

Original Research Article

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Some Important Neurological Parameters as Diagnostic and Prognostic Indicators in Posterior Paresis and Hind Quarter Weakness in Dogs

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ABSTRACT

The investigation on some important neurological parameters as diagnostic and prognostic indicators in spinal disorders in dogs was undertaken at Teaching Veterinary Clinical Complex, Nagpur Veterinary College, Nagpur during December 2015 to July 2018 on 53 dogs reported for the complaints of posterior paresis and hind quarter weakness. The dogs were subjected to clinical and neurological examinations and neurological grading was undertaken. All the dogs were treated according to their ailments by conservative management or the surgical interventions. Conservative medicinal treatment with injections of methyl prednisolone acetate (group I) or methyl prednisolone succinate (group II), both @ 30mg/kg body weight daily as per requirement, was given along with supportive treatment or surgical treatment was deployed on individual cases by using appropriate methods i.e. hemilaminectomy in spinal compression cases (group III) or spinal fixation in cases of fractures or luxation (group IV). Various neurological parameters such as conscious proprioception, deep pain sensation, panniculus reflex, urinary bladder tone and fecal control were studied before and during the course of treatment. The results indicated that these neurological tests proved very useful in determining the grades of the neurological deficits and improvement in neurological deficit and progress of the recovery could be judged on the basis of these tests proving their efficiency.

Keywords

Neurological tests,
Dog, Paraplegia,
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Introduction

The Central and peripheral nervous systems of animals play an important role in sensing and reacting to the surroundings. The delicate

brain and spinal cord are protected by skull and the vertebral column, providing a strong support. However, due to flexibility of vertebral column, in spite of peculiar location and strong musculature around, the vertebral

column and therefore the spinal cord is vulnerable to various instability conditions. The disorders of spinal cord, injuries and resultant neurologic deficit are common in dogs. The most common causes of such injuries are automobile accidents, falls from height, animal conflicts or less commonly the gunshot injuries (Nagaraja *et al.*, 2014) leading to varying degrees of spinal compression or fractures and luxation. The diagnosis of neurological disorders in dogs requires systemic approach and includes history, signalment, physical and neurological examinations. Performing and interpretation of the neurological tests is the keys to successful diagnosis and accurate treatment (Shares and Braund, 1993). The prognosis for functional recovery is determined mainly by the amount of compression of spinal cord causing severity of injury to the spinal cord. In view of the above-mentioned facts, the investigation on posterior paresis and hind quarter weakness in dogs was undertaken with the objectives to compare the assistance of neurological examination for diagnosis of spinal disorders and response to treatment in dog with posterior paresis and hindquarter weakness.

Materials and Methods

Total 52 dogs suffering with posterior paresis or the hindquarter weakness and reported at Teaching Veterinary Clinical Complex, Nagpur Veterinary College, Nagpur during the period December 2015 to September 2018 were included in the study. The selected dogs were subjected to thorough physical and neurological examinations. Further, the diagnosis of the disorder was confirmed on the basis of plain and contrast radiographic examinations and CT and MRI examinations in a few cases. Conservative medicinal treatment with injections of methyl prednisolone acetate (group I) or methyl prednisolone succinate (group II), both @

30mg/kg body weight daily as per requirement, was given along with supportive nerve tonics or surgical treatment was deployed on individual cases by using appropriate methods i.e. hemilaminectomy in spinal compression cases (group III) or spinal fixation in cases of fractures or luxation (group IV).

Neurological grading and examinations

The Neurological grading was recorded as suggested by Griffith (1982). The neurological deficits were graded as -Grade 1: Pain only; Grade 2: Ataxia, conscious proprioceptive deficit and para paresis; Grade 3: Paraplegia; Grade 4: Paraplegia with urinary incontinence and overflow; and Grade 5: Paraplegia, urinary incontinence and overflow and loss of deep pain sensation. Following tests were performed and graded as

1. Conscious proprioception: Score 1- Absent, Score 2- Sluggish, Score 3- Normal.
2. Deep pain sensation: Score 1- Absent, Score 2- Mild/only superficial, Score 3- Strong superficial and deep.
3. Panniculus reflex: Score 1- Absent, Score 2- Normal
4. Bladder tone: Increased-1, Normal-2 and Decreased-1
5. Fecal control: Absent or incontinence- 1, Normal-2

The scores of various tests were evaluated on the day of presentation to explore whether the dogs showing posterior paresis and hindquarter weakness shows changes in these parameters on the day of presentation and whether the scores varied with the grades. Similarly, the comparison was made between group I and II (conservative treatment groups) and between group III and IV (surgical treatment groups) on day 0 before treatment and at day 1, day 15, day 30 and 3 months after the initiation of therapy in order to

assess the success of the surgico-therapeutic modalities employed in the study. The data were analyzed by using two-way Factorial Completely Randomized Design (Snedecor and Cochran, 1994).

