

CASE REPORT

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NEUROLOGICAL PHYSIOTHERAPY IN LABRADOR RETRIEVER DOG WITH PARAPARESIS: A CASE REPORT

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ABSTRACT

Background: Spinal cord injuries (SCI) may cause neurological problems such as muscle weakness, sensory disorders, and incontinence. This case report aims to investigate the effectiveness of the sensorimotor rehabilitative physiotherapy program in a dog with paraparesis.

Case Description: A 1-year-old, 27 kg male dog was brought to Near East University, Animal Hospital, after a motor vehicle accident. The dog was diagnosed as a T13 vertebral fracture and luxation at the T13-L1 spinal level according to the clinical and radiological examination performed by a veterinary physician. The dog showed; poor standing, weakness in the hind limbs and back muscles, urinary and fecal incontinence at the clinical examination. The physiotherapy program included; massage, sensory stimulation applications, Neuromuscular Electrical Stimulation (NMES), joint mobilizations, standing-balance exercises, and gait training.

Outcome Measures: Consequently, improvements were obtained in standing and sitting balance, gait, bladder, and bowel functions at the end of the seven-week treatment period. The standing duration increased from 3 sec to >60 sec; also, thigh circumferences increased from 31cm to 36 cm in the right and 32 cm to 36 cm in the left limb. Canine Acute Pain Scale score was reduced from 2 to 1 in a positive sense.

Conclusion: There were a satisfying motor and functional recovery in our case. We believe that the dog's young age and the type of injury (neurapraxia) contributed to these positive results. Therewithal, early and active physiotherapy program plays a crucial role in maintaining functional independence, also coping with the symptoms in the dog.

Keywords: Animal physiotherapy, canine rehabilitation, paraplegia, neurorehabilitation.

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INTRODUCTION

Paraparesis or paraplegia are commonly seen in dogs with spinal cord injuries (SCI) or lesions. Acute paraparesis occurs with a rapid loss of muscle strength and difficulty in gait function, whereas paraplegia is the complete loss of voluntary motor movements [1,2].

The most common causes of paraparesis and paraplegia are prolapsed discs and traumas[3]. According to literature, motor vehicle injuries frequently lie behind the spinal cord dysfunction. Luxations and fractures are observed in 40-60% of cases after trauma. Injuries are classified as thoracolumbar or lumbosacral. T10-L2 level luxations are seen in 50% of injuries. Also, vertebral fracture coexists with luxations in 22% of the cases[4].

The pathophysiological consequences of injury may vary depending on the mechanism. Primary injuries include disc herniations (contusion and compression) and traction (vertebral fractures, spinal luxations). Secondary injuries are biochemical and vascular based. After the injury, the connection between the spinal cord and the brain is interrupted by destruction in neurons and glia. After SCI, weakness or paralysis, pain, and incontinence may emerge. In cases where SCI is incomplete, dogs can recover quickly after the injury because the intact neurons take over the task of the ones that have been destroyed. If the damage is complete, the prognosis is guarded [5]. The nerve healing in small animals with neurapraxia takes 4 to 6 weeks. Wallerian degeneration occurs when the myelin is damaged, but the endoneurium remains intact. The recovery rate is approximately 1 mm per day [6]. Spontaneous regeneration of the distal axonal segment begins 5 to 10 days after injury. EMG can monitor these fibrillations [7].

Treatment goals are; (1) prevention of secondary injuries, (2) sprouting and regeneration of intact neurons, and (3) increasing the functionality of intact neural networks after the SCI [5].

In this case report, we aimed to explore the effectiveness of the sensorimotor rehabilitative physiotherapy program in a spinal cord injured dog with paraparesis.

Subject Information

A one-year-old, 27 kg male Labrador Retriever named Rex was brought to Near East University Animal Hospital, Cyprus, in October 2018, 10 hours after a motor vehicle accident. Rex was diagnosed as a T13 vertebral fracture and luxation at the T13-L1 spinal level after clinical and radiological examination performed by a veterinary physician.

Physical Exam

The dog had poor standing, weakness in the hind limbs and back muscles, urinary and fecal incontinence according to the examination. Cranial nerves were intact. Evaluation and treatment were initiated as soon as the dog was brought to the hospital. In medical management, we used NSAID (1.8 mg/lb Tramadol) for analgesia.

Diagnostic and Assessment

The dog was assessed by a Modified Frankel Score (MFS)

to determine the neurological dysfunction level. The MFS is defined as; “Grade 5” normal gait with hyperesthesia; “Grade 4” ambulatory with paraparesis and/or ataxia, “Grade 3” non-ambulatory paraparesis, “Grade 2” paraplegia with entire superficial nociception in the pelvic limbs, “Grade 1” paraplegia with entire deep nociception in the pelvic limbs, “Grade 0” paraplegia with absent deep pain perception. Rex was grade 1 [8].

During voluntary motor function examination, it was attempted to move the sling from underneath the abdomen [9], and the dog was expected to maintain its balance for a few seconds. Rex could not stand by himself. Hind limbs were paretic and non-ambulatory. The dorsal side score was “2 out of 4,” according to the CAPS [10]. Deep pain perception was evaluated with forceps. The conscious proprioceptive test was performed on the hind limbs here-with; both senses were lost. Spinal-myotatic reflexes were intact according to reflex examination. There weren't any range of motion limitation obtained by goniometric assessment. Generally, the muscles were observed as atrophic. Thigh circumference measurements were done to assess the atrophy of extremity muscles (see Table 2). The distance between the greater trochanter and the patella was measured—the point is $\frac{1}{4}$ proximal to the greater trochanter accepted as reference. Also, the dog had urinary and fecal incontinence. Our physiotherapy program aimed to improve balance and coordination, dynamic joint stability, and prevent secondary injuries. The treatment started within 48 hours after the injury.

