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EVALUATION OF RADIOLOGICAL FINDINGS OF DOGS WITH THORACOLUMBAR DISORDERS

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Abstract: A study was undertaken to evaluate the radiological findings of thoracolumbar spinal disorders in dogs irrespective of breeds, age and sex at the Small Animal Orthopaedic Unit, Madras Veterinary College Teaching Hospital over a period of 11 months of period from June 2013 to April 2014. The data regarding the incidence of dogs presented with history and clinical symptoms suggestive of thoracolumbar spinal disorders during the study period were recorded and compared with previous findings.
Keywords: Thoracolumbar spinal disorders, Radiological findings, Paraplegic dogs.

Introduction

Thoracolumbar fractures are usually the result of high energy injuries. Because it is the anatomical and mechanical transition zone between the relatively rigid thoracic and more flexible lumbar spine, the thoracolumbar junction is the most common site of spinal injuries. Radiological findings helps Veterinarian for early tentative diagnosis in treatment of pets especially dogs with thoracolumbar disorders. Olby *et al.*(1994) reported that survey radiography was only 68 per cent -72 per cent accurate in identifying the site of disc extrusion. Lamb *et al.,* (2001) mentioned the six radiographic signs for narrowed intervertebral space that was 1. Narrowed or wedge-shaped intervertebral space; 2. narrowed articular process joint space; 3. Decreased size and/or increased opacity of the intervertebral foramen; 4. Calcified material in the vertebral canal; *5.*gas in the intervertebral space (vacuum phenomenon); and 6**.** Displacement of calcified dura towards the cord (automyelogram).

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Materials and Methods

The study was conducted at the Small Animal Orthopaedic Unit, Madras Veterinary College Teaching Hospital to evaluate the radiological findings of thoracolumbar spinal disorders in dogs irrespective of breeds. The data regarding the radiological findings of paraplegic dogs during the period from June 2013 to April 2014 were collected and the breed, age, sex and etiology of thoracolumbar spinal disorders were recorded along with Etiology of the disorder. One hundred and twenty cases of thoracolumbar spinal disorders were recorded and included for the present study. The dogs were sedated with xylazine hydrochloride at a dose rate of 1 mg/kg body weight intramuscularly. Lateral and ventrodorsal radiograph of the thoracolumbar of the spine were taken. For lateral view of radiograph 320 mA for large breeds and 160 mA for small breeds with 66 Kv and 6.5 mAs were used. For ventrodorsal view, 320 mA for large breeds and 160 mA for small breeds with 70 Kv and 6.5 mAs were used. Care was taken to see that the animals were subjected to minimal handling and movement especially in cases suspected with spinal fractures and luxations. With reference to (Bali *et al.,* 2009) Degree of dislocation ranged from 0 to 100 per cent and was assessed by calculating the displacement of the vertebral canal between the cranial and caudal segment. The ventral margin of the vertebral canal was defined as a direct line from the most dorsal point at the cranial vertebral end plate to the most dorsal point at the caudal vertebral end plate. The dorsal vertebral canal margin ran parallel to the first line, on the level of the most ventral aspect of the vertebral lamina. Axis deviation was assessed as the acute angle between the long axis of the cranial and the long axis of the caudal segment. The long axis of the each segment was calculated from the three vertebrae adjacent to the lesion. A direct line was drawn from the most ventral point of the vertebral channel at the level of the cranial vertebral end plate of the most cranial vertebra, to the most ventral point at the level of the caudal vertebral end plate of the most caudal vertebra.

Results

The percentage of incidence of thoracolumbar spinal disorders in various breeds among the 96 dogs were Boxer 9.30 per cent, Dachshund 21.87 per cent, Doberman 4.16 per cent, German Shepherd 12.55 per cent, Great Dane 2.08 per cent, Labrador Retriever 10.47 per cent, Lhasa Apso 2.08 per cent, Mongrel 18.75 per cent, Spitz 14.58 per cent and Pug 4.16 per cent respectively.

The percentage incidence of thoracolumbar spinal disorders in various age groups during the period of study were 39.58 per cent for 0 to 5 years, 43.75 per cent for 6 to 10 years and 16.67 per cent for 11 to 15 years.