Results and Discussion

Diagnosis of gait alteration and neural deficit in dogs is an important aspect of clinical evaluation that helps in diagnosing the disorder differentially and decides further line of action and prognosis of the case (McDonnell *et al.*, 2001). Therefore, various tests were conducted to segregate the suspected spinal cord affections and for localization of lesions as suggested by Shores and Braund (1993).

Conscious proprioception

The conscious proprioception reaction was evaluated which involves not only sensory function but motor response as well. The data regarding the scores of conscious proprioception in various groups on day of presentation, comparison between group I and II and between group III and IV is presented in Table 1.

The mean conscious proprioception score on day 0 varied between 1 to 1.50 in all the groups indicating that the conscious proprioception was absent or sluggish in all the groups and the differences between the groups were non-significant. Thus, it was observed that the conscious proprioception was adversely affected in all posterior paresis and hind quarter weakness cases and thus effective test to detect neurological deficit as proved on plain or contrast radiography and MRI.

The mean conscious proprioception score in group I on day 0 was 1.50 ± 0.11 which gradually improved and the score after 90

days was 2.81 ± 0.11 . Similar trend was observed in group II wherein the score improved from 1.28 ± 0.11 to 2.76 ± 0.11 at the end, indicating similar effect of both the conservative treatment modalities. It was further observed that the differences between the group I and II were non-significant and the differences at different days were also non-significant. The mean conscious proprioception score in group III on day 0 was 1.17 ± 0.17 which gradually improved and the score after 90 days was 3.00 ± 0.00 indicating that all the dogs showed normal conscious proprioception. More or less similar trend was observed in group IV wherein the score improved from 1.50 ± 0.22 to 2.75 ± 0.25 at the end. It was further observed that the differences between the group III and IV were non-significant indicating that both the surgical modalities had nearly similar improvement in the scores. Similarly, the differences within the respective groups at different scheduled intervals were also non-significant.

Conscious proprioception is a very sensitive reaction since the proprioceptive pathways are sensitive to compressions, any abnormality in the proprioception can be detected much earlier to the motor dysfunction. An absence or delayed response is abnormal and indicate involvement of afferent system by way of loss of position sense or the efferent system by exhibiting decreased motor control or paresis or in some cases, both (Shores and Braund, 1993). During the present investigation, the conscious proprioception was deficit in all 52 cases whereas the plain radiography could localize the lesions only in 44 cases whereas in 8 cases the lesions could not be identified on plain radiography and the myelography or MRI could detect the lesions. Thus, it was evident that conscious proprioception was a sensitive test for identifying the neurological deficit. Platt and Olby (2004) also observed proprioceptive deficit, ataxia and paraplegia

in affections of T3-L3 spinal segment with UMN deficits of hindlimb.

Deep pain

The data regarding the scores of deep pain perception in various groups on day of presentation, comparison between group I and II and between group III and IV is presented in Table 2.

The mean deep pain score on day 0 in group I, II, III and IV was 1.95 ± 0.17 , 1.67 ± 0.14 , 1.00 ± 0.00 and 1.33 ± 0.33 , respectively. Thus, in all the groups, the deep pain was absent to sluggish at the time of presentation. Thus, it was observed that the conscious proprioception was adversely affected in posterior paresis and hind quarter weakness cases. The statistical analysis indicated that the differences between all the groups on day 0 were significant. The animals of group III had the worst scores followed by animals of group IV, group II and group I had the highest score. This was obvious since the cases with high grade neurological findings were included in group III and IV and considered for surgery. Thus it was concluded that deep pain perception was a reliable test in judging and differentiating the neurological grades.

