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## Managing canine posterior paresis: Medication and physiotherapy strategies

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### Abstract

Posterior paresis is the most typical symptom of spinal cord diseases in dogs. The study, conducted from March 2022 to May 2023, investigated the incidence and management of posterior paresis in dogs over a six-year period (2017-22). Retrospective analysis revealed a prevalence of 0.85% among 55,478 cases, with the highest incidence in dogs less than 3 years old. Spinal disorders, primarily resulting from automobile accidents, disproportionately affected large purebred dogs, a trend reflected in prospective data as well. Thirty-six clinical cases were treated based on posterior paresis severity: mild (Group I, n=15), moderate (Group II, n=12), or severe (Group III, n=9). Treatment strategies included medicinal management, physiotherapy, or a combination. All groups showed improvement, with Group I respond well to medicinal treatment within three days. Group II, receiving both medication and physiotherapy, demonstrated varying degrees of recovery, while Group III, treated solely with physiotherapy, saw mixed outcomes, particularly in cases with delayed presentation. The study underscores the efficacy of combining medicine and physiotherapy for managing posterior paresis in dogs.

**Keywords:** Dog, posterior paralysis, therapeutic and Physiotherapeutic management

### 1. Introduction

Posterior paresis, characterized by hind limb weakness or paralysis, is a common manifestation of spinal cord diseases in dogs (McGowan *et al.*, 2007; Hoerlein, 1978) <sup>[1, 2]</sup>. It can arise from various causes including elder age, trauma, disc protrusion, or viral infections like canine distemper (Coates, 2000; Olby, 2010; McCormick, 1983) <sup>[3, 4, 5]</sup>. Most cases of posterior paresis are caused by the vertebral column pressing on the spinal cord. Protrusion of the vertebral disc is a common occurrence in elderly dogs. Severity of paresis ranges from mild ataxia to complete loss of hind limb function, often correlating with the degree of spinal cord compression or nerve involvement (Brisson, 2010; De Lahunta and Glass, 2009; Lorenz *et al.*, 2011; Scott, 1997) <sup>[6, 7, 8, 9]</sup>.

Immediate medical attention is crucial, with methylprednisolone showing potential benefit for severe cases (Bracken, 2012) <sup>[10]</sup>. In instances of acute spinal cord injury in humans, methylprednisolone sodium succinate (MPSS) is the preferred treatment option because of its neuroprotective qualities against the secondary physiological effects linked with spinal injury (Bracken, 2012) <sup>[10]</sup>. Treatment strategies vary based on the extent of nerve involvement, ranging from cage rest and analgesics for mild cases to physiotherapy for moderate ones (Mann *et al.*, 2007; Rai *et al.*, 1975) <sup>[11, 12]</sup>. However, the prognosis remains poor for severe injuries, warranting a holistic approach to patient care. In understanding posterior paresis, it's imperative to delve into its multifactorial etiology and the nuanced therapeutic interventions required for optimal outcomes. Through continued research and clinical advancements, the veterinary community strives to enhance the quality of life for dogs afflicted by this debilitating condition.

### 2. Materials and Methods

**2.1 Selection and treatment of posterior paresis dogs:** This study comprised sixty-two dogs of either sex, irrespective of age, that were diagnosed with posterior paresis and brought to the surgery unit of the Veterinary College, Anand, Kamdhenu University, Gujarat, India.

These were classified into three groups depending upon the degree of posterior paresis i.e., mild (n=28), moderate (n=20) and severe (n=14). However, due to poor follow-up or the owner did not come for proper treatment thirty-six cases only were given medical management either alone or in

combination with physiotherapeutic techniques. Different therapeutic protocols used in each of three groups are shown in Table 1. Patients with different degrees of posterior paresis classified into groups I, II and III were as follows.

