatment was successful in 18% (2/11), 96% (28/29), and 94% (15/16) of animals in Groups A, B and C, respectively. Statistically significant differences were detected between Groups A and B ( $p$ -value < 0.01) and between Groups A and C ( $p$ -value < 0.01), but no statistical difference between Groups B and C ( $p$ -value > 0.05). For successfully treated patients, mean recovery times were 12.5, 1.86 or 2.23 weeks for Groups A, B and C, respectively. The mean recovery time for Group A was significantly longer than for groups B and C ( $p$ -value < 0.01), while the mean recovery time was not statistically different between Groups B and C ( $p$ -value = 0.91). The results of this study suggest that TCVM (EAP, CHM) is a more effective treatment for hindlimb paresis/paralysis than a program of conventional medicine. Furthermore, adding conventional medicine to TCVM treatment neither improved success rate nor reduced treatment length needed for success.

**Key words:** acupuncture, back pain, paresis, paralysis, lameness, neurological disorder, TCVM, canine, feline, dog, cat, veterinary Chinese herbal medicine

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### ABBREVIATIONS

<b>CHM</b>	Chinese herbal medicine
<b>CT</b>	Computerized tomography
<b>DNAP</b>	Dry needle
<b>EAP</b>	Electro-acupuncture
<b>IVDD</b>	Intervertebral disc disease
<b>MRI</b>	Magnetic Resonance Imaging
<b>NSAIDS</b>	Non-steroidal anti-inflammatory drugs
<b>TCVM</b>	Traditional Chinese veterinary medicine

Neurological disorders such as hindlimb paresis and paralysis are commonly seen in canine and feline veterinary practice.<sup>1</sup> These may result from widely varying etiologies, including degenerative disease (interv-

ertebral disc disease, lumbosacral stenosis, degenerative myelopathy), trauma (acute injury, fractures), inflammatory/infectious disease (canine distemper, fibrocartilaginous thromboembolism, aortic thromboembolism), neoplasia and metabolic disorders such as hypocalcemia.<sup>2</sup> Complications of non-ambulatory hindlimb paraparesis vary and can include urinary incontinence, fecal incontinence/constipation, skin disease and muscle atrophy. These issues can be so severe as to have owners finally resort to euthanasia of a beloved animal.<sup>2,3</sup>

Diagnosis of hindlimb paresis and paraparesis includes the integration of clinical history, routine physical and neurological exam (location of lesion) with assignment of neurological grade (Grades 1-5).<sup>3,4</sup> Radiographs may show degenerative changes or narrowing of disc spaces/vertebral canal but definitive diagnosis and lesion localization requires advanced

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imaging such as myelography, magnetic resonance imaging (MRI) and computerized tomography (CT).<sup>2</sup>

The suggested treatment of nonambulatory hindlimb paresis/paralysis caused by spinal cord compression is surgery.<sup>1</sup> Indications for surgical management of thoracolumbar intervertebral disc disease (IVDD) include spinal hyperesthesia or paresis refractory to conservative therapy, recurrence or progression of neurologic deficits, paraplegia with intact pain perception, and paraplegia with loss of pain perception for less than 24 to 48 hours.<sup>1</sup> Surgery is, however, expensive and in developing countries there are generally few veterinary neurosurgeons. Medical treatment generally carries a poor prognosis as it does not optimally address compression of the spinal cord, which is responsible for most of the clinical signs.<sup>1</sup> Paralyzed animals that have a loss of pain perception for 48 hours or longer have a grave prognosis (less than a 5% chance for recovering the ability to walk) with or without surgery.<sup>2</sup> If conventional medical treatment is elected, steroids, analgesics (opioids) or non-steroidal anti-inflammatory drugs (NSAIDs) should ideally be used at home in combination with strict cage rest and administration of B vitamins, vitamin E and joint supplements.<sup>1</sup> Care should be taken to avoid concurrent administration of NSAIDs and corticosteroids, and not to administer corticosteroids for longer than 5 to 7 days as this increases risk of gastrointestinal ulceration and urinary tract infection.<sup>1</sup>

With surgical treatment often unavailable and conventional medicine offering less than satisfactory efficacy, acupuncture and Chinese herbal medicine have begun to be integrated into the treatment options for

hindlimb paresis and paralysis, largely due to their lower cost and high success rate.<sup>1,2</sup> When considering acupuncture as a treatment modality, electro-acupuncture (EAP) has a number of positive attributes for therapy of hindlimb paresis/paralysis. The effects of EAP are mediated by descending neural pathways in the spinal cord with low frequency application invoking analgesic and restorative processes, particularly suitable for treating pain conditions. Higher frequencies are selected where nerve dysfunction or paralysis is involved and can produce tonic contraction of muscles, which is useful in treating certain muscular conditions when applied in discontinuous or mixed mode.<sup>5</sup>

In classic Chinese medical texts, the Kidney was considered the center for vigor and strength. The brain was viewed as a reservoir of the Kidney system because when full, the body was strong and when deficient there was dizziness, aching limbs and fatigue.<sup>3</sup> Since the brain resides in the bony skull, it was considered a reservoir of bone marrow and called the “Sea of Marrow”. The spinal cord was considered bone marrow within the vertebral canal. Marrow from a traditional Chinese veterinary medicine (TCVM) perspective thus includes the brain, spinal cord and bone marrow. In TCVM, consideration of the Five Elements and *Yin* and *Yang* help to shape patterns of imbalance, therefore, TCVM Pattern identification is paramount to achieving optimum outcomes.<sup>3</sup> There are seven TCVM Patterns recognized in animals with hindlimb paresis/paralysis, almost all of which involve the Kidney. These patterns shape the selection of appropriate acupuncture treatment points and the Chinese herbal medicine (Table 1).<sup>3</sup>

**Table 1:** The seven TCVM Patterns recognized in animals with hindlimb paresis/paralysis. Almost all patterns involve the Kidney.<sup>1</sup>

