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## Retrospective Studies

# Acupuncture and Chinese Herbal Medicine Treatment for Neck Pain and Cervical Disc Disease: A Retrospective Study in 42 Dogs

Donna Hein

**ABSTRACT**

Cervical intervertebral disc disease accounts for 12.9-25% incidence of intervertebral diseases in dogs. This retrospective cohort study compared the efficacy of conventional treatment to traditional Chinese veterinary medicine (TCVM) for neck pain and/or cervical disc disease (CDD). Medical records were collected on 42 dogs that exhibited one or more of the following clinical signs: cervical pain, cervical stiffness, decreased range of motion of neck, hemiparesis or tetraparesis. Qualified cases were classified into a TCVM Treatment Group (n=31) using acupuncture/Chinese herbal medicine or a Control Treatment Group (n=11) using corticosteroids/non-steroidal anti-inflammatory drugs (NSAIDs). For each subject, assessment scores in cervical pain, stiffness, range of motion, neurological deficits and front limb lameness before and after 4 treatments were reviewed. The sum of all 5 clinical scores (overall improvement) was used as the final treatment outcome measurement for group comparisons. No statistically significant group differences were found in sex, age, weight and pre-treatment overall clinical score ($p$>0.05). The Control Group had an overall pre-treatment score (M±SD) of 8.36±3.07, which significantly improved (decreased) to 4.91±3.73 after completing the treatments ($p$=0.006). The TCVM Group's overall score (M±SD) improved from 9.39±3.13 to 1.23±0.72 ($p$=$9.3\times10^{-10}$). The improvement in the TCVM Group was significantly greater than the Control Group ($p$=0.00004). The results from this retrospective study suggest that, while both treatment schemes can improve clinical signs of cervical pain and/or cervical disc disease in dogs, the TCVM treatment has the potential for superiority to conventional medical treatment.

**Keywords:** acupuncture, cervical intervertebral disc disease, Chinese herbs, neck pain, retrospective study, traditional Chinese veterinary medicine

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**ABBREVIATIONS**

| | |
|---|---|
| **AP** | Acupuncture |
| **CDD** | Cervical disc disease |
| **CHM** | Chinese herbal medicine |
| **DNAP** | Dry needle acupuncture |
| **EAP** | Electro-acupuncture |
| **IVDD** | Intervertebral disc disease |
| **NSAID** | Non-steroidal anti-inflammatory drug |
| **ROM** | Range of motion |
| **TCM** | Traditional Chinese medicine |
| **TCVM** | Traditional Chinese veterinary medicine |

Cervical disc disease (CDD) is the protrusion or extrusion of disc material into the spinal canal which, in turn, can place pressure on the meninges, spinal cord and nerve roots. The reported incidence of CDD among intervertebral disc disease (IVDD) dogs has a reported incidence of 12.9-25.4%.[1,2] Breeds such as Dachshunds and beagles, along with older dogs are reported to have a higher incidence.[2] Overall, there are less neurological deficits with cervical disease compared to thoracolumbar (TL) IVDD, as it is thought to be related to the large vertebral canal to spinal cord ratio in the cervical region in canines.[2] The most common disc site affected for small breed dogs is reportedly C2-C3, while C6-C7 is most common among the large breed dogs and C5-C6/C6-C7 is most common among all dogs.[2,3] The severity of disc disease depends on the degree of nerve root and spinal cord compression, and the rate and force of disc protrusion or extrusion. Factors that contribute to this disease include genetics, trauma, obesity and age-related chondroid degeneration of the disc. Dogs with CDD may present with neck pain only with the most common clinical signs

including low head and neck carriage, not being willing to extend or flex the neck and muscle spasms.[4] These dogs may have a stiff, short-strided gait, refuse/reluctant to use stairs or jump, and/or drink or eat from a lowered dish. Thoracic limb lameness has been reported in 15-50% of CDD cases with nerve root compression, while increasing severity of spinal cord compression will cause neurological signs such as tetraparesis, hemiparesis or proprioceptive ataxia.[2,5]