The percentage sex-wise incidence of thoracolumbar spinal disorders during the period of study was 39.58 per cent in male and 60.42 per cent in females respectively. 30 per cent of males were intact whereas 48 per cent of female dogs were neutered.

The percentage incidence of various thoracolumbar spinal disorders were 36.46 per cent for intervertebral disc disease, 22.92 per cent for vertebral fracture, 13.54 per cent for vertebral luxation, 8.33 per cent for spondylitis, and 16.67 per cent for spinal cord concussion 2.08 per cent for others (Spondylosis, discospondylitis).

RADIOLOGICAL FINDINGS

Plain Radiography

Lateral and ventrodorsal views of plain radiographs were found appropriate for identifying the site of thoracolumbar spinal cord lesions. Plain radiological interpretations correlated with myelographic findings in five cases.

Plain radiography tentatively helped to diagnose one intervertebral disc prolapse based on narrowed intervertebral space, and intervertebral foramen in three cases which was subsequently confirmed by myelography. Plain radiographic imaging of spondylitic lesion indicated multiple vertebral osteophytic proliferations with compression at the level of T_{13}-L_1 (Plate 49). Lateral view of radiographs were found appropriate to measure axis deviation, dog no. 1 and degree of dislocation in dog no. 8. The figures are presented with Plain radiographic lateral view showing L fracture of vertebral body (Figure1), Plain lateral and ventrodorsal radiographic view showing T -L fracture luxation Figure 2 and 3), Plain radiographic lateral view showing L -L compression fracture (Figure 4) and Plain radiographic lateral view showing L -L fracture luxation (Figure 5).

