

## Hemilaminectomy Combined With Medical Therapy for Management of Lumbar Spinal Cord Disorders in Paraplegic Dogs

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### Abstract

The study was conducted to evaluate the functional outcome of lumbar spinal cord disorders in paraplegic dogs. Out of 66 dogs reported with lumbar spinal cord disorder to the Small Animal Orthopaedic Unit, Madras Veterinary College, 12 dogs were selected and divided into two groups. Group I were treated with Methyl prednisolone sodium succinate followed by Hemilaminectomy + Polyethylene glycol, in group II only Hemilaminectomy + Polyethylene glycol was performed. The subjective evaluation of pre and post operative correlation of the functional outcome in group I were higher when compared to group II. The study indicates early medical therapy combined with surgical intervention gives better result in lumbar spinal cord disorders.

**Keywords:** Hemilaminectomy, Polyethylene glycol (PEG), Methylprednisolone sodium succinate (MPSS)

### Introduction

Spinal trauma is a common cause of spinal cord dysfunction causing disability in animals and occurs from exogenous and endogenous injury. Spinal cord disorders involving the lumbar spine is frequently encountered in veterinary practice. Lumbar spinal disorders mainly include intervertebral disc disease, discospondylitis, ischaemic myelopathy, trauma and lumbosacral stenosis. The neurological dysfunction ranges from pain, ataxia, paresis to paraplegia, loss of bladder and bowel control to absence of deep pain sensation. The management of spinal cord disorders remains problematic and overall success rate remains low. Methyl prednisolone sodium succinate (MPSS) is usually used in acute spinal cord disorders (Hall, 1992), but the success rate of recovery remains low. Recent studies of Borgens and Riyi Shi (2000) reported that intralesional application of polyethylene glycol (PEG) have a physiological restoration of injured axons and prevented from further damage. So the study

was undertaken to evaluate the efficacy of combined medical and surgical treatment for the management of lumbar spinal cord disorders in paraplegic dogs.

### Materials and Methods

The study was conducted at the Small Animal Orthopedic Unit, MVC, Chennai over a period of one year. Out of 66 dogs presented with history of spinal disorders were subjected to physical, orthopedic, neurological examination followed by plain radiography. Finally Myelography was performed to localize the spinal lesion and to determine precise landmarks for surgery. Twelve dogs were selected for the study and divided randomly into two groups. Each group consists of six dogs. Group I dogs were treated with MPSS at the dose rate of 30mg/kg Body Weight (BW) within 8-12 hours of injury by slow I/V followed by 15mg/kg BW at 2 hrs and 6 hrs along with lactated ringer's solution (Braughler *et al.*, 1987) then Dorsolateral approach of hemilaminectomy was performed as per standard procedure and PEG was applied intralesionally into the spinal cord. In group II- only dorsolateral approach of hemilaminectomy was performed and PEG was applied intralesionally into the spinal cord. The dogs were kept in cage rest for six weeks with passive physical therapy to prevent the bed sore and muscle atrophy.

### Result and Discussion

The present study reveals that the percentage of lumbar spinal cord disorders were highest in mongrels (27.28%) followed by German shepherd (18.18%). Highest incidence occurred in the age group of 6-10 years (60.6%). This result correlates with the findings of (Priester, 1976) who reported that incidence of Hansen type II protrusion in nonchondrodystrophic breeds occur between 6-8 years of age. The incidence of lumbar spinal cord disorders were more common in dogs this is due to intervertebral disc prolapse

(40.9 %) followed by vertebral fractures (31.81%). This is in accordance with (Hansen, 1952) who stated that type II disc protrusion commonly occurs in nonchondrodystrophic breeds.

Neurological grading was done according to the classification of (Griffith, 1982). Among 66 dogs, 55.66% were graded

5, 31.81% were graded 4, 3.03 % were graded 3, 3.03% were graded 2 and 7.56% were graded 1. Deep pain sensation was a critical parameter in evaluating the severity of spinal cord damage. The grading and evaluation procedure used in the present study mentioned in (Table 1) gave the correct neurological status of the animal.

**Table 1: Preoperative neurological Grading**

Group	Dog No.	Hind limb reflexes			Panniculus Cut off	Muscle Tone	Neurological Syndrome	Bladder status	Localization of Spinal Segments	Grading
		Dp	Cp	Pat						
I	1	A	A	A	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	2	A	A	A	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	3	A	A	A	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	4	P	A	h	T13	Normal	UMN	Tense	T4-L3	4
	5	R	A	N	T13	Normal	UMN	Tense	T4-L3	4
	6	P	A	H	T10	Increased	UMN	Tense	T4-L3	4
II	1	A	A	A	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	2	A	A	h	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	3	A	A	A	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	4	A	A	A	L1	Reduced	LMN	Flaccid, Incontinence	L4-S3	5
	5	R	P	H	T13	Increased	UMN	Tense	T4-L3	4
	6	R	P	N	T13	Normal	UMN	Tense	T4-L3	4

A-Absent P-Present R-Reduced N-Normal H-Hyper h- hypo LMN-Lower motor neuron UMN- Upper motor neuron DP-deep pain CP- conscious proprioception PAT- patellar

Group I dogs were treated with MPSS which inhibit spinal tissue lipid per oxidation, prevents progressive ischemia and increased electrophysiological responses in the spinal cord (Braugher and Hall 1982). No side effects to the drug were observed. Myelography was used to identify the correct location of lesions in the spinal cord and the result was found to be 83.33%, this correlated with the reports of (Kirberger *et al.*, 1992) who reported correct localization of intervertebral disc extrusion as 72% in survey radiograph and 97% on myelogram.