Diagnosis is based on imaging (e.g. radiographs, myelography, computerized tomography/CT, or magnetic resonance imaging/MRI). The best diagnostic method for CDD in dogs is considered the MRI.[2,6] Currently, the standard treatment for neck pain/CDD in dogs involves either conservative or surgical treatment.[7-9] Conventional conservative treatment includes pain medications such as corticosteroids or non-steroidal anti-inflammatory drugs (NSAIDs) and cage confinement. Surgery is highly recommended for cases with reoccurring episodes of cervical pain, pain that lasts longer than 1-2 weeks, progression of neurological signs or failure of conservative treatments.[10,11] There are a number of disadvantages with surgery, however, which include expensive imaging (e.g. MRI, myelography) and post-operative complications such as excessive bleeding, persistent neck pain, cervical vertebra instability, neurological deterioration and prolonged recumbancy.[12-14] In a study by Hillman, it was concluded that only 60% of dogs presenting with non-ambulatory tetraparesis associated with cervical disc herniation had complete recovery post-surgery.[15] Given the aforementioned limitations of conventional conservative and surgical management, alternative treatment options for canine CDD are preferable.

Traditional Chinese medicine (TCM) has used acupuncture (AP) and Chinese herbal medicine to treat neurological conditions and pain for centuries.[16,17] From a TCM perspective, neck pain and CDD are associated with local cervical *Qi* Stagnation and Blood Stagnation.[18] Applying traditional Chinese veterinary medicine (TCVM) theory, there are seven TCVM Patterns associated with the clinical signs of this disease process.[19] The patterns are divided into either *Qi*-Blood Stagnation of the External Channels of the neck (i.e. pain only) or ataxia, paresis, paralysis associated with *Qi*-Blood Stagnation in the Spinal Cord meaning the disease has become Internal. Three patterns cause Stagnation in the External Channels: Wind-Cold-Damp Invasion with *Qi*-Blood Stagnation, External *Qi*-Blood Stagnation with Kidney *Yin* or *Yang* Deficiency. The immediate treatment focus for these patterns is to move *Qi* and Blood to resolve pain, which can be very severe.[19] In addition, the underlying Deficiencies must be addressed to prevent recurrence or extension into Internal involvement of the Spinal Cord. The last 4 Patterns are *Qi*-Blood Stagnation of the Spinal Cord with Kidney *Qi*, *Yang* and/or *Yin* Deficiencies. Ataxia, paresis or paralysis (*Tan-huan* syndrome) is present with these patterns. Aggressive treatment of the Stagnation is paramount to prevent further neuronal damage and promote nerve regeneration to recover function.

The successful use of AP in a case study to treat CCD was first reported in the United States in 1975, followed 10 years later by a more substantial report of 32 cases with a 70% effective rate.[20,21] In 2000, a study of 40 dogs with cervical spondylomyelopathy (Wobbler syndrome) reported that the dogs treated with electro-acupuncture (EAP) primarily or adjunctively had an 85% treatment success rate, compared with 20% of dogs receiving conventional medical and/or surgical interventions alone.[22,23] The use of Chinese herbal medicine (CHM) along with EAP for CDD is less commonly documented in the literature; however, a case of CDD with tetraparesis confirmed by myelography (C3-C4) recovered mobility after treatment with EAP and CHM only.[24] The CHM formulas (Double P II, Cervical Formula) used in this clinical case were selected to improve the flow of *Qi* and to direct that *Qi* flow to the cervical area to relieve pain and improve mobility.

The objective of this retrospective cohort study was to determine the effectiveness of AP and CHM for the treatment of canine neck pain/cervical disc disease based on quantitative clinical and neurological measurements. The hypothesis for this study stated that TCVM treatment (EAP, CHM) when compared to conventional medical treatment would demonstrate statistically significant greater improvement of pain and mobility in neck pain/ CDD affected dogs.