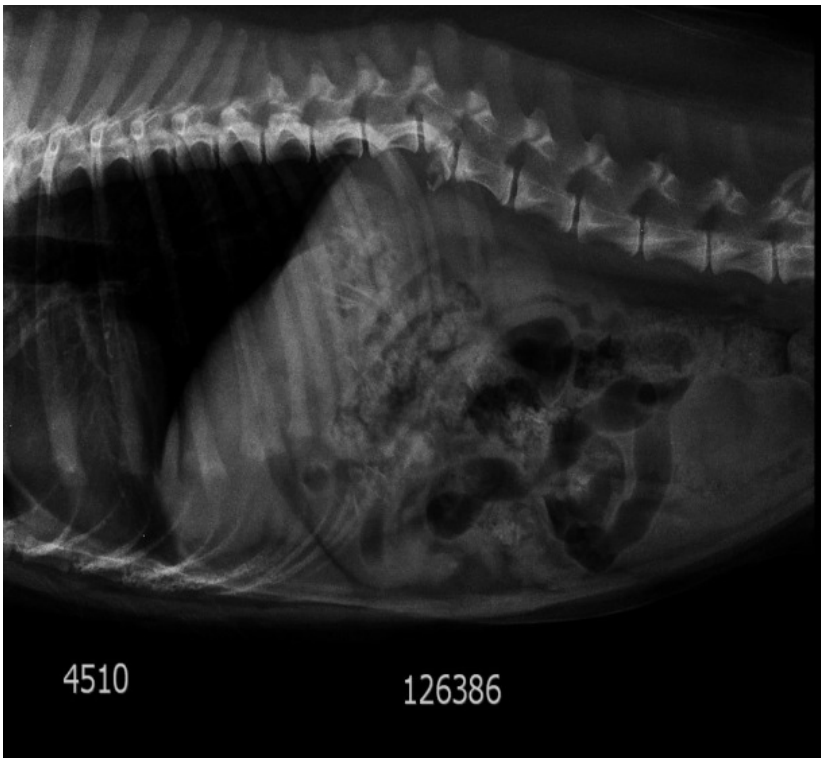

Figure 1. Plain radiographic lateral view showing L fracture of vertebral body

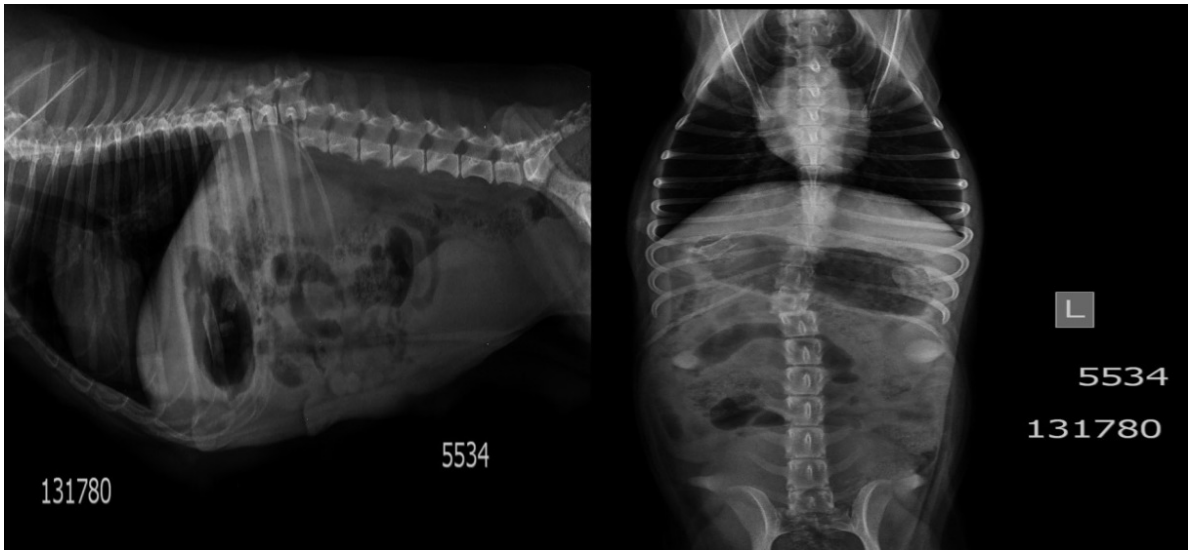

Figure 2 and 3. Plain lateral and ventrodorsal radiographic view showing T -L fracture luxation