Clinical Signs	TCVM Patterns Associated with Hindlimb Paresis and Paralysis
Acute onset back pain	Wind-Cold-Damp invasion with external <i>Qi</i> /Blood Stagnation caused by external invasion of these pathogens into the Governing Vessel and Bladder Channels of the back
Back pain with cool-seeking behavior	Kidney <i>Yin</i> Deficiency with External <i>Qi</i> /Blood Stagnation associated with chronic illness, Kidney <i>Jing</i> Deficiency and/or poor nutrition
Back pain, heat-seeking behavior	Kidney <i>Yang</i> Deficiency with External <i>Qi</i> /Blood Stagnation caused by chronic illness, poor nutrition, stress and/or Kidney <i>Jing</i> Deficiency
Lumbar back pain, paresis and/or paralysis, urinary incontinence	Spinal cord <i>Qi</i> /Blood Stagnation with Kidney <i>Qi</i> Deficiency caused by trauma
Cold extremities, paresis and/or paralysis	Spinal cord <i>Qi</i> /Blood Stagnation with Kidney <i>Yang</i> Deficiency caused by degenerative changes, chronic illness, poor nutrition, stress and aging
Cold-seeking behavior, dry skin, urinary incontinence, back pain, paresis and/or paralysis	Spinal cord <i>Qi</i> /Blood Stagnation with Kidney <i>Qi</i> and <i>Yin</i> Deficiency caused by chronic illness, environmental stress and Kidney <i>Jing</i> Deficiency
Chronic disease, poor nutrition, degeneration of the vertebrae and/or Kidney <i>Jing</i> Deficiency	Spinal cord <i>Qi</i> /Blood Stagnation with both Kidney <i>Yin</i> and <i>Yang</i> Deficiency

The author's clinical experience and current research show that TCVM treatment appears to shorten the recovery time and improve the degree of functional recovery.<sup>3</sup> In one study for example, 40 dogs with severe neurologic signs of thoracolumbar IVDD were treated with either decompressive surgery, electro-acupuncture (EAP) or decompressive surgery followed by EAP. A significantly higher success rate was seen in dogs treated with EAP compared to decompressive surgery (78.9% compared to 40.0%) and when decompressive surgery was followed by EAP, there was an improved recovery rate of 73.7%.<sup>3</sup> In another study, medical records of 80 dogs diagnosed with pelvic limb paresis/paralysis were reviewed. Patients were treated with either conventional medicine (prednisone) alone or a combination of conventional medicine, EAP and dry needle acupuncture (DNAP). Electro-acupuncture was performed by connecting needles at Governing Vessel (GV), GV-7 to GV-2, and applying a frequency of 2-15Hz at 0.5-2.5mV for 25-30 minutes. The recovery rate was significantly higher, recovery time significantly shorter and relapse rate significantly lower for patients treated with the combination therapy when compared to conventional medicine alone.<sup>6</sup>

Based on literature review and positive experiential clinical results of the author, the first objective of this study was to determine whether hind limb paresis/paralysis can be successfully treated with TCVM alone. The study was also designed to look at length of successful treatment as well as to compare whether efficacy could be improved by combining conventional medicine and TCVM treatment. The study hypothesis was that the TCVM treatment group (either as the sole treatment or combined with conventional treatment) would have a faster recovery with a greater number of dogs achieving mobility when compared to the group that was treated with conventional therapy only.

## MATERIALS AND METHODS

Between January and December 2015, dogs and cats with naturally occurring paresis/paralysis, that presented to the author's clinic [Praktek Dokter Hewan Bersama (PDHB) Small Animal Clinic, Jakarta, Indonesia], were used to select the clinical study population for this non-randomized, observational retrospective study. Any breed, sex and age of dogs and cats were considered for

enrollment if they were diagnosed with hindlimb paresis/paralysis and had been assigned a neurological grade (1-5) (Table 2). Radiography was performed on all animals. Animals diagnosed with bone fractures, medial patellar luxation, neoplasia, cranial cruciate ligament rupture, metabolic disease, infectious disease, hip dysplasia or hip luxation were excluded. An owner permission sheet and a study enrollment examination sheet, which included clinical signs along with neurological grade at initial examination and TCVM diagnosis, were completed for each animal before final enrollment in the study. All animals were under the care of their owners, so they were on a variety of different diets and housing. There were no specific exercise restrictions, but most owners kept their animals in crates with short walks of 10-20 minutes twice daily.

Study subjects were divided into 3 non-equal treatment groups, largely based on caretaker treatment preference. Group A contained 11 patients which received conventional medical treatment only. These animals received NSAIDS (Rimadyl<sup>a</sup>, Ketoprofen<sup>b</sup>) as needed for pain or steroids (dexamethasone<sup>c</sup>, prednisone<sup>d</sup>) for 5-7 days; along with vitamin and joint supplements (Neurobion<sup>e</sup>, Neurovit E<sup>f</sup>, Methycobal<sup>g</sup>, Bio ATP<sup>h</sup>, glucosamine/ chondroitin<sup>i</sup>) (Table 3).

Group B contained 29 patients which received TCVM treatment only (EAP, DNAP, Chinese herbal medicine (CHM), moxibustion) (Table 4). These animals were assigned a TCVM Pattern diagnosis. Patterns selected from to maintain group uniformity included: local *Qi*/Blood Stagnation of the spinal cord or thoracolumbar/hip area, with or without Kidney *Qi* and *Yin* or *Yang* Deficiency. The TCVM treatment principle for this group was to remove Stagnation by promoting flow of *Qi* and Blood. All animals received acupuncture treatment twice weekly for 10-20 minutes with bilateral stimulation of acupuncture points with an electro-acupunctoscope<sup>j</sup> set at 20-50 Hz. Chinese herbal medicines were administered orally for 3 months or 6 months dependent on clinical response (successful resolution of mobility or poor response to treatment, respectively). Body Sore<sup>k</sup> was used for relief of back pain associated with *Qi*/Blood Stagnation (Table 5). Kidney *Yang* Deficiency was treated with *Bu Yang Huan Wu*<sup>k</sup> to tonify Kidney *Yang* along with moxibustion. Kidney *Qi* Deficiency was also treated with *Bu Yang Huan Wu*

**Table 2:** Neurological grading scale used to assign severity of paresis/paralysis in study animals.<sup>3, 11</sup>

Neurological Grade	Clinical Signs
Grade 1	Back pain, no other deficits
Grade 2	Ataxia of pelvic limb, conscious proprioceptive deficit, ambulatory paraparesis
Grade 3	Non-ambulatory monoparesis, paraparesis, with or without urine and fecal incontinence
Grade 4	Parapelgia pelvic limb, deep pain sensation, with or without urine and fecal incontinence
Grade 5	Parapelgia pelvic limb, no deep pain sensation, with urine and fecal incontinence

(Table 6). Kidney *Yin* Deficiency was treated with *Di Gu Pi*<sup>k</sup> to tonify Kidney *Yin* (Table 7). The dogs received the Chinese herbal medicine appropriate for their TCVM Pattern diagnosis, twice per day, dosed orally at 1 capsule (0.5g) for 2.5-5 lbs or 1 capsule (0.5g) per 5-10 lbs.

