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Retrospective Studies

Retrospective Study on the Efficacy of Traditional Chinese Veterinary Medicine in Canine Heart Failure: A Case Series of 36 Dogs

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ABSTRACT

This retrospective study aimed to evaluate the efficacy of traditional Chinese veterinary medicine (TCVM) in treating canine heart failure. Thirty-six dogs with heart failure were included based on the following criteria: (1) poor response to Western medicine (WM) after 4 weeks or owners opting for TCVM; (2) treated with TCVM for over 3 months; and (3) had heart ultrasounds before and after TCVM treatment. TCVM treatments included acupuncture and Chinese herbal medicine, tailored to each dog's TCVM pattern diagnosis. Chinese herbs used included *Shen* Calmer, Heart *Qi* Tonic, Breathe Easier B, and *Su Zi Jiang Qi*, aimed at tonifying Heart *Qi*, stopping coughing and calming the *Shen*. Acupuncture points such as BL-15, CV-17, and PC-6 were used to nourish the Heart and alleviate clinical signs like panting and coughing. The outcomes were assessed by improvements in the clinical signs (fatigue, cough, panting, sleep) and ultrasound results [left atrium-to-aorta ratio (LA:Ao ratio), mitral valve regurgitation]. The mean (SD) overall clinical score significantly improved from 6.22 (SD 2.66) pre-treatment to 1.42 (SD 1.70) post-treatment (p=2.9×10^{-11}). The LA:Ao ratio decreased from 1.92 (SD 0.32) to 1.67 (SD 0.22), with 36.1% of dogs achieving normal LA:Ao values (p=9.3×10^{-10}). All individual clinical signs showed statistically significant improvement (p<0.001). These results suggest that TCVM may be a beneficial alternative or rescue therapy for canine heart failure when WM is ineffective. Further studies are needed to confirm these findings.

Keywords: acupuncture, canine heart failure, case series, Chinese herbal medicine, retrospective study, traditional Chinese veterinary medicine

ABBREVIATIONS: ACE inhibitors: angiotensin-converting enzyme inhibitors; BL: Bladder Meridian; CV: Conception Vessel (*Ren Mai*); GV: Governing Vessel (*Du Mai*); LA:Ao ratio: left atrium-to-aorta ratio; LSHF: left-sided heart failure; MV: mitral valve; PC: Pericardium Meridian; RSHF: right-sided heart failure; TCVM: traditional Chinese veterinary medicine; WM: Western medicine

Heart failure in dogs occurs when the heart is unable to pump blood effectively, resulting in insufficient oxygenation of tissues and fluid buildup in various organs. The condition is commonly categorized into left-sided heart failure (LSHF) and right-sided heart failure (RSHF), each presenting distinct clinical signs.[1,2] In LSHF, the failure of the left ventricle causes blood to back up into the lungs, leading to clinical signs such as coughing, exercise intolerance, and respiratory distress. Echocardiographic findings often include an increased left atrium-to-aorta ratio (LA:Ao ratio >1.6) and mitral valve regurgitation. Western medicine (WM) treatment typically involves diuretics, such as furosemide, and angiotensin-converting enzyme (ACE) inhibitors such as enalapril. These work to decrease pre-load to reduce clinical signs associated with edema and to decrease the workload of the heart. Positive inotropes, such as pimobendan, may also be used to improve cardiac contractility when indicated.[3-6] Right-sided heart failure, on the other hand, results from failure of the right ventricle, causing blood to back up into the systemic circulation. Common clinical signs include ascites (abdominal fluid accumulation), jugular vein distension, hepatomegaly, and peripheral edema. Echocardiography in RSHF may reveal right atrial and ventricular enlargement, tricuspid valve regurgitation, and a dilated caudal vena cava. Similarly, WM treatment for RSHF includes diuretics to manage ascites, ACE inhibitors to lower systemic resistance, and spironolactone for additional fluid management. Pimobendan is also commonly used to improve right ventricular function and reduce resistance.[6,7]

