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Case Series

Integrative Management of Poorly Responsive Canine Spinal Pain and Paresis Using Acupuncture, Chinese Herbal Medicine and Conventional Drugs: A Case Series

Kristin Velasco

ABSTRACT

This case series reports data on an integrative treatment (IVM) combining a Chinese herbal medicine (modified *Da Huo Luo Dan*), acupuncture, and conventional anti-inflammatory pharmaceuticals (CT) in relieving pain and restoring mobility in dogs with neck or back pain and paresis. A total of 11 dogs with acute neck or back pain (<30 days) unresponsive to CT therapy were evaluated for pain reduction and neurological improvement associated with IVM treatment. Two pain scores, Colorado State University (CSUPS) and Glasgow Composite (GCPS) along with a neurologic deficit score (NDGS), were assessed on Days 0, 7, 14, 21, and 28. The CSUPS (Mean±SD) on Day 0 was 3.27±0.61, which reduced to 1.59±1.07, 1.00±0.87, 0.80±0.75, and 0.50±0.67 on Days 7, 14, 21, 28, respectively, with all assessments statistically significant (p<0.01). For GCPS, Day 0 pain scores were 14.9±4.04, reduced to 9.09±5.19, 6.45±5.24, 4.90±5.02, and 3.50±4.09 on Days 7, 14, 21, 28, respectively (all statistically significant, p<0.01). The Day 0 NDGS was 1.86±0.78 which reduced to 1.46±0.82, 1.23±0.90, 0.97±0.94, and 1.03±1.00 on Day 7, 14, 21 and 28, respectively (all statistically significant with p<0.05). The IVM cases were compared to 15 concurrent CT cases (smaller, younger dogs with uncomplicated disease) and demonstrated more rapid pain relief and similar neurological improvement. The statistically significant clinical improvements observed for IVM cases suggest that integrating Chinese herbal medicine and acupuncture with CT can be effective in providing rapid pain relief and improved mobility in dogs that have failed to respond adequately to conventional therapy (NSAID/corticosteroid) only.

Keywords: acupuncture, back pain, Chinese herbal medicine, *Da Huo Luo Dan,* dogs, neck pain, paralysis

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ABBREVIATIONS

CHM	Chinese herbal medicine
CSUPS	Colorado State University Pain Scale
CT	Conventional therapy
DHLD	*Da Huo Luo Dan*
GCPS	Glasgow Composite Pain Scale
IVM	Integrative veterinary medicine
NDGS	Neurologic Deficits Grading Scale
NSAIDS	Non-steroidal anti-inflammatory drugs
TCVM	Traditional Chinese veterinary medicine

Spinal cord disorders causing pain, paresis and/or paralysis associated with a variety of etiologies are a common problem in dogs. Intervertebral disc disease (IVDD), in particular, makes up a large proportion of these, accounting for up to 1% of all cases in small animal practice.[1] It is equally a challenge to diagnose and treat these dogs in veterinary practice, due to the cost associated with complete diagnosis.[2-3] Despite this often undefined disease state, veterinary practitioners are called upon to treat pain, paresis and paralysis with the tools available.

Treatment can be divided into medical and surgical management. Currently, the main choices for medical management are non-steroidal anti-inflammatory drugs (NSAIDs) or corticosteroids, sometimes combined with muscle relaxants and opioids for pain relief. Studies have demonstrated that an NSAID or corticosteroid can be used interchangeably with similar success rates, although they may not be used concurrently.[4-7] The mechanism of action is not fully understood, but theorized to reduce edema and hemorrhage that may be present in spinal cord cases. Surgical treatment, while often effective, has some practical restrictions to its application. The ability to access

surgery is often limited, as its use depends on availability of specialized personnel, equipment for imaging and surgery, as well as owner funds to pay for expensive advanced treatments. In addition, surgery is not always associated with a successful outcome. When conventional medical treatment and surgery have failed to relieve pain and restore function and mobility, very few alternative options for treatment remain for affected dogs.

Traditional Chinese medicine and traditional Chinese veterinary medicine (TCVM) have been used for thousands of years to treat pain and neurologic symptoms. According to theories in TCVM, intervertebral disk disease and vertebral degeneration are considered forms of Bony *Bi* syndrome.[8] *Bi* (stiffness, blockage) syndromes involving primarily neck and back pain are associated with Excess patterns from External invasion (e.g. Wind, Cold, Damp). Failure to resolve this then can become Bony *Bi* which is a very chronic stage of *Bi* syndrome that now involves the bones and is associated with Deficiencies (Kidney *Yin*, Kidney *Yang*, Kidney *Qi*/*Yin*). These patterns are associated with *Qi*/Blood Stagnation in the External Channels and are often characterized by severe pain. Once neurological deficits are present, the disease syndrome is considered Internal with a TCVM Pattern of Spinal Cord *Qi*/Blood Stagnation with Kidney *Qi*, *Yang* and/or *Yin* deficiencies. Neurologic grades of 2-5 with paresis or paralysis is known as *Tan*-*huan* syndrome which needs aggressive treatment of the Spinal Cord *Qi*/Blood Stagnation to prevent further damage to neurons and promote nerve function and regeneration.[8,9] In both the External and Internal TCVM Patterns, *Qi*/Blood Stagnation resulting in *Qi* Deficiency below the site of Stagnation is a common thread. The TCVM principles of treatment for the Chinese herbal medicine (CHM), *Da Huo Luo Dan* (DHLD), included in the proposed integrative treatment, breaks down Stasis in the spine and moves *Qi* and Blood to relieve pain.[10,11]