## MATERIALS AND METHODS

Case records of a cohort of canine patients treated by qualified TCVM practitioners over a 10-year period for neck pain and/or CDD were collected and reviewed. Recruitment of cases was accomplished by email solicitation of veterinarians teaching in AP certification courses in the United States and veterinarians local to the author in the Houston, Texas area. Veterinarians were sent a document describing the background and significance of cervical disease in dogs, description of the limited current treatment options available, along with their efficacy and disadvantages. In addition, a proposal for the current study to evaluate the effectiveness of AP and CHM to treat neck pain and CDD was included. Along with the description of the study, veterinarians were sent an information table to enter salient clinical features of cases under consideration for enrollment (Appendix 1).

Medical records sent by veterinarians were reviewed and information was collected regarding nature of the cervical disease (acute, chronic), imaging, neurological classification, neck pain, lameness, stiffness and range of motion. In addition, information on both conservative and TCVM treatments were collected that included traditional pharmaceuticals, Chinese herbal medicines, acupuncture protocols, TCVM Pattern diagnoses, first and last treatment dates, frequency of treatment, total number of treatments and any adverse side effects noted.

There were no restrictions on breed or sex, and imaging was not required for the subject population of this retrospective study. For a case to be included, the clinical

report must have indicated that the patient had exhibited one or more of the following clinical signs: cervical pain, cervical stiffness, decrease in range of motion of the neck, hemiparesis, or tetraparesis. Other criteria included: 1) older than 1 year of age at the time of the treatment; 2) no previous disc disease or neck pain noted in the clinical report; and 3) no history of surgery to treat the neck pain/CDD. Subjects with chiropractic or laser treatment implemented at the time of treatment were excluded.

A two-arm controlled study was planned, where cases would be classified into two treatment groups: TCVM Group or Control Group. Information extracted from individual clinical records in the TCVM Group included medications, TCVM Pattern diagnosis (based on tongue and pulse), TCVM treatment modalities (e.g. dry needle acupuncture, EAP, CHM) and adverse effects from any TCVM treatment. In the Control Group, medications administered to patients were recorded along with any associated adverse effects. A neurological case in either group had information on clinical signs (e.g. cervical pain/stiffness, ataxia, reduced range of motion) and neurological deficit grade recorded before and after treatment (Table 1).

**Table 1:** Summary of the scoring system used for assessment of each clinical sign evaluated for improvement after 4 control treatments or 4 TCVM treatments; the sum of all clinical score improvements was used to generate overall improvement which was used as the final treatment outcome measurement

| Clinical Sign | Score Assignment for Degree of Severity |
|---|---|
| Neck Pain | 0 - No pain; 1 - mild; 2 - moderate; 3 - severe |
| Neurological Classification | 0 - Normal, no pain, no neurological dysfunction<br>1 - Ataxia, with or without pain, able to walk without assistance<br>2 - Severe ataxia, with or without pain, ambulatory paraparesis<br>3 - Non ambulatory paraparesis: loss of voluntary movement, normal bladder and fecal control<br>4 - Paralysis: loss of voluntary urinary control, has deep pain<br>5 - Complete paralysis: loss of urinary control and no deep pain |
| Lameness | Grade 1-5 (1 = none; 5 = severe) |
| Stiffness | None (0), moderate (1), severe (2) |
| ROM of Neck* | Full (0), slightly restricted (1), severely restricted (2) |

*ROM=range of motion

Assessment scores were given for cervical pain, stiffness, range of motion (ROM) of neck, neurological deficits and lameness before and after 4 treatments. Each clinician assigned these scores retrospectively from their medical records. For each subject, the overall improvement (sum of all clinical score improvements from before to after treatments) was calculated and used as the final treatment outcome measurement for testing the study hypothesis (i.e. neck pain score improvement + neurological score improvement + lameness score improvement + stiffness score improvement + ROM of neck score improvement).

Based on the outcome measurements described above, the study tested the hypothesis that the mean/ median total improvement of clinical sign scores was greater in the TCVM treated subjects than those in the Control Group. To test the hypothesis that compared continuous measurement between two independent groups, without assuming that the distribution of the test data was normally distributed, the non-parametric Wilcoxon Rank Sum tests were used. All tests were two-sided. A null hypothesis was rejected when the resulting *p*-value was less than 0.05.

