Efficacy of Pulsed Electromagnetic Field Therapy for Treatment of Canine Osteoarthritis

Aimee M. Krebsbach[a], Peter H. Eeg[b]
[a] Caerus Corp, Arden Hills, MN 55112, USA
[b] Poolesville Veterinary Clinic, Poolesville, MD 20837, USA

ABSTRACT

Canine osteoarthritis affects nearly one in four dogs and cats, causing joint pain and lameness to varying degrees of loss of function. Standard drug therapy for this disease comes at the cost of potential side effects and requires routine metabolic blood panels to continue medications long term. Pulsed electromagnetic fields are emerging as a drug-free pain relief therapy alternative or adjunct for various treatment protocols. This collective case study examined their effectiveness in the form of the EMbrace Relief System for canine osteoarthritis application. It was found that the device effectively reduced pain and symptoms of osteoarthritis in the study group over time based on data collected. This study shows promising results supporting the use of pulsed electromagnetic fields for canine osteoarthritis treatment.

INTRODUCTION

Canine osteoarthritis (OA) is a chronic degenerative disease which causes joint pain, stiffness, swelling, and progressive weakness. These signs are a result of cartilage damage, osteophytes, and capsular swelling, leading to deterioration of function. OA affects approximately 20% of the adult canine population, with older dogs and large breeds being at an even higher risk.[1] The common canine ailment, hip dysplasia, is also a sequela of OA and affects 16% of canines in the United States.[2] Traditional therapy for OA is dominated by pharmaceuticals, specifically non-steroidal anti-inflammatory drugs (NSAIDS) and, to a lesser extent, steroids. These varieties of drug treatment are accompanied by a host of potential side effects including ulceration, vomiting, abdominal pain, weight gain, osteoporosis, high blood sugar, cataracts, suppressed immune system, fluid retention, liver and kidney disease, increased risk of heart disease, aseptic necrosis, and decreased production of collagen causing further cartilage degradation over time.[1] Due to these staggering possible side effects, alternative therapies are emerging for the treatment of OA. Pulsed electromagnetic field (PEMF) therapy is one such approach which uses low frequency pulsed electromagnetic fields to restore cellular potential, activate endorphins, and increase blood and lymph flow, thereby relieving pain and inflammation. PEMF has been proven effective in human applications and has begun to gain prominence in veterinary use as well.[3] This study investigates the efficacy of the EMbrace Relief System by Caerus Corp, a PEMF therapy device which is worn as a garment with attachable PEMF delivery units to target regions where canine OA is most common: the hips, back, and shoulders.[4] Over the course of 5 weeks, participants were monitored in a collective case study to assess the effectiveness of PEMF in aiding canine OA.

METHODS

STUDY DESIGN

The present study was conducted using a single-center, prospective, observational, collective case design. The study followed 8 canine participants over the course of 5 weeks. Each participant used the device according to veterinary advised usage practices throughout the duration of the study. Canine owners observed participant

behavior over the course of the 5 weeks with weekly data collection. Data consisted of an owner's assessment of the participant's state using the Helsinki Chronic Pain Index (HCPI) and Canine Brief Pain Inventory (CBPI).

PARTICIPANTS

8 participants were included in the study. Weight ranged from 34 to 159 pounds with a mean of 67.6 pounds. Ages ranged from 6 to 16 years with a mean of 12.8 years. Of the participants, 5 were male and 3 were female. As this study was not of experimental design, outside variables related to health were present. Participants experienced a variety of conditions and therapies throughout the course of the study which were documented but not considered upon analysis and interpretation of study results. As a control, no new or additional therapies were initiated and all current therapies remained the same in study patients for the duration of the study.

HELSINKI CHRONIC PAIN INDEX

The HCPI is a scoring system proven in 2009 to be a valid, reliable, and responsive tool for assessment of response to treatment in dogs with OA.[5] The index consists of 11 items based on a simple descriptive scale for demeanor, behavior, and locomotion and a visual analog scale for pain and locomotion.[6] Items include: attitude and/or mood, willingness to participate in play or interact, frequency in vocalization or discomfort behavior, eagerness to walk, ability and/or willingness to walk up and/or down stairs, ability and/or willingness to run, ability and/or willingness to jump, ease in lying down, ease in rising from a down position, ease of movement after a long rest, and ease of movement during and/or after exercise/walks. Each item has a scoring scale from 0 to 4, where 0 represents the least pain (i.e. very willing, very eager, etc.) and 4 represents the most pain (i.e. does not jump at all, very difficult, etc.). Canine owners recorded scores based on observation of participant weekly for 5 weeks.

CANINE BRIEF PAIN INVENTORY

The CBPI is a scoring system proven in 2007 to obtain quantifiable assessments regarding the severity and impact of chronic pain and treatment for dogs with osteoarthritis.[7,8] The inventory consists of 11 items involving pain severity, pain interference with function, and quality of life. [6] Items include worst pain in last 7 days, least pain in last 7 days, average pain in last 7 days, current pain, general activity, enjoyment of life, ability to rise to standing from lying down, ability to walk, ability to run, ability to climb, and overall impression. Items are scored on a scale of 0 to 10 where 0 represents no pain or interference and 10 represents severe pain or complete interference. Canine owners recorded scores based on observation of participant weekly for 5 weeks.