There have been studies demonstrating the benefits of integrative veterinary medicine (IVM) that combines conventional medicine with acupuncture and CHM, as well as other therapies such as laser, physical therapy and massage in dogs.[12-14] The results are often superior to conventional medicine alone as demonstrated in a very large retrospective study of 5,195 patients.[13] To the author's knowledge, studies examining the efficacy of DHLD in canine spinal cord disease have not been reported. The objective of this case series was to determine if integrating Chinese herbal medicine (specifically, DHLD) and acupuncture with an NSAID or corticosteroid can be effective in providing improved pain relief and mobility in dogs that have failed to respond adequately to conventional therapy (NSAID/corticosteroid) only. The study hypothesis was that patients would have better assessment outcomes (pain score, neurological deficit grade) after the experimental integrative treatment when compared with a dog's pre-treatment scores.

MATERIALS AND METHODS

The subjects under investigation in this study were dogs with neck or back pain, with or without paresis and paralysis. All study subjects were recruited from cases presented to Bethany Family Pet Clinic (Portland, Oregon USA), as well as through referral from the surrounding general practice veterinary community. Inclusion criteria were: 1) dogs with neck or back pain, paresis or paralysis; 2) duration of clinical signs less than 30 days; 3) poor initial response to conventional treatment (NSAIDS/corticosteroids) or severe disease prompting owner request for integrative treatment enrollment; 4) older than 1 year and younger than 13 years of age; and 5) owners accepting TCVM integrative treatment and providing informed consent for participation of their animal in the study. Dogs previously diagnosed with a spinal tumor or with other underlying conditions (e.g. lymphocytic leukemia, degenerative myelopathy) were excluded from study enrollment.

All IVM patients received a full physical examination upon enrollment in the study. Subjects were treated with a veterinary specific modified *Da Huo Luo Dan* herbal formula (Double P II[a]) at 0.5 g per 20 lb. of body weight twice daily for 4 weeks by the owners/guardians. The group also received weekly dry needle (sterile, stainless steel, 32-gauge[b]) acupuncture treatment lasting 25 minutes, at acupoints GV-20, GV-17, GV-14, BL-10, *Bai*-*hui*, and BL-60/KID-3 for 4 weeks (Table 1). During the study, all subjects were also treated with either an NSAID or corticosteroid at appropriate anti-inflammatory dosage. Subjects with less severe neurologic scores (grades 1 or 2) were treated with NSAIDs, whereas corticosteroids were prescribed for those with more severe neurologic scores (grades 3 to 5). The conventional treatment (CT) cases were only treated with an NSAID (neurologic grades 1-2) or a corticosteroid (grades 3-5).

The following outcome measurements for testing the study hypothesis were collected from each subject over the 4-week duration of the trial: 1) a pain score based on the Colorado State University Canine Acute Pain Scale (CSUPS, Appendix 1); 2) a pain score based on the Glasgow Composite Pain Scale (GCPS, Appendix 2); and 3) a neurologic score according to the Neurologic Deficit Grading Scale (NDGS, Appendix 3).[15-17] The NDGS is similar to a grading scale presented at the 30th World Congress, World Small Animal Veterinary Association.[18] Each of the above measurements was assessed and recorded on Day 0 (baseline data), 7, 14, 21, and 28 days after the assigned treatment started. The ultimate study outcome measurements were the change at each post-treatment assessment time compared to the baseline value.

Outcome measurements are presented with mean and standard deviation (M±SD). For each of the measurements (CSUPS, GCPS, NDGS), the study tested the hypotheses on within-group improvement (i.e. pre-treatment vs. post-treatment outcome) for each of the post-treatment

Table 1: The location, attributes, indications, and actions of acupuncture points used in this study to treat spinal cord injuries

Acupuncture Point	Anatomical Location	Attributes, Indications, Actions[9]
Bai-hui	Dorsal midline between L7-S1	Pelvic limb paresis or paralysis, lumbosacral pain, intervertebral disk disease in lumbosacral region
GV-20	On the dorsal midline on a line drawn from the tips of the ears level with the ear canals	Crossing point of the GV and BL Channels; sedation point, *Shen* disturbances, epilepsy
GV-17	On the dorsal midline at the level of the caudal ear bases; 1.5 *cun* cranial to GV-16 just in front of the occipital protuberance	Crossing point between the GV and BL Channels; cervical pain, intervertebral disk disease, epilepsy, ocular disorders
GV-14	Dorsal midline in intervertebral space of C7-T1	*Yin* Deficiency, cervical pain, intervertebral disk disease
BL-10	On the dorsal aspect of the cervical spine, in a depression just caudal to the wings of the atlas (at the junction of C1-C2), 1.5 *cun* from the dorsal midline	Wind-Cold, nasal congestion, cervical pain, intervertebral disk disease, shoulder pain, epilepsy
BL-60	On the caudolateral aspect of the pelvic limb at the hock, in the thin fleshy tissue between the lateral malleolus of the fibula and the calcaneus, at the level of the tip of the lateral malleolus (opposite KID-3)	*Jing*-river (Fire); intervertebral disk disease, cervical pain, thoracolumbar pain, hock pain, epistaxis, hypertension
KID-3	On the caudomedial aspect of the pelvic limb in the thin fleshy tissue between the medial malleolus of the tibia and the calcaneus, level with the tip of the medial malleolus (opposite and slightly distal to BL-60)	*Shu*-stream point (Earth), *Yuan*-source point; renal diseases, dysuria, thoracolumbar intervertebral disk disease

assessments. Nonparametric Wilcoxon Signed Rank tests were employed for testing the hypotheses. If the study was able to include a total of 11 subjects for statistical evaluation, this sample size would offer an approximately 87% power to reject the null hypothesis (no improvements) with a 0.05 significance level. This is assuming the true mean improvement was at least as large as the standard deviation. A commercial statistical software[c] was used for all data graphic presentations and statistical analysis.