Group C contained 16 patients which received a combination of conventional medical and TCVM treatment. This included NSAIDS for pain or steroids (not greater than 7 days) if needed, vitamin and joint supplements along with TCVM Pattern diagnosis which was treated appropriately with acupuncture and Chinese herbal medicine (Tables 3 and 4).

Two outcome measures were set for each study subject. The first was the number of treatment weeks

required for either successful ambulation (walking without assistance) if non-ambulatory at study start or improvement of 1 neurological grade if ambulatory at study start with neurological deficits. The second outcome measure was set as a binary response to indicate treatment success or failure: 0 = treatment failed; 1 = treatment successful.

A Chi-square test was initially used to determine if the response rates were equal. If they were not, a Marascuillo procedure was used to identify the group with a statistically different response rate. Assuming that the maximal group difference in response rate was 80% vs. 20%, a sample size of 12 per group would have 90% power to reject the null hypothesis (all groups are equal).

**Table 3:** Medications and supplements used for study animals receiving conventional treatment for hindlimb paresis and paralysis.

Product	Composition	Indications
Rimadyl*	Carprofen	Relief of pain and inflammation associated with osteoarthritis in dogs
Ketoprofen*	Ketoprofen	Spondylosis, osteoarthritis, inflammation, back pain
Neurobion	Vit B1, Vit B6, Vit B12	Vit B deficiency, pain relief, neurological disorders
Neurovit E	Vit B1, Vit B6, Vit B12, Vit E	Neuritis, neuralgia, paresthesia
Methycobal	Mecobalamin (oral)	Neuropathy peripheral
Bio ATP	ATP, Vit B1, Vit B6, Vit B12, Vit E	Weakness, muscle atrophy, degenerative disease
Hip and joint supplement	Glucosamine, chondroitin, calcium	Supplement for joint
Corticosteroid*	Dexamethasone, prednisolone	Inflammation, spondylosis

\*=NSAIDS and corticosteroids not administered concurrently

**Table 4:** Acupuncture (dry needle and electro-acupuncture) and Chinese herbal medicine used for study animals receiving TCVM treatment for hindlimb paresis and paralysis.

TCVM Pattern	Dry Needle (twice per week)	Electro-acupuncture 20-50Hz (twice per week)	Veterinary Chinese Herbal Medicine (twice daily)	Moxa (twice per week)
Local <i>Qi</i> /Blood Stagnation (Spinal cord/ TL area and hip joint)	<i>Hua tuo-jia-ji</i> , GB-39, GB-41, <i>Liu-feng</i> , BL-20, BL-24, KID-1, GB-29, GB-30	<i>Bai-hui</i> and GV-3 BL-26 and BL-23 BL-35 and <i>Er-yan</i> GB-34 and BL-54 KID-3 and BL-40 LIV-3 and ST-36	<i>Bu Yang Huan Wu</i> Body Sore (Pain)	
KID <i>Qi</i> Deficiency	KID-7, BL-39, CV-3, CV-1, BL-24, BL-28, KID-10	same	<i>Bu Yang Huan Wu</i>	
KID <i>Yin</i> Deficiency	SP-6, BL-25, ST-25, GV-1	same	<i>Bu Yang Huan Wu</i> <i>Di Gu Pi</i>	
KID <i>Yang</i> Deficiency	<i>Shen-shu</i> , <i>Shen-peng</i> , <i>Shen-jiao</i>	same	<i>Bu Yang Huan Wu</i>	GV-4, CV-4, CV-6

TL=thoracolumbar; GB=Gall Bladder, BL=Bladder, KID-Kidney, LIV=Liver, ST=Stomach, GV=Governing Vessel, CV=Conception Vessel

**Table 5:** Ingredients of the Chinese herbal medicine Body Sore<sup>b</sup> (modified *Shen Tong Zhu Yu Tang*) and their actions.<sup>14</sup>

English Name	Pin Yin Name	Actions
Ligusticum	<i>Chuan Xiong</i>	Relieves pain and activates Blood
Notopterygium	<i>Qiang Huo</i>	Relieves pain and activates Blood
Angelica	<i>Dang Gui</i>	Activates Blood, resolves Stagnation and relieves pain
Epimedium	<i>Yin Yang Huo</i>	Tonifies Kidney <i>Yang</i> and <i>Yin</i>
Achryanthes	<i>Niu Xi</i>	Strengthens bones and limbs
Angelica	<i>Du Huo</i>	Relieves pain and eliminates Wind-Damp
Cuscuta	<i>Tu Su Zi</i>	Nourishes Kidney/ Liver
Cordyalis	<i>Yan Hu Suo</i>	Moves <i>Qi</i> /Blood, resolves Stagnation and relieves pain
Paeonia	<i>Chi Shao</i>	Relieves pain and cools Blood
Eucommia	<i>Du Zhong</i>	Strengthens bone and tonifies <i>Yang</i>
Psoralea	<i>Bu Gu Zhi</i>	Strengthens bone and tonifies <i>Yang</i>
Myrrh	<i>Mo Yao</i>	Moves Blood, relieves pain
Olibanum	<i>Ru Xiang</i>	Moves Blood, relieves pain
Milletia	<i>Ji Xue Teng</i>	Nourishes Blood
Persica	<i>Tao Ren</i>	Breaks down Blood Stasis, relieves pain
Carthamus	<i>Hong Hua</i>	Breaks down Blood Stasis, relieves pain