The mean deep pain score in group I on day 0 was 1.95 ± 0.17 which showed regular increasing trend, improved gradually and the score after 90 days was 2.86 ± 0.08 . Similar trend was observed in group II wherein the score improved from 1.67 ± 0.14 to 2.72 ± 0.14 at the end, indicating similar effect of both the conservative treatment modalities. It was further observed that the differences between the group I and II were non-significant, however, there was significant differences between the intervals indicating positive impact of the treatment. The mean deep pain score in group III on day 0 was 1.00 ± 0.00 which exhibited regular increasing

trend and the deep pain sensation gradually improved and the score after 90 days was 3.00 ± 0.00 indicating that all the dogs showed normal deep pain perception. More or less similar trend was observed in group IV wherein the score improved from 1.33 ± 0.33 to 3.00 ± 0.00 at the end of observation period. It was further observed that the differences between the group III and IV were non-significant indicating that both the surgical modalities had similar improvement in the score. However, the differences within the respective groups at different scheduled intervals were significant. Group IV had better outcome as compared to group III and normal strong deep pain score was achieved in group IV on day 30 where it was strong in group III after 90 days.

The deep pain perception is an important and reliable test. The data indicated that the deep pain perception was minimal on the day of presentation which gradually improved with the treatment. Out of 26 cases that exhibited pain score 1 or less on the day of presentation, 16 (61.54%) cases either showed partial improvement or cured completely due to treatment, whereas 10 (38.46%) cases did not recover in spite of the treatment. On the contrary, all the 27 cases that showed deep pain score more than 1 recovered with the treatment irrespective of the treatment modality used. Therefore, it was concluded that the dogs having pain score 1 had poor prognosis as compared to the dogs that exhibited pain score 2 or more. The findings are in agreement with the findings of Mckee (2008) who expressed that the prognosis was good in dogs that had intact pain perception. Bruce *et al.*, (2008) also expressed that the dogs with intact pain sensation prior to surgery had a good prognosis for functional recovery. In group III wherein hemilaminectomy was performed all 6 dogs had pain score 1 or less recovered whereas in spinal fixation group, out of 3 cases that had

score 1 or less, 2 cases did not recover and 1 case that had pain score 2 or more exhibited complete recovery. Muir *et al.*, (1995) observed that the deep pain sensation was not observed in either or both hind paws of 8 per cent of dogs in which pain sensation was elicited before surgery after hemilaminectomy as compared to 21 per cent after dorsal laminectomy and the dogs that had abnormal deep pain sensation before surgery, regained walk after either surgery in 50% cases. Wilkens *et al.*, (1996) also reported that the dogs having deep pain sensation had better prognosis. Olby *et al.*, (2003) reported that out of total 17 dogs with traumatic injuries, 9 were treated, and although 2 regained the ability to walk, none of the 17 dogs regained deep pain perception, whereas out of 70 dogs having intervertebral disk herniation, 64 dogs were surgically managed and total 37 (58%) dogs regained the deep pain perception and the ability to walk, 7 (11%) dogs could regain the ability to walk without regaining deep pain perception and 11 (17%) dogs remained paraplegic without deep pain perception. However, De Lahunta and Glass (2009) expressed that the superficial and deep pain sensation judging need further investigation since these were too subjective and unreliable.

Panniculus reflex

The data regarding the scores of panniculus reflex also called as the cutaneous trunci reflex in various groups on day of presentation, comparison between group I and II and between group III and IV is presented in Table 3.

The mean panniculus reflex scores on day 0 in group I, II, III and IV were 1.68 ± 0.10 , 1.78 ± 0.10 , 1.67 ± 0.21 and 1.83 ± 0.17 , respectively. Thus, in all the groups, the panniculus or the cutaneous trunci reflex ranged between absent to normal at the time of presentation. Therefore, it was observed

that the panniculus reflex was adversely affected in posterior paresis and hind quarter weakness cases in most of the cases. The statistical analysis however indicated non-significant differences between all the groups on day 0.

The mean panniculus reflex score in group I on day 0 was 1.68 ± 0.10 which showed undulating trend up to day 15 wherein the score was 1.95 ± 0.05 and thereafter remained the same till the end of observation period indicating near normal reflex in this group. In group II, the dogs exhibited normal panniculus reflex from day 15 onwards indicating better response as compared to group I. The differences between the group I and II were non-significant. However, there was highly significant difference between the scores at scheduled intervals indicating gradual and positive impact of the treatment. The mean panniculus reflex score in group III on day 0 was 1.67 ± 0.21 which increased to normal reflex score of 2.00 ± 0.00 from day 1 onwards indicating that all the dogs showed normal panniculus reflex. The group IV dogs showed irregular, undulating trend wherein the score improved from 1.83 ± 0.17 to 2.00 ± 0.0 on day 15 and it remained normal till the end of the observation period. Thus, although both the groups indicated positive impact of surgeries, the animals of group III showed better and early recovery on day 1 itself. The statistical analysis indicated that the differences between the group III and IV were non-significant. However, the differences within the respective groups at different scheduled intervals were significant.