RESULTS

A total of 14 dogs with neck or back pain met IVM inclusion criteria and were initially enrolled in the study. There were 3 animals removed from the study. One subject was euthanized before the first post-treatment (i.e. Day 7) assessment, and 2 subjects were later found to have underlying conditions (lymphocytic leukemia, degenerative myelopathy) that excluded them from data analysis as per study protocol exclusion criteria. Due to these post hoc exclusions, a total of 11 IVM treated cases completed the study and made up the population for data analysis. No adverse effects occurred during the 28-day study period from any of the IVM treatments given to these dogs.

Among the IVM dogs in this case series, only 1 (9.1%) was female and the rest were males (90.9%), which significantly dominated the group ($p = 0.012$). With respect to age, the M±SD was 11.00±1.59 years old (8 ~ 12.9; median = 11.0). There was a broad range for body weight (16 ~ 96 lbs.) which had a M±SD of 53.64±27.67 lbs. The dogs primarily presented with back pain (63.6%), with neck pain (36.4%) less common (Table 2). At the owner's request, one dog (#7) was included in the IVM treatment group even though it had not failed conventional therapy.

Table 2: The signalment and baseline clinical data for all IVM treated dogs

Subject	Sex	Age (years)	Body Weight (pounds)	Pain Location (Neurologic Grade)
1	F	12	62	Back (2)
2	M	11	51	Back (1)
3	M	12.5	77	Back (3)
4	M	12.6	55	Back (2)
5	M	11	30	Back (3)
6	M	12	83	Neck (2)
7*	M	8	24	Neck (1)
8	M	10	96	Neck (2)
9	M	12.9	75	Back (2)
10	M	9	16	Neck (1)
11	M	10	21	Back (1)
	9.1% female 90.9% male	11.0±1.6 (M±SD)	53.6±27.7 (M±SD)	63.6% back pain 36.4% neck pain

* Did not have clinical history of non-response to conventional therapy

There were 15 concurrent CT cases. There were almost equal numbers of males (8, 53.3%) and females (7, 46.7%). The mean age was 7.74±3.69 years old and body weight was 27.47±19.58 lbs. In general, these animals were younger and smaller than the IVM cases.

A Colorado (CSUPS) pain scale score was assigned at each assessment time point for each IVM treated dog (Table 3). The outcome data (M±SD) for all 11 dogs was assessed for within group improvement (pre-treatment vs. post-treatment) for each of the post-treatment assessment days. Study findings showed a steady decrease in pain throughout the treatment period starting at 3.27±0.61 (M±SD) at Day 0 and improving by 84.8% to 0.50±0.67 (M±SD) by study termination at Day 28 (Figure 1). This change was statistically significant at each assessment (Days 7, 14, 21, 28) ranging from p=0.001 (Day 7) to p=0.002 (Day 28) (Table 4).

The GCPS score was assigned at each assessment time point for each IVM treated dog (Table 3). The outcome data (M±SD) for all 11 dogs was analyzed using the same methods. Study findings showed a steady decrease in pain throughout the treatment period starting at 14.91±4.04 (M±SD) at Day 0 and improving by 76.7% to 3.50±4.09 (M±SD) by study termination at Day 28 (Figure 2). This change was statistically significant at each assessment (Days 7, 14, 21, 28) (Table 5).

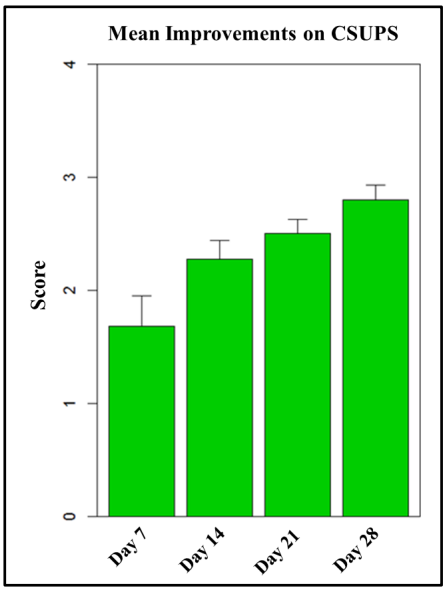

Figure 1: Mean improvement measured by the Colorado State University pain scale (CSUPS) for IVM cases on Day 0, Day 7, Day 14, Day 21, and Day 28

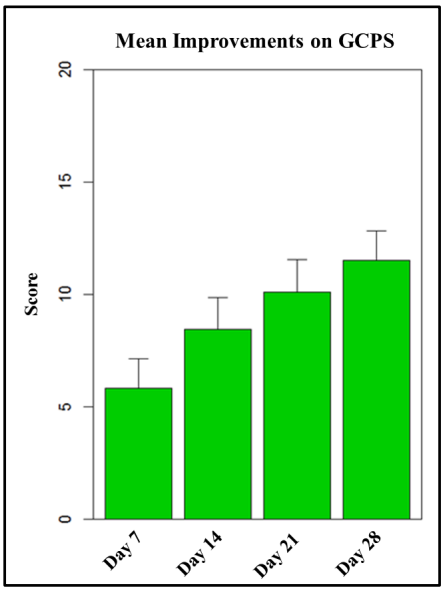

Figure 2: Mean improvement measured by the Glasgow Composite pain scale (GCPS) for IVM cases on Day 0, Day 7, Day 14, Day 21, and Day 28