**Table 1:** Distribution of dogs included in the study based on the degree of posterior paresis and its management

Groups	No. of animals	Degree of posterior paresis	Therapy	Description of paresis examination
I	15	Mild	Medical management	Hind limb toe dragging, Unilateral hind limb weakness, Intact pain sensation in the hind portion, Intact voluntary movement, Weight-bearing with toe touching the ground, Mild ataxia
II	12	Moderate	Medical management + Physiotherapy	Ataxia, Muscular weakness, Dragging of both hind limbs, Decreased pain sensation in hind portion, Crouching and arching of back
III	09	Severe	Physiotherapy	Muscle atrophy, Slight to no pain sensation, Inability to lift hind limbs, Sitting posture, Spastic and extended limbs, No control over urination and defecation

All dogs of group I (n= 15) were treated with medicinal treatment. Group I cases were treated by medicinal management which included steroids like Inj. Methylprednisolone sodium succinate @ 30mg/kg BW I/V QD for 3 days followed by Inj. Prednisolone acetate @ 0.5 – 1 mg/kg BW I/M QD in tapering dose for 5- 7 days, Antibiotic like Inj. Ceftriaxone with Tazobactam @ 25mg/kg BW IV or IM QD for 5 days, Nervine tonic like Inj. Methylcobalamin @ 1ml/10kg BW QD for 10 days and other

need based medical management was given by Oral NSAIDs and supportive medications. All dogs of group II (n=12) received the same medicinal treatment as group I, along with physiotherapy protocols. All dogs of group III (n=9) were treated with only physiotherapy protocols, which had already been treated medicinally by local vets or were chronic in nature. Different recent modalities of physiotherapy used in moderate and severe degrees of posterior paresis are summarized in Table 2.

**Table 2:** Physiotherapy protocols used in moderate and severe degrees of posterior paresis

Sr. No.	Physiotherapeutic technique	Time of application	Period of treatment
1	Infrared therapy (IRT)	40 min once a day	For 21 days
2	Pulsed Electromagnetic Field (PEMF)	1 hour once a day	For 21 days
3	Therapeutic Ultrasound (TU)	15 min once a day	For 21 days
4	Neuromuscular Electrical Stimulation (NMES)	15 min once a day	For 21 days
5	Transcutaneous Electrical Nerve Stimulation (TENS)	15 min once a day	For 21 days
6	Passive Range of Motion (PROM) exercises	10 min twice a day	For 21 days
7	Therapeutic exercises	10 min twice a day	For 21 days
8	Hydrotherapy	10 min once a day	For 21 days

**2.2 Grading and scoring of Posterior Paresis Dogs**

All dogs referred via Veterinary Clinical Complex to the Department of Veterinary Surgery and Radiology underwent an in-depth examination to figure out the posterior paresis condition. In accordance with the clinical entity, the following items like history, clinical signs, passive movement tests and in- depth neurological reflexes like Conscious proprioception, Patellar reflex, Withdrawal reflex, Panniculus / Cutaneous trunci reflex, Perineal / Anal reflex, Urinary bladder palpation, Pain perception were thoroughly examined. All reflexes were qualitatively recorded using an arbitrary score range of (+++) normal to (-) nil. Reflexes classified as +++ = Normal, ++ = Diminished / sluggish, + = weak, - = Nil. Radiographs were examined to determine whether a definitive diagnosis was either possible or not, and the lesion site was or wasn't apparent. In one case of severe degree of posterior

paresis, MRI was done to check the lesion location. The neurological reflexes were used to determine overall clinical recovery. Further, the cases of dogs included under the treatment outcome groups in present study were examined for treatment duration, pain levels, the return of functional activity, and weight bearing with balance and coordination. Based on the "Pain assessment (Verbal pain intensity scale, Table 3)," the levels of pain in the various groups of veterinary patients were evaluated (Karcioglu *et al.*, 2018) [13]. Based on "Resumption of functional activity (Patient-specific activity scoring scale, Table 3)" the functional activity of the veterinary patients in the various groups was evaluated. The "Modified Frankel Score" was used to evaluate the weight-bearing abilities, coordination, and balance of the dogs in the various groups as per Table 3.