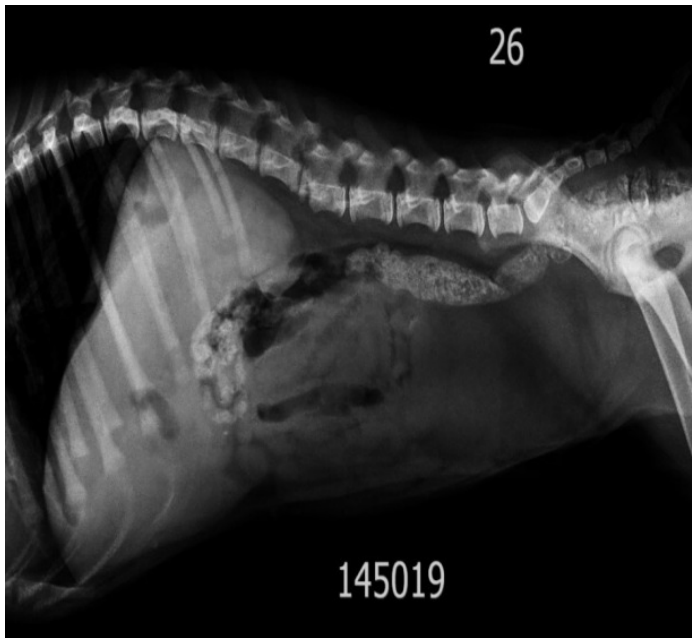

Figure 4. Plain radiographic lateral view showing L -L compression fracture

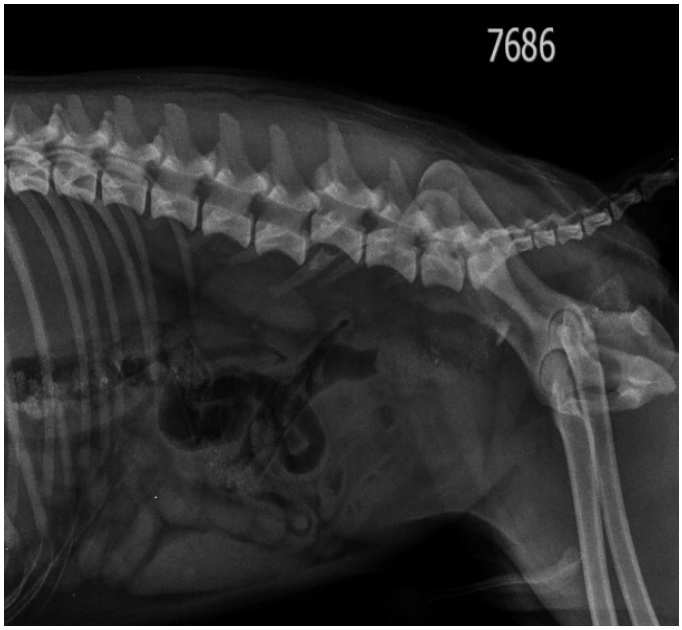

Figure 5. Plain radiographic lateral view showing L -L fracture luxation

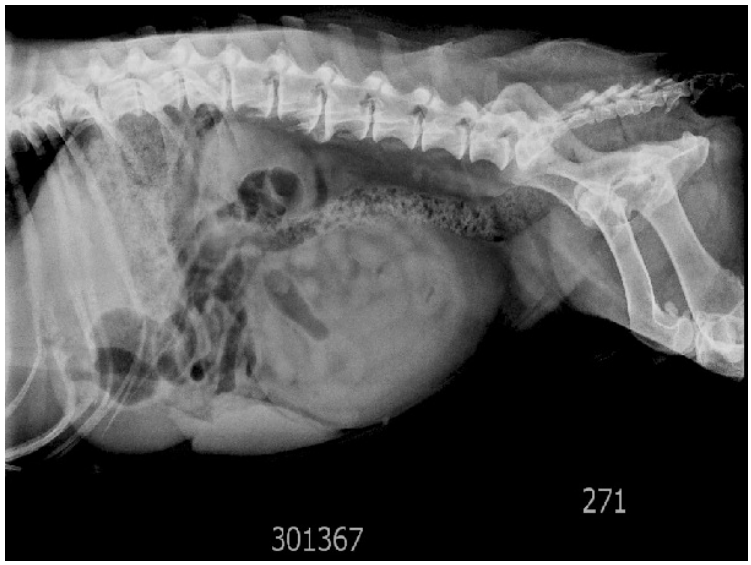

Figure 5. Plain radiographic lateral view showing vertebral osteophytic proliferation at lumbar vertebra

Plain radiography was unable to lateralise the lesion in intervertebral disc herniation. Positioning the animal for obtaining plain radiographs using foam pads and wedges assisted in keeping the spine parallel to the cassette and film.

A central beam of x-ray focused on the area of interest provided good diagnostic images. For lateral views, 320 mA for large breeds and 160 mA for small breeds with 66KV and 6.5mAs and for ventrodorsal views, 320 mA for large breeds and 160 mA for small with 70KV and 6.5 mAs provided good density, detail and contrast of the area of interest to assess the vertebral column adequately

Discussion

In the present study, lateral and ventrodorsal projections were examined to evaluate the thoracolumbar vertebral column. The axial skeleton was extended and the x-ray beam centered directly over the area of interest. Positioning the animal for obtaining plain radiographs was accomplished by using foam pads and wedges to keep the spine parallel to the cassette and film. This was in accordance with the procedure of Ronald (1992).

Precise radiographic diagnosis was possible only in cases of fractures, luxations and spondylitis. Radiographic features of sclerosis of the vertebral end plates, collapse of the intervertebral disc space and vertebral osteophytic proliferation involving the ventral aspect of thoracolumbar vertebrae were observed in spondylitis. This was in accordance with the report of Owens (1982) and Toombs and Bauer (1993). Radiographic study of fractures and luxations involved determination of location of fracture and/or luxation, approximating the

reduction in size of the vertebral canal and estimating the degree of angulation and amount of vertebral displacement. Vertebral segment instability cannot be determined from a single radiograph and the three compartment theory proposed by Bagley (2000) was used as a template to determine the stability of spine.