As the Wilcoxon Rank Sum test is the non-parametric version of the two-sample T-test, sample size justification based on an approximation (~5% less power) of a two-sample T-test was calculated. To ensure a 90% power to reject the null hypothesis with a 0.05 significance level when the group difference was at least 1.0 standard deviation (pooled 2 groups), at least 23 patients in each group would be required. All data graphic presentations and statistical analyses were generated using the statistical software R[a].

## RESULTS

The medical records from 123 cases were reviewed for inclusion in this retrospective study. Out of these records, 42 cases diagnosed and treated for cervical pain/ CDD were included in the study based on the inclusion and exclusion criteria. These subjects were presented to private practices from the Southeast United States (Texas, Louisiana, Georgia, Florida) over the past 10 years. Among these cases, 31 and 11 patients were treated with TCVM treatments and with conventional therapies, respectively. When assessing signalment for all dogs in the study, there were a variety of breeds with Dachshunds most frequently represented followed by mixed breeds (majority < 25 lbs.) (Table 2). Males and females were almost equally represented with body weight mean approximately 40 lbs. and ages ranging from (1 to 14 years) with a mean of approximately 9 years old. Group comparison of subject signalment data including sex proportion, age, and body weight did not conclude a significant difference between study groups (all *p*-values > 0.05), suggesting similar group comparability for investigating treatment effects (Table 3).

Forelimb lameness was the most common clinical sign reported at the beginning of the study with 100% incidence in both groups. The incidence of cervical neck pain was almost as common (100% controls, 94% TCVM) and was closely matched with decreased ROM (91% controls, 97% TCVM) and stiffness (91% controls, 94% TCVM). The incidence of neurological deficits was smaller in both groups with 1 control animal (9%) and 20 of 31 dogs (65%) in the TCVM Group.

Cases in the Control Group were treated with NSAIDS (6/11, 55%), corticosteroids (4/11, 36%) or methocarbamol (1/11, 9%). Adverse effects were observed in this group and included polyuria, polydipsia, polyphagia in dogs given a corticosteroid (36%). Dogs given NSAIDS experienced bloody diarrhea in 27% of the cases.

**Table 2:** Breed incidence of study dogs

| Breed | Control Treatment Breed Incidence (8 Breeds) | TCVM Treatment Breed Incidence (22 Breeds) |
|---|---|---|
| Dachshund | 3 | 3 |
| Mixed Breed | 1 | 4 |
| Yorkshire | 2 | 1 |
| Rat Terrier | 1 | 1 |
| Great Dane | 1 | 1 |
| Beagle | 1 | 0 |
| Cockapoo | 1 | 0 |
| Irish Wolfhound | 1 | 0 |
| Cavalier King Charles | 0 | 3 |
| Doberman Pincher | 0 | 2 |
| Standard Poodle | 0 | 2 |
| Schnauzer | 0 | 2 |
| Bichon | 0 | 1 |
| Boston Terrier | 0 | 1 |
| Chihuahua / Pomeranian Mix | 0 | 1 |
| Corgi | 0 | 1 |
| English Labrador | 0 | 1 |
| Labrador Retriever | 0 | 1 |
| German Shepherd | 0 | 1 |
| Miniature Pincher | 0 | 1 |
| Pomeranian | 0 | 1 |
| Rhodesian Ridgeback Mix | 0 | 1 |
| Rottweiler | 0 | 1 |
| Rough-coated Collie | 0 | 1 |
| Yorkie-Poodle Mix | 0 | 1 |

**Table 3:** Group comparison of subject signalment data including sex proportion, age, and body weight

| Signalment | Control | TCVM | *p*-value |
|---|---|---|---|
| Sex (% female) | 54.5% | 41.9% | 0.50 |
| Age (Mean±SD, years) | 9.4±4.3 | 8.3±3.6 | 0.50 |
| Weight (Mean±SD, lbs.) | 40.4±48.0 | 38.9±31.7 | 0.58 |

The TCVM Group was treated with dry needle acupuncture (DNAP) and/or electro-acupuncture [EAP (100%)] and/or CHM formulas (90%). The patients were not sedated for their AP treatments and the acupoints used were selected according to their TCVM diagnosis patterns (Table 4). The acupoints were stimulated by stainless steel needles with varying lengths depending on location and size of dog. With the DNAP method, the needles were inserted and remained for 15 to 30 minutes depending on the case. With EAP, the electrical stimulation was applied to a pair of acupoints using an electronic acupunctoscope[b] for 15 to 30 minutes with a frequency of 20 Hz for 15 minutes or 20 Hz for 15 minutes followed by 80-120 Hz for an additional 15 minutes. The treatments were performed twice weekly to once weekly until the clinical signs resolved. There were no adverse effects associated with AP treatments in the TCVM Group.