Table 3: Individual pain scores for the 11 IVM treated dogs from the first post-treatment assessment (Day 7) through study completion (Day 28)

Dog	CSUPS					GCPS				
	Day 0	Day 7	Day 14	Day 21	Day 28	Day 0	Day 7	Day 14	Day 21	Day 28
1	3	2	1	0	0	13	10	6	2	0
2	3	0	0	N/A	N/A	14	2	0	N/A	N/A
3	4	1	1	1	1	13	8	7	6	5
4	3.5	2	1	1	1	7	8	6	4	3
5	4	3	2.5	2	1.5	18	15	13	11	9
6	3	0	0	0	0	12	2	0	0	2
7	3.5	2.5	2	1	0	15	10	7	3	0
8	3	1	0.5	0.5	0	21	9	5	3	3
9	3	2	1	0.5	0	15	10	6	4	1
10	4	3	2	2	1.5	21	20	18	16	12
11	2	1	0	0	0	15	6	3	0	0

CSUPS – Colorado State University Pain Scale; GCPS – Glasgow Composite Pain Scale

There were 15 concurrent CT cases. There were almost equal numbers of males (8, 53.3%) and females (7, 46.7%). The mean age was 7.74±3.69 years old and body weight was 27.47±19.58 lbs. In general, these animals were younger and smaller than the IVM cases.

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The GCPS score was assigned at each assessment time point for each IVM treated dog (Table 3). The outcome data (M±SD) for all 11 dogs was analyzed using the same methods. Study findings showed a steady decrease in pain throughout the treatment period starting at 14.91±4.04 (M±SD) at Day 0 and improving by 76.7% to 3.50±4.09 (M±SD) by study termination at Day 28 (Figure 2). This change was statistically significant at each assessment (Days 7, 14, 21, 28) (Table 5).

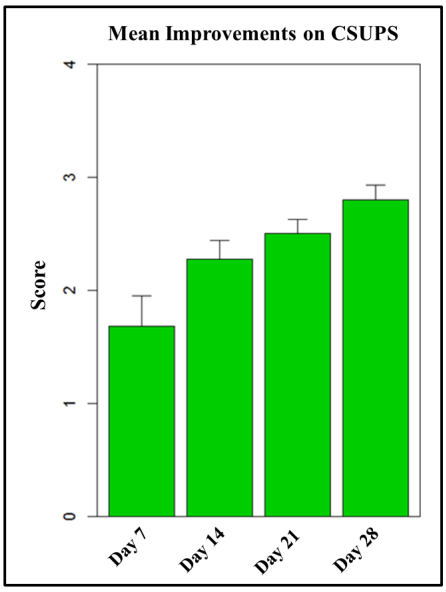

Figure 1: Mean improvement measured by the Colorado State University pain scale (CSUPS) for IVM cases on Day 0, Day 7, Day 14, Day 21, and Day 28

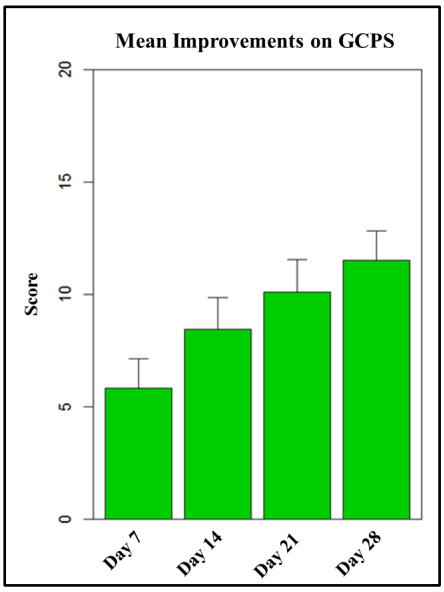

Figure 2: Mean improvement measured by the Glasgow Composite pain scale (GCPS) for IVM cases on Day 0, Day 7, Day 14, Day 21, and Day 28

Table 3: Individual pain scores for the 11 IVM treated dogs from the first post-treatment assessment (Day 7) through study completion (Day 28)

Dog	CSUPS					GCPS				
	Day 0	Day 7	Day 14	Day 21	Day 28	Day 0	Day 7	Day 14	Day 21	Day 28
1	3	2	1	0	0	13	10	6	2	0
2	3	0	0	N/A	N/A	14	2	0	N/A	N/A
3	4	1	1	1	1	13	8	7	6	5
4	3.5	2	1	1	1	7	8	6	4	3
5	4	3	2.5	2	1.5	18	15	13	11	9
6	3	0	0	0	0	12	2	0	0	2
7	3.5	2.5	2	1	0	15	10	7	3	0
8	3	1	0.5	0.5	0	21	9	5	3	3
9	3	2	1	0.5	0	15	10	6	4	1
10	4	3	2	2	1.5	21	20	18	16	12
11	2	1	0	0	0	15	6	3	0	0

CSUPS – Colorado State University Pain Scale; GCPS – Glasgow Composite Pain Scale

Table 4: Summary of CSU pain score data (M±SD) and percent change for IVM treated dogs between study initiation (Day 0) and completion (Day 28)