ANALYSIS

Data from all participants was gathered, randomized, and grouped by scoring system. To investigate the primary outcome of group improvement over time, all scores from each scoring system were grouped for each week. A paired sample t-test was conducted to compare means of these groups from baseline and endpoint as well as week to week progression. A one-tailed p-value of <0.01 indicates significant difference in group means. Item 11 of the CBPI, "overall impression", was excluded from analysis, as its ranking scale is opposite that of all other items. For analysis of the secondary outcome, individual improvement over time, scores for each participant

were grouped by week and scoring system. A paired sample t-test was conducted to compare means of each participant from baseline and endpoint for both scoring systems. One participant's data was omitted from analysis due to death during study caused by outside health conditions.

RESULTS

As a group, significant improvement of scores was seen for both scoring systems. The HCPI scoring group means significantly improved from baseline (week 1) to week 2, week 2 to week 3, week 3 to week 4, and baseline to endpoint (week 5). The CBPI scoring group means significantly improved from baseline to week 2, week 2 to week 3, week 3 to week 4, week 4 to endpoint, and baseline to endpoint. These primary outcome results can be seen in Figure 1 below. The secondary outcome, individual improvement over time, also saw promising results. It was found that 3 participants had significantly improved scores for both scoring systems from baseline to endpoint, 3 participants had significantly improved scores for one of the scoring systems, and only 1 participant did not have a significantly improved score for either scoring system ($p < 0.01$).

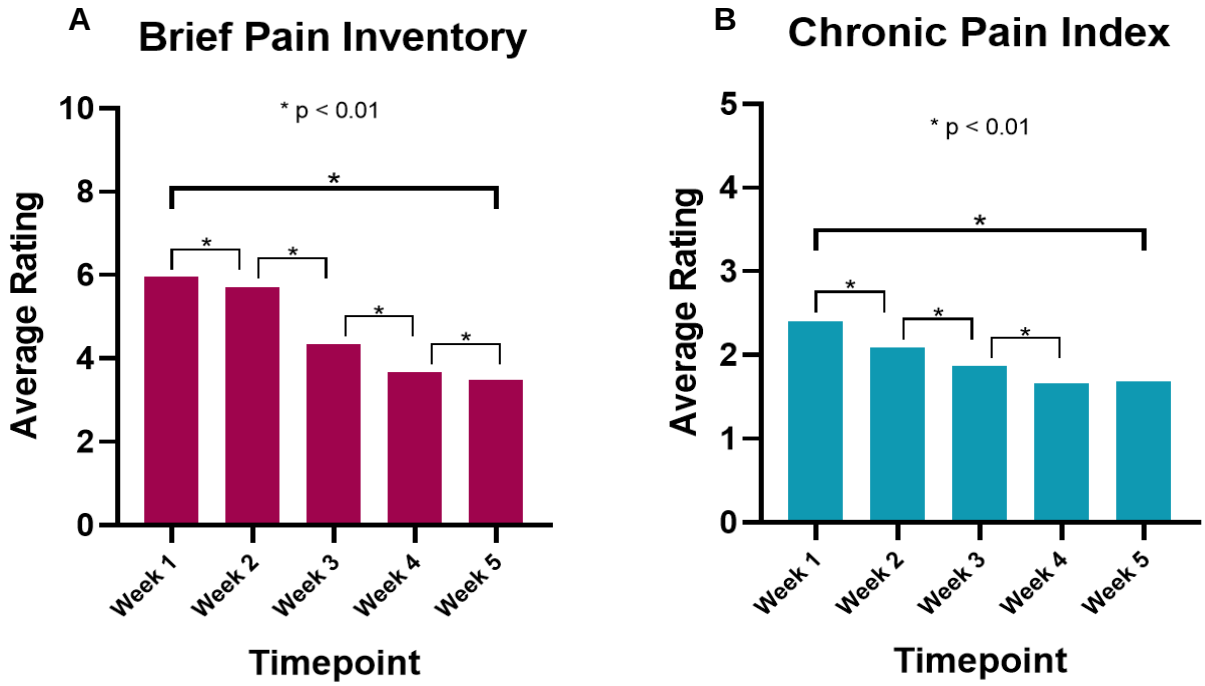

Figure 1: Mean scores over time from baseline to endpoint for CBPI (A) and HCPI (B). *(* indicates $p < 0.01$)*

DISCUSSION

Based on the progression of significantly reduced mean scores over the 5 week study duration, it can be understood that improvement was seen over time in the participant group as a whole based on both measurement systems. The measurement systems at hand have been proven valid for assessment of OA related pain reduction and treatment response, and therefore it can be determined that the device was found to be effective in treating OA in the study group. Limitations did exist in this study. As discussed, outside health-related variables were neglected upon analysis due to the nature of the study design. Additionally, the quantitative data was based on observational and subjective reporting. Finally, data reporting was limited to the items contained in the measurement systems and number of participants. While these variables are important

to note, the robust and consistent significance of all data pertaining to both the primary and secondary outcomes supports the result that Caerus Corp's EMbrace Relief System is effective in treating pain and major signs related to canine OA. These results show promising evidence for application of PEMF as a safe, effective, and drug-free veterinary therapy.

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