**Table 4:** Summary of common electro-acupuncture and dry needle acupuncture points used during the study for the TCVM Group

| Acupuncture Technique | Acupuncture Points |
|---|---|
| Dry Needle Acupuncture or Electro-acupuncture | *Jing-jia-ji* on side with greater pain at location of affected disc |
| | SI-3 on side of neck with greater pain and opposite BL-62 |
| Electro-acupuncture* | GB-20 crossing to opposite GB-21 |
| | GV-16 to GV-14 |
| Dry Needle Acupuncture | BL-65 |

* 20 Hz for 15 minutes or 20 Hz for 15 minutes followed by 80-120 Hz for additional 15 minutes

Chinese herbal medicine used in the TCVM Group treatments consisted of Concentrated Cervical Formula[c], Concentrated Body Sore[c], Double P II[c] or a combination of these and given to 28 of the 31 dogs (90%). The dogs that did not receive the herbal formulas were due to owner preference to use AP as the sole therapy. The oral dosage was 1 capsule (0.5 g) per 20-40 lb. body weight of the concentrated formulas and 1 capsule (0.5 g) per 20 lb. of body weight for the Double P II formula (Tables 5-7).[25] There were no adverse effects associated with administration of CHM during the study period.

**Table 5:** Ingredients of the Chinese herbal medicine Concentrated Cervical Formula[c] and their actions[25]

| *Pin Yin* Name | Common Name | Actions |
|---|---|---|
| *Ge Gen* | Pueraria | Clears Wind-Heat, benefits neck |
| *Bai Shao Yao* | Paeonia | Nourishes Blood |
| *Ji Xue Teng* | Millettia | Nourishes and activates Blood |
| *Gui Zhi* | Cinnamomum | Warms the Channels, relieves pain |
| *Dang Gui* | Angelica | Nourishes and activates Blood |
| *Chuan Xiong* | Ligusticum | Activates Blood, relieves pain |
| *Mu Gua* | Chaenomeles | Dissipates Stagnation, benefits Channels |
| *Gan Cao* | Glycyrrhiza | Harmonizes |
| *Qiang Huo* | Notopterygium | Benefits neck |

**Table 6:** Ingredients of the Chinese herbal medicine Concentrated Body Sore[c] and their actions[25]

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

**Table 7:** Ingredients of the Chinese herbal medicine modified *Da Huo Luo Dan*[c] (Double P II) and their actions[25]

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

The clinical sign scores for cervical pain, neurological deficits, lameness, stiffness, and range of motion of the neck were assessed before treatment started and after completing 4 treatments. These scores were combined to calculate an overall clinical score for each dog. The pre-treatment overall clinical scores were not significantly different between the two treatment groups ($p$ = 0.37), suggesting similar group comparability for treatment effect comparison.

Within the Control Group, 9 out of 11 subjects (81.8%) had improved overall clinical sign scores. The Mean±SD overall score before treatment was 8.36±3.07 which had a statistically significant decrease to 4.91±3.73 ($p$ = 0.006) after completing the treatments (Figure 1). Within the TCVM Group, all 31 subjects (100%) had improved overall clinical scores. The Mean±SD overall score before treatment was 9.39±3.13 with a statistically significant decrease to 1.23±0.72 ($p = 9.3\times10^{-10}$) after completing the treatments (Figure 1). Between group comparison of the Mean±SD overall score improvement in the Control Group (3.45±2.66) and TCVM Group (8.16±2.95) demonstrated a statistically significant difference ($p$ = 0.00004) between the groups with greater improvement in the TCVM Group (Figure 2).