	Day 0	Day 7	Day 14	Day 21^	Day 28^
CSUPS (M±SD)	3.27±0.61	1.59±1.07	1.00±0.87	0.80±0.75	0.50±0.67
Change from Day 0 (M±SD; %)	--	1.68±0.90	2.27±0.56	2.50±0.41	2.80±0.42
% change	--	↓ 51.4%	↓ 69.4%	↓ 75.8%	↓ 84.8%
p-value	--	0.001**	0.001**	0.002**	0.002**

** statistically significant $p<0.01$; ^ missing data on subject #2

Table 5: Summary of Glasgow Composite pain score data (M±SD) and percent change for IVM treated dogs between study initiation (Day 0) and completion (Day 28)

	Day 0	Day 7	Day 14	Day 21^	Day 28^
GCPS (M±SD)	14.91±4.04	9.09±5.19	6.46±5.24	4.90±5.02	3.50±4.09
Change from Day 0 (M±SD; %)	--	5.82±4.38	8.46±4.68	10.1±4.61	11.50±4.20
% change	--	↓ 39.0%	↓ 56.7%	↓ 67.3%	↓ 76.7%
p-value	--	0.003**	0.001**	0.002**	0.002**

** statistically significant $p<0.01$; ^ missing data on subject #2

Table 6: Individual neurological deficit grades for the 11 IVM treated dogs from the first post-treatment assessment (Day 7) through study completion (Day 28)

Dog	NDGS Score				
	Day 0	Day 7	Day 14	Day 21	Day 28
1	2	2	2	1.5	1.5
2	1	0	0.5	N/A	N/A
3	3	2.5	2	2	1.5
4	2.5	2.5	2	2	2.5
5	3	2.5	3	2.5	2.5
6	2	1.5	1	0.5	1.5
7	1	1	1	0	0
8	2	1	1	0.5	0.5
9	2	1	0.5	0.2	0
10	1	1	0.5	0.5	0.3
11	1	1	0	0	0

NDGS - Neurologic Deficits Grading Scale

The NDGS was used for assigning individual neurologic deficit scores throughout the study for the IVM dogs (Table 6). These were also analyzed by the same statistical methods. Similar to the pain scale evaluation, study findings showed a steady decrease in neurologic deficits throughout the treatment period starting at 1.86±0.78 (M±SD) at Day 0 and improving by 50.3% to 0.97±0.94 (M±SD) by Day 21 (Table 7, Figure 3). On Day 28, there was a mild decrease in improvement with a M±SD of 1.03±1.00. This may be related Dog #6, who was doing so well on Day 21 that DHLD was stopped. When assessed at Day 28, the dog's neurological grade had gotten worse going from a 0.5 to 1.5 grade. Also a factor, study dog #2 had missing NDGS data on days 21 and 28, as this dog was doing so well, the owner did not return for the last 2 clinical assessment exams.

Table 7: Summary of Neurologic Deficits Grading Scale (NDGS) data; Comparison of M±SD and percent change for NDGS data between study initiation (Day 0) and completion (Day 28)

	Day 0	Day 7	Day 14	Day 21^	Day 28^
NDGS (M±SD)	1.86±0.78	1.46±0.82	1.23±0.90	0.97±0.94	1.03±1.00
Change from Day 0 (M±SD; %)	--	0.41±0.44	0.64±0.50	0.98±0.49	0.92±0.60
% change	--	↓ 22.0%	↓ 34.4%	↓ 50.3%	↓ 47.2%
p-value	--	0.031*	0.008**	0.002**	0.004**

* statistically significant $p<0.05$; ** statistically significant $p<0.01$; ^ missing data on subject #2

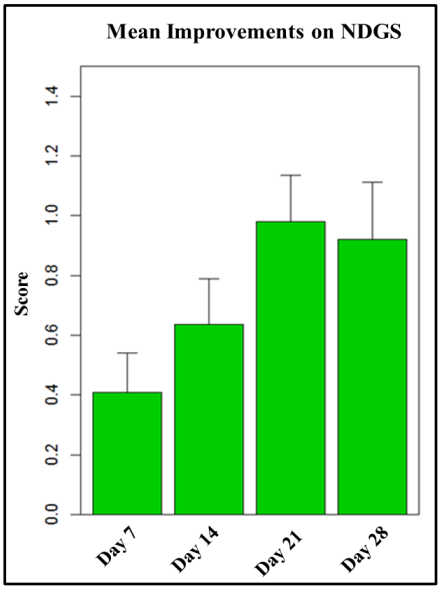

Figure 3: Mean improvement measured by the Neurologic Deficits Grading Scale (NDGS) for IVM cases on Day 0, Day 7, Day 14, Day 21, and Day 28

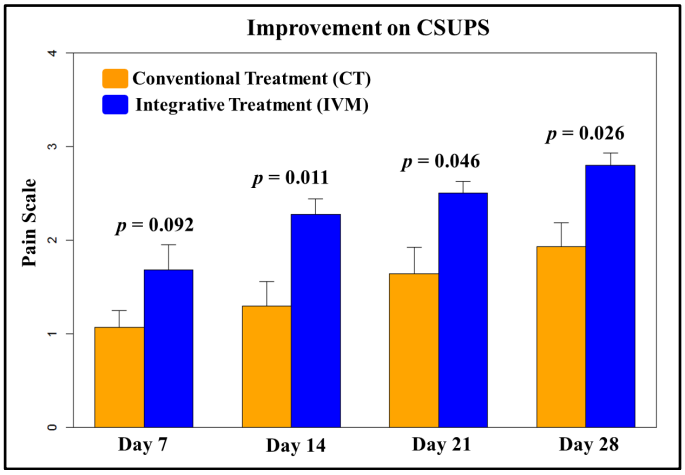

Figure 4: Comparison of improvement between conventional treatment and IVM treatment at each of the 4 post-treatment assessment time points

