

Using Physiotherapy to successfully manage Chronic Atrophic Hind Limb Lameness in the Beagle Dog.

A Case Study.

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Case

This presentation concerns a purpose bred juvenile female Beagle dog presenting with unilateral hindlimb muscular atrophy and lameness since arrival at a research establishment.

Background

Transient lameness in Beagle dogs is a familiar case in the research environment and can be easily treated with short term rest and medication however, chronic lameness resulting from a malformation or injury is much rarer and more challenging to treat.

Management of the chronic condition represents a scientific and ethical challenge; the animal's welfare and lifetime experience have to be considered when determining the suitability of a treatment plan and its impacts on any cumulative severity, against the option of euthanasia as the best case for the animal.

Consideration should also be given to the implications of premature removal or replacement of that animal on study (3R's), and the impact that it may have on the sample size, scientific outcome and the welfare of the other animals on study.

Objective

A plan of action was prepared to test the hypothesis that a physiotherapy plan could be used successfully to improve welfare and quality of life of a Beagle dog presenting with chronic injury-related atrophy and lameness, thereby enabling its use in a scientific study, as authorised by the Animals (Scientific Procedures) Act 1986, and avoid the requirement for premature euthanasia.

Methodology

A female juvenile Beagle dog, aged 10 months old, weighing 5.9kg, body score of 3/5, intended for use on a 13-week inhalation toxicity study for regulatory submission, presented after delivery with right hindlimb lameness with associated lateral lift during gait, and advanced muscular atrophy of the affected limb. A series of diagnostic digital radiographs were conducted under general anaesthesia in-house (Cuattro Slate 6 Veterinary Digital X-ray) and radiographic evaluation revealed a small area of higher ossific density on the right femoral neck.

It was hypothesized that both the atrophy and lameness were resultant of a historic injury, or congenital malformation, and that management of the current condition could be achieved to a satisfactory level, with a physiotherapy treatment plan to improve the animal's welfare and as an alternative to euthanasia and potential use of another dog. Referencing techniques used in veterinary and human clinical practice, we devised a treatment plan using a mixture of passive and physical exercise methods that we thought were achievable and appropriate.

We applied techniques on a daily basis (minimum of five of seven days per week) for a period of thirteen weeks (until end of study), starting with the easier tasks, then slowly introducing the more challenging tasks (Balance Therapy, Cavalletti). Challenge progression was driven by the patient's successful achievement of the foundation tasks. The patient demonstrated a strong desire for human contact time, which allowed us to utilise that as a reward for execution of the tasks. We introduced cardboard tubes for retrieval play during latter-stage cavalletti training, which proved successful.

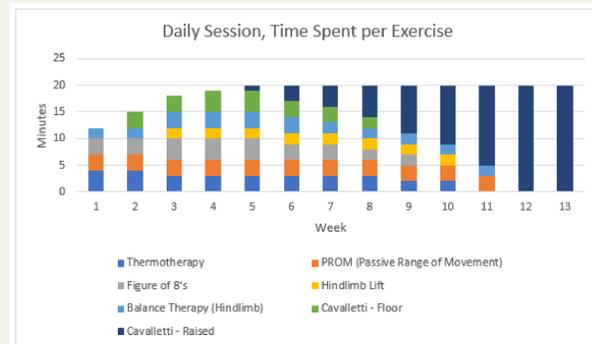
- Thermotherapy – using a heated oat bag for pain management, circulatory improvement;
- Passive Range of Movement (PROM) – assisted exercises to improve integrity, range and function of joint and limb, and proprioception. Performed in lateral recumbency;
- Figure of 8s (+/- stepover) on lead – improve joint flexion, proprioception, core and spinal flexibility;
- Hindlimb lift – lift contralateral limb to encourage short-term use of affected limb;
- Balance Therapy – encourage use of hindlimbs by having forefeet on a raised surface, improve core muscle strength, muscle mass, proprioception;
- Cavalletti – escalating in height/number through time. Encourages enthusiasm for treatment sessions. Improvements driven through gradually increasing the intensity of physical challenge (pace/height/ordination).