**Table 3:** Scoring system for grades of pain and functional activity recovery

Pain assessment			Weight bearing assessment		Recovery assessment	
Score	Grade	Operational definition	Score	Gait observed	Score	Functional activity Recovery
5	Normal	No pain	5	Normal gait with hyperesthesia	0	Unable to perform activity
4	Good	Mild pain	4	Ambulatory with paraparesis and/or ataxia	1-9	Varying degree of activity by animal
3	Fair	Moderate pain	3	Non ambulatory paraparesis		
2	Poor	Severe pain	2	Paraplegia with superficial nociception in pelvic limbs		
1	Trace	Very severe pain	1	Paraplegia with deep nociception in pelvic limbs	10	Able to perform an activity at the same level as before injury or problem
0	Zero	Worst possible pain	0	Paraplegia with absent deep pain perception		

### 2.3 Statistical analysis

In this study, the "Wilcoxon Signed Ranks Test," a non-parametric method, was utilized to compare means of variables within different groups. Moreover, the standard deviation between these means was computed. The analysis of the data was performed using the "SPSS" software, "Version 20.0."

## 3. Results and Discussion

### 3.1 Mild degree of posterior paresis

Among all fifteen cases classified as mild posterior paresis, a minor reduction in conscious proprioception was identified as a significant early-stage indicator of the disease. Additionally, all fifteen patients exhibited intact superficial and deep pain sensations. Nine of the fifteen patients exhibited reduced patellar relaxation and panniculus reflex. In all cases, the perineal/anal and urinary reflexes were found to be intact. Two views of plain radiographs were carried out on all fifteen cases exhibiting posterior paresis. Out of these four cases revealed spondylosis deformans. The treatment period lasted for an average of 6 days. After the treatment, all the dogs exhibited a complete recovery, demonstrating normal weight bearing and walking using their hind limbs. The observation indicated that cases that were presented early during the course of their illness had a greater chance of recovery and exhibited a positive response to medicinal treatment. In the current study, mild cases of posterior paresis showed signs of improvement within three days of commencing treatment. The mean  $\pm$  SD values of grades of pain, weight bearing with coordination and balance and resumption of activity score pre-treatment and post-treatment are presented in Table 4. The mean values for a grade of pain, weight bearing, and resumption of functional activity were increased highly significantly. Similarly, Bracken *et al.* (1990) [14], Boag *et al.* (2007) [15], and Olby (2008) [16] observed corticosteroids as a powerful anti-inflammatory substance and provided advantages in treating spinal or neurological disorders. According to Heary *et al.* (1997) [17], the administration of steroids in spinal cord trauma did not yield favorable effects. On the contrary, significant side effects such as gastrointestinal complications with dexamethasone and pancreatitis with methylprednisolone were observed, thereby discouraging their use.

### 3.2 Moderate degree of posterior paresis

In all twelve patients of moderate degree of posterior paresis, deep pain sensation remained intact, while superficial pain

sensation was absent. Diminished patellar relaxation and panniculus reflex was observed in eight out of twelve patients. In all cases, a slight decrease in the perineal/anal reflex was observed. Four out of twelve cases exhibited a slight decrease in the urinary reflex. A significant decrease in conscious proprioception was observed in all cases. Radiographs performed on all twelve individuals with posterior paresis revealed two cases with spinal cord compression, while in four cases spondylosis was identified. The average length of treatment for the cases in this group was 12 days. Out of the twelve cases, eight cases showed complete recovery, two cases exhibited slight ataxia, and two cases did not achieve complete recovery but showed an enhanced quality of life post-treatment. The mean values for a grade of pain, weight bearing, and resumption of functional activity pre-treatment and post-treatment were increased moderately significantly (Table 4). The physiotherapy protocol employed in the current study included passive range of motion (PROM) exercises, therapeutic exercises, hydrotherapy, transcutaneous electrical nerve stimulation (TENS), neuromuscular electrical stimulation (NMES), infrared therapy (IRT), transcutaneous ultrasound (TU), following the recommendations proposed by Olby *et al.* (2005) [18].