Only a summary evaluation was performed of the conventional cases. These were evaluated for percent improvement and compared to the IVM treated cases to look at differences in treatment results (Figure 4). Both series of cases treated by either IVM or conventional therapy demonstrated marked improvement with the IVM cases demonstrating more rapid and greater pain relief. The neurological deficit improvement was similar between the 2 series of dogs through Day 21, however, the CT cases had greater improvement at Day 28 (Tables 8 and 9).

DISCUSSION

When conventional medical treatment and surgery have failed to relieve pain and restore function and mobility in a dog with spinal cord disease, very few alternative options for treatment remain. The goal of this case series was to provide additional clinical options for these dogs through an integrative medical approach. The current study evaluated the efficacy of integrating the Chinese herbal medicine, DHLD, and acupuncture with a corticosteroid or NSAID to provide improved pain relief and mobility in dogs that had failed to respond adequately to conventional therapy. In the 11 IVM treated dogs that completed the 28-day trial, the study found that the integrative treatment was associated with statistically significant improved mean pain scores (CSUPS, GCPS) and neurological deficit scores at 7 days. The magnitude of improvement increased over time for the pain scores with an 84.8% improvement (CSUPS) and 76.7% improvement (GCPS) by the end of the study (Figures 1 and 2). The neurological scores improved with the greatest magnitude reached at Day 21 with a 50.3% improvement. The results supported the study hypothesis that patients would have better assessment outcomes (pain scores, neurological deficits) after the experimental integrative treatment when compared with pre-treatment assessment.

As this was a case series to evaluate efficacy of IVM treatment, the study was not organized with a true randomized control group or blinded clinical assessment. All cases, however, that were presented at the author's clinic during the same time period as the IVM dogs and were only treated with conventional therapy for neck or back pain (i.e. corticosteroids or NSAIDS) had their clinical outcomes evaluated for a general comparison. These dogs satisfied similar inclusion and exclusion criteria as the IVM cases; however, they had not failed conventional treatment.

Although these dogs were not optimally matched (i.e. smaller, younger dogs, less complicated disease), the comparison of the 2 series of dogs demonstrates some interesting findings. The conventionally treated (CT) dogs started out with less severe pain scores for CSUPS and GCPS but by Day 7, the IVM dogs demonstrated greater improvement that gained magnitude through the 28 day assessment. There was also neurological deficit improvement with the exception that the older, bigger dogs of the IVM group had improvement level off after Day 21. Overall, it is interesting to note that dogs that had initially failed conventional therapy were able to equal clinical improvement demonstrated by younger, smaller dogs with uncomplicated disease by adding acupuncture and CHM to their conventional treatment regime.

Acupuncture has been shown to be an effective treatment for cervical and spinal disease in dogs. [12-14,19] For example, Liu et al.'s retrospective study in 19 dogs with cervical spinal cord disease found that AP with *Jing-jia-ji* (cervical *jia-ji*) effectively treated the disease in different sized dogs as well as middle-aged to senior dogs.[3] Acupuncture treatment was efficacious in a case of fibrocartilaginous embolism (FCE) as well as demonstrated success with chronic disc disease where it was more effective than decompressive surgery.[12] From a TCVM perspective, spinal cord injuries are due to *Qi* and Blood Stagnation with *Qi* Deficiency below the site of Stagnation.[19] Acupuncture increases blood flow and circulatory changes occur both local and distal to the acupuncture points stimulated.[20,21] In an animal model study with rabbits, a significant increase in blood flow to the sciatic nerve trunk was obtained by dry needle acupuncture to the lumbar muscles of rabbits.[22] This increased blood flow associated with acupuncture reduces local inflammatory substances which provides pain relief.[14,20] In addition, endogenous opioid production (endorphin and dynorphin) is an important mechanism associated with acupuncture analgesia.[19]

Table 8: Comparison of M±SD and percent change for pain scores of conventionally treated neck/back pain cases and IVM treated cases

	Day 0	Day 7	Day 14	Day 21	Day 28
CSUPS					
CT Dogs Score	2.77±0.82	1.70±0.82	1.47±0.92	1.18±0.87	0.83±0.84
% change	--	↓ 38.6%	↓ 46.9%	↓ 59.2%	↓ 69.7%
IVM Dogs Score	3.27±0.61	1.59±1.07	1.00±0.87	0.80±0.75	0.50±0.67
% change	--	↓ 51.4%	↓ 69.4%	↓ 75.8%	↓ 84.8%
GCPS					
CT Dogs Score	12.47±5.37	7.90±5.06	5.13±4.45	3.93±3.10	3.47±4.58
% change	--	↓ 36.6%	↓ 58.8%	↓71.6%	↓72.2%
IVM Dogs	14.91±4.04	9.09±5.19	6.46±5.24	4.90±5.02	3.50±4.09
% change	--	↓ 39.0%	↓ 56.7%	↓ 67.3%	↓ 76.7%

Table 9: Comparison of M±SD and percent change for neurological deficit scores (NDGS) of conventionally treated neck/back pain cases and IVM treated cases