Among various surgical procedures, dorsolateral approach of hemilaminectomy is selected in this study which according to (Forterre *e. al.*, 2007) causes less disruption to the bio-mechanics of the spine and significantly better neurological status immediately after surgery when compared to dorsal laminectomy. Dorsolateral approach provided adequate exposure for the hemilaminectomy procedure and space for removal of disc material. These agreed with the findings of McKee (1992) who stated that disc removal by hemilaminectomy avoided injury to the spinalcord, increased ability to fenestrate the disc and reduced recurrence of disc disease. Poly Ethylene Glycol (PEG) was administered intraslesionally. This is in

accordance with the study of Borgens and Riyi shi (2000) who stated that immediate recovery of spinal cord injury through molecular repair of nerve membrane with PEG in guinea pigs and prevented from further degeneration. Local application of PEG did not elicit any reaction, may be due to its inert nature. Passive physical therapy was advocated to improve muscle tone and to prevent limb edema, muscle atrophy (Taylor, 1992). Wound dehiscence, mild seroma, decubitus ulcers, urine scalds, pressure sores on the digit, quadriceps muscle contracture were the post operative complications encountered

In group I, a subjective evaluation indicated improved neurological outcome when MPSS was administered within 8 hours of injury. This correlated with Hayashi *et al.* (2000) who stated that administration of MPSS more than 8 hrs after injury down regulates the expression of proteins useful in spinal cord healing which could slow the recovery in post operative patients. In group 1, dog no.2, 5, 6 showed increased response to deep pain following medical management but complete neurological recovery was not present. The study confers with Wheeler (2004) who stated that pre operative MPSS increase the recovery rate to about 70%. From this study it is understood that dogs which

showed an improvement of at least one grade of neurological function within 2 weeks of decompressive surgery had a good prognosis. The prognosis for dogs that failed to show a return of deep pain perception was poor and may be due to the fact that these dogs had irreversible spinal injury. This result correlates with Pierre et al. (2003) findings who stated that most sensitive indicator of functional

recovery in complete paraplegic dog was the reappearance of deep pain sensation within two weeks of surgical decompression. One dog with a poor functional outcome was rehabilitated with an indigenously developed ambulatory cart. In group two the neurological gradings were less as compared in group I (Table 2).

**Table 2: Post operative neurological Grading**

Group	Dog No.	Post operative Neurological Grading																										
		1st week					2nd week					4th week					8th week					12th week						
		DP	CP	Pat	bladder	FO	DP	CP	Pat	Bladder	FO	DP	CP	Pat	Bladder	FO	DP	CP	Pat	bladder	FO	DP	CP	Pat	Bladder	FO		
I	1	A	A	A	Flaccid	P	A	A	A	Flaccid	P	P	P	P	h	Flaccid	F	P	P	P	P	Flaccid	G	P	P	P	N	E
	2	A	A	A	Flaccid	P	P	P	N	Flaccid	G	P	P	N	N	E	P	P	N	N	E	P	P	N	N	N	N	E
	3	A	A	A	Flaccid	P	P	A	A	Flaccid	P	P	R	H	Flaccid	F	P	R	H	Flaccid	F	P	R	H	Flaccid	F		
	4	A	A	H	Tense	P	P	A	H	Tense	P	P	A	H	Tense	P	P	R	H	Tense	P	P	R	H	Tense	F		
	5	R	P	H	Tense	P	A	P	N	Tense	G	P	P	N	N	E	P	P	N	N	E	P	P	N	N	N	N	E
	6	P	A	H	Tense	P	R	A	H	Tense	P	P	R	H	N	G	P	A	H	N	G	P	P	H	N	G		
II	1	A	A	A	Flaccid	P	A	A	A	Flaccid	P	A	A	A	Flaccid	P	A	A	A	Flaccid	P	A	A	A	Flaccid	P		
	2	A	R	H	Flaccid	P	P	A	H	Flaccid	P	R	A	H	Flaccid	P	R	A	h	Flaccid	P	R		H	Flaccid	P		
	3	A	A	A	Flaccid	P	A	A	N	N	P	P	P	N	N	G	P	P	N	N	G	P	P	N	N	G		
	4	P	R	A	Flaccid	G	P	R	A	Flaccid	E	R	P	N	N	E	R	P	N	N	E	R	P	N	N	E		
	5	R	R	H	Tense	P	R	R	H	N	G	P	R	N	N	G	P	R	N	N	G	P	R	N	N	G		
	6	R	R	H	Tense	P	P	R	N	N	G	P	R	N	N	G	P	R	N	N	G	P	R	N	N	G		

FO-functional outcome P-Poor (Paraplegia); F-Fair (moderate to severe hind limb ataxia); G-Good (slight residual ataxia); E-Excellent- (full recovery)

From these finding we conclude that group I dogs showed higher neurological recovery grades than group II. This may be due to synergistic effect of MPSS and PEG.

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