**Table 6:** Ingredients of the Chinese herbal medicine *Bu Yang Huan Wu*<sup>b</sup> and their actions.<sup>14, 18</sup>

English Name	Pin Yin Name	Actions
Astragalus	<i>Huang Qi</i>	Warms and tonifies <i>Qi</i>
Angelica	<i>Dang Gui</i>	Nourishes Blood
Peonia	<i>Bai Shao</i>	Nourishes Blood and <i>Yin</i> , soothes Liver <i>Yang</i>
Earthworm	<i>Di Long</i>	Breaks Blood Stagnation
Ligusticum	<i>Chuan Xiong</i>	Activates Blood and relieves pain
Carthamus	<i>Hong Hua</i>	Breaks stasis and relieves pain
Persica	<i>Tao Ren</i>	Breaks stasis and relieves pain

**Table 7:** Ingredients of the Chinese herbal medicine *Di Gu Pi*<sup>b</sup> and their actions.<sup>14</sup>

English Name	Pin Yin Name	Actions
Lycium	<i>Di Gu Pi</i>	Nourishes <i>Yin</i> and clears deficient Heat
Moutan	<i>Mu Dan Pi</i>	Cools Blood, Clears Heat, resolves Stagnation
Rehmania	<i>Shu Di Huang</i>	Nourishes Blood and <i>Yin</i>
Rehmania	<i>Sheng Di Huang</i>	Clears Heat, nourishes <i>Yin</i>
Gentiana	<i>Qin Jiao</i>	Clears Wind-Damp, nourishes <i>Yin</i>
Psoralea	<i>Bu Gu Zhi</i>	Tonifies Kidney <i>Yang</i> and <i>Yin</i>
Drynaria	<i>Gu Sui Bu</i>	Tonifies Kidney <i>Yang</i> and strengthens the bone
Eucommia	<i>Du Zhong</i>	Strengthens the back
Alisma	<i>Ze Xie</i>	Drains Damp and benefits urination
Salvia	<i>Dan Shen</i>	Invigorates Blood and resolves Stagnation
Angelica	<i>Du Huo</i>	Dispels Wind, Cold and Dampness, relieves pain
Angelica	<i>Dang Gui</i>	Nourishes Blood and relieves pain
Phellodendron	<i>Huang Bai</i>	Nourishes <i>Yin</i> and clears Heat

**Table 8:** Signalment, diagnosis and response to therapy for Group A (Conventional/Western Treatment); Group B (TCVM Treatment) and Group C (TCVM + Conventional/Western Treatment).**Group A: Conventional/Western Treatment**

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Western Diagnosis	TCVM Diagnosis	Western Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
1	Chihuahua	F/1	Back pain, paresis/ hindlimb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Neurobion, Glucosamine, Chondroitin	F/5	2	2
2	Golden Retriever	M/3	Paresis/hindlimb right	Hip Joint Trauma, Right	<i>Qi</i> /Blood Stagnation Hip Area	Rimadyl, Neurobion, Bio-ATP, Glucosamine	F/2	2	2
3	Pomeranian	F/12	Back pain, Lameness/paresis, hindlimb bilateral	Spondylosis, L-2, L-3, DJD	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Yin</i> Deficiency	Methycobal, Neurobion, Bio-ATP	S/1	2	1
4	Pomeranian	M/12	Back pain, Lameness/paresis hindlimb bilateral	Spondylosis T-13, L-1, L-2	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Yin</i> Deficiency	Rimadyl, Glucosamine, Chondroitin	F/4	2	2
5	Poodle	F/15	Back pain, lameness/paresis, hindlimb bilateral	DJD	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Yin</i> Deficiency	Rimadyl, Glucosamine, Chondroitin, Neurobion, Methycobal	S/24	2	1
6	Mix Breed Cat	F/0.5	Back pain paralysis, hindlimb bilateral, fecal incontinence	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Neurobion, Glucosamine, Chondroitin	F/3	3	3
7	Persian Cat	M/1	Paralysis, hindlimb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Neurobion, Methycobal, Bio-ATP	F/6	3	3
8	Golden Retriever	M/12	Paralysis, hindlimb bilateral	DJD	<i>Qi</i> /Blood Stagnation Lumbar, Hip Area, KID <i>Yin</i> Deficiency	Neurobion, Glucosamine, Bio-ATP	F/1	3	3
9	Persian Cat	M/5	Back pain, paralysis, hindlimb bilateral, urine and fecal incontinence	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Qi</i> and <i>Yin</i> Deficiency	Neurobion, Bio-ATP	F/1	4	4
10	Dachshund	M/5	Back pain, paralysis, hindlimb bilateral, urine and fecal incontinence	IVDD Type I T-12, T-13	<i>Qi</i> /Blood Stagnation Thoraco-Lumbar Area, KID <i>Qi</i> Deficiency	Neurobion	F/1	4	4
11	Mix Breed Dog	M/13	Back pain/ paralysis, hindlimb neurogenic bladder fecal incontinence, no deep pain sensation	Spondylosis at L-1, L-2, L-3 DJD	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Qi</i> and <i>Yin</i> Deficiency	Neurobion, Glucosamine, Chondroitin, Bio-ATP, Methycobal	F/1	5	5

DJD=degenerative joint disease; L=lumbar; TM=treatment; EAP=electro-acupuncture; OA=osteoarthritis; Bilat=bilateral

**Group B: TCVM Treatment**

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Western Diagnosis	TCVM Diagnosis	TCVM Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
1	Golden Retriever	M/12	Paresis hindlimb bilateral, difficulty walking	DJD	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1.5	2	0
2	Golden Retriever	F/6	Paresis hindlimb right	Hip Joint Right Trauma	<i>Qi</i> /Blood Stagnation Hip Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
3	Beagle	M/6	Back pain, paresis hindlimb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
4	Shih Tzu	M/1	Lameness/paresis hindlimb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/2.5	2	0
5	Pomeranian	F/7	Lameness/back pain/paresis hindlimb bilateral	DJD	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i> + Body Sore	S/1.5	2	0
6	Shih Tzu	M/12	Lameness/back pain/paresis hindlimb bilateral	DJD	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/1	2	0
7	Shih Tzu	F/3	Lameness/paresis hind limb, bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
8	Labrador Retriever	M/12	Lameness/paresis hindlimb bilat	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Yin</i> Deficiency	EAP+ <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/1	2	0
9	Poodle	M/0.4	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
10	Chow Chow	M/1	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
11	Mix Breed	M/5	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP+ <i>Bu Yang Huan Wu</i>	S/1	2	0
12	Samoyed	M/2	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
13	Poodle	M/13	Lameness/paresis hindlimb bilat	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/1	2	0
14	Mix Breed Dog	M/15	Lameness/paresis hindlimb bilat	DJD with Spondylosis Lumbar Area, Hip Joint	<i>Qi</i> /Blood Stagnation Hip and Lumbar Area, with KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/1.5	2	0

Table 8 Group B cont.