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Both types of heart failure require early diagnosis and management to improve the quality of life in affected dogs. Dietary adjustments, exercise restrictions, and regular monitoring via ultrasound are essential parts of managing heart failure. Ultrasound findings, such as changes in heart chamber size and presence of valve regurgitation, provide critical information for tailoring the treatment plan. In severe cases, medications such as beta-blockers or calcium channel blockers may be added to manage heart rate and rhythm abnormalities.[8-12]

To the best of the authors' knowledge, no studies evaluating TCVM's treatment effects for heart failure in dogs have been reported. The objective of this retrospective study was to explore the efficacy of TCVM when treating this canine patient population through clinical observations of 36 cases. The hypothesis was that TCVM treatments can reduce clinical signs and improve cardiac function in dogs diagnosed with heart failure.

MATERIALS AND METHODS

Study Population

The subjects included in this retrospective study consisted of canine patients with heart failure conditions admitted at the He Mei Pet Hospital (Chongqing, China) from June 1, 2019, to September 20, 2023. Based on review of each patient's clinical record, those that met the following criteria were included in the study: (1) diagnosed with heart failure; (2) did not respond to WM after at least 4 weeks of treatment or responded to WM treatments initially but improvement did not persist; or the owner chose to pursue TCVM treatment rather than WM; (3) underwent TCVM treatment (acupuncture, Chinese herbal medicine therapy) for at least three months; and (4) had cardiac ultrasounds taken before and after the TCVM treatment period. Dogs that were non-compliant with the treatment protocol or had incomplete records were excluded.

Data Collected from Medical Records

Data extracted from the medical records for each patient in this study included the subject's signalment (sex, age, breed, body weight, and neutering status), presenting clinical signs (fatigue, cough, panting, and sleep quality as reported by the owner or observed during physical examination), and cardiac ultrasound findings (e.g. left atrium-to-aorta ratio, mitral valve regurgitation, and right-sided heart changes). Additionally, the treatments provided were documented, including TCVM modalities such as acupuncture (e.g. *An-shen*, BL-15, CV-17, PC-6, GV-14, *Ding-chuan* and CV-22), Chinese herbal medicines (e.g. *Shen* Calmer[a], Heart *Qi* Tonic[a], Breathe Easier B[a] and *Su Zi Jiang Qi*), and Western medical treatments were also recorded when applicable.

Data and Statistical Analysis

Outcome Data: Each subject's heart failure condition was assessed before receiving TCVM treatment and again after 3-6 months of TCVM treatment. This data, extracted from each patient's record, included client reported clinical symptoms, physical examination, and cardiac ultrasound measurements. The clinical signs included fatigue, cough, panting, and sleep quality, where each was assigned to a score: 0=normal, 1=mild, or 2=severe. Cardiac ultrasound measurements included: (1) LA:Ao ratio, a positive numerical data where below 1.6 was considered normal; (2) mitral valve (MV) regurgitation, 0=normal, 1=mild, or 2=severe; and (3) right-sided heart changes, 0=no change, 1=mild, or 2=severe. The numerical LA:Ao ratio was analyzed separately. All categorical scores (including the 2 from ultrasound) were combined as the overall clinical score.

Statistical Analysis: The primary study hypothesis was that patients would show improvement after TCVM treatment when pre-treatment and post-treatment overall clinical score and the LA:Ao ratio were compared. The Wilcoxon signed-rank test was used to test the hypothesis. Assuming the mean improvement of the outcome data is ½ of the sample standard deviation, a sample size of at least 35 subjects was required to have an 80% power to conclude a significant improvement with a significance level of 0.05. For the secondary analysis, the McNemar's Chi-squared test was also applied to assess the change of each categorical data. For example, to assess how the proportion of study dogs' fatigue condition changed from before to after the TCVM treatments. A p-value < 0.05 was considered statistically significant.

