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# **Case Study Contest**



**Use of PCSO-524®  
in Combination with  
Prednisolone for  
Treatment of Spinal  
Cord Injury from Disc Pro-  
trusion in Dogs**

**Kanokwan Kerdwut <sup>1</sup>  
Pichnan Leeharatanarak <sup>2</sup>  
Wutiwong Teerapan <sup>3</sup>  
Pakatorn Lewchalermwong <sup>4</sup>  
Anchulee Dulyachat <sup>5</sup>**

**Faculty of Veterinary Medicine,  
Kasetsart University**

## Abstract

Male Shih tzu dog aged 9 years and 1 month was diagnosed with limb paralysis after jumping 4 days prior to the hospital visit. The dog showed weak response of forelimb reflex and severe neck pain. X-ray examination showed block vertebrae at C3 and C4. Magnetic resonance imaging (MRI) examination found mild disc protrusion, compression on spinal cord and myelopathy at C4 and C5 with compression on the right dorsal lamina. Prednisolone and gabapentin were prescribed to reduce inflammation and pain, respectively. Follow-up examination showed that the dog had improved neurological signs and the limb paralysis was at level 2. However, weakness of all 4 legs was still present, particularly on the right side. The dog fell on the right more often than the left while walking. Reflex response of left forelimb was better than that of right forelimb. Neck pain was decreased. The dog had polydipsia and polyuria. Hematological examination found that alkaline phosphatase (ALK) highly increased compared to value on the first day; therefore dosage of prednisolone was reduced. Follow-up after reduction of prednisolone showed that the dog fell more often while walking and slight neck pain was present. Prednisolone dosage was then increased and PCSO-524® was prescribed to reduce inflammation of the spinal cord. Later examination found that the dog could walk without falling, both forelimbs showed normal reflex, and signs of neck pain disappeared. Termination of prednisolone was then started without any recurrent clinical signs. After continuous treatment with PCSO-524® for 6 weeks, the dog could walk normally, both forelimbs showed normal reflex, and the ALK level was nearly back to the level prior to the treatment.

### Keywords:

Disc protrusion, prednisolone, PCSO-524®, myelopathy, block vertebrae

## Case history

Intact male Shih Tzu aged 9 years and 1 month weighted 9 kg was admitted to veterinary hospital at Kasetsart University, Bang Khen campus. Clinical history was inability to walk since 4 days ago after jumping over a door sill. Prior to the admission, the dog was treated at a veterinary clinic but there was no response and the given medication was not known. The dog had normal appetite.

## Physical and neurological examination

Physical examination showed paralysis of 4 limbs at level 4 (Figure 5). Forelimb reflex was impaired. The dog could not control urination and defecation. The spasm and severe pain of neck muscle was observed. Response to pain was normal for all 4 limbs. Lung and heart sound and mucous color were normal.

## Diagnosis plan and results

Blood chemistry analysis showed that alanine aminotransferase (ALT) and alkaline phosphatase (ALK) were higher than normal (420 IU/L and 438IU/L, respectively). X-ray examination identified block vertebrae at C3 and C4 (Figure 1)



Figure 1. X-ray image showed block vertebrae at C3 and C4 (red arrow)

## Treatment outcome and Follow-up results

Preliminary physical, neurological, hematological and radiographic examinations provided evidence that the dog was suffered from dislocation of vertebral disc. Prednisolone (Prednisolone Olan®, Olan-Kemed Co., Ltd., Bangkok, Thailand) 0.5 mg/kg bid, gabapentin (VULTIN 100®, Unison Laboratories Co., Ltd) 10 mg/kg bid, 1 tablet of vitamin B complex (RE-B FORT®, Unison Laboratories Co., Ltd) sid, 1 tablet of acetylcysteine (MUCOMIX®, Samarth Lifesciences PVT., Ltd Samutprakarn, Thailand) 600 mg sid as anti-oxidant, 1 tablet of vitamin E (Natural VITAMIN E®, Mega Lifesciences Ltd., 200 mg sid, 1 tablet of sucralphate (Ulsanic TM, Siam Bheasach Co., Ltd. Bangkok, Thailand) 1 g bid as stomach-lining protector, and 1 tablet of samarin (Samarin®140, Berlin Pharmaceutical Industry Co., Ltd) 140 mg sid as liver supplement were prescribed. Four days after the treatment, the dog showed no signs of improvement; therefore, magnetic resonance imaging (MRI) examination was used for further diagnosis.