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Western Diagnosis	TCVM Diagnosis	TCVM Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
15	Alaskan Malamute	M/13	Paresis, hindlimb bilateral, lameness, hip joint, OA	DJD with Spondylosis Lumbar Area, Hip Joint	<i>Qi</i> /Blood Stagnation Hip and Lumbar Area, with KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/4	2	1
16	Pekingese	F/6	Lameness/paresis, hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
17	Pomeranian	M/5	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
18	Pomeranian	M/2	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
19	Dachshund	M/13	Lameness/back pain/paresis, hindlimb bilat	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/1.5	2	1
20	German Shepherd	M/12	Lameness/paresis, hindlimb bilat, hip pain, OA	DJD with Spondylosis Lumbar Area, Hip Joint	<i>Qi</i> /Blood Stagnation Hip and Lumbar Area, with KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/4	2	1
21	Golden Retriever	F/5	Lameness/paresis hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP+ <i>Bu Yang Huan Wu</i>	S/1	2	0
22	Dachshund	M/3	Back pain/paralysis hindlimb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	EAP+ <i>Bu Yang Huan Wu</i>	S/3	3	0
23	Dachshund	F/10	Back pain/paralysis, hindlimb bilat	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/2	3	0
24	Poodle	M/11	Back pain/paralysis hindlimb, bilat	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/2	3	1
25	Shih Tzu	M/8	Back pain/paralysis, hindlimb bilat, hip joint pain	DJD with Spondylosis Lumbar Area, Hip Joint Arthritis	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/2	3	1
26	Shih Tzu	M/12	Back pain/paralysis hindlimb bilateral, lameness, urine and fecal incontinence	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Qi</i> and <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/4.5	4	2



**Table 8 Group B cont.**

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Western Diagnosis	TCVM Diagnosis	TCVM Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
27	Pekingese	M/8	Back pain, paralysis, hindlimb bilateral, lameness, urine and fecal incontinence	IVDD Type II	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Qi</i> and <i>Yin</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	F/6	4	3
28	Pekingese	M/8	Back pain/paralysis hindlimb bilateral, urine and fecal incontinence	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar area	EAP + <i>Bu Yang Huan Wu</i>	S/4	4	0
29	American Cocker	M/8	Back pain/paralysis hindlimb bilat, urine and fecal incontinence	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Qi</i> Deficiency	EAP + <i>Bu Yang Huan Wu</i>	S/4	4	0

DJD=degenerative joint disease; L=lumbar; TM=treatment; EAP=electro-acupuncture; OA=osteoarthritis; Bilat=bilateral

**Group C: Conventional/Western and TCVM Treatment**

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Conventional Diagnosis	TCVM Diagnosis	Conventional + TCVM Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
1	Mix Breed Cat	F/1	Back pain/ paresis, hindlimb bilat	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Neurobion, Prednisolone, Curcuma and EAP + <i>Bu Yang Huan Wu</i>	S/2	2	0
2	Chow Chow	F/12	Lameness/ back pain/ paralysis, hindlimb bilat	DJD with Spondylosis Lumbar Area	<i>Qi</i> /Blood Stagnation Lumbar area, KID <i>Yin</i> Deficiency	Neurobion, Glucosamine, Chondroitin and EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/2	2	0
3	Dachshund	M/5	Back pain, paresis hind- limb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Rimadyl, Glucosamine, Chondroitin and EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
4	German Shepherd	M/1	Paresis hind- limb bilateral	Spinal Cord Trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Neurobion, Glucosamine, Chondroitin, Bio- ATP, and EAP+ <i>Bu Yang Huan Wu</i>	S/1	2	0
5	Maltese	F/23	Back pain, paresis hind- limb bilateral	Spondylosis L-1, L-2, L-3, DJD	<i>Qi</i> /Blood Stagnation Lumbar Area, with KID <i>Yin</i> Deficiency	Neurovit E, Bio-ATP, Glucosamine and EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/4	2	1

Table 8 Group C cont.