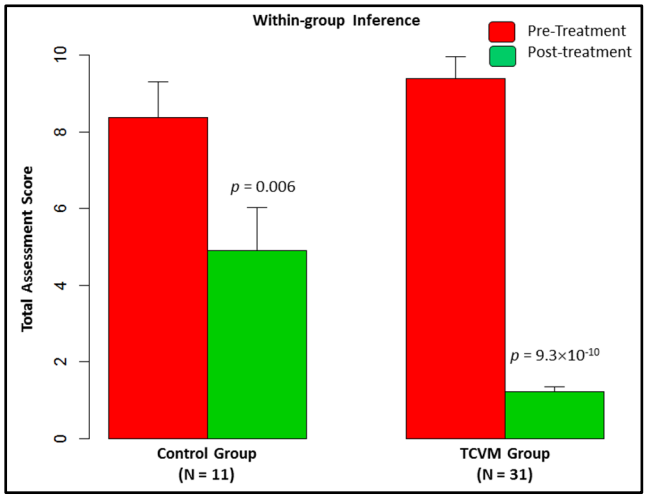


**Figure 1:** Mean overall clinical sign score assessed before the treatment started (red bar) and after completing all treatments (green bar) within each treatment group; a decreasing score indicates clinical improvement.

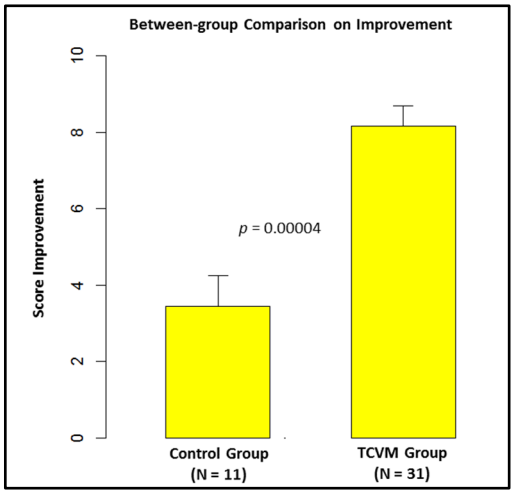


**Figure 2:** Comparison of overall clinical score improvement between the two treatment groups demonstrated a statistically significant (p<0.00004) difference between the groups with greater improvement in the TCVM Group.

**Table 8:** Improvement rate of each clinical sign score was calculated and compared between groups to investigate which clinical signs saw greater benefit from TCVM treatment; only subjects with a positive score (i.e. a clinical sign) were included in the analysis

| Clinical Sign | Control | TCVM | *p*-value |
|---|---|---|---|
| Neck Pain | 8/11 = 72.7% | 29/29 = 100% | 0.017 |
| Neurological Deficit(s) | 0/1 = 0% | 20/20 = 100% | NA* |
| Lameness | 4/11 = 36.4% | 27/31 = 87.1% | 0.002 |
| Stiffness | 9/10 = 90.0% | 29/29 = 100% | 0.256 |
| ROM | 8/10 = 80.0% | 30/30 = 100% | 0.058 |

* There were too few subjects in the Control Group for statistical inference

Improvement rate for each clinical score was calculated and compared between groups to further investigate which clinical signs saw greater benefit from TCVM treatment than conventional therapy (Table 8). For each analysis, only subjects with a positive score (i.e. clinical sign present) were included in the analysis. For neck pain, 72.7% (8/11) in the Control Group had improvements, whereas 100% (29/29) of the subjects in the TCVM Group improved. The difference was statistically significant ($p$ = 0.017). Only 1 control subject exhibited neurological deficits which did not improve after conventional treatment. In the TCVM Group, all subjects that had neurologic deficits (20) improved after the treatments. Group comparison (TCVM vs. control) was not carried out for neurologic clinical signs due to the small number of control subjects. For lameness, 36.4% (4/11) in the Control Group had improvements, whereas 87.1% (27/31) of the subjects in the TCVM Group improved. The difference was statistically significant ($p$ = 0.002). For stiffness, 90% (9/10) in the Control Group had improvements; 100% (29/29) of the subjects in the TCVM Group improved. The difference between groups was not

statistically significant ($p = 0.256$) in this small study. For ROM, 80% (8/10) in the Control Group had improvements, and again 100% (30/30) of the subjects in the TCVM group improved. The difference between groups was not statistically significant ($p = 0.058$) in this small study.