The cutaneous trunci reflex is a polysynaptic reflex with intersegmental transmission of impulses and was elicited by pinching unilaterally the skin of dorsal trunk between T2 and L7 and observing a contraction of the cutaneous trunci muscle bilaterally (Platt and Olby, 2004). The panniculus or

cutaneous trunci reflex is one of the important reflexes that give the idea about the grade of neurological deficit especially in cases of presence of lesions posterior to L1. However, if the lesion was cranial to L1 vertebra, then this reflex may not be an appropriate indicator of neurological deficit as reported by Brisson (2010). Wilkens *et al.*, (1996) reported that the panniculus reflex was absent caudal to the thoraco-lumbar segment in 3 dogs suffering from hind quarter paralysis. Platt and Olby (2004) documented that depending upon the severity of the lesion, the absence of cutaneous trunci reflex was noted in hind quarter weakness cases as also observed during the present investigation.

Urinary bladder tone

The data regarding the urinary bladder control scores in various groups on day of presentation, comparison between group I and II and between group III and IV is presented in Table 4.

The mean bladder tone reflex scores on day 0 in group I, II, III and IV were 1.32 ± 0.15 , 1.33 ± 0.18 , 1.33 ± 0.33 and 1.33 ± 0.33 , respectively. Thus, in all the groups, the mean bladder tone reflex was below the normal score. Therefore, it was observed that the bladder tone reflex was adversely affected in posterior paresis and hind quarter weakness cases in most of the cases and the differences between the groups on the day of presentation were non-significant indicating that the urinary bladder tone was not an indicator of severity of neurological grade.

The mean bladder tone reflex score in group I on day 0 was 1.32 ± 0.15 which showed undulating trend throughout the observation period and the score improved at the end indicating near normal reflex in this group at the end of observation period. In group II, the bladder tone reflex was 1.33 ± 0.18 at the time

of presentation which decreased slightly on day 1 but again improved on day 15 i.e. 1.83 ± 0.12 and remained stationary throughout the observation period. Both the groups indicated similar improvement and the differences between the group I and II were non-significant. However, there were highly significant differences between the scores at scheduled intervals indicating gradual and positive impact of the treatment. The mean bladder tone reflex score in group III on day 0 was 1.33 ± 0.33 which increased to normal reflex score of 2.00 ± 0.00 from day 1 onwards indicating that all the dogs showed normal bladder tone reflex. The group IV dogs showed regular, increasing trend and the score at the end of 90 days was 2.00 ± 0.00 . Thus, although both the groups indicated positive impact of surgeries, the animals of group III showed better and early recovery on day 1 itself. The statistical analysis indicated that the differences between the group III and IV and at various scheduled intervals were also non-significant.

The mean bladder tone control at the end of observation period also indicated that the dogs from conservative management groups never achieved complete regain of the bladder function and urinary incontinence was noted in few dogs, whereas in surgical groups, all the dogs showed complete remission of incontinence. However, Olby *et al.*, (2003) reported that out of 15 dogs that underwent decompressive surgeries, 12 dogs that regained deep pain perception had intermittent fecal and urinary incontinence and according to them, the dogs with disc herniation had a better chance of recovering motor function and persistent loss of deep pain perception did not affect the recovery of motor function, but such dogs remained incontinent postoperatively. Platt and Olby (2004) also observed that depending upon the severity of the lesion, the urinary retention and spinal hyperaesthesia were noted as also

observed during present investigation. All the treatment modalities resulted in favourable results during the present investigation.

Fecal control

The data regarding the fecal control scores in various groups on day of presentation, comparison between group I and II and between group III and IV is presented in Table 5. The mean fecal control scores on day 0 in group I, II, III and IV were 1.64 ± 0.10 , 1.56 ± 0.12 , 1.50 ± 0.22 and 1.17 ± 0.17 , respectively. Thus, in all the groups, the mean bladder tone reflex was below the normal score. Therefore, it was observed that the bladder tone reflex was adversely affected in posterior paresis and hind quarter weakness cases in most of the cases and the differences

between the groups on the day of presentation were non-significant. The mean fecal control score in group I on day 0 was 1.64 ± 0.10 which showed undulating trend, gradually improved with the treatment indicating near normal reflex in this group at the end of observation period. In group II, the fecal control reflex was 1.56 ± 0.12 at the time of presentation which remained same on day 1 but again improved on day 15 i.e. 1.83 ± 0.09 and subsequently at the end of observation period. Both the groups indicated more or less similar improvement and the differences between the group I and II were non-significant. However, there was highly a significant difference between the scores at scheduled intervals indicating gradual and positive impact of the treatment.