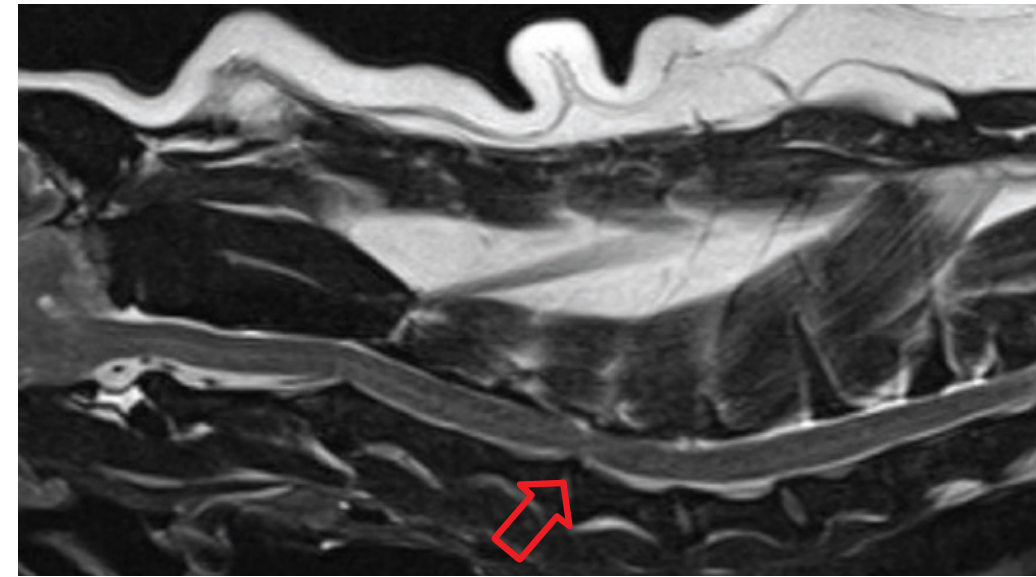


Figure 2. MRI (T2W) image showed compression of spinal cord from prolapsed vertebral disc at C4-C5 (red arrow)

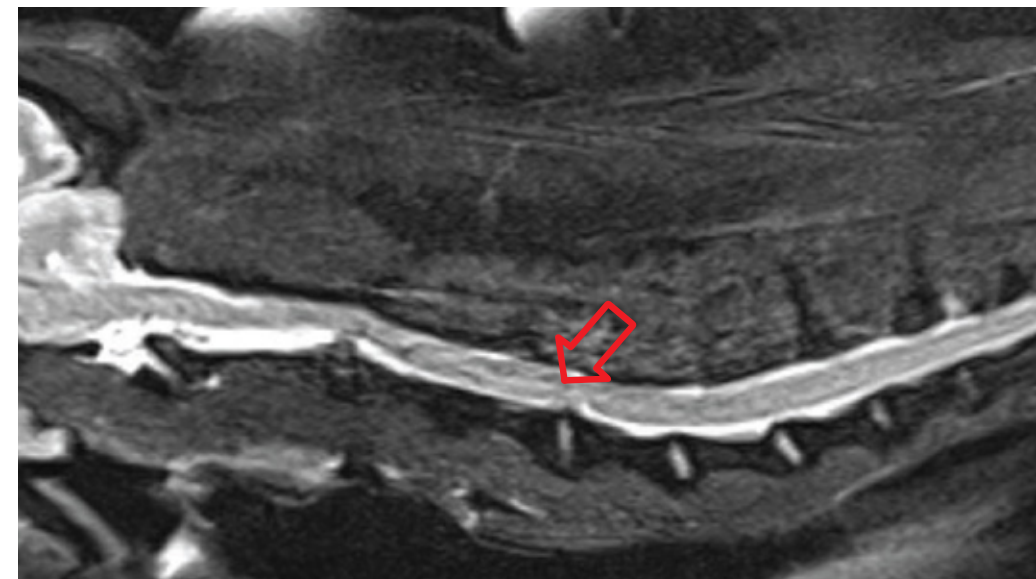


Figure 3. MRI (STIR) image showed inflammatory lesion of spinal cord (myelopathy) at the red arrow