Cavalletti – raised 15th August 2019



Charted below are the breakdowns of the time per day spent per exercise, across the individual week. It depicts the progression from the basic exercises to more demanding plyometric exercise and the transition from floor-based cavalletti to the raised cavalletti, highlighting the improvement in functional movement and limb use.



Shown below are photos taken at sequential timepoints, depicting progression through the treatment plan. Muscle bulk can be observed to increase as the timepoints progress.

Physiotherapy treatment commenced on the 20th May 2019.



2 weeks pre-treatment.
6th May 2019



Week 9.
16th July 2019



Week 11.
2nd August 2019



Week 13.
15th August 2019



Cavalletti – raised
15th August 2019

Discussion

It is the aim of physiotherapy to promote mobility and to alleviate impairments. There are three main groups of treatments that can be implemented to do so; hands on therapies, physiotherapeutic modalities and therapeutic exercises. Despite the lack of directly relevant evidence in support of these techniques, it is widely accepted that managing chronic pain using a physiotherapeutic approach is beneficial and can significantly improve mobility in most patients in both the short and long term (Fox and Mills, 2010; Millis, 2014). Improvements in proprioception, joint ROM (Range of Movement) and health, muscular strength and function can be accomplished by implementing a patient-specific strengthening and exercise regime (McGowan & Goff, 2007).

A successful regime, such as the one designed, for strengthening hip muscles in the dog must include at least some controlled aerobic exercise (e.g. figure of 8s, cavalletti) and some targeted exercises designed to improve strength and joint ROM (Edge-Hughes 2007; Starr, 2013). In the early stages, and throughout, the patient will also benefit from thermotherapy, the therapeutic effects of heat include promoting increased blood flow; reducing joint stiffness, associated pains and/or muscle spasm; reducing inflammation and oedema, and it aids in the post acute phase of healing (Prentice and Arnheim, 2008). Application of heat treatment to collagenous tissue permits an increase in extensibility through stretch-based exercises. Plyometric exercise is used by athletes to enhance performance and as a form of physiotherapeutic exercise used to improve muscle performance once significant healing and recovery of basic daily use has taken place. We used cavalletti for this purpose, the benefits gained through this exercise are core strengthening, improved strength and ROM in limbs, spinal flexibility, proprioception and associated improvements to balance and coordination (Sayers, 2018; Towson 2016).

Discussion cont.

It can be used to improve muscle mass and joint strength, proprioception and neuromuscular efficiency, and with the aim to correct any core imbalance acquired through previously limited use of the limb. Progress was patient-led but the physical challenge was gradually intensified as physical capabilities improved. There should be no evidence of pain before, during or after exercise. Our results demonstrated a credible improvement in muscle mass gained on the affected limb and in overall improved locomotion. We observed growing enthusiasm in the patient's approach to physical exercise and reduced avoidance of affected limb use. When considering the evidence and observations, it is reasonable to conclude that the life of the patient was improved as a result of the treatment and extended in the absence of euthanasia.

From a practical perspective, this simple treatment plan was relatively low maintenance to manage, requiring only 15-30 minutes of the working day to set up, implement and pack down, and only 1 member of staff at any time.

When considering the principles of the 3Rs, Replace, Reduce, Refine, we can see the application of these pillars within this case. As well as refining the experience for the patient the physiotherapy plan allowed us to refine the experience of all animals on the study; by enabling the use of the patient and avoiding acquisition of an additional animal we avoided scheduling delays.

Conclusion

This clinical case study demonstrates that 10-20 minutes a day of progressively active physiotherapy treatment, under an ascending challenge plan, can facilitate reversal of severe leg muscle atrophy, improve joint mobility and limb use, in the laboratory Beagle dog. This can be achieved within a relatively short period of time provided that the dog is compliant and its interest in the treatment structure is maintained. Achievements may vary depending on origin and severity of injury however the exercises listed can be used interchangeably depending on the patient and over a variable period of time.

Implementation of such a simple treatment plan could be used across the Industry, where indicated, in order to reduce individual suffering and to reduce the requirement for use of replacement animals.

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