RESULTS

This study enrolled a total of 36 canine patients with heart failure whose clinical records met the inclusion criteria. Among the subjects, 15 (41.7%) were female (all spayed) and 21 (58.3%) were male (all but 1 neutered), suggesting that the group was not dominated by either sex (p=0.405, exact binomial test). The group mean (SD) age and body weight were 10.0 (SD 3.7) years old and 7.0 (SD 8.5) kg, respectively. The group consisted of 10 breeds, including Yorkshire Terrier (4, 3 mixed), Bichon (6), Chihuahua (2), Golden Retriever (2), Japanese Shiba Inu (2), Poodle (13, 3 mixed), Old English Sheepdog (1), Pomeranian (4), Schnauzer (1), and Shetland Sheepdog (1). The reason for the majority of patients undergoing TCVM treatment (33/36=91.7%) was due to a lack of clinical response to conventional/WM treatment. The owners of the remaining 3 patients specifically requested TCVM instead of WM treatment.

Each dog received a personalized TCVM treatment plan based on TCVM pattern diagnosis, where the modalities focused on acupuncture and Chinese herbal medicine. Specific herbal formulas such as *Shen* Calmer[a], Heart *Qi* Tonic[a], Breathe Easier B[a], and *Su Zi Jiang Qi* were frequently used to tonify Heart *Qi* and calm the *Shen*. Acupuncture points including *An-shen*, BL-15, CV-17, PC-6, GV-14, *Ding-chuan*, and CV-22 were commonly selected to nourish the heart and stop panting/cough.

Only 1 subject (2.8%) had a pre-treatment LA:Ao ultrasound value below the normal threshold (i.e. <1.6).

This subject also remained normal after treatment. For the 35 subjects having abnormal values before TCVM treatment (i.e. >1.6), 12 dogs became normal after TCVM treatment. Based on the McNemar's Chi-squared test, the change on the proportion of normal (or abnormal) subjects was statistically significant (p=0.0015). On the comparison of values, the mean was 1.92 (SD 0.32) before the TCVM treatments and was reduced to 1.67 (SD 0.22) after the treatment (Figure 1). Based on the Wilcoxon signed rank test, the reduction on a subject's ultrasound LA:Ao values was statistically significant (p=9.3×10^{-10}).

Alterations of MV regurgitation and right-side heart changes for individuals at the end of the treatment period were examined. Before treatment, 7 subjects had no MV regurgitation issues, and the others had either mild (21) or severe problems (8). After the treatment period, the 7 unaffected dogs remained without issues, 15 of the 21 with mild issues improved to no issues and the others still had mild issues. All 8 dogs with severe issues before the treatment period remained static (Table 1). The change in the proportion of MV regurgitation improvement was statistically significant (p=3.0×10^{-4}).

The majority of the subjects (33/36=91.7%) in the study had left-side heart changes. There were, however, 3 dogs that had right-side changes with 2 demonstrating mild changes and 1 with severe right-side heart changes before treatment. Right-sided changes (e.g. right atrial enlargement, right ventricular enlargement, tricuspid valve regurgitation) were not separated further due to the small number of dogs with this change in the study. These dogs remained static post-treatment with 2 still demonstrating mild changes and the 1 dog with severe disease unchanged. The change after treatment was not statistically significant (p=1.000).