### 3.3 Severe degree of posterior paresis

In all nine cases of severe posterior paresis, a lack of conscious proprioception reflex and deep pain sensation was noted. All nine cases have positive incontinence and slight anal reflex. Slight patellar reflex and panniculus reflex were present in all cases. Radiographs revealed two cases with spinal cord compression, one case of luxation, one case of disco spondylitis and three cases of spondylosis. The cases in this group had taken a treatment duration of nineteen days on average. Among the nine cases, three cases achieved full recovery and another six cases did not achieve good recovery. The mean  $\pm$  SD values of grades of pain, weight bearing with coordination and balance and resumption of activity score observed pre-treatment and post-treatment are presented in Table 4. The mean values for a grade of pain, weight bearing, and resumption of functional activity were increased moderately significantly. There is physiotherapy protocol employed in severe cases of posterior paresis such as mild paresis. Research conducted by Gallucci *et al.* (2017) [19] involved 81 paraplegic dogs receiving a physiotherapy protocol, resulting in a recovery rate of 59.25%, which exceeded the recovery rate observed in the current study (33.33%).

**Table 4:** Mean  $\pm$  SD values of grade of pain, weight bearing and functional activity assessment scores in a mild degree of paresis cases in dogs (n=15) treated with medical management

Posterior Paresis	Mild degree*			Moderate degree**			Severe degree***		
	Pre-treatment	Post-treatment	P-value	Pre-treatment	Post-treatment	P-value	Pre-treatment	Post-treatment	P-value
Grade of pain score (0 to 5)	3.60 $\pm$ 0.51	5.00 $\pm$ 0.00	0.000	2.92 $\pm$ 0.79	4.67 $\pm$ 0.49	0.002	1.78 $\pm$ 0.44	2.89 $\pm$ 0.60	0.008
Weight bearing (coordination and balance) (0 to 5)	3.73 $\pm$ 0.46	5.00 $\pm$ 0.00	0.000	2.58 $\pm$ 0.67	4.33 $\pm$ 0.89	0.003	0.00 $\pm$ 0.00	2.44 $\pm$ 1.24	0.007
Resumption of functional activity score (0 to 10)	7.53 $\pm$ 0.52	10.00 $\pm$ 0.00	0.000	4.67 $\pm$ 1.07	8.17 $\pm$ 1.33	0.002	0.00 $\pm$ 0.00	5.11 $\pm$ 2.72	0.007

\* Mild degree of paresis cases in dogs (n=15) treated with medical management.

\*\* Moderate degree of cases in dogs (n=12) treated with medical and physiotherapy protocols.

\*\*\* Severe degree of cases in dogs (n=9) treated with physiotherapy protocols.

## Conclusions

In conclusion, our study highlights several key findings regarding posterior paresis in dogs. We observed a higher incidence of this condition in young dogs, particularly those

below 3 years of age, and in older dogs aged over 9 years. Automobile accidents emerged as the primary cause of posterior paresis, with non-descript dogs being most affected, followed by Labradors. Neurological reflex evaluations

proved crucial for classifying the severity of posterior paresis, guiding treatment decisions accordingly. Our results demonstrate that cases presented early in the course of illness responded favorably to medicinal treatment, leading to early recovery. Additionally, a combined approach of medicinal treatment and physiotherapy yielded improved recovery rates, particularly in moderate cases. For patients unresponsive to medicinal treatment, physiotherapy emerged as an effective alternative, underscoring the importance of tailored treatment strategies in managing posterior paresis in dogs.

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### Ethical approval

No ethical approval required for this study.

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