Figure 4. MRI image showed compression of spinal cord from prolapsed vertebral disc at C4-C5 with compression on the right dorsal lamina (red arrow)

MRI images showed dislocation of vertebral disc and mild compression of spinal cord (Figure 2), myelopathy (Figure 3), and compression of the right dorsal lamina (Figure 4). Prescription after the MRI diagnosis included 20% mannitol (Manital 20%, A.N.B. Laboratories Co., Ltd. 557 Ramintra Road, Bangkok, Thailand) 0.5 mg/kg, intravenous injection of furosemide (H-Mide®, L.B.S. Laboratories Ltd., Bangkok, Thailand) 0.07 mg/kg sid to reduce edema of the spinal cord, prednisolone 0.5 mg/kg bid, gabapentin 10 mg/kg tid, and diazepam (Sipam TM, Siam Bheasach Co., Ltd., Bangkok, Thailand) 0.5 mg/kg bid as muscle relaxant for neck pain relief.

After 1 week of follow-up, the dog showed improvement of clinical signs and the limb paralysis was at level 2. However, weakness of all 4 legs was still present, particularly on the right side. The dog fell on the right more often than the left while walking. Reflex response of left forelimb was better than that of right forelimb. Neck pain was decreased. The dog had polydipsia and polyuria. Hematological examination found that alkaline phosphatase (ALK) highly increased (2040 IU/L) compared to value on the first day as a result of long and continuous use of steroid. Therefore dosage of prednisolone was reduced to 0.5 mg/kg sid. Diazepam use was terminated and same (SAmE225®, Laboratories a division of FoodScience Co., Ltd., USA) 225 mg 1 tablet sid as liver supplement, and ursodeoxycholic acid (Ursolin®, Berlin Pharmaceutical Industry Co., Ltd., Bangkok, Thailand) half tablet sid were added.

The owner was suggested to limit mobilization of the dog. Three weeks after dosage of prednisolone was reduced, the movement of the dog was worse, falling was more often and the neck pain was slightly present. Prednisolone then was increased to 0.5 mg/kg bid for 1 week and down to sid in the following week in combination with 1 capsule of PCSO-524® (Antinol®, MDMC CO.,Ltd) sid.

The follow-up examination showed better movement of the dog, no falling, better reflex of the forelimbs, and no neck pain. Prednisolone was then reduced to 0.25 mg/kg sid and continued every other day for another week in combination with PCSO-524® for 4 weeks. By the end of treatment course, the dog could walk normally without falling, both forelimbs showed normal reflex, and the ALK level was nearly back to the level prior to the treatment (ALT 239 IU/L, ALK 508 IU/L).

The table of hematological results showed that ALK increased during 31 days of the treatment as a result of continuous prednisolone administration and decreased after prednisolone dosage was reduced.

ผลเลือด	10/11/2016 (Day 1)	22/12/2016 (Day 12)	10/01/2017 (Day 31)	24/01/2017 (Day 45)	20/02/2017 (Day 72)	ค่าปกติ
HGB	18.3	17.4	18.6	18.2	-	10-18gm%
PCV	51.00	49.8	49.5	51.4	-	35-55%
RBC	7.58	7.26	7.37	7.33	-	5-9X 10 <sup>6</sup> /cumm
WBC	16,300	8,050	8,000	8,920	-	6,000-17,000X 10 <sup>6</sup> /cumm
SEGS	14,670	6,520.5	6,800	6,511.6	-	3,000-11,400
LYMPH	1141	483	880	1,784	-	1,000-4,800
MONO	489	563.5	-	356.8	-	150-1,350
EOS	-	483	320	267.6	-	100-750
PLATELETS	337	383	401	359	-	200-500X10 <sup>3</sup> /μl
PROTEIN	8	6.2	7	7	-	6-7.5gm%
BUN	9	12	13	13	-	10-26mg%
CREATININE	0.72	0.58	0.63	0.63	-	0.5-1.3mg%
ALT SGPT	420	367	398	308	239	6-70 37° C IU/L
ALK PHOS	438	2,070	1,888	1,178	508	8-76 37° C IU/L
TP	8.1	-	-	-	-	5.3-7.8gm%
ALBUMIN	4.3	-	-	-	-	2.3-3.2gm%