Table.1 Comparison of mean conscious proprioception between conservative management groups (group I and group II), between surgical management groups (group III and group IV) and in different groups on Day 0

Group	Mean± SE conscious proprioception scores					
	Interval (Days)					Pooled average (Groups)
	Day 0	Day 1	Day 15	Day 30	Day 90	
Group – I	1.50 ± 0.11	1.73 ± 0.13	2.64 ± 0.12	2.68 ± 0.10	2.81 ± 0.11	2.27±0.07
Group – II	$1.28 \pm .11$	1.67 ± 0.18	2.72 ± 0.14	2.72 ± 0.11	2.76 ± 0.11	2.22±0.09
Pooled average (Interval)	1.40^a ±0.08	1.70^b ±0.11	2.68^c±0.09	2.70^d±0.07d	2.79^e ±0.08	
Critical Difference (C.D.) for interval :0.03437						
Group – III	1.17 ± 0.17	1.50 ± 0.22	2.17 ± 0.31	2.67 ± 0.21	3.00 ± 0.00	2.07±0.16
Group – IV	1.50 ± 0.22	2.00 ± 0.37	2.83 ± 0.31	2.75 ± 0.25	2.75 ± 0.25	2.31±0.15
Pooled average (Interval)	1.33^a±0.14	1.75^b±0.22	2.50^c±0.19	2.70^d±0.15	2.89^e±0.11	
Critical Difference (C.D.) for interval: 0.12815						
Pooled Average Gr I to Gr IV on day 0: 1.38 ±0.07						

Table.2 Comparison of mean deep pain sensation between conservative management groups (group I and group II), between surgical management groups (group III and group IV) and between different groups on Day 0

Group	Mean deep pain scores(±SE)					
	Interval (Days)					Pooled average (Groups)
	Day 0	Day 1	Day 15	Day 30	Day 90	
Group – I	1.95A ± 0.17	2.23 ± 0.16	2.64 ± 0.15	2.73 ± 0.13	2.86 ± 0.08	2.48 ± 0.07
Group – II	1.67B ± 0.14	2.06 ± 0.19	2.56 ± 0.15	2.72 ± 0.14	2.72 ± 0.14	2.34 ± 0.08
Pooled average (Interval)	1.83^a±0.11	2.15^b±0.12	2.60^c±0.11	2.73^d ± 0.09	2.79^e ±0.08	
Critical Difference (C.D.) for interval: 0.04082						
Group - III	1.00C ± 0.00	1.17 ± 0.17	2.67 ± 0.21	2.83 ± 0.17	3.00 ± 0.00	2.10 ± 0.17
Group - IV	1.33D ± 0.33	2.00 ± 0.37	2.33 ± 0.33	3.00 ± 0.00	3.00 ± 0.00	2.23 ± 0.18
Pooled average (Interval)	1.17^a± 0.17	1.58^b± 0.23	2.50^c ± 0.19	2.90^{df}± 0.10	3.00^{ef}±0.00	
Critical Difference (C.D.) for interval: 0.12513						
Pooled average Gr I to Gr IV on day 0- 1.67 ±0.10						
Critical Difference (C.D.) for Gr I to GR IV on day 0: 0.16369						

Table.3 Comparison of mean panniculus reflex between conservative management groups (group I and group II), between surgical management groups (group III and group IV) and between different groups on Day 0

Group	Mean panniculus reflex scores (±SE)					
	Interval (Days)					Pooled average (Groups)
	Day 0	Day 1	Day 15	Day 30	Day 90	
Group - I	1.68 ±0.10	1.86± 0.07	1.95± 0.05	1.95± 0.05	1.95±0.05	1.88±0.03
Group - II	1.78 ± 0.10	1.94 ± 0.06	2.00 ±0.00	2.00± 0.00	2.00± 0.00	1.94±0.02
Pooled average (Interval)	1.73^a±0.07	1.90^b±0.05	1.98^{cf}±0.02	1.98^{dfg}±0.02	1.97^{efg}±0.03	
Critical Difference (C.D.) for interval: 0.01709						
Group – III	1.67 ± 0.21	2.00 ±0.00	2.00±0.00	2.00±0.00	2.00 ±0.00	1.93±0.05
Group – IV	1.83 ±0.17	1.80± 0.20	2.00± 0.00	2.00±0.00	2.00 ±0.00	1.92±0.06
Pooled average (Interval)	1.75 ±0.13	1.91 ±0.09	2.00 ±0.00	2.00±0.00	2.00±0.00	
Pooled average Gr I to Gr IV on day 0: 1.73 ±0.06						