	Day 0	Day 7	Day 14	Day 21	Day 28
NDGS					
CT Dogs Score	1.63±0.93	1.29±0.66	0.89±0.58	0.79±0.58	0.63±0.58
% change	--	↓ 21.5%	↓ 46.0%	↓ 54.6%	↓ 61.3%
IVM Dogs Score	1.86±0.78	1.46±0.82	1.23±0.90	0.97±0.94	1.03±1.00
% change	--	↓ 22.0%	↓ 34.4%	↓ 50.3%	↓ 47.2%

In addition to the benefits of acupuncture which was added to the CT treatment of the IVM dogs in this study, a veterinary specific herbal formula (Double P II[a]) was used. This formula is a modification of the classic formula *Da Huo Luo Dan* and is marketed and recommended for the treatment of paresis and paralysis in both small and large animals according to TCVM principles.[23] The formula is synergistic with acupuncture treatment in that it similarly breaks down Blood Stasis in the spine, moves *Qi* and relieves pain.[11] *Huang Qi* (Astragalus) and *Dang Gui* (Angelica) act as the King herbs to tonify *Qi* and nourish Blood, strengthening the body's ability to fight pathogenic factors (Table 10).[11] The Minister herbs include *Du Zhong* (Eucommia), *Xu Duan* (Dipsacus), *Gu Sui Bu* (Drynaria), *Ba Ji Tian* (Morinda), *Chuan Niu Xi* (Cyathula) and *Bu Gu Zhi* (Psoralea) that work synergistically to strengthen bones and tonify Kidney *Yang*.[21] The adjuvant herbs in the formula have a variety of actions that include warming Channels to help clear Blood Stasis and moving *Qi* and Blood, which provides excellent pain relief. Clinical trials conducted with the classical formula in humans have demonstrated effective treatment of muscle atrophy, increased cerebral blood flow, treatment of angina pectoris and pain relief.[11] The pharmaceutical effects have been studied in a variety of animal models and have demonstrated DHLD's ability to decrease cerebral blood pressure and dilate blood vessels, therefore increasing perfusion and blood flow in the canine brain. In addition, inhibiting thrombosis and increasing skeletal muscle contraction are associated with DHLD. It can be hypothesized that the curative effects of DHLD on paresis and paralysis may be the result of improved local blood circulation, reduction of thrombosis, improved nerve function in paralyzed limbs and stimulation of skeletal muscles.[11]

Limitations to this study included those that typically accompany a case series; namely, a lack of blinding and randomization along with no control group, which may allow bias. In addition, the small number of animals with varying complicated clinical cases made uniform animal comparison and valid statistical evaluation difficult. There were also unexpected clinical findings. The occurrence of steady neurological improvement in the IVM dogs abruptly plateaued between Days 21 and 28 (Table 7). Looking at the individual cases during this time period, there were 2 dogs (#6, #4) that had worsening neurological scores between these 2 assessments and 3 dogs (#1, #5, #8) that had no improvement of their scores for this time period (Table 6). In addition, Dog #2 did not come back for assessment at Days 21 and 28 because it had improved so much, the owner didn't think it was necessary.

Table 10: Ingredients of the Chinese herbal medicine, modified *Da Huo Luo Dan* (Double P II[a]) and their actions.

Pin Yin	**Common Name**	**Actions[11]**
Ba Ji Tian	Morinda	Warms *Yang* and tonifies Kidney
Bu Gu Zhi	Psoralea	Tonifies Kidney *Yang* and strengthens bones
Chi Shao	Paeonia	Cools Blood, resolves Stagnation
Chuan Xiong	Ligusticum	Activates Blood, resolves Stagnation
Du Zhong	Eucommia	Strengthens back, tonifies Kidney *Yang*
Fu Zi (Shu)	Aconite	Warms *Yang* and Channels
Gan Cao	Licorice	Harmonizes
Gu Sui Bu	Drynaria	Strengthens bones and tonifies Kidney *Yang*
Hong Hua	Carthamus	Moves Blood, resolves Stagnation and Stasis
Huang Qi	Astragalus	Tonifies *Qi*
Ma Qian Zi	Strychnos	Activates Channels, relieves pain, clears Wind-Damp
Mo Yao	Myrrh	Resolves Stagnation and relieves pain
Quan Xie	Buthus	Resolves Stagnation
(Tian) San Qi	Notoginseng	Moves Blood, stops hemorrhage
Wu Yao	Lindera	Moves *Qi* and relieves pain
Xu Duan	Dipsacus	Strengthens bones and ligaments, tonifies Kidney *Yang*
Xue Jie	Draconis	Resolves Stagnation
Chuan Niu Xi	Cyathula	Tonifies Kidney *Yang* and strengthens the pelvic limbs
Dang gui	Angelica	Nourishes Blood, activates Blood, relieves pain
Ru Xiang	Frankincense	Resolves Stagnation and relieves pain

Dog #6 is interesting in that this dog was doing so well, he was taken off DHLD after the Day 21 assessment to concentrate on treating an ear infection. On Day 28, the dog's neurological status had significantly worsened. The dog was restarted on DHLD and 2 weeks later (after the study had ended), the neurological score returned to the former level of improvement. Dog #4 had severe disease at study start, only minimally responded during the study, and although imaging was not done, it is suspected the dog was affected with something other than disc disease. The 3 dogs that had no change in their scores had complicated clinical disease with either improving pain but minimal neurological improvement or hard to control pain but improving neurological function. Dog #1 at study start had not responded to corticosteroids and underwent surgery at Day 5. The surgeons identified a chronic, mineralized lesion at L5-6 which nothing much could be done for. This dog slowly but steadily improved through the study and was weaned off all drugs and maintained only on DHLD by Day 28. Dog #5 had been resistant to the NSAIDs and methocarbamol for a month and was in severe pain at study start. The dog had significant pain relief during the study but only minimal neurological score improvement. Dog #8 joined the study after developing acute lameness following bilateral stifle disease. The dog had good response to IVM but incomplete pain resolution. Referral to a neurologist diagnosed a cervical neuropathy with MRI recommendation but was not pursued.