## Discussion

Disorders of vertebrae such as hemivertebrae, butterfly vertebrae, and block vertebrae are genetic disorders. The deformed structure can affect vertebral stability and influence degeneration of the disc. The MRI examination in this case showed disc protrusion that caused compression of the spinal cord called Hansen type II IVDD (disc protrusion) at C4-C5. The lack of vertebral stability and the pressure that was higher than normal while the dog was jumping must have caused the protrusion since the block vertebrae was at C3-C4.

This case study found that use of prednisolone in combination with other medications for treatment of myelopathy due to disc protrusion and compression during the first 6 week of the incident may show no progressive results. Collapse while walking, neck pain, and abnormal reflex of forelimbs still remained. Recovery of neurological disorders usually takes 3-4 weeks. The attending veterinarian suggested spinal decompress operation but the owner preferred the medication treatment in addition to the fact that liver enzyme of the dog was high. Therefore PCSO-524® was prescribed in combination with prednisolone. The mechanism of PCSO-524® includes anti-inflammation. Omega-3, which is the main ingredient of PCSO-524® has neuroprotective effect in acute neurological injury and may have effect on central nervous system in which long-chain polyunsaturated fatty acid (PUFA) consists of omega-3 and 6 unsaturated fatty acid. The property of PCSO-524® may improve the neurological disorder in this case. However, further studies in other cases are needed

## Conclusion

After 6 weeks of prednisolone treatment for spinal cord injury due to disc protrusion, the dog showed improvement of neurological signs. Walking was restored, less neck pain was observed, but falling particularly on the right still remained. The falling was more frequent when prednisolone was reduced therefore PCSO-524® was prescribed in combination with prednisolone. After 6 weeks, no signs of falling and neck pain were observed and normal reflex of forelimbs was restored. Prednisolone was reduced and eventually terminated without recurrence of any clinical signs. The chance of getting adverse effects from long-term use of steroid was therefore eliminated.

## Illustrations

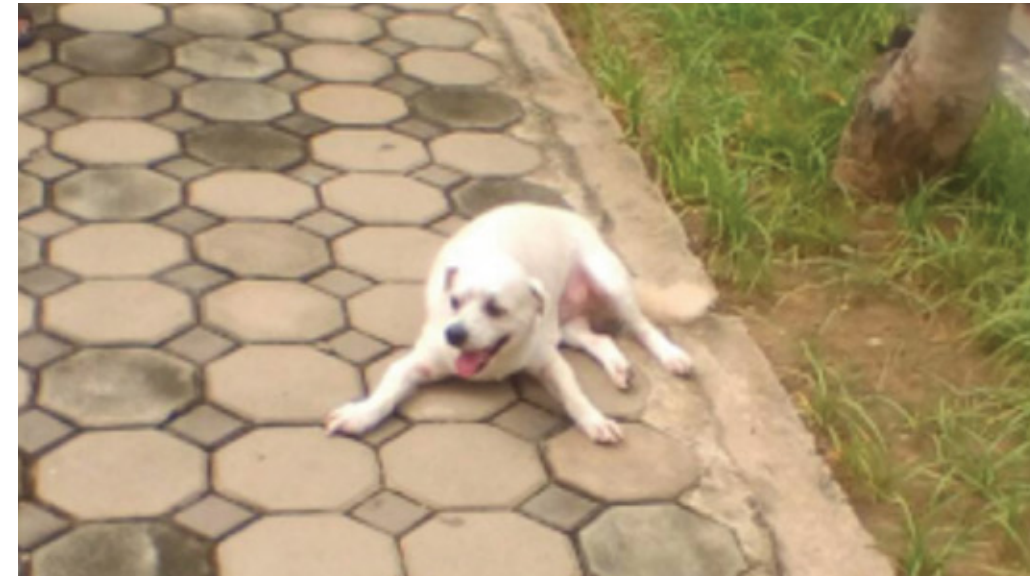


Figure 5. Paralysis of 4 limbs prior to the treatment





Figure 6. The dog could stand, walk and run normally

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