Interventions

The therapy program included massage, sensorial stimulation applications, NMES, hind limb joint mobilizations, standing-balance exercises, and gait training in the scope of sensorimotor based rehabilitative approaches [11] (Table 1). The massage was applied to the flexor and extensor group muscles of both thighs as stroking and kneading. The aim was to regulate the neuromuscular excitability and parasympathetic activity. The role of hormonal levels on relaxation also should be remembered as a consequence of massage [12]. Hind limb mobilizations combined joint approximation techniques were performed by the physiotherapist five days a week to maintain ROM. Neuromuscular electrical stimulation (NMES) (Intellect Advanced Chattonoga, Guildford Surrey, UK) was applied to each thigh's flexor and extensor muscle groups to improve muscle mass [13]. Brushing technique and porcupine balls were used on both hind limbs and paws for sensory integration of tactile and proprioception [14].

Active and active-assistive exercises were performed to increase muscle strength and function. Standing exercises started as active assistive with body sling. Then parastanding, three-leg standing, and cross-leg standing exercises applied. The physiotherapist applied tapping 3-5 times over the belly of muscles with fingertips for facilitation. Approximation techniques were applied to all extremities. Weight-shifting was started from the 3rd week to improve

the dynamic balance. The dog was trained on the exercise ball and wobble cushion. The training started on land and proceeded to the foam rubber mat, which provides a challenge to the dog and enhances recovering proprioceptive function [15].

Gait training was started in the first weeks with a wheelchair supported. Since the muscle strength was adequate, the dog was walking with a leash firstly supported with a towel and then unsupported. From 5th week, Rex was able to walk independently. Weight-shifting was continued in all directions with anteroposterior and lateral [15].

Table 1: Physiotherapy intervention

Intervention	Procedure	0-2 week	2-4 week	5-7 week
ROM	20 reps/ hind limbs	X	X	
NMES	200 μ s, 30 Hz, 20 min, each thigh muscles	X	X	X
Massage	Stroking/kneading, each thigh, 5 min	X	X	
Standing exercises	With body sling	X		
Standing exercises	Parastanding, three-leg standing, cross-standing		X	X
Weight-bearing	Dancing, three-leg standing, cross-standing		X	X
Approximations	All joints		X	X
Proprioception	Tactile stimulations, different surfaces, brushing	X	X	X
Sit to stand exercises	20 reps			X
Weight-shifting	20 reps, all directions			X
Gait training	Leash walking		X	
Gait training	Walking			X

Follow-up and Outcomes

The seven-week treatment outcomes are presented in Table 2.

Table 2: The seven-week treatment results

Evaluation parameters	Pre-treatment (0 weeks)		Post-treatment (7th week)	
	Standing duration (sec)	3 sec		>60 sec
Thigh circumferences	Right 31 cm	Left 32 cm	Right 36 cm	Left 36 cm
Canine Acute Pain Scale	2		1	

In the beginning, there was no limitation in ROM. According to the 7th-week reevaluation, the dog could stand more than 60 seconds and began to walk independently. The sitting function improved, and the dog was able to stand up by himself. DPP and incontinence were recovered.

After the hospitalization, the prognosis was followed by regular phone calls and video footage. The owner reported that Rex started running and playing activities after two weeks of discharge.

DISCUSSION

In our study, the dogs' gait and balance, muscle volume and functionality, DPP, and bladder function were improved

after seven weeks of physiotherapy and rehabilitation program.

Nerve healing begins in the fourth week in neurapraxia cases [6] but recovery is more complicated if the DPP is absent [16]. Our case was independently ambulated in the 7th week of the physiotherapy program.

In acute SCI, recovery depends on the severity of the injury, the occurrence of neurological findings, and the treatment [17]. Studies in the literature indicated that paraplegic dogs could improve gait and functionality with active exercises, similar to what we observed in our study [18,19].

Gallucci et al. [17] showed that paraplegic dogs with a loss of DPP in the pelvic extremities gained gait function only at 11%. The propriospinal and spinoreticular pathways are responsible for the transport of pain perception. They show very close localization to white and gray matter in the spinal cord. Therefore, they are only affected by severe injuries, so the loss of DPP indicates a poor prognosis [20]. Despite the loss of DPP, it was remarkable that nearly-total functional recovery was achieved in our case, at the end of 7-weeks.

Arias, Mendes, and de Paula Reis Filho [16] performed physiotherapy and acupuncture after decompression surgery in cases with vertebral luxation. They reported that dogs came to the ambulatory level and gained DPP after four months of surgery. Gallucci et al. [17] observed that assisted spinal walking returned 33 days after injury with applied early exercise programs (mean 9.5 days) in paraplegic dogs. Their physiotherapy program duration was 75 days. The rate of recovery from acute SCI is variable and depends on the severity of the injury, the rate of onset of clinical symptoms, and the type of treatment. According to our results, independent (spinal) walking returned 35 days. We believe that; early and active physiotherapy, young age, and low-weight affect the healing process and motor recovery.

CONCLUSION

The dog's age and the type of injury are the main determinants of the recovery process. Early physiotherapy has a crucial role in preventing other complications and progression of symptoms.

This case report points out that; an active and functional physiotherapy program based on sensorimotor approaches can be an effective strategy for spinal cord injured dogs. It should be noted that randomized controlled studies are needed to understand the short-term and long-term effects of these concepts.

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