Changes in clinical signs (fatigue, cough, panting, sleep disturbance) for individuals at the end of the treatment period were also examined. Before treatment, 11 subjects had no signs of fatigue, 20 had mild signs, and the remaining 5 had severe signs. After the study treatment period, the 11 normal dogs remained normal and all those with mild or severe fatigue signs had complete resolution, which was statistically significant (p=1.6×10^{-6}). For coughing, only 4 subjects had no sign of a cough before treatment, while 6 had mild signs, and the remaining 26 had severe signs. After the treatment period, the 4 dogs without a cough remained normal, while the 6 with mild signs had complete resolution. Nineteen of the severely affected subjects had complete resolution, while the remaining 7 improved to mild signs of coughing (p=5.2×10^{-7}). There were only 3 study dogs without any signs of increased panting before treatment. There were 12 dogs with mild signs and 21 dogs with severe panting. After the treatment period, the 3 dogs with no panting increase remained unaffected, 11 of the 12 dogs with mild signs showed complete resolution with 1 continuing to have mildly increased panting. Six of the 21 severely affected subjects had complete resolution and the remaining 15 had mildly increased panting (p=5.2×10^{-7}). Clinical signs of sleep disturbances were observed in 9 dogs (mild) and as severe in 16 dogs; while 11 dogs were unaffected. After the treatment period, the 11 dogs without sleep disturbances continued to have no problems, while those with mild signs had complete resolution. Twelve of the 16 severely affected dogs had complete resolution while the remaining 4 still had mild sleep disturbances (p=1.5×10^{-5}), (Table 1).

A mean overall clinical score was calculated for the clinical signs. Before treatment, the mean (SD) overall clinical score among the 36 subjects was 6.22 (SD 2.66), which was reduced to 1.42 (SD 1.70) when assessed after treatment (Figure 1). Based on the Wilcoxon signed rank test, the reduction of a subject's overall clinical score was statistically significant (p=2.9×10^{-11}).

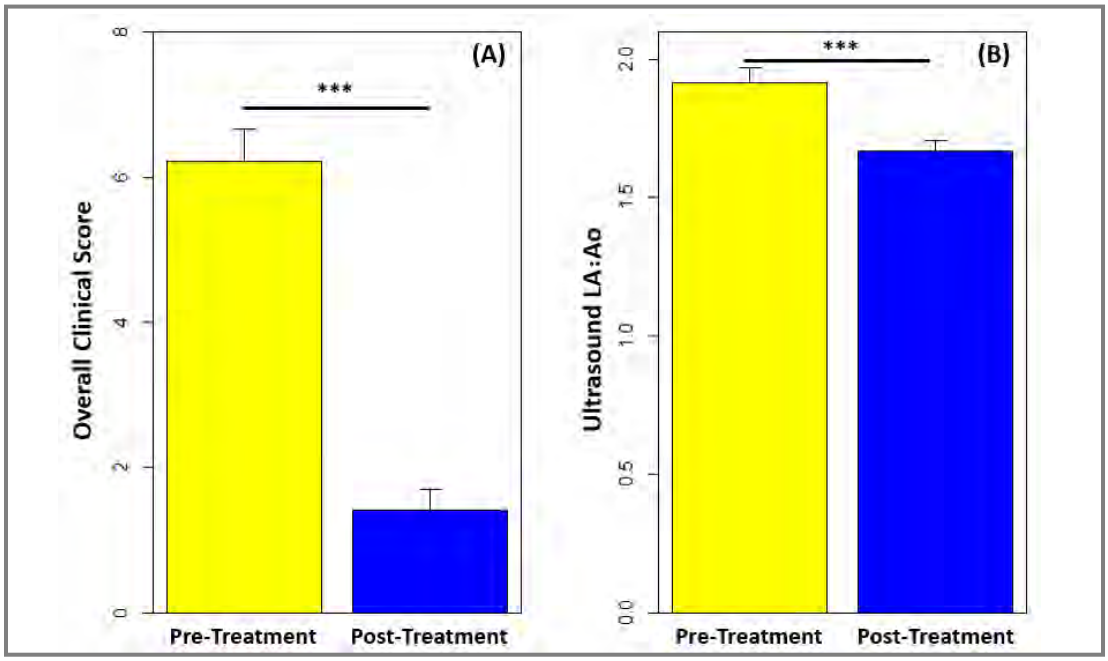

Figure 1: Pre- and post-treatment mean (+SE) on overall clinical score (A) and ultrasound LA:Ao value (B). *** p<0.001