In the present study, serial radiographs, degree of dislocation and axis deviation were assessed to determine which compartment or compartments were damaged. When two or three compartments were fractured or displaced, the fracture was considered unstable. If only one compartment was affected, the fracture was considered stable. Precise radiographic diagnosis of neurological lesion due to intervertebral disc prolapse was limited to the fact that spinal cord cannot be seen on plain radiography (William *et al*., 1990). Radiographic signs of intervertebral disc disease such as narrowing of the intervertebral disc space and intervertebral foramen were observed in the present study and were in accordance with Braund (1993). The six radiographic signs mentioned by Lamb *et al.* (2001) were: 1. narrowed or wedge-shaped intervertebral space; 2. narrowed articular process joint space; 3. decreased size and/or increased opacity of the intervertebral foramen; 4. calcified material in the vertebral canal; 5. gas in the intervertebral space (vacuum phenomenon); and 6**.** Displacement of calcified dura towards the cord (automyelogram). Of these, narrowed intervertebral space was the most predictive. However, normal variations in the width of the intervertebral varied according to the breed. The radiopaque calcified disc material in the intervertebral space could not be visualized in a majority of cases which could be probably be due to phagocytosis of the disc material or obscured by pedicles as reported by Hoerlein (1953).

Conclusion

In the present study, serial radiographs, degree of dislocation and axis deviation were assessed to determine which compartment or compartments were damaged. When two or three compartments were fractured or displaced, the fracture was considered unstable. If only one compartment was affected, the fracture was considered stable. Evaluation of the radiographs helped determine severity of injury and determine the method of fixation. Lateral and ventrodorsal views of plain radiographs were diagnostic in cases of thoracolumbar spinal fractures, luxations and spondylitis. Calculating degree of dislocation and axis deviation was found useful to determine the severity of spinal cord injury in cases with vertebral fractures and luxations. Intervertebral disc diseases were difficult to interpret in plain radiographs.

References

[1] Bagley, R.S., (2000). Spinal fracture or luxation. *Vet. Clin. North Am. Small Anim. Pract.,* 30: 133-153.

[2] Bali M.S., J. Lang, A. Jaggy, D. Spreng, M.G. Doherr and F. Forterre, (2009). Comparative study of vertebral fractures and luxations in dogs and cats. *Vet. Comp. Orthop. Traumatol.,* 22: 47–53.

[3] Braund, K.G., (1993). Intervertebral disc disease. Disease mechanism in small animal surgery. 2nd edn. In Bojrab M.J(Ed): Philadelphia, W.B. Saunders Co., pp.1070-1086.

[4] Hoerlein, B.F., (1953). Intervertebral disc protrusion in the dog – Incidence and pathological lesions. *J. Am. Vet. Res.,* 14: 260-269.

[5] Lamb, C.R., A. Nicholls, M. Targett and P. Mannion, (2001). Accuracy of survey radiographic diagnosis of intervertebral disc protrusion in dog. *Vet.Radiol & Ultras.,* 43(3): 222-228.

[6] Olby, N.J., J. Dyce and J.E.F. Haulton, (1994). Correlation of plain radiographic and lumbar myelographic findings with surgical findings in thoracolumbar disc disease. *J. Small Anim. Pract.,* 35: 345-350.

[7] Owens, M.J., (1982). The spine. In radiographic interpretation for the small animal clinician. 2nd edn. Ralston Purina co., St. Louis, Mussourl, USA. pp 83-84.

[8] Ronald, D.S., (1992). Radiography, myelography, computed tomography, and magnetic resonance imaging of the spine. *Vet. Clin. North Am. Pract,* 22: 811–831.

[9] Toombs, J.P. and M.S. Bauer, (1993). Intervertebral disc disease. Textbook of small animal surgery. In Slatter, D (Ed): II Edn, W.B. Saunders Co., Philadelphia, pp. 1070-1086.

[10] William, B.R., G.K. Braund and A. Shores, (1990). Radiographic evaluation of dogs and cats with acute spinal cord trauma. *Vet. Med.,* 18: 703-723.