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Conventional Diagnosis	TCVM Diagnosis	Conventional + TCVM Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
6	Mix Breed Dog	M/15	Back pain, paresis hind- limb bilateral	Spondylosis T-11 through L-3, DJD	<i>Qi</i> /Blood Stagnation Thoraco- Lumbar Area, with KID <i>Yin</i> Deficiency	Neurobion, Glucosamine, Chondroitin and EAP + <i>Bu Yang Huan Wu</i> + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/4	2	1
7	Persian Cat	M/1	Back pain, paresis hind- limb bilateral	Spinal cord trauma	<i>Qi</i> /Blood Stagnation Lumbar Area	Carboprofen, Methycobal, Bio ATP and EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
8	Persian Cat	M/0.4	Paresis hind- limb left	Trauma hip joint and stifle joint	<i>Qi</i> /Blood Stagnation Hip and stifle area	Neurobion, Glucosamine, Chondroitin and EAP + <i>Bu Yang Huan Wu</i>	S/3.5	2	0
9	West Highland Terrier	M/5	Lameness/ paresis, hind- limb bilateral	Spinal cord trauma	<i>Qi</i> /Blood Stagnation Lumbar area	Rimadyl and EAP + <i>Bu Yang Huan Wu</i>	S/1	2	0
10	Sheltie	F/4	Paralysis, hindlimb bilat neurogenic bladder	Spinal cord trauma	<i>Qi</i> /Blood Stagnation Lumbar area	Rimadyl and EAP + <i>Bu Yang Huan Wu</i>	S/2	3	0, normal urina- tion
11	Pomera- nian	M/8	Paralysis, hindlimb bilateral	Spinal cord trauma	<i>Qi</i> /Blood Stagnation Lumbar area	Bio-ATP and EAP + <i>Bu Yang Huan Wu</i>	S/2	3	0
12	Mix Breed Dog	M/8	Paralysis, hindlimb bilateral	Spinal cord trauma	<i>Qi</i> /Blood Stagnation Lumbar area	Bio-ATP, Rimadyl, Methycobal, Glucosamine, and EAP + <i>Bu Yang Huan Wu</i>	S/2	3	0
13	Mix Breed Dog	F/12	Paralysis, hindlimb bilat, urine incontinence	DJD with Spondylosis lumbar area	<i>Qi</i> /Blood Stagnation lumbar area, with KID <i>Qi</i> and <i>Yin</i> Deficiency	Neurobion, Glucosamine, and EAP + <i>Bu Yang Huan Wu</i>	S/3	3	0
14	Poodle	M/1	Paralysis, hindlimb bilateral, lameness, urine inconti- nence	Spinal cord trauma	<i>Qi</i> /Blood Stagnation lumbar area, KID <i>Qi</i> Deficiency	Neurobion, Glucosamine, Rimadyl, Bio ATP and EAP + <i>Bu Yang Huan Wu</i>	S/2	3	0
15	Golden Retriever	M/10	Back pain, paralysis, hindlimb bilateral, lameness, urine and fecal incontinence	Spondylosis L-1, L-2	<i>Qi</i> /Blood Stagnation lumbar area, KID <i>Qi</i> and <i>Yin</i> Deficiency	Neurobion, Rimadyl and EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	F/4	4	4

**Table 8 Group C cont.**

Case	Breed	Sex/ Age (Yrs)	Clinical Sign(s)	Conventional Diagnosis	TCVM Diagnosis	Conventional + TCVM Treatment	TM Success or Failure/ TM Length (wks)	Grade Neuro Exam	
								Before TM	After TM
16	Maltese	M/8	Back pain, paralysis, hind-limb bilateral, lameness, urine and fecal incontinence	IVDD Type II	<i>Qi</i> /Blood Stagnation lumbar area, KID <i>Qi</i> and <i>Yin</i> Deficiency	Neurobion and EAP + <i>Bu Yang Huan Wu</i> + <i>Di Gu Pi</i>	S/4	4	1

DJD=degenerative joint disease; L=lumbar; TM=treatment; EAP=electro-acupuncture; OA=osteoarthritis; Bilat=bilateral

A one-way analysis of variance (ANOVA) was applied to recovery time results to determine if the mean recovery time was the same for all treatment groups. If it was not, a multiple comparisons test was applied to identify the group with a statistically different recovery time. To test the null hypothesis for response rate, Chi-square test to test proportion equality will be applied. If the null hypothesis (response rates of the three treatment groups are the same) is rejected, Marascuillo procedure will be used to identify the treatment group that has a different response rate from the others (i.e. alternate hypothesis: the TCVM treatment group has a different response rate from the others).

## RESULTS

In this observational retrospective study, data was collected from a total of 50 dogs and 6 cats with hind limb paresis or paralysis that presented to PDHB Small Animal Clinic during the year of 2015. There were 41 (73%) males and 15 (27%) females. A total of 18 breeds were enrolled in the study: Chihuahua, Golden Retriever, Pomeranian, Poodle, Dachshund, Mixed breed, Beagle, Shih Tzu, Labrador Retriever, Chow Chow, Samoyed, Alaskan Malamute, Pekingese, German Shepherd, American Cooker, Maltese, West Highland Terrier, and Sheltie. Dog breeds with high prevalence in this study were Golden Retriever (12%), Pomeranian (12%), Poodle (10%), Dachshund (10%), Mixed breed (12%), and Shih Tzu (10%). The other dog breeds accounted for less than 10%. Only 2 breeds of cat were included in the study: Mixed breed (2 animals) and Persian cats (4 animals). Chi-squared test (for 3-proportion comparison) on sex distribution and pre-treatment neurological grade (categorized as grades 2-3 and grades 4-5) revealed no statistically significant difference between groups. Age comparison between groups was not included.

Outcome measures demonstrated that Group A (conventional treatment, 8 dogs and 3 cats), had 2 dogs (18%) treated successfully. Group B (TCVM treatment, 29 dogs) had 28 dogs (96%) treated successfully, and Group C (TCVM + Conventional, 13 dogs and 3 cats) had

successful treatment of 12 dogs and 3 cats (94%) (Table 8, Figure 1). The length of treatment required for success for Group A ranged from 1-24 weeks (mean  $\pm$ SD = 12.5  $\pm$ 16.3); Group B, ranged from 1-4.5 weeks (mean = 1.86  $\pm$ 1.19) and Group C ranged 1-4 weeks (mean = 2.23  $\pm$ 1.18) (Figure 2).

To test the null hypothesis that the proportions of successful treatment among the 3 treatment groups are equal, Chi-square test for 3-proportion comparison was applied. Results of the observed proportions of success were 18.2%, 96.6%, and 93.8% for Groups A, B, and C, respectively. The Chi-square test suggested that there existed a significant difference among the 3 groups ( $p$ -value < 0.0001). Since a difference existed, a follow-up multiple comparisons test (Marascuillo procedure) was conducted to investigate which group(s) was (were) different from the others. The results of the Marascuillo procedure demonstrated the success proportion in Group A was significantly smaller than both Group B and Group C ( $p$ -value < 0.01). There was no statistically significant difference between success proportions of Group B and Group C.