Table 1: Change in clinical signs before and after TCVM treatment with *p*-value

Clinical Signs	Pre-treatment			Post-treatment			*p*-value
	Normal	Mild	Severe	Normal	Mild	Severe	
MV Regurgitation	7	21	8	22	6	8	3.0×10^{-4}
Fatigue	11	20	5	36	0	0	1.6×10^{-6}
Cough	4	6	26	29	7	0	5.2×10^{-7}
Increased Panting	3	12	21	20	16	0	5.2×10^{-7}
Sleep Disturbance	11	9	16	32	4	0	1.5×10^{-5}

DISCUSSION

This retrospective study evaluated the efficacy of TCVM in managing heart failure in 36 dogs that either failed to respond to conventional treatment (33/36), or whose owners preferentially selected TCVM treatment (3/36). The treatment outcome was evaluated based on the improvement of clinical signs (fatigue, cough, panting, sleep quality) and the change of ultrasound outputs (LA:Ao ratio, mitral valve regurgitation). A significant improvement in mean (SD) overall clinical score was observed for study dogs, along with statistically significant improvement in all individual clinical signs. The LA:Ao ratio decreased significantly ($p=9.3\times10^{-10}$) with 36.1% of dogs reaching normal LA:Ao values. Improvement of mitral valve regurgitation also demonstrated statistically significant results ($p=3.0\times10^{-4}$). These findings support the study hypothesis that TCVM treatments can reduce clinical signs and improve cardiac function in dogs diagnosed with heart failure.

In veterinary medicine, previous studies on TCVM have primarily focused on conditions such as musculoskeletal disorders and chronic kidney disease, with promising results. While only limited studies on TCVM in veterinary cardiology exist, several parallels can be drawn from traditional Chinese medicine (TCM) research in human heart failure.[13] A systematic review of clinical studies assessed the available evidence from randomized controlled trials (RCTs) on the use of acupuncture for the treatment of heart failure.[14] The review found that while some studies showed potential benefits of acupuncture in improving certain outcomes such as hospital stay, readmission rates, and cardiac function, the overall evidence was inconclusive due to methodological limitations of the included studies. The authors concluded that further large and rigorous clinical trials were needed to establish the clinical utility of acupuncture as a therapy for heart failure.[15]

Studies on both human and veterinary subjects have demonstrated that TCVM modalities can improve cardiac function (e.g. heart rate, left ventricular function) and clinical signs associated with heart failure, such as coughing and respiratory distress.[13,15-17] Evidence supports improved cardiac function and symptom reduction by acupuncture through modulating the autonomic nervous system by enhancing parasympathetic tone and reducing sympathetic overdrive, a common feature in heart failure patients.[18] By stimulating specific acupoints, acupuncture may help stabilize heart rate variability and improve cardiac function. Moreover, acupuncture's anti-inflammatory effects, mediated by the release of endogenous opioids and cytokine modulation, could play a role in reducing the inflammatory burden associated with heart failure.[19] The findings from this study are consistent with these studies suggesting that TCVM treatment using acupuncture and herbal medicine formulas contributed to reducing panting, improving exercise tolerance and improved sleep quality in study dogs with heart failure.

Similarly, TCVM herbal medicine often combines multiple herbs with synergistic properties, targeting both the underlying energetic imbalances and physiological dysfunctions. Many herbs used in TCVM for heart failure contain bioactive compounds that improve myocardial contractility, reduce oxidative stress, and promote diuresis.[13,14,20] The use of herbs, such as *Dan Shen* (Salvia) and *Huang Qi* (Astragalus), has been shown to improve cardiac function and reduce inflammatory markers, which are often associated with heart failure progression.[21] The findings in the present study, which highlight improvements in clinical signs and quality of life, are consistent with these mechanisms. They suggest that TCVM therapies not only address symptomatic relief but also influence the underlying pathophysiology of heart failure. The exact pathways through which TCVM achieves these effects, however, remain an area of active investigation, necessitating further research to confirm and expand on these findings.