Table.4 Comparison of mean urinary bladder control score between conservative management groups (group I and group II), between surgical management groups (group III and group IV) and between different groups on Day 0

Group	Mean urinary bladder tone score (\pm SE)					Pooled average (Groups)
	Interval (Days)					
	Day 0	Day 1	Day 15	Day 30	Day 90	
Group – I	1.32 \pm 0.15	1.73 \pm 0.15	1.86 \pm 0.10	1.82 \pm 0.08	1.86 \pm 0.08	1.72\pm0.06
Group – II	1.33 \pm 0.18	1.28 \pm 0.16	1.83 \pm 0.12	1.83 \pm 0.09	1.83 0.09	1.62\pm0.06
Pooled average (Interval)	1.33^a\pm0.12	1.53^b\pm0.11	1.85^{cf}\pm0.08	1.83^{dfg}\pm0.06	1.85^{efg}\pm0.06	
Critical Difference (C.D.) for Interval: 0.03465						

Group – III	1.33 \pm0.33	2.00\pm 0.37	2.00\pm 0.00	2.00\pm0.00	2.00\pm0.00	1.86\pm0.11
Group – IV	1.33 \pm 0.33	1.50 \pm 0.34	1.67 \pm 0.21	1.75 \pm 0.25	2.00 \pm 0.00	1.62\pm0.12
Pooled average (Interval)	1.33\pm 0.22	1.75\pm0.25	1.83\pm0.11	1.90\pm0.10	2.00\pm0.00	
Pooled average Gr I to Gr IV on Day 0:1.33\pm0.10						

Table.5 Comparison of mean fecal control score between conservative management groups (group I and group II), between surgical management groups (group III and group IV) and between different groups on Day 0

Group	Mean fecal control scores (\pm SE)					Pooled average (Groups)
	Interval (Days)					
	Day 0	Day 1	Day 15	Day 30	Day 90	
Group – I	1.64 \pm 0.10	1.59 \pm 0.11	1.91 \pm 0.06	2.00 \pm 0.00	2.00 0.00	1.83\pm0.04
Group – II	1.56 \pm 0.12	1.56 \pm 0.12	1.83 \pm 0.09	1.89 \pm 0.08	1.89 0.08	1.74\pm0.05
Pooled average (Days)	1.60^a\pm0.08	1.58^a\pm0.08	1.88^c\pm0.05	1.95^{df}\pm0.03	1.95^{ef}\pm0.04	
Critical Difference (C.D.) for Interval:0.02358						
Group – III	1.50 \pm 0.22	1.67 \pm 0.21	2.00 \pm 0.00	2.00 \pm 0.00	2.00 \pm 0.00	1.83\pm0.07
Group – IV	1.17 \pm 0.17	1.33 \pm 0.21	1.67 \pm 0.21	2.00 \pm 0.00	2.00 \pm 0.00	1.58\pm0.10
Pooled average (Days)	1.33^a\pm0.14	1.50^b\pm0.15	1.83^c\pm0.11	2.00^{df}\pm0.00	2.00^{ef}\pm0.00	
Critical Difference (C.D.) for interval: 0.08518						
Pooled average Gr I to GR IV on Day 0: 1.54 \pm0.07						

The mean fecal control score in group III on day 0 was 1.50 \pm 0.22 which showed improvement from day 1 and returned to normalcy from day 15 onwards. In group II, similar trend was observed and the fecal control score was normal from day 30 onwards. Both the groups indicated more or less similar improvement and the differences between the group I and II were non-significant. However, there was highly significant difference between the scores at scheduled intervals indicating gradual and

positive impact of the treatment. Olby *et al.*, (2003) after performing decompressive surgeries reported that 15 and 12 dogs that regained deep pain perception had intermittent fecal and urinary incontinence, respectively. However, during the present investigation no such finding could be noted and all the dogs recovered normally as also observed by Holmberg *et al.*, (1990).

Considering all the neurological examinations on day of presentation and subsequently

during the course of treatment, it is concluded that conscious proprioception, deep pain perception, panniculus reflex and urinary bladder tone were found efficient in diagnosis and prognosis of the cases.

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