

62th The International Spinal Cord Society Annual Scientific Meeting

Influence of spinal shock on the neurorehabilitation of contusive spinal cord injury dogs



Déborá Gouveia ^{1,2,3}, Ana Cardoso ^{2,3}, Carla Carvalho ², Marina Moisés ², Óscar Gamboa ⁴, Rute Canejo-Teixeira ¹, António Ferreira ⁴ and Ângela Martins ^{1,2,3}

¹ Faculdade de Medicina Veterinária – Universidade Lusófona de Humanidades e Tecnologia (FMV-ULHT), Lisboa, Portugal;

² Escola Superior de Saúde, Proteção e Bem Estar Animal – IPLUSO, Lisboa, Portugal

³ Centro de Reabilitação Animal da Arrábida (CRAA), Vila Nogueira de Azeitão, Portugal; Hospital Veterinário da Arrábida (HVA), Vila Nogueira de Azeitão, Portugal;

⁴ Faculdade de Medicina Veterinária – Universidade de Lisboa (FMV-UL), Lisboa, Portugal;

INTRODUCTION

Acute noncompressive nucleus pulposus extrusion (ANNPE) is related to severe contusive spinal cord injuries in dogs. Usually has a characteristic peracute onset of clinical signs following trauma with non-progressive signs but in some cases with permanent presentation of spinal shock. This is possible due to calcium-mediated mechanisms changes that lead to ionic and vascular alterations, as well as excitotoxicity by glutamatergic pathways and apoptosis. All this process is similar with acute traumatic spinal cord injury in people.



Figure 1- Underwater treadmill locomotor training

AIM

The main aim of this study was to assess if the presence of spinal shock affects early neurorehabilitation outcomes in dogs

MATERIAL AND METHODS

This prospective controlled cohort clinical study was conducted at a Rehabilitation Center in Portugal (CRAA). All dogs had upper motor neuron injuries (T3–L3) and were paraplegic with or without nociception. The study group (n = 19) included ANNPE spinal shock dogs, and the control group (n = 19) ANNPE dogs without spinal shock.



Figure 2- Functional electrical stimulation



Figure 3- Land treadmill training



Figure 4- Class IV laser therapy

Both groups were under the **same intensive neurorehabilitation protocol** performed by a specialized interdisciplinary team, based on:

- ❑ **Functional electrical stimulation (FES)** by simultaneous contraction of both the quadriceps femoris group and the hamstring muscles group (Fig. 2):
<60 Hz, < 48mA, 150 us, duty cycle 1:4, trapezoid current, 10 min;
- ❑ **Photostimulation programs with class IV laser therapy** :
12J/cm², 810-987 nm, pulsed mode (Fig.3);
- ❑ **Locomotor training** through 10 min of task repetitions on a **land treadmill** (Fig.4) and 20 min on a **underwater treadmill** (Fig. 1);
- ❑ **Kinesiotherapy exercises** (Fig. 5 and 6).



Figure 5. A and B - Kinesiotherapy exercises. A) Cavaletti rails; B) Walking in different floors



Figure 6. A and B - Kinesiotherapy exercises. A) Passive range of motion exercises; B) Kneading massage technique

RESULTS

From the total of 38 dogs, 6 dogs were deep pain negative (DPN) and 2 were euthanized due to progressive myelomalacia. Total ambulatory status was achieved in 95% (36/38), although 61% (22/36) only achieved ambulation after 30 days of treatment. From these, all dogs were from the study group (dogs with spinal shock) and only 3 from the control group. The protocol was safe, tolerable, and feasible in all patients.

DISCUSSION AND CONCLUSION

Spinal shock was a negative factor for a successful outcome within less time. However, if early rehabilitation is applied it is still possible to have a positive outcome within 30 days of injury.