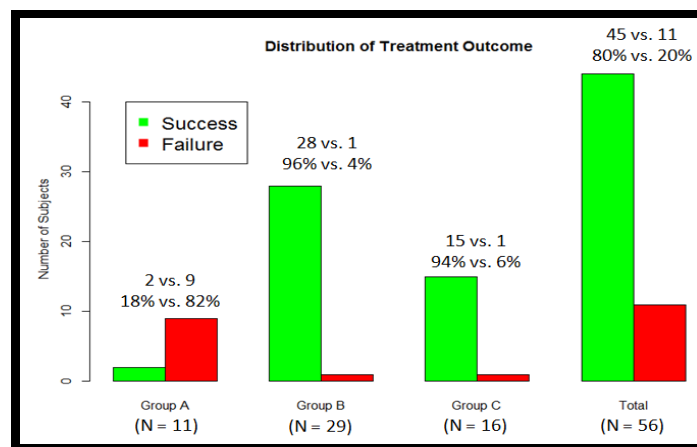
To test the second null hypothesis (the mean recovery times of the successfully treated patients were the same among the 3 treatment groups), a one-way ANOVA test for 3-group comparison was applied. With the observed mean recovery time being 12.5 weeks, 1.86 weeks, and 2.23 weeks for Groups A, B and C, respectively. The ANOVA test suggested that there existed a significant difference among the 3 groups ( $p$ -value < 0.0001). Similarly, since a difference existed, a follow-up multiple comparisons test (Tukey test) was conducted to investigate which group(s) was (were) different from the others. The 95% confidence intervals of the difference between two groups (intervals that did not include 0 suggest significant difference between two groups). The results of the Tukey's Multiple Comparisons test demonstrated that the mean recovery time in Group A was significantly longer than the other two groups (B and C). There was no significant difference between mean recovery time for Groups B and C.

## DISCUSSION

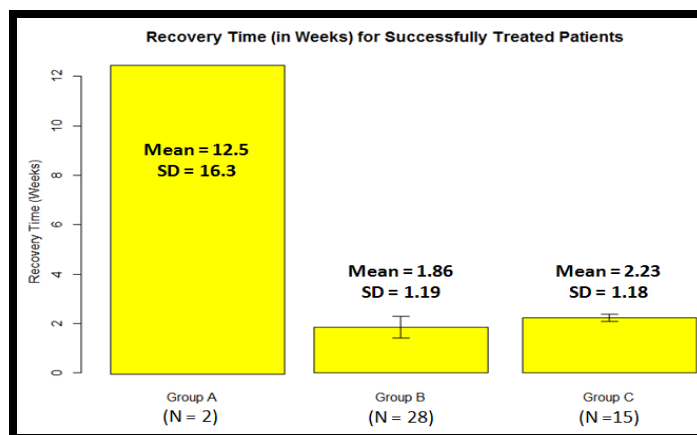
The results of this study demonstrated that the proposed TCVM treatments (electro-acupuncture and Chinese herbal medicine), could effectively treat hind limb paresis and/or paralysis in dogs and cats. Both treatment groups that included TCVM treatment had a significantly higher success rate than the group treated with conventional medicine alone (95% vs. 18%;  $p$ -value < 0.01). In terms of recovery time for patients with successful treatment, both treatment groups that included TCVM treatment had a significantly shorter recovery time than the group treated with conventional medicine alone (2 weeks vs. 12.5 weeks;  $p$ -value < 0.01). The difference between the two groups that received TCVM treatment was not significant ( $p=0.91$ ) suggesting the addition of conventional treatment does not improve efficacy of TCVM treatment.

In the present study, the results of TCVM treatment ranged from 93%-96% successful in Group B and C,

which is similar to the results of another retrospective study involving 84 dogs of various breeds with hindlimb paresis/paralysis. The dogs were divided into two treatment groups, group 1 (65 dogs) receiving acupuncture/electro-acupuncture only and group 2 (19 dogs) receiving surgical treatment. In the non-surgery group, the success rate was 95%. In the surgery group, good outcomes were achieved in 74% of the dogs.<sup>7</sup> When considering the neurological grade, this study found that acupuncture treatment was successful in 100% of grade 2 and 3 cases and 50%-75% of grade 4 cases. In addition, the neurological grade was found to influence length of treatment required to produce success. With acupuncture performed twice per week, grade 2 cases required 10-14 days (4 treatments total), grade 3 cases required 17-18 days (5 treatments total), and grade 4 cases required 24-26 days (8-9 treatments total).<sup>7</sup> Based on the results of the study, the authors presented a standardized acupuncture treatment protocol for thoracolumbar spinal cord disease.<sup>7</sup>



**Figure 1:** Distribution of treatment outcome (number of success vs. number of failure). Group A (conventional treatment) had an 18% success rate versus 96% and 94% success for Groups B (TCVM treatment) and C (conventional + TCVM treatment) respectively.



**Figure 2:** Mean recovery time for successfully treated patients in each of the treatment groups. Successful treatment in Group A (2 animals) had a mean  $\pm$ SD of 12.5  $\pm$ 16.3 weeks versus Group B (28 animals) with a mean  $\pm$ SD of 1.86  $\pm$ 1.19 weeks and Group C with mean  $\pm$ SD of 2.23  $\pm$ 1.18 weeks.

In another study, 50 dogs with signs of thoracolumbar intervertebral disk disease were evaluated. Dogs were randomly allocated to 1 of 2 treatment groups and classified as having a grade of 1 to 5 neurologic dysfunction. Dogs in group 1 received electro-acupuncture stimulation combined with standard conventional medical treatment; those in group 2 received only standard conventional medical treatment. Overall success rate (all dysfunction grades) for group 1 (23/26; 88.5%) was significantly higher than for group 2 (14/24; 58.3%).<sup>4</sup> A study looking at 40 dogs with cervical spondylomyelopathy (wobbler syndrome) compared surgery and orthodox medical treatment (Group 1) versus electro-acupuncture treatment every other day at 10 acupoints (Group 2). Dogs were divided into 3 groups of neurological dysfunction and assigned equally between the 2 experimental groups. A success rate of 85% was demonstrated with electro-acupuncture and 20% for dogs receiving surgery and conventional medicine alone.<sup>8</sup>