From this study's findings, some recommendations regarding treatment improvement can be made. These include modification of the case severity selection for DHLD administration and the addition of electro-acupuncture to the dry needle treatment. The optimal use of DHLD is for severe acute cases of pain with paresis/paralysis (grades 3-5, NDGS). A different Chinese herbal formula that should be considered is *Bu Yang Huan Wu*. This formula moves *Qi*/Blood and breaks Stasis similar to DHLD, but additionally, it addresses Deficiency. A case series report in 6 French bulldogs with caudal paralysis had good treatment outcomes combining acupuncture with the Chinese herbal medicines Double P II[a] and *Bu Yang Huan Wu Tang*.[24] Since the IVM treated dogs were older, deficiencies are an important consideration; therefore, dogs with less severe neurological deficits (grades 1-2, NDGS) might derive greater benefit from *Bu Yang Huan Wu Tang*.[11] The addition of electro-acupuncture is a consideration to also improve results. In experimental studies of spinal cord injury, electro-acupuncture has been shown to reduce cell death, promote neuronal plasticity and enhance cellular regeneration.[19] Clinical research has shown that electro-acupuncture and dry needle acupuncture combined with conventional treatments is significantly more effective to treat spinal cord injury from intervertebral disk herniation, than conventional therapy alone.[19]

In conclusion, the findings from this case series suggest that integrating acupuncture and Chinese herbal medicine with an NSAID or corticosteroid can be an effective treatment option to provide pain relief and improved neurologic status in dogs that have failed to respond adequately to conventional therapy (NSAID/corticosteroid) only. Further investigation of this integrative medical approach with larger groups of dogs using randomized controls with blinded clinical assessment and more uniform disease grouping would provide greater insight into the efficacy of this treatment approach.

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Declaration of Interest and Funding

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FOOTNOTES

[a] Dr Xie's Jing Tang Herbal, Inc, Ocala, FL USA

[b] Dr Xie's Jing Tang Herbal, Inc, Reddick, FL USA

[c] R version 3.5.2. The R Foundation for Statistical Computing, Vienna Austria; http://www.R-project.org

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Appendix 1: Scoring Criteria CSU Pain Scale[15]

Symptom / Behavior	Score
Comfortable, happy, interested in surroundings, non-tender to palpation of affected site; Little tension	0
Content to slightly unsettled, easily distracted by surroundings, reacts to palpation of body; looking around, flinching or whimpering; Mild tension	1
Looks uncomfortable when resting, may whimper or cry, lick affected site, droopy ears, worried expression, reluctant to respond when beckoned, flinches, whimpers/cries, pulls away with palpation; Mild to moderate tension	2
Unsettled, crying, biting affected area, guards painful area, may be unwilling to move all or part of body; May be subtly shifting eyes or increase respiratory rate if too painful to move; May have sharp cry, growl, bite, or pull away	3
Constantly groaning or screaming, may bite at painful area, potentially unresponsive to surroundings, difficult to distract from pain; Cries at non-painful palpation; Very rigid and tense	4

Appendix 3: Scoring Criteria Neurological Deficits Grading Scale (NDGS)[17]

Symptom / Behavior	Score
Neck or back pain and no other deficits	1
Ataxia in all four limbs or pelvic limbs, with or without conscious proprioceptive deficits and hemiparesis, quadriparesis or paraparesis w/ambulation spared	2
Non-ambulatory hemiparesis, quadriparesis, paraparesis with or without urinary or fecal incontinence; may or may not have reduced or absent cutaneous trunci responses	3
Quadriplegia and paraplegia (no voluntary movement) with preserved deep pain sensation and typically have fecal and urinary incontinence and reduced or absent cutaneous trunci responses	4
Paraplegia with no deep pain sensation; quadriplegia with no deep pain is rare as respiratory paralysis usually occurs	5

Appendix 2: Scoring Criteria for GCPS[16]

	Symptom / Behavior	Score
GCPS (i)	Quiet	0
	Crying or whimpering	1
	Groaning	2
	Screaming	3
GCPS (ii)	Ignoring any wound or painful area	0
	Looking at wound or painful area	1
	Licking wound or painful area	2
	Rubbing wound or painful area	3
	Chewing wound or painful area	4
GCPS (iii) At Rise or Walk	Normal	0
	Lame	1
	Slow or reluctant	2
	Stiff	3
	Refuses to move	4
GCPS (iv) With gentle pressure around painful area	Do nothing	0
	Look round	1
	Flinch	2
	Growl or guard area	3
	Snap	4
GCPS (v)	Happy and content or bouncy	0
	Quiet	1
	Indifferent or non-responsive to surroundings	2
	Nervous or anxious or fearful	3
	Depressed or non-responsive to stimulation	4
GCPS (vi)	Comfortable	0
	Unsettled	1
	Restless	2
	Hunched or tense	3
	Rigid	4
GCPS Total Score (i + ii + iii + iv + v + vi)		0-24