A total of 31 TCVM treated cases and 11 conventional therapy cases were collected for this retrospective study. With this sample size, assuming an 80% probability that a TCVM treated patient would have greater total improvement than a control subject on clinical sign scores, at least an 88% power to reject the null hypothesis with a 0.05 significance level was achieved.[26]

## DISCUSSION

This retrospective cohort study compared the treatment efficacy of acupuncture and Chinese herbal medicine (TCVM treatment) to conventional therapies (control) for treatment of neck pain and/or cervical disc disease in dogs. The medical records of 42 cases were assessed. Based on analysis of the overall clinical sign score (combined assessment for cervical pain, neurological deficits, lameness, stiffness, range of motion of neck), both study groups demonstrated statistically significant improvement ($p = 0.006$ for controls, $p = 9.3\times10^{-10}$ for TCVM Group). The improvement in the TCVM Group was significantly greater than that in the Control Group ($p = 0.00004$) with 100% of the dogs (versus 81.8% of controls) demonstrating an improved overall clinical sign score confirming acceptance of the hypothesis.

Further comparisons on the improvement rate of individual clinical signs revealed the patients in the TCVM Group receiving acupuncture with or without Chinese herbal medicine had significant improvement of their clinical signs. All TCVM patients (100%) had improvement of neck pain, neurological deficits, cervical stiffness, range of motion, and 87.1% had their lameness improved. The controls, in contrast, had 72.7% improvement for neck pain, 90% for stiffness, 80% range of motion and 36.4% had lameness improved (Table 5). Neurological deficit score improvement was not compared between the 2 study groups. Ten of the 11 control dogs started the study with a zero score (no neurological deficits), therefore, only 1 dog had any possibility for improvement (i.e. pre-treatment score > 0). This dog did not improve after conservative treatment. Finally, statistical comparison of improvement (control vs. TCVM treatment) among the 5 clinical signs evaluated in study dogs demonstrated a significant advantage when treating neck pain and lameness with TCVM compared to conventional therapy ($p < 0.05$).

Only two other studies on canine cervical disc diseases have been conducted using TCVM, one in the modern era (1985) and the other one in the current era (2015).[4,21] Both of these studies reviewed medical records of dogs treated with TCVM (AP and/or CHM) for cervical disease ranging from neck pain only to paralysis. Unlike the present study, neither of these studies had a conventional therapy cohort group to compare to the TCVM treated animals. Findings from the studies, demonstrated resolution of pain and improved mobility in dogs exhibiting neurological deficits, similar to the present study.

The 2015 study evaluated 19 cases and compared dry needle AP to EAP treatments (15/19 received CHM also) and were unable to establish a clear therapeutic difference between the two. The authors concluded a larger study was needed and recognized that the more severe cases with longer duration of disease had been treated with EAP making comparison in a small study inconclusive.[4] The 1985 study evaluated 32 cases that had received DNAP only for treatment of cervical disease. Overall, the total number of completely recovered subjects was 22 out 32 (69%), with an average recovery time of about 2 weeks.[21] This recovery rate was smaller compared to the present study, where the complete recovery rate from neck pain in the TCVM group was 93% (i.e. 27 out of 29 with neck pain had no pain after the TCVM treatments). Differences between the present study and Janssens's study were the addition of Chinese herbal medicine formulas and EAP which suggests these 2 factors may improve clinical outcomes.