With increasing proof from clinical studies that EAP significantly contributes neurologic and functional spinal cord lesion recovery, the underlying mechanisms which have largely remained unknown are being elucidated in mechanistic studies. In one study, the protein expression profile of injured spinal cord in an EAP treatment model was analyzed using two-dimensional electrophoresis-based proteomics. The study identified changes in 15 proteins in the spinal cord following EAP stimulation of the GV Meridian. These proteins are involved in a number of processes which include: inflammation, cell adhesion and migration, signal transduction and apoptosis.<sup>9</sup> Of particular interest were 2 proteins (ANXA5 and CRMP2) which are beneficial to neuronal survival and axonal regeneration. Results suggest that ANXA5 and CRMP2 may be neural specific proteins which increase during the process of GV-EAP treatment.<sup>9</sup> Another study, evaluating GV-EAP treatment of rats with transected spinal cords (T-10), documented EAP promoted transplanted bone marrow mesenchymal cell survival and differentiation. It was concluded that this was a promising therapy to promote axonal regeneration and partial locomotor functional recovery in the transected spinal cord.<sup>10</sup> Acute and chronic expression of Aquaporin-4 (AQP4), expressed by reactive astrocytes in traumatized cords was evaluated in a different study. It appears to be associated with impaired water transport/edema/syringomyelia in contused spinal cords. Electro-acupuncture of GV-4 and GV-14 (20Hz, for 20 minute) significantly reduced the expression of AQP4.<sup>11</sup> Finally, EAP improved microcirculation and neuronal morphology in the spinal cord of a rat intervertebral disc extrusion model (injury at L-1). EAP stimulation (20 minutes) of ST-36 and ST-44 increased spinal cord blood flow in the L-1 segment by approximately 22%. The increased blood flow was statistically significant ( $p < 0.01$ ) when compared to pre-stimulation. Study conclusions included EAP treatment enhances hind limb motor function in a rat model of intervertebral disc extrusion.<sup>12</sup>

In the TCVM treated groups in this study, Chinese herbal medicine was used to support the recovery process from hind limb paresis and paralysis. The predominant herbal formulas used were *Bu Yang Huan Wu* and *Di Gu Pi*. *Bu Yang Huan Wu Tang* comes from *Yi Lin Gai Cuo* (Corrections of Errors among Physicians) written by Wang Qing-Ren in 1830.<sup>13,14</sup> *Bu Yang Huan Wu* has the functions of tonifying *Qi*, nourishing Blood, moving Stasis and soothing the Channels. It is used to treat weakness, IVDD, sequelae of stroke and ataxia due to *Qi* Deficiency and Blood Stasis. *Huang Qi* (Astragalus) is the main herb in the formula which warms and tonifies *Qi*. *Huang Qi* (Astragalus) improves patients' functional outcomes at week 4 and at week 12 after hemorrhagic stroke onset, which may be due to its anti-inflammatory and antioxidant properties.<sup>15</sup> *Bu Yang Huan Wu* improved spinal cord regeneration and reduced damage from ischemia and reperfusion in a rat spinal cord trauma model.<sup>16</sup> *Di Gu Pi* is based on the classical formula *Di Gu Pi San*, which has been modified to better suit modern veterinary use. *Seng Mai San/ Di Gu Pi San* and *Sui Ku Fang* Chinese herbal formulas have been reported to reduce the size of spinal cord lesions and increase numerous biological parameters that indicate spinal cord regeneration and axonal regrowth in spinal cord injury in laboratory animals.<sup>17</sup> Various studies have demonstrated the herbal formula has anti-oxidant, immunostimulatory effects. One of its constituent herbs, *Qin Jiao* (Gentian), has an anti-inflammatory effect that is comparable to prednisone in a rat model of rheumatic arthritis.<sup>13</sup> In that study, *Qin Jiao* significantly reduced levels of prostaglandins and decreased joint swelling. Other studies have demonstrated it decreases levels of inflammatory cytokines and protects against osteoporotic bone loss as well as modulates bone metabolism to maintain bone strength.<sup>13</sup>

Some of the disadvantages and challenges faced in this retrospective observational study were lack of randomization (owners picked treatment), poor control over experimental variables and some available data may be of poor quality. In addition, due to the small number of animals, equal distribution of animals across groups both in numbers per group as well as neurological dysfunction grades, age, breed and sex was not possible. These differences, although a challenge, did not have statistically significant group differences, therefore, study outcomes are considered to be meaningful. Future studies such as prospective randomized controlled clinical trials with larger numbers of animals are needed to validate the findings of this study.

Under the conditions of this study, it was demonstrated that hind limb paresis and paralysis can be successfully treated by TCVM with a high success rate and short recovery time. Compared to other treatments such as surgery, it can be cost effective as well as an effective treatment that can be used in a general veterinary practice and in areas of the world where veterinary neurosurgeons are in short supply.

**Declaration of Interest**

The author declares that there is no conflict of interest that could be perceived as prejudicing the impartiality of this paper.

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**FOOTNOTES**

- <sup>a</sup> Rimadyl, Zoetis Indonesia Co. Jakarta, Indonesia  
<sup>b</sup> Ketoprofen, Hexpharm Jaya, Kawasan Industri Kelapa Gading, Jakarta Timur, Indonesia  
<sup>c</sup> Dexamethasone, Indo Farma Indonesia Co. Ltd. Manggarai, Jakarta, Indonesia  
<sup>d</sup> Prednisone, Indo Farma Indonesia Co. Ltd, Manggarai, Jakarta, Indonesia  
<sup>e</sup> Neurobion, Merck Indonesia Co. Ltd. Pasar Rebo, Jakarta, Indonesia  
<sup>f</sup> Neurovit E, Kimia Farma Co. Ltd. Jl.Veteran No 9, Jakarta Pusat, Indonesia  
<sup>g</sup> Methycobal, Isai Indonesia Co. Ltd. Jl. Jendral Sudirman No 9, Jakarta, Indonesia  
<sup>h</sup> Bio-ATP, Phapros Co., Ltd. Denpasar Raya Kav DIII, Kuningan, Jakarta Indonesia  
<sup>i</sup> Oste Forte, Soho Industri Pharmasi Co. Ltd. Kawasan Industri Jakarta Timur, Indonesia  
<sup>j</sup> Electro-acupuncture unit (JT-1A), Dr. Xie's Jing Tang Herbal Inc., Reddick, Florida, USA  
<sup>k</sup> Dr Xie's Jing Tang Herbal Inc., Reddick, Florida, USA

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