While this study supports the hypothesis that TCVM interventions, including acupuncture and herbal medicine therapies, may provide symptom relief and improve quality of life in affected animals, there are several findings that warrant further discussion due to their unique implications. First, while significant improvements were observed in clinical signs such as fatigue, coughing, and panting, as well as reductions in LA:Ao ratios, the lack of improvement of right-sided heart changes among the three affected dogs was notable. Future research could investigate whether modifications to acupuncture points or herbal medicine formulas might yield better outcomes for right-sided heart failure. Another point of interest was the variation in response to mitral valve regurgitation. While dogs with mild regurgitation showed improvement, those with severe regurgitation remained static. This might indicate that TCVM's efficacy diminishes in cases of advanced

structural heart changes, suggesting a need for early intervention or integrative approaches combining TCVM with Western medicine for severe cases. Finally, owner-reported improvements in quality of life, such as better sleep and reduced anxiety, align with TCVM's holistic approach but highlight the subjective nature of these assessments. The positive trends emphasize the potential value of TCVM in addressing overall well-being, yet they underscore the need for objective measures in future studies to validate these observations.

This study has limitations that should be acknowledged. It is subject to biases commonly associated with retrospective studies, including selection bias, recall bias, difficulty establishing causality, potential for missing data, confounding variables, and challenges in accurately assessing temporal relationships. These issues arise because the data was not collected specifically to address the research question, which limits the strength of the conclusions. Additionally, the sample size is relatively small, comprising only 36 cases, with the majority (33 out of 36) involving left-sided heart failure and only 3 cases exhibiting right-sided heart changes, indicating a need for further research focused on right-sided heart failure to provide a more comprehensive understanding. Owner compliance and the subjective nature of reporting clinical signs may have influenced the assessment of outcome measures, particularly regarding quality of life improvements. The absence of a control group is a significant limitation, preventing definitive conclusions about the clinical efficacy of traditional Chinese veterinary medicine as a treatment for canine heart failure. Furthermore, the lack of long-term follow-up data limits understanding of the sustainability of treatment outcomes. Future studies with larger sample sizes, inclusion of control groups, attention to both left- and right-sided heart failure, and long-term follow-up are essential to validate and expand upon these findings.

Despite its limitations, this retrospective study provides evidence that TCVM may serve as an effective complementary or alternative therapy for managing canine heart failure, particularly in situations where conventional Western treatments are not viable. The findings of this study are consistent with previous research indicating that acupuncture and herbal medicine treatments can modulate autonomic nervous system balance, reduce systemic inflammation, and enhance cardiac output in heart failure cases. To substantiate these findings, future research should prioritize controlled clinical trials and delve deeper into the mechanisms by which TCVM influences cardiac health as these therapies show potential in alleviating clinical signs, slowing disease progression, and improving cardiac function.

In summary, the significant improvements observed in clinical signs exhibited by the patients in this study suggest that TCVM may enhance cardiac function and improve the quality of life for affected dogs. These findings support the integration of TCVM into veterinary cardiology, emphasizing its role in providing holistic, patient-centered care and addresses not only the physical symptoms but also the underlying imbalances, promoting long-term well-being. As TCVM therapies, including acupuncture and herbal medicine, are well-tolerated and cost-effective, they represent a practical alternative or adjunct to traditional treatments. Moving forward, more rigorous studies, including larger-scale randomized controlled trials, are essential to better understand TCVM's mechanisms and validate its role in canine cardiology. Future research should also explore the long-term effects of TCVM, its impact on right-sided heart failure, and its potential synergy with Western veterinary practices for more comprehensive treatment strategies.

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FOOTNOTES

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

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