There are increasing numbers of reports supporting the therapeutic benefits of EAP treatment for spinal cord injury and shedding light on mechanisms of action. It has been shown that EAP reduces inflammation and increases blood supply to the spinal cord by applying a continuous flow and high amplitude stimulus to acupoints.[16] Increasing spinal opioid release, serotonin and adenosine has also been associated with EAP treatment which translates into improved pain relief.[16,27] According to Yen et al, mouse models have reliably shown EAP attenuates inflammatory pain. The group has newly identified a heat activated ion channel (subfamily V, member 1/TRPV1) which is found in all parts of the nervous system when inflammation is present. Through their research they have demonstrated that the use of EAP significantly reduces the levels of TRPV1 in the peripheral and central nervous systems and therefore reduces pain.[27] In addition, their group established through a mouse model that the use of EAP at distal acupoints (i.e. LI-4) has marked therapeutic benefits. They concluded these findings are relevant for the evaluation and treatment of clinical inflammatory pain syndrome. Finally, in addition to the therapeutic benefits of inflammatory pain modulation of EAP, other groups have reported the use of EAP stimulates the release of substance P which acts via neurokinin-1 receptors, promotes the proliferation of neural cells and is associated with regulation of neurogenetics.[28,29]

Similar to the findings of the present study, a recent 2021 literature review (226 dogs) of the clinical relevance of EAP/TCVM in dogs with spinal cord injury concluded EAP provided better analgesia than DNAP by increasing spinal opioid release and increased blood supply to the nerve roots and spinal cord.[16] The authors noted that combining Eastern with Western treatment offered faster recovery with improved pain control and better mobility than medical treatment alone and that EAP application,

combined with CHM, was an excellent therapeutic approach for postoperative care of patients with traumatic spinal cord injury.[16]

Limitations to the current study include a smaller control group than optimal and the common challenges faced with a retrospective approach. The lack of blinding, medical records quality, potential for bias with retrospective clinical sign scoring, potential for bias in treatments that are not randomized or prospective, and variation in diagnostics (imaging confirmation of lesions) are all considerations that impact study results. This research, however, offers encouraging information on the potential of using TCVM, in particular EAP and CHM, for treating cervical pain in dogs. More studies, especially prospective, randomized, controlled blinded trials are indicated in this area to confirm TCVM treatment efficacy for CDD in dogs.

In conclusion, 100% of the TCVM treated cases in this retrospective study had significantly improved clinical signs (neck pain, neurological deficits, cervical stiffness, range of motion, front limb lameness) and the overall improvement score was significantly greater in the TCVM Group ($p$ = 0.00004) when compared to conventional therapy. Study findings suggest that acupuncture and Chinese herbal medicine can benefit dogs with neck pain and/or CDD, with the added benefit that these therapies may have fewer side effects when compared to conventional pharmaceuticals.

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**FOOTNOTES**

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

[b] Jing Mei JM-3A, Wuxi Jiajian Medical Instrument Co, Ltd, Wuxi, China

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

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**Appendix 1**

**Information Sheet Sent to Veterinarians for Enrollment of Study Dogs**

**Dog Signalment:** Sex _____, Age _____, Breed _____, Weight _____

Total number of treatments _____ and frequency _____
Any imaging? _____
Any laser or chiropractic treatment? _____
Acute _____ or Chronic _____

| | **Date First Treatment** | **Date Last Treatment** |
|---|---|---|
| **Neck pain**<br>0 = no pain<br>1 = mild<br>2 = moderate<br>3 = severe | | |
| **Neurological classification**<br>Grade 0 - no ataxia,<br>Grade 1 - ataxia<br>Grade 2 -severe ataxia<br>Grade 3 - non-ambulatory paraparesis<br>Grade 4 - paralysis, loss of urinary control, deep pain preserved<br>Grade 5 - complete paralysis, no deep pain | | |
| **Lameness**<br>Grade 1 (none) - 5 (severe) | | |
| **Stiffness**<br>0 = none<br>1 = moderate<br>2 = severe | | |
| **Range of Motion**<br>0 = full ROM<br>1 = slightly restricted<br>2 = severely restricted | | |
| **Side effects of pharmaceuticals:**<br>1) GI 2) Clinical Chem 3) Other<br>NSAIDS?<br>Steroids?<br>Other? | | |
| **Side effects herbs/acupuncture:**<br>1) GI 2) Clinical Chem 3) Other<br>Cervical Formula?<br>Double P II?<br>Body Sore?<br>Other? | | |